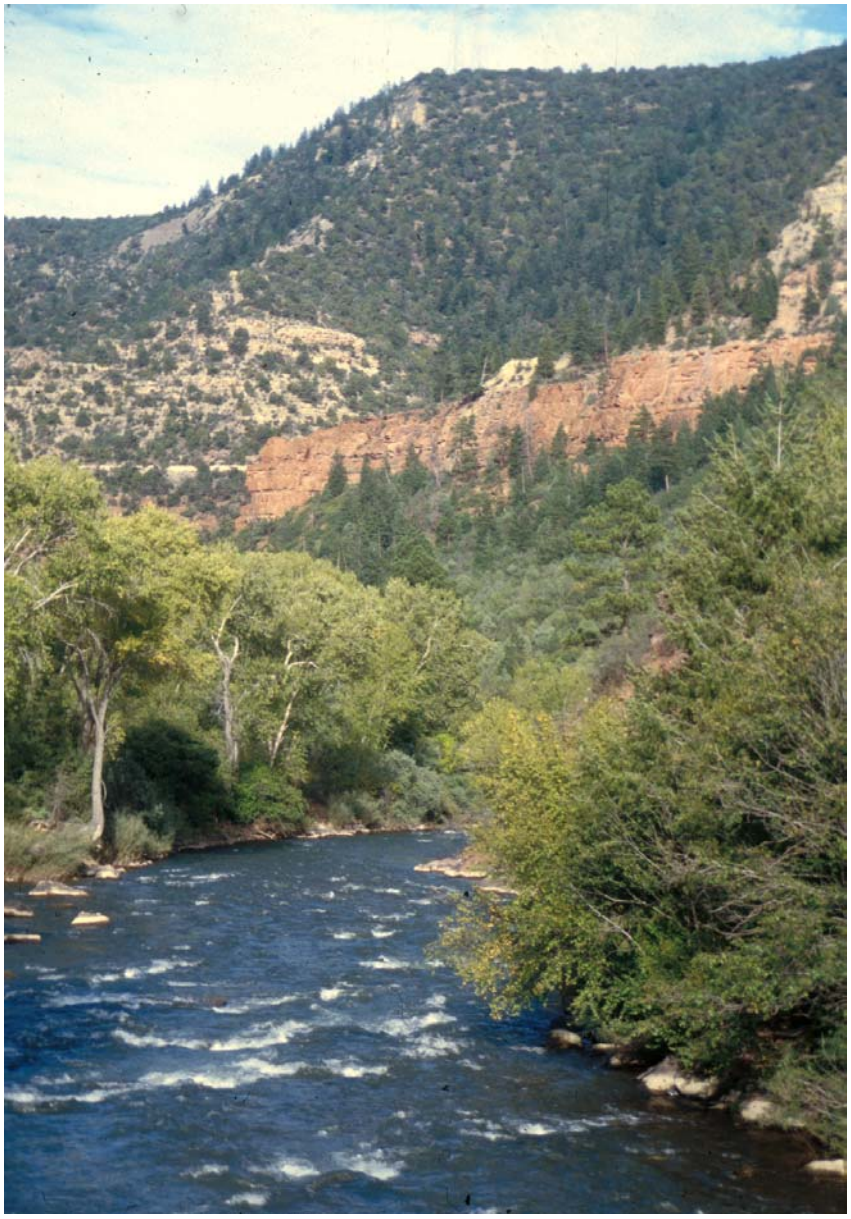
# A Natural Heritage Assessment
## San Miguel and Western Montrose Counties, Colorado



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# Executive Summary

Citizens of San Miguel and Montrose counties are concerned about rapid growth, resulting in loss of open space, wildlife habitat, and unique natural surroundings. They recognize the need to plan for the conservation of plants and animals that are native to the San Miguel River and Dolores River Basins, especially those that depend on this area for their survival. The people and government of San Miguel County are serious about protecting their natural heritage, and have taken many steps toward that end, including organizing the San Miguel Watershed Coalition, the San Miguel Conservation Foundation, and the San Miguel Open Space Committee. The county has dedicated funds to purchase land or development rights in the San Miguel and Dolores corridors. With limited resources, but many potential projects, these organizations are faced with having to set priorities. The need for information on the locations of irreplaceable biological resources of the area is urgent.

In 1998, The Nature Conservancy, and the Colorado Natural Heritage Program (CNHP) proposed to the San Miguel County Open Space Committee and the San Miguel Board of County Commissioners, that a biological assessment be conducted for the western part of Montrose County and all of San Miguel County. This would complete the survey that was conducted in the eastern half of Montrose County in 1998, and add to the growing number of Colorado counties that have been surveyed by CNHP. The goal of the project would be to systematically identify the localities of rare, threatened, or endangered species and the locations of significant natural plant communities. In addition, CNHP offered to present the results of the study to the county commissioners, county planning departments and interested local groups, and assist in protection efforts.

Funding for the biological assessment was provided by a Great Outdoors Colorado planning grant to San Miguel County. The county then contracted with Colorado Natural Heritage Program to perform the biological assessment.

The Colorado Natural Heritage Program began its research by updating its Biological and Conservation Data System with existing information. This was drawn from previous studies by various individuals and organizations, including the Colorado Division of Wildlife (CDOW) database, regional and local herbaria, local experts, federal agencies, and others. Based on these data, we identified over 180 targeted inventory areas (TIAs) for field research. Additional areas of interest were added to this list during the field surveys.

Field surveys began in April 1999 and continued through November 1999. Results of the survey confirm that San Miguel and western Montrose counties contain areas with high biological significance. The riparian zones of the San Miguel and Dolores River are outstanding when viewed at a global scale. There are several extremely rare plants and animals that depend on this area for the survival of their species. Conversely, as a result of this survey, some plants and animals were found to be more common than had been thought. Forty-four rare or imperiled plant species, twenty-four animal species, and fifty plant communities of concern have been documented for San Miguel and western Montrose counties. Of these, fifteen plant species, nine animal species, and eleven plant communities were recorded for the first time in the CNHP database for the area.

We have identified fifty-nine Potential Conservation Areas (PCAs), containing 338 occurrences of rare or imperiled plants, animals, and natural communities. Each PCA is ranked according to its biodiversity significance. Results of the survey are presented here, with descriptions and discussion of each Potential Conservation Area. The results will also be provided to the counties in GIS format, and will be available to the public on the CNHP website (http:\\www.cnhp.colostate.edu).

The delineation of Potential Conservation Area boundaries in this report does not confer any regulatory protection of recommended areas. They are intended to be used to support wise planning and decision making for the conservation of these significant areas. Additional information may be requested from Colorado Natural Heritage Program, 254 General Services Building, Colorado State University, Fort Collins, CO 80523.

**ACKNOWLEDGEMENTS**

This project would not have been possible without the help of many dedicated individuals.

We thank San Miguel County for sponsoring the project, and Great Outdoors Colorado for providing the funding. We appreciate the support of the San Miguel and Montrose County Commissioners. April Montgomery and members of the San Miguel County Planning Department and San Miguel Open Space Committee were extremely helpful with the logistics of accessing private lands. Both County Assessors' Offices were helpful in determining land ownership.

We received much help and good advice from the Bureau of Land Management, especially Jim Ferguson and Amanda Clements in the Uncompahgre Basin Resource Area and Gary Thrash in the San Juan Resource Area; the U. S. Forest Service, especially Craig Grother; and the Colorado Division of Wildlife, especially Jim Garner and Sherman Hebein.

Members of the Colorado Native Plant Society and other friends and volunteers helped in the field and in the office. Dickson Pratt, Peggy Howe, Karen Friedman, Gretchen VanReyper, Lori Brummer, Joan Schmid, and Liza Stephenson accompanied us on our explorations. Bob and Helen Olivier provided raft trips on the Dolores and San Miguel Rivers, and enthusiastically climbed up steep cliffs to look for hanging gardens. Vern Ebert drove us to the summit of Imogene Pass in his jeep. Art Goodtimes has been a constant supporter, and gave us a head start by helping us find rare milkvetches in the Dolores Canyon before the project began. Mallory Dimmit and Caroline Byrd of The Nature Conservancy helped to set up meetings for us to present our findings to the community.

We appreciate all of the landowners who gave us permission to survey their property. We enjoyed meeting them, and in many cases hiking with them on their property.

Our staff in Fort Collins, including Mary Klein, Jill Handwerk, Susan Spackman, Dave Anderson, Jodie Bell, Kim Fayette, Renee Rondeau, Barry Baker, Amy Lavender, Jeremy Siemers, and Mike Wunder all worked with us patiently.

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# I. Introduction

## 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, science-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 based upon the number of known locations of the species as well as its biology and known threats. By ranking the relative rarity or imperilment of a species, the quality of its populations, and the importance of associated conservation sites, the methodology can facilitate the prioritization of conservation efforts so the most rare and imperiled species may be preserved first. As the scientific community 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 species or communities is an important step in comprehensive conservation planning.

## Colorado's Natural Heritage Program

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

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

Museum in 1992 and then in 1994 to the College of Natural Resources at Colorado State University.

CNHP's 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 locations 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 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, the U.S. Bureau of Land Management 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 species or community 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. Naturita milkvetch, which is known from 37 locations in the Four Corners Area, 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.

## 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 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" followed by a character. **These ranks should not be interpreted as legal designations.**

| | |
|---|---|
| **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. |
| **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.

## 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** | Potential Endangered or Threatened; species or subspecies formally Potential for listing as endangered or threatened. |
| **PD** | Potential for delisting |
| **C** | Candidate: species or subspecies for which the U.S. Fish and Wildlife 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. This list does not include species that are listed endangered (LE) or threatened (LT).

**State Status:**

1. Colorado Division of Wildlife

**CO-E** Endangered
**CO-T** Threatened
**CO-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 is 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

## Potential 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. Not all element occurrences are included in PCAs. Sites are ordinarily drawn for A to C ranked G1 to G3 and S1 or S2 elements only. Other lower ranked element occurrences may fall geographically within the site boundaries, and are thus included, but would not warrant a PCA on their own. In addition, sites may be drawn for lower ranked species that are of local conservation interest, *e.g*. the Colorado River cutthroat trout in the San Miguel Basin study area.

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 Potential 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 necessarily recommend the exclusion of 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 and other significant elements that fall within the site.

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 thoughtful land-use planning at all levels.

## Off-Site Considerations

It is often the case that all relevant ecological processes cannot be contained within a Potential Conservation Area of reasonable size. For instance, while a PCA for Colorado River cutthroat trout may be drawn to include only the riparian zone of a river or creek, it should be remembered that activities in the entire watershed can affect water quality, which will in turn affect the trout population. 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 countywide efforts as well as coordination and cooperation with private landowners, neighboring land planners, and state and federal agencies.

## Ranking of Potential 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 rank (B rank)**:

> **B1** Outstanding Significance: the 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 Statewide 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. Protection strategies on private lands may involve purchase, purchase of development rights, or conservation easements. On public lands, they may include special designations such as Wilderness, Research Natural Areas, or Areas of Critical Environmental Concern (ACEC). They 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. Protection in this sense does not include management actions. 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 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 in order to ensure the element’s future existence. 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.). It may also include

conducting further research or monitoring. 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 the element is 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.

## II. Methods

The methods for assessing and prioritizing conservation needs over a large area are necessarily diverse. This study follows a general method that the Colorado Natural Heritage Program has and continues to develop specifically for this purpose. The San Miguel Basin Biological Assessment was conducted in several steps summarized below.

### Collect available information

CNHP databases were updated with information regarding the known locations of species and significant plant communities within San Miguel and western Montrose counties. A variety of information sources were consulted for this information. The Colorado State University museums and herbarium were searched, as were plant and animal collections at the University of Colorado, Western State, Rocky Mountain Herbarium, and local private collections. Both general and specific literature sources were incorporated into CNHP databases, as 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 (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 the San Miguel Basin.

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

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.

## 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 a variety of 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. 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. In addition, we took care that all major ecosystems, vegetation types and elevational zones in the area were included, as well as areas that are of particular local concern or interest for open space. Using the biological information stored in the CNHP databases, these information sources were analyzed for sites that have the highest potential for supporting specific elements. General habitat types can be discerned from the aerial photographs, and those chosen for survey sites were those that 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, etc.

This process was used to delineate over 180 survey areas that were believed to have relatively high probability of harboring natural heritage resources (Figure 1, and Appendix I). These areas vary in size from less than 10 to several thousand acres and include all major habitat types in the study area.

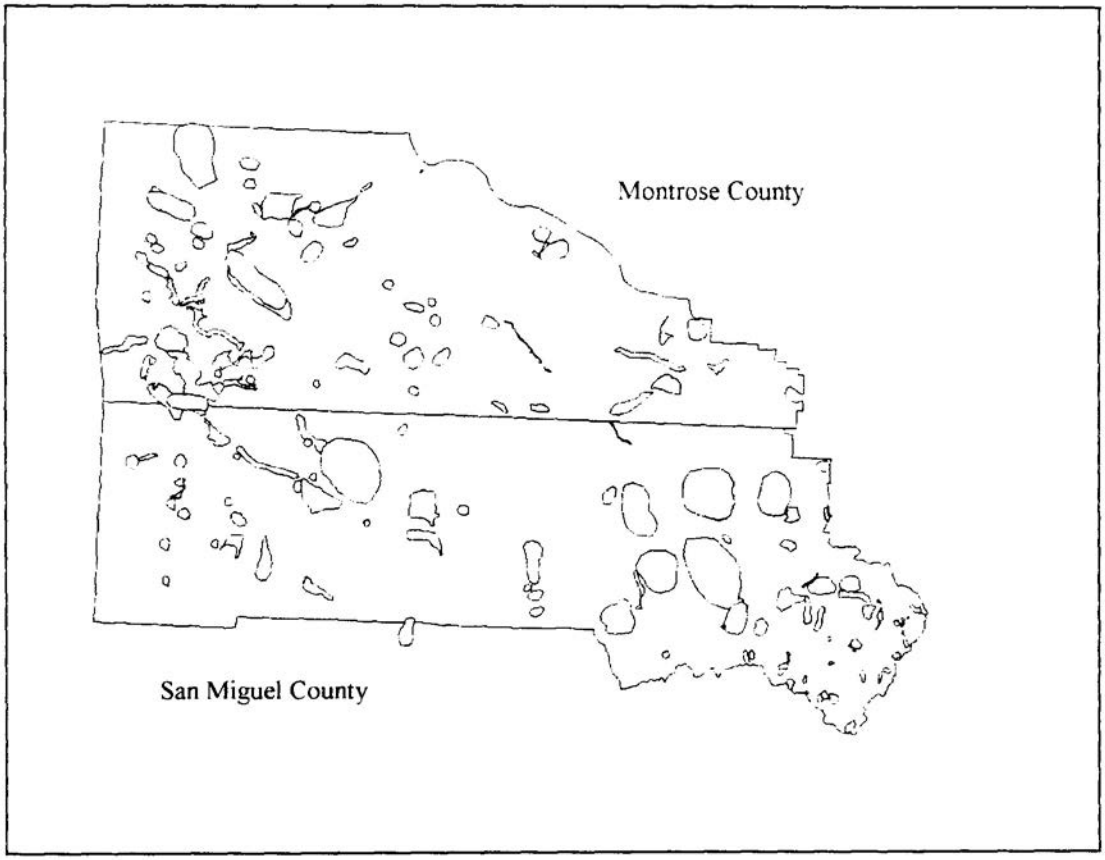
Roadside surveys were useful in further resolving the natural condition of these areas. The condition of grasslands is especially difficult to discern from aerial photographs, and a quick survey from the road can reveal such features as weed infestation or overgrazing.

Because of the overwhelming number of potential sites and limited resources, surveys for all elements were prioritized by the degree of imperilment. 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 documented as they were encountered.

## Contact Landowner

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 Montrose County and San Miguel County assessors' offices. Landowners were then either contacted by phone or in person. Members of the San Miguel Open Space committee were helpful in this stage of the survey. 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.** Private lands that were not visited may be included in Potential Conservation Areas, however, if they are adjacent to and have similar habitats to public lands that were surveyed.

**Figure 1. Targeted inventory areas, San Miguel and western Montrose counties. See Appendix 1 for TIA list with names and dates surveyed.**




## Conduct Field Surveys

Field surveys were conducted from April to November 1999. Survey sites where access could be attained 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 times of the season. Many of the plants in the western parts of the San Miguel Basin have extremely short flowering seasons, and all but disappear by mid-summer. May and June are the prime survey times for most of these species. Alpine species also have very short flowering times and are often inaccessible until late summer because of snow cover. Since there is such a wide elevational range in the study area, we began at the lowest elevations, and worked upward, finally surveying alpine areas in late summer and early fall.

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:** Sherman live traps, pitfall traps
**Birds:** visual or by song/call, evidence of breeding sought
**Insects:** aerial net, pit fall traps, moth lighting
**Plant communities:** visual, collect qualitative or quantitative composition data
**Wetland plant communities:** visual, collect qualitative or quantitative composition, soil, and hydrological function and value data
**Fishes:** electroshocking, seining, barbless fly-fishing, observation

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

When a rare species or significant natural community was discovered, 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 viability of the population, based on size, condition and landscape context. 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.

It should be noted that observations made in any one year may not represent the range of conditions over the long term. The summer of 1999 was unusual in that the early spring was very dry, while late summer had unusually high precipitation. This has probably lowered the numbers of early spring flowering plants and increased later blooming species, compared with average years. It also resulted in less of the annual, early season cheatgrass, and an unusually lush growth of late season bunchgrasses. Continued observations over several years may prove to modify some of our assessments.

## Delineate Potential Conservation Site Boundaries

Finally, since the objective for this inventory is to prioritize specific areas for conservation efforts, Potential conservation planning boundaries 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. 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 of the boundaries. Given the extremely large area covered in a short period of time, there are doubtless many other significant sites that were not surveyed. There is a continuing need for additional research, both of new areas and to update known occurrences.

# III. Results

As a result of this survey, 180 new and updated records were entered in the CNHP database, bringing the total for the study area to 478. Elements documented for the first time in western Montrose and San Miguel counties in the CNHP database included nine animals, fifteen plants, and eleven natural communities. Three plants were found to be more common than had been thought, and will be assigned lower ranks. The Naturita milkvetch rank was changed from G2G3 S2S3 to G3S3; the Abajo penstemon and from S2 to S2S3. With additional survey time, new occurrences could probably be found to justify lowering these ranks further.

We have identified fifty-nine Potential Conservation Areas, which include 338 of the occurrences of rare or imperiled plants, animals, and natural communities. Results of the survey are included here, with descriptions and discussion of each Potential Conservation Area. PCAs are listed below in order of their over all priority (biodiversity rank) and by county, and described beginning on page 82, where they are arranged alphabetically by name regardless of rank.

**Potential Conservation Areas by Biodiversity Rank**

**B1 PCAs**

Dolores Canyon-Slick Rock to Bedrock
La Sal Creek
Miramonte Reservoir
San Miguel River at Tabeguache Creek

**B2 PCAs**

Beaver Mesa
Big Bucktail Creek
Coyote Wash
Davis Mesa
Dolores Canyon South of Slick Rock
Dry Creek Basin
East Paradox Creek
Highway 141 and 145
Imogene Pass
McIntyre Canyon
Naturita Upland
Paradox Valley North
Sewemup Mesa
Silver Pick Basin
Spring Creek-Atkinson Mesa

**B3 PCAs**

Bear Creek
Bridal Veil Falls
Campbell Creek

Disappointment Valley
Dolores Canyon-Uravan to Roc Creek

Horsefly
Mailbox Park
Middle San Miguel Canyon
Naturita South
San Miguel River-Clay Creek to Horsefly Creek
San Miguel River at Cottonwood Creek
Silvey's Pocket
Slick Rock
Slick Rock Hill
South Fork San Miguel River
Uravan West

**B4 PCAs**

Beaver Creek-Lone Cone
Big Gypsum Valley
Bilk Basin
Buckeye Reservoir
Clay Creek
Greenback Mountain
Hog Point
Leopard Creek
Little Gypsum Valley
Little Red Canyon-Horsefly Creek
Lizard Head
Martin Mesa
Ophir Pass
Prospect Basin-Alta Lakes
Saltado Creek
Savage Basin
Summit Canyon
West Paradox Creek

**B5 PCAs**

Clear Creek
Deep Creek
Elk Creek
Fall Creek Falls
Hawk Mine
Spud Patch

**Figure 2.**

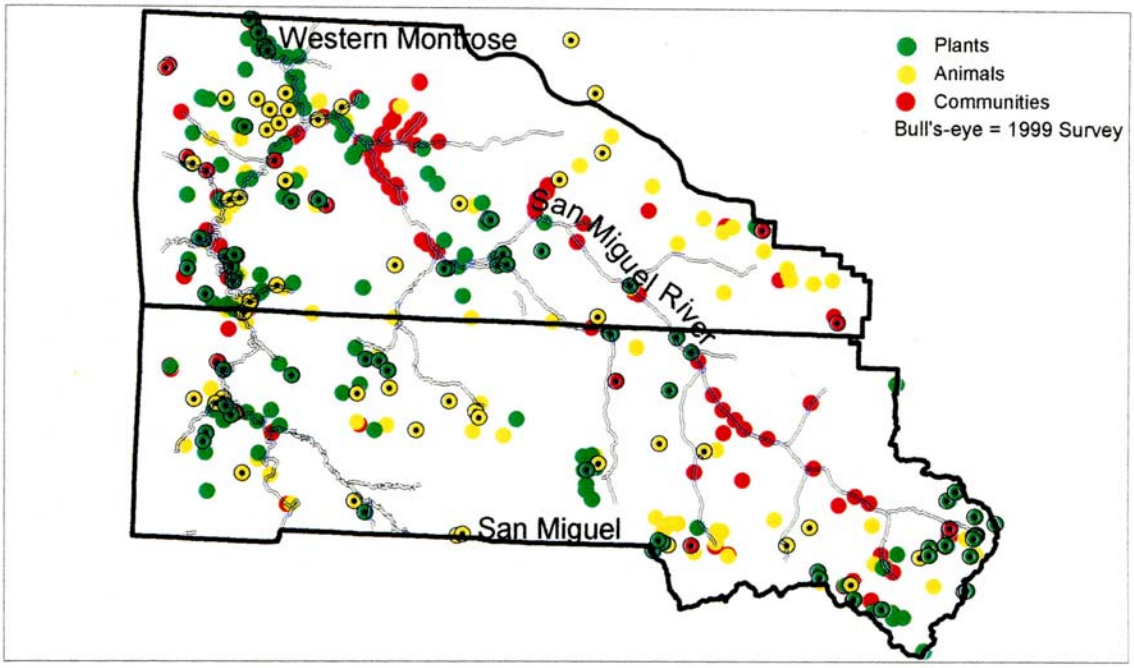
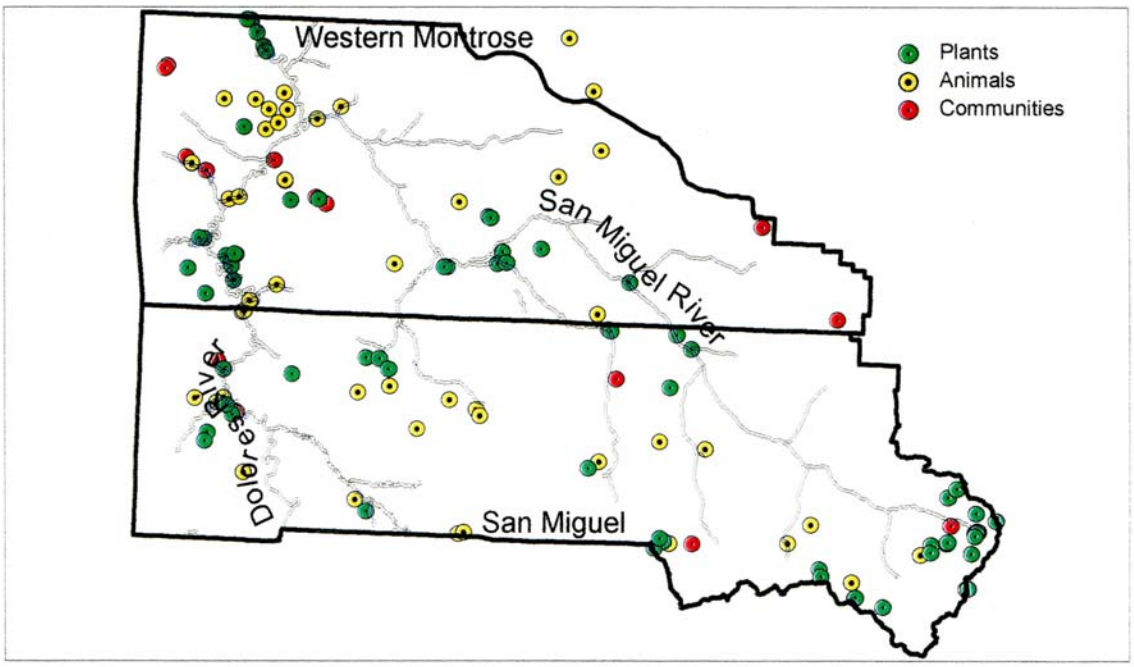


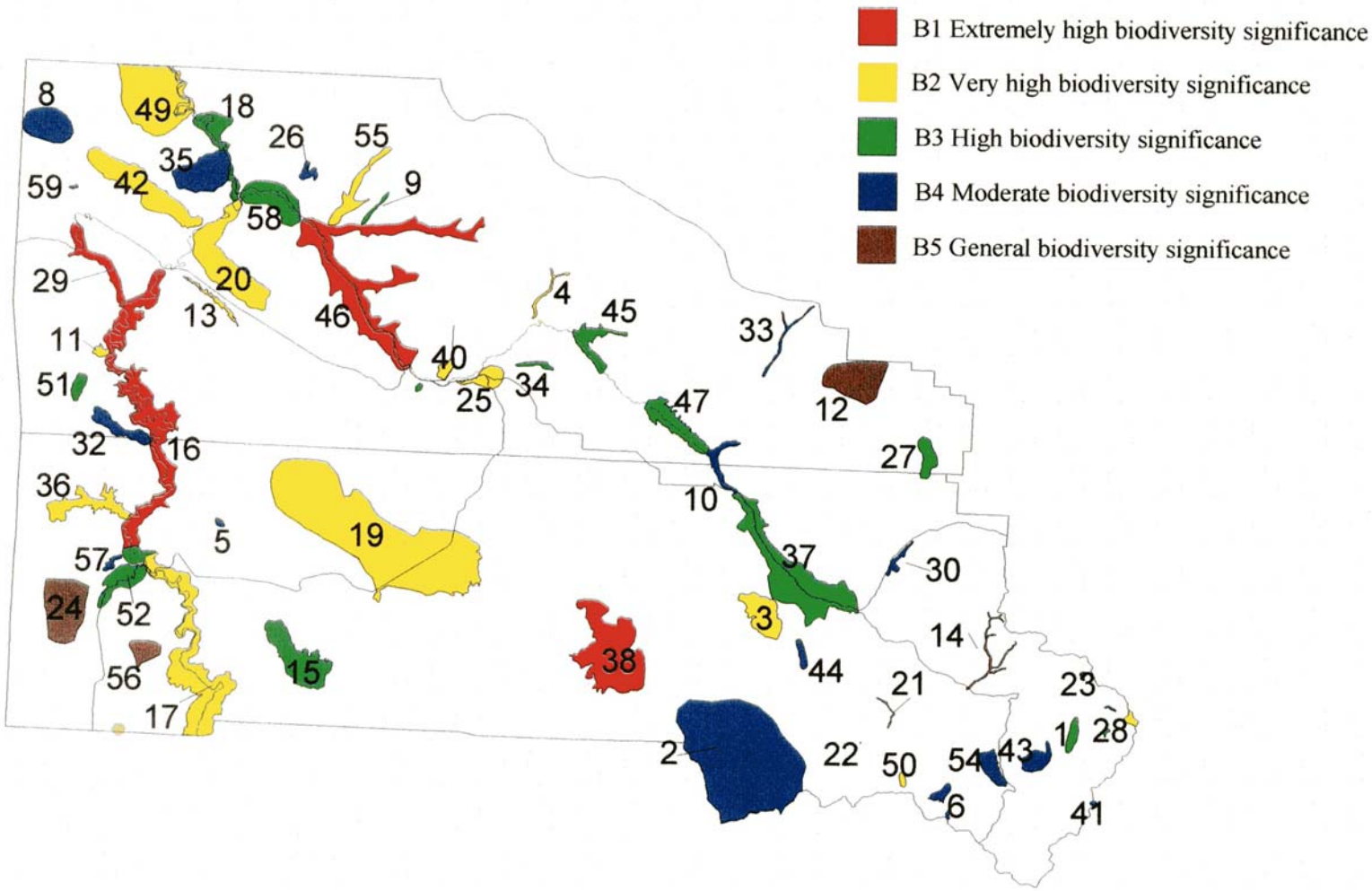

**Figure 3.**



# Table 3. Potential Conservation Areas San Miguel and Western Montrose Counties

| | | |
|---|---|---|
| 1 | B3 | BEAR CREEK |
| 2 | B4 | BEAVER CREEK-LONE CONE |
| 3 | B2 | BEAVER MESA |
| 4 | B2 | BIG BUCKTAIL CREEK |
| 5 | B4 | BIG GYPSUM VALLEY |
| 6 | B4 | BILK BASIN |
| 7 | B3 | BRIDAL VEIL FALLS |
| 8 | B4 | BUCKEYE RESERVOIR |
| 9 | B3 | CAMPBELL CREEK |
| 10 | B4 | CLAY CREEK |
| 11 | B2 | COYOTE WASH |
| 12 | B5 | CLEAR CREEK |
| 13 | B2 | DAVIS MESA SLOPES |
| 14 | B5 | DEEP CREEK |
| 15 | B3 | DISAPPOINTMENT VALLEY |
| 16 | B1 | DOLORES CANYON SLICK ROCK TO BEDROCK |
| 17 | B2 | DOLORES CANYON SOUTH OF SLICK ROCK |
| 18 | B3 | DOLORES RIVER CANYON URAVAN TO ROC CREEK |
| 19 | B2 | DRY CREEK BASIN |
| 20 | B2 | EAST PARADOX CREEK |
| 21 | B5 | ELK CREEK |
| 22 | B5 | FALL CREEK FALLS |
| 23 | B4 | GREENBACK MOUNTAIN |
| 24 | B5 | HAWK MINE |
| 25 | B2 | HIGHWAY 141 AND 145 |
| 26 | B4 | HOG POINT |
| 27 | B3 | HORSEFLY |
| 28 | B2 | IMOGENE PASS |
| 29 | B1 | LASAL CREEK |
| 30 | B4 | LEOPARD CREEK |
| 31 | B4 | LIZARD HEAD |
| 32 | B4 | LITTLE GYPSUM VALLEY |
| 33 | B4 | LITTLE RED CANYON-HORSEFLY CREEK |
| 34 | B3 | MAILBOX PARK |
| 35 | B4 | MARTIN MESA |
| 36 | B2 | MCINTYRE CANYON |
| 37 | B3 | MIDDLE SAN MIGUEL CANYON |
| 38 | B1 | MIRAMONTE RESERVOIR |
| 39 | B3 | NATURITA SOUTH |
| 40 | B2 | NATURITA UPLAND |
| 41 | B4 | OPHIR PASS |
| 42 | B2 | PARADOX VALLEY NORTH |
| 43 | B4 | PROSPECT BASIN |
| 44 | B4 | SALTADO CREEK |
| 45 | B3 | SAN MIGUEL RIVER AT COTTONWOOD CREEK |
| 46 | B1 | SAN MIGUEL RIVER AT TABEGUACHE CREEK |
| 47 | B3 | SAN MIGUEL RIVER-CLAY CREEK TO HORSEFLY CREEK |
| 48 | B4 | SAVAGE BASIN |
| 49 | B2 | SEWEMUP MESA |
| 50 | B2 | SILVERPICK BASIN |
| 51 | B3 | SILVEY'S POCKET |
| 52 | B3 | SLICK ROCK HILL |
| 53 | B3 | SLICKROCK |
| 54 | B4 | SOUTH FORK SAN MIGUEL RIVER |
| 55 | B2 | SPRING CREEK-ATKINSON MESA |
| 56 | B5 | SPUD PATCH |
| 57 | B4 | SUMMIT CANYON |
| 58 | B3 | URAVAN WEST |
| 59 | B4 | WEST PARADOX CREEK |

Figure 4. Potential Conservation Areas for San Miguel and western Montrose counties.



**PCA County Lists**

Although for ecological purposes this study area should be viewed in its entirety, many decisions based on this information will be at the county level. Therefore, we list below the PCAs by county, in order of Biodiversity Rank. (Note that three PCAs, Dolores Canyon-Slick Rock to Bedrock, Clay Creek and Little Gypsum Valley straddle the county line, so are shown for both counties.)

**San Miguel County PCAs**

**B1 PCAs**

Dolores Canyon Slick Rock to Bedrock
Miramonte Reservoir

**B2 PCAs**

Beaver Mesa
Dolores Canyon South of Slick Rock
Dry Creek Basin
Imogene Pass
McIntyre Canyon
Silver Pick Basin
Slick Rock Hill

**B3 PCAs**

Bear Creek
Bridal Veil Falls
Disappointment Valley
Middle San Miguel Canyon
Slick Rock
South Fork San Miguel River

**B4 PCAs**

Beaver Creek-Lone Cone
Big Gypsum Valley
Bilk Basin
Clay Creek
Greenback Mountain
Leopard Creek
Little Gypsum Valley
Lizard Head
Ophir Pass
Prospect Basin-Alta Lakes
Saltado Creek
Savage Basin
Summit Canyon

**B5 PCAs**

Deep Creek
Elk Creek
Fall Creek Falls
Hawk Mine
Spud Patch

## Montrose County PCAs

**B1 PCAs**

Dolores Canyon-Slick Rock to Bedrock
La Sal Creek
San Miguel River at Tabeguache Creek

**B2 PCAs**

Big Bucktail Creek
Coyote Wash
Davis Mesa Slopes
East Paradox Creek
Highway 141 and 145
Mailbox Park
Naturita Upland
Paradox Valley North
Sewemup Mesa
Spring Creek-Atkinson Mesa

**B3 PCAs**

Campbell Creek
Dolores Canyon-Uravan to Roc Creek
Horsefly
Naturita South
San Miguel River at Cottonwood Creek
San Miguel River-Clay Creek to Horsefly Creek
Silvey's Pocket
Uravan West

**B4 PCAs**

Buckeye Reservoir
Clay Creek
Hog Point
Little Gypsum Valley
Little Red Canyon-Horsefly Creek
Martin Mesa
West Paradox Creek

**B5 PCAs**

Clear Creek

## V. Discussion

The goal of this project was to identify significant natural areas that warrant conservation, and to assist San Miguel and Montrose counties and others to prioritize areas where their efforts would be most effective in protecting the biological diversity of the area. Therefore, we have listed below the highest priorities that are indicated from the survey results, based on Biodiversity Ranks, and have grouped them into general areas, by county. We have added to this four PCAs that, although they have lower Biodiversity Ranks (B4) have high Protection Urgency Ranks (P2).

**<u>San Miguel County</u>**

1. **Sage grouse sites**
   Miramonte Reservoir (B1)
   Dry Creek Basin (B2)
   Beaver Mesa (B2)

2. **Dolores River riparian zone**
   Dolores Canyon Slick Rock to Bedrock (B1)
   Dolores Canyon South of Slick Rock(B2)

3. **Alpine areas**
   Imogene Pass (B2)
   Silver Pick Basin (B2)

4. **San Miguel River mainstem riparian**
   Middle San Miguel Canyon (B3)

5. **San Miguel and Dolores River tributaries**
   Bear Creek (B3)
   Bridal Veil Creek (B3)
   McIntyre Canyon (B3)

6. **West end sites**
   Slick Rock Hill (B2)
   Slick Rock (B3)
   Disappointment Valley (B3)

7. **PCAs with high protection urgency**
   Clay Creek (B4, P2)
   Leopard Creek (B4, P2)
   Prospect Basin-Alta Lakes (B4, P2)
   Saltado Creek (B4, P2)

**Montrose County**

1. **Dolores River Canyon**
   Dolores Canyon-Slickrock to Bedrock (B1)
   Coyote Wash (B2)
   La Sal Creek (B1)
   Sewemup Mesa (B2)
   Dolores Canyon-Uravan to Roc Creek (B3)

2. **San Miguel River and tributaries**
   San Miguel River at Tabeguache Creek (B1)
   Spring Creek-Atkinson Mesa (B2)
   San Miguel River at Cottonwood Creek (B3)
   San Miguel River-Clay Creek to Horsefly Creek (B3)
   Middle San Miguel Canyon (B3)

3. **Paradox Valley**
   Davis Mesa Slopes (B2)
   East Paradox Creek (B2)
   Paradox Valley North (B2)

4. **Naturita-Nucla area**
   Highway 141 and 145 (B2)
   Mailbox Park (B2)
   Naturita Upland (B2)
   Naturita South (B2)

# VI. The Natural Heritage of the San Miguel Basin

**Location and Physical Characteristics**

The San Miguel Basin occupies a large intermountain valley bounded by the San Juan Mountains and the Uncompahgre Plateau. The San Miguel River is a major tributary of the Dolores River, which in turn is a major tributary of the Colorado River. The area covered by this survey includes the entire watershed of the San Miguel River, as well as the portion of the Dolores River watershed that falls in San Miguel and Montrose counties. The study area is located in the Colorado Plateaus Province, Canyonlands section, of Bailey's Ecoregions, and in the Southern Rocky Mountains Province (Bailey 1994).

Elevations within the study area range from about 4,600 feet at the Dolores River at the Montrose/Mesa County line, to 14,017 feet at the summit of Wilson Peak.

Major landforms of the project area are the valleys and canyons of the two major rivers, the San Miguel and Dolores and their tributaries; the low elevation semi-desert in the western part of the region, with its broad salt valleys and narrow winding sandstone canyons; mid-elevation mesas and foothills between the rivers and the mountains; the Uncompahgre Plateau; and the San Juan Mountains, including the Sneffels, San Miguel and Wilson ranges.

The San Miguel River is one of the few rivers in Colorado that retains its natural hydrologic regime, that is, has no major dams. Although there are water diversions for irrigation on many of its tributaries, none of the water is diverted away from the San Miguel Basin. Fed by snowmelt in the surrounding San Juans, and to a lesser extent, the Uncompahgre Plateau, the river sustains high quality riparian vegetation throughout its length.

The Dolores River begins at the southern boundary of the San Miguel Basin near Lizard Head Pass, and flows southward in Dolores County, then westward, where it is impounded at McPhee Reservoir. The river continues generally northward through the study area, and finally flows into the Colorado River at Dewey, Utah.

The western part of the study area is comprised of generally horizontal sandstones, highly dissected by deep, steep-walled canyons of the Dolores River and its tributaries. Snakelike meanders in the Dolores Canyon can approach 360 degrees.

Several east-west trending valleys, formed by collapsed salt domes, interrupt the general topography. During the Pennsylvanian Period, a large sea embayment covered this area. When this sea evaporated, its salts became concentrated in domes overlain with sedimentary rock. When the rocks were eroded, the domes, comprised of soluble salt and gypsum, were washed away, and the flanking structures collapsed, leaving the broad valleys of Paradox, Dry Creek Basin, Big Gypsum Valley, and Disappointment Valley.

The San Juan Mountains form the study area boundary around the upper San Miguel Basin. These mountains are composed of very ancient sedimentary and igneous rocks overlain by volcanic rock formed during the Tertiary Period, beginning about 72 million years ago. Both intrusive and extrusive igneous activity continued, becoming violent about 30 to 35 million years ago. During their explosive period, significant deposits containing gold, silver, lead, and other metals were concentrated in veins of intrusive igneous rock. Following this period, erosion cut canyons, and then, during the Pleistocene, glaciers carved the spectacular landscapes that can be seen today—U shaped

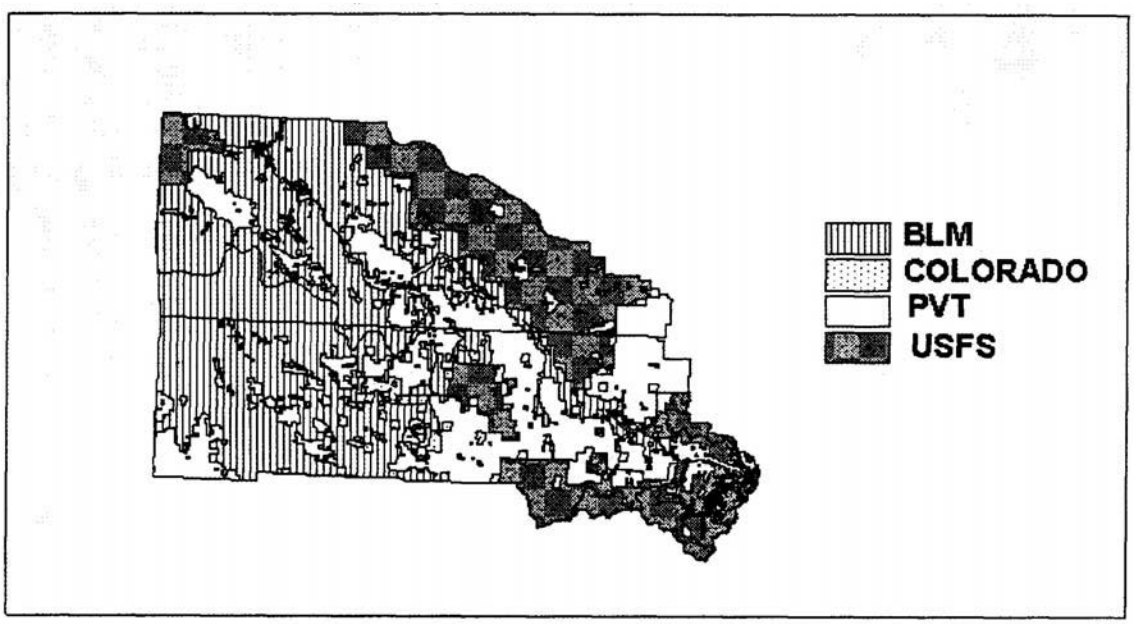
valleys, cirques, horns, and tarns. Several peaks of these rugged and scenic mountains rise above 14,000 feet, including Wilson Peak, the highest mountain in the study area. Dallas Divide, which is the divide between the Uncompahgre Basin and the San Miguel Basin, also divides the San Juan Mountains from the much older Uncompahgre Plateau.

The Uncompahgre Plateau is a ninety-mile long, thirty-mile wide uplift, trending in a northwest to southeast direction. The western side of the plateau, above the Dolores River Canyon, is quite steep, while the southern end has more gradual slopes. The Plateau is a remnant of an ancient highland known as Uncompahgria. It was first uplifted 300 million years ago, along with the ancestral Rockies. During the Pennsylvanian period, when the rest of Colorado was under an inland sea, Uncompahgria was an island. Erosion removed all the rock layers above the Precambrian metamorphic rock, until, by the end of the Permian period, the landscape was a nearly level peneplain. The Precambrian rock was again buried by sediments during the Triassic and Jurassic Periods, leaving an unconformity representing over 300 million years, or the entire Paleozoic sequence, between the Precambrian and Triassic rocks. The Mesozoic sediments can be seen now as the Cutler, Moenkopi, Chinle, Kayenta, and Wingate sandstones of the Triassic Period, and the Entrada and Morrison formations of the Jurassic. Over these layers were deposited the Dakota and Mancos formations of the Cretaceous period. The Plateau was again uplifted later in the Cretaceous period, during the Laramide Orogeny, along with the Rocky Mountains. This began a new period of erosion, which continues today. The last major uplift occurred during the Miocene, when the entire Colorado Plateau was elevated. Soils on the plateau tend to be shallow and well drained.

The foothills and mesas at the base of the San Juans and the Uncompahgre Plateau have proved to be some of the most hospitable lands for humans in the area, and have been heavily used for residential development, cattle and sheep grazing. There is little actual cropland in the area. Present population growth in the area is concentrated in this zone.

Ownership of the land within the study area is a mixture of private lands and public lands managed by the U. S. Forest Service (Uncompahgre National Forest and Manti-La Sal National Forest) or the U. S. Bureau of Land Management (Uncompahgre Basin Resource Area and San Juan Resource Area) . (Figure 5.) In addition there is a small amount of Colorado State land. In San Miguel County, land ownership is approximately 40% BLM, 37% private, 17% National Forest, and 6% state, including state land board sections and state wildlife areas. In western Montrose County, ownership is approximately 52% BLM, 28% National Forest, 20% private, and less than 1% state. Private lands are concentrated in the valley bottoms and on mid-elevation mesas. BLM lands are primarily in the western canyon country and the lower slopes of the Uncompahgre Plateau, while National Forest lands tend to occupy the higher elevation forests and alpine zones of the Uncompahgre Plateau and San Juan Mountains. BLM lands are used primarily for grazing, while National Forest lands are a source of timber as well as grazing lands. Uranium mining was predominant on BLM lands in the western part of the area, while gold and silver mining was concentrated on National Forest and private mining claims within the forest at the higher elevations. All public lands have seen an increase in recreational use in recent years, and management goals reflect this trend.

**Figure 5. Land ownership in San Miguel and western Montrose counties.** (Land status from Colorado Division of Wildlife Habitat Resources Section, 1998. Scale 1:100,000.)



**Vegetation**

Vegetation can be broadly divided into two major types: riparian and upland. Riparian vegetation includes all of the plants along rivers, streams or other bodies of water that are influenced by the presence of that water. Riparian and wetland vegetation occurs at all elevations in the study area.

The upland vegetation of San Miguel and western Montrose counties can be classified into nine major zones, which tend to follow elevational gradients. Each zone grades into the next, and micro-habitats influence what kinds of plants can grow in a given location. For instance, at the same elevation, north and south facing slopes may have very different plant communities. Concave slopes, where moisture accumulates can support plant communities that require more water than those that grow on convex slopes. Within each zone, variations may also be dependent on soil chemistry, texture and depth. We use the following groupings to describe the vegetation in this study area.

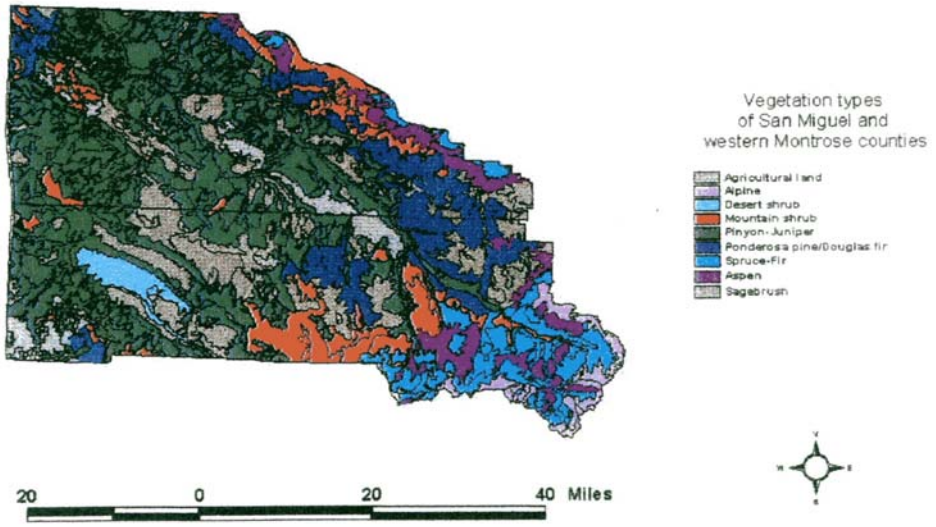
**I. Riparian zones and wetlands** of the major rivers and their tributaries

**II. Upland vegetation:**

**Agricultural lands**
**Semi-desert shrublands** (Shadscale, Four-wing saltbush, Greasewood)
**Sagebrush shrublands** (Big sage, Mountain big sage, Black sage, Silver sage)
**Pinyon-Juniper woodlands** (Pinyon pine, Utah juniper)
**Mountain shrublands** (Gambel's oak, Mountain mahogany, Serviceberry, Manzanita)
**Ponderosa pine forests**
**Aspen forests**
**Subalpine forests** (Engelmann spruce, Subalpine fir)
**Alpine** (meadows and tundra communities above timberline)

(Note that throughout this document we will refer to plants and animals by their common names. Scientific names are given in the Appendix).

**Figure 6. Vegetation types of San Miguel and western Montrose counties**
**(simplified from Colorado Division of Wildlife, Habitat Resources Section, 1998. 1:100,000.**



Within each of these zones we can identify a number of recognized plant communities or plant associations, that are named according to their (usually two) dominant species. For example, a common riparian plant community on the San Miguel River is Narrowleaf cottonwood-Blue spruce/Thinleaf alder (*Populus angustifolia-Picea pungens/Alnus incana*). It can also be referred to by the more general term "Montane riparian forests". The communities that are tracked by CNHP and were identified in San Miguel and western Montrose counties are listed in Table 4.

In addition to rare plant communities, we record excellent quality examples, or at least one representative per county, of the more common plant communities found there.

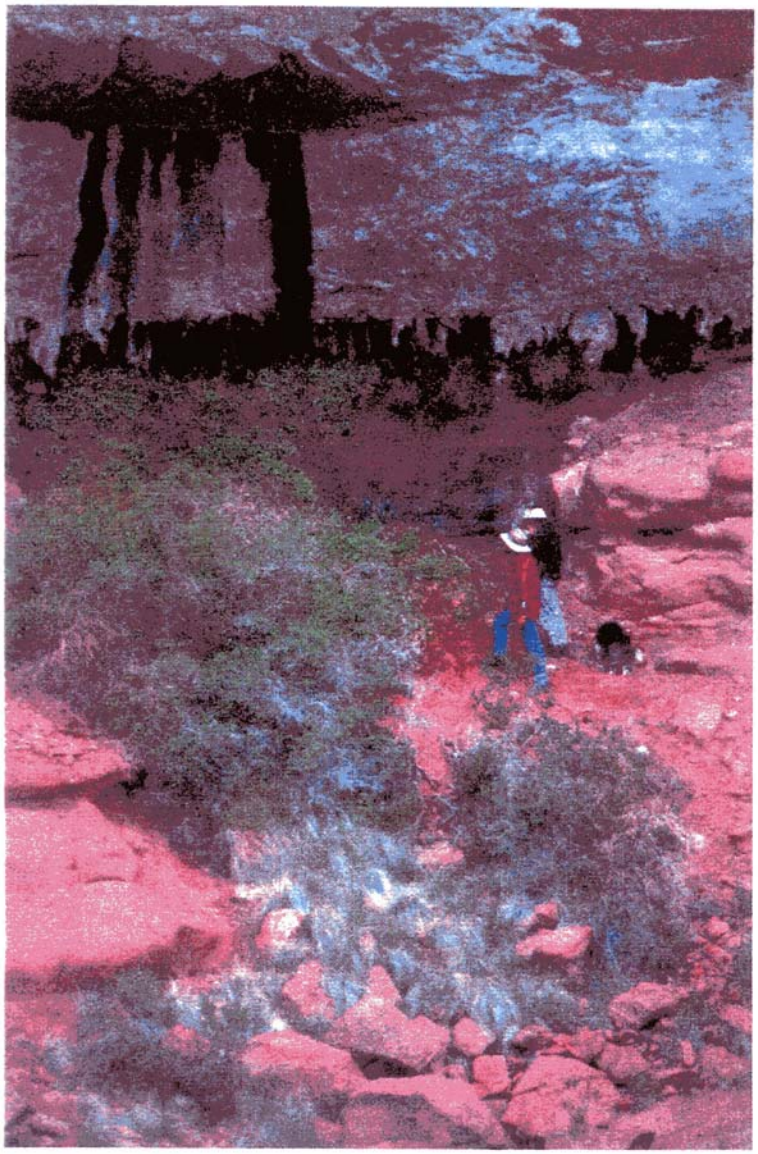


Figure 7. Hanging garden community in Dolores Canyon

**Table 4. Plant communities of San Miguel and western Montrose counties.**

| Common Name | Scientific Name | G rank | S rank |
|---|---|---|---|
| Alkali sacaton (Great Plains salt meadows) | *Sporobolus airoides* | G3Q | S3 |
| Aspen/Red osier dogwood (Aspen forests) | *Populus tremuloides/Cornus sericea* | G4 | S2 |
| Aspen/Tall forb (Aspen forests) | *Populus tremuloides/*tall forb | G5 | S5 |
| Barren ground willow/Mesic forb (Alpine willow scrub) | *Salix brachycarpa/*mesic forb | G4 | S4 |
| Beaked sedge (Montane wet meadows) | *Carex utriculata* | G5 | S4 |
| Blue grama/Galleta (Shortgrass prairie) | *Bouteloua gracilis-Hilaria jamesii* | G2G4 | SU |
| Blue spruce/Red osier dogwood (Montane riparian forest) | *Picea pungens/Cornus sericea* | G4 | S2 |
| Blue spruce/Thinleaf alder (Montane riparian forest) | *Picea pungens/Alnus incana* | G3 | S3 |
| Box elder/River birch | *Acer negundo/Betula occidentalis* | G1G2 | S1 |
| Box elder-rocky mountain juniper/Coyote willow | *Acer negundo-Juniperus scopulorum/Salix exigua* | GU | SU |
| Colorado pinyon/Needle and thread (Xeric western slope pinyon-juniper woodlands) | *Pinus edulis/Stipa comata* | G2? | S2 |
| Colorado pinyon-Dwarf mountain mahogany (Xeric western slope pinyon-juniper woodlands) | *Juniperus osteosperma/Cercocarpus intricatus* | G? | S? |
| Coyote willow/bare ground (Riparian shrubland) | *Salix exigua/*bare ground | G5 | S5 |
| Coyote willow/Mesic graminoid (Riparian shrubland) | *Salix exigua/*mesic graminoid | G5 | S5 |
| Douglas fir/Red osier dogwood (Lower montane riparian forests) | *Pseudotsuga menziesii/Cornus sericea* | G4 | S2 |
| Douglas fir/Rocky Mountain maple (Lower montane forests) | *Pseudotsuga mensiezii/Acer glabrum* | G4? | S1 |
| Drummond's willow/Bluejoint reedgrass (Lower montane willow carrs) | *Salix drummondiana/Calamagrostis canadensis* | G3 | S3 |
| Drummond's willow/Mesic forb (Lower montane willow carrs) | *Salix drummondiana/*mesic forb | G4 | S4 |
| Four-wing saltbush/galleta (Cold desert shrublands) | *Atriplex canescens/Hilaria jamesii* | G3G4 | SU |
| Fremont's cottonwood/Coyote willow (Riparian forest) | *Populus deltoides* ssp. *wislizenii/Salix exigua* | GU | S1S2 |
| Fremont's cottonwood/Skunkbrush (Riparian forest) | *Populus deltoides* ssp. *Wislizenii/Rhus trilobata* | G2 | S2 |
| Galleta (Western Slope grasslands) | *Hilaria jamesii* | G2G4 | S1 |
| Gambel's oak-Rocky Mountain juniper (Riparian woodland) | *Quercus gambellii-Juniperus scopulorum/Rhus trilobata* | GU | SU |
| Geyer's willow-Rocky Mountain willow/Mesic forb (Montane willow carrs) | *Salix geyeriana-Salix monticola/*mesic forb | G3 | S3 |
| Geyer's willow-Rocky Mountain willow/Mesic graminoid (Montane willow carrs) | *Salix geyeriana-Salix monticola/*mesic graminoid | GU | S3 |
| Greasewood/Seablight (Saline bottomland shrublands) | *Sarcobatus vermiculatus/Suaeda moquinii* | GUQ | SU |
| Mancos columbine-Eastwood monkey-flower (Hanging gardens) | *Aquilegia micrantha-Mimulus eastwoodiae* | G2G3 | S2S3 |
| Narrowleaf cottonwood/Red osier dogwood (Montane riparian forest) | *Populus angustifolia/Cornus sericea* | G4 | S3 |
| Narrowleaf cottonwood/River birch (Montane riparian forest) | *Populus angustifolia/Betula occidentalis* | G3 | S3? |
| Narrowleaf cottonwood/Skunkbrush (Riparian | *Populus angustifolia/Rhus trilobata* | G3 | S3 |

| | | | |
|---|---|---|---|
| forest) | | | |
| Narrowleaf cottonwood/Thinleaf alder (Montane riparian forest) | *Populus angustifolia/Alnus incana* | G3? | S3 |
| Narrowleaf cottonwood-Blue spruce/Thinleaf alder (Montane riparian forests) | *Populus angustifolia-Picea pungens/Alnus incana* | G3 | S3 |
| Needle and thread (Great Basin herbaceous vegetation) | *Stipa comata* Great Basin herbaceous vegetation | G2G4 | SU |
| New Mexico privet (Foothills riparian shrubland) | *Forestiera pubescens* | G1G2 | S1 |
| Planeleaf willow/Marsh marigold (Subalpine willow carrs) | *Salix planifolia/Caltha leptosepala* | G4 | S4 |
| Planeleaf willow/Water sedge (Subalpine willow carrs) | *Salix planifolia/Carex aquatilis* | G5 | S4 |
| Ponderosa pine/Gambel's oak (foothills woodland) | *Pinus ponderosa/Quercus gambelii* | G5 | S4 |
| Ponderosa pine/Greenleaf manzanita (Western slope woodlands) | *Pinus ponderosa/Arctostaphylos patula* | G5 | S1 |
| River birch/Mesic graminoid (Lower montane riparian shrublands) | *Betula occidentalis/mesic graminoid* | G3 | S2 |
| Shadscale/galleta (Cold desert shrublands) | *Atriplex confertifolia/Hilaria jamesii* | G3G5 | S2? |
| Shadscale/Salina wild rye (Cold desert shrublands) | *Atriplex confertifolia/Leymus salinus* | G3G5 | S3 |
| Silver buffaloberry (Foothills riparian shrublands) | *Shepherdia argentea* | G3G4 | S1 |
| Silver sagebrush/Thurber fescue (Western Slope sagebrush shrublands) | *Artemisia cana/Festuca thurberi* | G2G3 | S2S3 |
| Skunkbrush/Coyote willow (Riparian shrubland) | *Rhus trilobata/Salix exigua* | G2 | S2 |
| Subalpine fir-Engelmann spruce/chiming bells (Montane riparian forests) | *Abies lasiocarpa-Picea engelmannii/Mertensia ciliata* | G5 | S5 |
| Thinleaf alder/Mesic graminoid (Montane riparian shrublands) | *Alnus incana/*mesic graminoid | G3 | S3 |
| Thurber fescue-White peavine (Montane grassland) | *Festuca thurberi-Lathyrus leucanthus* | G4 | S4 |
| Utah juniper/Salina wild rye (Mesic Western Slope pinyon-juniper woodlands) | *Juniperus osteosperma/Leymus salinus* | G1Q | SU |
| Utah juniper-Utah serviceberry (Mesic Western Slope pinyon-juniper woodlands) | *Juniperus osteosperma/Amelanchier utahensis* | GU | SU |
| Water sedge (Montane wet meadows) | *Carex aquatilis* | G5 | S4 |

## Riparian and Wetland Vegetation

The riparian zones of the San Miguel and Dolores rivers and their tributaries are of extreme importance, although the actual area that they cover is small. It has been estimated that only 1 to 2% of the land area of Colorado is covered by riparian or wetland vegetation, but that 75-80% of wildlife depend on these areas for all, or at least part, of their life cycle. The riparian zone in San Miguel and western Montrose counties is the most highly used and altered by humans. The river valleys have traditionally been used for agriculture, transportation, and residences. Most of the roads in San Miguel County were built along the San Miguel River and its major tributary streams.

The headwaters of the San Miguel River above timberline support low willow and sedge communities dominated by barrenground or planeleaf willows. Common graminoids in the high country are water sedge, beaked sedge and tufted hairgrass. In

addition, there is often an abundance of colorful herbaceous plants such as marsh marigold, Parry's primrose, Indian paintbrush, King's crown, Rose crown, chiming bells, triangle leaf groundsel, and buttercups.

As the river passes through the subalpine and montane zones, the taller Rocky Mountain, Drummond's or Geyer's willows replace the low willows. Blue spruce, Engelmann spruce and subalpine fir are major tree species, growing with an understory of red osier dogwood, willows, or thinleaf alder. Smaller tributary streams and wetlands often have a combination of bittercress, cowbane, triangle leaf groundsel and chiming bells. The tributaries of the San Miguel River and their associated waterfalls located within the subalpine and montane zone support colonies of Black Swifts. Also within the montane zone along the San Miguel in areas such as the Middle San Miguel PCA there are likely spots for the brimstone clubtail. The tributaries of the San Miguel within this zone also support the last remaining populations of Colorado River cutthroat trout in the San Miguel Basin.

Aspen and Rocky Mountain juniper at the upper montane give way to narrowleaf cottonwood and blue spruce as the river moves downstream. Along the Middle San Miguel Canyon, a great diversity of trees and shrubs share the riparian zone. In addition to cottonwood and spruce, there are Douglas fir, ponderosa pine, box elder, river birch, thinleaf alder, red osier dogwood, skunkbrush, Rocky Mountain juniper, wild rose, twinberry honeysuckle, snowberry, serviceberry, Rocky Mountain willow, silver buffaloberry, Gambel's oak, coyote willow, and numerous grasses, forbs and sedges. Common graminoid species in this area are horsetails, Baltic rush, water sedge, beaked sedge, swordleaf rush, and scouring rush. Herbaceous plants include false solomonseal, coneflower, cow parsnip, willow-herb, bog orchids, field mint, and osha. A transitional zone between the riparian vegetation and the upland pinyon-juniper zone often supports a community of Gambel's oak, Rocky Mountain juniper, big sagebrush, and skunkbrush.

In the lower reaches of the San Miguel near Uravan, the broad-leaved Fremont's cottonwood appears along with the narrowleaf cottonwood, and hybrids of the two are common. New Mexico privet, skunkbrush and coyote willow are the most common native shrub species. At this elevation, invasion by the exotic tamarisk becomes a problem.

The plant community <u>New Mexico privet</u> is known only from the Four Corners area, and is considered to be globally imperiled. Further research may determine that the community is more widespread than has been documented at this time. Based on the range of distribution of New Mexico privet, it is likely to occur in the Mojave and Sonoran deserts of southern California, east across southern Nevada, southeastern Utah, and northern Arizona to New Mexico. It may also extend into Oklahoma and Texas and south to Baja California and Chihuahua, Mexico.

Another critically imperiled community is the <u>Box elder/river birch riparian forest</u> found only along La Sal Creek. This community was identified by CNHP riparian ecologists in 1991 (Kittel and Lederer 1991), and despite expectations of finding more examples, none has been recorded. It has been verbally reported from Utah, but not documented.

The specific plant community found in any one location may be the result of hydrological processes of the river, substrate, and natural succession. For instance, newly created sandbars are usually colonized first by coyote willow, which build soil, allowing the establishment of narrowleaf cottonwood. Narrowleaf cottonwoods may also be the

pioneer species on gravel bars. As the cottonwoods mature and die, and the banks collapse, the stage is set for bank erosion and changes in the stream channel, and colonization of new sand and gravel bars. The result is a mosaic of plant communities representing different successional stages. Human impacts such as channelization of the streambed or damming the stream can interrupt this process of deposition and erosion, and prevent the renewal of riparian ecosystems.

The San Miguel River is one of the last remaining rivers in Colorado with no major dams or diversions. In some areas it has been channelized and constricted by the highway. However, it has largely retained its ability to function naturally, with seasonal flooding and changes in the channel that allow for natural succession.

The Dolores River riparian zone in San Miguel and western Montrose counties resembles that of the lower reaches of the San Miguel. Impoundment of the Dolores River at McPhee Reservoir has altered the hydrology of the river, encouraging the spread of tamarisk. However, the roadless, deep canyon section of the Dolores between Slick Rock and La Sal Creek is surprisingly free of tamarisk. The typical shoreline vegetation here consists of a mixture of coyote willow, giant reed, New Mexico privet, wild rose, red osier dogwood and skunkbrush. There are occasional cottonwoods and box elders, but there is little room in the narrow canyon for floodplains that would support riparian woodlands.

Deep canyons of the tributaries of the Dolores like Coyote Wash and Bull Canyon often support a luxuriant growth of box elder, hackberry, skunkbrush, Rocky Mountain juniper, poison ivy, Baltic rush, bulrushes, and giant reed.

A small but important community found in the canyons, is the “hanging garden” (Figure 7). This occurs in moist crevices, alcoves and ledges of sandstone cliffs. Moisture from precipitation or melting snow on the mesa top percolates through porous layers until it reaches an impermeable layer, and then moves horizontally to emerge as trickles or seeps through fissures in the rock. Soil is gradually built up through erosion and wind deposition, supporting some uncommon plants such as the Kachina daisy, Eastwood monkey-flower, southern maidenhair fern, helleborine orchid and Mancos columbine.

There are few natural ponds or lakes in the area. Lentic wetlands in the lower elevations are mostly confined to reservoirs and seasonal stock ponds, most of which have little native riparian vegetation. Instead, they provide an opportunity for invasion of weedy species; in fact, some of the most common plants around stock ponds are Russian knapweed, Canada thistle, cockleburs, tumble mustard and tamarisk.

The mainstem of the Dolores River below McPhee Reservoir to the confluence of the Colorado and Dolores rivers contains populations of both flannelmouth suckers and roundtail chubs. The Dolores River, its canyons, and associated side canyons support populations of canyon treefrogs and tree lizards, and the riparian plant communities along the river support populations of the Yuma skipper and plateau striped whiptail. Peregrine Falcons nest along the canyon cliffs of the river and pale lump-nosed bats forage along the river and its tributaries and roost within the mines and rocks of the canyon walls.

**Agricultural Lands**

Agricultural lands are concentrated in three main areas (Figure 8). Irrigated lands are located on the mesas above the San Miguel River in the Norwood, Naturita and Nucla area, and in Paradox Valley. Dryland agriculture occupies the southwestern corner of San Miguel County in the Egnar area. Most of the cultivated land produces hay for winter feed for livestock. Natural vegetation of the agricultural land would be primarily sagebrush and pinyon-juniper.

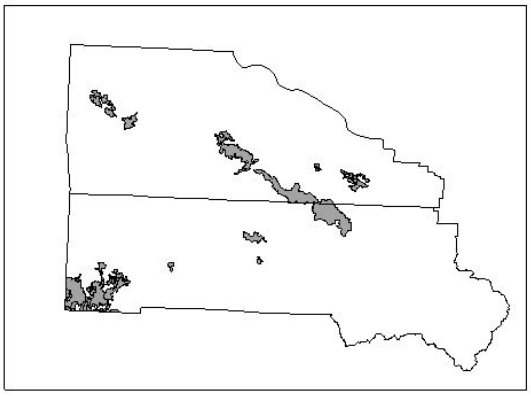


Figure 8. Distribution of Agricultural Lands.

**Semi-desert Shrublands**

The semi-desert shrubland communities are found in lower elevations, particularly in the salt valleys of Dry Creek, Paradox, Big Gypsum Valley, Little Gypsum Valley, and Disappointment Valley (Figure 9). This is the edge of the range of a vegetation type, which is most common and widespread in the Great Basin and southeastern Utah.

Members of the Goosefoot Family, including shadscale, four-wing saltbush and greasewood usually dominate the community types found in this zone. Also known as "cool desert," "semi-desert," "salt desert," and "Upper Sonoran Zone," it occurs in climates with hot summers, cold winters, and low precipitation which falls mostly as winter snow and summer thunderstorms (Mutel and Emerick 1992). Soils are fine textured with slow infiltration rates, derived from highly saline shales (Knight 1994). In this area, it is found on soils derived from Mancos Shale.

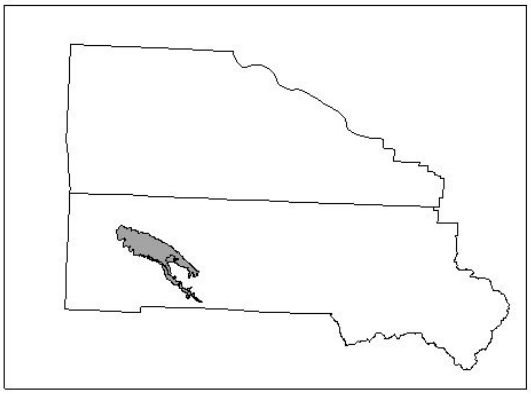


Figure 9. Distribution of Semi-desert shrublands.

Many of the plants in this vegetation type have evolved special adaptations suiting them to survive drought and saline soils; for example, succulence in cacti, and salt tolerance and reduced leaf area in shadscale, four-wing saltbush, and tamarisk. Unlike sagebrush, many of these shrubs will sprout after disturbance.

Greasewood can be found in nearly pure stands on alkaline soils with a consistently high water table (Mutel and Emerick 1992). In drier areas, greasewood is often mixed with big sagebrush, shadscale, four-wing saltbush, rabbitbrush, snakeweed and winterfat. Greasewood communities seem to be especially susceptible to weeds in the understory, especially cheatgrass. A good quality occurrence of the plant association Greasewood/Seablight (G2G3 S2S3) such as

the one in Disappointment Valley PCA is noteworthy. Other areas where we noted large occurrences of greasewood were Little Gypsum Valley, on the west side of the Dolores River, where it was accompanied by snakeweed, four-wing saltbush, rabbitbrush, galleta and Russian knapweed; Silvey's Pocket, where it was mixed with big sagebrush, galleta and six-weeks fescue; and Dry Creek Basin, where the understory was mainly cheatgrass. Other species that often occur with greasewood are scarlet globemallow and prickly pear cactus.

Four-wing saltbush is one of the most adaptable and widespread western shrubs, growing in a wide variety of arid environments. It usually occurs on less alkaline, better drained soils than shadscale or greasewood. Although it is widely distributed as a minor component of the plant communities in our area, it may also be the dominant species, associated with galleta, Indian ricegrass and blue grama. Again, cheatgrass is often a major invader of this community. We recorded a good quality occurrence of the plant association Four-wing saltbush/galleta (G3G4 SU) in the East Paradox Creek PCA, north of the highway, below the pinyon-juniper zone. Other plants in this community were scarlet globemallow, snakeweed, prickly pear cactus, blue grama and cheatgrass.

Shadscale is the third common dominant shrub in the semi-desert shrubland zone. In undisturbed sites, it occurs with galleta or, usually on north facing slopes, with Salina wild rye. The occurrence of the Shadscale/galleta community that is included in the Disappointment Valley PCA was in better condition than most. Other areas surveyed in Disappointment Valley had little grass, or more blue grama than galleta. Common associated species were low rabbitbrush and snakeweed. The Shadscale/Salina wild rye community in Disappointment Valley was found to be in only fair condition. Shadscale dominated communities can also be found in Paradox Valley, Hieroglyphic Canyon (Clements, personal communication 1999), and Dry Creek Basin.

Effects of heavy grazing in the semi-desert shrubland zone usually will result in a decrease of the more palatable species such as fourwing saltbush, winterfat, and native grasses, along with an increase in unpalatable species like rabbitbrush, shadscale and Russian thistle. Disturbances will encourage the invasion of cheatgrass and Russian knapweed.

The weak-stemmed mariposa lily was found in semi-desert shrublands. This vegetation type is used as foraging habitat by pale lump-nosed bats, spotted bats, and is home to plateau striped whiptails and midget faded rattlesnakes. These areas are also frequented by Gray Vireos and Short-eared Owls.

**Sagebrush Shrublands**

Sagebrush occupies areas that are better drained and aerated than the semi-desert shrubland habitat discussed above. It occurs mixed with salt tolerant shrubs in transitional areas in the valleys, and forms pure stands where the soils are less alkaline. It is abundant in the higher valleys and on mesas in the western part of San Miguel and Montrose counties (Figures 10, 11.). It is often a major component of pinyon-juniper communities, and frequently occurs with oak, ponderosa pine, and aspen.

Four common types of woody sagebrush, and one state rare species, are found in the study area. All four common species have a wide ecological range, and there is much overlap between their ranges. However, each has some habitat preferences. Black sage

grows in very dry areas in the valleys, on alkaline soils, and in shallow sandy soils or on windswept ridges in the pinyon-juniper zone. It often assumes a very compact, cushion like form. Big sagebrush, the tallest of the species, occupies deep soils in the valleys. It is found in moist ravines and on roadsides where runoff collects. In Maverick Draw, near Nucla, it reaches a height of over ten feet, and a trunk diameter of eight inches.
It is common in the riparian zone of the Dolores River, mixed with New Mexico privet, skunkbrush, rabbitbrush, and coyote willow. Mountain big sage is the most abundant species in our area. It occupies higher, cooler sites, on shallower and drier soils. It is the dominant species in large areas, and also the most common sagebrush species in the pinyon-juniper zone. Silver sage is found at the higher elevation zones of ponderosa pine and aspen, on Horsefly, Dallas Divide and Iron Springs Mesa, and is included in the discussion of mountain shrublands.

A dwarf species of sagebrush, Pygmy sagebrush, is rare in Colorado. It was found in Dry Creek Basin, in a site dominated by black sage. It appears to be the most drought tolerant of all the sagebrushes, growing in slightly elevated and better drained microsites than the black sagebrush. In Utah, this species is known to grow in “peculiar edaphic situations” on clay and other soils, and is often a component of communities that support rare plant species (Welsh 1993).

Sagebrush is intolerant of fire, and will not sprout from roots after a disturbance, as many shrubs do. It has been mechanically removed in some areas to increase forage production for livestock. Unfortunately, this sometimes results in a decrease of desirable grasses and forbs, and invasion by exotic weeds such as cheatgrass and Russian knapweed.

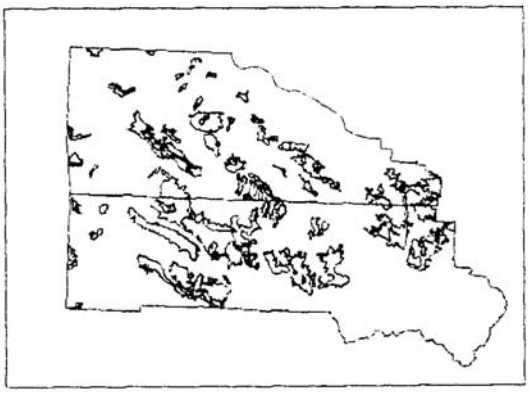


Figure 10. Distribution of Sagebrush shrublands.

Common associates of sagebrush are snakeweed, rabbitbrush, galleta, western wheatgrass, blue grama, needle and thread, muttongrass, Indian rice grass, Indian paintbrush, hairy golden aster, rough-seed cat’s-eye, many-lobed groundsel, scarlet globemallow, sand aster, actinea, and several milkvetches. The most common weedy invader is cheatgrass. Crested wheatgrass has been planted in many sagebrush sites. Twenty to 40 years ago, many sagebrush sites were 'treated' by chaining, disking, burning, or spraying to reduce shrub cover and increase forage for livestock. These areas were usually planted with non-native crested wheatgrass.

Large areas of sagebrush, with a good mixture of grasses and forbs, are essential for the survival of the Gunnison Sage Grouse. Heavy grazing tends to increase the sagebrush cover and decrease perennial bunch grasses. Shrubs such as rabbitbrush and snakeweed will increase, and cheat grass and other annual weeds may invade (USDA 1972)

Large expanses of sagebrush occupy the mesas such as Wild Steer Mesa, Monogram Mesa, Mailbox Park, Miramonte Reservoir, Hamilton Mesa, and valleys of Dry Creek Basin, Disappointment Valley, Paradox Valley and Bull Canyon. Two rare plant species, the pygmy sagebrush and Parish’s alkali-grass were found in this

vegetation type. Sagebrush shrublands support nesting populations of Gunnison Sage Grouse and Sage Sparrows. The sagebrush ecosystem is represented in the PCAs Beaver Mesa, Dry Creek Basin, and Miramonte Reservoir.

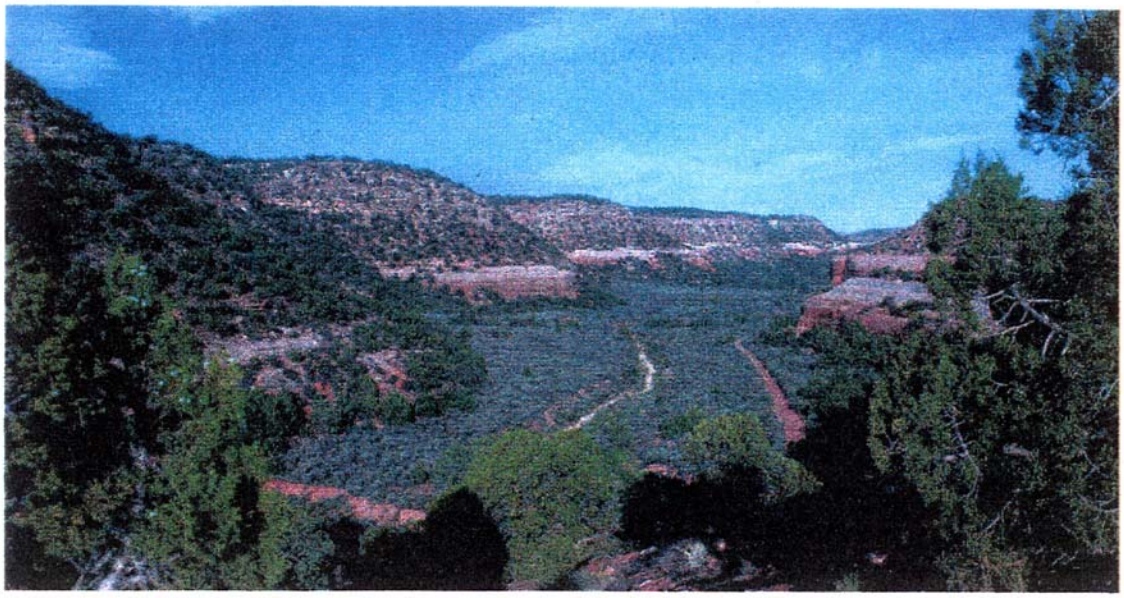


Figure 11. Sagebrush shrublands in valley floor, Bull Canyon, San Miguel County. Pinyon-juniper woodlands on canyonsides.

**Pinyon-juniper Woodlands**

Pinyon-juniper woodlands are a common vegetation type in San Miguel and western Montrose counties, occupying large areas on the canyonsides and mesas in the west, the slopes of the Uncompahgre Plateau, and the foothills of the San Juans (Figures 11, 12.). Pinyon-juniper woodlands are found from 4,500 to 9,000 feet, most commonly between 5,000 and 7,000 feet. At higher elevations they occur on south and west facing slopes.

The trees in this zone are typically short and widely spaced, with an understory ranging from almost barren to a diverse mixture of shrubs, forbs and grass. Soils are usually coarse, sandy, and shallow, with low fertility. With increased moisture the canopy can become more dense, with a resulting decrease in understory vegetation. The pinyon-juniper type is widespread throughout the western United States, with different species of pinyon pine and juniper in different areas. The species found in western Colorado are the Colorado pinyon (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*), with Rocky Mountain juniper (*Juniperus scopulorum*) occurring mostly in relatively mesic sites. In most of the region pinyon pine and juniper are co-dominant. However, of the two tree species, pinyon is more tolerant of cold, and juniper more tolerant of drought (Mutel and Emerick 1992). Juniper therefore occurs at lower elevations, where it is often mixed with sagebrush and desert shrubs, while pinyon is found at the higher elevations, where it gradually gives way to Gambel's oak and ponderosa pine. Pinyon-juniper sites are usually warm and dry, with a mean annual temperature between $45^0$ and $55^0$ F., annual

precipitation between 10 and 20 inches, and at least 80 frost free days (Mutel and Emerick 1992).

The shrub understory of the pinyon-juniper zone depends on site characteristics such as slope, aspect, and disturbance history. Shrubs may include saltbushes and other species discussed above under the semi-desert shrub vegetation type at the lower elevations; sagebrush (probably the most common associate); and mountain mahogany, Gambel's oak, serviceberry, snowberry, and other shrubs discussed below under the mountain shrubland vegetation type, at the higher elevations. The herbaceous understory is often sparse, especially where grazed by cattle. Typical native grasses are needle and thread, Indian rice grass, blue grama, galleta, Sandburg bluegrass, and bottlebrush squirreltail. Cheatgrass is the most frequent non-native invader. Common forbs are hairy golden aster, twin bladderpod, roughseed cat's-eye, and scarlet globemallow.

Succession after disturbance such as fire in the pinyon-juniper zone progresses from annual grasses to perennial grasses, shrubs, and finally pinyon and juniper. It may take 300 years to re-establish a pinyon-juniper woodland. This leads to a mosaic of different successional stages on the landscape. Openings in the pinyon-juniper woodlands in western Colorado may be sagebrush or grassland patches consisting of the native bunchgrasses mentioned above. The plant community "Needle and thread Great Basin herbaceous vegetation" is frequent in the western part of the study area. Often the patches are small, and the quality variable, with high quality bunchgrass patches adjacent to patches dominated by cheatgrass. Some of the best quality sites that have been documented were located in a BLM study in 1980 using helicopters, and were found on benches and isolated mesas that are inaccessible to both livestock and researchers on foot.

Plant communities recorded in the pinyon-juniper zone of San Miguel and western Montrose counties are Pinyon pine/Needle and thread; Pinyon pine/dwarf mountain mahogany; Utah juniper-Utah serviceberry; Utah juniper/Salina wildrye; and Needle and thread Great Basin herbaceous vegetation.

Riparian areas in the pinyon-juniper zone of the San Miguel River are often dominated by narrowleaf cottonwood with an understory of coyote willow or skunkbrush. In the Dolores River drainage, riparian areas are more often New Mexico privet, coyote willow, and skunkbrush, with cottonwoods less frequent. In both drainages, tamarisk has invaded. Hanging gardens, previously discussed, occur primarily in the pinyon-juniper zone.

Rare plant species found in the pinyon-juniper zone were the five species of milkvetch, two species of penstemon, Payson lupine, and Paradox breadroot.

Gray Vireos nest within the pinyon-juniper zone and a pair was observed during the survey. Other rare animals visiting pinyon-juniper communities include Lewis's

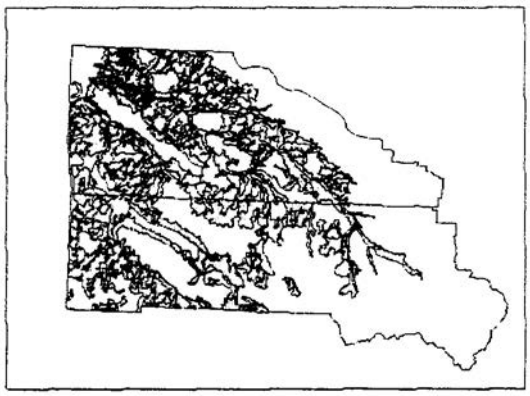


Figure 12. Distribution of pinyon-juniper woodlands

Woodpecker, tree lizards, and plateau striped whiptails. Midget faded rattlesnakes live in the pinyon-juniper zone and pale lump-nosed bats, spotted bats, and Peregrine Falcons forage extensively within this habitat.

**Mountain shrublands**

Mountain shrublands extend into the pinyon-juniper zone below, and upward into the montane forests with mixed conifers and aspen (Figure 13). They occur on hillsides, upland benches, and well-drained lowlands, with fifteen to twenty-seven inches of precipitation per year (Johnston 1987). Mountain shrublands are most common between 7,000 and 9,000 feet elevation. They are widespread in central and western Colorado and Utah, reaching their northern limit in south central Wyoming (Knight 1994). In the San Miguel Basin, this common type is often a seral stage where the climax vegetation would be a pinyon pine woodland or montane forest of ponderosa pine or Douglas fir. In the absence of the tree cover, it forms dense thickets covering large areas, or smaller islands in a mosaic with sagebrush or grasslands.

Gambel's oak is the most abundant shrub, next to sagebrush, in the San Miguel Basin. It may be associated with other shrubs such as Utah serviceberry, snowberry and mountain mahogany and trees such as ponderosa pine, Douglas fir and Rocky Mountain juniper. Gambel's oak also occupies a transitional zone between riparian and upland communities, where it may reach tree size.

Gambel's oak is a clonal species, and may live to be very old. Stands in Utah exceed 4000 years of age (Mutel and Emerick 1992). It is an important invader after fire. In disturbed ponderosa pine forests, it may prevent the re-establishment of pine. Erdman (1970) found that in Mesa Verde, oak and the other mountain shrubs became established in only a few years after a fire, and remained dominant for one hundred years before being replaced by pinyon and juniper.

Gambel's oak is a major component of the vegetation of the Uncompahgre Plateau (Figure 14). On cool north-facing hillsides such as above Clay Creek, and McKenzie Creek, it occurs with Douglas fir, Rocky Mountain juniper, mountain mahogany, mountain lover, snowberry, Oregon grape, and elk sedge. The opposite, south-facing sides of the same canyons have dry pinyon-juniper woodlands. In drier sites, it is associated with pinyon pine and ponderosa pine. Common associated plants are sagebrush, squaw apple, Fendler's ceanothus, lupines, pussytoes, Geyer onion, muttongrass, mules ears, arrowleaf balsamroot, American vetch, spreading fleabane, Nuttall's larkspur, longleaf phlox, mountain parsley, scarlet gilia, single stemmed butterweed, bastard toadflax, yarrow, and Wyoming paintbrush, hairy golden aster, sulphur buckwheat (Lyon 1995). Figure 13 shows the distribution of lands dominated by Gambel's oak in the San Miguel Basin. However, the extent of oak is much greater when the areas mapped as ponderosa pine or Douglas fir, but having abundant oak in the understory are included.

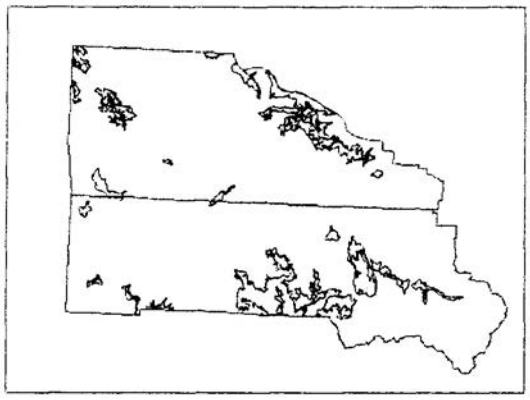


Figure13. Distribution of mountain shrublands.

Two other notable mountain shrubland communities, which are less common in Colorado, occur in the region. Along the west-side of the Uncompahgre Plateau, at about 8,000 feet, are hundreds of acres dominated by greenleaf manzanita. Most of this community is in Mesa County, but it extends into Montrose County. Manzanita is also found as an understory in ponderosa pine forest in the far northwest part of the study area around Buckeye Reservoir, and on the Uncompahgre Plateau. This community, Ponderosa pine/greenleaf manzanita is represented in the Buckeye Reservoir PCA.

Silver sagebrush is the dominant shrub in large open parks on the south side of the Uncompahgre Plateau and in the Dallas Divide area. In unaltered sites, the understory species would include the grasses Thurber fescue and Parry's oatgrass. Much of this area has been grazed for a century, and non-native grasses such as Kentucky bluegrass and increaser herbaceous plants like mule's ears have replaced the native grasses. This community is represented in the Horsefly PCA.

Although many animals such as small rodents, rabbits, and numerous species of songbirds occupy and visit mountain shrublands, the only rare animal frequenting this habitat type in the San Miguel Basin is Lewis's Woodpecker.

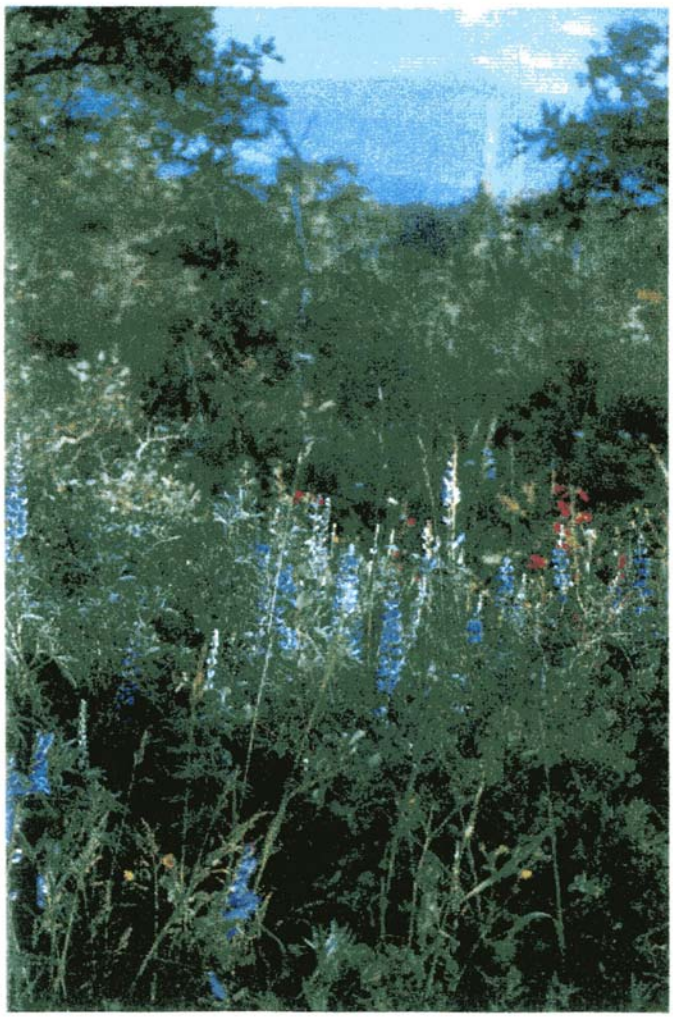


Figure 14. Mountain shrub vegetation, Uncompahgre Plateau.

**Ponderosa Pine Forests**

Large areas of San Miguel and western Montrose counties are covered with ponderosa pine forests (Figure 15). Douglas fir dominates smaller areas, which is also frequently present in ponderosa pine dominated sites. Other trees that are less frequent in this zone are Rocky Mountain juniper and white fir. Aspen occurs at the same elevations, but will be discussed separately.

Major areas of ponderosa pine are found along the west side of the Uncompahgre Plateau, in the Uncompahgre National Forest lands south of Norwood, the Uncompahgre National Forest southeast of Egnar and west of the Dolores River in southern San Miguel County, and the Manti-La Sal National Forest in the northwest part of Montrose County near Buckeye Reservoir and Carpenter Ridge (Figure 14).

Ponderosa pines are the largest conifers in the Southern Rocky Mountains. They occur both as the dominant trees in forested areas, in mixed conifer stands with Douglas fir, and as scattered individuals in pinyon-juniper and riparian areas. The trees are adapted to withstand drought, with taproots up to 35 feet and lateral roots as long as 100 feet. Their thick, corky bark protects them from the frequent ground fires to which they are adapted. Although scattered trees may occur as low as 5,000 ft., they are mostly found between 7,000 and 8,500 ft. in Colorado. This species is found on dry warm sites with less than 25 in. of annual precipitation, most of which falls as snow. Soils are coarse, shallow, and rocky (Mutel and Emerick 1992).

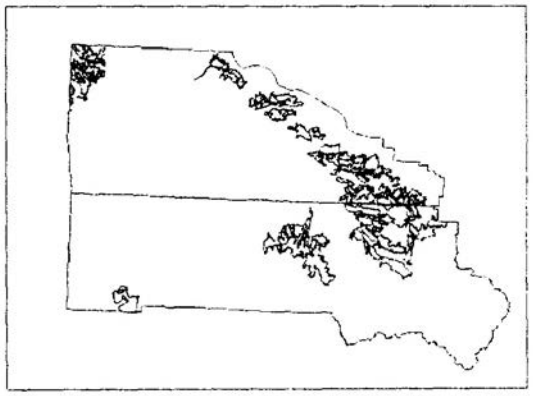


Figure 15. Distribution of Ponderosa pine and Douglas fir forests.

Few ponderosa pine stands have remained unaltered by humans. Since European settlement the trees have been cut for fuel, mining timbers, and lumber, or cleared for homes and pastures. Much of the ponderosa pine in San Miguel and Montrose counties has been logged. It is estimated that the potential ponderosa pine forest in the study area is only 40 to 45% stocked. Much of the area has been converted to Gambel's oak (USDA 1972).

Large areas of ponderosa pine forest have also been killed by the mountain pine beetle. In their natural state, ponderosa pine landscapes are open and park-like, with widely spaced trees and a rich understory of native grasses. Removal of grass by grazing reduces fire frequency. Grazing may also increase tree density by removing competition for seedlings. The result is a more closed canopy, with dense stands of weaker trees. Because these trees do not get adequate sun and nutrients, they are unable to produce enough resins, and are susceptible to beetle infestation (Mutel and Emerick 1992).

The understory in ponderosa pine forest depends on the density of trees and available moisture. Gambel's oak is the most common understory species. Other shrubs include the same as those that are associated with the oak, including Utah serviceberry, snowberry, Oregon grape, mountain lover, and mountain mahogany. In addition, shrubby cinquefoil, wild rose, common juniper, kinnikinnick, and Fendler's ceanothus are often associated with the pine. In some rocky sites with very shallow soils, greenleaf

manzanita replaces the oak. Common native graminoids in this type are elk sedge, muttongrass, bottlebrush squirreltail, and June grass. The exotic species Kentucky bluegrass and cheatgrass are also common invaders of ponderosa pine forests. Herbaceous species include pussytoes, mules ears, arrowleaf balsamroot, lupines, cinquefoil, Richardson's geranium, spreading fleabane, yarrow, death camas, northern bedstraw, actinea, fineleaf hymenopappus, white peavine and American vetch.

The Ponderosa pine/Gambel's oak and the Ponderosa pine/greenleaf manzanita plant communities are both included in the Buckeye Reservoir PCA.

Douglas fir is found in cooler and more mesic sites within the ponderosa pine zone, and extends to somewhat higher elevations. It typically occurs in patches on north-facing slopes, in draws, and in riparian areas. Douglas fir, like ponderosa pine, has thick bark, which has adapted it to survive fire. Mature stands have an open structure, maintained by fire. When dense, it is susceptible to spruce budworm and Douglas fir bark beetle. It is cold tolerant and can perform photosynthesis even under snow (Mutel and Emerick 1992).

The understory in Douglas fir stands tends to be more sparse than in the ponderosa pine forest, but less so than in spruce-fir. Most of the species associated with Douglas fir are also found with ponderosa pine, oak, or spruce. The shade and thick litter of dense stands encourage shrubs such as Oregon grape, Rocky Mountain maple, and mountain lover. Common herbaceous plants that were found with Douglas fir were elk sedge, mountain parsley, white peavine, starry false solomonseal, meadowrue, and Kentucky bluegrass.

The ponds, fens, and swamps of the ponderosa pine woodlands support populations of northern leopard frogs in the San Miguel Basin. A pair of Lewis's Woodpeckers was observed nesting in a ponderosa pine snag in this habitat type. Also, spotted bats frequent ponderosa pine woodlands during their breeding season, Peregrine Falcons forage here, and midget faded rattlesnakes occur here.

**Aspen Forests**

Aspen, the only deciduous forest tree in the region, is the most widespread tree in North America. Although deciduous, aspen is effectively evergreen, because its bark is able to perform photosynthesis, even at freezing temperatures (Knight, personal communication 1994).

Aspen occurs in the San Miguel Basin between elevations of 7,200 and 10,200 feet (Figures 16, 17) . At lower elevations it is associated with Gambel's oak and ponderosa pine, where it occurs in relatively mesic sites, often in draws with cool air drainage, on north-facing slopes, in riparian zones, or in areas with snowdrifts or seeps. At upper elevations it may be dominant, or mixed with Engelmann spruce and subalpine fir. Mixed aspen and Engelmann spruce is very common on the Uncompahgre Plateau.

Aspen, like Gambel's oak, is clonal. Although individual stems live for about 100 years, their root systems can live for 1000 or more years (Peet 1988). They are able to thrive in sunny places with poor soils. They are thus adapted for colonizing disturbed or burned sites. The other tree, which is a major colonizer after fire in the Rocky Mountains, lodgepole pine, is conspicuously absent from the San Miguel and Dolores drainages. Aspen is especially plentiful in sites once heavily disturbed by mining, logging, and grazing. After disturbance, colonization can be completed within five to ten

years. Maximum density is reached in 25 to 50 years, after which shade tolerant species such as Douglas fir and subalpine fir may increase. Whether or not aspen occurs in some locations as the climax, rather than a seral species, is a matter of some debate. Presumed climax forests are characterized by large trees, a lush understory, and soil which is loamy, porous, and moist throughout the season (Mutel and Emerick 1992).

Aspen forests are typically even aged. Because of apical dominance, young shoots usually do not survive under mature trees (Schier *et al.*1985). Once established, aspen forests are the most species rich of all the vegetation types. This may be due to the increased fertility and moisture holding capacity of the soil with the addition of the deciduous leaf litter (Peet 1988). Aspen leaves decompose readily, since they are low in the tannins and resins that retard decomposition in conifer needles (Mutel and Emerick 1992).

Understory species associated with aspen include a diverse mixture of shrubs, grasses and herbs, depending on soils and available moisture. In drier sites, aspen is often interspersed with patches of grassland, particularly Thurber fescue, and less frequently, on the Uncompahgre Plateau, Parry's oatgrass. Shrubs that are common in the drier sites include snowberry, serviceberry, Gambel's oak, shrubby cinquefoil, Oregon grape, common juniper, kinnikinnick and wild rose. Herbaceous species include mountain parsley, lupine, white peavine, American vetch, yarrow, Richardson's geranium, aspen daisy, tall fleabane, sweet cicely, northern bedstraw, blue violet, Canada violet, strawberry, golden banner, and orange sneezeweed. More mesic aspen stands may have a shrub component of serviceberry, Rocky Mountain maple, and chokecherry. Very

Figure 16. Aspen forest with mesic forb understory, Uncompahgre Plateau.

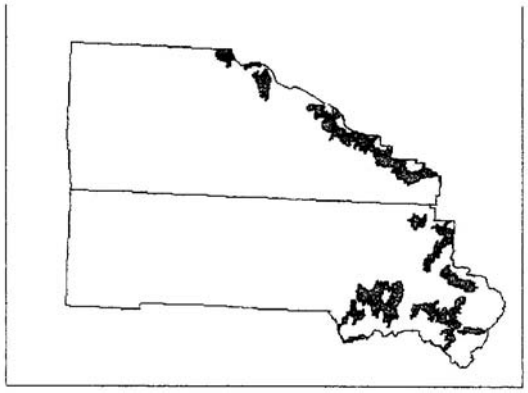


Figure 17. Distribution of Aspen forests.

moist aspen areas, such as the north facing slopes of the San Juans and some parts of the Uncompahgre Plateau have an extremely lush understory of tall herbaceous plants like osha, tall larkspur, meadowrue, Richardson's geranium, bracken fern and cow parsnip. Common graminoids in aspen stands are Thurber fescue, Idaho fescue, Kentucky bluegrass, elk sedge, silvertop sedge and blue wildrye.

Rare plants found in the aspen zone are King's clover, variegated scouring rush, and canyon bog orchid. The majority of Northern Goshawk nests in the San Miguel Basin occur in aspen forests. Boreal owls are the only other rare animal occupying the aspen forests of the Basin.

**Subalpine Forests**

Subalpine forests dominated by Engelmann spruce and subalpine fir cover the upper elevations of the San Miguel Basin to treeline (Figures 18, 19). They are most highly developed above 9,000 feet. The forest typically has a closed canopy, with a sparse understory of shade tolerant species. Interspersed with the forests, and becoming more common at higher elevations, are subalpine meadows or "parks." Globally, the combination of various species of spruce and fir is common, and is characteristic of the taiga biome. It occurs in cold, wet areas with a short growing season. Annual precipitation is from 11.8 to 33.5 inches, with most of it falling as snow (Mutel and Emerick 1992). This ecosystem is important in Colorado for water supply and recreational values.

Soils in the spruce-fir zone are acidic, and often shallow and infertile, due to their recent origin, leaching and the acidic foliage. There is little bacterial activity at the low temperatures of this zone, and much of the carbon in the ecosystem is locked up in humus. Some compensation for this is achieved through mycorrhizal associations, which increase nutrient uptake (Mutel and Emerick 1992).

The shady understory of spruce-fir forests tends to contain few plant species. Typical understory species in the spruce-fir zone in our area are dwarf blueberry, mountain lover, Oregon grape, elk sedge, meadowrue, and sweet cicely. In very deep shade, there are rattlesnake plantain, one-sided wintergreen, and pictureleaf wintergreen.

Mesic forest openings and wet meadows have a greater diversity of species, including tall larkspur, Richardson's geranium, Colorado columbine, elderberry, cow parsnip, bluebells, bittercress, triangle leaf groundsel, marsh marigold, planeleaf and barren-ground willows, and smallwing, water and Northwest Territory, or beaked sedges.

Figure 18. Spruce-fir forest near Lone Cone, San Miguel County.

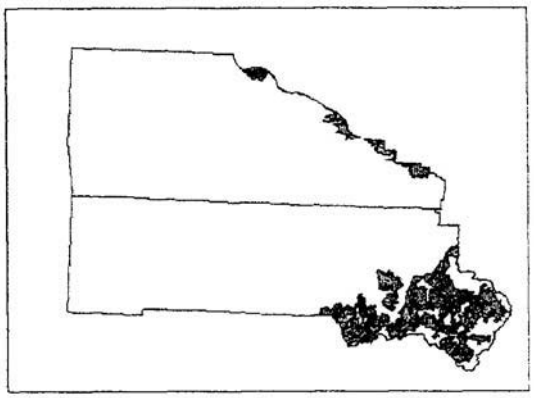


Figure 19. Distribution of spruce-fir forests.

Rare plants found in the spruce-fir zone include several species of *Botrychium* (moonwort), Steller's cliff-brake, King's clover, and Altai cottongrass. Important animal species found in the spruce-fir zone include the boreal owl, goshawk, and Colorado River cutthroat trout.

**Alpine**

Alpine communities occur at the highest elevations in the San Juans, surrounding the upper San Miguel River on three sides (Figures 20, 21). Species are so intermixed that it is often difficult to claim dominance for any one. Common alpine species of drier sites in our area include whortleberry, alpine avens, false strawberry, alpine sage, smelowskia, snow willow and arctic willow. Wet, late snowmelt areas are often dominated by marsh marigold with globeflower, Parry's primrose, willow-herb, and buttercups. Watercourses may have a high percent cover of barrenground and planeleaf willows.

Several rare plants occur in the alpine zone: five species of *Draba*, or whitlow-wort, several *Botrychiums*, or moonworts, and Altai chickweed were documented in 1999. Rare animals of the alpine zone include the Brown-capped Rosy Finch and Whitetailed Ptarmigan. Although neither were observed during this survey they both are likely residents of the alpine areas around Telluride. Brown-capped Rosy Finches were observed on the Ouray side of the San Miguel-Ouray county line in the vicinity of Yankee Boy Basin. Ptarmigan are alpine birds of the San Juan Mountains, but are difficult to observe during summer because of their cryptic coloration and secretive nature.

Alpine vegetation is represented in the Imogene Pass, Silver Pick Basin, Lizard Head, Bilk Basin, Greenback Mountain, Ophir Pass, and Savage Basin PCAs.

Figure 20. Alpine vegetation , Lizard Head Wilderness, San Miguel County.

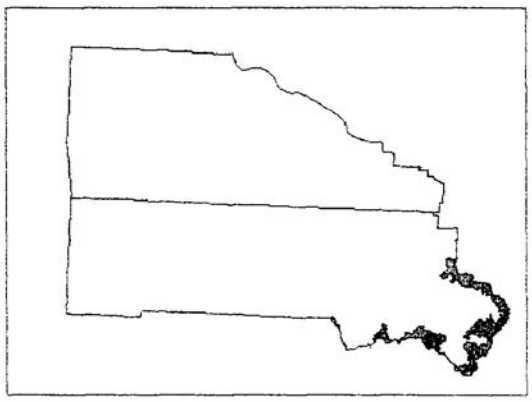


Figure 21. Distribution of alpine vegetation.

**Weeds**

Exotic plant invasion is an increasingly serious problem in western Colorado. Weeds tend to take advantage of any disturbance of the soil. Wind, water, animals, people and vehicles disperse their seeds. In some cases, we have planted them intentionally. Once established, they often lack the native competitors, predators, and pathogens that would keep them under control in their native habitat.

Major weeds in our area are: Canada thistle, Russian knapweed, white top, purple loosestrife, oxeye daisy, yellow toadflax, tamarisk, Russian olive, hound's tongue, cheatgrass, burdock, cocklebur, Jim Hill mustard, Russian thistle, perennial pepperweed, cranesbill, and musk thistle.

In addition, there are a number of exotic species that are more generally tolerated, but would not be present in pristine natural communities. These include reed canary grass, yellow sweet clover, Kentucky bluegrass, dandelion, and common pasture grasses such as orchard grass, smooth brome, crested wheatgrass and meadow timothy.

Following are some of our observations of the locations of weeds in San Miguel and western Montrose counties.

Canada thistle is widespread throughout the area. It invades almost anywhere, from the desert to the montane zone, where soils are disturbed and there is sufficient moisture. It is difficult to eradicate because it has underground stems, or rhizomes, which will continue to produce new shoots after the above ground parts of the plant are killed or removed. Digging and hand pulling are rarely effective. In addition, its seeds can remain dormant in the soil for many years. Prevention, by avoiding any unnecessary disturbance of the soil, is the best defense. *Although many people are under the impression that all thistles are bad, it is important to note that there are native thistles that are not aggressive and should not be destroyed.*

Russian knapweed is abundant in disturbed areas, along roads, and in the greasewood flats in Disappointment Valley. It was present along the Dolores River between Slick Rock and Bedrock near frequently used campsites, in Broad Canyon, Mailbox Park, Tuttle Draw, Dry Creek Basin, Slick Rock, and many other locations.

White top can be found in disturbed areas, often invading hayfields and roadsides. We noted it near Mesa Creek, Maverick Draw, and Atkinson Creek. It is a serious contaminant of hayfields in the Redvale and Norwood areas.

Purple loosestrife was recently found in western Montrose County, on both BLM and private lands, and is being aggressively combated by the county weed control department. At present, its extent is estimated at 40 to 50 acres (Grother, personal communication 2000). This tall purple-flowered plant invades wet areas and is potentially a serious threat to wetlands and riparian areas.

Oxeye daisy is becoming a huge problem in the mountain areas from the San Miguel River to Lizard Head Pass. It is found along the South Fork, and in the Mountain Village area. The oxeye daisy is still planted by many people as a "native" wildflower. It originally was established as a garden plant around homesteads, and has escaped to become a rapidly increasing weed. In some areas it has crowded out nearly all vegetation. We have observed the plants now growing in areas like the banks of the San Miguel River downstream from the Norwood bridge, where it was absent as recently as 1994.

Yellow toadflax, like oxeye daisy, was originally planted as an ornamental, and escaped to become an invasive weed. It is common along the San Miguel and on the mesas, as well as in the mountains.

Tamarisk is found in riparian areas along the Dolores River, and has moved up the San Miguel River. It is most abundant on the Dolores River from about La Sal Creek north, and in the broad valleys that the river crosses, such as Big Gypsum, Disappointment and Paradox. There was less in the steeper parts of the Dolores River Canyon between Slick Rock and Bedrock. Tamarisk has moved up the San Miguel River as far as the South Fork confluence. It is being treated along the entire San Miguel with the goal of preventing a serious infestation in the more pristine river areas (Grother, personal communication 2000). Annual treatment by The Nature Conservancy and volunteers at the San Miguel at Tabeguache Preserve has proved effective. Trees are cut, and the stumps are painted with a herbicide. This is an ongoing battle, and this degree of labor-intensive management is probably not feasible in large sites such as the Dolores River Canyon.

Russian olive is less abundant than tamarisk, but occupies similar riparian habitats. It is common in the Nucla area.

Hound's tongue is widespread and abundant at higher elevations, particularly in the montane zone. We found it on the south side of the Uncompahgre Plateau. It is present in both San Miguel and Dolores counties above Miramonte Reservoir on the Dolores/Norwood road, and is currently being treated by the two counties together.

Cheatgrass is found in the semi-desert shrublands, sagebrush shrublands, pinyon-juniper and mountain shrubland zones, wherever there has been disturbance such as fire or heavy grazing. It is extremely difficult to eliminate, once it has invaded an area. Cheatgrass is an annual grass and is able to complete its lifecycle in the spring before the summer dry weather begins. When dry, it is extremely flammable. Frequent fires favor cheatgrass by eliminating competing perennial vegetation. Its seeds survive in the unburned organic material on a site. Rapid growth and vigorous reproduction assure cheatgrass dominance in postburn stands (FEIS 1999). Range managers advise grazing early in the season for several years, before the grass sets seed, to keep it under control. Particularly heavy invasions were found in Bull Canyon, Paradox Valley, Dry Creek Basin, Slick Rock, Disappointment Valley, and Gypsum Gap.

Musk thistle and other invasive biennial thistle, tend to be found in moist areas in the middle elevations. It was noted along roads on the Uncompahgre Plateau, e.g. Sheep Draw, and in Dry Creek Basin. At its worst, it can form thickets that are impenetrable to livestock and wildlife.

Burdock is found throughout the area in moist disturbed sites.

Cockleburs were abundant in drying stock ponds in the pinyon-juniper zone.

Species that are commonly planted for pasture or for erosion control are frequent throughout the area. These include yellow and white sweet clover, orchardgrass, smooth brome, timothy, Kentucky bluegrass, crested wheatgrass, red top, and alfalfa. These species are especially evident along roads and trails. They usually are not found in the interior of the forests away from trails.

Kentucky bluegrass is very abundant in moist areas, replacing native grasses. Although it provides feed, its shallow roots are not as effective in holding soil on stream

banks as other native species are (FEIS 1996). It is particularly abundant in the montane zone.

Dandelions are common in the mountains in disturbed and heavily grazed sites. Although not considered a serious problem by many people, they do replace native grasses and forbs. The largest populations were seen on the Uncompahgre Plateau. The west side of Hastings Mesa is heavily infested with dandelions as well.

Reed canary grass is abundant in wetlands and along most of the rivers and streams at lower elevations. Although it serves to stabilize banks, it is probably replacing native grasses and sedges.

Some of the most troublesome weeds are listed below by area:

- Dolores River: tamarisk, reed canary grass, Russian knapweed, Canada thistle
- San Miguel River: Canada thistle, Russian knapweed, oxeye daisy, yellow toadflax, Russian olive, tamarisk
- Western Montrose and San Miguel counties sagebrush areas: cheatgrass, Russian knapweed, perennial pepperweed, crested wheatgrass
- Uncompahgre Plateau: oxeye daisy, dandelion, houndstongue, thistles (perennial and biennial)
- San Juan Mountains: hound's tongue, oxeye daisy, yellow toadflax
- Mesa tops: Kentucky bluegrass and other introduced pasture grasses, Canada thistle, whitetop, yellow toadflax
- Naturita-Nucla area: cheatgrass, Russian knapweed, white top, purple loosestrife, tamarisk and Russian olive
- Dry Creek Basin: Russian knapweed, cheatgrass, musk thistle, tamarisk
- Water impoundments (stock ponds) in west end: Russian knapweed, Russian thistle, cocklebur, yellow sweet clover, tamarisk

## Rare and Imperiled Plants of San Miguel and Western Montrose Counties

Plants may be rare for a variety of reasons. They may have a narrow geographic range, or be widespread but sparsely distributed, never forming large populations, or have very specific habitat requirements (e.g. specific soil substrates) that are not often met. Any one or a combination of these factors can describe the rarity of a particular plant species. Some plants were never abundant, while others have suffered major declines due to loss of habitat, detrimental land uses, and other causes. Likewise, threats to a rare species vary. For instance, in Hawaii, where 90% of native plants are considered rare, a major threat is displacement by exotic species, whereas near Montrose the narrow geographic range of the clay-loving wild buckwheat is threatened by residential development.

In San Miguel and western Montrose counties, several of the rare plant species are restricted to specific habitats, as well as having very small geographic ranges. The hanging gardens and small seeps in otherwise dry areas that are home to Kachina daisy, Eastwood monkey-flower, and helleborine orchid, are unusual habitats (Figure 7), and these plants may never have been abundant. Some of the alpine species like the San Juan whitlow-grass, are endemic to the San Juan Mountains, while others, like the Altai chickweed are restricted to unusual habitats (scree slopes), but are also found in the Altai region of Siberia.

Much more research is needed to understand all of the reasons for rarity and the ecological needs for most of our rare species. Pollination vectors, seed dispersal mechanisms, relation to soil chemistry, and many other factors remain unknown. Finding the locations of rare plants and assessing their abundance and condition is a prerequisite to further study. This project has contributed to that first step.

Thirty-six plant species that are rare or imperiled, globally or in Colorado, have been documented from San Miguel and western Montrose counties during the last ten years. They are described below, and are included in Potential Conservation Areas (PCAs).

Eight additional species that have been reported from the area were not included in PCAs, because we lack confidence in the records for various reasons: they were reported only once, more than ten years ago; their locations were not precise enough; they are not known to constitute a viable population; or their identification is questionable. These are *Phacelia constancei, Lygodesmia doloresensis, Oreocarya rollinsii, Senecio dimorphophyllus* var. *intermedius, Woodsia neomexicana, Polygala subspinosa* and *Draba rectifructa*. These species may yet prove to be valid constituents of the flora with further research.

Eighty-nine new rare plant occurrences were located during this survey, and were entered into the CNHP database to join the 109 previously documented, making a total of 198 occurrences of rare plants for the area.

Thirteen plant species were recorded in the CNHP database in 1999 for the first time for this study area. They are: the seven species of moonwort, King's clover, Parish's alkali grass, purple cliff-brake, smooth cliff-brake, thick-leaf whitlow-grass, and variegated scouring rush.

The Kachina daisy remains the most rare plant in the area, followed by Payson's lupine, reflected moonwort, pale moonwort, San Juan whitlow-grass, and Parish's alkali grass.

**Table 5. Rare and Imperiled Plants of San Miguel and western Montrose counties.**

| Common Name | Scientific Name | G rank | S rank |
|---|---|---|---|
| Abajo penstemon | *Penstemon lentus* | G4Q | S2 |
| Altai chickweed | *Stellaria irrigua* | G4? | S2 |
| Altai cottongrass | *Eriophorum altaicum* var. *neogaeum* | G4T? | S3 |
| Arctic draba | *Draba fladnizensis* | G4 | S2S3 |
| Canyon bog-orchid | *Limnorchis ensifolia* | G4G5T3? | S3 |
| Colorado Divide whitlow-grass | *Draba streptobrachia* | G3 | S3 |
| Common moonwort | *Botrychium lunaria* | G5 | S2S3 |
| Eastwood monkey-flower | *Mimulus eastwoodiae* | G3? | S1 |
| Grand Junction milkvetch | *Astragalus linifolius* | G3Q | S3 |
| Helleborine orchid | *Epipactis gigantea* | G4 | S2 |
| Kachina daisy | *Erigeron kachinensis* | G2 | S1 |
| King's clover | *Trifolium kingii* | G4 | S1 |
| Lance-leaved moonwort | *Botrychium lanceolatum* | G5T4 | S2S3 |
| Leathery grape fern | *Botrychium multifidum* ssp. *coulteri* | G5 | S1 |
| Little penstemon | *Penstemon breviculus* | G3Q | S2 |
| Mingan moonwort | *Botrychium minganense* | G4 | S1 |
| Mountain whitlow-grass | *Draba rectifructa* | G3? | S2 |
| Naturita milkvetch | *Astragalus naturitensis* | G3 | S3 |
| Northern moonwort | *Botrychium pinnatum* | G4? | S1 |
| Pale moonwort | *Botrychium pallidum* | G2 | S2 |
| Paradox breadroot | *Pediomelum aromaticum* | G3 | S2 |
| Parish's alkali grass | *Puccinellia parishii* | G2 | S1 |
| Payson lupine | *Lupinus crassus* | G2 | S2 |
| Pygmy sagebrush | *Seriphidium pygmaeum* | G4 | S1 |
| Reflected moonwort | *Botrychium echo* | G2 | S2 |
| San Juan whitlow-grass | *Draba graminea* | G2 | S2 |
| San Rafael milkvetch | *Astragalus rafaelensis* | G3 | S1 |
| Sandstone milkvetch | *Astragalus sesquiflorus* | G3? | S1 |
| Slender rock-brake | *Cryptogramma stelleri* | G5 | S2 |
| Smooth cliff-brake | *Pellaea glabella* ssp. *simplex* | G5T4? | S2 |
| Southern maiden-hair | *Adiantum capillis-veneris* | G5 | S2 |
| Spike pappus grass | *Enneapogon desvauxii* | G5 | S1 |
| Thick-leaf whitlow-grass | *Draba crassa* | G3 | S3 |
| Variegated scouring rush | *Hippochaete variegata* | G5T? | S1 |
| Weak-stemmed mariposa lily | *Calochortus flexuosus* | G4 | S1 |
| Wetherill milkvetch | *Astragalus wetherillii* | G3 | S3 |

**Abajo penstemon** ***Penstemon lentus*** **Pennell G4Q S3**

Abajo penstemon (Figure 22) is a showy, lavender flowered member of the Figwort family (Scrophulariaceae). Its broad, fleshy basal leaves are gray-green, contrasting with the red sandy soils on which it often grows. The plant appears to spread vegetatively, as well as by seed, and we found many basal leaves throughout the summer with no flowering stems. Plants flower in May and June. Some botanists have included this species with Osterhout's penstemon (Weber 1996), but others find that it is distinct, based on its broader leaf shape and geographic separation (Cronquist *et al.* 1984). The habitat of these plants is usually pinyon-juniper woodlands, with mountain mahogany, cliff rose, Mormon tea, or Gambel's oak often present. Elevations range from 5,200 to 7,600 feet. The plants we observed were often growing on eroding soils, and seem to be well adapted to this situation by their long, elastic roots. The species is a Colorado endemic, occurring in southeastern Utah, Arizona and Colorado. In Colorado, it is known from Archuleta, LaPlata, Dolores, Montezuma, San Miguel and Montrose counties. We added seven new occurrences to the 18 that were already documented in Colorado, and have changed its state rank from S2 to S3 as a result of this survey. It is represented in the Slick Rock Hill and Paradox Valley North Potential Conservation Areas, as well as in several locations that did not qualify as PCAs.

**Altai chickweed** ***Stellaria irrigua*** **G4?S2**

This tiny plant grows in the most inhospitable habitat imaginable: barren scree slopes high in the mountains. Its flowers, only about a quarter of an inch in diameter, are exquisite when viewed closely (Figure 23). Each of its five petals is cleft to the base, and touches its neighboring petal segment at the tip, forming a five-pointed star. The stamens are opposite and nearly as long as the petals. The leaves are purplish green. The roots are long and elastic, allowing the plants to advance along with the downward creep of the rocks. This plant is found in North America only in Colorado and New Mexico, but is also found in the Altai region of Siberia, where it is also rare. It is one of several plants that share this disjunct distribution, suggesting that the two areas were once connected by habitat suitable to those species. In Colorado, it is known from nine counties in the San Juans and Central Rockies. In this survey, we found the plants on Lone Cone, Greenback Mountain, Imogene Pass, Lizard Head, Ophir Pass, and Silver Pick Basin--that is, nearly everywhere that we investigated high elevation scree slopes.

**Altai cottongrass** ***Eriophorum altaicum*** **var.** ***neogaeum*** **G4T?S2**

Altai cottongrass (Figure 25), also known as cottonsedge or bog wool, is a member of the sedge family, Cyperaceae. The plants are rhizomatous, with solitary white fleecy heads on the tops of the stems, and lacking well-developed leaf blades (Weber 1996). A more common, closely related plant, the narrowleaf cottongrass, has multiple heads and leaf blades nearly as long as the stems. Altai cottongrass grows in wet meadows, fens, and around ponds, usually above or at treeline. It is often associated with elephant-head pedicularis, tufted hairgrass, marsh marigold, mosses and sedges. Like the Altai chickweed, it is closely related to plants found in Siberia. In North America, it is found in Montana, Wyoming, Utah and Colorado. The species is represented in ten counties in Colorado. The plants have been recorded in San Miguel County at Bilk Basin and Prospect Basin. Those in Prospect Basin may be threatened by ski area development.

Figure 22. Abajo penstemon

Figure 23. Canyon bog orchid

Figure 24. Altai chickweed

Figure 25. Altai cottongrass

Figure 26. Colorado Divide whitlow-grass

**Canyon bog orchid** ***Limnorchis ensifolia*** **G4G5T3?S3**
**(*Platanthera sparsiflora* var. *ensifolia*)**

The canyon bog orchid (Figure 23) is a tall spike-like plant with small greenish flowers scattered along the stem, and tulip-like leaves. The genus is also classified by some botanists as *Habenaria* or *Platanthera*. It grows in moist or wet soil in mountain meadows, marshes, swamps, fens, open or dense forests, on stream banks and open seepage, frequently about springs. It has a wide range, from Oregon to Mexico, but good habitat is limited. The orchid's survival depends on a reliable year-round supply of moisture. The combination of grazing and trampling by livestock in the mucky areas where the orchid grows may eradicate the plant. We found it to be sparse but present at a small lake near Lone Cone and along the South Fork of the San Miguel.

**Colorado Divide whitlow-grass** ***Draba streptobrachia*** **G3S3**

Colorado Divide whitlow-grass (Figure 26) is one of several *Draba* species found in the high mountains of Colorado. All are diminutive yellow or white flowered members of the mustard family, or Brassicaceae. The Colorado Divide whitlow-grass is a tap-rooted perennial plant with a rosette of stellate-pubescent basal leaves and yellow flowers. The plants grow on weathered rock and loose soil in the alpine tundra, on scree margins and fell-fields, above 11,500 feet. It is endemic to the mountains of Colorado. It was found in San Miguel County at Ophir Pass.

**Eastwood monkey-flower** ***Mimulus eastwoodiae*** **G3S1S2**

Eastwood monkey-flower (Figure 30) has a bright crimson flower and sharply toothed leaves. It grows in hanging gardens with a year round moisture supply. The plants put down new roots from points where their stems contact the sandy soil, and thus often are found growing in a line in horizontal cracks of sandstone canyon walls. The tubular flowers bloom in late July to early September. The plants are frequently associated with the yellow Mancos columbine and the giant helleborine orchid. The species' global range includes Utah, Arizona and four counties in southwest Colorado: Mesa, Montrose, San Miguel and Delta (Spackman *et al.* 1997). In western Montrose County, the monkey-flower was found at four seeps: Coyote Wash, McIntyre Canyon, Sewemup Mesa, and an unnamed seep between Slick Rock and Bedrock. Two of these were new occurrences, bringing the total for Colorado to nine.

**Grand Junction milkvetch** ***Astragalus linifolius*** **G3QS3**

Grand Junction milkvetch (Figure 31) is an attractive, bushy herbaceous perennial in the pea family (Fabaceae). It produces pure white flowers that mature into upright red pods. It is usually found with pinyon and juniper, on sandy or clay soils derived from the Morrison formation, between 4,800 and 6,200 feet. Associated species include Indian rice grass, hairy golden aster, low rabbitbrush and snakeweed. The Grand Junction milkvetch is usually found on the eastern side of the Uncompahgre Plateau, around Grand Junction and south to Escalante and Roubideau canyons. There is some question as to whether the specimens from the Uravan area are actually *A. linifolius* or *A. rafaelensis*. A distinguishing characteristic, the orientation of the pods (upright or hanging down) does not seem to be a completely reliable character. Some have suggested that the two species are actually one and the same. However, even if the two species were combined, the total

number would still indicate that they are globally vulnerable. Further research on the relationship of these species is needed.

**Helleborine orchid** ***Epipactis gigantea*** **G4S2**

The helleborine orchid (Figure 28), like Eastwood monkey-flower, is often associated with hanging gardens in sandstone canyons. The greenish-purple flowers of the giant helleborine orchid have the familiar orchid shape, but are about an inch across and grow several to a stalk. Flowers appear in June and July, and fruit is produced in August and September. The plant has a wide geographic distribution in western North America, and is found occasionally from Mexico to Canada. There are twenty-six known locations in Colorado, distributed over eight counties (Spackman *et al.* 1997). Threats to the plants include diversion of the water feeding the seeps, and trampling. This species is found in the Coyote Wash, Dolores Canyon Slick Rock to Bedrock, Dolores Canyon Uravan to Roc Creek, and Sewemup Mesa PCAs.

**Kachina daisy** ***Erigeron kachinensis*** **G2S1**

The Kachina Daisy (Figure 29) was first discovered and named in Utah in 1968, and is the most rare of all the plants found in San Miguel and Montrose counties. The daisy has a small, white flower head and dark green, shiny spatulate leaves grouped in large clumps. A Colorado Plateau endemic, it is known only from a few locations in southeastern Utah, and two in Montrose County. It is found in horizontal crevices of seeping alcoves in sandstone cliffs, often along with Mancos Columbine. Despite extensive searching in potential habitat all along the Dolores River, no new populations were found in 1999. Research presently being conducted on the species may result in the Colorado populations being segregated into a separate variety from the Utah plants (Loreen Woolstenhulme, personal communication 1999). In this case, the variety will be even more rare, and in greater danger of extinction because of its rarity. Clusters of plants can most easily be seen near the Mesa County line in the Dolores River Canyon. This species is found in the Coyote Wash and Sewemup Mesa PCAs.

**King's clover** ***Trifolium kingii*** **G4S1**

This attractive tall pink clover is found in wet meadows and streambanks in the aspen and mixed conifer zone (Figure 32, 18). It has bright green three-parted toothed leaves and downturned flowers. It was known from Montrose, Mesa and Garfield counties in Colorado and the La Sal Mountains in Utah. As a result of this survey, San Miguel County can be added to the list. It is represented in the Beaver Creek-Lone Cone and Bridal Veil Falls PCAs.

**Little penstemon** ***Penstemon breviculus*** **G3Q S2**

The Little penstemon (Figure 35) has narrow, gray-green leaves, bluish-purple flowers with darker veins, and a copiously bearded staminode with long golden-orange hairs. The inflorescence has short glandular hairs. It is usually less than 3 dm. tall. It grows in desert shrub, sagebrush and pinyon-juniper communities in Utah, Colorado and New Mexico. In Colorado, it is known only from Montezuma, San Miguel and Montrose counties. In 1999, we added nine new occurrences to the thirteen that were already

Figure 27. Common moonwort.

Figure 28. Helleborine orchid.

Figure 29. Kachina daisy.

Figure 30. Eastwood monkey-flower.

Figure 31. Grand Junction milkvetch.

Figure 32. King's clover.

Figure 33. Naturita milkvetch.

Figure 34. Payson lupine.

Figure 35. Little penstemon.

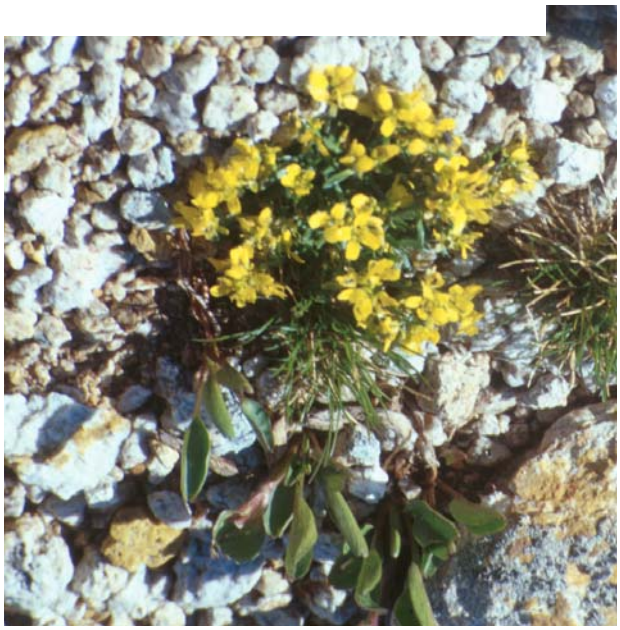


Figure 36. San Juan whitlow-grass.

known. It is present in five of the Potential Conservation Areas described here: Dry Creek Basin, Slick Rock Hill, Highway 141 and 145, Little Gypsum Valley, and Naturita South.

| | | | |
|---|---|---|---|
| **Moonwort species** | ***Botrychium species:*** | ***B. echo*** | **G2S2** |
| | | ***B. lanceolatum*** | **G5S2S3** |
| | | ***B. lunaria*** | **G5S2S3** |
| | | ***B. minganense*** | **G4S1** |
| | | ***B. multifidum*** | **G5S1** |
| | | ***B. pallidum*** | **G2S2** |
| | | ***B. pinnatum*** | **G4S1** |

Seven different species of moonworts, or grape ferns, were found in San Miguel County in 1999: *B. echo, B. lanceolatum, B. lunaria, B. minganense, B. multifidum, B. pallidum,* and *B. pinnatum.* Often, two or more species were found growing together. Moonworts are extremely tiny and inconspicuous, and are often overlooked (Figure 27). The aboveground parts may not appear every year, even though the root system is surviving underground, making it difficult to assess the extent of a population in any given year. Several years' observation is recommended. We found the moonworts in spruce-fir forests, usually in clearings and previously disturbed areas, including logged areas near Lone Cone and road cuts in Savage Basin and near Bridal Veil Falls. With the exception of *B. echo*, the reflected moonwort, and *B. pallidum*, the pale moonwort, these species are widespread in the U. S. but uncommon to rare in Colorado. *B. echo* is restricted to Colorado, Utah and Arizona. Colorado populations of *B. pallidum* are disjunct from Minnesota, Michigan and Maine. The twelve new *Botrychium* occurrences found this year were the first ones documented in San Miguel County. They are included in the Savage Basin, Ophir Pass, Bridal Veil Falls, Lizard Head, Prospect Basin and Beaver Creek-Lone Cone PCAs.

**Naturita milkvetch** ***Astragalus naturitensis*** **Payson G3S3**

Naturita milkvetch (Figure 33) was first described by Edwin Payson (1915) as a "new and noteworthy" species, similar to *A. desperatus*, but "bicolored with conspicuously mottled pods." Naturita milkvetch is a white and purple flowered member of the pea family (Fabaceae), growing from a basal rosette of leaves. The plants are often only vegetative, and have extremely small pinnate leaves with tiny gray-green leaflets that tend to fold in half, showing their lighter-colored undersides. The pods are red-mottled, firm-walled, and dorsiventrally compressed. The species is restricted to the Four Corners area (Utah, Arizona and Montrose, San Miguel, and Montezuma counties in Colorado) and Mesa County, Colorado. It is found in pinyon-juniper woodlands, in areas with shallow soils over exposed bedrock. Usually it is in small soil pockets or rock crevices in sandstone pavement along canyon rims. Sometimes it is found nearby in deeper sandy soils with or without soil crusts. Associated species include Townsend's Easter daisy and fineleaf Hymenopappus. The milkvetch seems to tolerate and even thrive on some disturbance. The plants have been found around power poles and in the compacted tracks of dirt roads. Ten new occurrences of the Naturita milkvetch were located in 1999, bringing the total from 27 to 37 known locations. This resulted in a rank change from G2G3S2S3 to G3S3. It is included in the Dolores Canyon Slick Rock to Bedrock, Slick Rock Hill, Highway 141 and 145, Little Gypsum Valley, Mailbox Park, McIntyre Canyon, Naturita South, Silvey's Pocket, Slickrock, and Summit Canyon PCAs.

**Paradox breadroot** ***Pediomelum aromaticum*** **G3S2**

Paradox breadroot is a perennial member of the pea family (Fabaceae), with branched stems and clover-like heads of small purple and white flowers. Leaves are palmately compound with five (sometimes seven) leaflets. It is similar to the large-flowered breadroot that often grows in the same habitat, but distinguished by its smaller flowers and branching habit. It grows in open pinyon-juniper, sagebrush and shadscale zones, on sandy or clay soils, often on the sides of dry washes. It is frequently found in the same locations as Payson lupine in Colorado. Other associated species include galleta, Indian rice grass, snakeweed, Townsend's Easter daisy, prickly pear cactus, yucca, yellow cat's-eye, and needle-and-thread grass. Its global range is restricted to Utah, Arizona, and Montrose and Mesa counties in Colorado. It is included in the Dolores Canyon Slick Rock to Bedrock, East Paradox Creek, La Sal Creek, Paradox Valley North, and Silvey's Pocket PCAs.

**Parish's alkali grass** ***Puccinellia parishii*** **G?S1**

This small annual grass is found in low-lying, seasonally wet areas in alkaline flats. Surveyors for a new gas pipeline first discovered it in Colorado in 1997 near Miramonte Reservoir. Although it had been considered for listing under the Endangered Species Act, recent new discoveries in Arizona and New Mexico had caused its nomination to be dropped. The Colorado discovery significantly extended the known range of the plant. It is included in the Miramonte Reservoir PCA.

**Payson lupine** ***Lupinus crassus*** **Payson G2S2**

Payson lupine (Figure 34) was first described by, and is named for, Edwin Payson (1893-1927), a native of Naturita, and a brilliant botanist who studied under Aven Nelson at the University of Wyoming, and made extensive collections in the Naturita area where his father raised cattle. The lupine, a member of the pea family (Fabaceae) is one of the few white flowered lupines. It spreads by underground stems, or rhizomes, and often the decumbent leaves can be found with no flowering stalks. It is found in the pinyon-juniper zone, often in dry washes with little other vegetation. The two main areas where it is found have very different geological substrates, the Chinle Formation with its dark red soils near Paradox, and the Mancos Formation, with light colored clay soils near Naturita. It is a Colorado endemic, known only from Montrose County. It is represented in eight PCAs: Davis Mesa Slopes, East Paradox Valley, Highway 141 and 145, Hog Point, La Sal Creek, Naturita Uplands, Paradox Valley North, and San Miguel River at Tabeguache.

**Purple cliff-brake** ***Pellaea atropurpurea*** **G5S2S3**

The purple cliffbrake has green, glabrous fronds, and dark purple or black hairy stipes (stems). Its sori (packages of spores) are found along the edge of the fertile pinnules, protected by the inrolled margin. It grows in relatively dry areas, often at the base of sandstone cliffs, from 4000 to 7300 feet. Like many of our ferns, it has a broad range covering much of the country, but is relatively uncommon in Colorado. Previous to this survey, it was known only in Baca, Ouray, Larimer and Las Animas counties in Colorado. We found it in 1999 in the Sewemup Mesa PCA, at the base of cliffs near the Mesa County line.

**Pygmy sagebrush** ***Seriphidium pygmaeum*** **(*Artemisia*) G4S1**

This diminutive sagebrush is only about three inches tall, except for its taller inflorescence, but it has a hefty root system worthy of a large shrub. Its leaves are so narrow that they resemble tiny evergreen needles. The whole plant is reminiscent of a bonsai tree. It grows in the driest parts of the driest sagebrush areas, along with black sage and viscid rabbitbrush. Its global range is limited to the Four Corners area, Utah, Arizona, New Mexico and Colorado. In our area, it is found in Dry Creek Basin, in disturbed areas, on clay soils derived from Mancos shale. This is the only known Colorado population. It is included in the Dry Creek Basin PCA.

**Rocky Mountain whitlow-grass** ***Draba fladnizensis*** **G4S2S3**

One of several rare *Drabas* of the San Juan Mountains, Rocky Mountain whitlow-grass has white flowers that often appear pale yellow in the field. Its one or two stem leaves are reduced, and its basal leaves ciliate margined. We found it in some of the more densely vegetated areas of the alpine tundra, mixed with a great diversity of sedges and forbs. Some of its common associates were alpine avens, cinquefoil species, tufted hairgrass, Indian paintbrush and thickleaf clover. Its global range extends south from Alaska, with Colorado at its southern limit. In Colorado, it is known from eleven counties, mostly in the Central Rockies. It occurs in San Miguel County in the Imogene Pass, Ophir Pass and Silver Pick Basin PCAs.

**San Juan whitlow-grass** ***Draba graminea*** **G2S2**

San Juan whitlow-grass (Figure 36) is nearly always found above 12,000 feet in elevation. Plants are usually flowering and easiest to see in late July and early August. Look for bright yellow, four-petaled flowers nestled in dark green, narrow-leaved rosettes. The *Draba* is usually found about 10 to 50 feet away from the melting edge of a snowbank, in cold wet tundra with little other vegetation. Closer to the snow, soils are too cold, and any plants that may grow there are so small and undeveloped that they are hard to identify. Farther away from the *Draba* zone, the tundra has dried and warmed so that it supports a dense cover of grasses and forbs, which out-compete the *Draba*. The species is endemic to the San Juan Mountains. Three new populations of the San Juan Whitlow-grass were found this summer in San Miguel County. This brings the total for Colorado to thirteen.

**San Rafael milkvetch** ***Astragalus rafaelensis*** **G3QS1**

San Rafael milkvetch (Figure 37) is a bushy plant with many persistent old stems at its base. Its flowers are white to pink with a purple spot on the keel, and its fruits are reddish, and downturned. The leaves are so narrow that superficially they appear to be all stems. There is some question as to whether it can be distinguished from its relative the Grand Junction milkvetch, which occurs on the eastern side of the Uncompahgre Plateau. The nearest other population center for the San Rafael milkvetch, and its type locality is in the San Rafael Swell in Utah.

**Sandstone milkvetch** ***Astragalus sesquiflorus*** **G3S1**

Sandstone milkvetch (Figure 38) is a prostrate, mat-forming plant with small pink-purple flowers and papery purple-mottled pods. It grows on sandstone ledges and crevices of slickrock. Associated species include pinyon, juniper, large-flowered breadroot, yucca, and prickly pear cactus. A Colorado Plateau endemic known from

Utah and New Mexico, the plants in the Dolores Canyon mark the northeastern edge of its range. Of the five Colorado records, two were from the Paradox area, and three were from the Entrada sandstone above the Dolores Canyon, north of Uravan. It is represented in the Dolores Canyon, Uravan to Roc Creek PCA.

**Smooth cliff-brake** ***Pellaea suksdorfiana* ssp. *simplex (P. glabella)*** **G5T4?S2**

Smooth cliff-brake is similar to purple cliff-brake described above, but has most pinnae simple, rather than divided. The species is widespread in North America, and is known from Moffatt, Garfield, and Las Animas counties in Colorado. In San Miguel County, it was found at Bear Creek Falls, and in Montrose County in an alcove seep in the Dolores Canyon between Slick Rock and Bedrock.

**Steller's cliff-brake** ***Cryptogramma stelleri*** **G5S2**

Steller's cliff-brake is a slender, delicate fern with a creeping rhizome and two kinds of fronds. Fertile fronds are taller and narrower than the sterile fronds, and have in-rolled edges that cover the sori (clusters of spore cases). Petioles are dark purple near the base. The plants grow in moist crevices of cliffs at middle and upper elevations in the mountains. This species resembles the more common rock-brake that is found in drier sites, but is much smaller and more delicate. The species is circumboreal, and occurs as far south as Colorado and Utah in the west, and New Jersey in the eastern U.S. Before this survey CNHP had records of twelve occurrences of the species in Colorado, in eight counties. The species was known in San Miguel County from one location in Bear Creek canyon. We found two very small additional occurrences at Bear Creek Falls and near Bridal Veil Falls.

**Southern maidenhair fern** ***Adiantum capillis-veneris*** **G5S2**

The delicate fronds of this small fern are pinnately compound with broad fan-shaped pinnules (Figure 41). The dark rachis (stem) is smooth and shiny. The fern is widespread in North America, known from British Colombia east to South Dakota and south to Texas, as well as from Missouri, Virginia and Florida (Welsh *et al.* 1993). In Colorado, its habitat is quite rare. It grows in seeps and hanging gardens, usually in sandstone. Other species that are often found in the same location include the yellow Mancos columbine, Eastwood monkey-flower, and helleborine orchid. There are a total of eleven documented occurrences in Colorado, from Las Animas, Mesa, Moffat, Montezuma, Montrose and Ouray counties. Only one location has been documented in this study area, in Dolores Canyon about two miles south of the Mesa County line. It is included in the Sewemup Mesa PCA.

**Spike pappus grass** ***Enneapogon desvauxii*** **G5S1**

This small, decumbent perennial grass was only recently found in Colorado. It has a narrow, spike-like, feathery panicle. The culms shatter and spread its fertile spikelets like tumbleweeds (Weber 1996). It grows in sandy soils of slickrock pavement in the pinyon-juniper zone. It was collected near the mouth of Leach Creek, a tributary of the Dolores River, at 5,250 feet elevation, and is included in the Dolores River Slick Rock to Bedrock PCA.

**Thick-leaf whitlow-grass** ***Draba crassa*** **G3S3**

The thick-leaf whitlow grass (Figure 40) grows in talus and other rocky areas above treeline. It has a rosette of dark green, glabrous, succulent leaves, thick roots, and bright yellow, four petaled flowers. It is found in Montana, Wyoming, Utah and nine counties in Colorado. This is the first time the species has been recorded for San Miguel County. We found it in the talus at Ophir Pass and at Imogene Pass.

**Variegated scouring rush** ***Hippochaete variegata*** **(*Equisetum*) G5S1**

This relative of the more common scouring rush is slender, with 5 to 12 angled and grooved stems. It grows on sandy bars of streams, often with wetland plants such as water sedge, beaked sedge, Baltic rush and spike rush. It can be found in all northern states in the U.S. The only two other Colorado occurrences in the CNHP database are from Gunnison County. We found it along West Beaver Creek, in the Beaver Creek-Lone Cone PCA.

**Weak-stemmed mariposa lily** ***Calochortus flexuosus*** **G4S1**

An attractive relative of the more common sego lily, the weak-stemmed mariposa lily has wildly contorted stems, and a yellow band on the petals (Figure 39). It is restricted to desert flats in the southwest (California, Nevada, Utah, Colorado, New Mexico and Arizona). It apparently reaches its eastern limit in western Colorado. Of the ten Colorado records that were in the CNHP database, seven were from Montezuma County. There is one record each from Archuleta, Montrose and San Miguel counties. The Montrose record is based on a collection made by Edwin Payson in 1914 in the Naturita area, where it has not been documented since. The San Miguel record was mapped at Egnar in 1980, and was not relocated in 1999. The occurrence that we found this summer in Little Gypsum Valley is new.

**Wetherill milkvetch** ***Astragalus wetherilli*****i G3S3**

Wetherill milkvetch (Figure 42), a member of the pea family (Fabaceae) has pinkish white flowers and rather large, inflated pods. The leaflets of its pinnately compound leaves are almost round. It grows on steep slopes, canyon benches, and talus under cliffs, in sandy clay soils derived from shale or sandstone (Barneby 1964). It is often the only plant growing in small dry washes on rocky clay hillsides, where its very light-weight pods are dispersed downhill by gravity and seasonal surface water. Associated plant species are pinyon pine, Utah juniper, mountain mahogany and sagebrush. Threats to the species include oil and gas development, overgrazing, road construction and other habitat modifications (O'Kane 1988). The species is known from seven western Colorado counties. There are thirty-eight known occurrences, with an estimated total of 9000 individuals. The majority of occurrences are on BLM land. Two occurrences in the western part of San Miguel and Montrose counties are historic, and therefore not included in Potential Conservation Areas. However, the region should be further surveyed for this species. Two recently observed occurrences are included in the Clay Creek PCA.

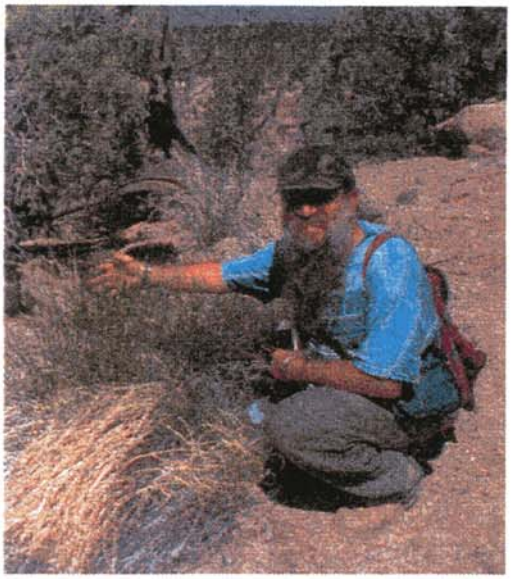


Figure 37. San Rafael milkvetch.

Figure 38. Sandstone milkvetch.

Figure 39. Weak-stemmed mariposa lily.

Figure 40. Thick-leaf whitlow-grass.

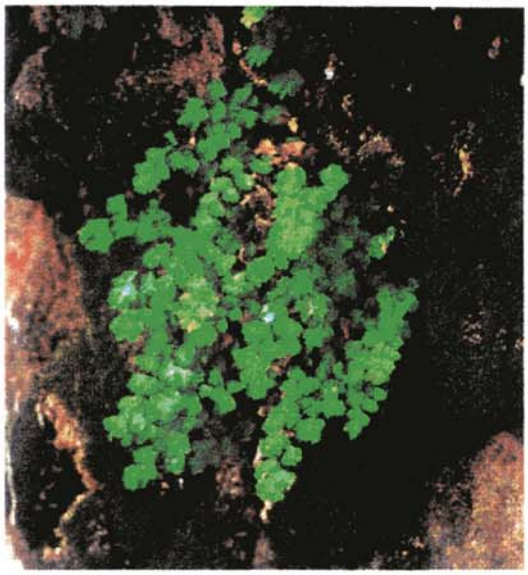


Figure 41. Southern maidenhair.

Figure 42. Wetherill milkvetch.

**Rare and Imperiled Animals of San Miguel and Western Montrose Counties.**

A total of 24 animal species that are rare or imperiled, globally or in Colorado, have been documented from San Miguel and western Montrose Counties during the last ten years (Table 6). They are described below, and all but four are included in Potential Conservation Areas.

Eight additional species reported from the area were not included, because we lack confidence in the records for various reasons: they were reported only once, more than ten years ago; their locations were not precise enough; or their identification is questionable. These are *Physa utahensis* (banded physa, a snail), *Speyeria nokomis nokomis* (nokomis fritillary, a butterfly), *Strix occidentalis lucida* (Mexican Spotted Owl), *Dendroica graciae* (Grace's Warbler), *Erebia theano* (theano alpine, a butterfly), *Pyrgus ruralis* (two-banded skipper, a butterfly), *Neotoma albigula brevicauda* (white-throated woodrat), and *Gulo gulo* (wolverine). These species may yet prove to be valid constituents of the fauna with further research. Species that were known historically from this area, but presumed extinct, are grizzly bear, lynx (prior to reintroduction), and timber wolf.

Fifty-two new rare animal occurrences were located during this survey, and were entered into the CNHP database to join the previously documented 78, making a total of 130 occurrences for the area.

Nine animal species were recorded in the CNHP database in 1999 for the first time for this study area. They are: the midget-faded rattlesnake, Black Swift, flannelmouth sucker, Gunnison Sage Grouse, Lewis's Woodpecker, plateau striped whiptail, Gunnison's prairie dog, tree lizard, and Yuma skipper.

**Table 6. Rare and Imperiled Animals of San Miguel and western Montrose counties**

| Common Name | Element | G rank | S rank |
|---|---|---|---|
| American Peregrine Falcon | *Falco peregrinus anatum* | G4T3 | S3B, SZN |
| Bald Eagle | *Haliaeetus leucocephalus* | G4 | S1B, SZN |
| Black Swift | *Cypseloides niger* | G4 | S3B |
| Boreal Owl | *Aegolius funereus* | G5 | S2 |
| Brimstone clubtail | *Gomphus intricatus* | G4 | S2 |
| Canyon treefrog | *Hyla arenicolor* | G5 | S2 |
| Colorado River cutthroat trout | *Oncorhynchus clarki pleuriticus* | G4T3 | S3 |
| Flannelmouth sucker | *Catostomus latipinnis* | G3G4 | S3 |
| Gray Vireo | *Vireo vicinior* | G4 | S2B,SZN |
| Gunnison Sage Grouse | *Centrocercus sp 1* | G1 | S1 |
| Gunnison's prairie dog | *Cynomys gunnisoni* | G5 | S5 |
| Lewis's Woodpecker | *Melanerpes lewis* | G5 | S4 |
| Lynx | *Lynx canadensis* | G5 | S1 |
| Midget-faded rattlesnake | *Crotalis viridis concolor* | G5T4 | S3? |
| Northern Goshawk | *Accipiter gentilis* | G5 | S3B, SZN |
| Northern leopard frog | *Rana pipiens* | G5 | S3 |
| Pale lump-nosed bat | *Corynorhinus townsendii* | G4T4 | S2 |
| Plateau striped lizard | *Cnedophorus velox* | G5 | S4 |
| Roundtail chub | *Gila robusta* | G2G3 | S2 |

| | | | |
|---|---|---|---|
| Sage Sparrow | *Amphispiza belli* | G5 | S3B,SZN |
| Short-eared Owl | *Asio flammeus* | G5 | S2B,SZN |
| Spotted bat | *Euderma maculatum* | G4 | S2 |
| Tree lizard | *Urosaurus ornatus* | G5 | S4 |
| Yuma skipper | *Ochlodes yuma* | G5 | S2 |

**American Peregrine Falcon** ***Falco peregrinus anatum*** **G4T3 S3B SZN**
**Status: federally endangered; listed October 13, 1970.**

The American Peregrine Falcon (Figure 43) is a medium sized raptor with dark gray/brown back and white chest with black streaks. The Peregrine Falcon saw widespread decline throughout its range in the late 1960's and into the 1970's. Although they have never been abundant, their numbers in Colorado became critically low in 1972. In that year, there were no breeding pairs in the state. These declines were traced to the effect that pesticides, particularly DDT, had on thinning of eggshells and subsequent death of unhatched chicks due to egg fragility. Primary threats include environmental toxins, habitat loss, human disturbance, and illegal take. Today, the Peregrine Falcon is recovering from regional extirpation, and numbers currently are stable or increasing. The recovery objectives have been met in most areas, and the bird is widely distributed, with large numbers of occurrences in remote wilderness. In Colorado, through intensive reintroduction efforts over the past 17 years, more than 300 American Peregrine Falcons have been released in various locations throughout the state, including downtown Denver. Throughout the 1990's Colorado has had ~24 breeding pairs of peregrines, including nest sites in Paradox Valley and Slick Rock Canyon along the Dolores River that were active in 1999. The West Slope population of peregrines is stable and should increase naturally. Continued existence of Peregrine Falcons in Colorado is dependent upon protection of traditional nesting sites, identification and protection of critical habitat both for the breeding areas and for wintering, foraging, and roosting areas. Some additional relief to the peregrine's plight in Colorado can be provided by keeping the remaining nest sites free from human intrusions during nesting season and by ensuring that land use changes protect habitat that supports the peregrine's prey species.

Peregrine Falcons were recorded from the following PCAs: Dolores Canyon South of Slick Rock, Dolores Canyon Slick Rock to Bedrock, East Paradox Creek, and Paradox Valley North.

**Bald Eagle** ***Haliaeetus leucocephalus*** **G4 S1B SZN**
**Status: federally threatened; Colorado threatened; listed March 11, 1967.**

The Bald Eagle (Figure 44) has a dark gray/brown body with white head and large yellow hooked bill. Threats include loss of habitat, poisons, and human intrusion. The Bald Eagle is found only in North America, and it is the continent's second largest bird of prey. Only the California condor, also on the federally endangered list, is larger. Populations of this symbolic species are present in Colorado, and according to recent surveys, Bald Eagle populations seem to be making significant comebacks (Winternitz 1998). Like other raptor populations, DDT use after WWII is thought to have been a major cause of great declines in numbers. Since the banning of this pesticide and the listing of this species, on both state and federal ESA levels, recovery has been successful.

Recently, due to the successful increase in Bald Eagle populations, the U.S. Fish and Wildlife Service (USFWS) has called for a reevaluation of this species' status in order to determine if it should be delisted from the Endangered species list. Historically, only two to three pairs of Bald Eagles nested in Colorado, but the nesting pairs have increased steadily since the 1980's to 38 confirmed nests in 1995 (Winternitz 1998). The state is a very popular wintering area for Bald Eagles. The annual midwinter count shows a stable population of 600 to 800 eagles. Some of these wintering areas occur in western San Miguel County, with one such winter roost located in the vicinity of Hamm Canyon. Eagle abundance declined nationally due to increased human impacts in primary nesting areas. These impacts included habitat destruction, illegal shooting and pesticide poisoning. To combat those problems in Colorado, existing nest sites and adjacent hunting areas must be kept free of human intrusion during the breeding seasons, and key areas must also be maintained along the major river systems for the wintering Bald Eagles. A Bald Eagle roost was recorded from the San Miguel River at Horsefly PCA.

**Black Swift** ***Cypseloides niger*** **G4 S3B**

Black Swifts (Figure 45) are medium sized birds, blackish overall, with a long, slightly forked tail. Specific threats to this species are unknown, but too little is known to consider the species secure. Black Swifts could be called Colorado's most eccentric bird because of their penchant for nesting on rock faces in the coldest, dampest spots they can find. Because of the secluded and inaccessible placement of their nests, studying these birds is difficult and much remains unknown about their distribution and habits (Stiles and Negret 1994). Black Swifts are colonial birds that nest behind or next to waterfalls and wet cliffs (Michael 1927, Knorr 1961, Foerster and Collins 1990). Nests are built in dark inaccessible sites with an unobstructed flight path (Knorr and Knorr 1990), and nest site persistence and tenacity is almost absolute (Knorr and Knorr 1990). The nest itself is a cup-like structure of mud, mosses and algae and in Colorado all nests are located on sheer cliff faces with waterfalls pouring down close to the nesting colony (Boyle 1998). Only one offspring is produced in a given year and hatchlings are fed all summer long, fledging in September.

Globally, this bird is widespread, occupying more than 1,000,000 sq. miles of the Americas. Winter range is poorly known; however, northern populations like those in Colorado may winter in South America (Stiles and Negret 1994). Four new sightings of Black Swifts at falls in San Miguel County were recorded during this inventory, including observations at Bridal Veil Falls, Bilk Creek Falls #3, Bear Creek Falls, and one breeding colony was verified at Fall Creek Falls. Although calculation of population size is difficult because of colony inaccessibility it is estimated that over 200 nesting pairs occur in Colorado representing between 10% and 20% of the total nesting population of this species (Boyle 1998). This makes Colorado's population an important component of this bird's total population.

Black Swifts are tolerant of human disturbance as demonstrated by the group at Bridal Veil Falls power plant, but flowing falls are a necessity for Colorado's nesting swifts. Diversion of stream flows reducing water flow at the falls could result in abandonment of breeding sites.

Black Swifts were recorded from the following PCAs: Bear Creek, Bridal Veil Basin, Bilk Basin, and Fall Creek Falls.

**Boreal Owl** ***Aegolius funereus*** **G5 S2**

Boreal Owls have a black facial border, with chocolate streaking of their underparts, and a pale bill (Figure 46). Their primary threat is forest harvesting. The quiet of the Colorado high country is often disrupted by the call of this bird. The owls' clear, six to eight syllable calls are often heard in subalpine forests above 9,000 feet. This intriguing owl has inspired Internet web pages on how to find boreal owls (Pulliam 1995). Boreal Owls are moderately widespread, or widespread with a spotty distribution (10,000-1,000,000 sq. miles) to widespread (greater than 1,000,000 sq. miles) in North America and the wide range, and apparently large numbers seem to make this species secure. Boreal Owls have been ranked the tenth most abundant owl in Colorado (Bridges 1992). There are 31 records of nesting Boreal Owls in Colorado (Ryder 1998). The USFS has identified three occurrences of nesting owls in the Uncompahgre National Forest within San Miguel County. In Colorado these year round residents prefer dense coniferous forest of Engelmann spruce and subalpine fir above 9000 feet, most commonly in proximity to open grassy situations (AOU 1983); streams, and bogs, but lodgepole pine and aspen can be occupied. These owls roost in dense cover by day, in cool microsites in summer; and frequently change roosting sites. Major threat may be indirect effects of forest harvesting practices. Harvesting may reduce primary prey populations, remove forest structure used for foraging, and eliminates nesting cavities (Hayward and Hayward 1993). Boreal Owls, however, are not very threatened range-wide and are not known to have difficulty with non-destructive intrusion. Large home ranges and low population densities require that preserves exceed 1000 sq. km of suitable habitat (Hayward and Hayward 1993). Management of forests for both maintenance of snags and maintenance of aspen groves with large diameter trees would benefit the owls. Uneven-age timber management may be compatible, but clear-cuts are not considered suitable habitat for foraging (Hayward and Hayward 1993). Stewardship needs include furnishing nesting cavities and forest structure necessary for foraging in the long-term. Nest boxes are used extensively for mitigation, but must be maintained over the several hundred years before natural cavities become available (Hayward and Hayward 1993).

Boreal owls are included in the following PCAs: Beaver Creek-Lone Cone and Prospect Basin-Alta Lakes.

**Brimstone clubtail** ***Stylurus intricatus*** **G4 S1**

The brimstone clubtail (Figure 47) is a small dragonfly. There are only three known occurrences of the brimstone clubtail in Colorado, and this dragonfly is not abundant where known. This species is known from Dinosaur National Monument, Moffat Co.; San Miguel River, Montrose Co.; and the Dolores Canyon. The occurrences are widely separated and observations are from relatively few miles of widely separated rivers. Although this species was reported from Uravan, Colorado in 1990, it was not observed along the San Miguel River during this survey. The population trend in the state is unknown, but probably declining. At least one occurrence is protected in Dinosaur National Monument.

Threats to this species are primarily poor water quality and pollutants. Water quality is a legitimate threat, particularly in the San Miguel River near Uravan. This is an

early emerging species that may be missed by collectors. Stewardship of this species requires monitoring and protection of all known occurrences.
The brimstone clubtail was recorded from the Uravan West PCA.

**Canyon Treefrog** ***Hyla arenicolor*** **G5 S2**
**Status: Colorado State Species of Special Concern**

The canyon treefrog (Figure 48) has expanded paddle-like toe tips, and a light brown or gray back. These frogs are easily recognizable by the suction like toe pads that assist in gripping and walking on canyon walls.

The canyon treefrog occurs from western Colorado and southern Utah south to central Mexico (Stebbins 1985). Colorado is at the northern margin of its range. This species occurs in the canyonlands of the western slope and the Mesa de Maya region of the eastern plains (Hammerson 1982). Of the 32 records in Colorado, recent observations include Colorado National Monument, John Brown Canyon, Mesa de Maya (updating an 1886 record) (Hammerson 1982), and the Dolores River drainage (this survey). Of the 32 observations, four are from western Montrose County, one from this year and three greater than 10 years old; and three were recorded from San Miguel County in 1992. All of these observations are from side canyons of the Dolores River.

Threats to the treefrogs appear to be modest or localized. The primary factors justifying a conservation concern for canyon treefrogs are the small number of occurrences, restricted range and relatively low numbers (qualitative judgement) of individuals. There are no quantitative data on population size or trends.

Canyon tree frogs were recorded from the following PCAs: Dolores Canyon Slick Rock to Bedrock, Egnar Hill, and Summit Canyon.

**Colorado River Cutthroat Trout** ***Oncorhynchus clarki pleuriticus*** **G4T3 S3**
**Status: Colorado State Species of Special Concern**

Colorado River cutthroat trout (Figure 49) can be identified by the bright red stripe on each side of lower jaw. This subspecies is the only trout native to the upper Colorado River basin. Its native range extends southward to the Escalante River on the west and the San Juan drainage on the east sides of the basin, including the Green, Yampa, Gunnison, Dolores, San Juan rivers, and their tributaries (CDOW 1986, Proebstel 1994, Young *et al.* 1996). Its current distribution includes remnant populations in Colorado, Wyoming, and Utah. The historical habitat included most clear water streams and rivers of western Colorado (Behnke 1992). The trout remains only in smaller order streams and a few high elevation lakes of the mountainous country. Presently there are 42 populations in Colorado judged to be genetically pure (A category) (Proebstel 1994). Of these 42 populations only one A category population occurs within this survey area at the Deep Creek Potential Conservation Area.

Threats include hybridization, competition from non-native trout, habitat alteration/fragmentation, overgrazing, logging, mining effluents, water diversion for irrigation, and Whirling Disease. The primary reasons for conservation concern at the global and state levels are long-term trend prognoses and threats. Populations continue to decline in many streams (Young *et al.* 1996); hybridization between this subspecies and non-native trout species poses the greatest threat to the elimination of pure populations. Due to hybridization only 26% of the remaining populations of this trout are considered

genetically pure (Young *et al.* 1996). Competition with non-native trout species and exotic fish diseases also pose threats. Other concerns include interference with recolonization by established populations of non-native salmonids (Spahr *et al.* 1991, Behnke 1992, Young 1995). The trout are susceptible to overharvest if angling is unrestricted.

Management strategies include construction of fish barriers to prevent interbreeding with other trout, rehabilitation of both streambanks and water quality, elimination of non-native trout through chemical treatment, and transplanting genetically pure cutthroat into rehabilitated habitat (Spahr *et al.* 1991). Colorado has instituted restrictive angling regulations (Young 1995). Colorado River cutthroat trout are included in the following PCAs: Elk Creek, Little Red Canyon-Horsefly Creek, and Horsefly Creek.

**Flannelmouth Sucker *Catostomus latipinnis* G3G4 S3**
**Status: Colorado Species of Special Concern**

The flannelmouth is an elongated sucker with an overhanging ventral mouth and thick upper lip (Figure 50) . In clear water it appears to be greenish-blue-gray on the back, fading to yellow on its belly. The flannelmouth sucker is moderately widespread (10,000-1,000, 000 sq. miles) and occurs throughout the Colorado River basin, from southwestern Wyoming to southern Arizona. It is more widespread in the upper basin than in lower basin, and is declining in at least some areas. In Colorado this fish is found in the large rivers of western Colorado. In the study site it occupies the Dolores River from Slick Rock, Colorado downstream to the Montrose-Mesa County line.

This species has disappeared from some water systems like the Gunnison River above Blue Mesa where the nonnative white displaced it and longnosed suckers (Woodling 1985). Threats include alteration of the hydrologic and thermal characteristics of river habitats, and blockage of migration routes due to dam construction; predation and competition by non-native aquatic species; and hybridization with other *Catostomus* species (Arizona Game and Fish Department 1995 and 1996). Flannelmouth suckers hybridize with the humpback, white and longnosed suckers (Sigler and Miller 1963). Elevated sediments, channelization, modified flow regimes, stream dewatering, and contaminants have also contributed to reduced populations. This fish may be fairly resistant to nondestructive intrusion (W. Fertig, personal communication, 1997). Protection of this fish in Colorado requires prohibiting introduction of nonnative species to waters with stable populations of flannelmouth suckers.

Flannelmouth suckers have been recorded from the following PCAs: Dolores River-Slick Rock to Bedrock, Dolores River-Uravan to Roc Creek, East Paradox Creek, and Sewemup Mesa.

**Gray Vireo *Vireo vicinior* G4 S2B, SZN**

Gray Vireos (Figure 51) are small songbirds, gray above, white below, with a gray eye ring, and dull white lores. Their wings are brownish with two faint bars. Gray Vireos occupy some of the hottest, driest, and most inhospitable habitats in Colorado, filling the surrounding landscape with the sweetest melody any vireo can sing (Bent 1950). The Gray Vireo is a migrant that breeds in southwestern North America and winters in western Mexico. Colorado includes the northeastern portion of its breeding

range (National Geographic Society 1987). The Gray Vireo is characterized as an uncommon and very local summer resident in Colorado (Andrews and Righter 1992). A coarse estimate of this species' abundance is between 3,000 and 10,000 individuals. There are 56 records of Gray Vireos from at least 16 Colorado counties including Montrose and San Miguel, but only one confirmed breeding record from Colorado (Andrews and Righter 1992). Occurrences in both western Montrose and San Miguel counties include five records each, beginning with observations from 1992 and ending with this survey, 1999.

The primary threat to the species is destruction of pinyon-juniper woodlands. Historical management of pinyon-juniper habitat may have negatively impacted the ecological integrity over large areas (Ron Lambeth, personal communication), and consequently may impact the Gray Vireo. The occurrence of wildfire may exacerbate the problem of weedy invasion into this bird's habitat. Although considered globally secure, few breeding occurrences, lack of knowledge on population status, and limited range within the state, are all factors which contribute to the S2B rank in Colorado. The Gray Vireo is considered of High Priority on the AOU 1996 WatchList (Carter *et al.* 1996). Gray Vireos have been recorded from the following PCAs: Little Gypsum Valley, Spring Creek-Atkinson Mesa, and Summit Canyon.

**Gunnison's Prairie Dog** ***Cynomys gunnisoni*** **G5 S5**

Gunnison's prairie dog (Figure 52) is the smallest Colorado prairie dog, yellowish buff to cinnamon dorsally, and paler ventrally. Gunnison's prairie dog is a regional endemic (100-10,000 square miles) restricted to the "Four Corners" area in the southern Rocky Mountains where Utah, Colorado, New Mexico, and Arizona meet. The Colorado Natural Heritage Program listed Gunnison's prairie dogs as a tracked species in 1998, and little information exists in the CNHP database on their distribution and abundance in Colorado. Other authors, however, have recorded numerous occurrences of this species in Colorado's southwestern region (Armstrong 1972), and it is estimated that there are over 100 occurrences statewide (CNHP 1999). This survey identified three active prairie dog colonies, two in Montrose County. One of these was a large colony of Gunnison's prairie dogs, while the other was not identifiable to species. There was one prairie dog colony of unknown species identified in San Miguel County.

Gunnison's prairie dogs are moderately threatened range-wide. Indiscriminate poisoning has reduced the species' numbers and range, and they are extremely susceptible to the plague. Their habitat lends itself to alternate use, particularly grazing. They are a very fragile species; plague has potential to eradicate a colony within months. The prairie dogs benefit from management of grasslands to favor native species (Slobodchikoff *et al.* 1989). Existing colonies should be protected from poisoning. There is a need for current information on distribution, population status, social organization, and spacing and habitat relationships. Prairie dogs were recorded from the Dry Creek Basin PCA.

**Gunnison Sage Grouse** ***Centrocercus*** **sp 1 G1 S1**
**Status: Colorado Species of Special Concern**

The Gunnison Sage Grouse (Figure 52) is a small grouse, about two-thirds the size of Sage Grouse elsewhere. Their whiter, more distinct tail feathers, and more

colorful filoplume feathers also distinguish the birds. Sage Grouse range across much of the Colorado and Columbia Plateaus. Colorado is in the southeastern portion of that range (Andrews and Righter 1992). In the 1980's researchers became aware that the Sage Grouse in the Gunnison Basin, Colorado, were distinct from Sage Grouse found elsewhere in most of the United States. (Although it has been determined to be a distinct species, it has yet to be given a scientific name, and thus is referred to as sp1). The Gunnison species occurs south of the Colorado River from southeastern Utah east to the San Luis Valley. The total breeding population in Colorado includes approximately 5,000 individuals (Braun and Young 1995). However, specialized monitoring data in Colorado show that population numbers have been reduced, and that available habitat has become more fragmented and degraded, in part due to the application of fire and herbicides on sagebrush habitats (Braun *et al.* 1994). Additionally, pinyon-juniper woodlands encroaching upon sagebrush parks due to long-term fire suppression may be a significant factor contributing to the decline (Ron Lambeth personal communication). This species is ranked G1/S1 because both populations and available habitat have been reduced in quantity and quality. Subsequently, the potential for large-scale impact with minimal disturbance is real. There are an estimated 15 to 20 occurrences in southwestern Colorado (Braun 1995). Populations of this subspecies are currently limited to southwestern Colorado and southeastern Utah. The largest remaining population of over 2,000 birds is found in Gunnison County. Although the Sage Grouse historically occurred throughout approximately 15 counties in western Colorado, its entire historical range is unknown. It is presently restricted to one large, contiguous population in southern and central Gunnison and northeastern Saguache counties, and several much smaller populations sporadically located across Mesa, Montrose, Ouray, San Miguel, and Dolores counties (Braun *et al.* 1994). In San Miguel County there are three distinct populations of Gunnison Sage Grouse with five active leks. One population has been present since 1978, and in 17 years of observations this lek site has averaged 51 males/year. These populations are an important component for the overall conservation of this species.

Threats include habitat loss, fragmentation, and degradation of sagelands by development, agriculture, and grazing. Populations have declined in some areas, apparently in response to widespread chaining, spraying, and burning of sagebrush-dominated rangeland to benefit livestock production (see Ritchie *et al.* 1994). Use of organophosphorus insecticides on agricultural lands adjacent to sagebrush resulted in grouse die-offs in southeastern Idaho Blus (1989). Large-scale treatment of sagelands with herbicide and fire has negatively impacted Sage Grouse habitat (Braun *et al.* 1994). Existing populations have become smaller and more fragmented. Protection of identified seasonal habitats (wintering, breeding, nesting and brooding) is important for continued existence of this species in Colorado. Gunnison Sage Grouse are represented in the following PCAs: Beaver Mesa, Dry Creek Basin, and Miramonte Reservoir.

**Lewis Woodpecker** ***Melanerpes lewis*** **G5 S4**

Lewis’s Woodpecker (Figure 53) can be recognized by its greenish-black head and back, gray collar and breast, dark red face, and pinkish belly. Lewis's Woodpecker has a large range in western U.S. and adjacent southern Canada. It is moderately widespread or widespread with spotty distribution (10,000-1,000,000 sq. miles). Lewis’s

Woodpecker is widespread in southern Colorado and can be fairly common in some areas. There is no evidence of statewide declines and no threats are identified. Its habitat requirements appear to be met in many areas (CNHP 1999). There are many breeding occurrences within their range and this bird was noted nesting in the Uncompahgre National Forest near Columbine Pass in Montrose County during this survey. Andrews and Righter (1992) considered the Lewis's Woodpecker to be an uncommon to locally fairly common resident. Much of the range is in southern Colorado foothills, valleys, canyons, and mesas.

Although there is no direct evidence of statewide declines, many experts have expressed concern for this species in the northern parts of its Colorado range. It is considered of High Priority on the AOU 1996 WatchList (Carter *et al.* 1996) and Region 2 of the U. S. Forest Service has classified this species as sensitive. The birds are vulnerable to loss of nesting sites (large snags), such as may result from forest management practices, and degradation of riparian habitats by drought and overgrazing. Such habitat alteration evidently has caused declines in coastal areas of British Columbia and Washington (Ehrlich *et al.* 1992). Drought and overgrazing pose continued threats to riparian habitats in arid regions (Ehrlich *et al.* 1992). This species is tolerant of nondestructive intrusion. Lewis's woodpecker is not tracked by CNHP, and has not been included in any PCA.

**Lynx** ***Lynx canadensis*** **G5 S1**

**Status: Colorado endangered**

The lynx (Figure 54)is a large carnivorous feline averaging 13 kilograms in weight, with distinctive facial hair tufts below its cheeks. The species is widespread in northern North America with a global Range extending throughout Alaska and Canada south through the Rocky Mountains, northern Great Lakes region, and northern New England. Declines have occurred in some populations, but apparently the lynx is still relatively abundant in most of historic range.

USFWS (Federal Register, 26 August 1994) found that federal listing of the North American population may be warranted and initiated a formal status review. In 1997, they determined that listing of the contiguous U.S. population is warranted, but precluded by other higher priority actions (Federal Register, 27 May 1997).

The lynx is considered globally secure (G5) but critically imperiled (S1) in Colorado, with fewer than 50 occurrences documented, most of which are historical. Most of the recent records were from Eagle County, suggesting that individuals may be extant in Colorado. However, studies indicate that existing records may represent sporadic populations based more upon wandering and dispersing individuals rather than viable, long-term populations (Ruggiero 1994; Halfpenny *et al.* 1980). The Colorado Division of Wildlife lists the lynx as endangered in Colorado (CDOW draft 1997), and as of 1971, further hunting of lynx was not allowed in Colorado (CDOW draft 1997).

The Colorado Division of Wildlife embarked upon a lynx reintroduction project during the summer of 1999. A total of 41 lynx were released in 1999, of these, 24 remain alive, and three, all females, have established residence in the San Juan Mountains, with one frequenting the Lizard Head Peak area north of Telluride.

Threats to lynx include loss of habitat due to suppression of forest fires, intensive logging, and development; increased human access via logging roads; past trapping, and

possible displacement by bobcat and coyote. Lynx must be protected from overharvest. Protection of large, continuous blocks of public land, with minimal development or roads providing vehicular access, will be critical for survival of reintroduced lynx (Ruggiero 1994). Management of spruce-fir stands and snowshoe hare should also benefit lynx reintroduction (Ruggiero 1994). Although lynx were not included in any PCA, its potential presence here adds to the conservation significance of the high elevations of the San Juan Mountains.

**Midget Faded Rattlesnake** ***Crotalus viridis concolor*** **G5 T4**
**Status: Colorado Species of Special Concern**

The midget faded rattlesnake rarely exceeds twenty-six inches. Its upper body is yellowish or cream colored, and it has 23-27 dorsal scale rows, with more than 13 scale rows at its mid-tail.

This subspecies ranges from southern Wyoming and eastern Utah south to the Four Corners area (Stebbins 1985). Colorado is at the eastern margin of the subspecies' range where it occurs in Mesa, Delta, Garfield, Montrose, and San Miguel counties. The midget-faded rattlesnake is found within most habitats in the range (Hammerson 1982). There are approximately 40 localities documented from Colorado (Hammerson 1982) with many others likely to be found. There are no rangewide estimates available; however, midget faded rattlesnakes are visibly common in much of west central Colorado. Trends are difficult to estimate across the state. It is likely that the species was severely depleted with the near eradication of large prairie dog towns on the plains.

Threats to this snake are generally low, but many individual populations are highly threatened from human encroachment near urban areas. Many humans revile rattlesnakes, and often go out of their way to destroy individuals or dens when discovered (Hammerson 1982). Historical alteration and current residential expansion create threats to rattlesnake populations. Also, there is possible intergradation with prairie rattlesnake in northwestern and southwestern Colorado (Lauren Livo, personnel communication 1997, Hammerson 1982). This snake was not recorded from any of the established PCAs.

**Northern Goshawk** ***Accipiter gentilis*** **G5 S3B**
**Status: Colorado Species of Special Concern**

The Northern Goshawk (Figure 55) is a large raptor with a blue-gray back and white underparts with gray barring. It has a broad white eye stripe separating its dark crown from its back.

The Northern Goshawk is a widespread species, found year-round throughout most of Canada, Alaska, western and northeastern U.S., as well as into Mexico (Squires and Reynolds 1997). It winters south to the northern Great Plains states and the eastern edge of the Rocky Mountains (Squires and Reynolds 1997). The Northern Goshawk is found throughout the state of Colorado, above 7500 feet (Andrews and Righter 1992). In winter, the Northern Goshawk may occur more broadly than during the breeding season. This secretive bird is difficult to census, but its habitat is extensive. In Colorado there are estimated to be less than 100 occurrences, most of which are historical. Total numbers are roughly estimated at 1,000 to 3,000 individuals. Nevertheless, there have been 62 nest sites reported from Colorado's National Forests. Twenty-one goshawk nests have been identified in the Uncompahgre National Forest in San Miguel and western Montrose

counties. In the 1990's nesting activity has been identified at eight of these nests, most recently at two nests in 1998.

Trends are not well documented, but forest fragmentation and development appear to have caused some declines. Timber harvest is considered a possible threat to nesting populations (Reynolds *et al.* 1992). Breeding Bird Survey results exhibit a non-significant downward trend for the continent (Colorado Bird Observatory 1997).

Fragmentation and development, small estimated population, and lack of detailed knowledge are factors that contribute to this species rank of vulnerable within the state (S3B). Protection needs are still being debated among experts. Critical habitat needs to be better defined for the various parts of the range before protection needs can be clearly detailed. However, in general, protection of large, mature to old-growth forest tracts should be beneficial. Stewardship requires that in suitable habitat, unnatural forest fragmentation be avoided.

Northern Goshawks are included in the Beaver Creek-Lone Cone and Horsefly Creek PCAs.

**Northern Leopard Frog *Rana pipiens* G5**
**Status: Colorado Species of Special Concern**

The northern leopard frog (Figure 56) is green or brownish above, white or cream colored below, with oval or round dark dorsal spots, and a white stripe on its upper jaw. This frog has a large range throughout much of the U.S. and southern Canada in a diverse array of pristine and disturbed aquatic and wetland habitats (Hammerson 1982). Most locational records in Colorado are below 11,000 feet elevation (CDOW 1994). There are estimated to be less than 100 occurrences in Colorado, most of which are historical. Population in the state is estimated to be between 3,000 and 10,000 individuals.

Apparent trends for the northern leopard frog are puzzling. This species has become scarce in many areas of Colorado where it was formerly abundant (Hammerson 1982; Corn 1994) and has been extirpated from several sites (Lauren Livo, personal communication 1997). However, the species has returned to some areas that previously suffered substantial declines. Reasons for population declines are not known but appear to be complex. They may include habitat loss or degradation, and interactions with non-native species. Bullfrogs have been suggested as causing declines, but declines and local extinctions have occurred in areas where bullfrogs are not present (Hammerson 1982). Laboratory results suggest that there may be an interaction between crowding, temperature, and mortality from bacterial infection, e.g., red-leg disease (Brodkin 1992). While still common, conservation concern for the northern leopard frog stems from the declining trends and poorly defined but apparent threats. This frog was not recorded from any of the PCAs.

**Pale Lump-nosed Bat *Corynorhinus townsendii pallescens* G4T4 S2**

The pale lumpnosed bat (Figure 57) has large ears (30-38mm), brown-grayish hair, and protruding glandular masses between its eyes/nostrils. It is a widespread and evidently secure species, occurring in lower elevation pinyon-juniper woodlands, semi-desert shrublands, and montane forests of the western United States south into Mexico. Colorado represents the edge of this species' range (Fitzgerald *et al.* 1994, Armstrong *et al.* 1994). Individuals of this subspecies are non-migratory and winter in roost colonies.

In summer, males tend to roost as individuals in rock crevices and on walls, separate from the nursery colony (Fitzgerald *et al.* 1994).

Because winter mortality is a leading factor limiting population growth, conservation actions include limiting disturbance of abandoned mines and cave sites used for hibernacula by using grates to limit human access (Armstrong *et al.* 1994, Fitzgerald *et al.* 1994). Mine closures may cause a decrease in population as well (Armstrong *et al.* 1994). This species is considered imperiled in Colorado (S2) because of its low numbers of individuals encountered for a colonial species, low population size, and high threats. There are approximately 20 non-historical occurrences in Colorado. Several locations have dozens to hundreds of individuals (Armstrong *et al.* 1994). Pale lumpnosed bats were recorded in 1997 from one location each in Sam Miguel and Western Montrose counties near Egnar and Uravan, respectively, and from Martin Mesa in 1999. Insufficient data exist to describe population trends of this subspecies in Colorado, but historical sites seem to be abandoned or greatly reduced in size (Kirk Navo, personal communication). This species is moderately threatened range-wide. It is extremely fragile, and primary threats include loss of habitat (e.g., reclamation of abandoned mines), vandalism, and increased visitation (spelunking) by humans to maternity roosts and hibernacula. Large clusters or colonies are susceptible to disturbance and have been reportedly declining (CDOW 1984). Human access to mines and caves disrupts wintering populations, where disturbance needs to be minimal (Armstrong *et al.* 1994, Fitzgerald *et al.* 1994). Proper stewardship requires continuing inventories, via bat surveys, to establish hibernacula for this species. Protection of natural hibernacula from disturbance is a necessity if this species is to survive in Colorado. Occupied roosts need to be protected from disturbance (May to mid-September for maternity roosts, October-April for hibernacula).

Pale lumpnosed bats are included in the following PCAs: Spud Patch, Dolores River Canyon Uravan to Roc Creek, Hawk Mine, Martin Mesa, and Uravan West.

**Plateau Striped Whiptail** ***Cnemidophorus velox*** **G5 S4**

Plateau striped whiptails (Figure 58) have a long slender body and tail, and six or seven light stripes on their back and sides. Of interest is that plateau striped whiptails are a nearly all-female species, and eggs develop without being fertilized by male sperm, a process called parthenogenesis. Plateau striped whiptails are active from May to September (hatchlings may be active through mid-October, or later), feeding on a variety of insects (Hammerson 1982).

This species is endemic to the Colorado Plateau and occupies southern Utah, western Colorado, northern Arizona, and northern New Mexico, from elevations of about 4,500 to 8,000 ft (1370-2440 m) (Stebbins 1985). Plateau striped whiptails inhabit pinyon-juniper woodland, open chaparral, oak woodland, lower elevations of ponderosa pine and fir forests, and lowland riparian woodlands (Stebbins 1985, Hammerson 1982). The plateau striped whiptail is common in its habitat; however, quantitative estimates of population size are not available. There are at least 30 occurrences known, and based on the distribution of habitat, likely to be many more (CNHP 1999).

Although quantitative trend data are not available, there are no indications that this species is other than stable in western Colorado. Many occurrences are considered protected on public lands, largely those managed by BLM. There are no known threats to

this species in Colorado; however, there are several populations that are likely being impacted by sprawling communities such as Grand Junction, Cortez, and Delta.

Whiptails were recorded from the following PCAs: La Sal Creek, Sewemup Mesa, Slick Rock, Dolores Canyon Slick Rock to Bedrock, and Highway 141 and 145.

**Roundtail Chub** ***Gila robusta*** **G2G3 S2**

**Status: Colorado Species of Special Concern**

The roundtail chub (Figure 59) is a moderately streamlined minnow with silvery shading dorsally to dusky yellow or light green. Adults can reach 18 inches in length and 2 pounds in weight. The roundtail chub is endemic to the Colorado River basin, occurring in large streams and intermediate sized rivers throughout the basin (Woodling 1985, Page and Burr 1991). In Colorado, this species occurs in the Colorado River mainstem and its larger tributaries, including the White, Yampa, Dolores, San Juan, and Gunnison rivers (Woodling 1985). Colorado populations are at the upstream margin of the species' range and comprise the majority of occurrences for this species. The roundtail chub occurs in the Dolores River within the study area from Slick Rock, Colorado downstream to the Montrose-Mesa county line.

This species is considered vulnerable at the global (G2G3) level and very vulnerable at the state (S2) level because of its restricted range and continued threats to its habitat. It is estimated that there are less than 20 occurrences of this species in Colorado.

Threats include low water temperatures, attributed to cold water releases from dams, that may affect reproductive patterns (Woodling 1985; Vanicek and Kramer 1969), and interactions of watershed changes such as reductions in suitable habitat due to impoundment, channel downcutting, substrate sedimentation, water diversion, and groundwater pumping, and displacement through invasion of non-native predatory and competitive species (Hubbs 1954, Miller 1961, Minckley and Deacon 1968, Meffe 1985). The importance of retaining a natural flow regime in southwestern streams has been emphasized repeatedly (e.g., see Meffe and Minckley 1987, Minckley and Meffe 1987).

Management needs include careful monitoring of existing populations and eliminating detrimental water and land use and exposure to non-native fishes. Large stream areas that incorporate diverse habitats (pools, riffles, runs, backwaters, adequate substrate, and current diversity) must be preserved. Protection of existing populations that are not yet infected by non-native fishes can be achieved by building fish barriers or enhancing natural barriers. Barrier design should not significantly alter stream flow and the potential impact on natural upstream and downstream movements of native fishes should be assessed. Appropriate agencies and the Desert Fishes Recovery Team must approve barrier design.

Roundtail chubs are included in the following PCAs: Dolores River-Slick Rock to Bedrock, Dolores River-Uravan to Roc Creek, East Paradox Creek, and Sewemup Mesa.

**Sage Sparrow** ***Amphispiza belli*** **G5 S3B, SZN S2**

The Sage Sparrow (Figure 60) has a buffy brown back with dusky streaks, white underparts with a central dark spot on its breast, a gray-brown head, white eye ring, and a white lore spot or eyebrow. This widespread sparrow has a large range in the western U.S. and Mexico, and is fairly common and stable in many areas, with local declines.

The breeding range for the Sage Sparrow extends primarily across the Great Basin and onto the Columbia Plateau, but the species is also a permanent resident west over the Sierras and onto the California coastline (National Geographic Society 1987). Sage Sparrows occur locally in the lower elevation sagebrush steppes of western Colorado (Andrews and Righter 1992). There are less than 100 occurrences of this species in Colorado. There are at least 12 occurrences in Mesa County and perhaps more than 50 in Moffat county. There are records of Sage Sparrows from western Montrose and San Miguel Counties, including the Dolores River, Paradox Valley, Gypsum Valley, Dry Creek Basin, and Atkinson Mesa. There are no data indicating declines or increases of this species in Colorado and its population appears to be stable. This species was ranked as a S3B within the state because of a loss in sagebrush shrubland habitat occurring throughout its range and the species' relatively low numbers. The major threat to this species is the loss of sagebrush shrubland habitat.

Sage Sparrows are included in the Spring Creek-Atkinson Mesa and East Paradox Creek PCAs.

**Short-Eared Owl** ***Asio flammeus*** **G5 S2B, SZN**

The Short-eared Owl (Figure 61) is a medium-sized, tawny owl with bold vertical streaks on the breast and a pair of barely visible "ear" tufts close together at the top of the facial disk. Its belly is pale, lightly streaked, and its wings are long with a buffy patch beyond the wrist above and a dark patch at the base of the primaries below. Its dark facial disk contrasts with its yellow eyes.

Short-Eared Owls are moderately widespread in the southern U. S. and Mexico. This owl's winter range extends from the southern one-third of the western U.S., across to the southern two-thirds of the eastern U.S. It is a permanent resident across much of the northern one-third of the U.S. and parts of southern Canada, and migrates to the northern part of the continent in summer. The Short-eared Owl inhabits open fields, marshes, dunes and grasslands (National Geographic Society 1987).

No population trends are available for Colorado, but observations indicate that distribution is very spotty in the western part of the state (Andrews and Righter 1992) and it appears to be declining in Colorado (Andrews and Righter 1992) and throughout North America (Holt and Leasure 1993). There are less than 15 occurrences of this species in Colorado, and probably fewer than twenty breeding pairs in the state. Its overall population is likely less than 1,000 individuals. Three pairs of nesting Short-eared Owls were recorded in San Miguel County, at Hamm Canyon in 1992. The species' reportedly low population numbers and questionable breeding status justify a rank of imperiled (S2B) in the state. The species as a whole is deemed secure, due mainly to its extensive range. Threats to this species include conversion of open habitats to agriculture, grazing, and urban development (Holt and Leasure 1993). Nest disturbance from domestic and feral cats and dogs, and interspecific competition with Barn Owls may also pose threats (Holt and Leasure 1993). Repeatedly occupied areas should be protected, and stewardship needs require maintenance of large continuous tracts of prairie habitat for this owl and its prey. From the available data it is obvious that land preservation efforts must be aimed at protecting large tracts of open habitat with low vegetation. Areas of approximately 50 ha or larger, of low, open grasslands or similar habitat with abundant small mammal populations, their major food resource, should also be considered as

potential breeding or wintering habitat. Short-eared Owls are included in the Dolores Canyon South of Slick Rock and Disappointment Valley PCA.

**Spotted Bat** ***Euderma maculatum*** **G4 S2**

Spotted bats have huge pink ears, a blackish dorsum, and white shoulders and rump. The spotted bat occurs in ponderosa pine woodlands, pinyon-juniper woodlands, and open semi-desert shrublands of the southwestern United States and Mexico. This species has been found to roost in crevices on cliff faces, but the winter status of the spotted bat is poorly understood (Armstrong *et al.* 1994). The elevational range of this species is broad, from below sea level up to 10,600 feet (Fitzgerald *et al.* 1994). Colorado represents the eastern edge of the spotted bat's range (Fitzgerald *et al.* 1994). This moderately widespread western North American bat may be more common than formerly believed, but abundance, population trend, and threats are essentially unknown. Although this species is considered extremely rare in the state, new methods of identifying bats by their echolocatory calls may increase the number of records documented for this species along the western slope (Navo *et al.* 1992). No breeding records exist in Colorado and there are insufficient data to determine population trends in Colorado. However, it is suggested that, with increased survey efforts, more spotted bats will be identified (Kirk Navo, personal communication 1997).

This species is ranked as imperiled in Colorado (S2) primarily because of the small number of occurrences, assumed small population size, and its restricted state range. There are fewer than 20 occurrences of this species in Colorado, and it is known in Colorado from only a few individuals. One member of this species was recorded in Montrose County in 1994.

Only speculations can be made about threats. Habitat destruction, such as construction of dams that inundate high cliffs and canyon walls, possibly is a threat (Snow 1974) and the use of pesticides also may be detrimental.

Spotted bats were recorded from the Coyote Wash PCA.

**Tree Lizard** ***Urosaurus ornatus*** **G5 S4**

The tree lizard (Figure 62) can be recognized by the dark crossbars on its back, back scales of irregular sizes and a skin fold across the throat. Males have a blue belly patch on the sides and a blue throat.

This species occurs from southwestern Wyoming to Texas and into Mexico, and occupies habitat that is relatively inaccessible to humans. Tree lizards are found from the desert to lower edge of spruce-fir zone, occupying approximately 20% of Colorado in eleven counties. The western slope has many occurrences documented with more than 50 known localities (Hammerson 1982) and numerous others expected to occur. The lizard has no identified threats, and is considered protected by the abundance of public lands. They were located during this study at Bull Canyon and along the Dolores River near Bedrock, Colorado. They are included in the Dolores Canyon-Slick Rock to Bedrock and La Sal Creek PCAs.

**Yuma Skipper** ***Ochlodes yuma*** **G5 S2**

The Yuma skipper (Figure 63) is a small, one to 1.5 inch long butterfly. Males are a bright tawny color with dark wing veins, while the female is a duller color. The stigma is long, narrow and black.

This butterfly is a Great Basin endemic, and is distributed from northern Arizona and western Colorado, across southern Utah, Nevada, and into eastern California (Scott 1986). Colonies are usually small, rare, and strictly limited to stands of its host plant, the giant reed (Pyle 1989). In Colorado this butterfly is associated with natural wetlands and riparian habitat that is often subject to alteration, but irrigation may favor this species by the establishment of the giant reed. There are only four records of the Yuma skipper, three from Mesa and Delta counties in the late 1970's and early 1960's, and one from San Miguel County in 1999. The extent of its host plant along the Dolores River suggests this butterfly might have an extensive distribution along the river. The Yuma skipper is of conservation concern in the state because there are so few occurrences, small populations, colonial breeding, and its restriction to wetland habitats. Tamarisk invasion, common through its range, may threaten Yuma skipper habitat by displacing the giant reed (CNHP 1999). Protection of natural wetlands with stands of giant reeds will help to assure continued existence of this species in Colorado.

This butterfly was recorded from the Dolores Canyon-Slick Rock to Bedrock PCA.

Figure 43. American Peregrine Falcon.

Figure 44. Bald Eagle at winter roost.

Figure 45. Black Swift in flight.

Figure 46. Boreal Owl.

Figure 47. Brimstone clubtail (a dragonfly).

Figure 48. Canyon treefrog.

Figure 49. Colorado River cutthroat trout.

Figure 50. Flannelmouth Sucker.

Figure 51. Gray Vireo.

Figure 52. Gunnison Sage Grouse, a male displaying on lek.

Figure 53. Lewis's Woodpecker.

Figure 54. Lynx: reintroduced in Colorado summer 1999.

Figure 55. Northern Goshawk.

Figure 58. Plateau striped whiptail.

Figure 56. Northern leopard frog.

Figure 59. Roundtail chub.

Figure 57. Pale lump-nosed bat.

Figure 60. Sage Sparrow.

Figure 61. Short-eared Owl.

Figure 62. Tree Lizard.

Figure 63. Yuma skipper.

# VII. Potential Conservation Areas

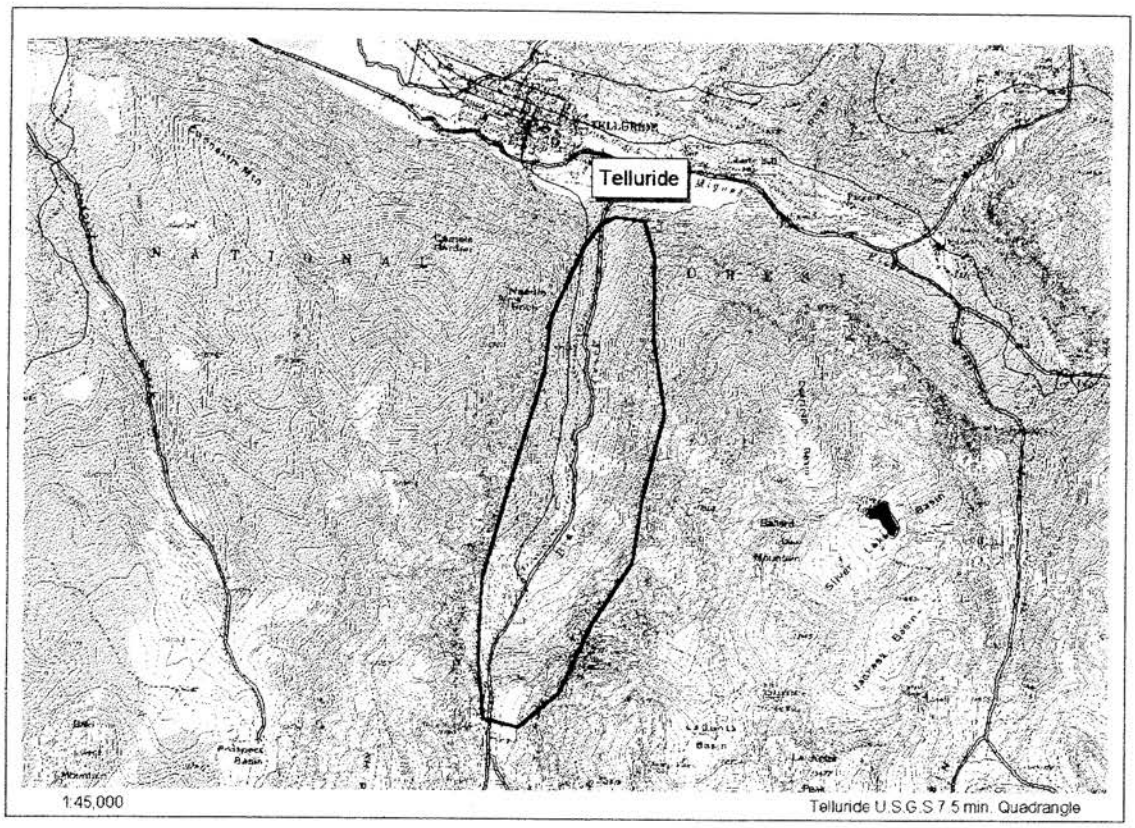
Fifty-nine Potential Conservation Areas (PCAs) are described below. They are arranged alphabetically by site name, regardless of rank. See page 4 for an explanation of Natural Heritage Ranks.

Following each rank is a notation of the "driving element", or the element on which the site rank was based. The driving element is also in bold type in the chart of element occurrences. Other elements which fall within the site are included in the chart and discussed under "biodiversity significance comments", but did not influence the site rank. Elevation range indicates the lowest and highest elevations within the PCA. Note that elevations are approximate, and may be rounded. Size of the PCA, in acres, is approximate. Information on soils in the PCAs was taken from ----, and information on geological formations from ---.

Figure 64. Lizard Head and Wilson Peak from Hastings Mesa

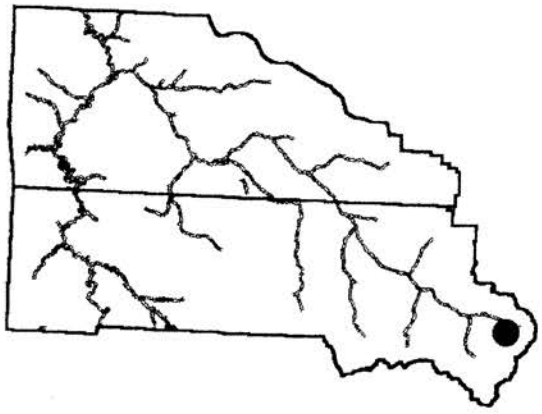
# Bear Creek

## Potential Conservation Area




0.5 0 0.5 1 1.5 2 Miles

N



# Bear Creek

**Biodiversity Rank: B3** (High Biodiversity Significance) Bear Creek contains an excellent occurrence of a tall willow community that is considered to be vulnerable on a global scale.

**Protection Urgency Rank: P3** There is a definable threat to the occurrence, but not expected within the next five years.

**Management Urgency Rank: M3** Ongoing, recurrent management action would help to maintain the current quality of element occurrences.

**Location:** San Miguel County. Bear Creek is located just south of the town of Telluride.

U.S.G.S. 7.5 minute quadrangle: Telluride

**Legal description:** T42N R9W S1, 12, 13; T42N R8W S6, 7.

**Elevation range:** 8,880 to 11,600 feet

**Size:** 708 acres

**General Description:**

A popular hiking and bicycle trail begins in the town of Telluride, at the foot of Pine Street, and continues up the Bear Creek drainage for about 2 miles to Bear Creek Falls. Formerly a road, it is now closed to motorized vehicles.

Geologic formations in the PCA are, from lower to higher elevations, Cutler and Dolores sandstones, Eocene pre-volcanic sedimentary rocks, and Tertiary volcanics.

Forested areas on the north-facing hillsides are in excellent condition, and include several plant communities that are representative of the San Miguel Basin's montane zone. At the lower part of the proposed conservation area, a mix of aspen, spruce and white fir dominate the canopy. The understory has a very rich assemblage of shrubs, grasses and forbs. Some of the most common species are red-osier dogwood, Rocky Mountain maple, twinberry honeysuckle, meadowrue, and russet buffaloberry. A complete list of 127 species observed is available from CNHP. Other than a few pasture grasses and introduced forbs (e.g. Kentucky bluegrass, orchard grass, meadow timothy, red clover, shepherd's purse) along the trail, all the plants in the PCA are native to the area.

Farther upstream, subalpine fir and Engelmann spruce become the dominant species in the canopy, and the understory is very deeply shaded and moist. Farther yet, open areas have wet meadows or willow carrs. A high quality community of Geyer willow in an avalanche run was documented as part of the riparian classification project conducted by CNHP in 1993 (Kittel and Lederer 1993).

Black Swifts were observed at the Bear Creek Falls, and they may be nesting behind the cascades of the falls. Bear Creek Falls offers several features necessary for Black Swift breeding habitat: permanent water flow, a commanding view of the valley,

open flight paths to access falls, cascades of ~65 feet, many niches for nesting, and extensive moss cover behind cascades within which the swifts excavate a nest. Flowing falls are a necessity for Colorado's nesting Black Swifts. Regulation of practices that divert stream flows, to prevent complete loss of water flow at nesting falls and subsequent abandonment of breeding sites, would be beneficial to the swifts.

Small populations of two rare ferns, slender rock-brake and smooth cliff-brake, were found at the falls in 1999, both occurring under dripping ledges wet with spray from the waterfall.

Natural Heritage element occurrences at the Bear Creek PCA.

| Element | Common Name | G rank | S rank | Federal/ State status | EO* rank |
|---|---|---|---|---|---|
| ***Salix geyeriana-Salix monticola*/mesic forb** | **Geyer's willow-rocky mountain willow/mesic forb** | **G3** | **S3** | | **B** |
| *Populus tremuloides/Cornus sericea* | Aspen forests | G4 | S2 | | A |
| *Cypseloides niger* | Black Swift | G4 | S3B | USFS | B |
| *Abies lasiocarpa-Picea engelmannii/Mertensia ciliata* | Montane riparian forests | G5 | S5 | | B |
| *Cryptogramma stelleri* | Slender rock-brake | G5 | S2 | | E |
| *Cryptogramma stelleri* | Slender rock-brake | G5 | S2 | | C |
| *Pellaea glabella* ssp. *simplex* | Smooth cliff-brake | G5T4? | S2 | | C |

*EO=Element Occurrence

**Biodiversity comments:** Bear Creek contains an excellent occurrence of an aspen forest community and a good to fair occurrence of a tall willow community. Both of these communities are considered to be vulnerable on a global scale. In addition, two species of ferns, the slender rock-brake and the smooth rock-brake, considered to be rare in Colorado were found here. Black swifts, considered vulnerable in Colorado, were also documented in the PCA. The spruce-fir montane riparian forest, while common both globally and in Colorado, was found to be in good condition.

**Boundary Justification:** The boundary was drawn to include Bear Creek, with its riparian area and examples of surrounding forest, from the trailhead to Bear Creek Falls. The PCA encompasses the areas of aspen forest and tall willow community that were surveyed and found to be in good to excellent condition. This does not imply that areas outside the boundary that were not surveyed are not equally significant. Bear Creek Falls is the nesting site of Black Swifts. The entire area needed by this species for foraging would extend much farther, and was not included in the PCA. Likewise, the entire watershed upstream of the PCA boundaries can potentially affect the hydrology of this site. Flowing falls are a necessity for Colorado's nesting swifts. Diversion of stream flows reducing water flow at the falls could result in abandonment of breeding sites. This

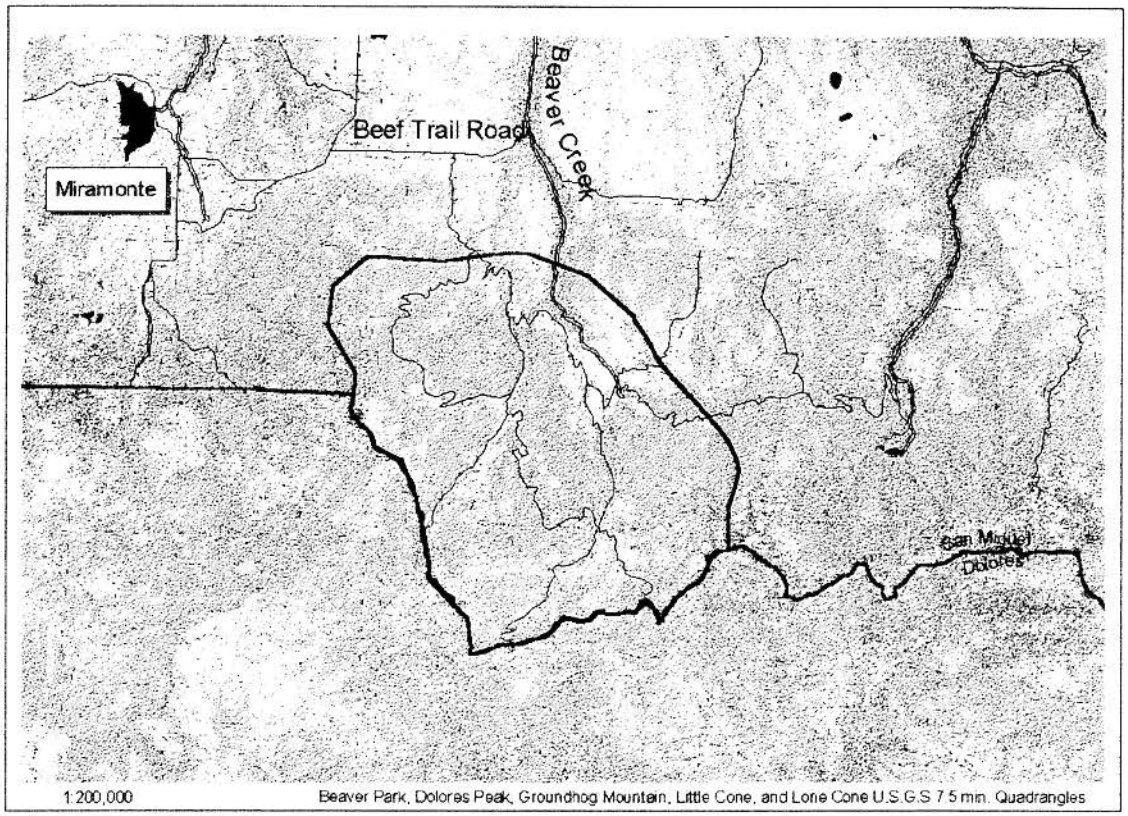
could also cause the loss of the two ferns that were found growing in cliffs that are wet with spray from the falls.

**Protection Rank Comments:** Much of this PCA has been protected through the efforts of the Town of Telluride, San Miguel Conservation Foundation, and private citizens. There are numerous private mining claims in the area, and opportunities still exist to protect more of the land through purchase, purchase of development rights, or conservation easements.

**Management Rank Comments:** Efforts to revegetate disturbed areas, control weeds and protect the site from bicycle and foot traffic off the trail are ongoing, and will need to be continued to maintain the quality of the aspen forest community. Black Swifts are apparently tolerant of human presence, and continued visitation of the falls by hikers should not compromise their nesting.

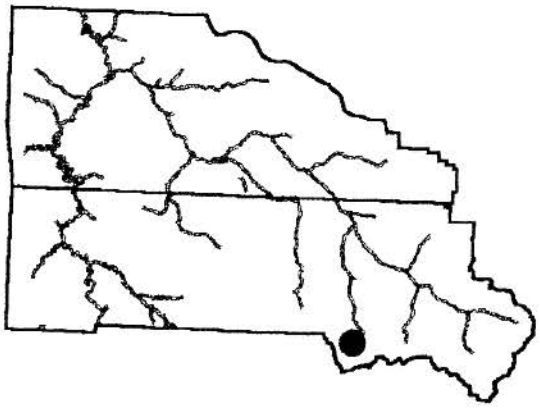
# Beaver Creek - Lone Cone

## Potential Conservation Area




2 0 2 4 6 8 Miles

N



# Beaver Creek-Lone Cone

**Biodiversity Rank: B4** (Moderate Biodiversity Significance) The Beaver Creek-Lone Cone PCA contains a good example of a willow plant community that is vulnerable throughout its range. In addition, the area has several plants that are imperiled within Colorado, and the PCA is home to Boreal Owls and Northern Goshawks.

**Protection Urgency Rank: P3** There is a definable threat to the occurrence, but not expected within the next five years.

**Management Urgency Rank: M3** Ongoing, recurrent management action would help to maintain the current quality of element occurrences.

**Location:** Beaver Creek-Lone Cone is located 14.5 air miles southeast of Norwood, Colorado in southern San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Beaver Park, Lone Cone

**Legal description:** T41N R11W Section 6; T41N R12W Sections 1-6, 8-12; T42N R11W Sections 30, 31; T42N R12W Sections 2-6, 7-11, 13-36; T42N R13W Sections 1, 2, 11, 12, 13, 14, 24, 25.

**Elevation range:** 8,800 to 12,613 feet

**Size:** 2,790 acres

**General Description:**

The Beaver Creek-Lone Cone PCA includes the north side of Lone Cone Mountain and the upper reaches of Beaver Creek. Lone Cone and the adjacent mountains at the southern part of the PCA are composed of Tertiary Period volcanic rock that covered the underlying Mancos Shale (Cretaceous) found in the rest of the PCA. This PCA provides excellent examples of several plant communities that are common in Western Colorado. At the lowest elevations are aspen forests with clearings of Thurber fescue and other native grasses. Blue spruce riparian forest and willow communities line the streams. Spruce-fir forests and alpine tundra occupy the higher elevations on the flanks of Lone Cone. This PCA provides the large areas of habitat required for Northern Goshawks.

A small natural lake on the east side of Lone Cone is the site of a population of King's clover, a plant that is extremely rare in Colorado, and the canyon bog orchid, a globally vulnerable plant. The unnamed lake is rimmed by a beautiful mossy wetland of water sedge, beaked sedge and tufted hairgrass, enhanced with elephantella, bog orchids, felwort, and death camas. The surrounding area is a wet, boggy forest of Engelmann spruce and subalpine fir.

King's clover and another plant that is extremely rare in Colorado, variegated scouring rush, were also found along West Beaver Creek. Tiny ferns known as moonworts were growing along an old logging road in young second growth spruce below Lone Cone. They occur in areas that have sparse vegetation. Associated species in

this part of the PCA were black groundsel, wild strawberry, fireweed, Whipple's penstemon, Richardson's geranium, heartleaf arnica, spike trisetum, and alpine bluegrass. On the talus slopes at Devil's Chair, an excellent occurrence of Altai chickweed with thousands of individuals was found. The plants were growing in fine scree soils above a rock glacier. They were especially abundant in the shelter of larger rocks, accompanied by alpine groundsel, tufted hairgrass, moss campion, featherleaf fleabane, black groundsel, and sky pilot. The adjacent tundra community, with more soil development, consisted of a variety of grasses, forbs, mosses and lichens. Common species included slender wheatgrass, spike trisetum, pussytoes, alpine avens, Fremont's groundsel, alpine fescue, yarrow, mountain parsley, Geyer's onion, thickleaf clover, Colorado cinquefoil, plantain goldenweed, and alpine fescue. Farther downhill, currant, mountain avens and Colorado columbine dominated the slopes.

A Boreal Owl was recorded nesting within this PCA in 1999 and Northern Goshawks nested here in the 1980's and 90's, most recently in 1998.

The area provides habitat for wildlife and is popular for big game hunting. In addition to its recreational and scenic values, the area is important for maintaining proper function of the watershed. Logging and cattle grazing have been important uses. There are several maintained forest roads in the area, as well as former mining roads that have been closed to motorized vehicles.

Natural Heritage element occurrences at the Beaver Creek-Lone Cone PCA.

| Element | Common Name | G rank | S rank | Federal/ State status | EO rank* |
|---|---|---|---|---|---|
| ***Salix geyeriana-Salix monticola*/mesic forb** | **Geyer's willow-Rocky mountain willow/mesic forb** | **G3** | **S3** | | **B** |
| *Festuca thurberi-Lathyrus leucanthus* | Thurber fescue-white peavine montane grasslands | G4 | S4 | | B |
| *Trifolium kingii* | King's clover | G4 | S1 | | C |
| *Trifolium kingii* | King's clover | G4 | S1 | | B |
| *Stellaria irrigua* | Altai chickweed | G4? | S2 | | A |
| *Limnorchis ensifolia* | Canyon bog-orchid | G4G5T3? | S3 | | C |
| *Limnorchis ensifolia* | Canyon bog-orchid | G4G5T3? | S3 | | E |
| *Abies lasiocarpa-Picea engelmannii/Mertensia ciliata* | Montane riparian forests | G5 | S5 | | B |
| *Accipiter gentilis* | Northern Goshawk | G5 | S3B,SZN | BLM, USFS | H |
| *Accipiter gentilis* | Northern Goshawk | G5 | S3B,SZN | BLM, USFS | E |
| *Accipiter gentilis* | Northern Goshawk | G5 | S3B,SZN | BLM, USFS | H |
| *Accipiter gentilis* | Northern Goshawk | G5 | S3B,SZN | BLM, USFS | E |

| | | | | | |
|---|---|---|---|---|---|
| *Accipiter gentilis* | Northern Goshawk | G5 | S3B,SZN | BLM, USFS | H |
| *Accipiter gentilis* | Northern Goshawk | G5 | S3B,SZN | BLM, USFS | H |
| *Aegolius funereus* | Boreal Owl | G5 | S2 | USFS | E |
| *Aegolius funereus* | Boreal Owl | G5 | S2 | USFS | B |
| *Botrychium lunaria* | Common moonwort | G5 | S2S3 | | C |
| *Hippochaete variegata* var. *variegata* | Variegated scouring rush | G5T? | S1 | | B |

*EO=Element Occurrence

**Biodiversity comments:** The Beaver Creek-Lone Cone PCA contains a good example of a willow plant community that is globally vulnerable throughout its range. In addition, the area has several plants that are imperiled within Colorado. King's clover is known from five states, and is apparently secure globally. However, the only other occurrences of this species in Colorado in the CNHP database were found in 1998 in Montrose County, on the Uncompahgre Plateau. Common moonwort, likewise, is secure globally, but rare in Colorado. The variegated scouring rush is a species of the northern states of the U.S., reaching its southern limit in Colorado and Utah. This is the only known location of this species in San Miguel County. There are only two other known occurrences in Colorado, both in Gunnison County. The canyon bog orchid occupies similar wetland habitats. Two occurrences of this species were found in the PCA. The first, found in 1990, was in a roadside ditch. The second, found in 1994 and revisited in 1999, was in the wetland on the west-side of a small lake. There is still some question as to the identification of this population, as the plants observed in 1999 appeared to resemble the more common northern bog orchid.

The PCA is home to Boreal Owls and Northern Goshawks, both globally common species. Boreal Owls are imperiled in Colorado, while Northern Goshawks are considered to be vulnerable in Colorado.

**Boundary Justification:** The boundary is drawn to include several occurrences of plant communities, rare plants, and raptors in the Beaver Creek drainage. Although all of these occurrences are found in the northern half of the PCA, the headwaters of Beaver Creek were included, as their condition affects the health of the downstream lands. Although not visited during this survey, additional good quality stands of the Thurber fescue community have been reported and are expected at the higher elevations contained in the PCA.

**Protection Comments:** The PCA is mostly on National Forest land, with one or more inholdings and some adjacent private lands with no special protection. Protection needs for Northern Goshawks are still being debated among experts. In general, protection of large, mature to old-growth forest tracts should be beneficial. Avoidance of unnatural forest fragmentation such as clear-cutting in suitable habitat would benefit goshawks.

Although all of the element occurrences in this PCA were on National Forest

Land, there are one or more private inholdings on Beaver Creek that may be subject to development.

**Management Comments:** Forest management for both maintenance of snags and maintenance of aspen groves with large diameter trees will benefit the Boreal Owl and Northern Goshawk. Uneven-age timber management may be compatible, but clear-cuts are not considered suitable habitat for foraging Boreal Owls (Hayward and Hayward 1993). Stewardship needs include furnishing nesting cavities and forest structure necessary for foraging in the long-term. Management actions on the private as well as forest lands may affect the water quality of Beaver Creek and downstream riparian areas.

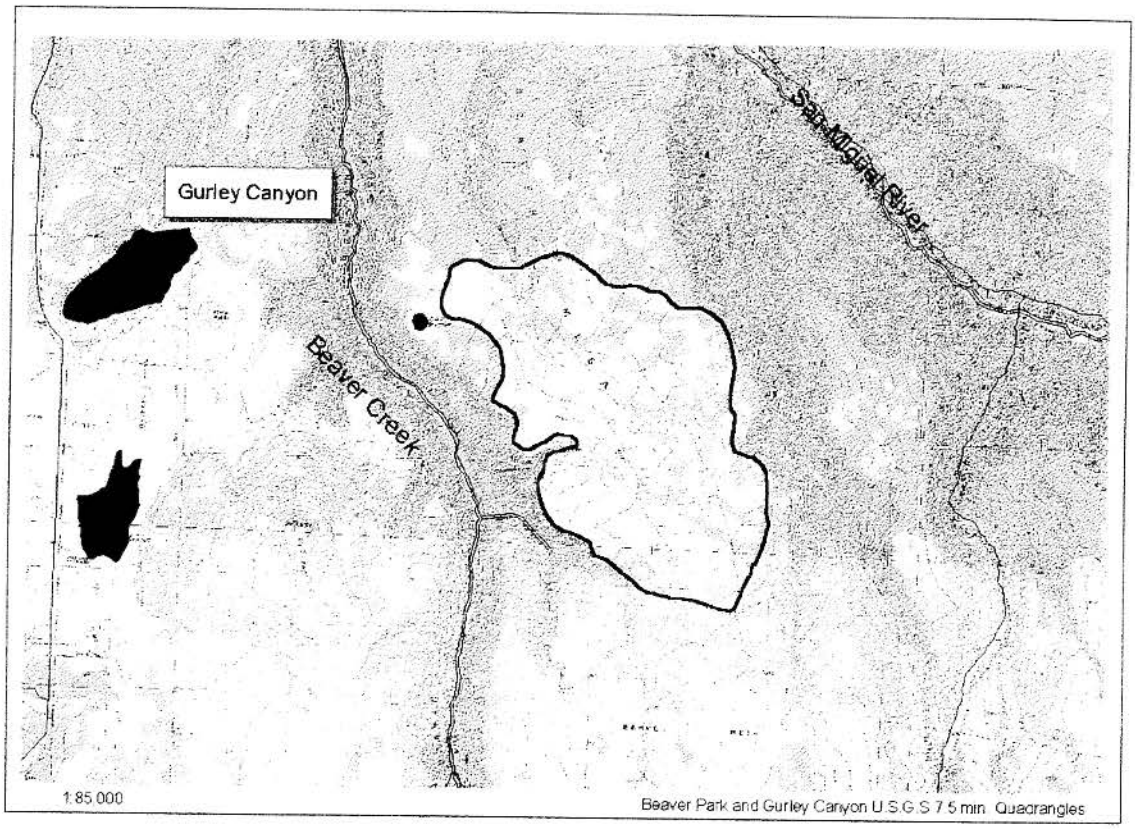
Thurber fescue meadows at lower elevations that are heavily grazed by cattle are in poor condition compared to higher elevation meadows that have historically been grazed by sheep (Grother, C. personal communication 2000). Periods of rest from cattle grazing would benefit this plant community.

More research is needed on the taxonomic identity of the canyon bog orchid, as well as the reproductive ecology of both the bog orchid and King's clover within this PCA. Periodic monitoring of the site will serve to detect changes in condition that might warrant management action.

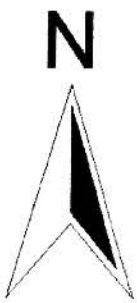
Large home ranges and low population densities of Boreal Owls require that preserves exceed 1000 sq. km. of suitable habitat (Hayward and Hayward 1993). Forest management for both maintenance of snags and maintenance of aspen groves with large diameter trees would benefit the owls. Uneven-age timber management may be compatible, but clear-cuts are not considered suitable habitat for foraging Boreal Owls (Hayward and Hayward 1993). Long-term stewardship needs include furnishing nesting cavities and forest structure necessary for foraging.

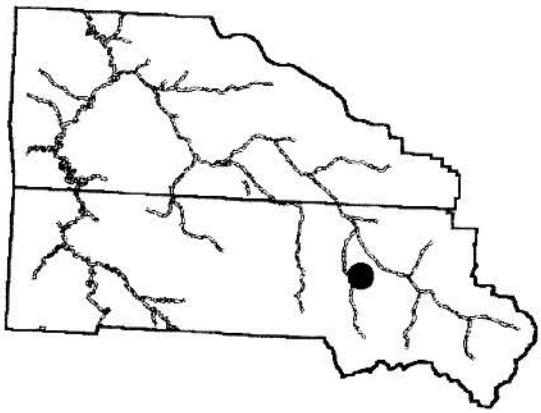
# Beaver Mesa

## Potential Conservation Area







# Beaver Mesa

**Biodiversity Rank: B2** (Very high biodiversity significance) This PCA contains a fair occurrence of Gunnison Sage Grouse, a species that is critically imperiled on a global scale.

**Protection Urgency Rank: P2** Threat is expected within five years.

**Management Urgency Rank: M3** Ongoing, recurrent management actions are needed to maintain or improve the current quality of the site as Sage Grouse habitat.

**Location:** Beaver Mesa is 3.3 air miles east of Cone Reservoir in west central San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Gurley Canyon and Beaver Park

**Legal Description:** T43N R12W Sections 2, 3, 4, 10, 11, 14; T44N R12W Sections 22, 28, 33, 34, 35

**Size:** 3,154 acres

**Elevation:** 8,360 to 8,760 feet

**General Description:**

Beaver Mesa is a relatively flat plateau at approximately 8,500 feet elevation. Past the eastern boundary of the PCA, the plateau declines steeply into the valley at Saltado Creek, and beyond the western boundary, the topography falls off into Beaver Canyon. The geologic features at the PCA include Cretaceous Dakota Sandstone and Burro Canyon Formations that consist of sandstone, shale, and conglomerates. On this PCA approximately 95% of the land is unprotected, grazed ranchland with the remaining 5% grazed BLM land.

This plateau supports a lekking population of Gunnison Sage Grouse, discovered in 1998. In 1998 this lek supported four displaying males.

Natural Heritage element occurrences at the Beaver Mesa PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Centrocercus* sp. 1** | **Gunnison Sage Grouse** | **G1** | **S1** | **BLM, CO-SC** | **C** |

*EO=Element Occurrence

**Biodiversity comments:** This PCA contains a low quality occurrence of the Gunnison Sage Grouse and the probability that this population will persist into the future is estimated as fair. There are only 15 to 20 estimated occurrences in southwestern Colorado (Braun 1995). Populations of this species are currently limited to southwestern Colorado and southeastern Utah. There has been a long-term reduction in the distribution and abundance of the Gunnison Sage Grouse in Colorado since the early 1900's (Braun *et al.* 1994).

**Boundary Justification:** There is much discussion in the literature on determining the extent of conservation site boundaries for Gunnison Sage Grouse and the protection of habitat within 3 km of lekking sites is the recommended standard (Schroeder *et al*. 1999). The random distribution of nests in relation to lek location suggests that Gunnison Sage Grouse choose nesting sites based on habitat components other than distance from leks. The quantity of habitat necessary to support minimum viable populations is necessarily greater than the 3 km target. The greatest factors contributing to nest failure are predation of eggs, adults on nests, and young during feeding, as well as food availability. In addition, overwinter survival is compromised when large continuous stands of big sagebrush are absent. This PCA was drawn to include territory accommodating all required seasonal habitats of the grouse.

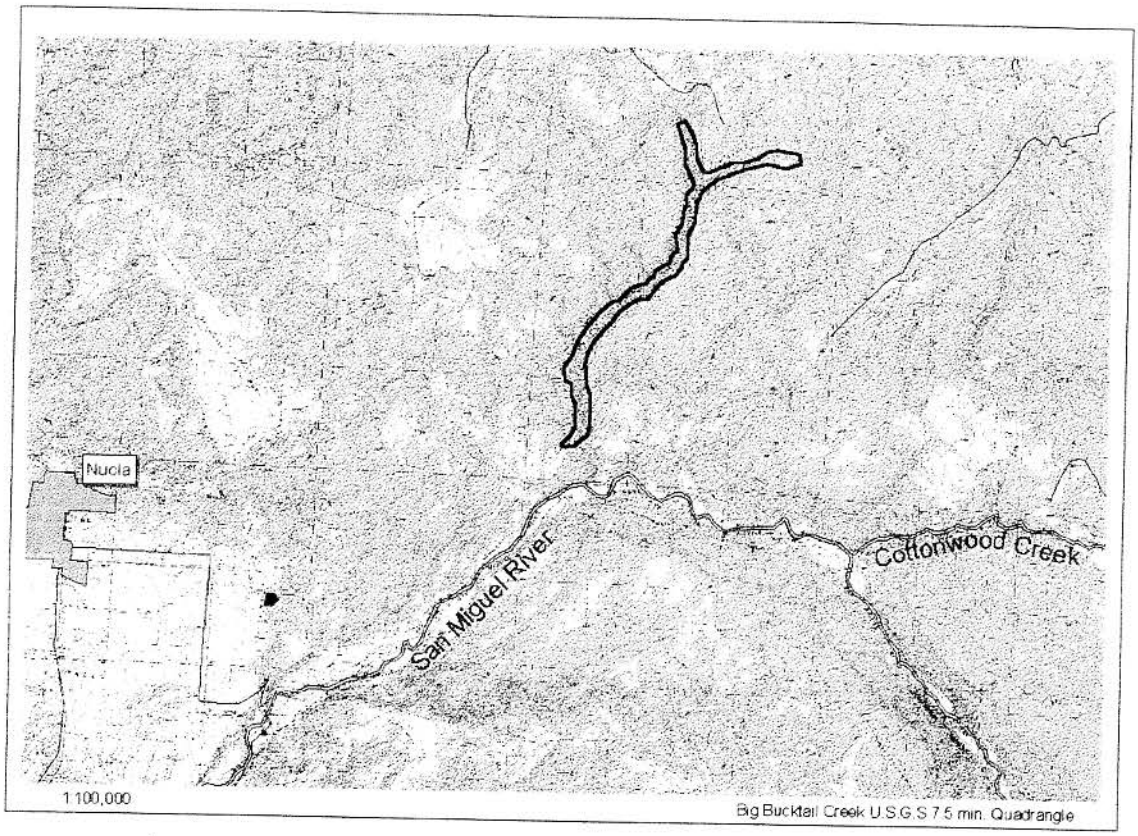
**Protection Rank Comments:** Protection of identified seasonal habitats (wintering, breeding, nesting and brooding) is important for continued existence of this species on Beaver Mesa. Approximately 95% of this PCA is in private ownership, and has been subdivided. Development in this area is a severe threat to the Gunnison Sage Grouse population. Protection of the site through purchase, purchase of development rights or conservation easement would be beneficial to the Sage Grouse.

**Management Rank Comments:** Management is required at this PCA if Gunnison's Sage Grouse is to be protected against disturbances compromising chick survival on brooding ranges and adult survival through winter. Threats at this PCA include habitat loss and degradation of sagelands through development, agriculture, and grazing. Management of this PCA to maintain areas of big sagebrush and relatively tall and thick grass, forb, and shrub cover will improve Sage Grouse habitat. These components supply cover from predation for both adults and chicks and supply adequate food in the form of buds, blossoms, leaves, stems, fruit, and also insects, which are particularly important to juveniles within their first three weeks of life. They also supply winter forage, which consists primarily of big sagebrush. Experts recommend that sagebrush habitats not be treated with chaining, spraying, or burning to benefit livestock production (Ritchie *et al.* 1994) which would reduce winter forage availability and cover and food in all seasons. Use of organophosphorus insecticides on agricultural lands adjacent to sagebrush can result in grouse die-offs (Blus 1989). Eliminating grazing during the chick rearing period (May-August) may be beneficial. Thinning of pinyon-juniper stands, utility poles, and other perching sites can help to prevent predation of adults on leks by raptors.

The habitat requirements of this grouse differ during the year, and differ for sex and age classes. Therefore the presence of each habitat type in healthy condition in close proximity to winter, lek, nest and brood-rearing habitat is essential. They occupy foothills, plains and mountain slopes where sagebrush is present (AOU 1983). In summer, native or cultivated meadows, grasslands, aspen, and willow thickets adjacent to or interspersed with sagebrush are occupied (Andrews and Righter 1992). Winter habitat (palatable sagebrush) probably is the most limited seasonal habitat in some areas.

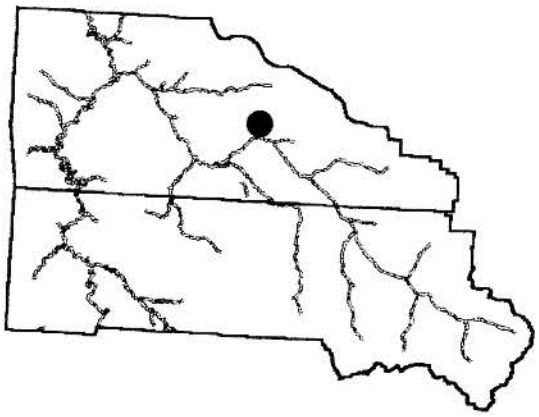
# Big Bucktail Creek

## Potential Conservation Area




1 0 1 2 3 4 Miles

N



# Big Bucktail Creek

**Biodiversity Rank: B2** (Very high biodiversity significance) The Big Bucktail Creek PCA supports an excellent occurrence of the skunkbrush/coyote willow riparian shrubland community, considered to be imperiled on a global scale.

**Protection Urgency Rank: P4** No special protection should be required.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Big Bucktail Creek is located 3.5 air miles east of Nucla, Colorado in west-central Montrose County.

U.S.G.S. 7.5 minute quadrangles: Big Bucktail Creek

**Legal description:** T47N R14W Sections 16, 17, 20, 29, 30, 31.

**Elevation range:** 6,000 to 6,800 feet

**Size:** 397 acres

**General Description:**

Big Bucktail Creek is a tributary of the San Miguel River running south from the Uncompahgre Plateau. The creek cuts through Jurassic sandstones and shales of the Morrison, Summerville and Entrada formations. This PCA was surveyed by CNHP in 1997 (Stevens and Zoerner 1997). It was found to sustain several high quality riparian plant communities dominated by skunkbrush and Gambel's oak, although there is little surface water in the area in mid-summer. The narrowly confined canyon has a cobble-boulder channel, with sediment between the boulders. Skunkbrush lines the edge of the channel, giving way to oak on the higher banks. Other common plant species in this dense shrub community are Utah serviceberry, Wood's rose, and thinleaf alder.

Natural Heritage element occurrences at the Big Bucktail Creek PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Rhus trilobata/Salix exigua*** | **Skunkbrush/Coyote willow riparian shrubland** | **G2** | **S2** | | **A** |
| *Populus angustifolia/Rhus trilobata* | Narrowleaf cottonwood/skunkbrush | G3 | S3 | | A |
| *Populus angustifolia/Rhus trilobata* | Narrowleaf cottonwood/skunkbrush | G3 | S3 | | A |
| *Vireo vicinior* | Gray Vireo | G4 | S2B, SZN | | C |

*EO=Element Occurrence

**Biodiversity comments:** In addition to four excellent sub-occurrences of the skunkbrush/coyote willow riparian shrubland, this PCA has two excellent, one good and one fair sub-occurrences of the narrowleaf cottonwood/skunkbrush community. This

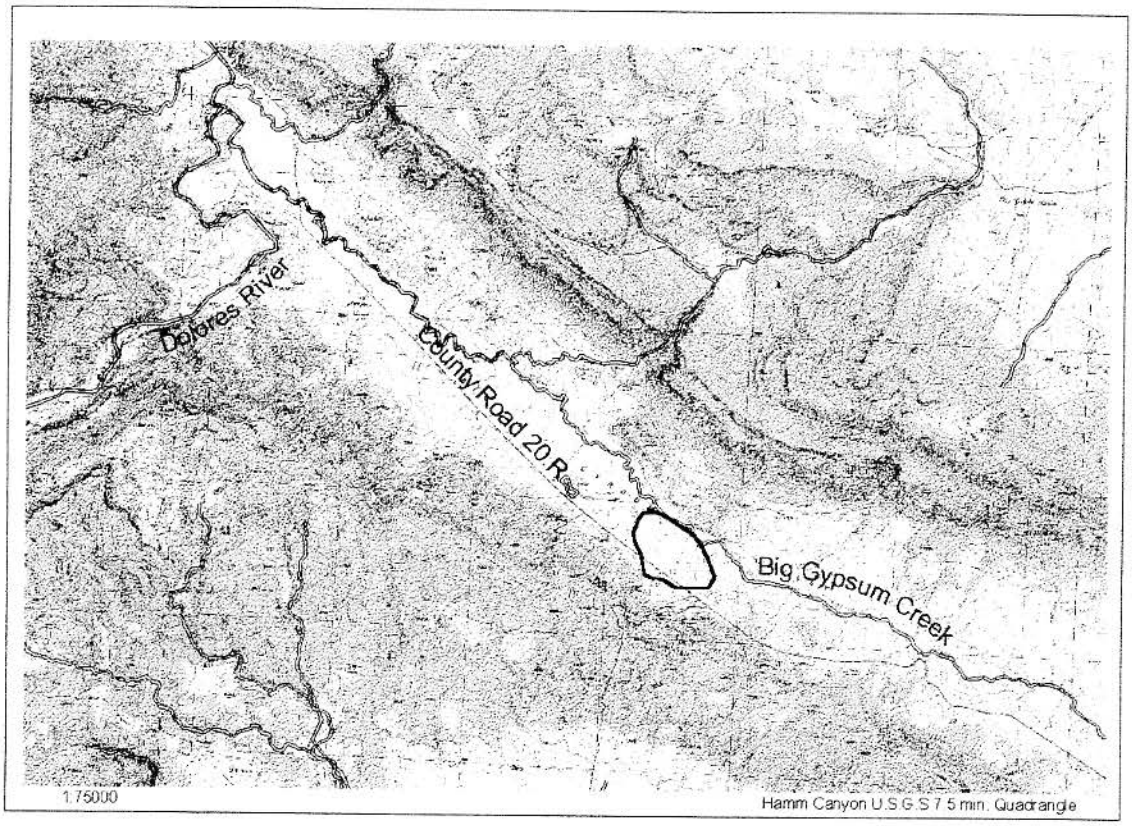
community is considered vulnerable both globally and in Colorado. There is also one occurrence of a Gray Vireo, for which breeding populations in Colorado are rare.

**Boundary Justification:** The boundary is drawn to include several high quality examples of riparian plant communities, as well as some of the uplands that may affect these communities. Other similar tributaries of the San Miguel contribute to the quality of the river, and should be considered significant for that reason. Although the nesting location of the Gray Vireo is included, the boundary does not take in the entire area that is used by the bird.

**Protection Rank Comments:** This PCA is located on BLM and National Forest lands. Access to the PCA is difficult, and serves to protect the area from human disturbance.

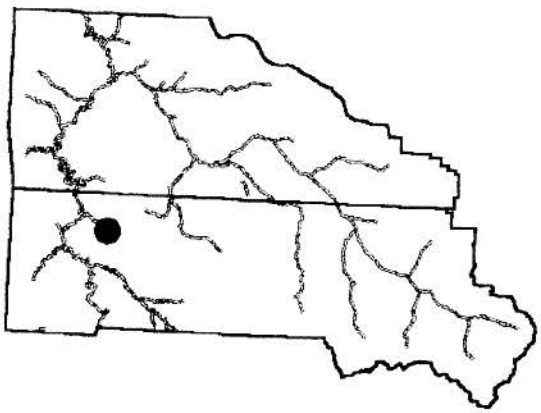
**Management Rank Comments:** BLM land in this PCA is managed for livestock, wildlife and riparian values. Activities in the watershed including grazing and timber harvest could impact the riparian communities in the future. At present, cattle tend to stay out of the narrow, incised riparian zone. The researchers reported no exotic species. Management actions in the pinyon-juniper woodlands may affect the Gray Vireo.

# Big Gypsum Valley
## Potential Conservation Area




0.5 0 0.5 1 1.5 Miles

N



# Big Gypsum Valley

**Biodiversity Rank: B4** (Moderate Biodiversity Significance) Big Gypsum Valley has an excellent occurrence of the weak-stemmed mariposa lily, a plant that is extremely rare in Colorado.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Big Gypsum Valley is located 14.0 air miles west of Basin, Colorado in southeastern San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Gypsum Gap

**Legal description:** T44N R18W Section 13.

**Elevation range:** 5,700 to 5,800 feet

**Size:** 148 acres

**General Description:**

Big Gypsum Valley is one of several east-west trending valleys in western San Miguel and Montrose counties. The broad, flat valley has saline soils and desert shrub/grassland vegetation. Geologic formations in the PCA include Mancos shale (Cretaceous) in the northern half, and Morrison, Summerville and Entrada sandstones and shales (Jurassic) in the southern half. The area has several uranium mines.

This PCA contains the largest population of the weak-stemmed mariposa lily known from Colorado. The grassy, west-facing slope, on the north side of Highway 80 also supported galleta, Indian ricegrass, scarlet globemallow, larkspur, and winterfat. The majority of this PCA is publicly owned and managed by the Bureau of Land Management. Nearby private lands may also contain the mariposa lily.

The mariposa lily apparently has a very early flowering period. The population was discovered on May 26. When CNHP biologists returned to the area two weeks later to search for more occurrences, the original population was no longer visible.

Natural Heritage element occurrences at the Big Gypsum Valley PCA.

| Element | Common Name | G | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Calochortus flexuosus*** | **Weak-stemmed mariposa lily** | **G4** | **S1** | | **A** |

*EO=Element Occurrence

**Biodiversity comments:** The population of the weak-stemmed mariposa lily in Big Gypsum Valley is one of the best known in Colorado. Prior to the discovery of this population, there were ten Colorado occurrences of this species in CNHP's database, seven from Montezuma County, one from Archuleta, one from San Miguel and one from

Montrose. Only two of these populations have been seen within the last ten years, both in Mesa Verde National Monument. Little is known about the record from Montrose County, which is based on a herbarium specimen collected by Edwin Payson in 1914 near Naturita. The other San Miguel record was mapped as occurring in Egnar, and was based on a herbarium specimen collected in 1980. Neither of these sites could be relocated in 1999. The Big Gypsum population, therefore, may be the northernmost extant occurrence of this species. Globally, the species is known from six southwestern states, and is apparently secure in areas outside Colorado.

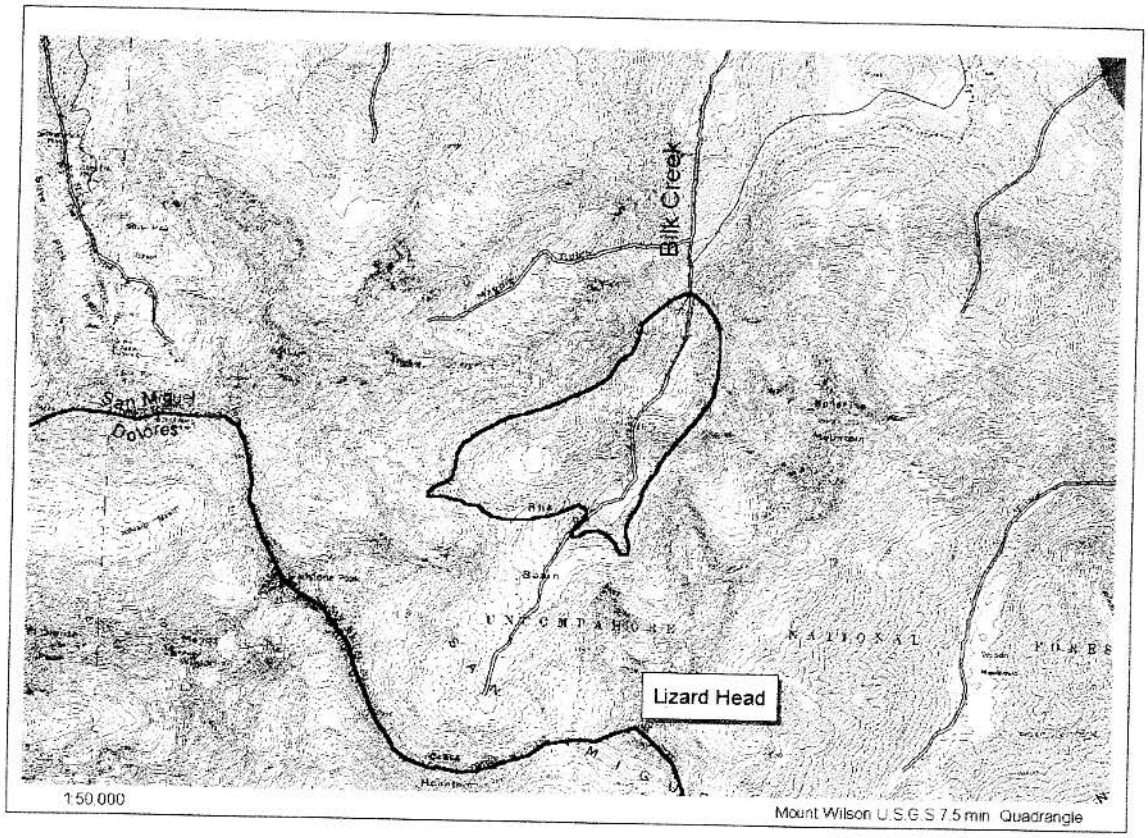
**Boundary Justification:** The boundary is drawn to encompass the population of the weak-stemmed mariposa lily, along with some adjacent potential habitat in the shrub/grasslands of the valley bottom, to allow for future expansion of the population.

**Protection Rank Comments:** The PCA is entirely on BLM land. Protection from future mining or other surface disturbing activities in the area would help to ensure the plants' survival.

**Management Rank Comments:** BLM management objectives for this PCA emphasize mining, wildlife, soils and water (USDI 1985). The PCA is adjacent to a public highway. The weak-stemmed mariposa lily is far enough away from the road that it should not be threatened by roadside weed spraying, as long as care is taken to avoid spraying when wind could carry the drift to the plants. Periodic monitoring of this population may add to our understanding of the plants' ecology and management needs.

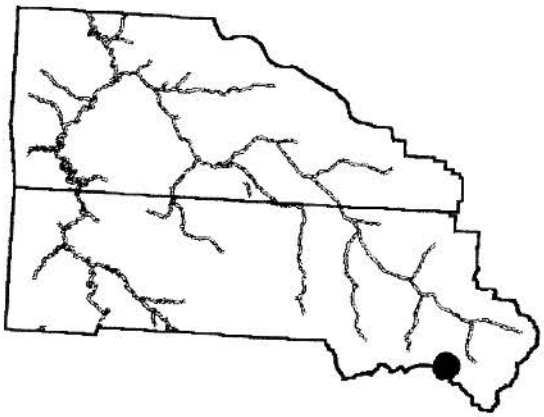
# Bilk Basin

## Potential Conservation Area




0.3 0 0.3 0.6 0.9 1.2 1.5 1.8 Miles

N



# Bilk Basin

**Biodiversity Rank: B4** (Moderate Biodiversity Significance) The Black Swift, a bird species that is considered to be globally secure but vulnerable in Colorado, was identified at the third waterfall in Bilk Basin.

**Protection Urgency Rank: P5** Protection is complete.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Bilk Basin is located 9.75 air miles southwest of Telluride, Colorado in southeastern San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Mount Wilson

**Legal description:** T41N R10W Sections 3, 4; T42N R10W Sections 26, 27, 33, 34, 35.

**Elevation range:** 10,000 to 11,800 feet

**Size:** 511 acres

**General Description:**

Bilk Basin is a large mountain basin just above treeline at the headwaters of Bilk Creek. Wilson Peak, Mount Wilson, Cross Mountain, Lizard Head, and Sunshine Mountain rim the spectacular site.

The mountains were formed by Tertiary volcanic flows that overlie Cretaceous Mancos shale comprised of shallow, turbid marine, calcareous sediments. Soils of the PCA are classified as Cryochrepts.

Planeleaf willow occupies the central, wetter areas of the basin, while barren ground willow dominates the side slopes with better drainage. Associated with the barren ground willow was osha, forming a 20% cover. There were smaller amounts of triangle leaf groundsel and monkshood. Patches of sedge wetlands consisting of about equal amounts of beaked sedge and water sedge were interspersed with the willows. The narrow, crystal-clear stream meanders through this community, often curving nearly 360 degrees (Figure 65). Drier areas had pools and rivulets among bedrock outcrops and patches of krummoholz on frost-heaved islands.

There are four falls within the basin along Bilk Creek and at the third falls a single Black Swift was observed. Verification of nesting swifts at this falls was not possible, however, this falls and two of

Figure 65. Bilk Basin sedge wetlands.

the others offer good quality swift habitat. All of the falls are permanent and they have many ledges and pockets for nesting. A developed trail passes the falls, but the falls are relatively undisturbed.

Natural Heritage element occurrences at the Bilk Basin PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Cypseloides niger*** | **Black Swift** | **G4** | **S3B** | **USFS** | **B** |
| ***Salix brachycarpa/*mesic forb** | **Alpine willow scrub** | **G4** | **S4** | | **A** |
| ***Salix drummondiana/*mesic forb** | **Drummonds willow/mesic forb** | **G4** | **S4** | | **A** |
| ***Salix planifolia/Caltha leptosepala*** | **Subalpine riparian willow carr** | **G4** | **S4** | | **A** |
| *Eriophorum altaicum* var. *neogaeum* | Altai cottongrass | G4T? | S3 | USFS | B |

*EO=Element Occurrence

**Biodiversity comments:** In addition to the nesting population of Black Swifts, the PCA has a good occurrence of the Altai cottongrass, a species that is vulnerable in Colorado and listed as sensitive by the USFS. Of the twenty-nine known occurrences in Colorado, this is the only one known from San Miguel County. The species is more common in San Juan and LaPlata counties. The PCA also contains excellent occurrences of three common willow communities.

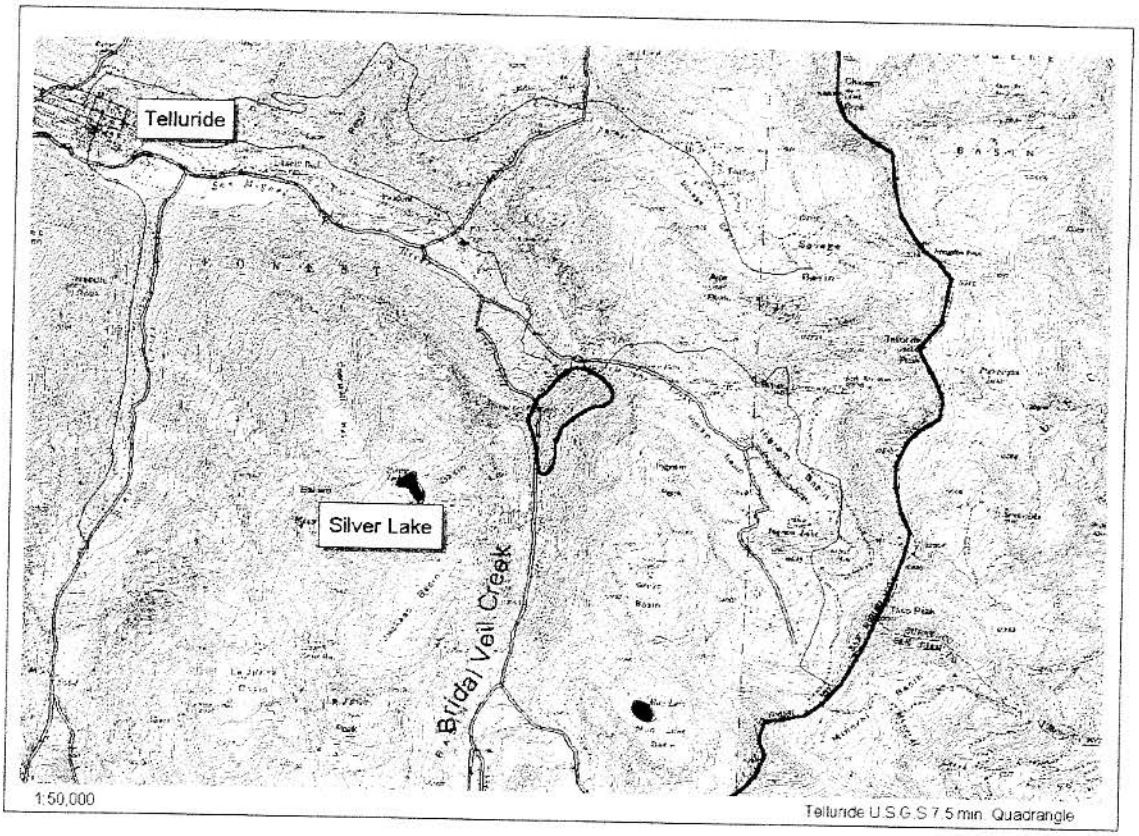
**Boundary Justification:** The PCA includes all element occurrences in Bilk Basin, and follows the natural boundaries of the basin. The falls which are the nesting area of Black Swifts are contained in the PCA; however, the entire area needed for their survival is not included.

**Protection Rank Comments:** Protection of this PCA is complete, as it is contained within the Lizard Head Wilderness.

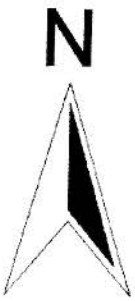
**Management Rank Comments:** Grazing on this PCA was discontinued in the 1980's. The area is a popular hiking area, but users stay on the trail, and no adverse impacts have been observed. Periodic monitoring of the site will serve to detect changes in condition that might warrant management action.

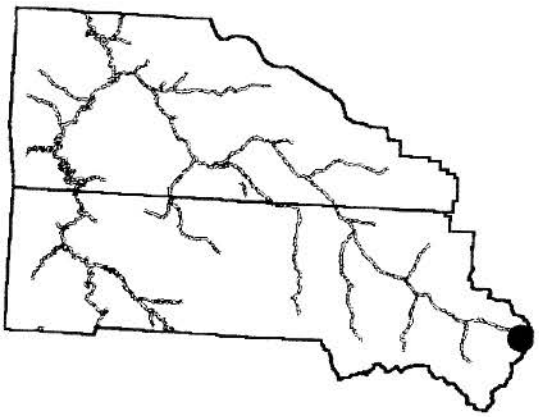
# Bridal Veil Falls

## Potential Conservation Area




0.5 0 0.5 1 1.5 2 Miles



# Bridal Veil Falls

**Biodiversity Rank: B3** (High Biodiversity Significance) The pale moonwort, considered to be imperiled globally and in Colorado, was identified at this PCA. The occurrence is unranked, as several years observation are necessary to assess the size of a population.

**Protection Urgency Rank: P3** There is a definable threat to the occurrence, but not expected within the next five years.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of the element occurrence.

**Location:** Bridal Veil Falls is located 2.0 air miles east of Telluride, Colorado in eastern San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Telluride

**Legal description:** T42N R8W Sections 5, 8.

**Elevation range:** 9,800 to 10,600 feet

**Size:** 62 acres

**General Description:**

Bridal Veil Falls is a spectacular waterfall east of the town of Telluride. It features a vertical drop of one hundred feet. A power plant is situated at the top of the falls. An old road leading to Bridal Veil Basin is closed to motorized vehicles, but is extensively used by hikers accessing Blue Lake and Bridal Veil Basin. Black Bear Road, a popular four-wheel drive route, crosses the PCA.

One species of grape fern that is globally imperiled and two that are rare in Colorado, were found in disturbed areas on switchbacks of Black Bear Road above Bridal Veil Falls. Two small populations of King's clover were found in this PCA--one along Black Bear Road, and the other on the closed road to Bridal Veil Basin above the falls.

Five Black Swifts were identified at Bridal Veil Falls, but no nests of this elusive colonial bird were observed. The speed at which Black Swifts fly makes it difficult to accurately count observed birds and the secretive placement of their nests makes it difficult to verify nesting. This group of swifts probably numbered more than five, and could indeed be nesting at Bridal Veil Falls. This may be the largest number of Black Swifts observed at any one falls in Colorado outside of the nesting population located at Box Canyon Falls in the city of Ouray, Colorado. The falls themselves offer excellent swift habitat. High volumes of water plunge from the cliff face for approximately 100 feet to the ground below. The falls offer a commanding view of the San Miguel River Valley, clear flight paths to the falls, many pockets and ledges for nesting, protection from predators, and moss for nest excavation, all of which are necessary for Black Swifts. The operation of a hydroelectric generating facility by Bridal Veil Power Company probably is inconsequential to the swifts, which are very tolerant of human disturbance.

Natural Heritage element occurrences at the Bridal Veil Falls PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Botrychium pallidum*** | **Pale moonwort** | **G2** | **S2** | | **E** |
| ***Botrychium*** *minganense* | Mingan moonwort | G4 | S1 | | E |
| *Cypseloides niger* | Black Swift | G4 | S3B | USFS | B |
| *Trifolium kingii* | King's clover | G4 | S1 | | D |
| *Trifolium kingii* | King's clover | G4 | S1 | | D |
| *Botrychium lunaria* | Common moonwort | G5 | S2S3 | | E |
| *Cryptogramma stelleri* | Slender rock-brake | G5 | S2 | | D |

*EO=Element Occurrence

**Biodiversity comments:** Three species of moonworts were found at the Bridal Veil Falls PCA. One of these, the pale moonwort, is imperiled throughout its range, while the Mingan moonwort is extremely rare in Colorado. The common moonwort, despite its name, is considered vulnerable in Colorado. Small populations of King's clover, extremely rare in Colorado, were found here, along with the slender rock brake, a species rare in the state. These occurrences were so small that their viability is questionable. However, their presence may indicate that more plants could be found in this habitat with further searching. Nesting colonies of Black Swifts are considered to be vulnerable in Colorado.

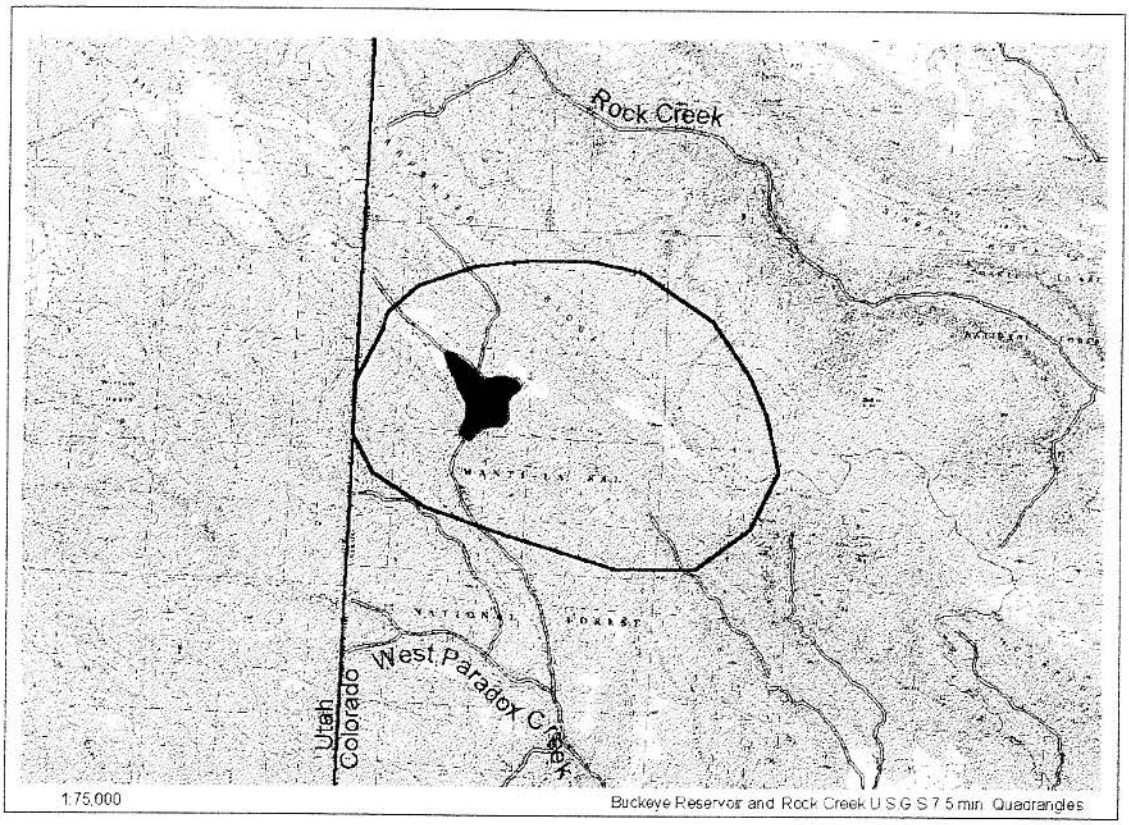
**Boundary Justification:** The PCA includes the locations of the rare plants found in the site, and the falls that are home to the Black Swifts. The site does not provide for the foraging area of the Black Swifts. Further survey of this area could result in extending the locations of the rare plants, and thus the site boundaries.

**Protection Rank Comments:** The majority of the land in the PCA is privately owned and subject to development.

**Management Rank Comments:** Diversion of water upstream at Blue Lake to supply increased residential development in the Telluride area could lower flows at the falls, resulting in abandonment of this nesting site by the Black Swifts. Regulation of water diversions from Bridal Veil Creek to prevent complete loss of water flows would serve to prevent abandonment of the falls by nesting swifts. Roadside populations of the plants are vulnerable to disturbance from road maintenance and hikers.

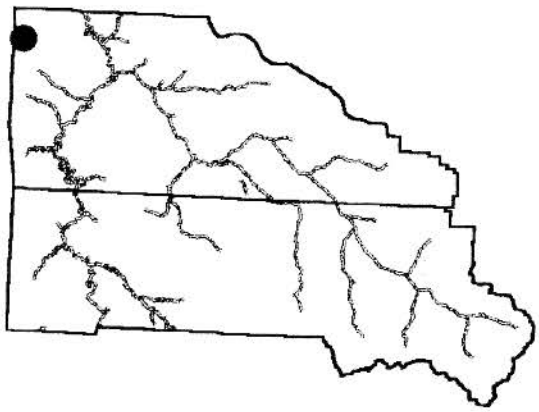
# Buckeye Reservoir

## Potential Conservation Area




1 0 1 2 3 Miles

N



# Buckeye Reservoir

**Biodiversity Rank: B4** (Moderate Biodiversity Significance) A good quality occurrence of a Ponderosa pine/manzanita woodland was documented at Buckeye Reservoir. While globally secure, this plant community is extremely rare in Colorado. This is the best known occurrence of this community in San Miguel and western Montrose counties.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M5** No management needs are known or anticipated in the potential conservation area.

**Location:** Buckeye Reservoir is located 5.0 air miles northwest of Paradox, Colorado in northwestern Montrose County.
U.S.G.S. 7.5 minute quadrangles: Buckeye Reservoir

**Legal description:** T48N R19W Sections 6, 7; T48N R20W Sections 1-3, 10-12.

**Elevation range:** 6,000 to 8,000 feet

**Size:** 3,576 acres

**General Description:**

Shallow soils over Dakota sandstone support a plant community unusual in Colorado: a Ponderosa pine forest with an understory of greenleaf manzanita, a broadleaf evergreen shrub. Eight hundred twenty-five acres of this community were mapped from on the ground surveys, and it is likely to be more extensive. Adjacent areas with deeper soils have Gambel's oak as the dominant understory species. The two communities intergrade, with some areas having about equal amounts of oak and manzanita. Aspen forms patches in slightly more mesic drainages, while other areas have a ponderosa pine forest with sparse understory. The community is in good condition, except for some introduced bulbous bluegrass along the road. Native plant species at the PCA include spreading fleabane, pussytoes, stonecrop, golden banner, Utah serviceberry, Oregon grape, bitterbrush, muttongrass, mountain lover, and hairy golden aster. The PCA is within the Manti-La Sal National Forest. Use of the area is heavy during hunting season. Recreational use is concentrated at nearby Buckeye Reservoir during the summer.

Natural Heritage element occurrences at the Buckeye Reservoir PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Pinus ponderosa/Arctostaphylos patula*** | **Ponderosa pine/manzanita western** | **G4** | **S1** | | **B** |
| *Pinus ponderosa/Quercus gambelii* | Ponderosa pine/Gambel's oak foothills woodland | G5 | S4 | | B |

*EO=Element Occurrence

**Biodiversity comments:** The PCA contains a plant community that is extremely rare in Colorado, although it is apparently secure globally. The populations of greenleaf manzanita in western Colorado mark the eastern limit of the species' range. Manzanita is of value for its fruits, which are eaten by grouse, skunks, deer, quail, bears, and coyotes (Stubbendieck *et.al.* 1994). The adjacent Ponderosa pine/Gambel's oak community, although not rare, is in good condition, and is included here to complete the vegetation representation of the area.

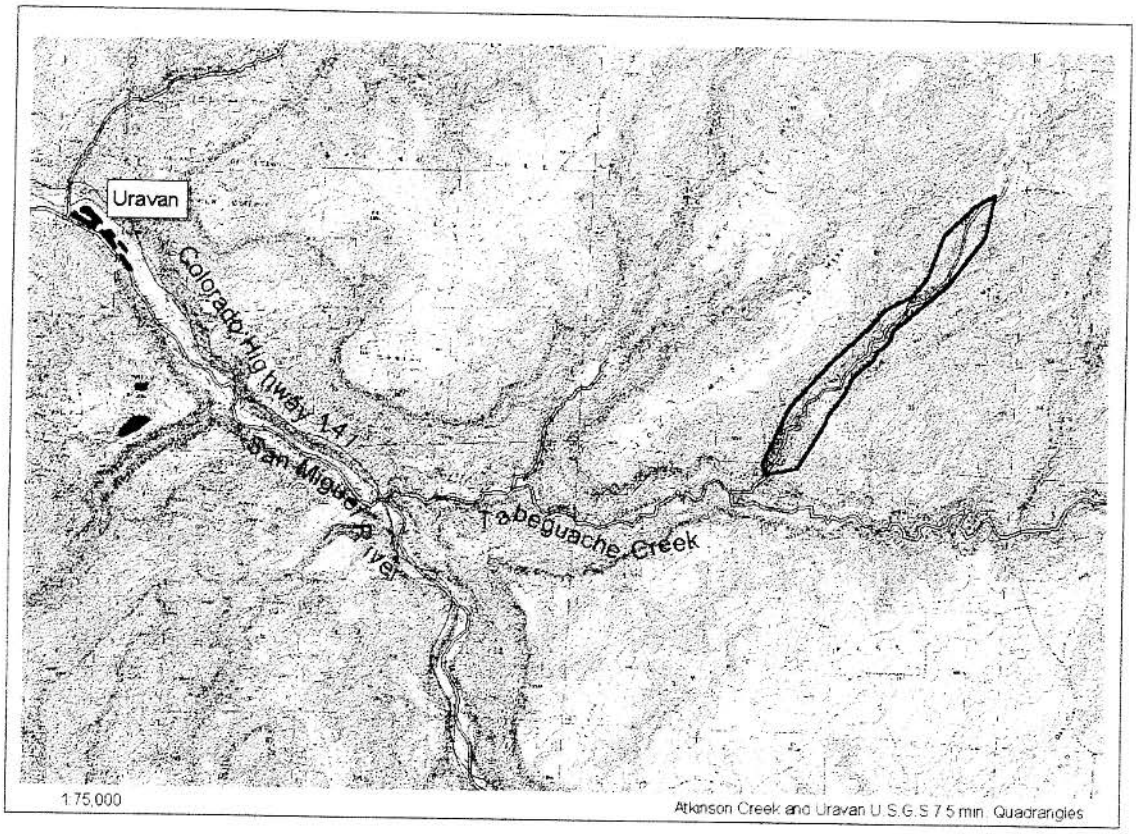
**Boundary Justification:** The boundary is drawn to include occurrences of two plant communities. These communities may be more widespread in this area, but have not been mapped. Further survey effort would be needed to determine their full extent in Montrose County.

**Protection Rank Comments:** This PCA is within the Manti-La Sal National Forest. No special protection should be required.

**Management Rank Comments:** The area is grazed, and popular for recreation, including fishing and hunting. However, these uses do not appear to threaten the plant community. Periodic monitoring of the site will serve to detect changes in condition that might warrant management action.

# Campbell Creek

## Potential Conservation Area

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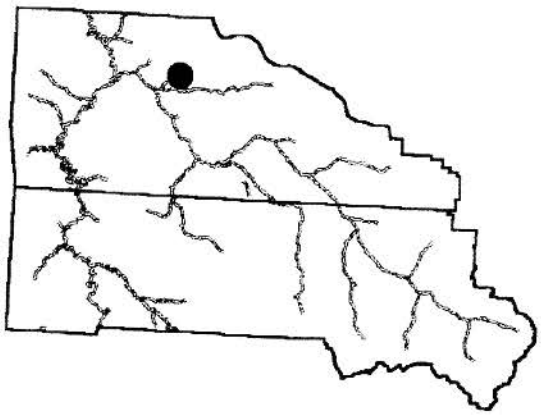


# Campbell Creek

**Biodiversity Rank: B3** (High Biodiversity Significance) An excellent occurrence of the narrowleaf cottonwood/skunkbrush community was found at Campbell Creek. This community is globally vulnerable.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Campbell Creek is located 9.0 air miles northwest of Nucla, Colorado in west-central Montrose County.

U.S.G.S. 7.5 minute quadrangles: Atkinson Creek, Uravan

**Legal description:** T47N R16W Section 5; T48N R16W Sections 28, 32, 33.

**Elevation range:** 5,400 to 6,200 feet

**Size:** 315 acres

**General Description:**

Campbell Creek, a tributary of Tabeguache Creek, flows southwestward from the Uncompahgre Plateau through the Dakota and Burro Canyon sandstones of the Cretaceous Period. The creek has a high quality riparian area, with several sub-populations of the narrowleaf cottonwood/skunkbrush community. All age classes of cottonwoods are represented. In addition to the skunkbrush, coyote willow is a common understory species. The creek occupies a narrow valley. The stream bottom varies from cobbles and sediments to cobbles and boulders. The PCA is primarily on BLM land, with a small amount of private land at the north and south ends.

Natural Heritage element occurrences at the Campbell Creek PCA.

| Element | Common Name | G rank | S rank | Federal/ | Eo rank* |
|---|---|---|---|---|---|
| ***Populus angustifolia/Rhus trilobata*** | **Narrowleaf cottonwood/skunkbrush** | **G3** | **S3** | | **A** |

*EO=Element Occurrence

**Biodiversity comments:** The narrowleaf cottonwood/skunkbrush community is in good to excellent condition in this PCA. This plant association occurs in Nevada, Utah and Colorado (CNHP 1999). In Colorado it occurs on the Uncompahgre Plateau, small tributaries of the western half of the Colorado River Basin, the San Juan National Forest and in the San Luis Valley (Kittel *et al.* 1994).

**Boundary Justification:** The boundary is drawn to include the riparian zone of Campbell Creek and the immediately adjacent slopes. The upland parts of the site are

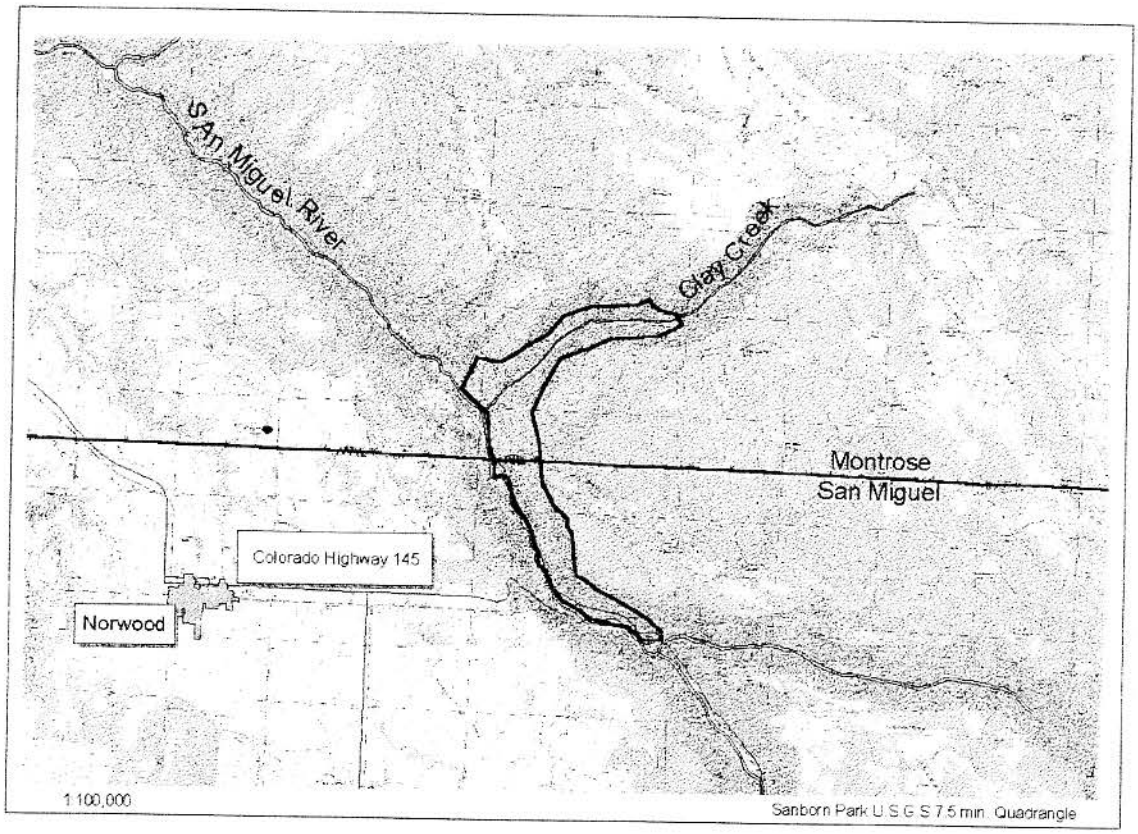
important as any alterations in the current hydrological regime could potentially affect the elements.

**Protection Rank Comments:** This PCA is located entirely on BLM lands managed by the Uncompahgre Basin Resource Area. There is no special protection in place.

**Management Rank Comments:** This PCA is managed by BLM primarily for livestock grazing. Grazing is heaviest in the parks, and apparently has not adversely affected the riparian vegetation. Periodic monitoring of the site will serve to detect changes in condition that might warrant management action.

# Clay Creek

## Potential Conservation Area

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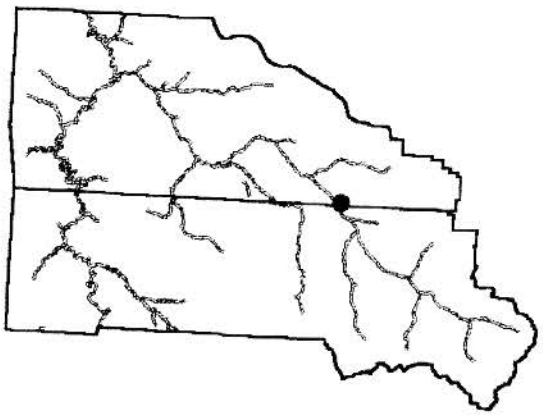


# Clay Creek

**Biodiversity Rank: B4** (Moderate Biodiversity Significance) A fair population of Wetherill milkvetch, a plant that is globally vulnerable, was found at the Clay Creek PCA.

**Protection Urgency Rank: P2** A threat is expected within five years.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Clay Creek is located 2.25 air miles east of Bedrock, Colorado in western Montrose County.

U.S.G.S. 7.5 minute quadrangles: Sanborn Park

**Legal description:** T45N R12W Sections 5, 7, 8, 18, 19; T45N R13W Section 12.

**Elevation range:** 6,600 to 7,800 feet

**Size:** 1,014 acres

**General Description:**

Clay Creek is a perennial stream that flows in a southwesterly direction into the San Miguel River from the Uncompahgre Plateau. Geologic formations in the PCA are Jurassic Morrison Formation sandstones on the canyonsides, topped by a cap of Cretaceous Dakota sandstone.

The steep canyonsides have an open pinyon-juniper woodland with mountain mahogany and squaw apple on the south-facing slopes. North-facing slopes have a dense cover of Douglas fir and Gambel's oak, with Oregon grape, mountain lover and elk sedge in the understory. The riparian vegetation along the creek supports a community of narrowleaf cottonwood and red-osier dogwood, with skunkbrush, Rocky Mountain maple, box elder, and twinberry also present.

Wetherill milkvetch, a plant that is globally vulnerable, was found at this PCA. The preferred habitat of Wetherill milkvetch is rocky dry washes and eroded gullies in the pinyon-juniper community. Soils are derived from clays and sandstones of the Morrison Formation, and are very soft and highly erodable. The plants are most often found on small level areas next to boulders where the light, inflated fruits have lodged. They are often in open areas, away from other plants. They seldom grow in areas with significant cover of litter. Associated species in the area include Indian ricegrass, twin bladderpod, rabbitbrush, mountain mahogany, and serviceberry.

The PCA includes BLM, National Forest and private lands. Wetherill milkvetch was found on BLM land above the San Miguel River and on National Forest land above Clay Creek. Although the private lands were not surveyed, they also contain potential habitat for the milkvetch.

Natural Heritage element occurrences at the Clay Creek PCA.

| Element | Common Name | G rank | S rank | Federal/State status | EO* rank |
|---|---|---|---|---|---|
| ***Astragalus wetherillii*** | **Wetherill milkvetch** | **G3** | **S3** | **USFS** | **C** |
| *Astragalus wetherillii* | Wetherill milkvetch | G3 | S3 | USFS | D |

*EO=Element Occurrence

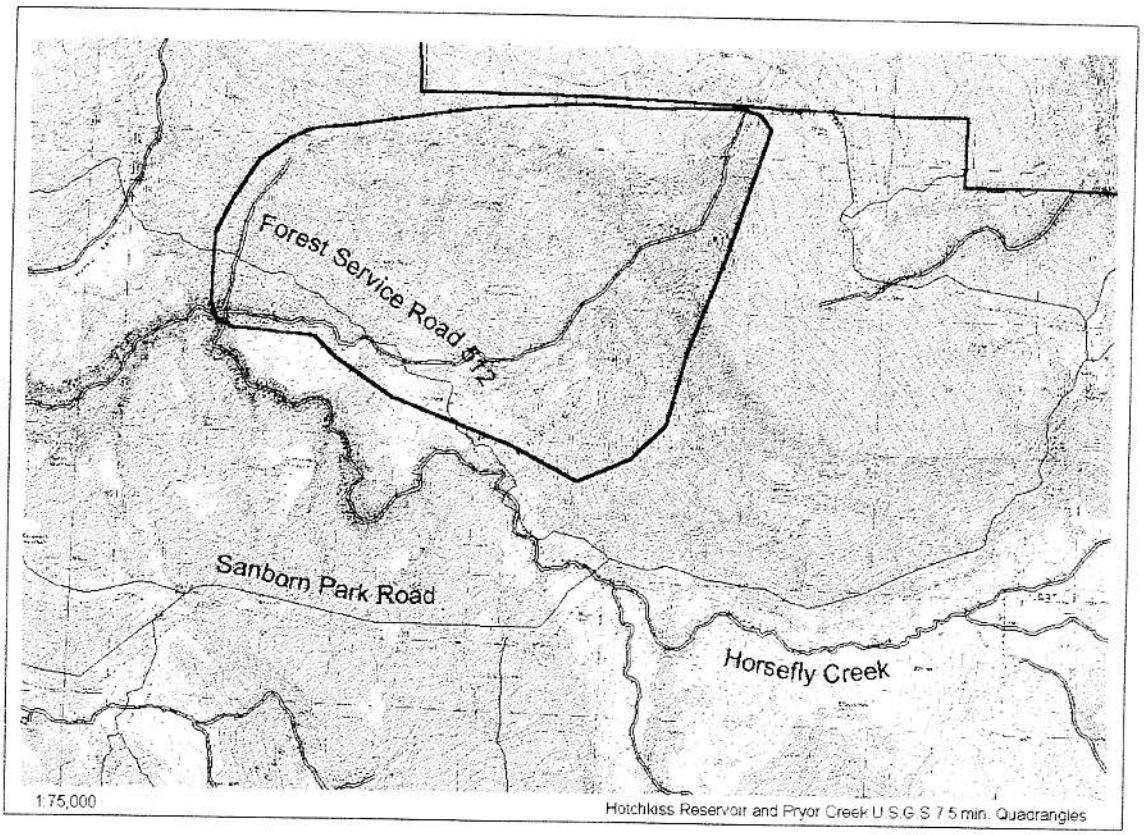
**Biodiversity comments:** The populations of Wetherill milkvetch at this PCA were relatively small, so that they may not be viable, although there was sufficient habitat for the species in the area. Numbers of individuals appear to vary substantially from year to year, and further surveys may determine that the population is more extensive.

**Boundary Justification:** The PCA was drawn to include the populations of Wetherill milkvetch that were found on the slopes above Clay Creek and above the San Miguel River, as well as intervening potential habitat. The unoccupied suitable habitat provides for the the species to move over time and colonize new sites.

**Protection Rank Comments:** Toe slopes above the San Miguel River on private land adjacent to the BLM are likely to also contain the milkvetch. These properties have been subdivided and are subject to development. Development could be planned so that the dry wash habitats of the Wetherill milkvetch are kept as open space. BLM lands in this PCA are included in a designated Area of Critical Environmental Concern (ACEC).

**Management Rank Comments:** The habitat of the Wetherill milkvetch is not currently used or impacted by humans. Disturbance of the site is natural. Weed control efforts along the road are not likely to affect the populations, which are in dry washes well away from the road. BLM lands in the PCA are managed to protect the riparian communities. Periodic monitoring of the site will serve to detect changes in the size and condition of the milkvetch population that might warrant management action.

# Clear Creek
## Potential Conservation Area

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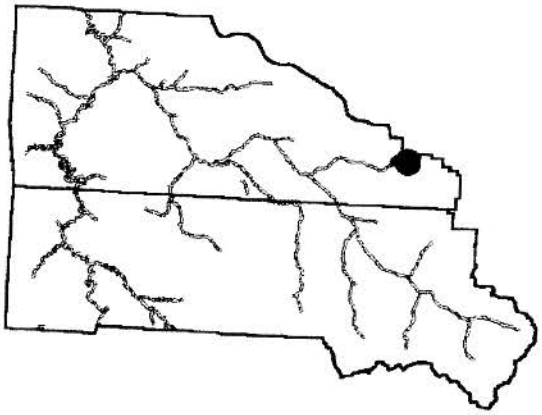


# Clear Creek

**Biodiversity Rank**: **B5** (General Biodiversity Significance) The Clear Creek PCA contains a good example of a Colorado River cutthroat trout population. This subspecies is apparently secure on a global scale, but vulnerable in Colorado.

**Protection Urgency Rank**: **P3** There is a definable threat to this occurrence, but not expected within the next five years.

**Management Urgency Rank**: **M2** Ongoing, recurring management must continue to prevent loss of these element occurrences.

**Location:** Clear Creek is three air miles north of Hotchkiss Reservoir in extreme south central Montrose County.

U.S.G.S. 7.5 minute quadrangles: Hotchkiss Reservoir, Horsefly Peak, and Pryor Creek

**Legal Description:** T46N R10W Sections 19, 20, 29, 30; and T46N R11W Sections 8, 9, 15, 16, 17, 21, 22, 23, 24, 25, 26, 27, 28.

Size: **5397 acres**

**Elevation:** 8,080 to 9,820 feet

**General Description:**

The Clear Creek PCA is characterized by a high elevation montane ecosystem running east to west along and north of Horsefly Creek. Drainages entering Horsefly Creek from the north bisect the site across its length, resulting in high areas interspersed between stream valleys and canyons running north to south. Dominant vegetation of the area includes ponderosa pine and aspen woodland with some areas of big sagebrush in the valley bottoms. Riparian vegetation is dominated by narrowleaf cottonwood and blue spruce with an understory of thinleaf alder. Geologic features of the PCA include Jurassic Morrison, Summerville, and Entrada Formations, and Cretaceous Mancos Shale, Dakota Sandstone, and Burro Canyon Formations. The Forest Service manages most of this PCA with the remainder under private ownership. Intense grazing occurs throughout the site.

The Colorado Division of Wildlife discovered a population of Colorado River cutthroat trout at Clear Creek in 1996.

Table. Natural Heritage element occurrences at the Clear Creek PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Oncorhynchus clarki pleuriticus*** | **Colorado River cutthroat trout** | **G4T3** | **S3** | **BLM, USFS, CO-SC** | **B** |
| *Accipiter gentilis* | Northern Goshawk | G5 | S3B,SZN | BLM, USFS | E |
| *Accipiter gentilis* | Northern Goshawk | G5 | S3B,SZN | BLM, USFS | E |
| *Accipiter gentilis* | Northern Goshawk | G5 | S3B, SZN | BLM, USFS | B |

*EO = Element Occurrence

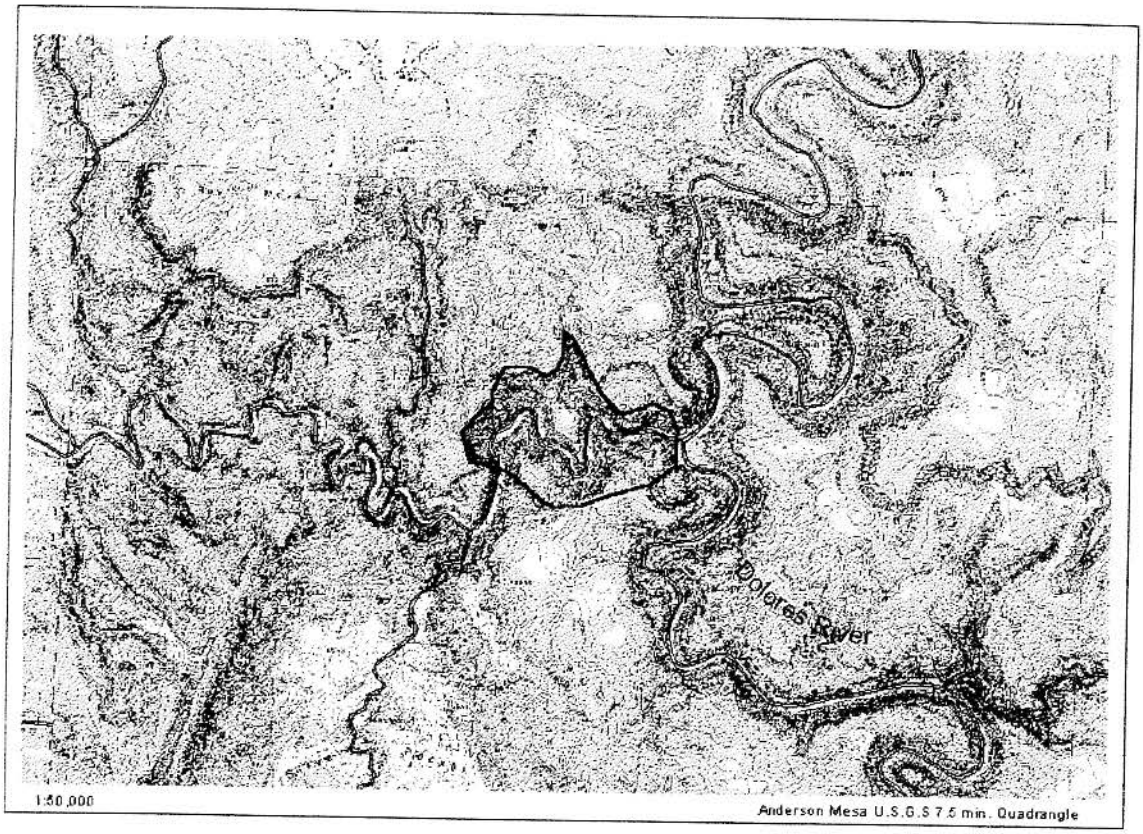
**Biodiversity Rank Justification:** Cutthroat trout are a sensitive species that are native to the Colorado River basin, and have recently been in decline. Remnant populations still remain in Colorado, Wyoming, and Utah. In addition to the population of Colorado River cutthroat trout at Clear Creek, nesting Northern Goshawks, considered vulnerable in Colorado, have used the aspen and pine forests of this PCA throughout the 1990's. The most recent activity documented was in 1997. Altogether, a total of four nests have been identified within the boundaries of the PCA.

**Boundary Justification**: The PCA was drawn to include all of Clear Creek and the aspen-pine forests used by the nesting Northern Goshawks. It also includes habitat upslope from the stream important to maintaining the natural hydrologic features that prevent excessive sedimentation of Clear Creek.

**Protection Rank Comments:** Approximately 13% of the Clear Creek PCA is private ranchland. The land along Clear Creek is intensively grazed, upsetting the hydrologic features of the stream system. There is no indication that this activity will stop or decline in the future unless the land is protected.

**Management Rank Comments:** Altered hydrology, increased grazing, and agricultural practices will increase sedimentation within Clear Creek and reduce cover along the stream. The present impacts of grazing are heavy. This trout requires cool, clear water and well-vegetated streambanks for cover and bank stability. Restricting grazing along Clear Creek would benefit the cutthroat trout population. Cutthroat trout are susceptible to overharvest if angling is unrestricted, so Colorado has instituted restrictive angling regulations. Strict enforcement of these regulations will help to ensure survival of this population of cutthroats.

# Coyote Wash
## Potential Conservation Area

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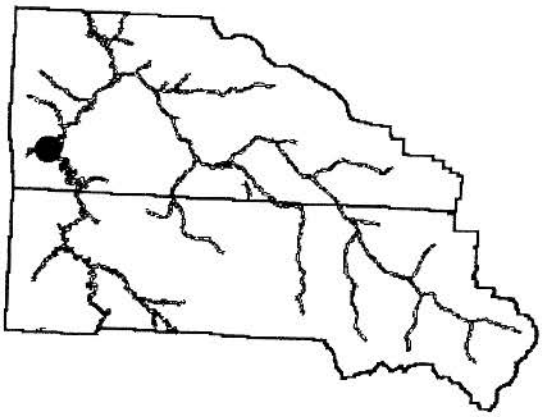


# Coyote Wash

**Biodiversity Rank: B2** (Very high biodiversity significance) The Coyote Wash PCA contains the best known Colorado occurrence of the globally imperiled Kachina daisy.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Coyote wash is located 9.5 air miles south of Paradox, Colorado in extreme southwestern Montrose County.

U.S.G.S. 7.5 minute quadrangles: Anderson Mesa

**Legal description:** T46N R19W Sections 15, 21, 22.

**Elevation range:** 5,100 to 5,800 feet

**Size:** 329 acres

**General Description:**

Coyote Wash is a steep-sided tributary canyon that joins the Dolores Canyon in the roadless area between Slick Rock and Bedrock. Its flat sandy bottom has a small meandering stream that occasionally floods.

Vegetation in the wash includes giant reed, bulrushes, and Baltic rush. The rocky sandstone canyon sides are covered with pinyon-juniper woodland, with some open grasslands on benches and mesa tops. Seeping alcoves in the sandstone canyon walls high above the wash are the sites of hanging garden communities that support several rare plants.

Colorado's largest population of the Kachina daisy is located here. It grows in horizontal crevices in seeping alcoves. Studies currently underway suggest that the Colorado populations of this plant are distinct from those in Utah, and may warrant at least separate varietal status (Woolstenhulme personal communication). Eastwood's monkeyflower is also found in horizontal crevices on seeping canyon walls, along with the more common yellow columbine and poison ivy. Helleborine orchids are found in the wet grassy areas just below the seeps, along with several sedges, rushes, and bulrushes. Side drainages entering the wash support box elder, hackberry, single leaf ash, skunkbrush, New Mexico privet, Baltic rush, giant wild rye, and Rocky Mountain juniper. Grasslands on flat benches have been identified by the BLM as ungrazed relic communities of needle and thread, galleta, blue grama, and Indian ricegrass. There are few exotic plant species in the area.

The rocky outcrops, steep cliffs, and canyons of the area offer ideal roosting sites for the spotted bat, *Euderma maculatum*. There are fewer than 20 occurrences, with few individuals in each, in Colorado. One member of this species was recorded at this PCA in 1994.

Red spotted toads and Woodhouse's toads were observed in pools in the wash. Bighorn sheep have been reintroduced in the canyon, and are apparently surviving.

This PCA is difficult to access by land, but is an easy walk for those rafting or kayaking on the Dolores River. However few people venture to climb up the sides of the canyon where the significant biological resources are located. The PCA is entirely in public ownership, managed by BLM. Coyote Wash has been selected as a Colorado Natural Area.

Natural Heritage element occurrences at the Coyote Wash PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Erigeron kachinensis*** | **Kachina daisy** | **G2** | **S1** | **BLM** | **A** |
| *Stipa comata* | Needle and thread (Great Basin herbaceous vegetation) | G2G4 | S2? | | A |
| *Mimulus eastwoodiae* | Eastwood monkey-flower | G3? | S1 | BLM | B |
| *Epipactis gigantea* | Helleborine orchid | G4 | S2 | BLM | A |
| *Epipactis gigantea* | Helleborine orchid | G4 | S2 | BLM | B |
| *Euderma maculatum* | Spotted bat | G4 | S2 | BLM, USFS | E |

*EO=Element Occurrence

**Biodiversity comments:** The Coyote Wash PCA contains the best known Colorado occurrence of the globally imperiled Kachina daisy. This species is the most imperiled of all plants found in San Miguel and Montrose counties. As one of only two known populations in Colorado, this PCA is extremely important for further research. Current taxonomic research on the Kachina daisy may result in assigning the Colorado plants to a separate species or variety, in which case this population would be considered even more rare and imperiled, perhaps raising its biodiversity rank to B1 (outstanding significance). An excellent example of the Great Basin Herbaceous Vegetation dominated by needle and thread grass was documented in the PCA. A high quality population of Eastwood monkey-flower, a plant that is vulnerable throughout its range, and extremely rare in Colorado, was found in hanging gardens in Coyote Wash. An excellent and a good occurrence of the helleborine orchid, rare in Colorado, also were found in the PCA.

Spotted bats are considered to be rare in Colorado. Spotted bats are locally common in various habitats (pinyon-juniper woodland, riparian corridors, over river) in canyons in northwestern Colorado (Navo *et al.* 1992). The bats roost in caves and in cracks and crevices in cliffs and canyons, with which this species is consistently associated. They are often captured over waterholes near cliffs with numerous vertical cracks. Population trends are not known for Colorado. Due to the lack of sufficient information, only speculations can be made about threats. Although no longer tracked by CNHP, the bat Yuma myotis (*Myotis yumanensis*) that is considered sensitive by BLM has been observed in the PCA.

**Boundary Justification:** The boundary is drawn to include the element occurrences known from Coyote Wash, including the riparian area and the cliffs that are the location of the hanging garden communities. It includes the habitat of the Kachina daisy that is known to be occupied, as well as adjacent areas that are potentially available for future colonization by this species. Upstream portions of the wash that are not included in the PCA may also contribute significantly to the quality of the riparian area.

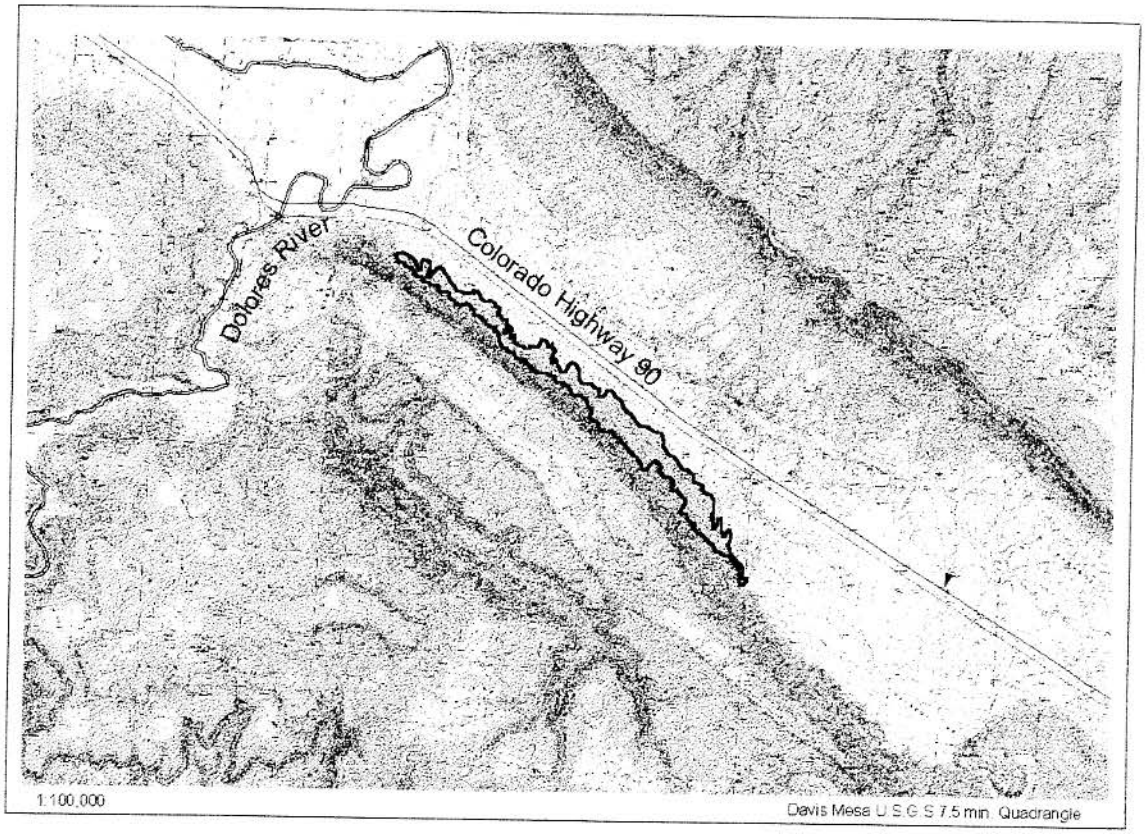
**Protection Rank Comments:** The PCA is located on lands managed by the BLM. This area has been identified as a State Natural Area, recommended as a Research Natural Area, and is a BLM Wilderness Study Area (WSA). Continuance of the Kachina daisy population is probably not threatened by direct human disturbance. However, a prolonged drought or diversion of the source water on Ray Mesa could cause its extinction at this PCA. The grassland is located on a small mesa top that is inaccessible except by helicopter, and is therefore secure from disturbance. There is no question that the area is significant and remote enough to warrant wilderness status. Wilderness designation of this site could afford additional permanent protection. On the other hand, it could lead to an increase in visitors, causing more impacts on plants and plant communities.

**Management Rank Comments:** No current management needs are known for the plants in the PCA, but increased visitation could impact them in the future. Periodic monitoring of this important rare plant population would enable the detection of any changes in size or condition that might require management action. The PCA is extremely important for further research on the Kachina daisy. Little is known about the reproductive ecology of this species, and as the best known site in Colorado, this PCA would be the primary location for obtaining that information.

More research is needed on the current distribution, abundance, life history and ecology of the spotted bat. Habitat destruction, such as construction of dams that inundate high cliffs and canyon walls, possibly is a threat (Snow 1974). The use of pesticides also may be detrimental. The bats are fairly resistant and tolerant of nondestructive intrusion. The greatest management need is to obtain further information on current distribution and abundance, life history, and ecology. Until more is known, it is difficult to determine what can be done to increase the population of the spotted bat. However, Snow (1974) recommended the following: 1) determine the presence of the spotted bat by surveying likely habitat; 2) establish and maintain waterholes in likely spotted bat habitat (it is well known that the bat will fly for several miles to find water, and a water hole will benefit many species; and 3) support and cooperate in studies to determine more about the impacts by humans. It is probable that the spotted bat has never been very common (Snow 1974).

# Davis Mesa Slopes

## Potential Conservation Area

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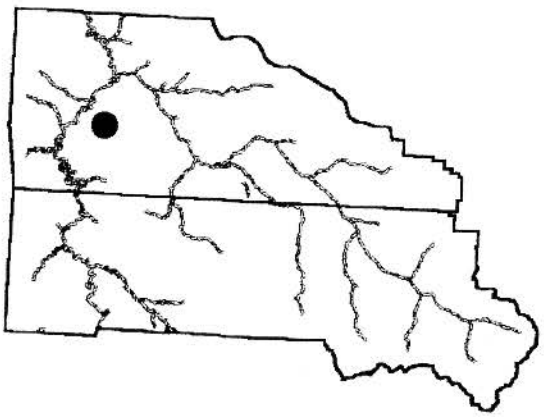


# Davis Mesa Slopes

**Biodiversity Rank: B2** (Very high biodiversity significance) The Davis Mesa Slopes PCA has an excellent occurrence of Payson lupine, a plant that is imperiled on a global scale.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Davis Mesa Slopes is located 2.25 miles southeast of Bedrock, Colorado in western Montrose County.

U.S.G.S. 7.5 minute quadrangles: Davis Mesa

**Legal description:** T46N R18W Sections 1, 12; T47N R18W Sections 27, 28, 34, 35, 36.

**Elevation range:** 5,200 to 5,500 feet

**Size:** 554 acres

**General Description:**

The Davis Mesa Slopes PCA is located on the south side of Paradox Valley, at the base of the pinyon-juniper hillside. The area includes both private and BLM land. An unimproved road and a power line run through the PCA. Thousands of individuals of Payson lupine were found in the pinyon-juniper woodland on soils derived from the Chinle Formation. The plants were particularly abundant in dry washes, and were even found in the middle of the dirt road. Adjacent sagebrush flats do not support the lupine. There were few exotic plants observed in the PCA.

Natural Heritage element occurrences at the Davis Mesa Slopes PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Lupinus crassus*** | **Payson lupine** | **G2** | **S2** | **BLM** | **A** |

*EO=Element Occurrence

**Biodiversity comments:** An excellent occurrence of Payson lupine was recorded at this site. This species is known only from Montrose County, Colorado. The three highest quality occurrences are located in Paradox Valley.

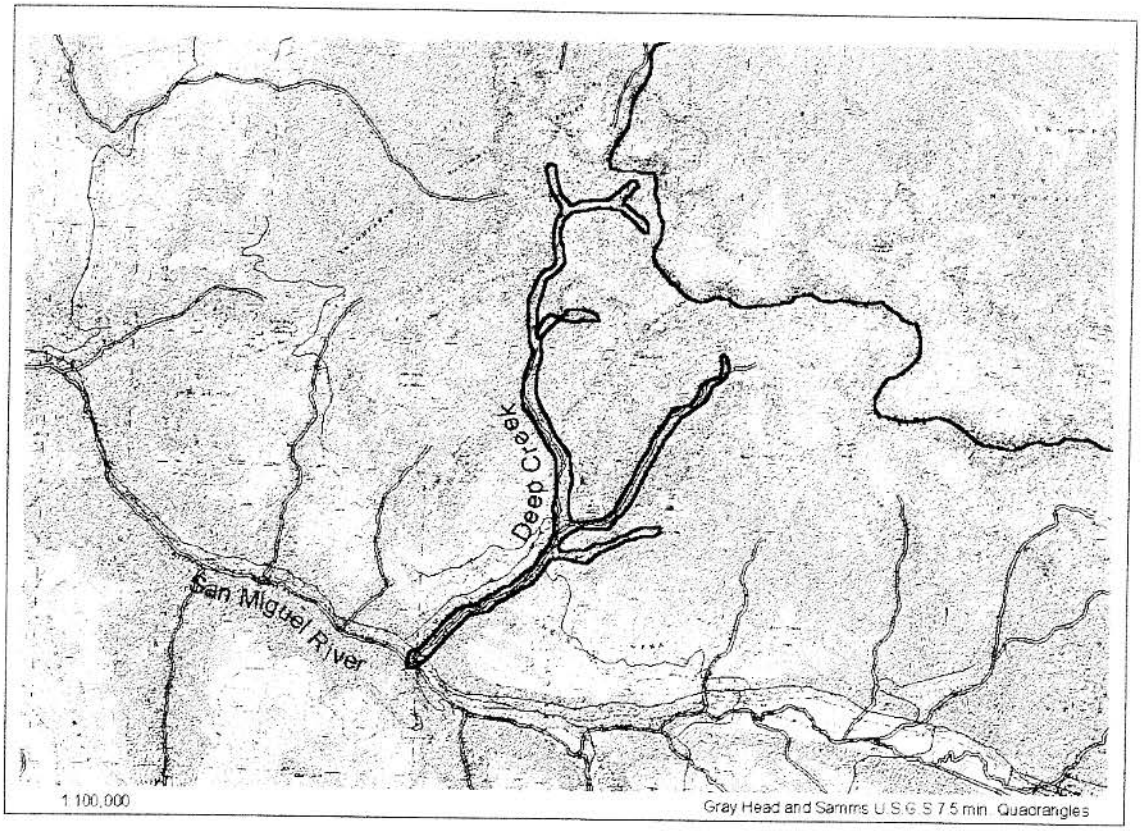
**Boundary Justification:** The PCA encompasses the known location of Payson lupine on the south side of Paradox Valley, and adjacent area in the same habitat type. The boundary was drawn to include the lower, gentle slopes in the pinyon-juniper zone, to which the species appears to be restricted. It does not include the steep cliffs above and the more level sagebrush areas below the pinyon-juniper zone, where the species does not

occur. This represents our current best estimate of the area needed to sustain the population and allow movement or expansion into similar adjacent habitat over time.

**Protection Rank Comments:** Most of this PCA is on BLM land, managed by the Uncompahgre Basin Resource Area. The area is not heavily used, and should not require special protection in the near future. Surface disturbing activities such as new pipelines or powerlines have the potential to negatively impact the lupine.

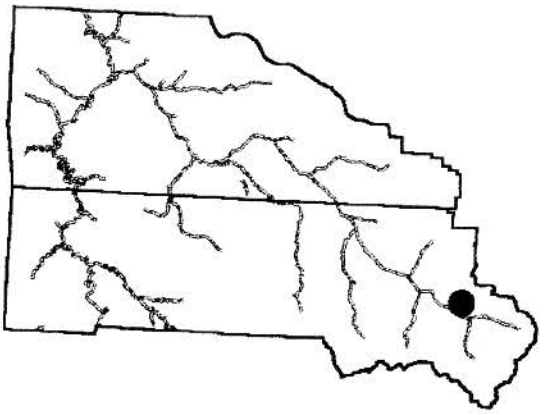
**Management Rank Comments:** A four-wheel drive road and a power line pass through the PCA. However, no adverse impacts on the Payson lupine have been observed. The plant appears to tolerate some disturbance, and has been found growing in naturally disturbed sites and in the road. Current research on the reproductive ecology and possible seed predation of the lupine may add to our understanding of management needs. Monitoring of this site will aid in the detection of any changes in the number of individuals and the condition of the population that would warrant management intervention.

# Deep Creek
## Potential Conservation Area




1 0 1 2 3 Miles

N



# Deep Creek

**Biodiversity Rank: B5** (General Biodiversity Significance) The Deep Creek PCA has a good genetically pure (rated A- grade purity by CDOW) population of Colorado River cutthroat trout, a species that is apparently secure globally and vulnerable in Colorado.

**Protection Urgency Rank: P1** The population of trout is immediately threatened by a golf course proposed along Deep Creek's eastern drainage plain.

**Management Urgency Rank: M3** Ongoing, recurrent management action would help to maintain the current quality of the trout population.

**Location:** Deep Creek is 5 air miles west of Telluride, Colorado, in east-central San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Gray Head and Sams

**Legal description:** T43N R9W Sections 12, 13, 25, 26; T43N R10W Sections 7, 8, 17 to 20, 30; T44N R9W Section 31; T44N R10W Section 36.

**Elevation range:** 7,920 to 12,400 feet

**Size:** 5,182 acres

**General Description:**

Deep Creek drains the region south of the Sneffels Wilderness Area and enters the San Miguel River at the Lime townsite on Colorado Highway 145 west of Telluride, Colorado. The PCA follows along Deep Creek, rising from the San Miguel River and terminating at the southern base of Mount Sneffels, and crosses numerous vegetative communities and geologic formations along its route.

Geologic features of the PCA include sedimentary rock of the Triassic Dolores Formation; Jurrasic Morrison, Wingate, and Entrada Formations; Cretaceous Dakota Sandstone and Mancos Shale; and igneous rocks of the Tertiary occur at the base of Mount Sneffels. Surface soils include bedrock at Mount Sneffels to fine loamy-skeletal substrates near the San Miguel River. The dominant vegetation of the area moving up the PCA from the San Miguel River to Mount Sneffels includes deciduous oak, subalpine meadows, aspen forest, and alpine tundra. Approximately 75% of the PCA falls within USFS land and the remaining 25% is under private ownership.

Deep Creek contains a population of Colorado River cutthroat trout that is of local conservation significance. Within the San Miguel Basin there are only seven known cutthroat trout streams and of these the purest genetically is the population occupying Deep Creek (rated A- grade purity by CDOW). This population of trout is listed in the *Conservation Agreement and Strategy for Colorado River Cutthroat Trout* (*Oncorhynchus clarki pleuriticus*) *in the states of Colorado, Utah and Wyoming* (March 1999). Because of its genetic purity, this population of cutthroat trout may be an important source of fish that could be used, through reintroduction, to effect recovery of the subspecies throughout all three states.

Natural Heritage element occurrences at the Deep Creek PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Oncorhynchus clarki pleuriticus*** | **Colorado River cutthroat trout** | **G4T3** | **S3** | **FS, BLM, CO-SC** | **B** |

*EO=Element Occurrence

**Biodiversity comments:** The Deep Creek PCA has a good example of a Colorado River cutthroat trout population. The primary reasons for conservation concern for the cutthroat at the global and state levels are long-term trend prognoses and threats. Populations continue to decline in many streams (Young *et al.* 1996). Hybridization between this subspecies and non-native trout species poses the greatest threat to the elimination of pure populations. Due to hybridization only 26% of the remaining populations of this trout are considered genetically pure (Young *et al.* 1996).

**Boundary Justification:** The current complete distribution of the cutthroat trout population within the Deep Creek drainage has not been scientifically determined. This PCA was drawn to include Deep Creek and its tributaries in their entirety. Riparian areas were included because of their importance in maintaining bank stability to protect water quality.

**Protection Rank Comments:** The privately owned land along the lower reaches of Deep Creek are within 10 miles of Telluride, Colorado, an area seeing increased growth and development. Threats of development are not only associated with the golf course on Deep Creek Mesa, but include expansion of residential development throughout the private lands along the creek, both in association with the golf course and from the desirability of living within this beautiful canyon close to Telluride. Development of the creekside on the private lands could threaten the continued existence of this cutthroat population, one of only two such populations still remaining within the upper reaches of the San Miguel River.

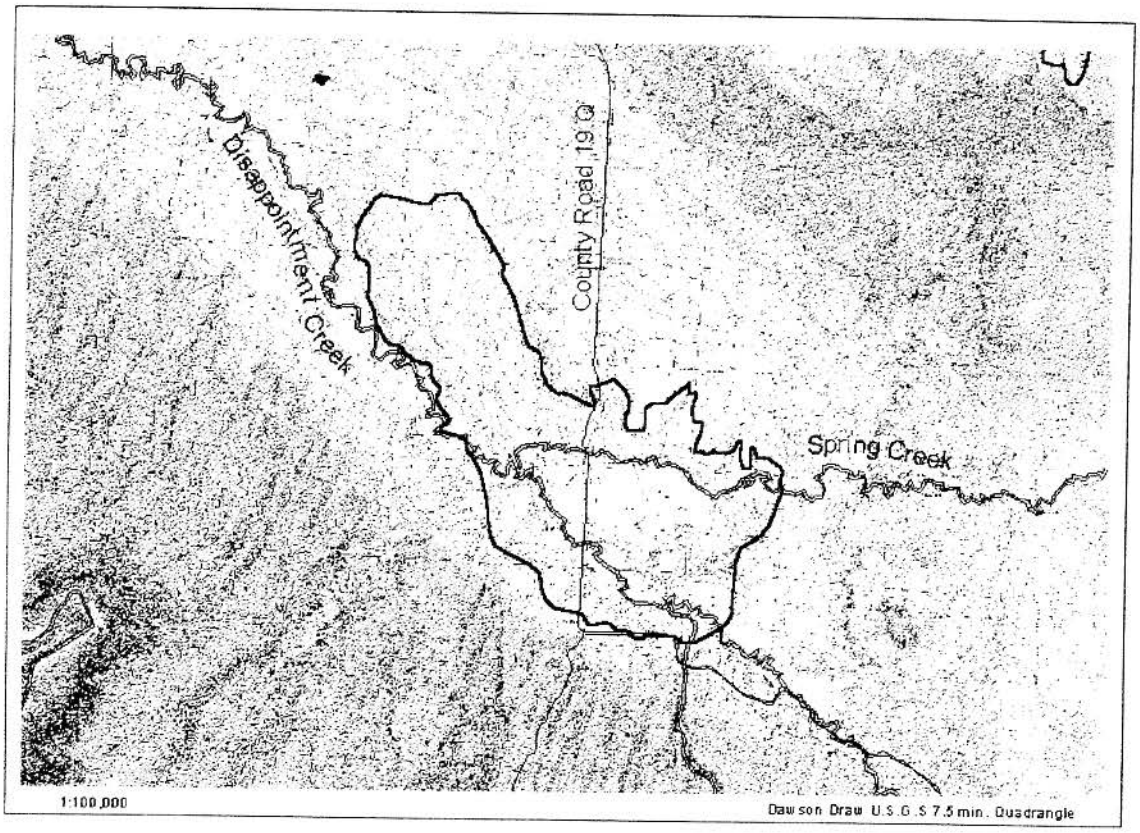
**Management Rank Comments:** Basic population data need to be gathered and analyzed to determine the distribution of cutthroat trout over the main stem of Deep Creek, its two eastern forks, and Sheep Creek. An extensive program of electro-shocking would assist in determining species composition and genetic composition of the cutthroat trout populations in Sheep Creek and the east forks of Deep Creek. It would also aid in the identification of non-native fish and in determining the location of fish barriers to prevent migration of non-native fishes into the trout habitat.

A proposed golf course and residential development on the mesa above Deep Creek are of concern at this PCA. The potential effects of the golf course and its associated disturbance on the Deep Creek cutthroat population include effluents from golf course fertilization and water diversion for golf course irrigation. The major concern is water quality and increases in both affluent loading and sedimentation from the eastern drainage plain on Deep Creek Mesa due to the installation and operation of the golf course. Actions that would help to ensure the survival of the cutthroats include protection of the watershed from siltation, industrial chemicals, and heavy equipment

fluids during construction of the golf course. Furthermore, designing the golf course to alleviate runoff and leaching of fertilizers, herbicides, and pesticides into Deep Creek and evaluating water rights to assure that water depletion and diversion leave adequate water resources to sustain the cutthroat trout population would also assist in preserving the cutthroat trout population.

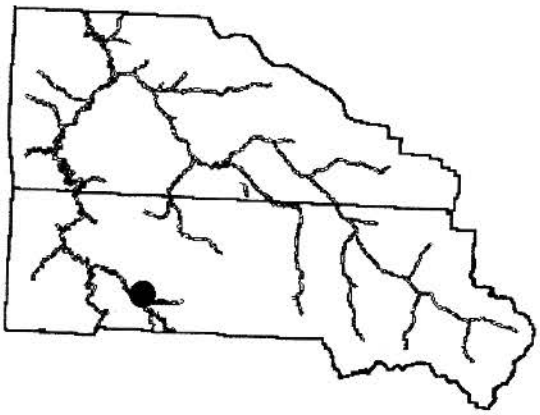
The fish are susceptible to overharvest if angling is unrestricted. Colorado has instituted restrictive angling regulations (Young 1995).

# Disappointment Valley
## Potential Conservation Area




0.9 0 0.9 1.8 2.7 3.6 Miles

N



# Disappointment Valley

**Biodiversity Rank: B3** (High Biodiversity Significance) The Disappointment Valley PCA has good examples of two desert shrub communities--greasewood/seablight and shadscale/galleta, that are rare in Colorado.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Disappointment Valley is located 7.0 miles southeast of the old townsite of Slick Rock, Colorado in western San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Dawson Draw

**Legal description:** T42N R16W Section 6; T42N R17W Sections 1,2; T43N R16W Sections 30, 31; T43N R17W Sections 15, 16, 21, 22, 23.

**Elevation range:** 5,800 to 6,200 feet

**Size:** 5,182 acres

**General Description:**

Disappointment Valley is a broad valley of Quaternary alluvium and Cretaceous Mancos Shale, which consists of shallow, turbid, marine, and calcareous deposits. The soil layer consists of the typic torriotthents composition. Much of the area is an alluvial fan with greasewood, big sagebrush and the grasses blue grama, Indian ricegrass and galleta. The majority of this PCA is on privately held ranchland, with the rest on BLM land.

Disappointment Valley has the most extensive examples of two salt desert shrub communities in San Miguel County. The greasewood/seablight community is found in seasonally moist areas on the flat valley floor and in drainages. The understory species known as seablight is a desirable native plant, in a community that is often vulnerable to weedy species. The shadscale/galleta community is common on slightly drier sites. Common associated species here are blue grama, viscid rabbitbrush, and snakeweed. Higher ground adjacent to the desert shrubland is dominated by sagebrush, while higher yet, on the valley sides, are pinyon and juniper woodlands.

The colony of prairie dogs at this PCA has declined considerably from its first recording in 1997. Adjacent colonies that were mapped by the Colorado Division of Wildlife in 1997 were found to be extirpated in 1999. Historically, indiscriminate poisoning of this species has reduced numbers throughout its range, and prairie dogs are extremely susceptible to the plague. This prairie dog colony is threatened by poisoning and grazing and associated introduction of non-native grass species, as prairie dogs favor native grasses.

Natural Heritage element occurrences at the Disappointment Valley PCA.

| Element | Common Name | G rank | S rank | Federal/State status | EO* rank |
|---|---|---|---|---|---|
| ***Sarcobatus vermiculatus/Suaeda torreyana*** | **Saline bottomland shrublands** | **GUQ** | **S2?** | | **B** |
| *Atriplex confertifolia/Hilaria jamesii* | Cold desert shrublands | G3G5 | S2 | | B |
| *Stipa comata* | Needle and thread (Great Basin herbaceous vegetation) | G2G4 | S2? | | A |
| *Cynomys sp.* | Prairie dog | G5 | S5 | | C |

*EO=Element Occurrence

**Biodiversity Comments:** The Disappointment Valley PCA has good examples of two desert shrub communities: greasewood/seablight and shadscale/galleta. Both are vulnerable on a global scale.

The needle and thread Great Basin herbaceous vegetation community (formerly known as Stipa comata-West) was documented in a BLM study in 1980. The grassland was estimated to consist of 19% needle and thread, 11% blue grama, 6% Galleta, and 4% Indian ricegrass.

In addition, prairie dog colonies have been documented in this PCA. Although prairie dogs are still fairly common, they have declined significantly in the last twenty years, and are currently being considered for listing under the Endangered Species Act. Prairie dogs are a very fragile rodent. Plague has the potential to eradicate a colony within months.

**Boundary Justification:** The PCA is drawn to encompass the broad valley of Disappointment Creek that contains the two desert shrub communities and is habitat for prairie dogs.

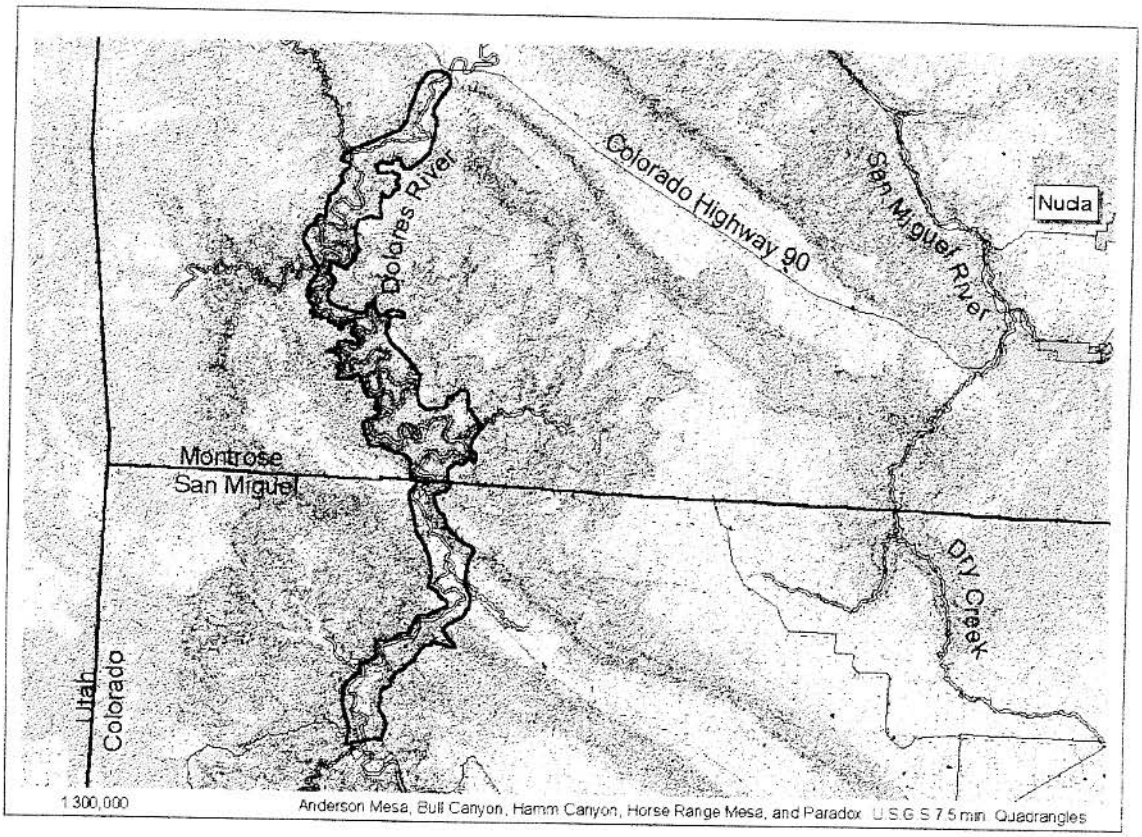
**Protection Rank Comments:** Loss of habitat to development and agriculture, along with plague, has seriously impacted the species. Actions that would benefit existing colonies in this PCA include protection of several acres for each colony to ensure adequate foraging area and space for colony expansion.

**Management Rank Comments:** Agricultural practices on private lands, including irrigation or drainage, could impact the desert shrub plant communities. Much of the private land within the PCA is irrigated and utilized for hay production, and future expansion of haying operations is a potential threat. Steps to prevent the invasion of exotic species will benefit both the plant communities and the prairie dogs.

There are 46,000 acres of BLM land in Disappointment Valley that are closed to ORV travel except on designated roads and trails to protect soils and water. A BLM watershed management plan is in effect for this area.

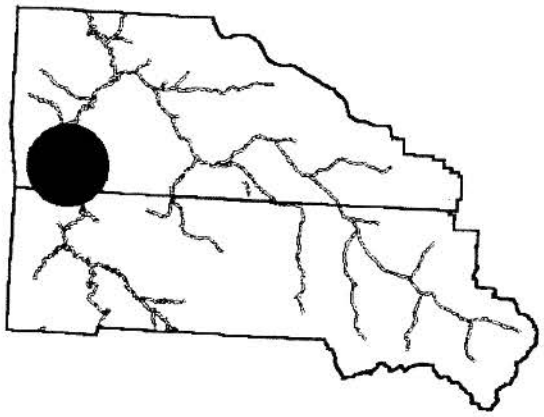
# Dolores Canyon - Slick Rock to Bedrock

## Potential Conservation Area




3 0 3 6 9 12 Miles

N



# Dolores Canyon-Slick Rock to Bedrock

**Biodiversity Rank: B1** (Outstanding Biodiversity Significance) The Dolores Canyon Slick Rock to Bedrock PCA has an excellent occurrence of the globally imperiled New Mexico privet riparian shrub community.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** This PCA extends between the old townsite of Slick Rock, Colorado and Bedrock, Colorado in northwestern San Miguel County and southwestern Montrose County.

U.S.G.S. 7.5 minute quadrangles: Anderson Mesa, Bull Canyon, Gypsum Gap, Hamm Canyon, Horse Range Mesa, Joe Davis Hill, Paradox

**Legal description:** T44N R19W Sections 12, 13, 21, 24, 25; T44N R18W Sections 7, 8, 9, 18, 19, 30; T45N R19W Sections 1, 12; T45N R18W Section 4-9, 17-21, 28, 29, 32, 33; T46N R18W Sections 30, 31; T46N R19W Sections 1, 2, 10, 11, 12, 14, 15, 22, 23, 25, 26, 35, 36; T47N R19W Sections 35, 36; T47N R18W Sections 19, 30, 31.

**Elevation range:** 4,966 to 6,200 feet

**Size:** 15,384 acres

**General Description:**

The Dolores River has carved a spectacular deep canyon through Jurassic and Triassic sandstones at this PCA. Steep vertical cliffs dominate the canyonsides, broken only when tributaries enter the canyon. Major geologic formations in the canyon are Wingate, Kayenta, Navajo and Entrada sandstones. The Morrison Formation appears near the southern end of the PCA.

This PCA includes the riparian zone and adjacent uplands along the Dolores River for approximately fifty miles, from Slick Rock north to Bedrock. Most of this area is roadless and accessible only by raft, canoe or kayak. The canyon bottoms support a nearly continuous occurrence of the riparian plant association known as New Mexico privet foothills riparian shrubland. Typical vegetation along the river includes a band of coyote willow, mixed with giant reed at the water's edge between the low and high water marks. On slightly higher ground is a band of New Mexico privet, often accompanied by skunkbrush, big sagebrush, giant reed and wild rose. Cottonwoods and box elders are occasional. Most of this area has few weeds, and surprisingly little tamarisk compared with other parts of the river.

In an alcove seep at river mile 77.5, CNHP researchers found a hanging garden community with Eastwood's monkeyflower and Mancos columbine. While the columbine was abundant, the monkeyflower was represented by only six plants. Adjacent species were Utah juniper, Mormon tea, skunkbrush, single leaf ash, New

Mexico privet, and two ferns, purple cliffbrake and slender lip-fern. Kachina daisy was not present. Several other alcoves in this stretch were investigated, but did not contain any of the targeted species.

A cliff base just upstream of Spring Creek was the site of a good population of helleborine orchids. Another smaller occurrence was found below the seep at mile 77.5.

Uplands in this area have pinyon-juniper woodlands, sagebrush, or barren sandstone cliffs. Naturita milkvetch was found in the pinyon-juniper community at a campsite at mile 72. Benches sometimes have patches of native grasslands. Relic patches of high quality grasslands were identified by BLM in 1980. Formerly known as "*Stipa comata* – West", this community is now called *Stipa comata*, or "Needle and thread Great Basin herbaceous vegetation". The species composition of the communities varies. It usually includes, in addition to needle-and-thread grass, galleta, Indian ricegrass, and blue grama. In the occurrences in this PCA, needle-and-thread was the dominant grass, ranging from 6% to 20% cover. Blue grama accounted for 1% to 11% cover.

This area has a number of occurrences of animal species with conservation significance, the rarest of which are the roundtail chub and flannelmouth sucker. Nesting Peregrine Falcons also occur at this PCA. The peregrine eyries occur along the cliff tops to approximately 100 feet below the cliff tops of the Dolores River Canyon. Also found within the PCA are a number of animals that globally are demonstrably secure (G5) including the Yuma skipper, canyon tree frog, plateau striped whiptail, and tree lizard.

Natural Heritage element occurrences at the Dolores Canyon-Slick Rock to Bedrock PCA

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Forestiera pubescens*** | **New Mexico privet foothills riparian shrubland** | **G1G2** | **S1** | | **A** |
| ***Forestiera pubescens*** | **New Mexico privet foothills riparian shrubland** | **G1G2** | **S1** | | **A** |
| *Erigeron kachinensis* | Kachina daisy | G2 | S1 | BLM | H |
| *Stipa comata* | Needle and thread (Great Basin herbaceous vegetation) | G2G4 | S2? | | A |
| *Stipa comata* | Needle and thread (Great Basin herbaceous vegetation) | G2G4 | S2? | | B |
| *Gila robusta* | Roundtail chub | G2G3 | S2 | BLM, CO-SC | H |
| *Astragalus naturitensis* | Naturita milkvetch | G2G3 | S2S3 | BLM, USFS | B |
| *Aquilegia micrantha-Mimulus eastwoodiae* | Hanging gardens | G2G3 | S2S3 | | C |
| *Astragalus naturitensis* | Naturita milkvetch | G2G3 | S2S3 | BLM, USFS | H |
| *Pediomelum aromaticum* | Paradox breadroot | G3 | S2 | BLM | H |
| *Mimulus eastwoodiae* | Eastwood monkey-flower | G3? | S1 | BLM | C |
| *Catostomus latipinnis* | Flannelmouth sucker | G3G4 | S3 | BLM, CO-SC | E |

| | | | | | |
|---|---|---|---|---|---|
| *Epipactis gigantea* | Helleborine | G4 | S2 | BLM | B |
| *Epipactis gigantea* | Helleborine | G4 | S2 | BLM | C |
| *Vireo vicinior* | Gray Vireo | G4 | S2B,SZN | | E |
| *Penstemon lentus* | Abajo penstemon | G4Q | S2 | | D |
| *Falco peregrinus anatum* | American Peregrine Falcon | G4T3 | S2B,SZN | LE-PDL | E |
| *Ochlodes yuma* | Yuma skipper | G5 | S2 | | C |
| *Hyla arenicolor* | Canyon treefrog | G5 | S2 | BLM, CO-SC | E |
| *Hyla arenicolor* | Canyon treefrog | G5 | S2 | BLM, CO-SC | H |
| *Hyla arenicolor* | Canyon treefrog | G5 | S2 | BLM, CO-SC | H |
| *Cnemidophorus velox* | Plateau striped whiptail | G5 | S4 | | B |
| *Cnemidophorus velox* | Plateau striped whiptail | G5 | S4 | | B |
| *Urosaurus ornatus* | Tree lizard | G5 | S4 | | B |
| *Salix exigua/*mesic graminoid | Coyote willow/mesic graminoid | G5 | S5 | | A |
| *Pellaea glabella* ssp. *simplex* | Smooth cliff-brake | G5T4? | S2 | | B |

*EO=Element Occurrence

**Biodiversity comments:** There are good to excellent occurrences of the globally imperiled riparian shrub community dominated by New Mexico privet along the Dolores River. This plant community is known only from the major rivers in the Four Corners area.

A historic record of the Kachina daisy from Bull Canyon has not been relocated since 1978. A good occurrence of the Naturita milkvetch, considered to be vulnerable both globally and in Colorado was located in the PCA. Hanging garden communities, imperiled to vulnerable on a global scale, contained small populations of the globally vulnerable, state rare Eastwood monkeyflower. Paradox breadroot was located near Bedrock in 1981.

Excellent occurrences of relic native bunchgrass communities were identified on benches in this PCA during the BLM's inventory of 1984.

Peregrine falcons nest along the cliffs above the Dolores River Canyon. Eyries have been actively used in this PCA throughout the 1990's.

The Yuma Skipper and canyon tree frog are both rare in Colorado, although apparently secure globally. The primary factors justifying a conservation concern for canyon treefrogs are the small number of occurrences, restricted range and relatively low numbers (qualitative judgement) of individuals. There are no quantitative data on population size or trends.

The Dolores River throughout the length of the PCA supports populations of the roundtail chub and flannelmouth sucker. These fish are imperiled and vulnerable on a global scale, respectively, and the chub is rare within the state, while the sucker is vulnerable. In Colorado, both fish inhabit the Colorado River mainstem and its larger tributaries, including the White, Yampa, Dolores, San Juan, and Gunnison rivers (Woodling 1985). Colorado populations of the chub are at the upstream margin of the species' range and comprise the majority of occurrences for this species. The sucker has disappeared from some water systems like the Gunnison River above Blue Mesa were it was displaced by white and longnose suckers (Woodling 1985).

**Boundary Justification:** The boundary is drawn to include the riparian zone of the Dolores Canyon, as well as upland benches that contain relic grassland communities. It encompasses both the river itself, containing the chub and sucker populations, and cliffsides that provide habitat for Peregrine Falcons. Hydrological processes originating upstream, and not included within the boundary, particularly the regulation of water flows at McPhee Reservoir, have a profound effect on this PCA. The health of the riparian vegetation as well as the endangered fish is dependent on the timing and adequacy of flows. Likewise, upland diversions of water could have a detrimental effect on the hanging garden communities.

**Protection Rank Comments:** The roadless section of BLM land in the Dolores Canyon between McIntyre Canyon and La Sal Creek warrants special protection as wilderness, based on its biological significance and remoteness.

The BLM Resource Management Plan of 1985 found this to be the only one of seven Wilderness Study Areas in the Uncompahgre and San Juan Resource Areas that is suitable for wilderness designation. It was found to possess “highly outstanding characteristics for primitive and unconfined recreation, solitude, and naturalness, as well as scenic grandeur and superb wilderness characteristics. It is a nationally unique area and is worthy of preservation in its natural state.” The significant values listed are: Wild and Scenic River candidate; “outstanding primitive and unconfined recreation opportunities associated with the river, canyons, and mesas; unique plant and animal communities found within the WSA that contain threatened and endangered species habitat; and extremely diverse topography and geology that create outstanding scenic vistas and excellent solitude opportunities.” BLM recommended wilderness designation for a total of 28,539 acres, which includes some side canyons represented here in separate PCAs. Effects of such designation, while protecting the PCA in perpetuity, could lead to an increase in visitors, with resulting impacts to plants, animals and plant communities.

Relic natural communities such as the Stipa comata Great Basin Herbaceous Vegetation could be protected by BLM as Research Natural Areas. They are valuable as reference sites to compare ungrazed areas with those currently grazed.

**Management Rank Comments:** If private river use greatly increases in the future, BLM may need to initiate a permit system as is presently in place for commercial rafters. There are a few disturbed areas in this fifty-mile stretch, mostly near campsites used by rafters and kayakers. These areas often have significant Russian knapweed infestations. The quality of the riparian area noticeably deteriorates a few miles south of the

confluence of La Sal Creek, where tamarisk is well established. There has been some problem with trespass cattle in the lower portion of La Sal Creek, and grazing issues remain to be settled.

Conservation of the high quality relic sites of *Stipa comata* Great Basin herbaceous vegetation could be aided by protection from livestock grazing by maintaining their remoteness and abstaining from building of any new roads, trails or water developments in their vicinity. Periodic monitoring of these areas would permit the detection of changes in condition that might warrant management action.

Both the roundtail chub and flannelmouth sucker are sensitive to disturbance, including the blockage of migration routes, introduction of non-native fish, and the alteration of hydrologic and thermal characteristics of the river, including channelization, modifications of flow regimes, and increased sedimentation.

Tamarisk invasion may threaten Yuma skipper habitat by displacing its host plant, the giant reed (CNHP 1999). Protection of natural wetlands with stands of giant reed will help to assure the continued existence of this species in Colorado.

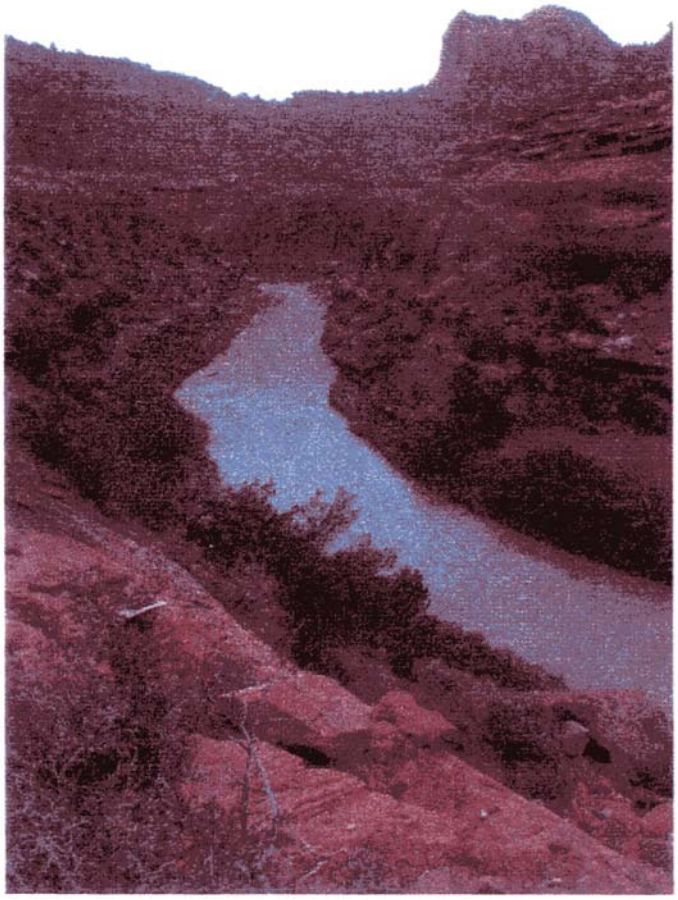
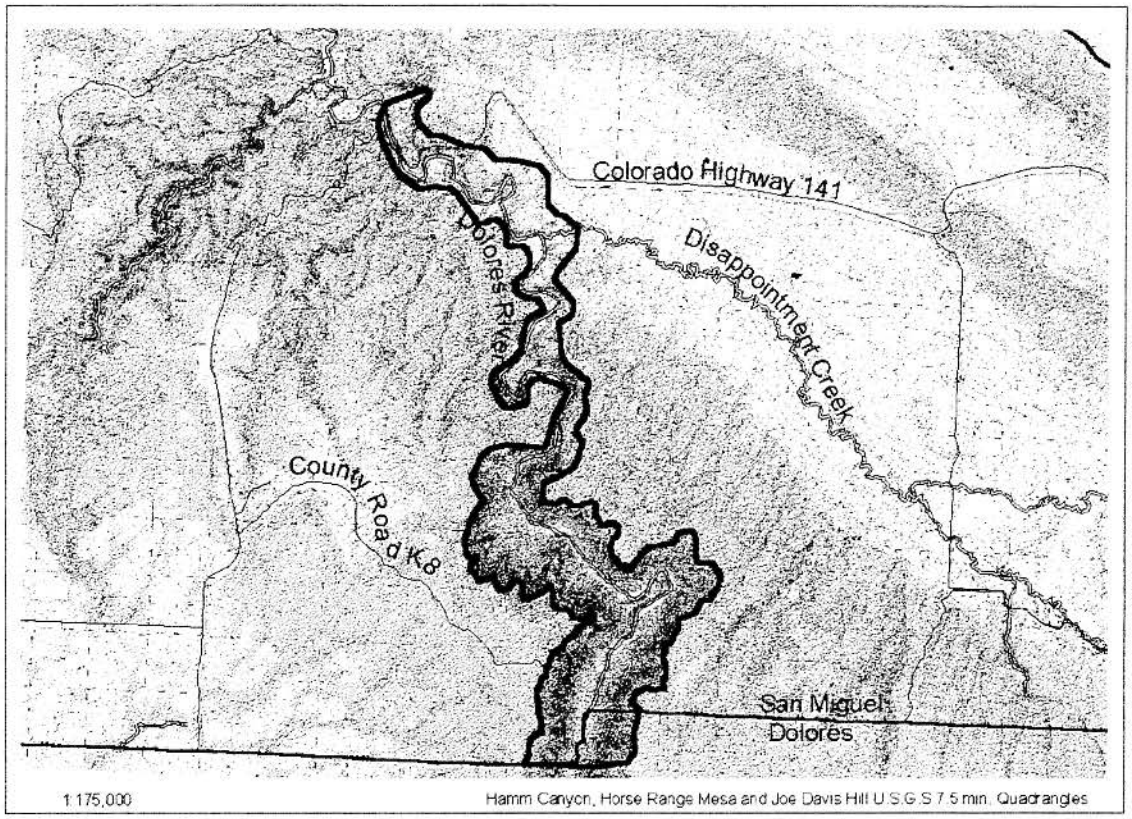


Figure 66. Dolores River Canyon

# Dolores Canyon South of Slick Rock

## Potential Conservation Area




2 0 2 4 6 8 Miles

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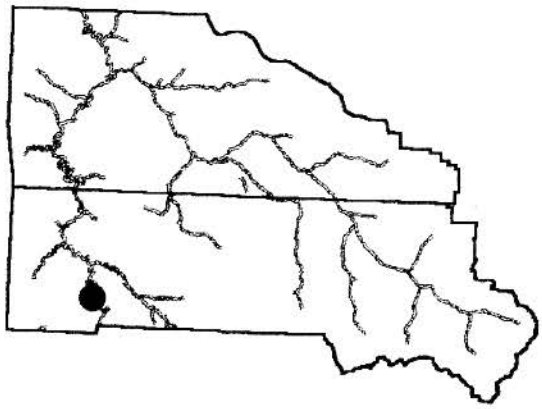


# Dolores Canyon South of Slick Rock

**Biodiversity Rank: B2** (Very high biodiversity significance) This section of the Dolores River has a good to excellent occurrence of the globally imperiled New Mexico privet foothills riparian shrubland.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** San Miguel County. Extending from Slick Rock to the San Miguel-Dolores County line.
U.S.G.S. 7.5 minute quadrangles: Joe Davis Hill, Hamm Canyon, Horse Range Mesa.

**Legal description:** T42N R17W Section 6, 7; T42N R18W Sections 11-15, 22-24; T43N R17W Section 31; T43N R18W Sections 2-5, 10, 11, 14, 15, 21-23, 26-28, 33-36; T44N R18W Sections 29-34.

**Elevation range:** 5,500 to 8,100 feet

**Size:** 11,207 acres

**General Description:**

The Dolores River, between Slick Rock and the southern border of San Miguel County has many of the same attributes as the Dolores Canyon Slick Rock to Bedrock PCA. Geologic formations in the canyon include Permian Cutler Formation, Triassic Wingate, Kayenta and Navajo sandstones, Jurassic Entrada, Morrison, and Summerville sandstones and shales, and Cretaceous Burro Canyon and Dakota sandstones.

A large part of the PCA is roadless and remote. The majority of the PCA is on BLM land managed by the San Juan Resource Area in Durango.

The impoundment of the river at McPhee Reservoir has had a profound effect on riparian vegetation of the Dolores River. Water levels are strictly controlled, and absence of normal spring flooding has reduced the reproduction of native cottonwoods and willows, while encouraging the spread of the exotic tamarisk. However, good examples of native New Mexico privet and Coyote willow riparian shrublands remain. Inaccessible benches above the river contain good examples of pinyon-juniper and grassland communities.

Natural Heritage element occurrences at the Dolores River Canyon South of Slick Rock PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Forestiera pubescens*** | **New Mexico privet foothills riparian** | **G1G2** | **S1** | | **A** |
| *Falco peregrinus anatum* | American Peregrine Falcon | G4T3 | S2B,SZN | LE-PDL | E |
| *Hyla arenicolor* | Canyon treefrog | G5 | S2 | BLM, CO-SC | E |
| *Asio flammeus* | Short-eared owl | G5 | S2B,SZN | | H |
| *Salix exigua/*mesic graminoid | Coyote willow/mesic graminoid | G5 | S5 | | A |
| *Salix exigua/*mesic graminoid | Coyote willow/mesic graminoid | G5 | S5 | | A |

*EO=Element Occurrence

**Biodiversity comments:** This PCA supports good to excellent occurrences of riparian shrub communities dominated by New Mexico privet or coyote willow. The PCA is home to Peregrine Falcons, Short-eared Owls, and canyon tree frogs. None of these occurrences has been ranked. The U.S. Fish and Wildlife Service, due to recent increases in numbers have proposed removal of the American Peregrine Falcon from the Endangered Species List.

**Boundary Justification:** The boundary is drawn to encompass both the riparian zone in the canyon bottom, and the steep cliffs of the canyonsides that provide nesting habitat for the Peregrine Falcons. It does not provide for all of the needs of the falcon or the Short-eared Owl. The PCA is tentatively drawn to end at the San Miguel-Dolores County line, but should probably be extended, once surveys have been completed in Dolores County. Although the upstream part of the river is not included within the boundary, activities upstream, including the regulation of flows in the Dolores River at McPhee Reservoir, have a profound effect on the health of the riparian plant communities in this PCA.

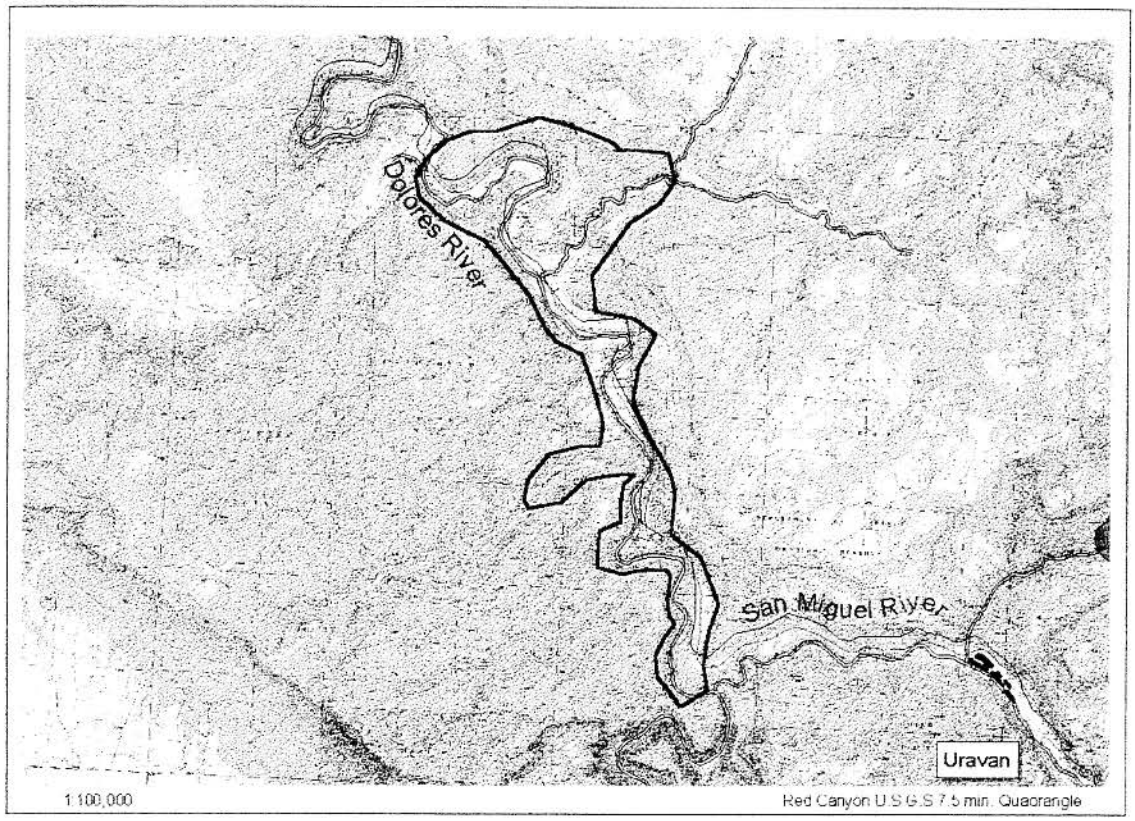
**Protection Rank Justification:** This PCA is located primarily on BLM land, with a small amount of private land at the confluence of Disappointment Creek. The Colorado Wilderness Network has proposed the area for wilderness designation with support from U. S. Representative Diana DeGette. BLM has not recommended the area as wilderness because of the presence of several roads.

**Management Rank Justification:** BLM management calls for an emphasis on recreation in this PCA (USDI 1985). The remote nature and opportunity for solitude in most of the canyon may warrant special designation as wilderness. Present BLM management policy treats this area as wilderness (Thrash personal communication 2000). Although this section of the Dolores River is popular with rafters, it has not experienced the invasion of Russian knapweed that is commonly associated with recreational use. Riparian communities would benefit from the control of tamarisk and other exotic species; however, the intensive management that would be required probably make tamarisk

control impractical until biological controls are available. Monitoring for impacts from recreation as use increases would help managers to determine whether the establishment of designated campsites is necessary. Monitoring of the riparian vegetation will also aid in understanding the hydrological processes necessary for the health of the New Mexico privet community in relation to stream flows.

# Dolores Canyon - Uravan to Roc Creek

## Potential Conservation Area




1 0 1 2 3 4 Miles

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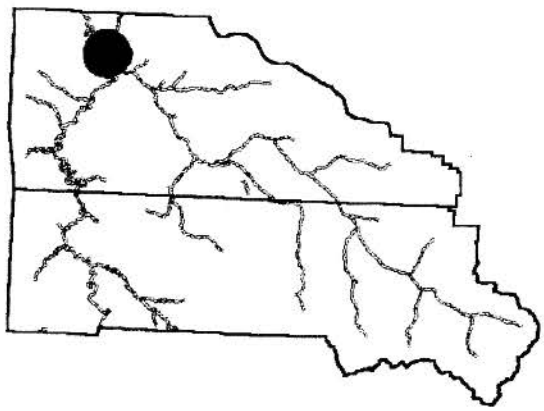


# Dolores Canyon - Uravan to Roc Creek

**Biodiversity Rank: B3** (High Biodiversity Significance) This PCA supports two good occurrences of San Rafael milkvetch, a plant that is vulnerable both on a global scale and extremely rare in Colorado, and an unranked occurrence of the roundtail chub, a fish that is globally imperiled.

**Protection Urgency Rank: P3** There is a definable threat to the occurrences, but not expected within the next five years.

**Management Urgency Rank: M3** Ongoing, recurrent management action would help to maintain the current quality of element occurrences.

**Location:** This PCA is located 4 air miles northwest of Uravan, Colorado in northwestern Montrose County.

U.S.G.S. 7.5 minute quadrangles: Red Canyon

**Legal description:** T48N R18W Sections 2-4, 10, 11, 13, 14, 15, 23-25, 36.

**Elevation range:** 4,800 to 5,400 feet

**Size:** 3,445 acres

**General Description:**

This PCA is located along the Dolores River north of Uravan, Colorado. It contains a combination of privately owned land and BLM land. The PCA is situated on sediments of the Jurrasic Period including the Morrison Formation: stream sands, shale, gravel, and ash; the Summerville Formation: an extensive marine sequence; and the Entrada Formation: dune sand, weak calcareous cement. The soil layer composition is Zyme characterized by mesic, clayey substrates. The vegetation surrounding the canyon within the PCA is dominated by pinyon-juniper woodland.

The San Rafael milkvetch was found on benches above the canyon in the Morrison Formation. Several hundred plants were observed in dry washes below the canyon rim, making this the second best site for the species in Colorado.

The sandstone milkvetch was located in soil pockets in the Entrada sandstone. It was first observed in the PCA in 1982, when it constituted an extension in the species' range from northern New Mexico and southeastern Utah. That population has not been relocated. A second occurrence in this PCA was last seen in 1995, but only five plants were observed. Despite some searching, neither of these populations were relocated in 1999.

The giant helleborine orchid is found in wet areas below seeps in the Wingate Sandstone.

Roundtail chubs and flannelmouth suckers are known to occupy the Dolores River from around the old townsite of Slick Rock, Colorado to its termination in Utah; a stretch of the river that includes this PCA.

There is a recent (1997) record of the pale lump-nosed bat from the PCA.

Natural Heritage element occurrences at the Dolores River Canyon, Uravan to Roc Creek PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Gila robusta*** | **Roundtail chub** | **G2G3** | **S2** | **LE/E, CO-SC** | **E** |
| ***Astragalus rafaelensis*** | **San Rafael milkvetch** | **G3** | **S1** | **BLM** | **B** |
| ***Astragalus rafaelensis*** | **San Rafael milkvetch** | **G3** | **S1** | **BLM** | **B** |
| *Astragalus rafaelensis* | San Rafael milkvetch | G3 | S1 | BLM | H |
| *Astragalus sesquiflorus* | Sandstone milkvetch | G3? | S1 | BLM | E |
| *Astragalus sesquiflorus* | Sandstone milkvetch | G3? | S1 | BLM | E |
| *Catostomus latipinnis* | Flannelmouth sucker | G3G4 | S3 | BLM, CO-SC | E |
| *Epipactis gigantea* | Helleborine | G4 | S2 | BLM | H |
| *Corynorhinus townsendii* | Pale lump-nosed bat | G4T4 | S2 | BLM | E |

*EO=Element Occurrence

**Biodiversity comments:** This PCA supports two good occurrences of San Rafael milkvetch, a plant that is vulnerable both on a global scale and extremely rare in Colorado. The sandstone milkvetch is extremely rare in Colorado, and considered vulnerable on a global scale. The helleborine orchid, while apparently secure globally, is rare in Colorado.

Pale lump-nosed bats are found in abandoned mines in the PCA. This bat is limited in its abundance in Colorado, with only 20 non-historical occurrences recorded in the state.

The Dolores River, throughout the length of the PCA, supports populations of the roundtail chub and flannelmouth sucker. The roundtail chub is imperiled on a global scale while the flannelmouth sucker is globally vulnerable. In Colorado, both fish inhabit the Colorado River mainstem and its larger tributaries, including the White, Yampa, Dolores, San Juan, and Gunnison rivers (Woodling 1985). Colorado populations of the chub are at the upstream margin of the species' range and comprise the majority of occurrences for this species. The sucker has disappeared from some water systems like the Gunnison River above Blue Mesa where it was displaced by white and longnose suckers (Woodling 1985).

**Boundary Justification:** This PCA encompasses the riparian zone of the Dolores River as well as the sandstone canyonsides in the Entrada and Morrison formations that are the habitat of the sandstone and San Rafael milkvetch, respectively. The boundary does not include the feeding area of the pale lump-nosed bat, the extent of which is difficult to define. The PCA also includes approximately eight miles of the Dolores River, which contains populations of the roundtail chub and flannelmouth sucker.

**Protection Rank Comments:** The PCA includes a substantial amount of private land, as well as BLM land. Retaining the BLM land in this PCA in public ownership and avoiding surface disturbing activities will help to ensure the continuance of the rare plant population. Although the San Rafael milkvetch was found on BLM lands, the adjacent private mining claims are also likely to contain the species. These mining claims could be developed in the future if uranium mining again becomes economical.

Roundtail chubs and flannelmouth suckers have been displaced from many waterways within the Colorado River Basin. Protection of current populations of these fish is necessary for the survival of the species.

Pale lump-nosed bats are extremely fragile and primary threats include loss of habitat (e.g., reclamation of abandoned mines), vandalism, and increased visitation (spelunking) by humans to maternity roosts and hibernacula. Large clusters or colonies are susceptible to disturbance and have been declining (CDOW 1984). Human access to mines and caves disrupts wintering populations, where disturbance needs to be minimal (Armstrong *et al.* 1994, Fitzgerald *et al.* 1994). Protection of natural hibernacula from disturbance is a necessity if this species is to survive in Colorado.

**Management Rank Comments:** Much of the riparian vegetation along this section of the Dolores River has been invaded by tamarisk. Habitat for the sandstone milkvetch is probably secure, as it grows in crevices and soil pockets of barren slickrock. The San Rafael milkvetch could be disrupted by off road vehicles, mining and other uses. Both the roundtail chub and flannelmouth sucker are sensitive to disturbance including the blockage of migration routes, introduction of non-native fish, and the alteration of hydrologic and thermal characteristics of the river including channelization, modifications of flow regimes, and increased sedimentation.

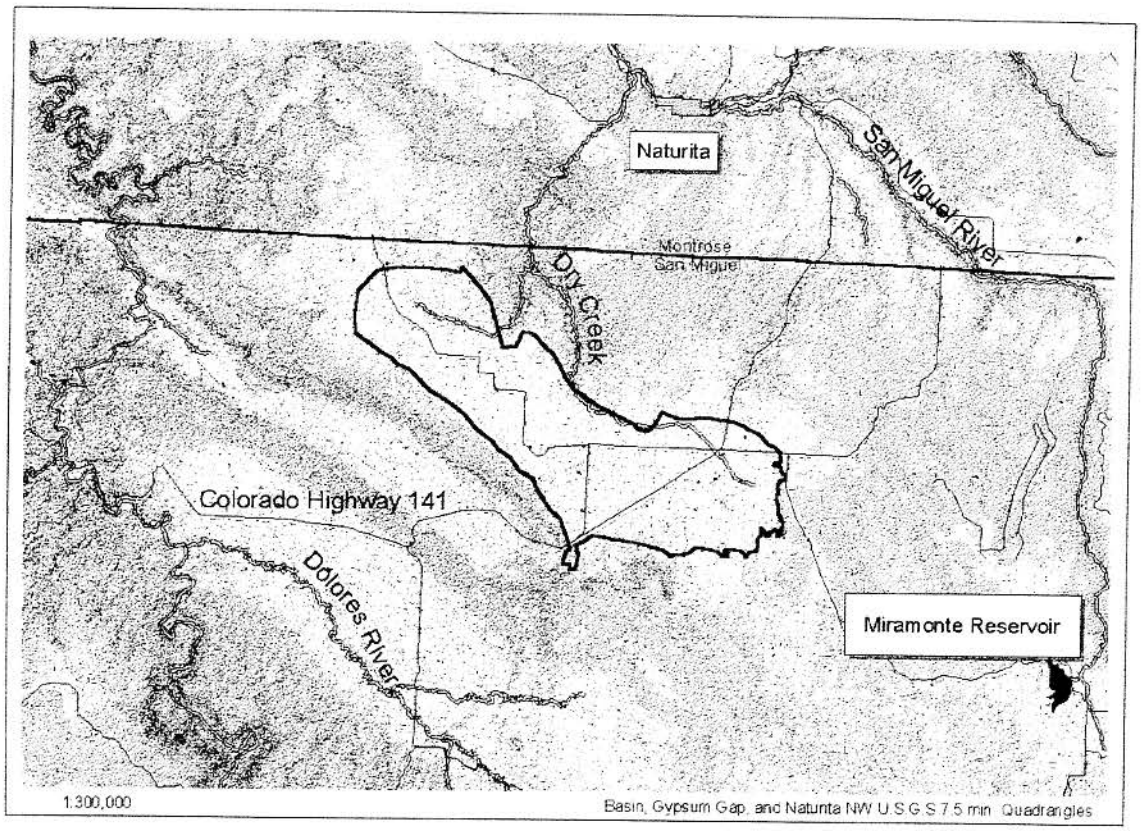
Grazing has been heavy along roads. Some disturbance of riparian areas from small-scale recreational placer mining has occurred.

Needs for the survival of the pale lumpnosed bat include protection of occupied roosts from disturbance (May to mid-September for maternity roosts, October-April for hibernacula); and evaluation of occupied caves or mines for gate installation. See White and Seginak (1987) for gate designs for protecting caves. Gates can successfully limit human access and disturbance but, if poorly designed, gates may restrict bat access and result in population decline. Conditions for the bats can be improved by maintaining canopy cover in areas surrounding caverns, rock faces, and other sites used for roosting; retaining large diameter snags and stands of old growth; avoiding heavy equipment and blasting near roosts; and avoiding chemical insecticides. Caves and mines should be surveyed prior to any logging or mine closures in suspected occupied habitat.

Figure 67. Habitat of San Rafael milkvetch

# Dry Creek Basin

## Potential Conservation Area

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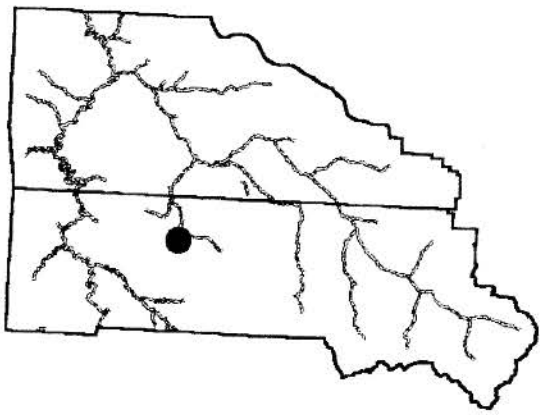


# Dry Creek Basin

**Biodiversity Rank: B2** (Very high biodiversity significance) Dry Creek Basin is the site of a good occurrence of the Gunnison Sage Grouse. The Sage Grouse is considered to be critically imperiled throughout its range.

**Protection Urgency Rank: P3** There is a definable threat to the occurrence, but not expected within the next five years.

**Management Urgency Rank: M2** Ongoing annual management action would help or element occurrences could be lost or irretrievably degraded within 1 year.

**Location:** Dry Creek Basin is located at the town of Basin, Colorado in San Miguel County. The PCA can be accessed from Colorado State Highway 141 traveling south from its junction with Highway 145 east of Naturita, Colorado. Highway 141 bisects the east side of the PCA at the town of Basin.

U.S.G.S. 7.5 minute quadrangles: Basin, Gypsum Gap

**Legal Description:** T43 R16 Section 3; T44N R15W Sections 7, 15-22, 27-34; T44N R16W Sections 3-11, 13-18, 20-28, 34-36; T44N R17W Sections 1-3, 11, 12; T45N R16W Sections 19, 30-33; T45N R17W Sections 21-28, 33-36

**Elevation range:** 5,317 to 6,720 feet

**Size:** 32,184 acres

**General Description:**

This PCA is located just south of Basin, Colorado, extending east and west of the town. The PCA is situated within the Paradox Basin in the Four Corners (the common corner of UT, CO, NM, and AZ) area. The basin was formed by a collapsed salt dome. A large sea embayment separated from the remaining sea covered this area in the Pennsylvanian age, and upon evaporation of this sea, its salts became concentrated in domes overlain with sedimentary rock. Once these sedimentary rocks were breached by erosion, the domes comprised of soluble salt and gypsum were washed away, and the flanking structures collapsed leaving broad valleys at Paradox, Gypsum, and Dry Creek. The resulting soils at Dry Creek Basin are alkaline, and the dominant vegetative community throughout the PCA is big sagebrush, occupying the most mesic sites, and black sage in the most xeric sites.

The PCA falls completely within the basin at Dry Creek. Approximately 50% of the lands within the PCA are under the management of the BLM with the remaining 50% split evenly between private ranchland and Dry Creek Basin State Wildlife Area (SWA). Prior to establishment of the SWA, the entire PCA was grazed ranchland. The SWA is maintained as a grouse preserve without grazing, and because of the inhospitable

nature of the landscape and climate, the SWA sees little public activity. Outside of the SWA the dominant land use is cattle grazing. Of significance is the occurrence of cheatgrass within the PCA. This non-native grass is susceptible to fire and the surrounding sagebrush shrubland is a fire intolerant community of critical importance to the survival of the Gunnison Sage Grouse.

There are three active Gunnison Sage Grouse leks in this PCA. The lek sites were first identified in 1992, and have been used consistently since then. Numbers of male birds on the lek sites have varied over the years, with the most consistently used lek averaging twelve to thirteen males per year. The presence of three consistently used leks in close proximity suggests that this PCA contains a viable and persistent population of the grouse. It is thought that the Gunnison Sage Grouse may migrate between this PCA and Miramonte Reservoir, over Hamilton Mesa, although this has yet to be verified.

Excellent occurrences of the pygmy sagebrush were found within the driest areas dominated by black sage, along the Monument Mesa Road. These areas are somewhat disturbed, and tend to be slightly elevated (less than one foot) above the surrounding surface. Soils are light gray Mancos Shale, and there is little other vegetation in the microsite. The plants were notably absent on adjacent yellow soils, and on deeper soils. Over 2000 individuals were counted. Most were under 2 cm tall, but with inflorescences extending about 5 cm. above the vegetative parts, and with very thick, woody roots. The Dry Creek Basin SWA is directly across the road from the occurrences, but no pygmy sagebrush was found in the SWA. The Little penstemon in this PCA was also found in disturbed places with black sage. Its numbers were low, and the population may not be viable at this site.

This area is of critical importance to the conservation of the Gunnison Sage Grouse in western Colorado.

Natural Heritage element occurrences at the Dry Creek Basin PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Centrocercus* sp 1** | **Gunnison Sage Grouse** | **G1** | **S1** | **BLM, CO-SC** | **B** |
| ***Centrocercus* sp 1** | **Gunnison Sage Grouse** | **G1** | **S1** | **BLM, CO-SC** | **B** |
| *Centrocercus* sp 1 | Gunnison Sage Grouse | G1 | S1 | BLM, CO-SC | C |
| *Centrocercus* sp 1 | Gunnison Sage Grouse | G1 | S1 | BLM, CO-SC | H |
| *Penstemon breviculus* | Little penstemon | G3Q | S2 | BLM | C |
| *Seriphidium pygmaeum* | Pygmy sagebrush | G4 | S1 | | A |
| *Seriphidium pygmaeum* | Pygmy sagebrush | G4 | S1 | | A |
| *Seriphidium pygmaeum* | Pygmy sagebrush | G4 | S1 | | E |
| *Amphispiza belli* | Sage Sparrow | G5 | S3B, SZN | | E |

*EO=Element Occurrence

**Biodiversity comments:** In addition to the Gunnison Sage Grouse, the sagebrush flats are home to excellent occurrences of the pygmy sagebrush, a species extremely rare in Colorado, although it is apparently secure globally. The Little penstemon population was small but has the potential to increase over time. A sage sparrow was observed in the Dry Creek Basin SWA in 1992, and included in the Colorado Breeding Bird Atlas (Kingery 1997).

**Boundary Justification:** There is much discussion in the literature on determining the extent of conservation site boundaries for Sage Grouse. The target of management efforts has often been the protection of habitat within 3 km of lekking sites (Schroeder *et al*. 1999). The random distribution of nests in relation to lek location suggest that Sage Grouse choose nesting sites based on habitat components other than distance from leks. The quantity of habitat necessary to support minimum viable populations is necessarily greater than that afforded by the 3 km target. The greatest factors contributing to nest failure is predation of eggs and adults on nest and young during feeding, and food availability. Components of landscape structure important to nesting Sage Grouse include areas of big sagebrush and relatively tall and thick grass, forb, and shrub cover. These components supply cover from predation for both adults and chicks and supply adequate food in the form of buds, blossoms, leaves, stems, fruit, and also insects, which are particularly important to juveniles within their first 3 weeks of life. The PCA was thus drawn to include all habitats in Dry Creek Basin within proximity of lekking sites that include the aforementioned components important to nest success.

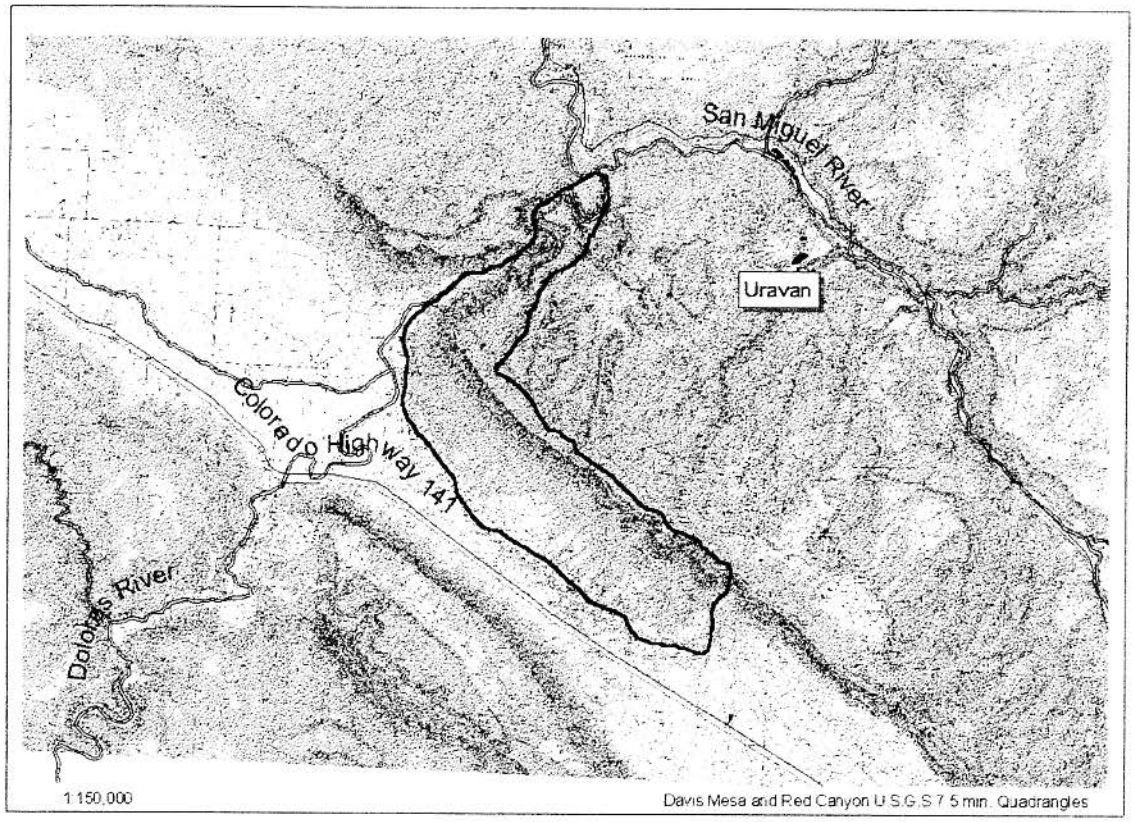
**Protection Rank Comments:** Area is mixed ownership consisting of BLM managed land subject to intensive grazing, a state managed SWA protected against all disturbance, and privately held and grazed ranchland. Protection of identified seasonal habitats (wintering, breeding, nesting and brooding) is required for continued existence of this species in Colorado. The Bureau of Land Management has proposed purchase of private lands and CNHP supports that land purchase.

**Management Rank Comments:** This area is under the management of a combination of agencies (BLM, SWA, Private), and a synergy of management practices is required if Gunnison's Sage Grouse is to be protected against disturbance that can compromise chick survival on brooding ranges and adult survival through winter. Threats include habitat loss, fragmentation, and degradation of sagelands by development, agriculture, and grazing. Large-scale treatment of sagebrush lands with herbicides and fire has negatively impacted Gunnison Sage Grouse habitat (Braun *et al.* 1994). Invasion of the exotic cheatgrass is of concern in the habitat of the Gunnison Sage Grouse. Use of organophosphorus insecticides on agricultural lands adjacent to sagebrush can result in grouse die-offs. Eliminating grazing during the chick rearing period (May-August) may be beneficial. Thinning of pinyon-juniper stands, utility poles, and other perching sites can help to prevent predation of adults on leks by raptors.

No current management needs are known for the pygmy sagebrush. However, many of the plants are close to the road, where they are vulnerable to road maintenance activity.

# East Paradox Creek

## Potential Conservation Area

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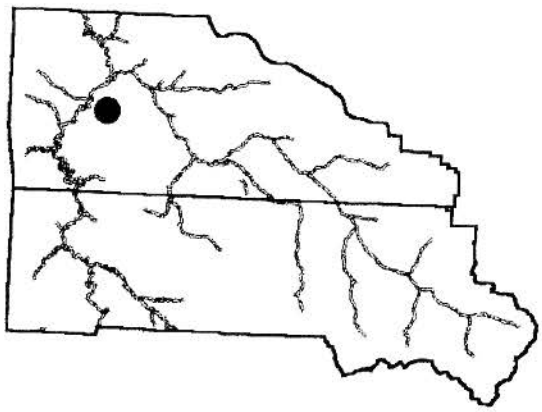


# East Paradox Creek

**Biodiversity Rank: B2** (Very high biodiversity significance) The East Paradox Creek PCA has the best occurrence known of Payson lupine, a plant that globally imperiled and is known only from Colorado.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M2** Ongoing, recurring management must continue within 5 years to prevent loss of this element occurrence.

**Location:** East Paradox Creek is located 4.5 air miles west of Uravan, Colorado in western Montrose County.

U.S.G.S. 7.5 minute quadrangles: Davis Mesa

**Legal description:** T47N R17W Sections 19, 29-32; T47N R18W Sections 1-3, 9-11, 13-16, 22-26, 36; T48N R18W Sections 25, 35, 36.

**Elevation range:** 5,100 to 6,900 feet

**Size:** 7,865 acres

**General Description:**

The East Paradox Creek PCA is located west of Naturita, Colorado north of Highway 90 as it travels through Paradox Valley. This site has a geologic history similar to that of the Dry Creek Basin PCA. Geologic formations in the site are Hermosa, Moenkopi, Cutler, Kayenta, Chinle, and Quaternary alluviums. The PCA is underlain by four different soil compositions including the Mikim composition (ustic torriorthents, fine-loamy, mesic, mixed calcareous soils); Palmer composition (ustollic haplargids, coarse-loamy, mixed, mesic soils); and the Zyme composition (ustic torriorthents, clayey, montmorillontic calcareous, mesic shallow soils).

Dark red soils that are apparently derived from the Chinle Formation provide the habitat of the Payson lupine. The dominant vegetation in the upper part of the PCA is pinyon-juniper woodland, grading into big sagebrush and grassland at the lower part. Parallel drainages run down from the cliffs, with openings of a very high quality needle-and–thread grassland between them.

An excellent occurrence of the Payson lupine is found in the pinyon and juniper woodland at the base of steep sandstone cliffs. In this and the Davis Mesa Slopes PCA on the south side of the valley, the plants occur on soils derived from the Chinle Formation, on the bottoms and sides of the washes. These soils are notably different from those at the other major location of the lupine near Naturita. Growing with the lupine, and often farther downstream in the washes are very large populations of the Paradox breadroot. Although some areas within the PCA have been degraded and have significant amounts of cheatgrass, the drainages with the lupine and breadroot are free of exotic species. Native species that are associated with the rare plants include wallflower, yellow cat's-eye, rock cress, three-awn, twin bladderpod, snakeweed, Easter daisy, and

prickly-pear cactus. There are well developed cryptogamic crusts between plants.

This area has a number of occurrences of animal species with conservation significance the rarest of which are the roundtail chub and flannelmouth sucker. Nesting Peregrine Falcons also occur at this PCA. A pair of adult falcons has consistently fledged young throughout the 1990's, including 1999. Also within this PCA are populations of the Plateau striped whiptail, and nesting records from the 1990's of a Sage Sparrow and Gray Vireo.

Natural Heritage element occurrences at the East Paradox Creek PCA.

| Element | Common Name | G rank | S rank | Federal/ State status | EO* rank |
|---|---|---|---|---|---|
| ***Lupinus crassus*** | **Payson lupine** | **G2** | **S2** | **BLM** | **A** |
| *Stipa comata* | Needle and thread (Great Basin herbaceous vegetation) | G2G4 | S2? | | B |
| *Stipa comata* | Needle and thread (Great Basin herbaceous vegetation) | G2G4 | S2? | | C |
| *Pinus edulis/Stipa comata* | Xeric western slope pinyon-juniper woodlands | G2? | S2 | | C |
| *Gila robusta* | Roundtail chub | G2G3 | S2 | LE/E | E |
| *Pediomelum aromaticum* | Paradox breadroot | G3 | S2 | BLM | A |
| *Pediomelum aromaticum* | Paradox breadroot | G3 | S2 | BLM | A |
| *Astragalus sesquiflorus* | Sandstone milkvetch | G3? | S1 | | H |
| *Bouteloua gracilis/Hilaria jamesii* | Blue grama/galleta shortgrass prairie | G2G4 | SU | | C |
| *Catostomus latipinnis* | Flannelmouth sucker | G3G4 | S3 | BLM | E |
| *Atriplex canescens/Hilaria jamesii* | Cold desert shrublands | G3G4 | SU | | B |
| *Vireo vicinior* | Gray Vireo | G4 | S2B,SZN | | E |
| *Falco peregrinus anatum* | American Peregrine Falcon | G4T3 | S2B,SZN | LE-PDL | E |
| *Amphispiza belli* | Sage sparrow | G5 | S3B,SZN | (PS) | E |
| *Cnemidophorus velox* | Plateau striped whiptail | G5 | S4 | | B |
| *Juniperus osteosperma/Amelanchier* | Mesic western slope pinyon-juniper woodlands | GU | SU | | C |

*EO=Element Occurrence

**Biodiversity comments:** The East Paradox Creek PCA has the world's best occurrence known of Payson lupine, a plant that is globally imperiled, and known only from Colorado. It also contains a good occurrence of needle and thread Great Basin herbaceous vegetation. In addition, this PCA has two excellent occurrences of the Paradox breadroot, a plant that is considered to be globally vulnerable and rare in

Colorado. Cold desert shrublands with fourwing saltbush and galleta were found to be in good condition on lower slopes in the PCA, while mesic western slope pinyon-juniper woodlands with Utah serviceberry were in fair condition. Both of these plant communities are of unknown status in Colorado, and need more research. A fair occurrence of another grassland plant association with blue grama and galleta was interspersed with the shrub community.

The Dolores River throughout the length of the PCA supports populations of the roundtail chub and flannelmouth sucker. In Colorado, both fish inhabit the Colorado River mainstem and its larger tributaries, including the White, Yampa, Dolores, San Juan, and Gunnison rivers (Woodling 1985). Colorado populations of the chub are at the upstream margin of the species' range and comprise the majority of occurrences for this species. The sucker has disappeared from some water systems like the Gunnison River above Blue Mesa were it was displaced by white and longnose suckers (Woodling 1985). These fish are imperiled and vulnerable on a global scale, respectively. The chub is rare within the state, while the sucker is vulnerable.

Three bird species that are vulnerable in Colorado were documented in the PCA: the American Peregrine Falcon, Sage Sparrow and Gray Vireo.

**Boundary Justification:** The boundary encompasses both the lower elevation shrublands and the higher pinyon-juniper community on the north side of Paradox Valley, the river itself containing the chub and sucker populations, as well as the cliff faces that provide nesting habitat for Peregrine Falcons. It encompasses the known occupied sites of Payson lupine and Paradox breadroot, while allowing adequate additional habitat for these species to move or expand over time. The site does not allow for all of the needs such as foraging area for the bird species.

**Protection Rank Comments:** The majority of the pinyon-juniper uplands in this PCA are on BLM land, while the lower elevations are privately owned. The high quality occurrences of both Payson lupine and Paradox breadroot would support designation of the BLM lands as a Research Natural Area.

**Management Rank Comments:**

This PCA is used for hunting, and there is evidence of off-road vehicle use. Quality of the grasslands is mixed, with some good condition areas and some very poor patches. Some of the grazed areas are heavily infested with cheatgrass. A 1999 BLM assessment of the health of the region may result in some new management actions. These could include plowing and reseeding of cheatgrass areas, and alterations in grazing schedules.

Because of the high significance of this PCA as the best known location of Payson lupine, it would be ideal as a site to support further research on this plant species. Additional information about the reproductive ecology of the lupine could elucidate management needs. Monitoring of this site will aid in the detection of changes in the number of individuals and the condition of the population that would warrant management intervention.

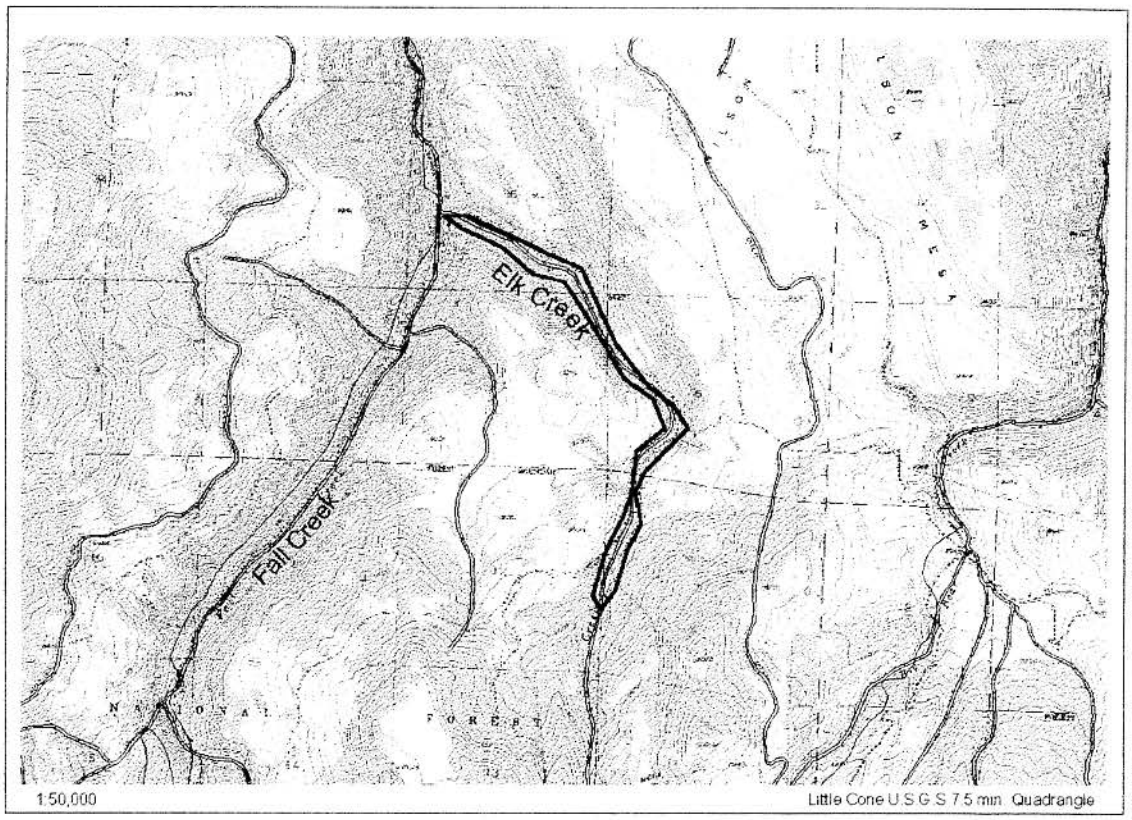
Both the roundtail chub and flannelmouth sucker are sensitive to disturbance, including the blockage of migration routes, introduction of non-native fish, and the

alteration of hydrologic and thermal characteristics of the river, including channelization, modifications of flow regimes, and increased sedimentation.

Continued existence of Peregrine Falcons in Colorado is dependent upon protection of traditional nesting sites, identification and protection of critical habitat both for the breeding areas and for wintering, foraging, and roosting areas. Some additional relief to the peregrine's plight in Colorado can be provided by keeping the remaining nest sites free from human intrusions during nesting season and by ensuring that land use changes protect habitat that supports the peregrine's prey species. At this particular PCA, protection against disturbance by climbing scaling routes on the cliffs north of Highway 90 from February through July is paramount.

# Elk Creek

## Potential Conservation Area

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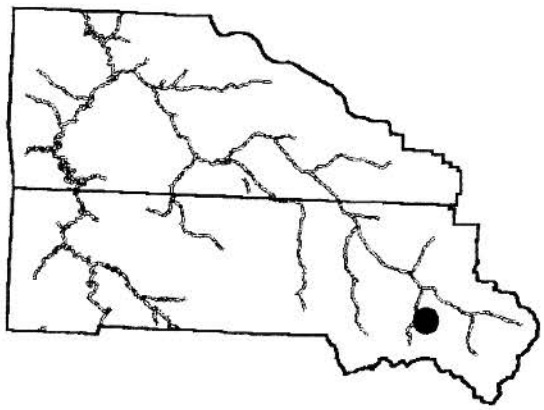


# Elk Creek

**Biodiversity Rank**: **B5** (General Biodiversity Significance) This PCA contains a good occurrence of Colorado River cutthroat trout, a subspecies that is vulnerable on a global scale. Both the Forest Service and BLM list this species as Sensitive, and the Colorado Division of Wildlife lists it as a Species of Special Concern.

**Protection Urgency Comment: P3** There is a definable threat to the occurrence, but not expected within the next five years.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** This PCA is 6.25 air miles south of Placerville, Colorado in San Miguel County. To access the PCA from State Highway 145 just east of Placerville, take County Road 57.P to its junction with County Road 56.L. The PCA starts at the junction of these two county roads and follows Elk Creek upstream along County Road 56.L.

U.S.G.S. 7.5 minute quadrangle: Little Cone

**Legal Description:** T42N R10W Sections 6-7; T42N R11W Sections 1, 12; T43N R11W Section 36

**Size:** 128 acres

**Elevation:** 8,160 to 9,280 feet

**General Description:**

This PCA is located along Elk Creek, from 4.2 miles below its origin to its confluence with Fall Creek. Geologic features along the stream include Jurassic Morrison, Wanakah and Entrada Formations, Cretaceous Dakota Sandstone and Mancos Shale Formations. Spruce-fir forest and aspen are the dominant vegetation upslope, and a riparian community occupies the creekside. Beavers have dammed the area along the creek, and there are numerous pools throughout the PCA. Approximately 50% of the lands on this PCA are privately owned, the State Land Board owns 33%, and the remaining 17% are Forest Service lands.

A population of Colorado River cutthroat trout inhabits this stretch of Elk Creek. The Colorado Division of Wildlife detected the population in 1996, and the population was substantiated by this survey in 1999. The waters of Elk Creek in this area are cool, clear, with well-vegetated stream banks offering both cover and bank stability. Instream cover in the form of deep pools and boulders also occur here. All of the aforementioned characteristics are important to cutthroat trout, which are adapted to relatively cold water at high elevations (Spahr *et al.* 1991, Young 1995).

Natural Heritage element occurrences at the Elk Creek PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Oncorhynchus clarki plueriticus*** | **Colorado River cutthroat trout** | **G4T3** | **S3** | **BLM, USFS, CO-SC** | **B** |

*EO=Element Occurrence

**Biodiversity comments:** Colorado cutthroat trout are native to the Colorado River Basin and have been declining in many streams, but remnant populations still remain in Colorado, Wyoming, and Utah.

**Boundary Justification:** The PCA was drawn to include the entire stretch along Elk Creek where water flows have been disrupted by beaver dams, thus creating cutthroat trout habitat. It also includes habitat upslope from the stream that, if developed, would lead to deterioration of the natural hydrologic features through increased sedimentation and increased discharge of particulate metals into the stream system.

**Protection Rank Comments:** Approximately 50% of the land along the stream within the PCA is at risk to development because it is under private ownership. Presently there is development on Wilson Mesa just west of the PCA, and eventually this development could extend to privately held lands along Elk Creek. Development is likely to cause bank erosion, increasing sedimentation in the stream. If this occurs, this population of cutthroat trout could be lost, because they require clear, waters and vegetated streamsides.

**Management Rank Comments:** One of the major threats to the Colorado cutthroat trout is hybridization with non-native trout species. Due to hybridization only 26% of the remaining populations of this trout are considered genetically pure (Young *et al.* 1996). Competition with non-native trout species and exotic fish diseases also pose threats. There is no indication that either non-native trout from the San Miguel River or whirling disease have invaded Elk Creek, but they still remain a concern.

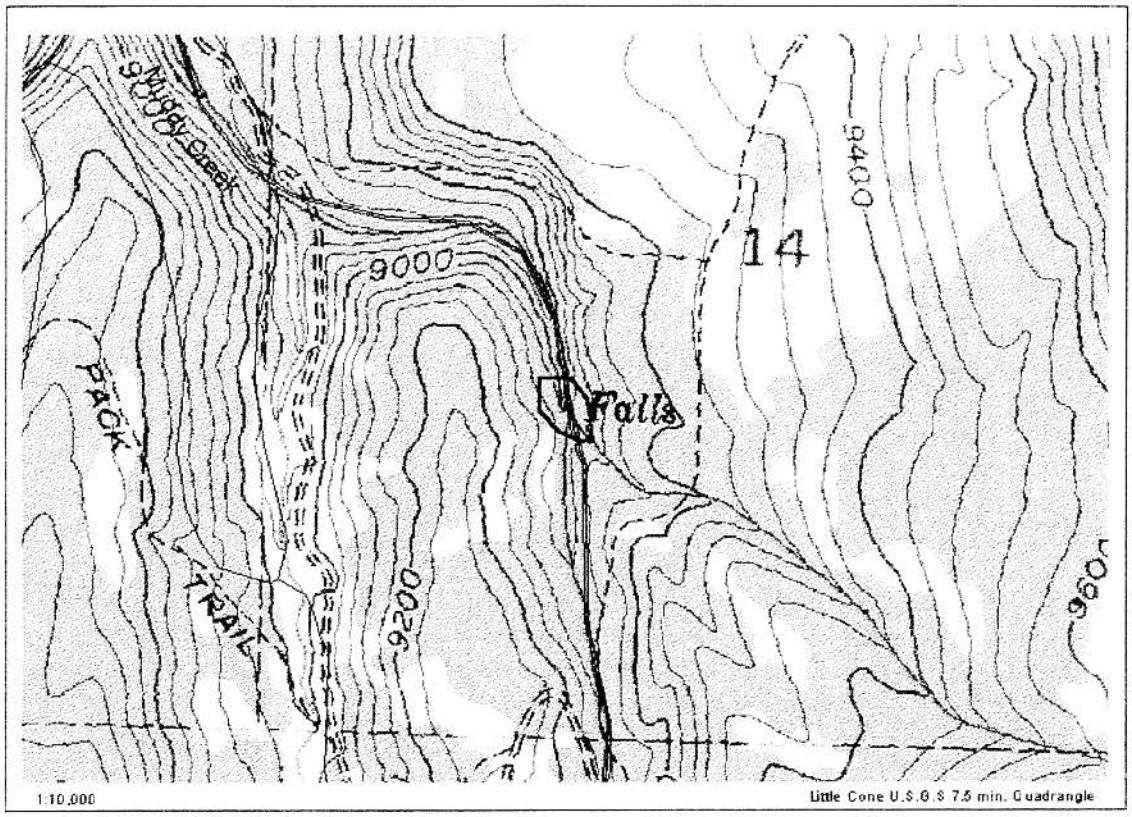
Development of the land along Elk Creek would increase sedimentation of the creek, and because of the natural geology of the area, might result in increased concentrations of particulate metals, both of which would have negative impacts on the cutthroat trout.

Cutthroat trout occur in this stream because the natural pools created by beaver activity create feeding and spawning habitat. Therefore, management for the continued existence of beaver populations at the PCA would be beneficial to the trout.

Management to directly benefit the trout would include: maintaining restrictive fishing regulations and monitoring for invasion of non-native trout species from the San Miguel River. In the event that non-native trout do reach this part of the San Miguel drainage, fish barriers could be constructed to prevent interbreeding with the other trout, non-native trout can be removed through chemical treatment.

# Fall Creek Falls

## Potential Conservation Area

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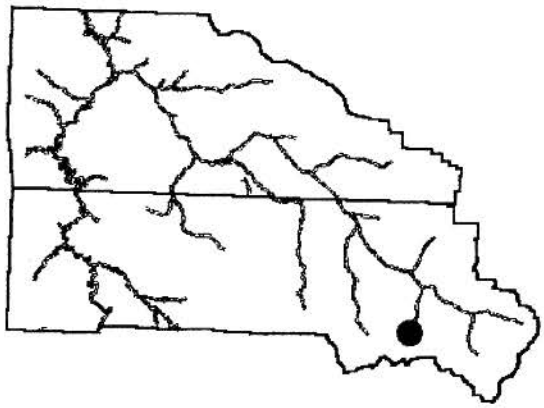


# Fall Creek Falls

**Biodiversity Rank**: **B5** (General Biodiversity Significance) The Fall Creek Falls PCA contains a very good occurrence of a Black Swift colony. This species is apparently secure on a global scale, but vulnerable in Colorado.

**Protection Urgency Rank**: **P4** No threat is known for the foreseeable future.

**Management Urgency Rank**: **M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Fall Creek Falls is 1.25 air miles north of Woods Lake, in southeastern San Miguel County.

U.S.G.S. 7.5 minute quadrangle: Little Cone

**Legal Description:** T42N R11W Section 14

**Size:** 1.5 acres

**Elevation:** 8,720 to 8,920 feet

**General Description:**

Fall Creek Falls is a secluded falls located south of Woods Lake on an eastern channel of Fall Creek. It features a vertical drop of approximately 50 feet. County Road 57.P passes within 0.25 miles of the falls, and there is an undeveloped campsite and pull off at the access to the falls. The geologic feature of the sight is Cretaceous Dakota Sandstone, and the dominant vegetation is spruce-fir forest.

Six Black Swift nests were identified at Fall Creek Falls in 1999, and three had chicks. The falls themselves offer average swift habitat. The falls are close to Woods Lake, which sees extensive recreational use, and the county road. However, they are difficult to access and relatively undisturbed. The grasslands at the top and to the east of the falls are privately owned and grazed, but this activity is probably of no consequence to the Black Swifts.

Table. Natural Heritage element occurrences at the Fall Creek Falls PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Cypseloides niger*** | **Black Swift** | **G4** | **S3B** | **USFS** | **B** |

*EO = Element Occurrence

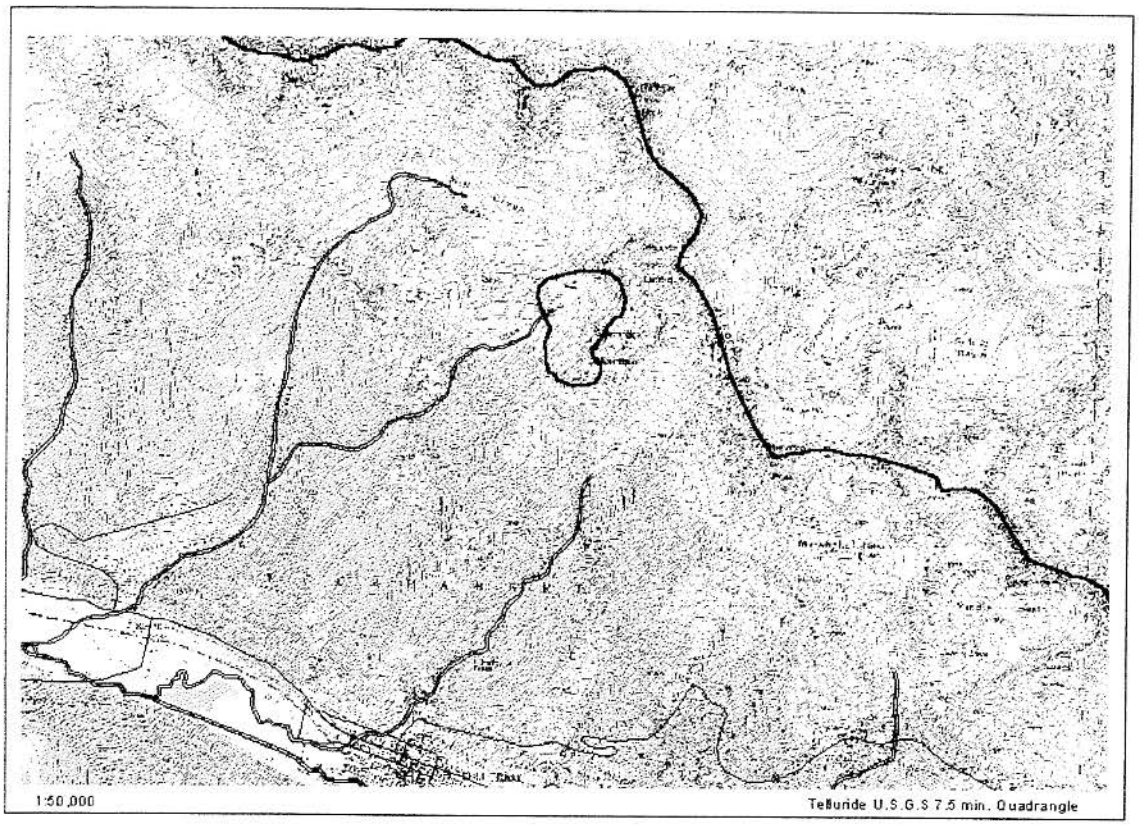
**Biodiversity Rank Justification:** The only known conservation target at this PCA is the population of Black Swifts.

**Boundary Justification:** The boundary was drawn to include the falls and associated nesting habitat of the Black Swift.

**Protection Rank Comments:** The Fall Creek Falls PCA is privately owned, but there is no indication that the falls area will be further developed in the near future.

**Management Rank Comments:** Currently, there is public access and an undeveloped trail to the falls, but recreational use at the falls appears minimal, and Black Swifts are tolerant of human disturbance. Diversion of stream flows resulting in complete loss of water flow at nesting falls will lead to subsequent abandonment of breeding sites.

# Greenback Mountain
## Potential Conservation Area

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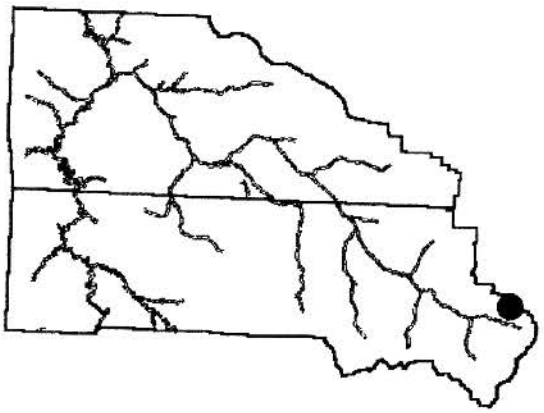


# Greenback Mountain

**Biodiversity Rank: B4** (Moderate Biodiversity Significance) The PCA has an excellent occurrence of the Altai chickweed, a plant that is rare in Colorado.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Greenback Mountain is located 2.0 air miles north of Telluride, Colorado in eastern San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Telluride

**Legal description:** T43N R8W Section 19; T43N R9W Section 24.
**Elevation range:** 11,800 to 12, 500 feet
**Size:** 109 acres

**General Description:**

The Greenback Mountain PCA is located just above treeline on the west-side of Greenback Mountain. The PCA is accessible from the Sneffels Highline Trail, which begins in Telluride. Altai chickweed was found to be common on the scree slopes where there was little other vegetation. The only other plant that was common in this habitat was three-toothed groundsel, which shares an evolutionary adaptation with the chickweed. The long elastic roots of both plants allow them to move downslope along with the natural creep of the rock. The tiny chickweeds are easily overlooked, and are probably not threatened by human activity, as hikers tend to stay on the trails.

Natural Heritage element occurrences at the Greenback Mountain PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Stellaria irrigua*** | **Altai chickweed** | **G4?** | **S2** | | **A** |

*EO=Element Occurrence

**Biodiversity comments:** Altai chickweed was the only element occurrence found at this PCA.

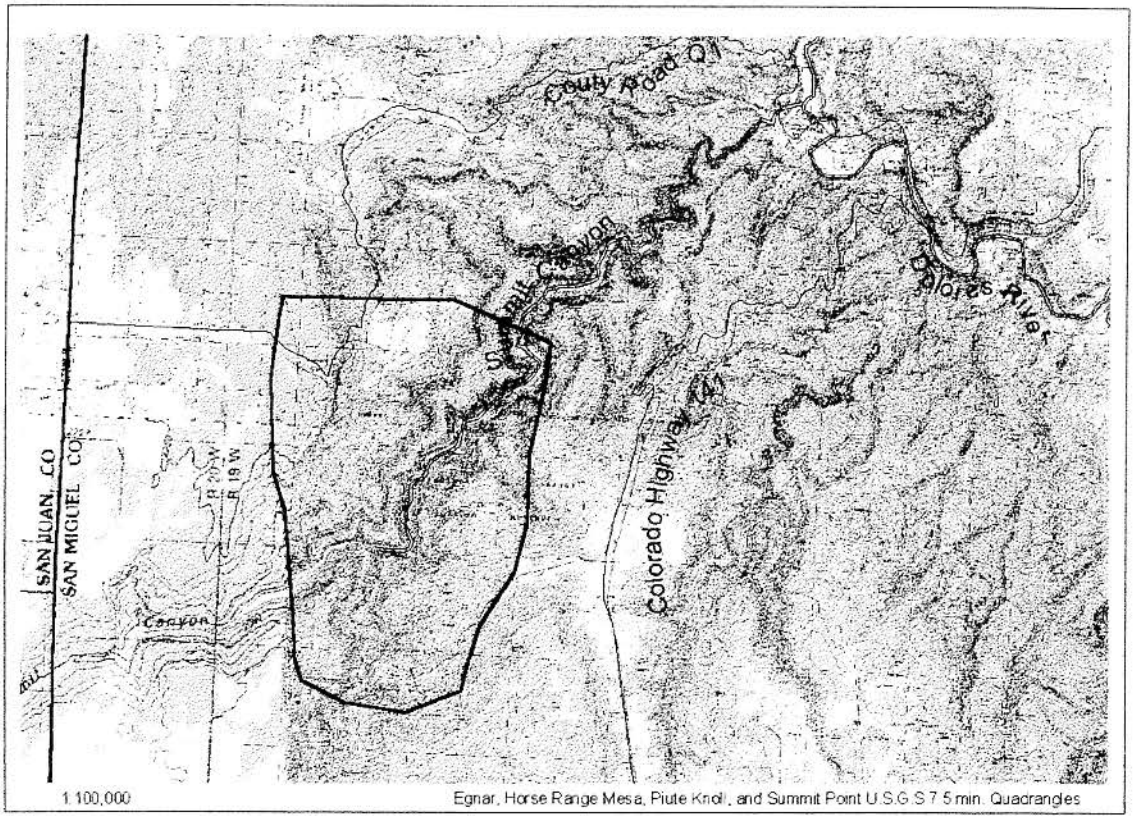
**Boundary Justification:** The boundary is drawn to encompass the scree slopes that are habitat of the Altai chickweed.

**Protection Rank Comments:** This PCA is within the Uncompahgre National Forest, and includes some private mining claims. Efforts are being made by the Forest Service to acquire mining claim in-holdings within the Forest. This area is difficult to access, and so is probably secure from development.

**Management Rank Comments:** Although the trail to this PCA is well-used, few hikers would likely leave the trail and damage the Altai chickweed on the scree slopes.

# Hawk Mine

## Potential Conservation Area

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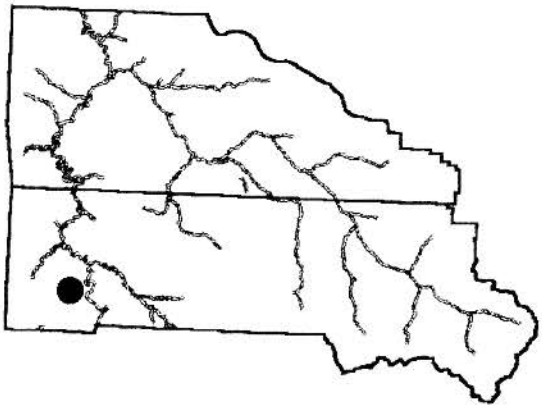


# Hawk Mine

**Biodiversity Rank: B5** (General Biodiversity Significance) The Hawk Mine PCA has an unranked occurrence of the pale lump-nosed bat that is considered to be rare in Colorado.

**Protection Urgency Rank: P4** No threat is known in the foreseeable future.

**Management Urgency Rank: P4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Hawk Mine is located 5.5 air miles southwest of the old townsite of Slick Rock, Colorado in northwestern San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Egnar and Joe Davis Hill

**Legal Description:** T43N R19W Sections 3, 4, 5, 6, 7, 8, 9, 10, 15, 16, 17, 18, 19, 20, 21, 28, 29, 30

**Elevation range:** 5,900 to 7,565 feet

**Size:** 36 acres

**General Description:**

The Hawk Mine PCA includes within its boundaries the portals associated with old mines at Hawk, Frankie, Legin, Golden Rod, and Radium Group mines. The PCA also includes approximately four miles of Bishop and Summit Canyons and the plateau drops steeply into these canyons. This PCA is just west of Highway 141A, approximately five miles north of Egnar, Colorado.

The geologic features of the area include Jurassic Morrison (stream sands, shale, gravel, and ash), Summerville (marine sequence); and Entrada formations (dune sand, weak calcareous cement), and Jurassic/Triassic Glen Canyon Group and Chinle Formation. The soil layers of the PCA consist of the Bond composition (lithic ustollic haplargids, loamy, mixed, and mesic). Vegetation in the area is dominated by xeric pinyon-juniper woodland.

The mines and their tunnels evidently supply necessary environmental conditions for pale lump-nosed bats. A single pale lump-nosed bat was recorded from one of the mines on the PCA in 1997 and observations in February 2000 identified four species of bats using the mine as hibernacula including the pale lump-nosed bat. The mine is an extensive system with three interconnecting portals with the best bat habitat located in the main stem of the system. The rest of the system is poor quality bat habitat with high levels of background radiation. The bat uses caves, buildings, and tree cavities for night roosts. Throughout much of the known range, it commonly occurs in xeric habitats containing pinyon-juniper woodlands and/or semi-desert shrublands.

Natural Heritage element occurrences at the Hawk Mine PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Corynorhinus townsendii*** | **Pale lump-nosed bat** | **G4T4** | **S2** | **BLM** | **E** |

*EO=Element Occurrence

**Biodiversity comments:** The pale lump-nosed bat subspecies is considered to be rare in Colorado, although apparently secure on a global scale. Pale lump-nosed bats are limited in abundance in Colorado because of strict needs, including preference for relatively cold places for hibernation near entrances in well-ventilated areas. Only 20 occurrences have been recorded in the state in the last ten years.

**Boundary Justification:** This PCA was drawn to include a known roosting site and potential hibernacula of pale lump-nosed bat. Although the PCA includes all of the surrounding mine portals and associated shafts and some surrounding area, it does not include the surrounding pinyon-juniper woodlands and steep rocky cliffs that are important foraging habitat, and that supply day roosting sites for this bat during its active period. The foraging area of this bat likely extends over Summit and Bishop canyons, throughout East Summit Mesa, and could include extensive distances along the Dolores River Canyon. The extent of land used for foraging and day roosts by the bats using the mines for hibernacula is difficult to define.

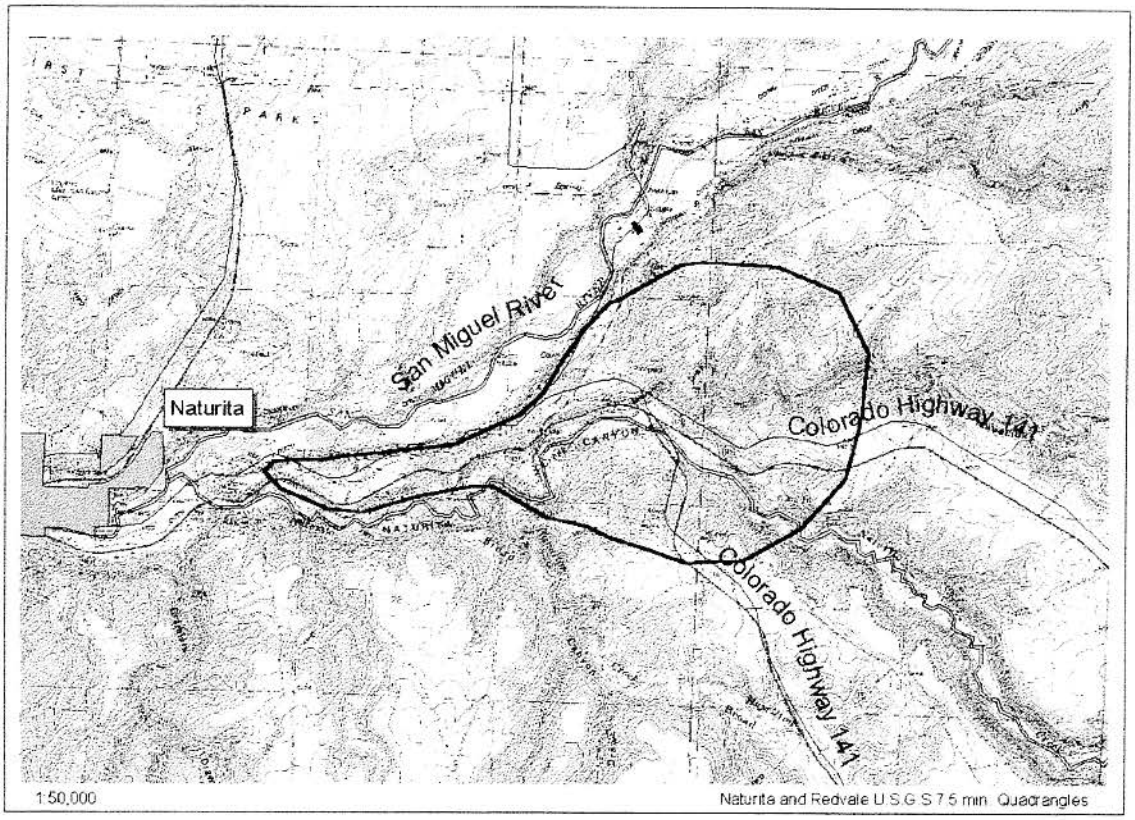
**Protection Rank Comments:** The majority (94%) of the PCA is publicly owned and managed by the BLM, and is open and easily accessed by curiosity seekers who may enter the mines where Pale lump-nosed bats were recorded. Pale lump-nosed bats are extremely fragile, and primary threats include loss of habitat (e.g., reclamation of abandoned mines), vandalism, and increased visitation (spelunking) by humans to maternity roosts and hibernacula. Large clusters or colonies are susceptible to disturbance and have been declining (CDOW 1984). Human access to mines and caves disrupts wintering populations, where disturbance needs to be minimal (Armstrong *et al.* 1994, Fitzgerald *et al.* 1994). Protection of natural hibernacula from disturbance is a necessity if this species is to survive in Colorado.

**Management Rank Comments:** Needs for the survival of the pale lumpnosed bat include protection of occupied roosts from disturbance (May to mid-September for maternity roosts, October-April for hibernacula); and evaluation of occupied caves or mines for gate installation. See White and Seginak (1987) for gate designs for protecting caves. Gates can successfully limit human access and disturbance but, if poorly designed, gates may restrict bat access and result in population decline (Matthews and Moseley 1990). Conditions for the bats can be improved by maintaining canopy cover in areas surrounding caverns, rock faces, and other sites used for roosting; retaining large diameter snags and stands of old growth; avoiding heavy equipment and blasting near roosts; and avoiding chemical insecticides. Caves and mines should be surveyed prior to any logging or mine closures in suspected occupied habitat.

Work completed by CDOW biologist Tom Ingersoll in February 2000 (personal communication) concludes that two portals should be closed with access to the hibernacula allowed through installation of a bat gate on the main portal.

# Highway 141 and 145

## Potential Conservation Area

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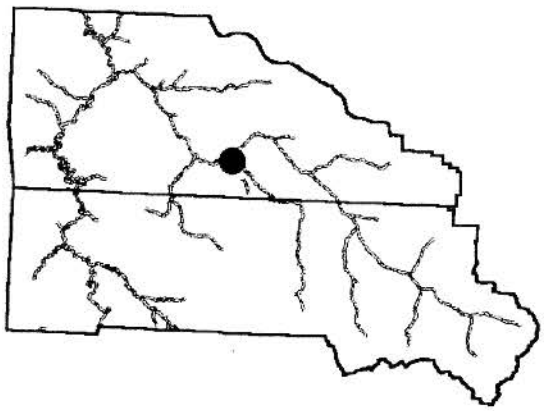


# Highway 141 and 145

**Biodiversity Rank: B2** (Very high biodiversity significance) This PCA has a good population of Payson lupine, which is only known from Colorado, and is imperiled throughout its range.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Highway 141 and 145 is located 1.0 air mile east of Naturita, Colorado and circumscribes the area around Colorado Highway 141 and 145 junction in west-central Montrose County.

U.S.G.S. 7.5 minute quadrangles: Naturita, Redvale

**Legal description:** T46N R15W Sections 14, 15, 20-23, 26-28.

**Elevation range:** 5,500 to 6,000 feet

**Size:** 1,454 acres

**General Description:**

This PCA is located near the intersections of Colorado State Highway 141 with SH145, and SH 97, south of the town of Nucla and above Naturita Canyon and Maverick Draw. The area has gentle south and east-facing slopes with sandy soils and rock outcrops of Dakota sandstone. Vegetation is a mosaic of pinyon-juniper woodland with openings of sagebrush and grasslands dominated by needle and thread grass and blue grama. Common plant species in the area include Utah juniper, big sagebrush, black sage, needle-and-thread, blue grama, galleta, prickly pear cactus, cats-eye, and many-lobed groundsel. Other associated species are Indian ricegrass, sand aster, Easter daisy, scarlet globemallow, four o'clocks, and Wingate milkvetch. Some patches of these plant communities are in excellent condition, in spite of part of the area having been used as a local unofficial dump. Other patches have been invaded by cheatgrass and Russian knapweed.

Three rare plant species were found in the area: Payson lupine, little penstemon, and Naturita milkvetch. Payson lupine was common in draws and on barren soils between draws, both north of Highway 141 and on both sides of Highway 145. Due to its rhizomatous character, the lupines are difficult to count, but there is abundant potential habitat in the area. Little penstemon occupied slopes above the rimrock, while the Naturita milkvetch was found in pockets of Dakota sandstone pavement on the canyon rims. Associated plant species in the PCA were mountain big sagebrush, blue grama, Indian ricegrass, prickly pear cactus, hedgehog cactus, actinea, sand aster, fineleaf hymenopappus, Townsend's Easter daisy, scarlet globemallow, four o'clock, Wingate milkvetch, Eastwood-plant, vernal daisy, and rough-seed cat's-eye.

The striped whiptail was seen scurrying away in rocky outcrops in the pinyon-juniper.

Natural Heritage element occurrences at the Highway 141 and 145 PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Lupinus crassus*** | **Payson lupine** | **G2** | **S2** | **BLM** | **B** |
| *Lupinus crassus* | Payson lupine | G2 | S2 | BLM | E |
| *Stipa comata* | Needle and thread (Great Basin herbaceous vegetation) | G2G4 | S2? | | A |
| *Astragalus naturitensis* | Naturita milkvetch | G3 | S3 | BLM, USFS | C |
| *Penstemon breviculus* | Little penstemon | G3Q | S2 | BLM | B |
| *Penstemon breviculus* | Little penstemon | G3Q | S2 | BLM | B |
| *Cnemidophorus velox* | Plateau striped whiptail | G5 | S4 | | E |

*EO=Element Occurrence

**Biodiversity comments:** This PCA has a good population of Payson lupine, a plant that is imperiled globally. There is also an excellent example of needle and thread Great Basin herbaceous vegetation, formerly known as Western slope grasslands, that is of unknown status in Colorado, but vulnerable on a global scale. The globally vulnerable Naturita milkvetch is represented by a fair occurrence, and the globally vulnerable little penstemon by two good quality occurrences. The concentration of rare plant species and high quality grassland on the northern BLM portion of the PCA make this an important location for further research on the ecology of the rare plants and communities.

The Plateau striped whiptail was documented here, and is apparently secure globally and in Colorado. It was found to be more common than had been previously thought.

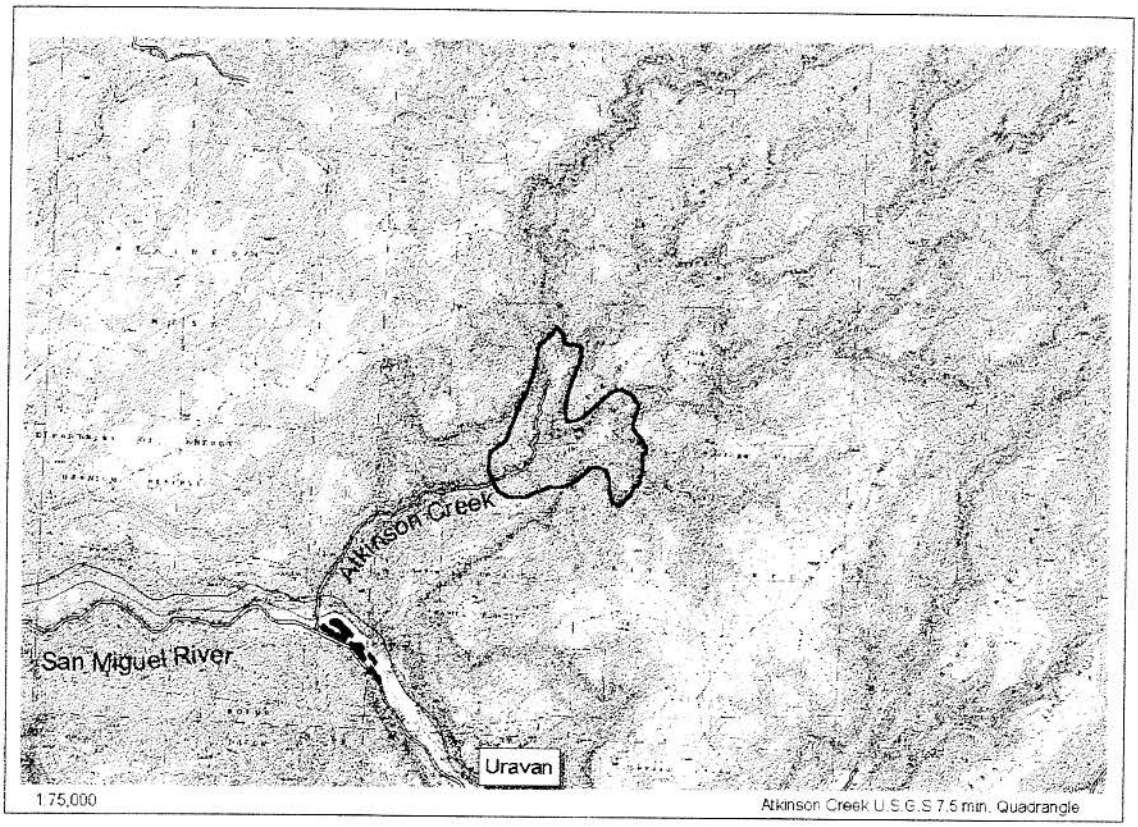
**Boundary Justification:** The boundary circumscribes occurrences of three rare plants and a grassland community in excellent condition. It also includes some adjacent potential habitat that is important to allow the species to move over time and colonize new sites.

**Protection Rank Comments:** The PCA is located on both BLM and private lands. No special protection is in place.

**Management Rank Comments:** The PCA has several unimproved roads, and is frequently used as an unofficial dump. So far, it does not appear that the significant elements have been impacted. Research currently underway on the reproductive ecology of the Payson lupine may elucidate management needs. Monitoring of this site will aid in the detection of changes in the number of individuals and the condition of the rare plant populations that would warrant management intervention.

# Hog Point

## Potential Conservation Area

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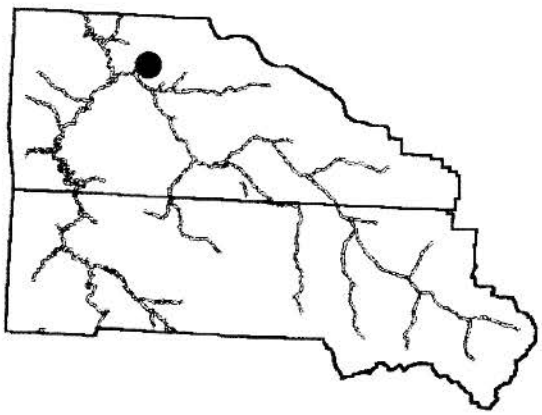


# Hog Point

**Biodiversity Rank: B4** (Moderate Biodiversity Significance) The Hog Point PCA has a fair occurrence of the globally imperiled Payson lupine, and a fair occurrence of narrowleaf cottonwood/skunkbrush riparian shrubland, a plant community that is imperiled on a global scale.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M3** Ongoing, recurrent management action would help to maintain the current quality of element occurrences.

**Location:** Hog Point is located 2.25 air miles north of Uravan, Colorado in western Montrose County.

U.S.G.S. 7.5 minute quadrangles: Atkinson Creek

**Legal description:** T48N R17W Sections 14, 15, 22, 23.

**Elevation range:** 5,200 to 5,800 feet

**Size:** 508 acres

**General Description:**

BLM personnel found the Payson lupine in 1987, on cobbley silt and sandy alluvial soils. Estimated number of plants was more than 1000. Associated species included big sagebrush, virgin's bower, yucca and Indian ricegrass. At that time the researchers noted that grazing was heavy, especially in section 14.

The riparian plant community on Atkinson Creek at this PCA was surveyed in 1991 by CNHP. It was evaluated as only a fair occurrence, because researchers found numerous exotic grass and forb species in an area that is apparently heavily used by cattle. In addition to the exotic species, stream banks had been eroded, the channel widened, and willows heavily grazed.

Natural Heritage element occurrences at the Hog Point PCA.

| Element | Common Name | G rank | S rank | Federal/State status | EO* rank |
|---|---|---|---|---|---|
| ***Lupinus crassus*** | **Payson lupine** | **G2** | **S2** | **BLM** | **C** |
| *Populus angustifolia/Rhus trilobata* | Narrowleaf cottonwood/skunkbrush | G3 | S3 | | C |

*EO=Element Occurrence

**Biodiversity comments:** The Payson lupine at this location was estimated to contain over 1,000 individual plants. The narrowleaf cottonwood/skunkbrush community was evaluated as being in fair condition. However, the degraded condition of the site lowers the viability of the occurrences and the biodiversity significance of the entire PCA.

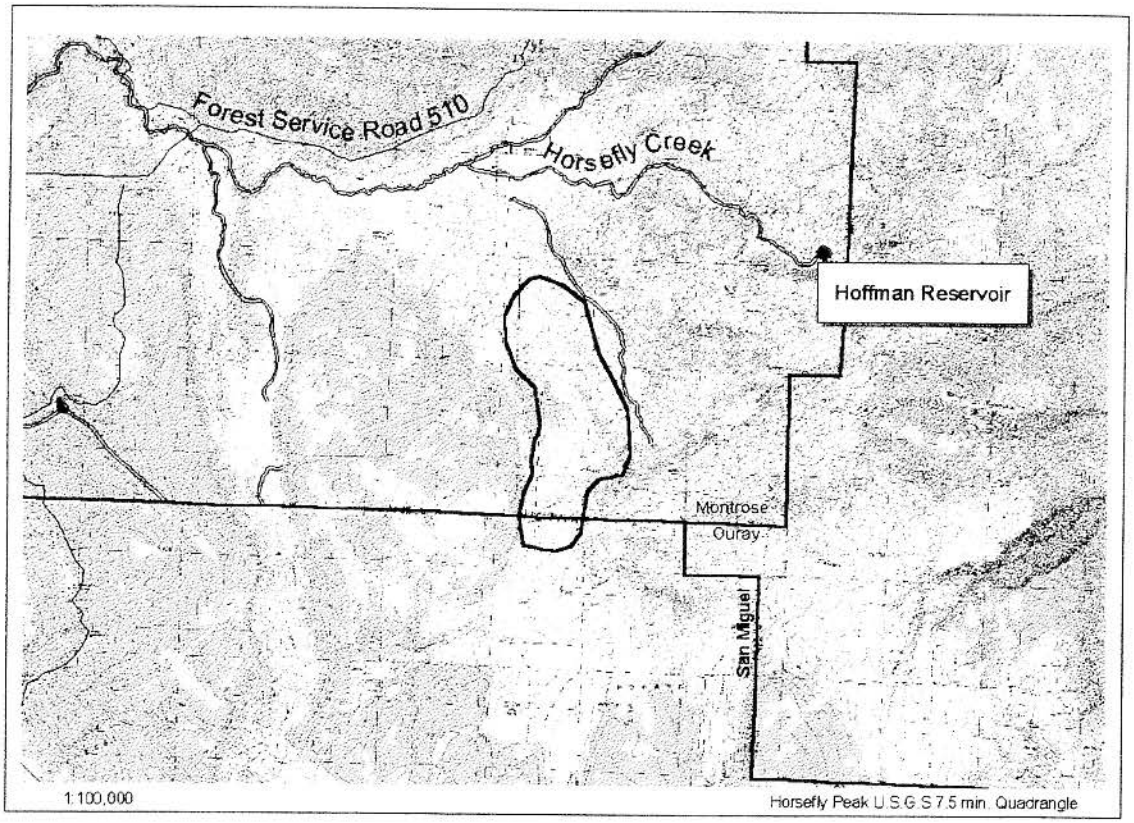
**Boundary Justification:** The boundary is drawn to encompass the Payson lupine and the narrowleaf cottonwood/skunkbrush element occurrences.

**Protection Rank Comments:** The PCA is entirely on BLM land, with no special protection. No change of status is recommended at this time. If this location proves to have a good occurrence of Payson lupine, protection may be warranted, due to the small number of populations known for this species.

**Management Rank Comments:** Two separate researchers noted heavy grazing and stream bank erosion along Atkinson Creek in 1991. However, recent intensive grazing management, which limits the time that livestock are in the area to a few days should improve this situation. Further inventory is needed to relocate the Payson lupine in this site. A survey in 1994 failed to locate the species, but it may still be present.

# Horsefly

## Potential Conservation Area

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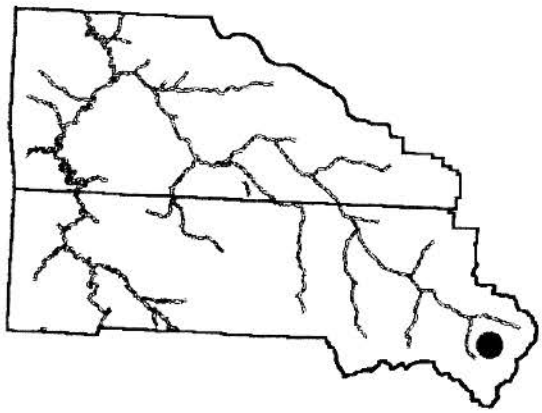


# Horsefly

**Biodiversity Rank: B3** (High Biodiversity Significance) The Horsefly PCA has a fair occurrence of the Western Slope sagebrush shrublands plant community, considered to be imperiled to vulnerable on a global scale.

**Protection Urgency Rank: P3** There is a definable threat to the occurrence, but not expected within the next five years.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Horsefly is located 10.5 air miles north of Placerville, Colorado in extreme northeastern San Miguel County and south-central Montrose County.

U.S.G.S. 7.5 minute quadrangles: Horsefly Peak

**Legal description:** T45N R10W Sections 5, 8, 9, 16, 17.

**Elevation range:** 8,700 to 9,200 feet

**Size:** 1,324 acres

**General Description:**

The Horsefly PCA is located on a bench at the southern end of the Uncompahgre Plateau. It is situated within one of the largest areas of private land in the San Miguel Basin. Historically a ranching area, large tracts are now being developed for home sites. The area boasts magnificent long views of distant mountains and open meadows punctuated by aspen groves, making it extremely attractive to potential homeowners.

Vegetation comprises a mosaic of aspen forests with large open parks of silver sagebrush, grasses and forbs. At higher elevations, Ponderosa pine and Gambel's oak become more frequent. The high elevation silver sagebrush community in this PCA is quite unusual in Colorado. It is known from only four other locations, in Mesa, Grand and Summit counties. In its pristine state, this plant association would consist of silver sagebrush and Thurber fescue or Parry's oatgrass. A century of grazing has significantly altered its composition, so that shrubs have increased relative to grasses, and many of the native grasses have been displaced by exotic species such as Kentucky bluegrass. However, there are still enough remaining native grasses to indicate the potential natural community. In one representative plot, canopy cover was estimated at 75% silver sage, 5% rubber rabbitbrush, and 30% grasses and forbs, which included Thurber fescue, Parry's oatgrass, Kentucky bluegrass and hairy golden aster. Other notable plant species in the area include snowberry, mules ears, mountain sagebrush, owl clover, and lupines. No rare plants were found in this habitat.

Natural Heritage element occurrences at the Horsefly PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Artemisia cana/Festuca thurberi*** | **Western slope sagebrush shrublands** | **G2G3** | **S2S3** | | **C** |

*EO=Element Occurrence

**Biodiversity comments:** The western slope sagebrush shrublands dominated by silver sagebrush constitute a plant community that is considered imperiled to vulnerable throughout its range.

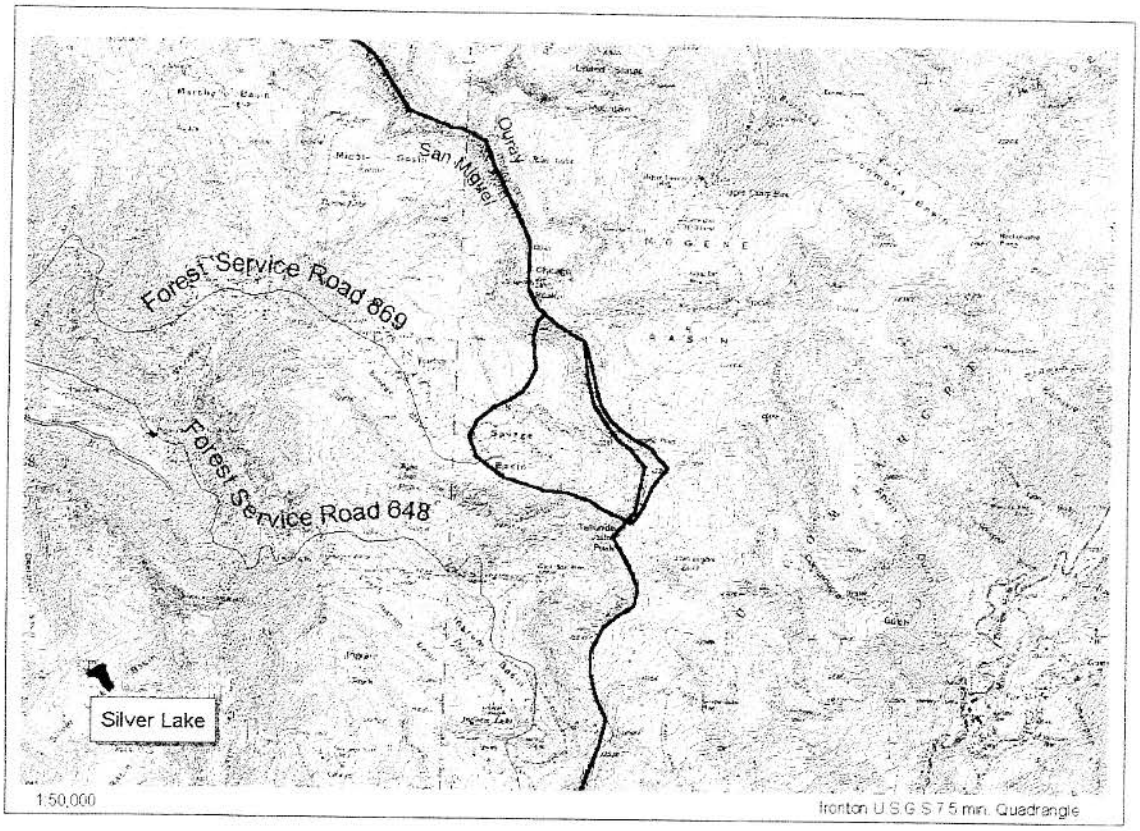
**Boundary Justification:** The boundary is drawn to encompass the silver sagebrush shrubland community.

**Protection Rank Comments:** Although development is expected to continue, lot sizes are large, and valued for their expansive vistas of sagebrush meadows. Representative plant communities may be protected for their scenic values. Efforts to conserve open space in this PCA could both benefit the plant community while providing protection of viewsheds.

**Management Rank Comments:** The species composition of the Western Slope sagebrush shrublands has been altered by a long history of livestock grazing. Reduced grazing pressure may encourage the increase of native grasses.

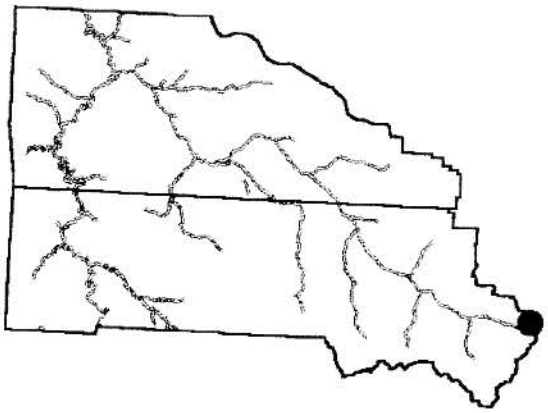
# Imogene Pass

## Potential Conservation Area




0.5 0 0.5 1 1.5 2 Miles

N



# Imogene Pass

**Biodiversity Rank: B2** (Very high biodiversity significance) Imogene Pass is the site of an excellent occurrence of the San Juan whitlow-grass, a plant that is imperiled on a global scale, and known only from Colorado.

**Protection Urgency Rank: P3** There is a definable threat to the occurrence, but not expected within the next five years.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Imogene Pass is located 3.9 air miles east of Telluride, Colorado on the Ouray-San Miguel county line in extreme eastern San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Ironton

**Legal description:** T42N R8W Section 3, 4; T43N R8W Sections 33, 34.

**Elevation range:** 12,000 to 13,114 feet

**Size:** 304 acres

**General Description:**

At 13,200 ft., Imogene Pass is the highest point in the study area that is accessible by motorized vehicles. The four wheel drive road, connecting Telluride and Ouray, is a popular drive, with fairly heavy traffic during the summer. Vegetation at the PCA ranges from subalpine meadows filled with wildflowers, to alpine tundra, barren rock and scree slopes. Snowbanks often last throughout the summer. Typical alpine plants in this PCA are New Mexican groundsel, McCauley's buttercup, wallflower, sky pilot, alpine fescue, golden saxifrage, alpine bluegrass, alpine avens, moss campion, cutleaf daisy, Glaber daisy, alpine parsley, Colorado ragwort, alpine smelowskia, and thickroot claytonia. No exotic plants were observed at the PCA.

Figure 68. Imogene Pass, habitat of San Juan whitlow-grass

At Imogene Pass researchers found four rare plant species, including 3 diminutive drabas (whitlow-grasses) and the Altai chickweed. The most rare of these, the San Juan whitlow-grass, was abundant along the ridge that extends north from the top of the pass, and between Savage Creek and the road on the Telluride side, below the switchbacks. This occurrence now constitutes the largest one known in Colorado. Of the 25 previously documented occurrences in the state, the largest was estimated at 200 plants, and most comprised less than 50 individuals or had not been evaluated. At Imogene Pass, the estimated the number of individuals was in the thousands. The plants were usually found

about 20 to 50 feet from late-melting snowbanks, occurring with another snow-loving plant, McCauley's snow buttercup, in otherwise barren, gravelly soil.

Three sub-populations of the Arctic draba were found, along a small road extending southeast from the summit, and on the Telluride side of the pass below the San Juan whitlow-grass site, extending as far downhill as Savage Basin. The plants were growing in both disturbed and undisturbed sites, and in well vegetated as well as barren areas. Typical locations were along roads, at the edges of small knolls and islands of vegetation within loose scree areas, and at the base of large boulders. The thick-leaf whitlow-grass occupied similar and overlapping habitats.

Altai chickweed occupied sites in the loose scree on steep slopes where there was some packed soil resulting from natural slides or animal trails. There was little other vegetation in these sites. The elastic roots of the chickweed enable it to survive by moving downhill along with the creeping rocks. The tiny plants numbered in the thousands, and in some places made up nearly 50% ground cover.

Natural Heritage element occurrences at the Imogene Pass PCA.

| Element | Common Name | G rank | S rank | Federal/State status | EO* rank |
|---|---|---|---|---|---|
| ***Draba graminea*** | **San Juan whitlow-grass** | **G2** | **S2** | | **A** |
| *Draba crassa* | Thick-leaf whitlow-grass | G3 | S3 | | B |
| *Draba fladnizensis* | Arctic draba | G4 | S2S3 | | E |
| *Stellaria irrigua* | Altai chickweed | G4? | S2 | | A |

*EO=Element Occurrence

**Biodiversity comments:** The biodiversity rank of this PCA is based on the excellent occurrence of the San Juan whitlow-grass, a plant that is imperiled on a global scale and in Colorado. In addition, there is a good occurrence of the globally vulnerable thick-leaf whitlow-grass, and an excellent occurrence of Altai chickweed, rare in Colorado. The Arctic draba, rare to vulnerable in Colorado, was not given an occurrence rank, as the record is based on a herbarium specimen with no abundance data given.

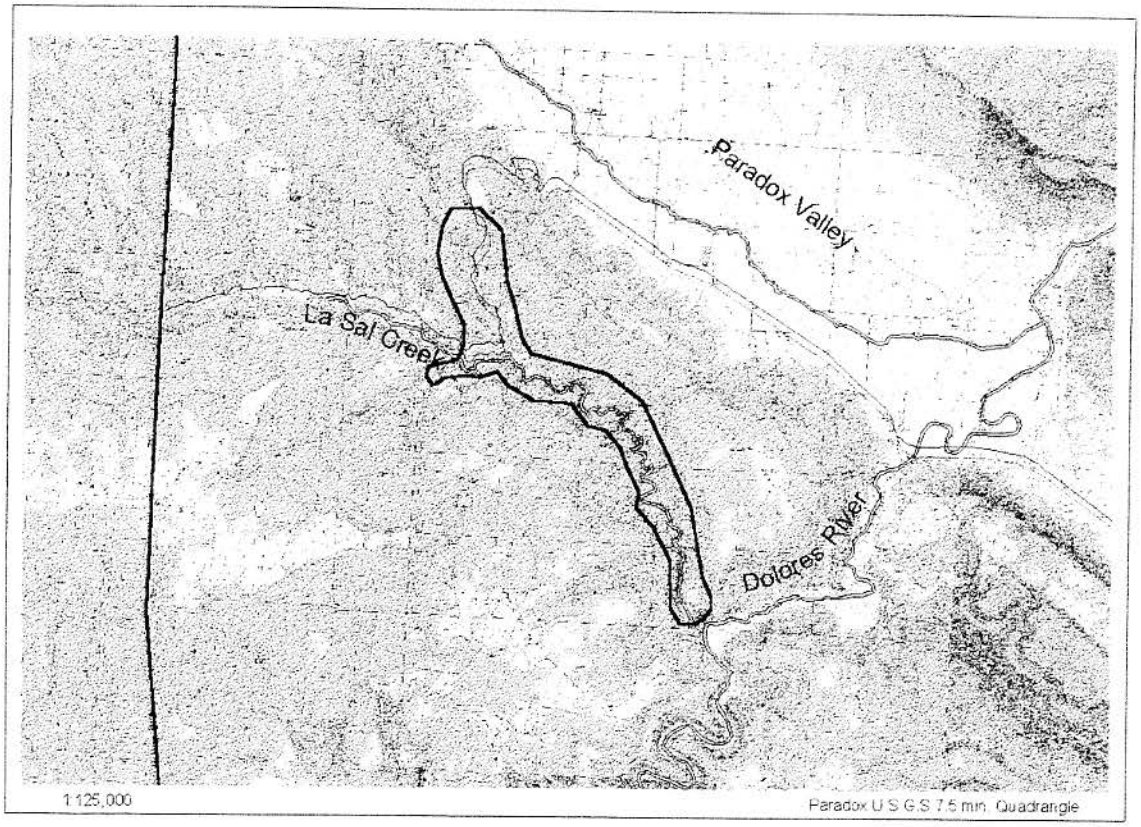
**Boundary Justification:** The boundary is drawn to encompass the occurrences of four rare plant species, from Imogene Pass west to Savage Basin. Intervening potential habitat is included to allow these species to move over time and colonize new sites.

**Protection Rank Comments:** There is some potential for development of private mining claims within the PCA. National Forest Service may acquire mining claim inholdings. This would help insure survival of the rare plants.

**Management Rank Comments:** Off road vehicles could damage the rare plant populations. Foot traffic is of less concern, although the plants immediately at the summit could be jeopardized. Further inventory is needed to determine the full extent of these occurrences. Monitoring of this site will aid in the detection of changes in the number of individuals and the condition of the rare plant populations that would warrant management intervention.

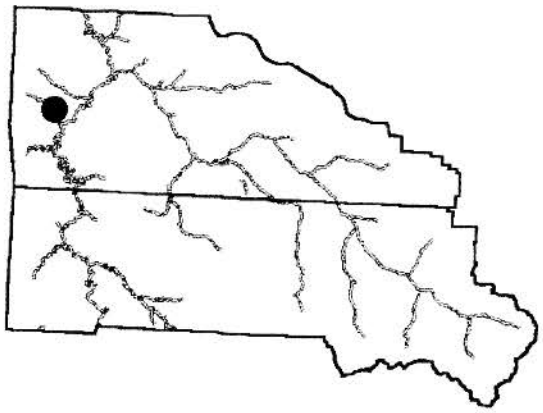
# La Sal Creek

## Potential Conservation Area




1 0 1 2 3 4 Miles

N



# La Sal Creek

**Biodiversity Rank: B1** (Outstanding biodiversity significance) La Sal Creek is the only known location in Colorado of the box elder/river birch riparian community, which is critically imperiled on a global scale.

**Protection Urgency Rank: P3** There is a definable threat to this occurrence, but not expected within the next five years.

**Management Urgency Rank: M2** Ongoing, recurring management must continue to prevent loss of this element occurrence.

**Location:** La Sal Creek is located 3.0 air miles east of Bedrock, Colorado in extreme western Montrose County.

U.S.G.S. 7.5 minute quadrangles: Paradox

**Legal description:** T47N R19W Sections 8,15-17, 20-23, 26, 27, 35.

**Elevation range:** 5,000 to 6,200 feet

**Size:** 2,393 acres

**General Description:**

This PCA circumscribes the canyon of La Sal Creek, a tributary that enters the Dolores River just upstream from Bedrock, Colorado, and includes part of the canyonsides of Spring Creek, a tributary of La Sal Creek. La Sal Creek cuts a narrow sandstone canyon that drops as much as 100 feet in places, and separates Nyswonger Mesa to the east from Ray Mesa to the west. Dramatic Navajo sandstone cliffs striped with desert varnish form the sides of the canyon. The soil at the PCA consists of the Zyme composition characterized by mesic, clayey, ustic torriorthents. A dirt road follows the stream several miles, ending at the Cashen uranium mine.

A critically imperiled plant association consisting of box elder and river birch was first documented here during CNHP's riparian survey of 1991 (Kittel 1993). Since then, the same association has been looked for in many similar canyons, to no avail. In the narrow band of riparian vegetation, box elder accounts for as much as 70% cover, with river birch providing 25 to 60% cover. New Mexico privet, coyote willow, red-osier dogwood, giant reed, and wild rose are also common. Although there are some introduced pasture grasses, including Kentucky bluegrass, there is no tamarisk along the upper part of the creek.

Upland vegetation consists of pinyon-juniper woodland with both true and dwarf mountain mahogany, cliffrose, Gambel's oak, yucca, cacti, and rabbitbrush. A good sized population of the Paradox breadroot, with several hundred plants, was found on a dry bench overlooking La Sal Creek. Although there is a specimen of the Payson lupine from this location at Brigham Young University herbarium, this species was not found here during this survey. An excellent quality relic occurrence of native bunchgrasses typical of Western Slope grasslands was documented in the lower end of the PCA by

BLM in 1980. This association was formerly called "Stipa comata West", although it is not necessarily dominated by needle and thread grass. At this site it consisted of a mixture of 22% galleta, 11% needle-and-thread, 3% Indian ricegrass and 7% blue grama.

Animals of note recorded from this PCA include the tree lizard, and the plateau striped whiptail, which this survey has found to be common in western Montrose and San Miguel counties. Trends are not documented for these reptiles, but there are no suggestions of declines and many occurrences are on protected public lands.

Natural Heritage element occurrences at the La Sal Creek PCA.

| Element | Common Name | G rank | S rank | Federal/State status | EO* rank |
|---|---|---|---|---|---|
| ***Acer negundo/Betula occidentalis*** | **Boxelder/river birch** | **G1G2** | **S1** | | **B** |
| *Stipa comata* | Needle and thread (Great Basin herbaceous vegetation) | G2G4 | S2? | | A |
| *Lupinus crassus* | Payson lupine | G2 | S2 | BLM | E |
| *Pediomelum aromaticum* | Paradox breadroot | G3 | S2 | BLM | A |
| *Pediomelum aromaticum* | Paradox breadroot | G3 | S2 | BLM | E |
| *Juniperus osteosperma/Cercocarpus intricatus* | Xeric western slope pinyon-juniper woodlands | G? | S? | | A |
| *Cnemidophorus velox* | Plateau striped whiptail | G5 | S4 | | A |
| *Urosaurus ornatus* | Tree lizard | G5 | S4 | | E |

*EO=Element Occurrence

**Biodiversity comments:** The biodiversity rank of this PCA is based on the excellent occurrence of a critically imperiled plant community. Only a few other small occurrences of this community are known. The PCA also includes an excellent occurrence of a grassland community that is globally vulnerable, and is of unknown rarity in Colorado. This PCA also contains an excellent occurrence of a xeric pinyon-juniper woodland plant community that is considered to be globally vulnerable. In addition, there is an excellent occurrence of the globally vulnerable Paradox breadroot, and a historic record of Payson lupine, based on a herbarium collection from 1982.

**Boundary Justification:** The boundary was drawn to encompass the canyon of La Sal Creek, including the riparian and upland vegetation communities, from the intersection of County Road X4 to just above the confluence with the Dolores River. Also included is the canyonside west of Spring Creek, a tributary of La Sal Creek that parallels Highway 90 between Paradox and La Sal Creek. This hillside contains a good representation of the typical canyon rim plant community found in this area. The lowest part of La Sal Creek, at the confluence, is in very poor condition, with heavy tamarisk invasion, and is therefore not included in the PCA.

**Protection Rank Comments:** Future plans for the private lands within the PCA are unknown. BLM lands would be appropriate for special protection such as ACEC designation. Protection of the private lands by acquisition, purchase of development rights or conservation easement would help to preserve the integrity of the canyon.

**Management Rank Comments:** Management emphasis on the BLM lands in this PCA is directed toward protecting the riparian plant communities. Livestock grazing in this narrow canyon is incompatible with this goal, as there is very little available feed except in the riparian area. Decisions on continued livestock use are pending.

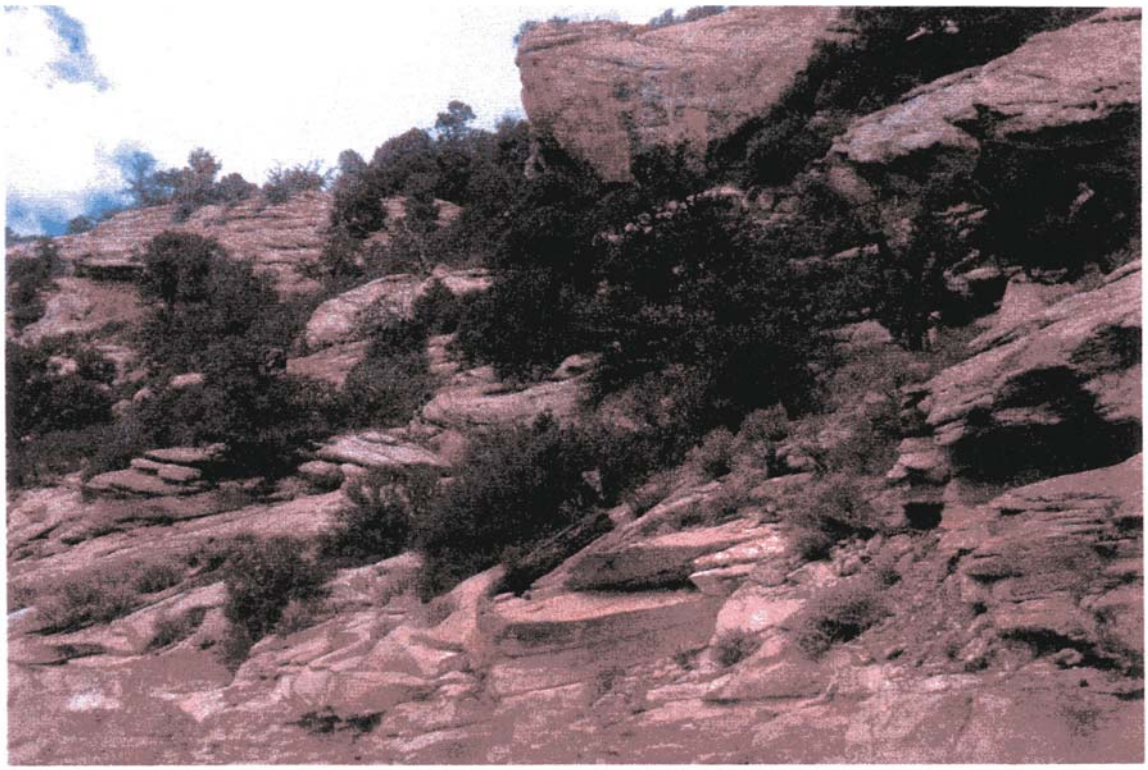
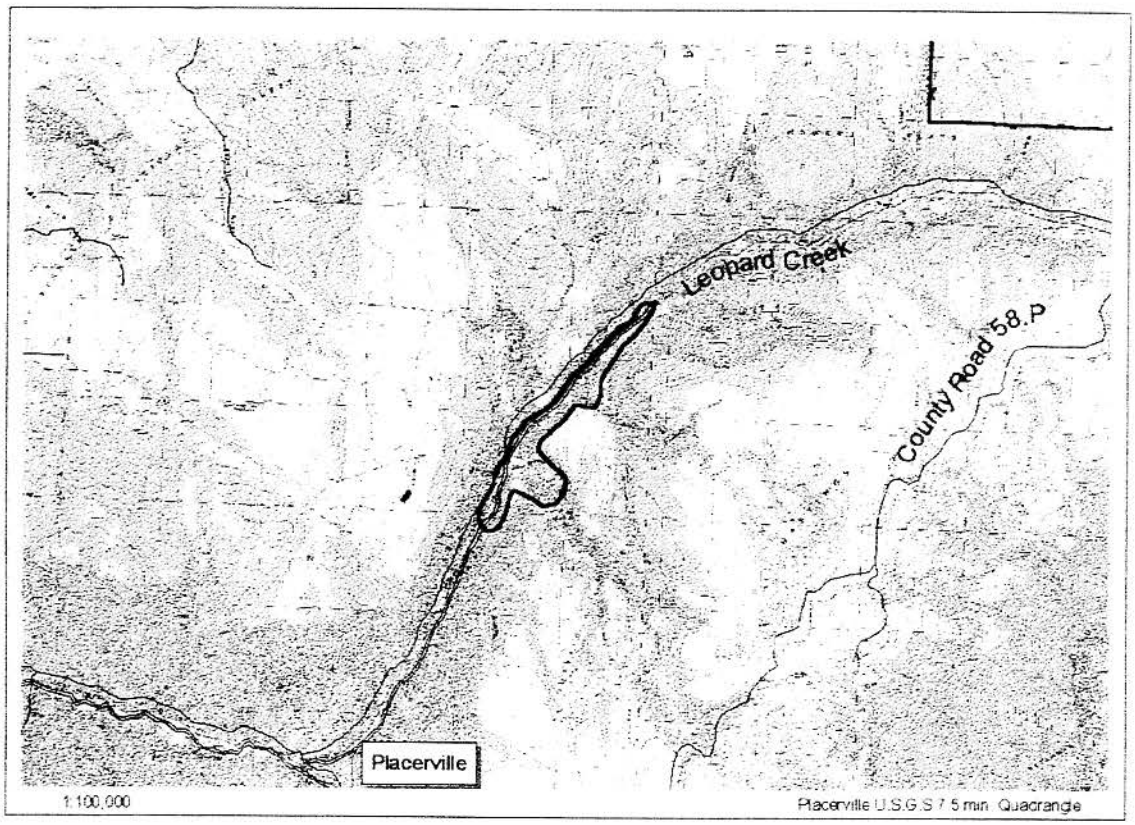


Figure 69. Upland vegetation with Utah juniper and dwarf mountain mahogany at La Sal Creek PCA.

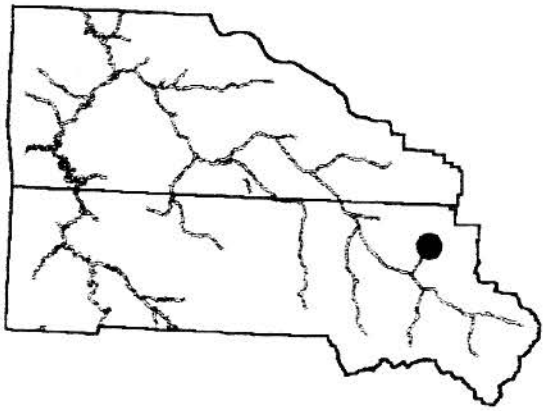
# Leopard Creek

## Potential Conservation Area




1 0 1 2 3 4 Miles

N



# Leopard Creek

**Biodiversity Rank: B4** (Moderate Biodiversity Significance) Leopard Creek has a fair occurrence of a willow community that is considered to be vulnerable on a global scale.

**Protection Urgency Rank: P2** A definable threat is expected in this PCA within the next five years.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** The Leopard Creek PCA is located 3.25 air miles northeast of Placerville, Colorado along Colorado Highway 62, between Placerville and Ridgway, Colorado, in San Miguel County.

U.S.G.S. 7.5 minute quadrangle: Placerville

**Legal description:** T44N R10W Sections 6, 7; T44N R11W Sections 12, 13, 24.

**Elevation range:** 7,600 to 8,400 feet

**Size:** 490 acres

**General Description:**

Extensive tall, dense willow carrs, interspersed with sedge wetlands, characterize the Leopard Creek riparian zone between Sheep Draw and Alder Creek. Beavers originally created the ponds that have succeeded to sedges and willows in this broader part of the canyon. Other plant species found in the riparian area include Nebraska sedge, thinleaf alder, Kentucky bluegrass, coneflower, and cow parsnip. Adjacent uplands are forested with aspen, Douglas fir, Ponderosa pine, Gambel's oak and Engelmann spruce.

Major flooding in 1999 showed dramatically the resilience of this plant community to disturbance. Whereas, in narrow parts of the canyon, huge boulders and trees were uprooted and soil erosion was severe, the area within this PCA remained relatively unscathed.

Natural Heritage element occurrences at the Leopard Creek PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Salix geyeriana-Salix monticola*/mesic forb** | **Geyer's willow-rocky mountain willow/mesic forb** | **G3** | **S3** | | **C** |

*EO=Element Occurrence

**Biodiversity comments:** The PCA rank is based on a fair example of the globally vulnerable Geyer's willow-rocky mountain willow/mesic forb plant community.

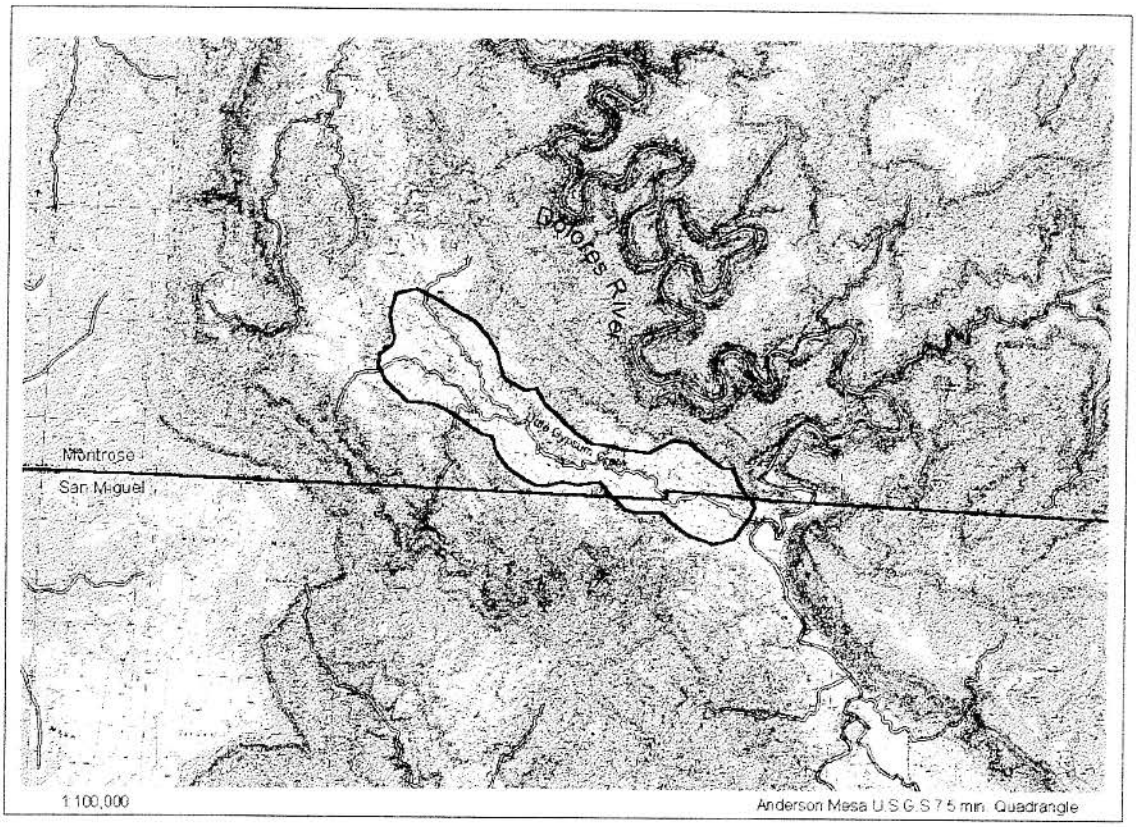
**Boundary Justification:** The PCA includes the willow and sedge communities near the confluence with Alder Creek, and a buffer of additional land in the riparian area upstream.

**Protection Rank Comments:** The land is privately owned and subject to development.

**Management Rank Comments:** No special management needs are known.

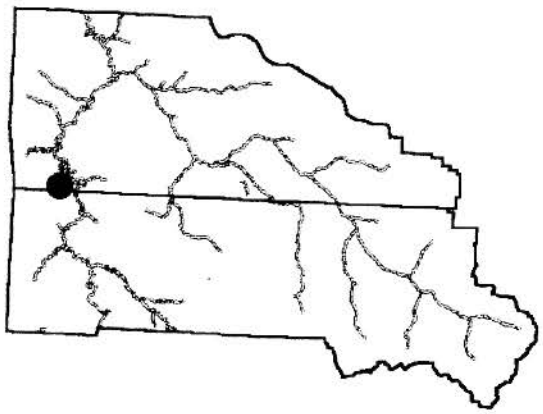
# Little Gypsum Valley

## Potential Conservation Area




1 0 1 2 3 4 Miles

N



# Little Gypsum Valley

**Biodiversity Rank: B4** (Moderate Biodiversity Significance) Little Gypsum Valley has a fair occurrence of Naturita milkvetch, a plant considered to be vulnerable on a global scale.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Little Gypsum Valley is located 7.8 air miles north of the old townsite of Slick Rock, Colorado on the San Miguel County and Montrose County border in western Colorado.

U.S.G.S. 7.5 minute quadrangles: Anderson Mesa

**Legal description:** T45N R18W Section 18; T45N R19W Sections 3, 10-14.

**Elevation range:** 5,400 to 5,861 feet

**Size:** 1,809 acres

**General Description:**

This PCA is located in southwestern Montrose county extending partially into extreme northwestern San Miguel County. The PCA circumscribes Little Gypsum Valley, the continuation of Big Gypsum Valley north of the Dolores River. The geologic features of the area include Quaternary landslide deposits, Cretaceous Mancos Shale, and the Jurassic Morrison, Summerville, and Entrada Formations. The valley is the result of a large sea embayment separated from the remaining sea that covered this area in the Pennsylvanian age. Upon evaporation of this sea, its salts became concentrated in domes overlain with sedimentary rock. Once these sedimentary rocks were breached by erosion, the domes, comprised of soluble salt and gypsum, were washed away and the flanking structures collapsed, leaving the broad valleys at Paradox, Gypsum, and Dry Creek. Soils of the PCA consist of the Mikim composition characterized by ustic torriothents, fine-loamy, mixed (calcareous), and mesic soils.

The Naturita milkvetch was found on a low sandstone hill, where bedrock of the Salt Wash member of the Morrison Formation was exposed above the Mancos Shale of the valley bottom. This was a small population, but the species appears to be widely distributed in the western parts of San Miguel and Montrose counties in suitable habitat. A previous herbarium record from this area listed the habitat as “open pinyon-juniper woodland with sagebrush openings”.

The little penstemon record is taken from a herbarium specimen at the University of Colorado. Its habitat was given as “gently sloping valley floor, sheep driveway.”

The Yuma skipper, a rare butterfly, was observed along the Dolores River within this PCA. It was occupying a stand of the giant reed, its host plant, which occurs extensively throughout the Dolores River drainage. There are only four records of the

Yuma skipper in Colorado, three from Mesa and Delta counties in the late 1970's and early 1960's, and the one from this PCA in 1999. The Yuma skipper is of conservation concern in the state because of so few occurrences, small populations, colonial breeding, and its restriction to wetland habitats. Tamarisk invasion, common through its range, may threaten Yuma skipper habitat by displacing the giant reed (CNHP 1999). Protection of natural wetlands with stands of giant reed will help to assure continued existence of this species in Colorado.

Also recorded from this PCA were two Gray Vireos and a plateau striped whiptail. Within Colorado, trends of the Gray Vireo are not adequately monitored. Stokes and Stokes (1996) report an increase in the western region of the United States. Destruction of pinyon-juniper woodlands is a threat to this species. According to recent surveys, the plateau striped whiptail is more common in Colorado than previously thought, and there are no known threats for this species.

Natural Heritage element occurrences at the Little Gypsum Valley PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Astragalus naturitensis*** | **Naturita milkvetch** | **G3** | **S3** | **BLM, USFS** | **C** |
| *Astragalus naturitensis* | Naturita milkvetch | G3 | S3 | BLM, USFS | E |
| *Penstemon breviculus* | Little penstemon | G3Q | S2 | BLM | E |
| *Ochlodes yuma* | Yuma skipper | G5 | S2 | | C |
| *Vireo vicinior* | Gray vireo | G4 | S2B,SZN | | E |

*EO=Element Occurrence

**Biodiversity comments:** This PCA contains a good occurrence of the Naturita milkvetch, considered to be globally vulnerable. The second milkvetch and the Little penstemon records are more than ten years old, and their present condition is unknown. Breeding populations of the Gray Vireo are rare in Colorado. This population is not ranked, but was confirmed to be breeding, according to the Breeding Bird Atlas (Kingery 98). The PCA includes an occurrence of the Yuma skipper, a butterfly that is rare in Colorado.

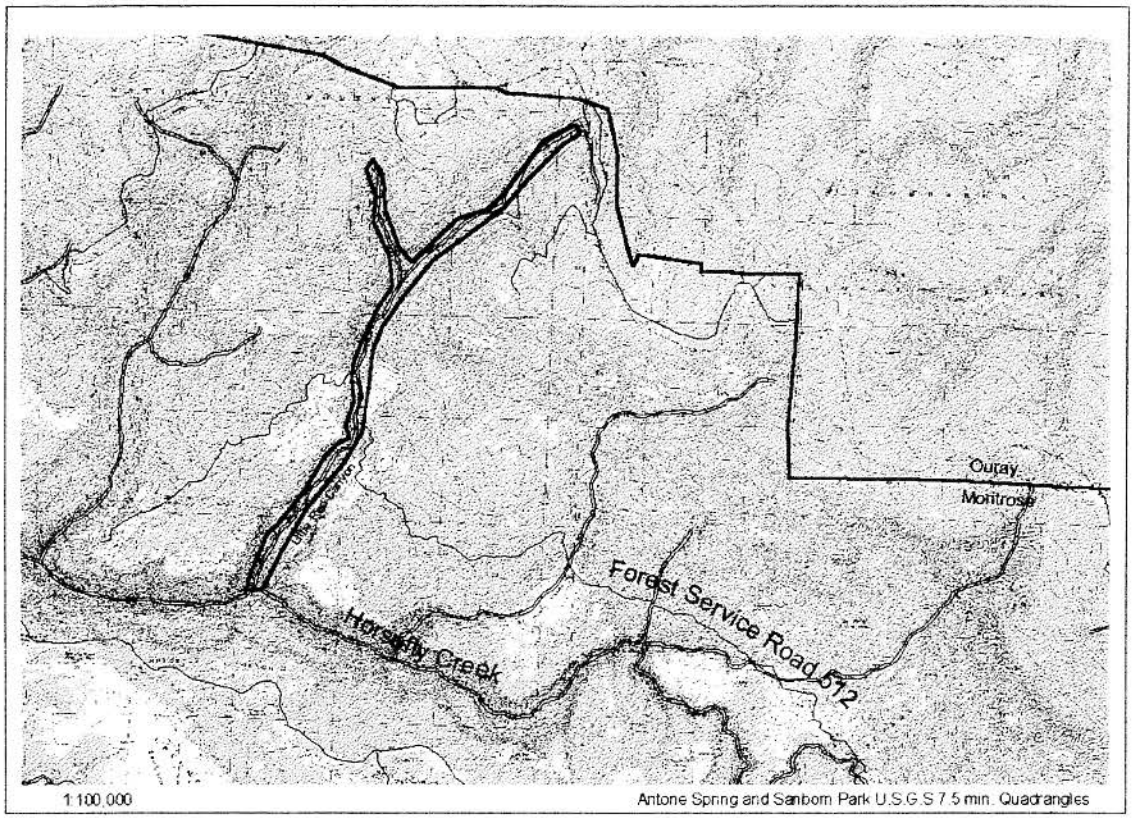
**Boundary Justification:** The PCA includes the locations of the Naturita milkvetch and Little penstemon occurrences, as well as adjacent areas that appear to be suitable habitat for those species. This extended area would provide new sites for the plants to occupy in the future. The site does not provide for all the needs of the bird species.

**Protection Rank Comments:** The PCA is located entirely on BLM lands with no special protection. Protection from surface disturbances at this site would be beneficial to the plant population.

**Management Rank Comments:** No special management needs are known for this PCA. The BLM management plan emphasizes livestock management.

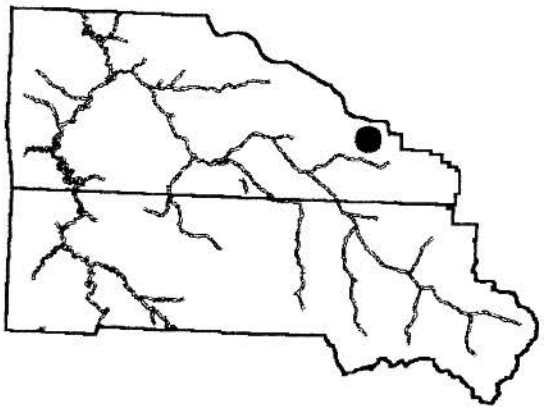
# Little Red Canyon - Horsefly Creek

## Potential Conservation Area




1 0 1 2 3 4 Miles

N



# Little Red Canyon-Horsefly Creek

**Biodiversity Rank: B4** (Moderate Biodiversity Significance) The Little Red Canyon-Horsefly Creek PCA contains a good example of the blue spruce/red-osier dogwood montane forest, a plant community that is rare in Colorado.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Little Red Canyon-Horsefly Creek 10.75 air miles northeast of Norwood, Colorado in south-central Montrose County.

U.S.G.S. 7.5 minute quadrangles: Antone Spring

**Legal description:** T46N R12W Sections 2, 3; T47N R12W Section 35.

**Elevation range:** 8,400 to 9,200 feet.

**Size:** 331 acres

**General Description:**

This PCA is north of Sanborn Park in Montrose County. Little Red Creek is a short (~6.0 miles) tributary of Horsefly Creek. The creek forms a canyon over its length and the PCA circumscribes the bottom one third of the canyon. The canyon walls are of moderate slopes that drop for approximately 100 feet to the canyon floor. The geologic features include Jurassic Morrison, Summerville, and Entrada Formations; and the Mesa Verde and Dakota formations of the Cretaceous. Soils are of the Fughes composition (pachic argiborolls, fine, montmorillontic) and the Hapgood Family (pachic cryoborolls, loamy skeletal, mixed).

The upland vegetation of the area is predominantly aspen and Gambel's oak. During CNHP's riparian survey in 1991, several high quality riparian areas were identified, and were revisited in 1999. A dense stand of mature narrowleaf cottonwoods with an understory of red-osier dogwood occupies terraces of the old flood plain on gravelly sandy clay loam soils. Cottonwoods appeared to be regenerating successfully. Associated species are serviceberry, river birch, sweet cicely, meadowrue, coneflower, triangle leaf groundsel, chiming bells, twinberry honeysuckle, Rocky Mountain willow, hawthorn, and false solomonseal. The few exotic species included red clover, meadow timothy, smooth brome, and dandelion.

Wetlands of water sedge and rushes were recorded in a former channel downstream from a beaver dam. Wetter adjacent areas had more spike rush and fowl mannagrass. Both of these communities are dynamic, dependent on beaver activity to bring about succession from stream channel to pond, to wetlands, and then creating new stream channels as dams break. In a narrower part of the canyon, a high quality stand of Colorado blue spruce with red-osier dogwood was documented. Moderate cattle grazing was noted.

A population of Colorado River cutthroat trout inhabits the creek at Little Red Canyon-Horsefly Creek. The fish is of conservation concern at the global and state levels due to long term trend prognoses and threats. Populations continue to decline in many streams (Young *et al.* 1996). Hybridization between this subspecies and non-native trout species poses the greatest threat to the elimination of pure populations. Competition with non-native trout species and exotic fish diseases also pose threats. Other concerns include habitat alteration/fragmentation from overgrazing by livestock, logging, toxic effluents from mining, and water diversion for irrigation (Spahr *et al.* 1991, Behnke 1992, Young 1995). Populations are susceptible to over-harvest if angling is unrestricted.

Natural Heritage element occurrences at the Little Red Canyon-Horsefly Creek PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Picea pungens/Cornus sericea*** | **Blue spruce/red osier dogwood montane riparian** | **G4** | **S2** | | **A** |
| *Populus angustifolia/Cornus* | Cottonwood riparian forest | G4 | S3 | | A |
| *Oncorhynchus clarki pleuriticus* | Colorado river cutthroat trout | G4T3 | S3 | | E |
| *Carex aquatilis* | Montane wet meadows | G5 | S4 | | A |

*EO=Element Occurrence

**Biodiversity comments:** The biodiversity rank of this PCA is based on a good to excellent occurrence of the blue spruce/red osier dogwood montane riparian forest, considered to be a rare community in Colorado. Also recorded in the PCA was a good to excellent occurrence of cottonwood riparian forest, vulnerable in Colorado. Montane wet meadows dominated by water sedge, although not rare, were found to be in good to excellent condition. Colorado cutthroat trout is known from the creek, but the quality and viability of the population has not been determined. This subspecies of trout is considered to be vulnerable both globally and in Colorado.

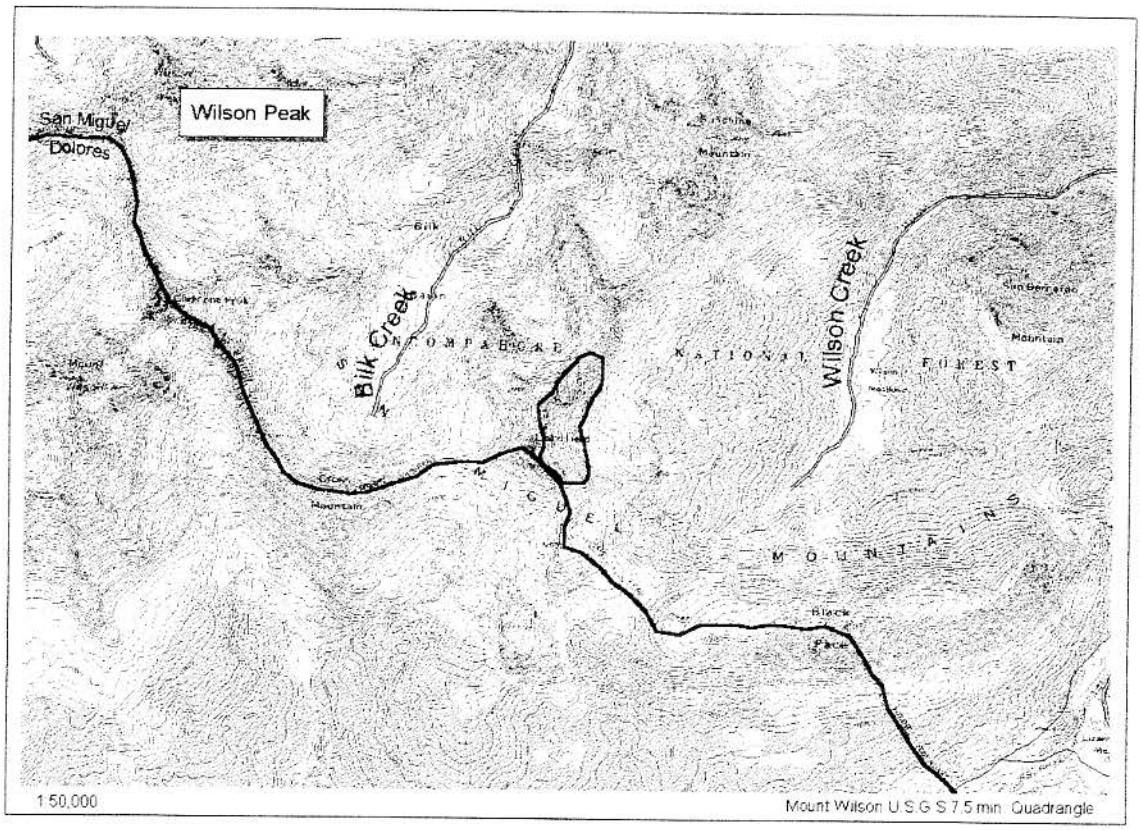
**Boundary Justification:** The boundary is drawn to include the documented riparian communities in Little Red Canyon-Horsefly Creek. It does not include the entire area that would be of importance for the survival of the cutthroat trout population.

**Protection Rank Comments:** The PCA is entirely within the Uncompahgre National Forest. There is no special protection in place and no threats warranting special protection have been identified.

**Management Rank Comments:** Management strategies for cutthroat trout include construction of fish barriers to prevent interbreeding with other trout, rehabilitation of both stream banks and water quality, elimination of non-native trout through chemical treatment, and transplanting genetically pure cutthroat into rehabilitated habitat (Spahr *et al.* 1991). Colorado has instituted restrictive angling regulations (Young 1995).

# Lizard Head

## Potential Conservation Area

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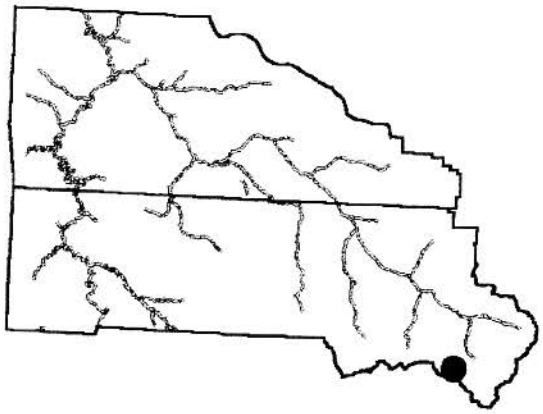


# Lizard Head

**Biodiversity Rank: B4** (Moderate Biodiversity Significance) The Lizard Head PCA has an excellent occurrence of the Altai chickweed, a plant that is rare in Colorado.

**Protection Urgency Rank: P5** Land protection is complete.

**Management Urgency Rank: M5** No management needs are known or anticipated.

**Location:** Lizard Head is located 10.0 air miles southwest of Telluride, Colorado on the Dolores-San Miguel county line in eastern San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Mount Wilson

**Legal description:** T41N R10W Sections 2, 3, 10, 11.

**Elevation range:** 11,800 to 12,800 feet.

**Size:** 82 acres

**General Description:**

Lizard Head is a well-known landmark in San Miguel County. The volcanic intrusion that once had the shape of a Lizard's Head, has since lost its nose, but the surrounding area beneath the monolith is as magnificent as ever. As one climbs, vegetation changes from aspen, to moist spruce-fir forests, and finally alpine tundra. On the alpine slopes at the base of Lizard Head, researchers found two plant species that are rare in Colorado, the Altai chickweed and the common moonwort.

The chickweed was found in a north-facing cirque to the northeast of the massif. It was growing among treacherous, unstable talus ranging in size from large blocks to gravel, composed of volcanic materials from the cliffs above. Associated plant species in the area included king's crown, Indian paintbrush, spike trisetum, alpine avens, Colorado columbine, kittentails, wallflower, sheep sorrel, and sky pilot. There were no exotic plant species present. Three sub-populations consisting of thousands of individuals in a pristine setting were located. Although adjacent similar habitats were searched, the chickweed was not present.

The moonwort was also growing in loose scree, about one to ten centimeters in diameter, on a steep slope northeast of the chickweed site. Associated taxa at that location included black groundsel (a frequent companion to moonworts), King's crown, rose paintbrush, New Mexican groundsel, edible valerian, and Whipple penstemon.

This PCA is within the Lizard Head Wilderness of the Uncompahgre National Forest. Any disturbance to the site is likely to be natural.

Natural Heritage element occurrences at the Lizard Head PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Stellaria irrigua*** | **Altai chickweed** | **G4?** | **S2** | | **A** |
| *Botrychium lunaria* | Common moonwort | G5 | S2S3 | | B |

*EO=Element Occurrence

**Biodiversity comments:** In addition to the Altai chickweed, rare in Colorado, the PCA has a good population of the common moonwort, considered to be globally secure, but rare to vulnerable in Colorado.

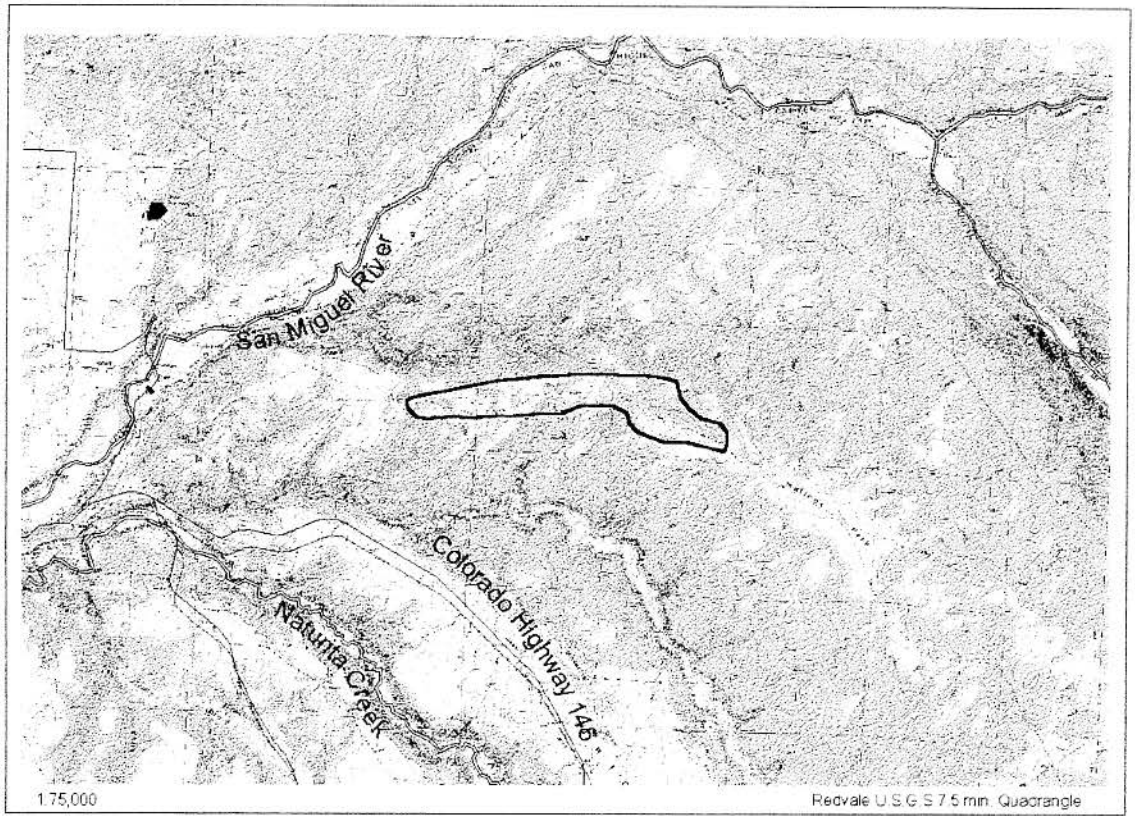
**Boundary Justification:** The boundary is drawn to include the scree slopes northeast of Lizard Head, the site of two rare plant populations.

**Protection Rank Comments:** The PCA is protected within the Lizard Head Wilderness.

**Management Rank Comments:** There were no exotic species observed. Disturbances at this PCA tend to be natural.

# Mailbox Park

## Potential Conservation Area

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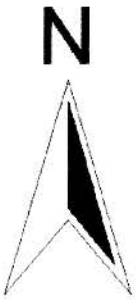
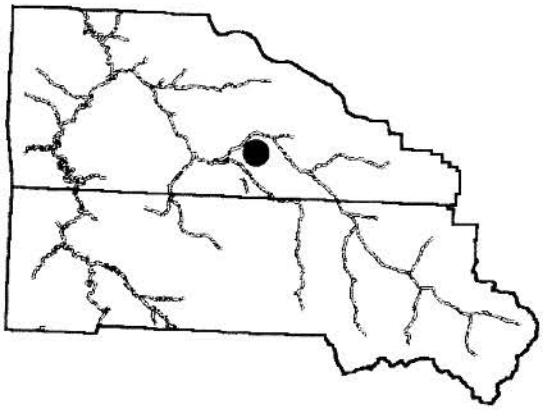


# Mailbox Park

**Biodiversity Rank: B3** (High Biodiversity Significance) The Mailbox Park PCA has a good occurrence of Naturita milkvetch, a plant considered to be vulnerable on a global scale.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Mailbox Park PCA is located 4.9 air miles east of Naturita, Colorado in western Montrose County.

U.S.G.S. 7.5 minute quadrangles: Redvale

**Legal description:** T46N R14W Sections 17, 18; T46N R15W Section 13.

**Elevation range:** 6,100 to 6,400 feet

**Size:** 404 acres

**General Description:**

Mailbox Park occupies a ridge top between the San Miguel River on the north and Naturita Creek on the south. Outcrops of sandstone pavement with very thin soils characterize its southern rim. Vegetation consists of pinyon-juniper woodland, with much bare sandy soil, and generally well developed cryptogamic soil crusts. There are some level areas of sagebrush interspersed with the wooded areas. The area appears to be heavily used for hunting, but not much used for the rest of the year. A power line and gravel road run through the PCA. The PCA is primarily on BLM land, but also includes about 120 acres of private land.

A large, widely scattered population of the Naturita milkvetch was found along the south rim of this PCA. The plants were most abundant in crevices of the sandstone pavement, but sometimes also occurred in deeper soils. Individuals were very small, and few had flowers or fruit. Common plant species associated with the Naturita milkvetch at this PCA are scarlet globemallow, Townsend's Easter daisy, rough-seed cats-eye, twin bladderpod, fineleaf hymenopappus, Eastwood-plant, and snakeweed.

Natural Heritage element occurrences at the Mailbox Park PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Astragalus naturitensis*** | **Naturita milkvetch** | **G3** | **S3** | **BLM, USFS** | **B** |

*EO=Element Occurrence

**Biodiversity comments:** The Naturita milkvetch is the only tracked element found in this PCA.

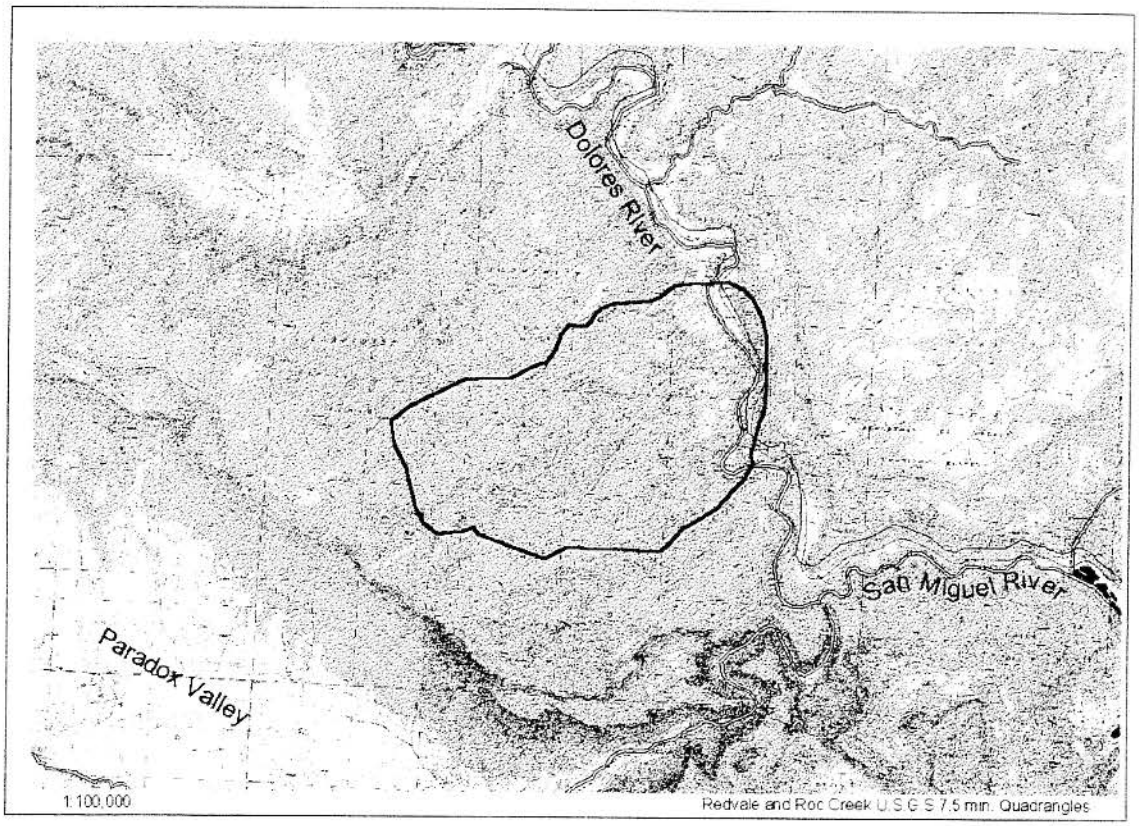
**Boundary Justification:** The boundary was drawn to encompass the ridge top that is the site of the Naturita milkvetch. Adjacent areas with deeper soils and sagebrush do not supply the required habitat for this species.

**Protection Rank Comments:** The PCA includes a combination of BLM and private lands. No special protection should be needed for the Naturita milkvetch at this location

**Management Rank Comments:** There are infestations of Russian knapweed and cheatgrass in disturbed areas along the road. These could increase with heavy off-road ATV use. Currently, away from roads, there are few exotic species. The habitat of the Naturita milkvetch, with its shallow soils, is probably secure from weed invasion. Off road vehicle traffic could potentially affect the plants.

# Martin Mesa

## Potential Conservation Area

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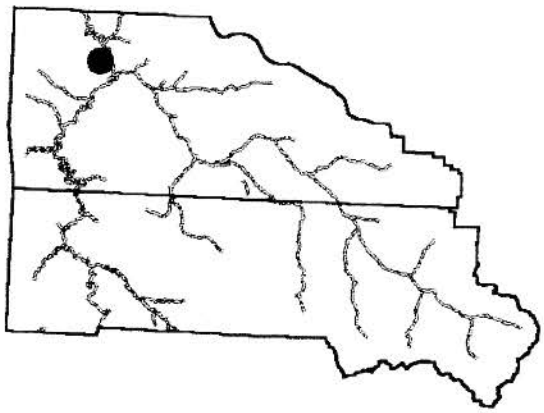
N



# Martin Mesa

**Biodiversity Rank: B4** (Moderate Biodiversity Significance) Martin Mesa has an excellent population of the pale lump-nosed bat, apparently secure on a global scale, but rare in Colorado.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M3** Ongoing, recurrent management action would help to maintain the current quality of element occurrences.

**Location:** Martin Mesa is located 3.0 air miles northeast of Bedrock, Colorado in west-central Montrose County.

U.S.G.S. 7.5 minute quadrangles: Red Canyon and Roc Creek

**Legal description:** T048N R018W Sections 11, 14-17, 20-23, 26-29.

**Elevation range**: 4760 to 6760 feet.

**Size:** 4347 acres

**General description:**

Martin Mesa is a relatively flat mesa top with a gradual incline from the top of the Dolores River Canyon on the east to the edge of Paradox Valley on the west. The PCA includes within its boundaries both the tops of Martin Mesa and Carpenter Flats on the west. On the east, the PCA includes the rugged canyons and sheer cliffs of Red Canyon, Beehive Canyon and the Dolores River Canyon north of Uravan, Colorado. The PCA sits atop Morrison, Summerville, and Entrada Formations of the Jurrasic. Kayenta, Wingate, and Chinle Formations of the Triassic are exposed in the canyons. Soils within the PCA are mixed mesic, and range from coarse-loamy to clayey, and calcareous. Dominant vegetation of the PCA includes pinyon-juniper woodland and big sagebrush. Grasses common to the PCA include needle-and-thread grass, blue grama, galleta, Indian ricegrass, western wheatgrass, bottlebrush squirreltail, and other perennial grasses and forbs. Black sagebrush, big sagebrush, winterfat, shadscale, and fourwing saltbush, are common shrubs. Approximately 93% of the PCA is owned by the BLM, Uncompahgre Basin Resource District, with the remaining 8% held in private mining claims.

Located within the boundary of this PCA are the open portals and associated tunnels of over 70 mines that supply roosting and maternity habitat, and hibernacula for the pale lump-nosed bat. There were 40 observations of pale lump-nosed bats from 17 mines within the PCA in 1999 (Navo *et al.* 1999). Although there are no confirmed maternity roosts at the PCA, there are 11 mines identified with hibernating bats representing 4 distinct hibernacula. Numerous reproductive male and post lactating female pale lump-nosed bats have been documented from the PCA.

These bats prefer relatively cold places for hibernation, often near entrances and in well-ventilated areas. These restrictive requirements are often difficult to find, thus limiting the abundance of this bat in Colorado. Throughout much of the known range,

pale lump-nosed bats commonly occur in mesic habitats containing pinyon-juniper woodlands and/or semi-desert shrublands similar to the Martin Mesa PCA.

Natural Heritage element occurrences at the Martin Mesa PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO*rank |
|---|---|---|---|---|---|
| ***Corynorhinus townsendii*** | **Pale lump-nosed bat** | **G4T4** | **S2** | **BLM** | **E** |

*EO=Element Occurrence

**Biodiversity comments:** This PCA offers the best known concentration of pale lump-nosed bats in Colorado. Prior to the summer of 99 there were only 20 occurrences recorded in the state within the last ten years. The high quality of the bat population makes this PCA of moderate biological significance and of immediate importance to the conservation of pale lump-nosed bats in Colorado.

**Boundary Justification:** The boundary of this PCA was drawn to include all mines known to be inhabited by pale lump-nosed bats on Carpenter flats and Martin Mesa. It also includes the chasms of Red and Beehive Canyons and the Dolores River Canyon, the sheer rock cliffs of which supply day roosting sites for this bat during its non-hibernating period. Also included within the PCA are the waterways of the Dolores River, and Red and Beehive drainages along which the bats will acquire water and forage, and the foraging habitat of the pinyon-juniper woodlands surrounding the mines. It is difficult to define the distance foraging pale lump-nosed bats will travel from hibernacula during summer, and no attempt has been made to include the entire potential extent of foraging habitat surrounding the hibernacula.

**Protection Rank Comments:** All mines from which pale lump-nosed bats have been recorded on Martin Mesa occur on BLM owned property and therefore there are no immediate threats to the hibernacula. There are, however, private mining claims near all of the hibernacula, and future uranium mining at mines on both private and BLM property would be a direct threat to these bats, which are very fragile and sensitive to disturbance at hibernacula, roosting, and maternity sites.

**Management Rank Comments:** Pale lump-nosed bats are extremely fragile, and primary threats include loss of habitat (e.g., reclamation of abandoned mines), vandalism, and increased visitation (spelunking) by humans to maternity roosts and hibernacula. Large clusters or colonies are susceptible to disturbance and have been reportedly declining (CDOW 1984). Human access to mines and caves disrupts wintering populations, where disturbance needs to be minimal (Armstrong *et al.* 1994, Fitzgerald *et al.* 1994). Occupied roosts need to be protected from disturbance (May to mid-September for maternity roosts, October-April for hibernacula).

The mines occupied by the bats at Martin Mesa would benefit from installation of bat gates. This measure would protect the day roosts, hibernacula, and maternity sites from disturbance by prospectors and spelunkers. Installation of bat gates is controversial due to the cost associated with maintaining the gates and the added legal liabilities assumed by the BLM through installation of the gates. Kirk Navo, biologist for CDOW, has recommended that the BLM install bat gates at all mines on Martin Mesa acting as

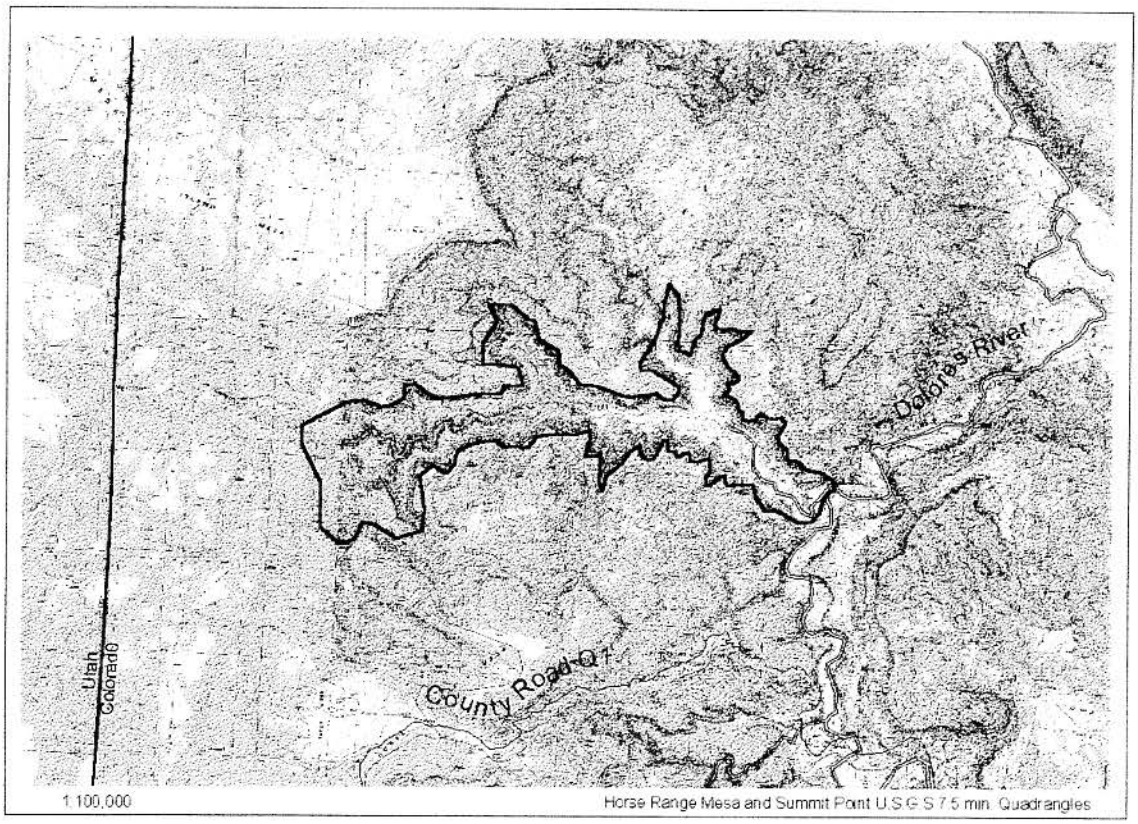
hibernacula for this bat. See White and Seginak (1987) for gate designs for protecting caves. Gates can successfully limit human access and disturbance but, if poorly designed, gates may restrict bat access and result in population decline (Matthews and Moseley 1990).

Of secondary concern are the levels of background radiation due to the natural mineral formations at the occupied mines. Levels of radiation at mines proposed for gate installation on Martin Mesa are within acceptable levels (Navo *et al.* 1999), but radiation monitoring at known bat hibernacula, roosts, and maternity sites should continue, to assure properly low levels of radiation. Closure of mines with high radiation levels may be warranted, regardless of bat use.

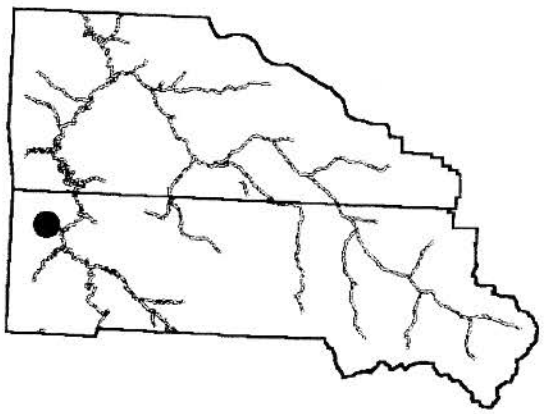
Other management actions that would benefit the bats include maintaining canopy cover in areas surrounding caverns, rock faces, and other sites used for roosting; retaining large diameter snags and stands of old growth; avoiding heavy equipment and blasting near roosts; and avoiding chemical insecticides. Caves and mines should be surveyed prior to any logging or mine closures in suspected occupied habitat.

# McIntyre Canyon

## Potential Conservation Area




1 0 1 2 3 4 Miles

# McIntyre Canyon

**Biodiversity Rank: B2** (Very high biodiversity significance) McIntyre Canyon has a good occurrence of xeric western slope pinyon-juniper woodlands, considered to be rare on a global scale.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M3** Ongoing, recurrent management action would help to maintain the current quality of element occurrences.

**Location:** McIntyre Canyon is located 3.5 air miles northwest of the old townsite of Slick Rock, Colorado in northwestern San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Horse Range Mesa

**Legal description:** T44N R19W Sections 2-4, 7-15, 17, 18; T45N R19W Sections 33-36.
**Elevation range:** 5,400 to 6,200 feet.
**Size:** 3,104 acres

**General Description:**

McIntyre Canyon is a major tributary of the Dolores River, draining a large area of western San Miguel County and southeastern Utah. Except for a small amount of private land at the confluence, the canyon is on BLM land. An unmapped dirt road that apparently services a pipeline was observed. There is some evidence of grazing. Otherwise, the lower part of the canyon is remote and difficult to access, except by raft or kayak from the Dolores River.

Vegetation of the area is sagebrush shrubland with widely spaced pinyon and juniper. The major grass in the lower part of the canyon is blue grama, with some needle and thread, six-weeks fescue and cheatgrass. Other common plants were Indian ricegrass, galleta, scarlet globemallow, sand aster, actinea, many-lobed groundsel, prickly-pear cactus, snakeweed, hairy golden aster, Townsend's Easter daisy, rough-seed cats-eye, four o'clocks, and princes plume.

Baker documented an excellent occurrence of the common plant association of pinyon pine and mountain mahogany on benches in the upper part of the canyon in 1983 (Baker 1984). Also, the pinyon pine/needle-and-thread association, considered to be less common, was found to be in good condition. It was observed in 1999, as well. This association occurs frequently in openings in the pinyon juniper woodland, usually in small patches, making it difficult to map.

A new occurrence of the Naturita milkvetch was found in 1999, along the base of the cliffs on the north side of the canyon, in red sandy soils derived from the Navajo Formation. The plants were particularly abundant in the disturbed area along the road. This supports our observations from other sites, that this species seems to thrive on some disturbance. Over 200 individuals were counted, and there are doubtless many more. In 1983, a smaller population of the milkvetch was found several miles upstream from the confluence, again on the disturbed pipeline route and on cryptogamic soil.

In alcoves of Navajo sandstone cliffs, are found hanging garden communities dominated by yellow columbine, and containing a small population of the rare Eastwood

monkeyflower. Other associated species in this habitat included Utah serviceberry, fendlerbush, mountain mahogany, New Mexico privet, skunkbrush (forma *simplicifolia,* the form with unlobed leaves), single leaf ash, and gray aster. Survival of the hanging garden community is dependent on the continued availability of the water source from the mesa above. Water diversions or prolonged drought could obliterate this habitat. It appears that the Eastwood's monkeyflower requires more permanent water than the more common columbine. In this and other sites, it grows in a deep horizontal crack that holds moisture, and on spongy, algae covered walls. The columbine is more often present in drier sites, and may be able to tap a deeper source of water.

Natural Heritage element occurrences at the McIntyre Canyon PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Pinus edulis/Stipa comata*** | **Xeric western slope pinyon-juniper woodlands** | **G2?** | **S2** | | **B** |
| ***Astragalus naturitensis*** | **Naturita milkvetch** | **G3** | **S3** | **BLM, USFS** | **A** |
| *Aquilegia micrantha-Mimulus eastwoodiae* | Hanging gardens | G2G3 | S2S3 | | B |
| *Astragalus naturitensis* | Naturita milkvetch | G3 | S3 | BLM, USFS | B |
| *Mimulus eastwoodiae* | Eastwood monkey-flower | G3? | S1 | BLM | B |
| *Mimulus eastwoodiae* | Eastwood monkey-flower | G3? | S1 | BLM | E |
| *Pinus edulis/Cercocarpus montanus* | Mesic western slope pinyon-juniper woodlands | G5 | S4 | | A |

*EO=Element Occurrence

**Biodiversity comments:** This PCA gains its high significance rank from the good occurrence of Xeric western slope pinyon-juniper woodlands, with a significant component of needle-and-thread grass. In addition, there are good occurrences of a globally imperiled hanging garden community, containing the globally vulnerable Eastwood's monkey-flower. An excellent example of globally common woodlands with Colorado pinyon and mountain mahogany occurs at the PCA.

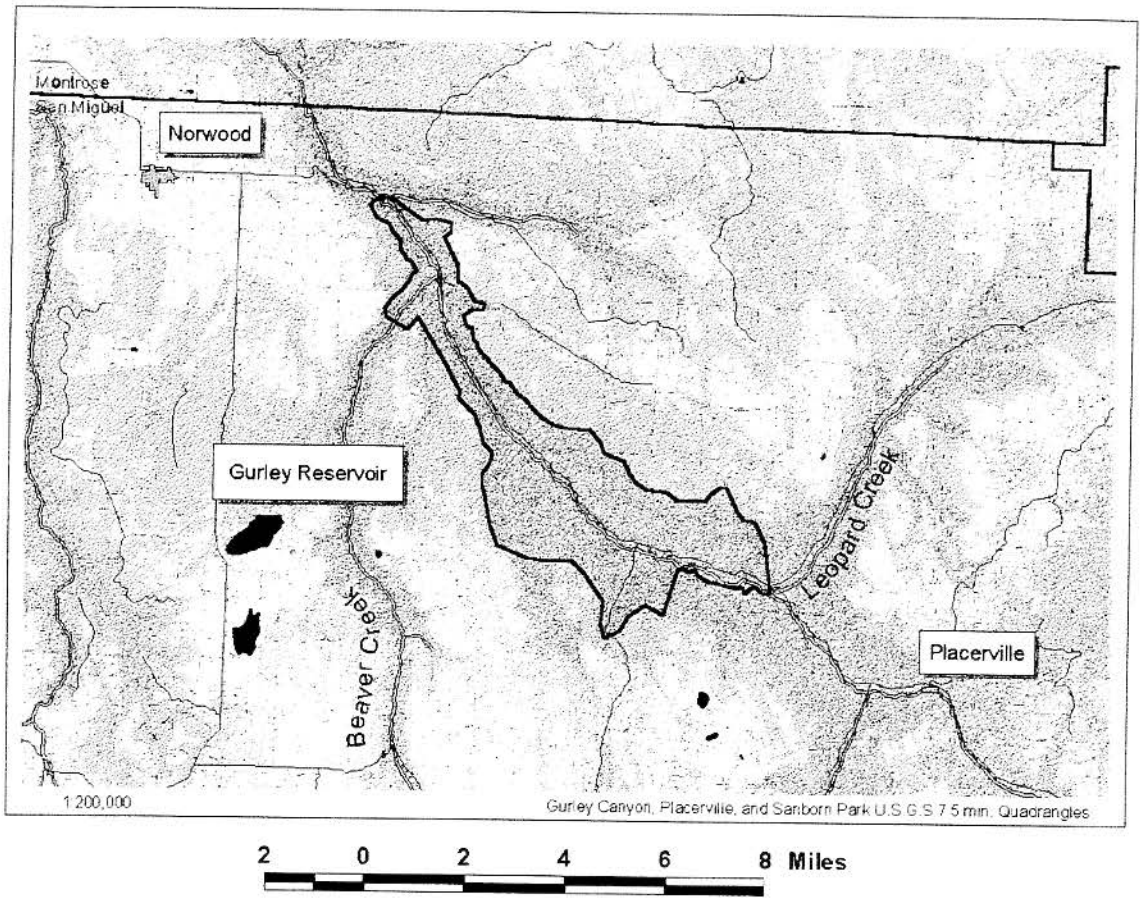
**Boundary Justification:** The boundary encloses the element occurrences listed above, located near the mouth of the canyon and several miles upstream, and the intervening canyon. Although the entire canyon was not surveyed, the habitat appears to be continuous, and Naturita milkvetch can be expected in the areas between the documented occurrences.

**Protection Rank Comments:** This PCA is primarily on BLM land, with a small amount of private land located at the confluence with the Dolores River. Due to its inaccessibility, this PCA probably does not require special protection at this time.

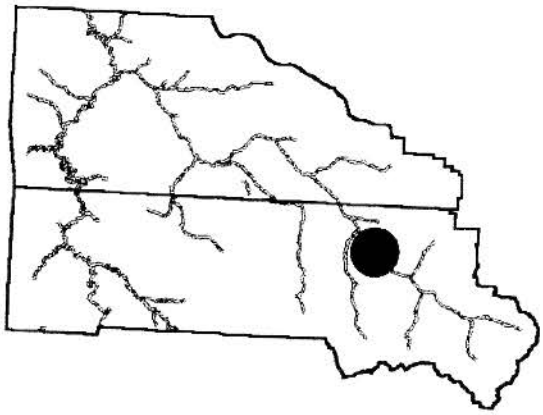
**Management Rank Comments:** There is Russian knapweed along the pipeline road and near the confluence. Weed control and revegetation of disturbed areas would improve the site.

# Middle San Miguel

## Potential Conservation Area







# Middle San Miguel Canyon

**Biodiversity Rank: B3** (High Biodiversity Significance) Middle San Miguel Canyon has two good examples of lower montane riparian shrublands, a plant community that is vulnerable on a global scale.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Middle San Miguel Canyon is located 0.5 air miles west of Placerville, Colorado and extends between Placerville and the Norwood Bridge along Colorado Highway 145 in San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Gurley Canyon, Placerville

**Legal description:** T43N R11W Sections 5-7; T44N R11W Sections 19-21, 27-34; T44N R12W Sections 3, 4, 9, 10, 11; T45N R12W Sections 28, 29, 33, 34.

**Elevation range:** 6,575 to 9,200 feet

**Size:** 753 acres

**General Description:**

The section of the San Miguel River between Placerville and the Norwood Bridge contains some of the best examples of globally imperiled riparian communities in Colorado. The riparian vegetation has been classified as narrowleaf cottonwood-blue spruce/thinleaf alder and as narrowleaf cottonwood/river birch. However, there is an impressive diversity of tree and shrub species within these communities. In addition to the dominant species named above, tree species include Ponderosa pine, Douglas fir, Rocky Mountain juniper, Gambel's oak, and box elder. Shrubs include red-osier dogwood, twinberry honeysuckle, snowberry, serviceberry, and several willows.

Several major tributaries enter the San Miguel in this stretch of the river. They include Specie Creek, Saltado Creek, Beaver Creek and McKenzie Creek.

Surveys of this PCA have been made by The Nature Conservancy, and by CNHP in 1991, 1997 and 1999 (Kittel 1991, Stevens and Zoerner 1997). The PCA includes The Nature Conservancy's San Miguel Canyon Preserve, as well as BLM and some private lands. The Norwood School has established an environmental education "outdoor classroom" on BLM land near the Norwood Bridge, in cooperation with the BLM. A signed nature trail identifies some of the common plants in the PCA.

The area is popular for fishing, picnicking, and river rafting. There is a developed BLM campground and raft launch area at Beaver Creek, and a raft launch area at Specie Creek.

Natural Heritage element occurrences at the Middle San Miguel Canyon PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Betula occidentalis*/mesic graminoid** | **Lower montane riparian shrublands** | **G3** | **S2** | | **B** |
| ***Betula occidentalis*/mesic graminoid** | **Lower montane riparian shrublands** | **G3** | **S2** | | **B** |
| *Betula occidentalis*/mesic graminoid | Lower montane riparian shrublands | G3 | S2 | | C |
| *Populus angustifolia/Betula occidentalis* | Montane riparian forest | G3 | S3? | | B |
| *Populus angustifolia/Betula occidentalis* | Montane riparian forest | G3 | S3? | | B |
| *Populus angustifolia-Picea pungens/Alnus incana* | Montane riparian forests | G3 | S3 | | A |
| *Populus angustifolia-Picea pungens/Alnus incana* | Montane riparian forests | G3 | S3 | | A |
| *Populus angustifolia-Picea pungens/Alnus incana* | Montane riparian forests | G3 | S3 | | A |

*EO=Element Occurrence

**Biodiversity comments:** Two riparian plant communities in this PCA, both containing river birch, are considered to be vulnerable on a global scale, and rare in Colorado. In addition the PCA has five excellent examples of the more common narrowleaf cottonwood-blue spruce/thinleaf alder montane riparian forest.

**Boundary Justification:** The boundary is drawn to include both the riparian zone of the San Miguel River between Placerville and the Norwood Bridge, as well as the canyonsides, up to the level mesa tops. The uplands are included, since they can influence the hydrology of the PCA through sedimentation and discharge of particulate metals into the stream system.

**Protection Rank Comments:** Current protection of this PCA includes designation of the BLM portion as an ACEC (Area of Critical Environmental Concern), and The Nature Conservancy's ownership of the San Miguel Middle Preserve. The ACEC comprises 20,964 acres of public land, within a Special Resource Management Area (SRMA) of 32,641 acres. It includes the San Miguel River and several tributaries from Placerville to Horsefly Creek.

Development of the private lands near Placerville could occur in the future. County regulations may not be sufficient to protect the riparian vegetation and hydrology of the river.

Of greater long-term concern is the maintenance of sufficient instream flows to support the fishery and the riparian vegetation of the river. Future diversions for residential use, coupled with increased snow-making at the ski area, could lower water levels to the legally guaranteed minimums, a level that is probably inadequate to maintain the health of plant and animal communities. Instream flow studies are currently being performed by BLM.

**Management Rank Comments:** BLM lands in the PCA are managed according to the plan set forth in the 1993 amendment to the RMP (USDI 1993). Lands within the ACEC are to be managed with emphasis on protection of the "unique, high quality riparian vegetation resources", the scenic values of the corridor, and preservation of relic riparian communities. Providing quality recreation experiences while maintaining the riparian systems is the second major goal within the ACEC. In accordance with the management plan, several changes have been accomplished since the designation.

Camping has been directed toward established campgrounds with the closure of several roads. San Miguel County has set camping limits at a 7 day maximum. Vehicles are restricted to designated roads and trails. There are constraints on utility construction in the area. Although the area is open to mineral extraction, the likelihood of this occurring commercially is negligible. Small scale placer mining by recreationists is allowed, and may cause damage to stream beds and riparian vegetation. Sections of the river that were previously mined for gold and gravel, such as the reach just above Specie Creek, have taken many years to recover. Commercial rafting has increased substantially in the last few years. Most of this is day use only. The Nature Conservancy's San Miguel Preserve is closed to motor vehicles and overnight camping. Fishing on that property is catch and release only.

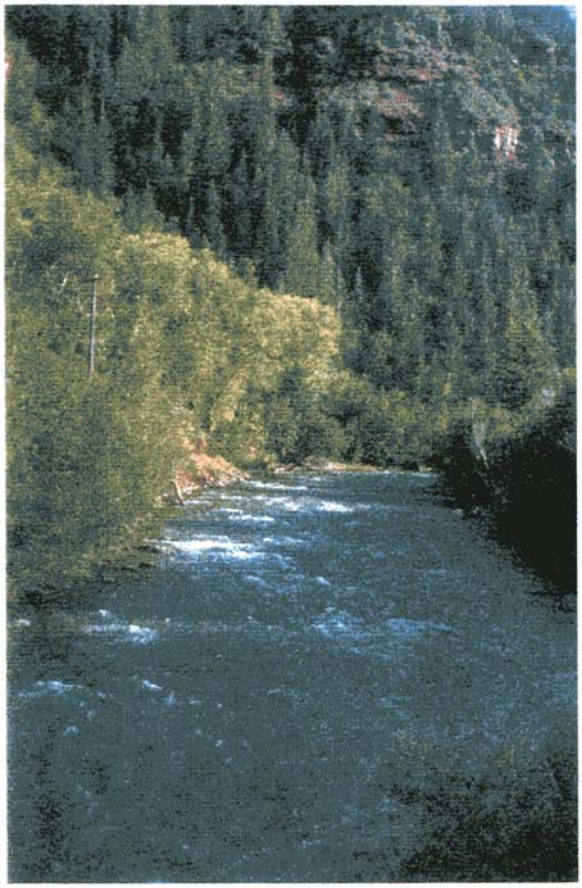
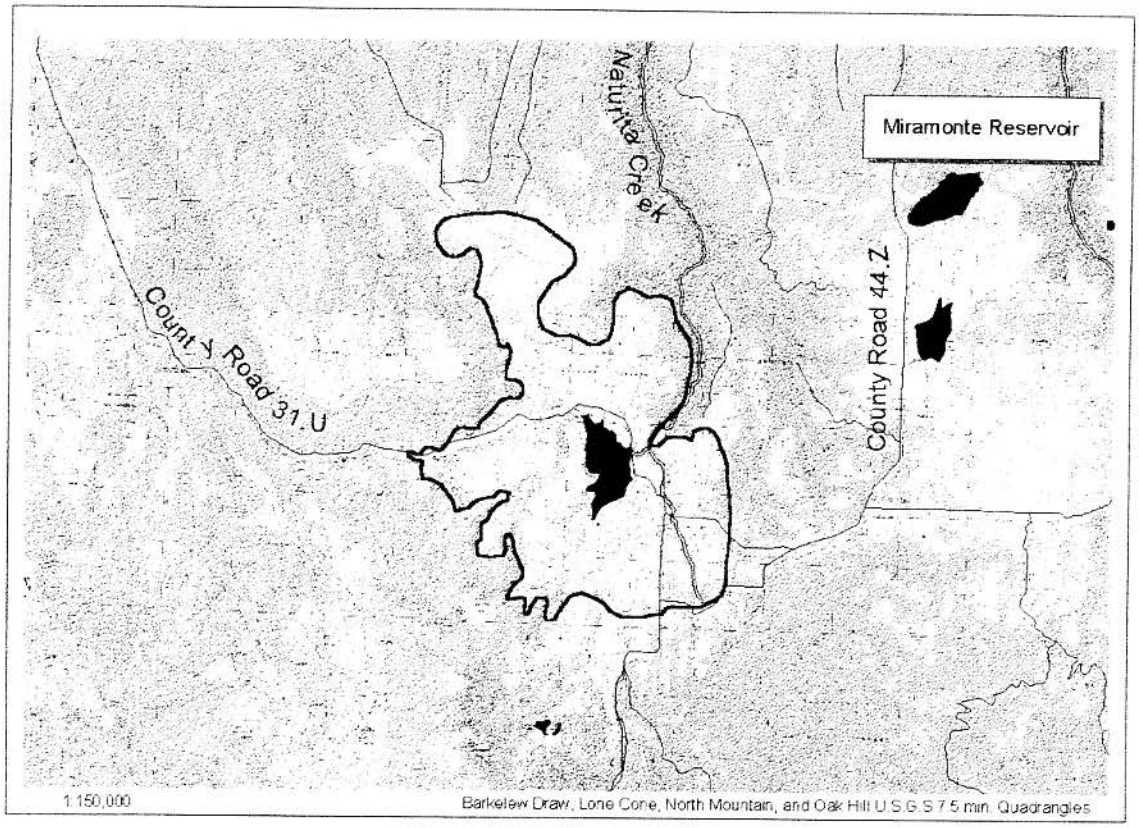


Figure 70. Middle San Miguel River Canyon.

# Miramonte Reservoir

## Potential Conservation Area




2 0 2 4 6 8 Miles

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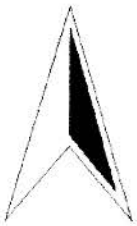
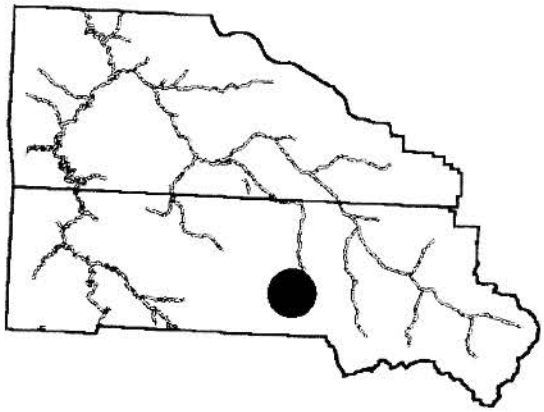




# Miramonte Reservoir

**Biodiversity Rank: B1** (Outstanding Biodiversity Significance) Miramonte Reservoir supports an excellent occurrence of the Gunnison Sage Grouse, a species critically imperiled on a global scale.

**Protection Urgency Rank: P2** Threat is expected within five years.

**Management Urgency Rank: M2** Ongoing, recurring management must continue within 5 years to prevent loss of this element occurrence.

**Location**: Miramonte Reservoir is located 11 air miles south of Norwood, in San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Lone Cone, North Mountain, Oak Hill, Barkelew Draw

**Legal Description:** T43N R14W Sections 1-3, 11-14, 23-26, 35, 36; T43NR13W Sections 7, 8, 17-21, 28-33.

**Size:** 10,409 acres

**Elevation:** 7,720 to 8,080 feet

**General Description:**

This PCA is situated on a high plateau at approximately 7,800 feet, dominated by Greager Flats. The dominant vegetation on the site is mountain big sagebrush with foothills/mountain grassland. Ponderosa pine forest borders the PCA along its eastern edge and Naturita Creek parallels the eastern boundary. To the west, beyond the PCA's boundary, the land rises to Hamilton Mesa and Sandy's Fort Pass. The PCA circumscribes Miramonte Reservoir. The geologic features include Cretaceous Mancos Shale, Dakota Sandstone, and Burro Canyon formations, and Eolian Deposits of the Quaternary age. The soils are of fine mixed sand, loam, silt and clay. Approximately 2% of the lands within the PCA are under the management of the BLM, 90% is held in private ownership as ranchland, and the remaining 8% lies within Miramonte Reservoir State Wildlife Area. Outside of the SWA the dominant land use is cattle grazing. Of significance is the occurrence of cheatgrass within the PCA. This non-native grass is susceptible to fire, and the surrounding sagebrush shrubland is a fire intolerant community of critical importance to survival of the Gunnison Sage Grouse.

A lek site of the Gunnison Sage Grouse occurs near the center of this PCA. This lek has seen annual use since its detection in 1978, with an average of 51 male grouse per year utilizing the lek. The latest observation recorded 61 males on the lek in 1998.

The rare grass, Parish's alkali grass, was found west of Miramonte Reservoir in 1998, during a survey for a new gas pipeline. At this site, it was growing in alkaline swales and basins, a habitat easily visible from the salts on the surface. Water at these

sites is ephemeral, and continuation of the population depends on the continued availability of seasonal water.

Natural Heritage element occurrences at the Miramonte Reservoir PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Centrocercus* sp.1** | **Gunnison Sage Grouse** | **G1** | **S1** | | **A** |
| *Puccinellia parishii* | Parish's alkali grass | G2 | S1 | | B |

*EO=Element Occurrence

**Biodiversity comments:** This is the highest quality occurrence of Gunnison Sage Grouse in far western Colorado, and is of critical importance to conservation of this species. In addition to the Gunnison Sage Grouse, this PCA has a good occurrence of Parish's alkali grass, a species that is imperiled globally and is extremely rare in Colorado. This is the first known location of the grass in Colorado. This species, previously known from Arizona and New Mexico, was recently considered for listing under the Endangered Species Act, but its nomination was withdrawn when new occurrences were discovered.

**Boundary Justification:** There is much discussion in the literature on determining the extent of conservation site boundaries for Sage Grouse. The target of management efforts has often been the protection of habitat within 3 km of lekking sites (Schroeder *et al*. 1999). The random distribution of nests in relation to lek location suggest that Sage Grouse choose nesting sites based on habitat components other than distance from leks. The quantity of habitat necessary to support minimum viable populations is necessarily greater than that afforded by the 3 km target. The greatest factors contributing to nest failure are predation of eggs and adults on nests and young during feeding, and food availability. In addition, overwinter survival is compromised when large continuous stands of palatable big sagebrush are absent. The PCA was thus drawn to include all habitats at Miramonte Reservoir within proximity of lekking sites that include the components important to nest success and overwinter survival. There may be immigration over Hamilton Mesa between this population of grouse and those located at Dry Creek Basin, making one panmictic population.

The location of Parish's alkali grass and adjacent alkaline soils where it may spread in the future fall within the larger boundary dictated by the needs of the Gunnison Sage Grouse.

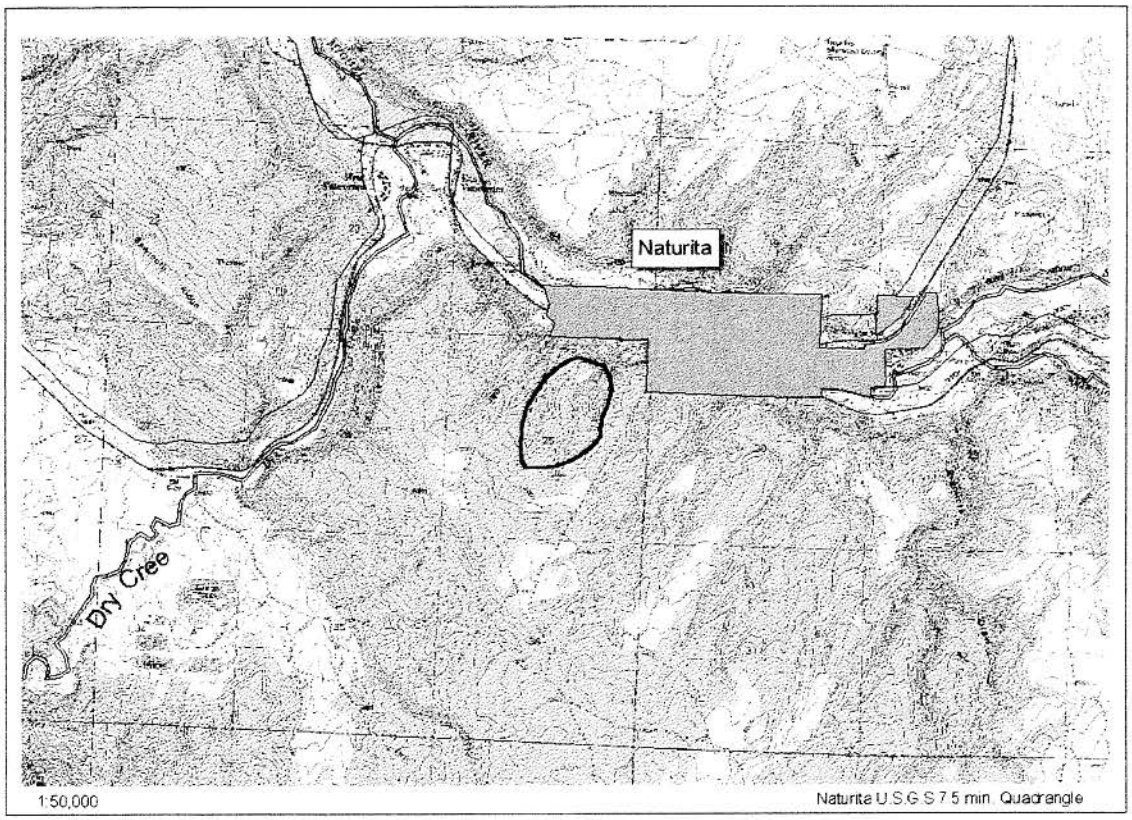
**Protection Rank Comments:** Protection of identified seasonal habitats (wintering, breeding, nesting and brooding) is necessary for continued existence of this species in Colorado. The Bureau of Land Management has proposed purchase of private lands, and CNHP supports that land purchase. The importance of this area for continued existence of the Gunnison Sage Grouse in western Colorado cannot be overemphasized. Subdivision and residential development on this site would be detrimental to the grouse. Just over 90% of these lands are held in private ownership and Miramonte Reservoir State Wildlife Area protects less than 2%. Recreational use of the reservoir is high. The area has easy access, and is a desirable residential area. Nearby properties are currently being developed for residences. This area is a high priority for open space protection.

**Management Rank Comments:** Gunnison Sage Grouse require a variety of habitats. Their habitat requirements differ during the year, and differ for sex and age classes. Therefore the presence of each habitat type in healthy condition in close proximity to winter, lek, nest and brood-rearing habitat is essential. They occupy foothills, plains and mountain slopes where sagebrush is present (AOU 1983). In summer, native or cultivated meadows, grasslands, aspen, and willow thickets adjacent to or interspersed with sagebrush are occupied (Andrews and Righter 1992). Winter habitat (palatable sagebrush) probably is the most limited seasonal habitat in some areas.

Management is required at this PCA if the Gunnison's Sage Grouse is to be protected against disturbances compromising chick survival on brooding ranges and adult survival through winter. Threats at this PCA include habitat loss and degradation of sagelands through development, agriculture, and grazing. The private ranchland at this PCA is intensively grazed. Management of this PCA to benefit Gunnison Sage Grouse would include maintaining areas of big sagebrush and relatively tall and thick grass, forb, and shrub cover. These components supply cover from predation for both adults and chicks and supply adequate food in the form of buds, blossoms, leaves, stems, fruit, and also insects, which are particularly important to juveniles within their first 3 weeks of life. They also supply winter forage, which consists primarily of big sagebrush. Treatment of sagebrush habitats by chaining, spraying, or burning to benefit livestock production (see Ritchie *et al.* 1994) would reduce winter forage availability and cover and food in all seasons. Use of organophosphorus insecticides on agricultural lands adjacent to sagebrush can result in grouse die-offs (Blus 1989). Eliminating grazing during the chick rearing period (May-August) may be beneficial. Thinning of pinyon-juniper stands, utility poles, and other perching sites can help to prevent predation of adults on leks by raptors.

# Naturita South

## Potential Conservation Area

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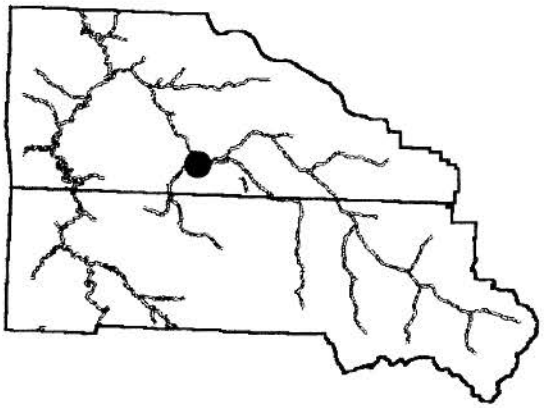


# Naturita South

**Biodiversity Rank: B3** (High Biodiversity Significance) The Naturita South PCA has a good occurrence of the Little penstemon, considered to be vulnerable on a global scale, and rare in Colorado.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Naturita South is located 0.5 air miles south of Naturita, Colorado in western Montrose County.

U.S.G.S. 7.5 minute quadrangles: Naturita

**Legal description:** T46N R16W Section 25

**Elevation range:** 5,700 to 5,860 feet.

**Size:** 113 acres

**General Description:**

This PCA occupies a mesa south of the town of Naturita. The area around the town of Naturita was the first known location of Naturita milkvetch, collected by Naturita native and well-known botanist Edwin Payson in 1914. It also is the location of the two largest populations of the Little penstemon found this year.

Researchers found these occurrences by walking from the west-side of town, up the hill between parallel drainages on the south side of the San Miguel Canyon. The hillsides here are vegetated with pinyon, juniper and mountain mahogany. Several flat mesa tops between the major drainages have deeper soils with big sagebrush. The Naturita milkvetch was found along the canyon rims in sandy soils with Utah juniper, black sagebrush and needle-and–thread grass. It was sparsely scattered in soil pockets of the exposed rimrock. The penstemon, on the other hand, was found near the drainage bottoms on gentle slopes with deeper soils. Other species in the PCA included blue grama, princes plume, scarlet globemallow, four-wing saltbush, mountain mahogany, fendlerbush, thrift mock goldenweed, pinyon pine, sego lily, rough- seed cats-eye, Townsend's Easter daisy, Indian ricegrass, sand aster, fineleaf hymenopappus, gumweed aster, Mormon tea, pincushion, many-lobed groundsel, and blue flax. Much of the area had well developed soil crusts.

Natural Heritage element occurrences at the Naturita South PCA.

| Element | Common Name | G rank | S rank | Federal/State status | EO* rank |
|---|---|---|---|---|---|
| ***Penstemon breviculus*** | **Little penstemon** | **G3Q** | **S2** | **BLM** | **B** |
| *Astragalus naturitensis* | Naturita milkvetch | G3 | S3 | BLM, USFS | C |

*EO=Element Occurrence

**Biodiversity comments:** In addition to a good occurrence of the Little penstemon, the PCA has a fair occurrence of Naturita milkvetch, considered vulnerable globally and in Colorado.

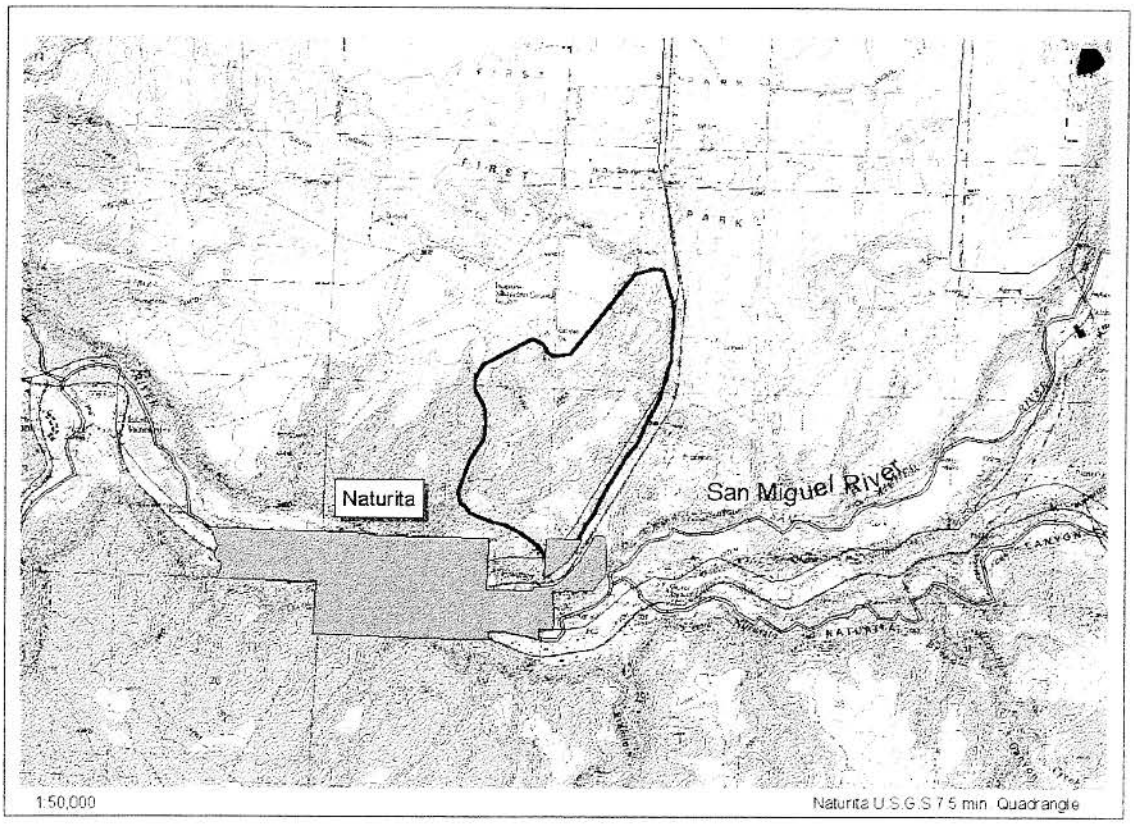
**Boundary Justification:** The boundary is drawn to include the two rare plant occurrences with some of the adjacent potential habitat. The total potential habitat for these species would extend much farther. Further survey effort could result in enlarging this PCA.

**Protection Rank Comments:** The PCA is on BLM land with no special protection. Both rare plant species are widespread in the area, and it does not seem reasonable to recommend special protection for this PCA over others.

**Management Rank Comments:** There was some evidence of ATV use on the mesa tops. This use could affect the penstemon, while the locations of the Naturita milkvetch on the rims of small canyons are probably secure. A monitoring program would aid in the detection of any changes in condition or weed invasion that might require management intervention.

# Naturita Upland

## Potential Conservation Area




0.5 0 0.5 1 1.5 2 Miles

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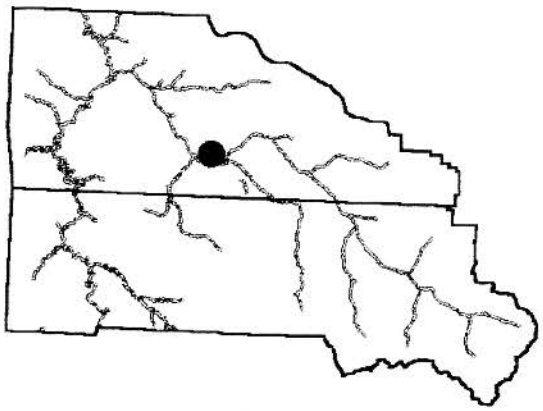


# Naturita Upland

**Biodiversity Rank: B2** (Very high biodiversity significance) The Naturita Upland PCA contains a good occurrence of Payson lupine, a plant that is imperiled on a global scale.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

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

**Location:** Naturita Upland is located 0.5 air miles north of Naturita, Colorado's in western Montrose County.

U.S.G.S. 7.5 minute quadrangles: Naturita

**Legal description:** T46N R15W Sections 17-20.

**Elevation range:** 5,700 to 5,900 feet.

**Size:** 543 acres

**General Description:**

This PCA, north of Naturita near the airport, is based on an occurrence of the Payson lupine found originally in 1983, and updated in 1990. The population size was originally estimated at 3700 plants, although Jennings only reported seeing 30 to 40 plants along the roadside. All plants were vegetative in late May. The soils are sandy, derived from the Morrison Formation, and notably different from the red Chinle soils at the lupine sites in the Paradox Valley. Associated species noted at the PCA included Utah juniper, galleta, prickly pear cactus, and scarlet globemallow.

Natural Heritage element occurrences at the Naturita Upland PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Lupinus crassus*** | **Payson lupine** | **G2** | **S2** | **BLM** | **B** |

*EO=Element Occurrence

**Biodiversity comments:** The PCA rank is based on a good occurrence of Payson lupine, a globally imperiled plant. Although this occurrence is not as large as those in Paradox Valley, it is important for representing the range of potential habitats for the plant.

**Boundary Justification:** The boundary encompasses the Payson lupine occurrence, with some adjacent potential habitat. The extended area allows for the expansion of the population into new sites over time.

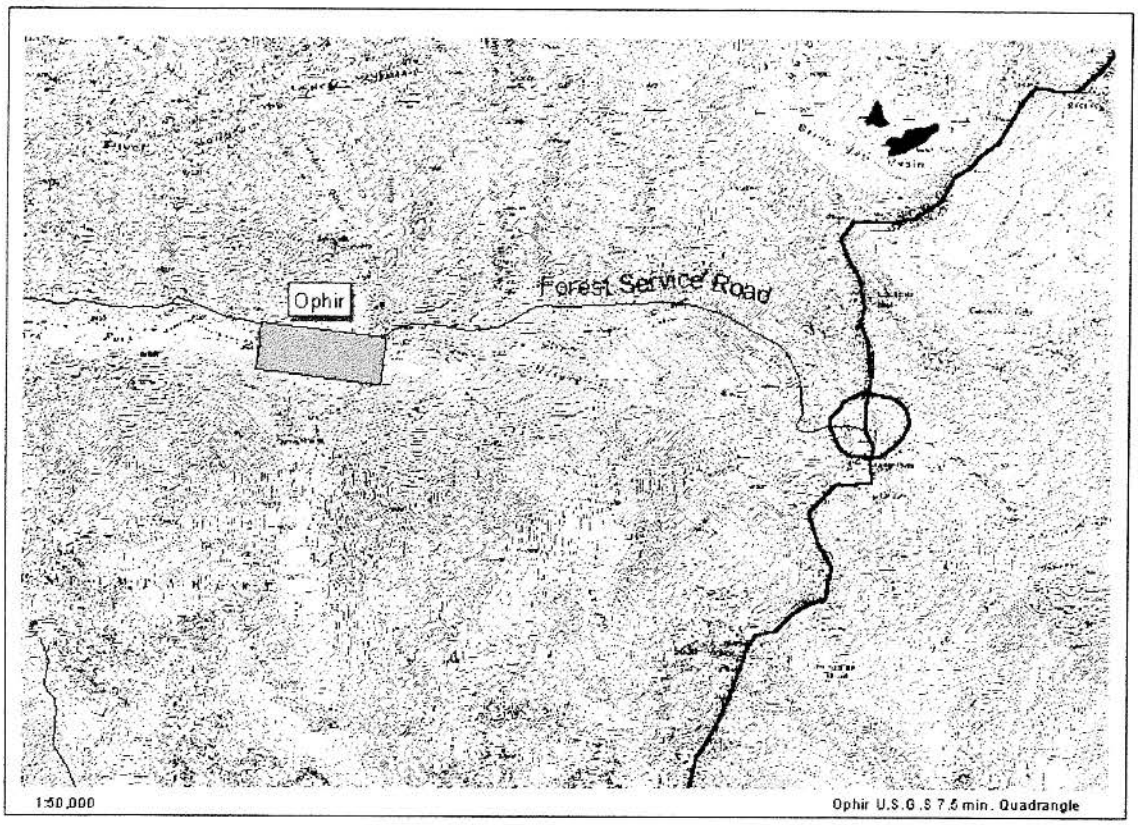
**Protection Rank Comments:** The PCA includes both BLM and private land. Plans for future use of the private land are not known. It would be appropriate for open space protection through purchase or a conservation easement if the owner is willing. The

occurrences in the BLM part of the PCA are probably secure as long as the site is retained in public ownership.

**Management Rank Comments:** Current research on possible seed predation of the lupine may add to our understanding of management needs. Monitoring of this site will aid in the detection of changes in the number of individuals and the condition of the population that would warrant management intervention.

# Ophir Pass

## Potential Conservation Area

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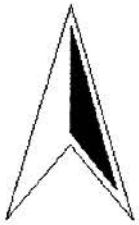
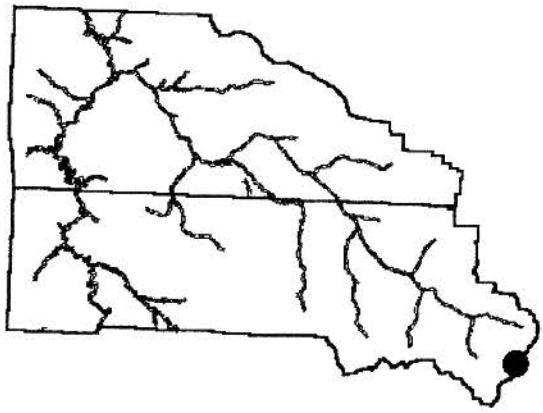




# Ophir Pass

**Biodiversity Rank: B4** (Moderate Biodiversity Significance) The Ophir Pass PCA contains good occurrences of two plants that are rare in Colorado: the Altai chickweed and the Arctic draba.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

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

**Location:** Ophir Pass is located 2.8 air miles east of Ophir, Colorado on the San Miguel-San Juan county line in extreme eastern San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Ophir

**Legal description:** T42N R8W Sections 31, 32.

**Elevation range:** 11,789 to 12, 187 feet.

**Size:** 61 acres

**General Description:**

Ophir Pass, at the far eastern end of San Miguel County, is home to several rare alpine plant species. Three species of whitlow-wort, two species of moonwort, and the Altai chickweed were found here in 1999. The PCA straddles the county line and extends into San Juan County. A gravel county road provides access to the pass. The PCA is located north of the pass, and can be accessed by a trail that follows the power line just east of the pass. There are two small lakes in the PCA. Common plant species in the site include cutleaf daisy, snow lover, alpine harebell, rose paintbrush, candytuft, moss campion, three-toothed groundsel, snow willow, alpine sandwort, alpine avens, golden saxifrage, western paintbrush, Colorado columbine, blue violet, Glaber daisy, black-head daisy, Greene's daisy, diamond-leaf saxifrage, alpine bistort, American bistort, alpine parsley, and bilberry.

Two sub-populations of the Altai chickweed were found on the summit north of the pass, and on the northeast-facing slope at the saddle southwest of the power line. They were found in scree, where few other plants were growing. Most of the tiny plants were vegetative, and could be easily overlooked.

The Arctic draba, on the other hand, was growing among fairly dense vegetation dominated by alpine avens. Associated species included diamond-leaf saxifrage, American bistort, alpine sandwort, old man of the mountain, dwarf clover, moss campion, cushion phlox, Rocky Mountain lousewort, alpine fescue, and curly sedge. There were no exotic plant species found in the PCA.

Natural Heritage element occurrences at the Ophir Pass PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Stellaria irrigua*** | **Altai chickweed** | **G4?** | **S2** | | **B** |
| *Draba fladnizensis* | Arctic draba | G4 | S2S3 | | B |
| *Draba crassa* | Thick-leaf whitlow-grass | G3 | S3 | | D |
| *Draba streptobrachia* | Colorado divide whitlow-grass | G3 | S3 | | D |
| *Botrychium pinnatum* | Northern moonwort | G4? | S1 | | D |
| *Botrychium lanceolatum* | Lance-leaved moonwort | G5T4 | S2S3 | | D |

*EO=Element Occurrence

**Biodiversity comments:** In addition to good occurrences of the Altai chickweed and the Arctic draba, small populations of two other *Draba* species, the thick-leaved whitlow-grass and the Colorado Divide whitlow-grass, and two moonwort species, the northern moonwort and lance-leaved moonwort, were found at this PCA. Further surveys may show that these species are more abundant than are presently known, in which case the rank of this PCA could be raised to B3 or higher. If there are no more individuals present than have been observed, these populations may not be viable.

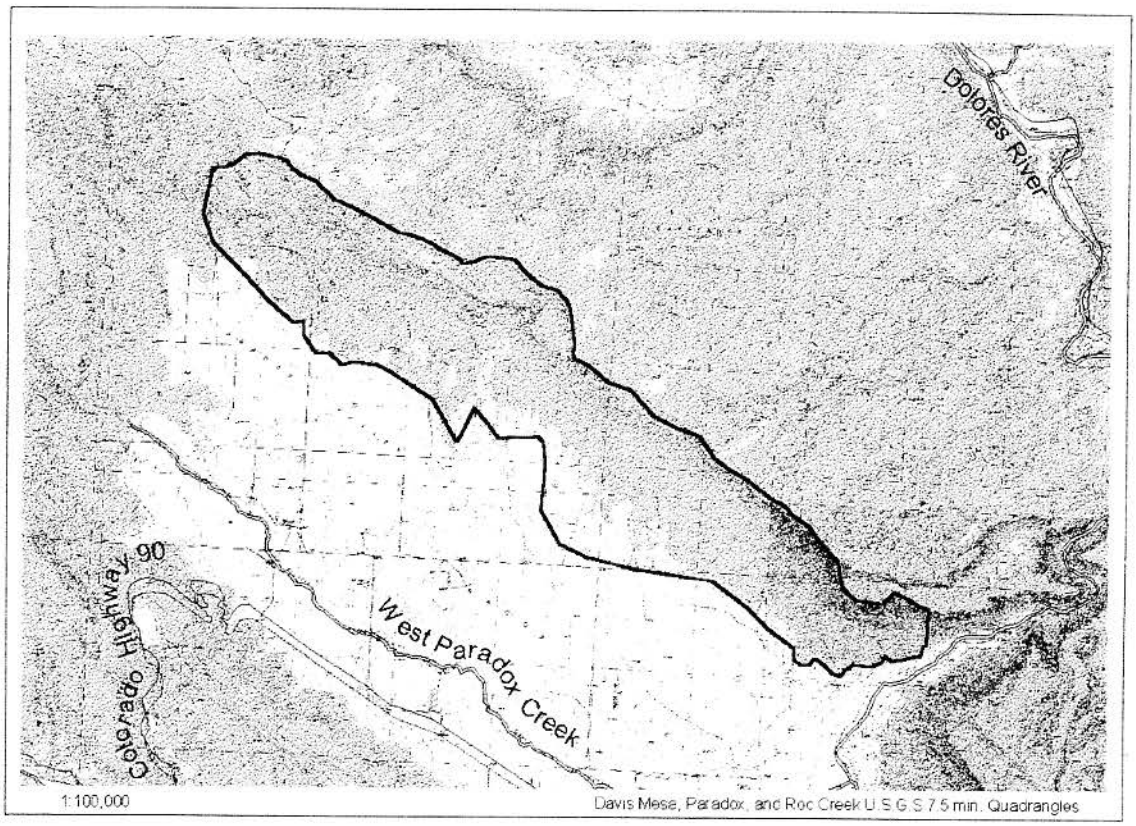
**Boundary Justification:** The boundary encompasses the occurrences of several rare plants at this PCA.

**Protection Rank Comments:** The PCA includes both National Forest and private lands. The Forest Service is pursuing purchase of all private inholding in forest lands.

**Management Rank Comments:** Maintenance of the power line that traverses the PCA could pose a threat in the future. Monitoring of this site will aid in the detection of changes in the number of individuals and the condition of the population that would warrant management intervention.

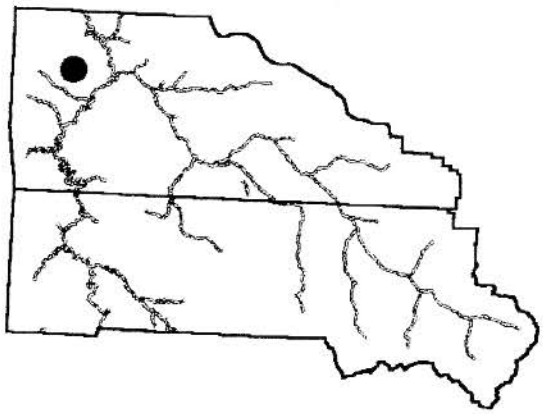
# Paradox Valley North

## Potential Conservation Area




1 0 1 2 3 4 Miles

N



# Paradox Valley North

**Biodiversity Rank: B2** (Very high biodiversity significance) This PCA contains an excellent occurrence of Payson lupine, a plant that is imperiled on a global scale.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M2** Ongoing, recurrent management action would help to prevent loss of the element occurrences.

**Location:** Paradox Valley North is located 2.8 air miles north of Paradox, Colorado in northwestern Montrose County.

U.S.G.S. 7.5 minute quadrangles: Paradox, Roc Creek

**Legal description:** T48N R18W Sections 29-33; T48N R19W Sections 14-17, 21-27, 36; T47N R18W Sections 3-5.

**Elevation range:** 5,200 to 7,000 feet.

**Size:** 6,552 acres

**General Description:**

The Paradox Valley North PCA is located on the north side of Paradox Valley on west of the Dolores River at the base of Carpenter Ridge, on dark red soils derived from the Chinle Formation. The Payson lupine and Paradox breadroot are both locally common in the bottoms and on the sides of draws at the base of the south-facing slopes. There are many thousands of individuals of each species, with a variety of ages represented. Vegetation in the PCA consists of Utah juniper woodland, with galleta and snakeweed. The plant community is in good condition with few exotic species present.

The Abajo penstemon occurs on the slopes with pinyon, juniper, cliffrose, Mormon tea, and serviceberry. Other associated species are mountain big sagebrush, yellow cats-eye, rough-seed cat's-eye, blue grama, Spanish bayonet, Wingate milkvetch, three-awn, Townsend's Easter daisy, prickly pear cactus, and hedgehog cactus.

The area experiences light vehicle use. Ownership of the PCA is mostly BLM with some private land on the south side.

Natural Heritage element occurrences at the Paradox Valley North PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Lupinus crassus*** | **Payson lupine** | **G2** | **S2** | **BLM** | **A** |
| *Lupinus crassus* | Payson lupine | G2 | S2 | BLM | B |
| *Lupinus crassus* | Payson lupine | G2 | S2 | BLM | C |
| *Lupinus crassus* | Payson lupine | G2 | S2 | BLM | E |

| | | | | | |
|---|---|---|---|---|---|
| *Pediomelum aromaticum* | Paradox breadroot | G3 | S2 | BLM | A |
| *Penstemon lentus* | Abajo penstemon | G4Q | S2 | | E |
| *Penstemon lentus* | Abajo penstemon | G4Q | S2 | | H |
| *Falco peregrinus anatum* | Peregrine falcon | G4T3 | S2B, SZN | | A |
| *Falco peregrinus anatum* | Peregrine falcon | G4T3 | S2B, SZN | | E |
| *Cnemidophorus velox* | Plataeu striped whiptail | G5 | S4 | | E |

*EO=Element Occurrence

**Biodiversity comments:** The biodiversity rank of this PCA is based on the excellent occurrence of Payson lupine, a globally imperiled plant. There is also an excellent population of the globally vulnerable Paradox breadroot, and historic occurrences of the Abajo penstemon from 1986. Two adult pairs of Peregrine Falcons successfully fledged two at this site in 1999, and the eryies have been used throughout the 1990's by nesting peregrines.

**Boundary Justification:** The boundary is drawn to include the lower edge of the pinyon-juniper community which support the Payson lupine and Paradox breadroot, and includes the cliff faces to the canyon rim, which are the site of Peregrine Falcon eyries. It encompasses the known occupied sites of Payson lupine and Paradox breadroot, while allowing adequate additional habitat for these species to move or expand over time. The site does not allow for all of the needs such as foraging area for the bird species.

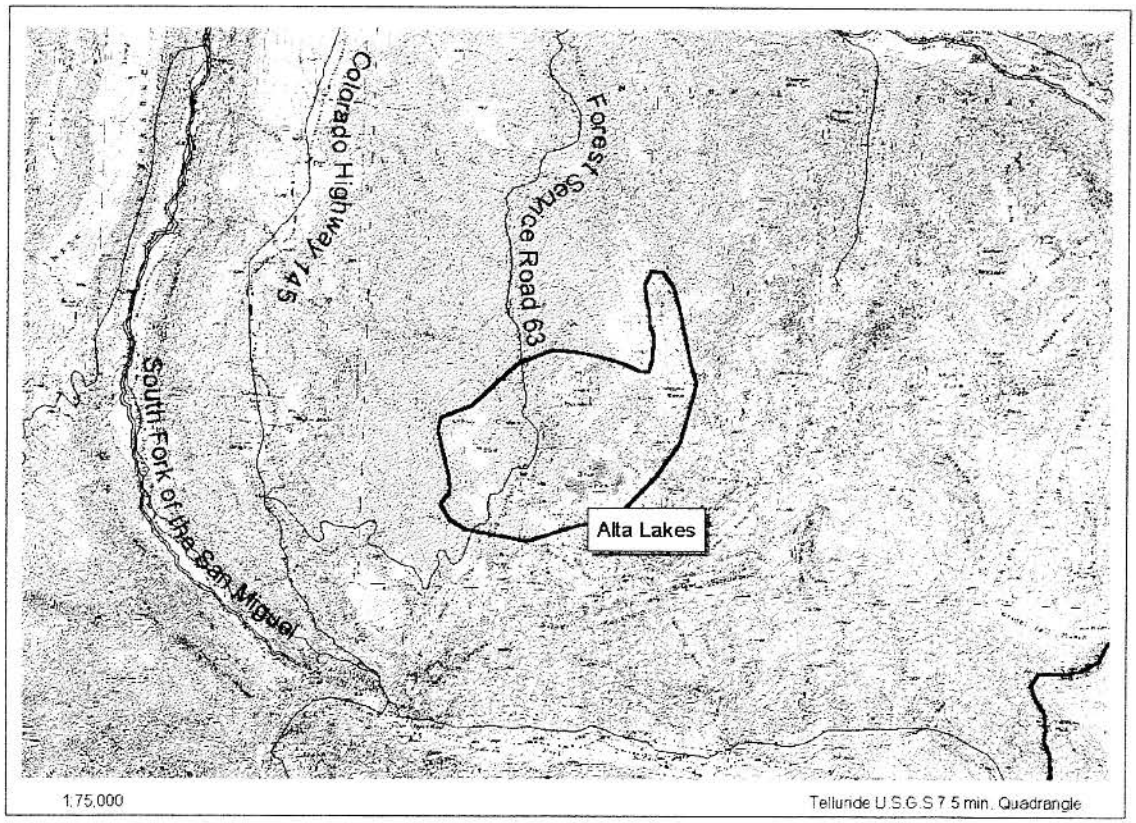
**Protection Rank Comments:** The PCA is entirely on BLM land. The excellent occurrence of Payson lupine and Paradox breadroot at this site would support designation as a Research Natural Area.

**Management Rank Comments:** Because of the high significance of this PCA as the best known location of Payson lupine, it would be ideal as a site to support further research on this plant species. Additional information about the reproductive ecology of the lupine could elucidate management needs. Monitoring of this site will aid in the detection of changes in the number of individuals and the condition of the population that would warrant management intervention.

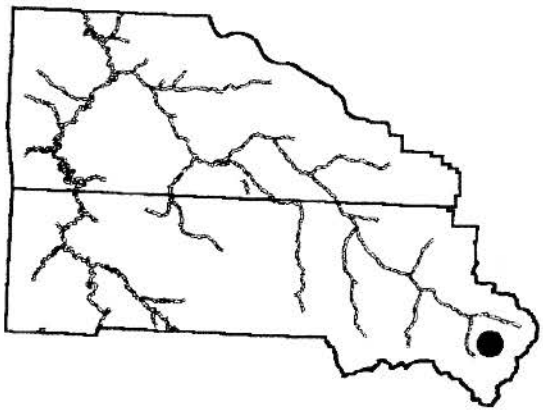
Lack of access through private land to the cliff face will probably prevent disturbances to the peregrines. If not already closed, closing the BLM part of the PCA to human use, including off road vehicle traffic and rock climbing during the nesting season would serve to protect the Peregrine Falcons.

# Prospect Basin - Alta Lakes

## Potential Conservation Area




1 0 1 2 Miles

# Prospect Basin-Alta Lakes

**Biodiversity Rank: B4** (Moderate Biodiversity Significance) A good population of the northern moonwort, a species that is extremely rare in Colorado, was found at this PCA.

**Protection Urgency Rank: P2** A definable threat is expected in this PCA within the next five years.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Prospect Basin-Alta Lakes is located 2.25 air miles south of Telluride, Colorado in San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Telluride

**Legal description:** T42N R9W Sections 14-16, 21-23.

**Elevation range:** 10,400 to 12,200 feet.

**Size:** 1,349 acres

**General Description:**

Prospect Basin is a relatively flat basin at the base of steep terrain defined by Bald Mountain and Palmyra Peak and lies just south of Telluride, Colorado. This alpine basin contains geologic features of the Tertiary Prospect Lake Formation and Quaternary landslide deposits. Soils within the PCA consist of Pendergrass Family (lithic cryorthents, loamy-skeletal, mixed) and Cryochrepts. Dominant vegetation includes spruce-fir forest and mixed tundra. Common plants associated with the local soil components include elk sedge, slender wheatgrass, spike trisetum, needle grass, Thurber fescue, Oregon grape, northern bedstraw, western yarrow, kinnikinnick, common juniper, Fendler meadowrue, and mountain snowberry. This alpine basin and its associated wetlands are more sensitive to ecological stresses than are downstream systems due to high levels of precipitation, large areas of exposed bedrock, rapid hydrological flushing during runoff, and limited soils and vegetation.

Recently this basin has come before the public's attention because of the proposed expansion of the Telluride Ski Area into the basin. The basin has been identified as potential lynx habitat and is home to two plant species and an owl that are of moderate conservation significance. The PCA also includes the Alta Lakes area. There is public concern that the Prospect Basin expansion will provide opportunities for real estate development that are inappropriate for the area, particularly with respect to land exchanges between the Forest Service and private land owners within the Alta Lakes area. The Forest Service has rejected recent land exchange proposals. Considerations for the analysis of future land exchanges include the potential for development to impact water quality at Alta Lakes, the San Miguel River, and to groundwater; potential impacts to migrating and resident waterfowl; potential impact to wildlife habitat and migration corridors; and potential impacts to wetlands. The Telluride Ski and Golf Company

expansion will lead to the fragmentation of existing old growth fir-spruce forest and degrade traditional elk calving grounds. It will also sever a connection between lynx habitat north and east of the town of Telluride with habitat in the Lizard Head Wilderness. In addition, instream flows of the San Miguel River will be reduced because of water diversion from Prospect Creek for snowmaking and use at planned facilities (i. e. restaurants). National Forest Service estimates suggest that those reductions would be negligible (USDA 1999). Increased traffic and construction associated with the expansion may lead to increased erosion and sedimentation within Prospect Creek and the San Miguel, and disruption of the natural filtering characteristics at the confluence of the San Miguel and Prospect Creek will increase concentrations of metals in both waterways (USDA 1999). The Forest Service's own analysis suggests that heavy metal concentrations would be increased by an average of 6% during the October to January snowmaking period (USDA 1999). The net effect may be decline of water quality below acute levels for aquatic life in the San Miguel River.

Four Boreal Owls were detected representing one or more territorial owls on or adjacent to parcels identified as NFD and SMI-1 of the Alta Lakes Land Exchange Proposal.

In the area proposed for the expansion of the Telluride Ski Area, environmental consultants discovered two rare plant species, Altai cottongrass, and pinnate moonwort. Altai cottongrass grows in a wetland at the head of a small lake, along with the more common narrowleaf cottongrass. Associated species included beaked sedge, Drummond's rush, bittercress, and elephantella. Other nearby ponds and lakes were searched, but yielded only the narrowleaf cottongrass. Although the site was visited by CNHP in 1999, it was too early to identify the plants. The wetland was determined to be intact and in good condition.

The moonwort was found on a relatively dry hillside in an opening in the Engelmann spruce and subalpine fir forest, and again near a powerline tower. Both areas were somewhat disturbed. Common associated species included strawberry, rock jasmine, dandelion, Indian paintbrush, common juniper, mosses and lichens. A collection was sent to Colorado fern expert Peter Root for identification. There may be one or more additional moonwort species at the site that were not collected.

Natural Heritage element occurrences at the Prospect Basin-Alta Lakes PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Botrychium pinnatum*** | **Northern moonwort** | **G4?** | **S1** | | **B** |
| *Aegolius funereus* | Boreal Owl | G5 | S2 | | B |
| *Eriophorum altaicum* var. *neogaeum* | Altai cottongrass | G4T? | S3 | USFS | B |

*EO=Element Occurrence

**Biodiversity comments:** In addition to the northern moonwort, a good population of Altai cottongrass was located at this PCA. This species is apparently secure globally; however, there is some question as to the rarity of the variety. A Boreal Owl survey conducted for the Forest Service in 1998 suggests that there are one or more nesting pairs

in the vicinity of Alta Lakes. This species is rare in Colorado, although apparently secure on a global scale.

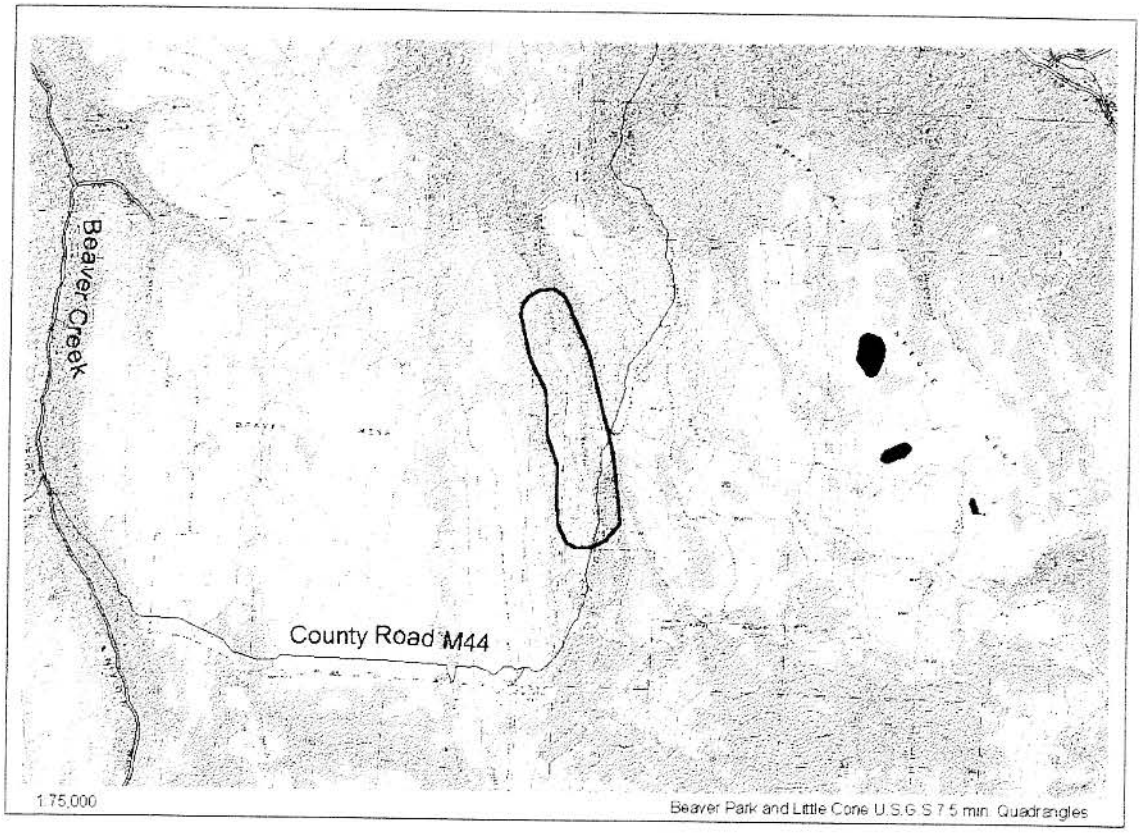
**Boundary Justification:** The boundary is drawn to encompass the occurrences of the northern moonwort, Altai cottongrass and Boreal Owl. The PCA also includes an important travel corridor connecting potential lynx habitat to the north and east of the town of Telluride and at Prospect Basin to other suitable habitat in the Lizard Head area.

**Protection Rank Comments:** The Forest Service is pursuing purchase of private lands around Alta Lakes to protect the area from development. See above for further discussion. Forest Service ownership of parcels NFD and SMI-1 would assist in protecting both Boreal Owl nesting habitat and potential lynx habitat. Large home ranges and low population densities of Boreal Owls require that preserves exceed 1000 sq. km of suitable habitat (Hayward and Hayward 1993).

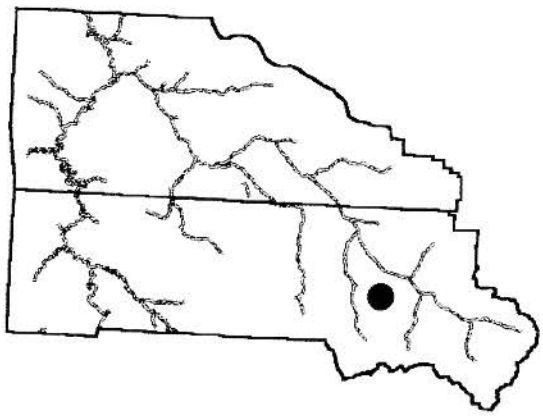
**Management Rank Comments:** Management strategies to benefit Boreal Owls include preservation of snags for nesting cavities, and maintenance of aspen groves with large diameter trees. Uneven-age timber management may be compatible, but clear-cuts are not considered suitable habitat for foraging Boreal Owls (Hayward and Hayward 1993).

# Saltado Creek

## Potential Conservation Area




1 0 1 2 3 Miles

# Saltado Creek

**Biodiversity Rank: B4** (Moderate Biodiversity Significance) The Saltado Creek PCA contains a fair example of a willow community that is considered to be vulnerable on a global scale.

**Protection Urgency Rank: P2** A threat is expected within five years.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Saltado Creek is located 4.5 air miles southwest of Placerville, Colorado in central San Miguel County

U.S.G.S. 7.5 minute quadrangles: Beaver Park, Little Cone

**Legal description:** T43N R11W Sections 18, 19; T43N R12W Section 13.

**Elevation range:** 8,300 to 9,000 feet.

**Size:** 505 acres

**General Description:**

Saltado Creek, a tributary of the San Miguel River, drains mesas to the south of the San Miguel Canyon. The creek was surveyed in 1991 as part of riparian survey conducted by CNHP (Kittel 1991). The willow community along the creek was found to be in fair condition, with Rocky Mountain willow accounting for approximately 50% of the cover, and Geyer willow making up 20%. Other species present were Bebb willow, coneflower, and nodding brome.

Natural Heritage element occurrences at the Saltado Creek PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Salix geyeriana-Salix monticola*/mesic forb** | **Geyer's willow-rocky mountain willow/mesic forb** | **G3** | **S3** | | **C** |

*EO=Element Occurrence

**Biodiversity comments:** The Geyer willow-Rocky Mountain willow community is the only documented occurrence in the PCA.

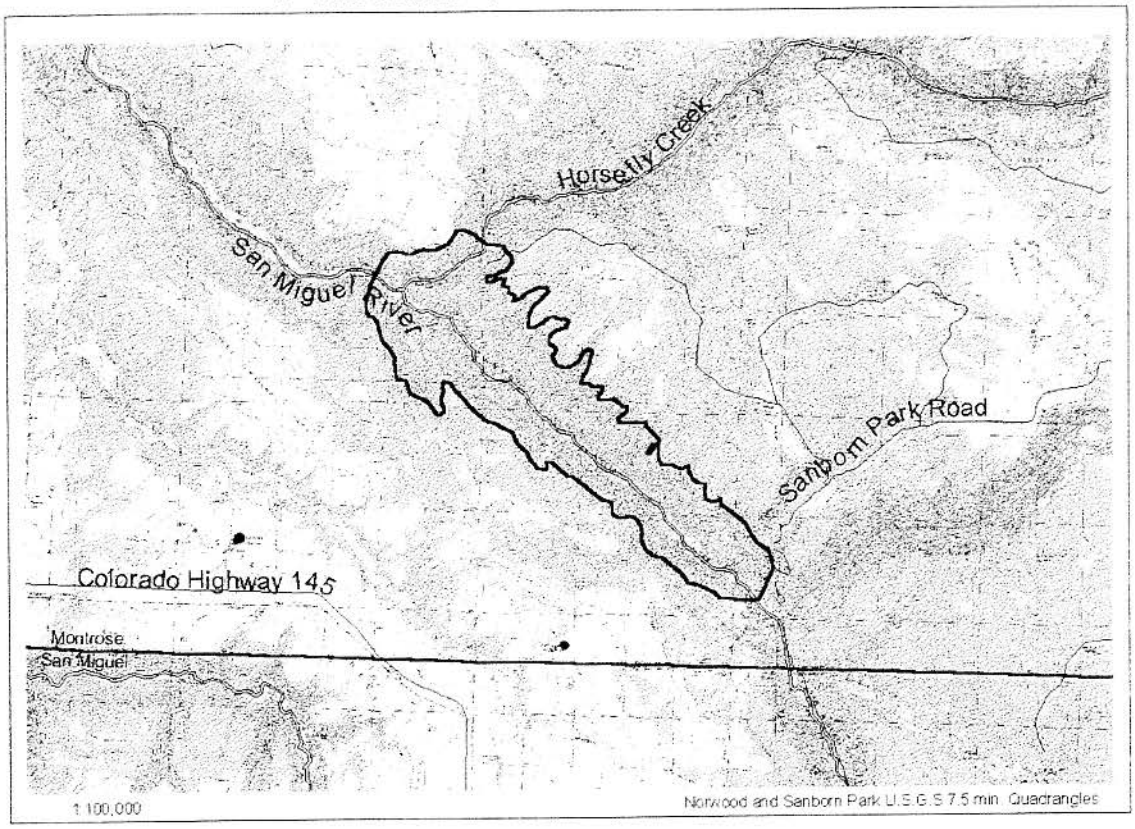
**Boundary Justification:** The PCA includes the section of the riparian area of Saltado Creek with the documented willow occurrence, along with some adjacent uplands that are important in sustaining the quality of the riparian zone. Parts of the creek not surveyed, both upstream and downstream, may also be of conservation significance.

**Protection Rank Comments:** This PCA is located entirely on private lands between BLM land downstream and National Forest land upstream on Saltado Creek. This mesa top is probably subject to development pressure. The property is part of a 1,900 acre

parcel that was purchased in 1999. Development plans of the new owners are not known. However, if the private land in the riparian zone of Saltado Creek becomes available, it would be valuable as protected open space, due to its location between public lands of the National Forest and BLM.

**Management Rank Comments:** This riparian plant community is dependent on the continued flows of water in Saltado Creek.

# San Miguel River
# Clay Creek to Horsefly Creek
## Potential Conservation Area




1 0 1 2 3 4 Miles

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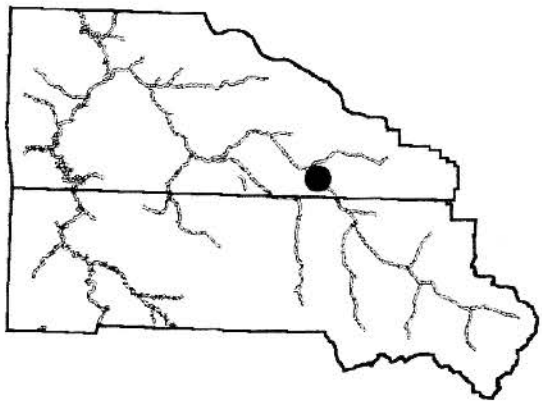


# San Miguel River-Clay Creek to Horsefly Creek

**Biodiversity Rank: B3** (High Biodiversity Significance) This PCA contains excellent occurrences of several riparian plant communities, including the lower montane riparian shrubland dominated by river birch, considered to be vulnerable throughout its range, and rare in Colorado.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** This PCA is located 4.0 air miles north of Norwood, Colorado in western Montrose County.

U.S.G.S. 7.5 minute quadrangles: Norwood, Sanborn Park

**Legal description:** T45N R13W Sections 2-4, 11; T46N R13W Sections 27-29, 32-35.

**Elevation range:** 6,200 to 7,200 feet

**Size:** 3,129 acres

**General Description:**

Horsefly Creek joins the San Miguel in the roadless section of the canyon between the Norwood Bridge and Pinyon. It drains a large part of the Uncompahgre Plateau. This PCA extends along the San Miguel from about a half mile downstream to three miles upstream from the confluence of Horsefly Creek. Riparian vegetation in this PCA was surveyed in 1991 and 1997 by CNHP (Kittel 1991, Stevens 1997). The PCA was again visited in 1999. This section of the river is used in summer by rafters and kayakers. It receives little use during the winter.

In general, the narrow riparian area has a mature overstory of blue spruce and narrowleaf cottonwood, with river birch, thinleaf alder and red-osier dogwood in the understory. In places where the tree canopy is missing, birch and alder dominate. Various combinations of these dominant plants account for the six different plant associations documented. The plant communities were judged to be of very high quality with few exotic species. Other plants in the PCA are Ponderosa pine, Douglas fir, Gambel's oak, wild rose, Kentucky bluegrass, silver buffaloberry, coyote willow, Fendler's barberry, false Solomonseal, actinea, Rocky Mountain juniper, and thistles. It was noted in 1991 that cattle grazing was reducing the native herbaceous flora. Although not documented previously, oxeye daisy was observed along the river banks in 1999.

Upland vegetation in the area is pinyon-juniper and Gambel's oak woodland. Associated species include wild rose, nodding onion, actinea, pussytoes, prickly-pear cactus, Oregon grape, aspen daisy, buckwheat and skunkbrush. In openings on a south-facing slope, there was a good-sized population of the Abajo penstemon. The plants were growing on naturally eroded, barren, sandy soils. Much potential habitat for this species remains unsurveyed in this area.

Natural Heritage element occurrences at the San Miguel River at the Clay Creek to Horsefly Creek PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Betula occidentalis*/mesic graminoid** | **Lower montane riparian shrublands** | **G3** | **S2** | | **A** |
| ***Picea pungens/Alnus incana*** | **Blue spruce/thinleaf alder montane riparian forests** | **G3** | **S3** | | **A** |
| *Populus angustifolia/Alnus incana* | Montane riparian forest | G3? | S3 | | A |
| *Picea pungens/Cornus sericea* | Blue spruce/red osier dogwood montane riparian forest | G4 | S2 | | A |
| *Populus angustifolia-Picea pungens/Alnus incana* | Montane riparian forests | G3 | S3 | | A |
| *Shepherdia argentea* | Silver buffaloberry foothills riparian shrubland | G3G4 | S1 | | C |
| *Penstemon lentus* | Abajo penstemon | G4Q | S2 | | B |
| *Haliaeetus leucocephalus* | Bald eagle | G4T?Q | S1B,S3N | LT/T | B |
| *Alnus incana*/mesic graminoid | Montane riparian shrubland | G5Q | S3 | | A |

*EO=Element Occurrence

**Biodiversity comments:** This PCA contains excellent occurrences of six riparian plant communities that form a mosaic in the PCA. They are: the lower montane riparian shrublands dominated by river birch, considered to be vulnerable throughout its range, and rare in Colorado; the globally vulnerable blue spruce/thinleaf alder montane riparian forest, and narrowleaf cottonwood/thinleaf alder riparian forests; blue spruce/red osier dogwood, rare in Colorado; thinleaf alder riparian shrublands, vulnerable in Colorado; and narrowleaf cottonwood-blue spruce/thinleaf alder, considered to be globally common. A small patch of silver buffaloberry riparian shrubland was observed at the confluence of Horsefly Creek (Figure 71). This community may extend farther up the creek, and warrant a higher occurrence rank with further survey. A communal roost of bald eagles was documented in this PCA in 1998. This is the only such roost known between Telluride and Uravan.

**Boundary Justification:** The boundary is drawn to include the high quality riparian vegetation in the San Miguel Canyon from just downstream of the confluence of Horsefly Creek to about 3 miles upstream.

**Protection Rank Comments:** The BLM portion of this PCA is protected by designation as an Area of Critical Environmental Concern. The ACEC comprises 20,964 acres of public land, within a Special Resource Management Area (SRMA) of 32,641 acres, between Placerville and Horsefly Creek.

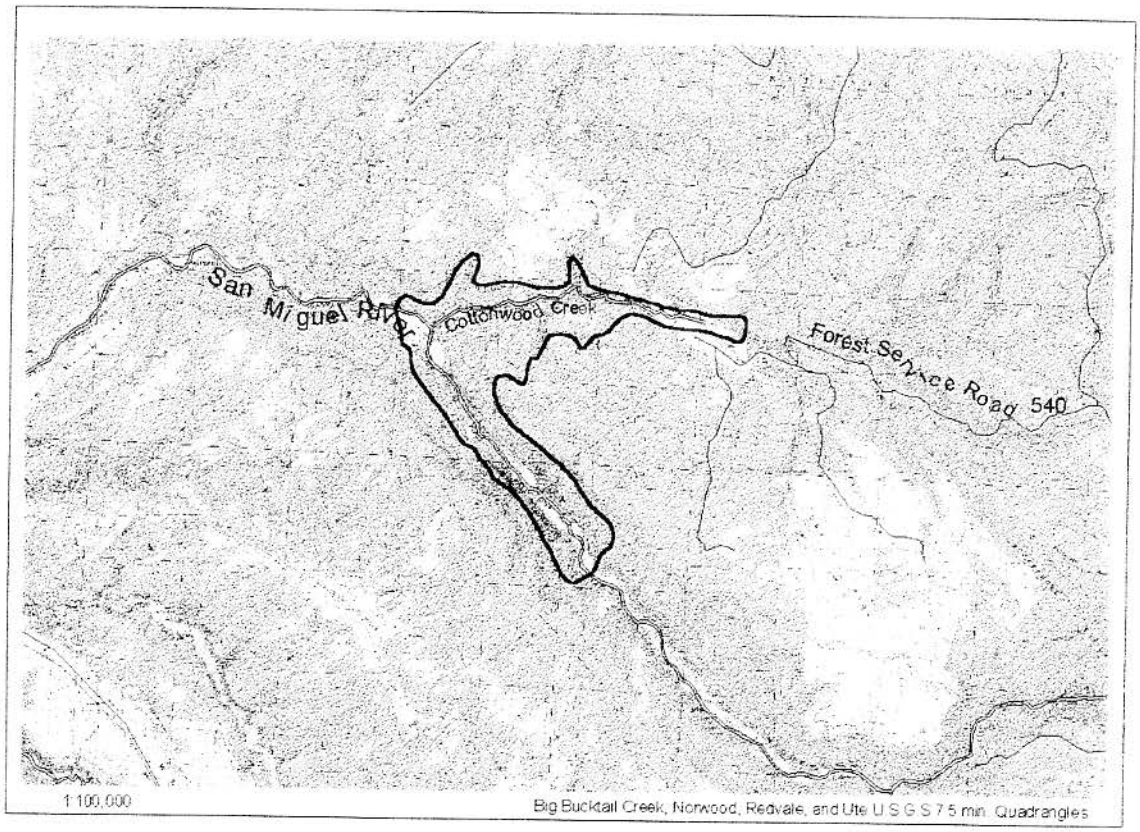
Instream flows in the river may prove to be inadequate to maintain the present quality of the riparian vegetation with future diversions for residential and snowmaking use.

**Management Rank Comments:** BLM lands in this PCA are managed according to the plan set forth in the 1993 amendment to the Resource Management Plan (USDI 1993). Lands within the ACEC are to be managed with emphasis on protection of the "unique, high quality riparian vegetation resources", the scenic values of the corridor, and preservation of relic riparian communities. Providing quality recreation experiences while maintaining the riparian systems is the second major goal within the ACEC. Use of the BLM lands in this PCA is primarily by rafters and kayakers, who may have impacts at frequently used campsites. Campsites are being developed for use by outfitters, in order to concentrate use in a controlled area. No OHV use is allowed on the public lands. All roads on public land within the PCA are to be closed according to the management plan. New occurrences of the exotic weed, oxeye daisy, were observed along the river bank in 1999.

Figure 71. Silver buffaloberry riparian shrubland at confluence of Horsefly Creek and San Miguel River.

# San Miguel River at Cottonwood Creek

## Potential Conservation Area




1 0 1 2 3 4 Miles

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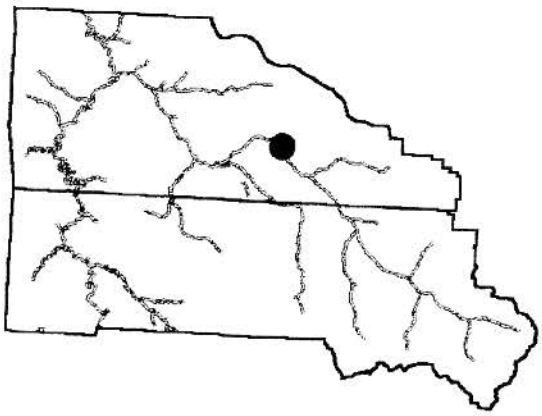


# San Miguel River at Cottonwood Creek

**Biodiversity Rank: B3** (High Biodiversity Significance) This PCA contains a fair to good occurrence of the skunkbrush/coyote willow riparian shrubland, a plant community that is considered to be imperiled on a global scale.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M3** Ongoing, recurrent management action would help to maintain the current quality of element occurrences.

**Location:** This PCA is located 4.8 air miles northeast of Redvale, Colorado at the confluence of the San Miguel and Cottonwood River's in western Montrose County.

U.S.G.S. 7.5 minute quadrangles: Big Bucktail Creek

**Legal description:** T46N R13W Section 6; T46N R14W Sections 1-3, 10, 11, 13, 14; T47N R14W Sections 34, 35.

**Elevation range:** 5,800 to 6,400 feet.

**Size:** 2,007 acres

**General Description:**

The San Miguel River at Cottonwood Creek PCA is located at the downstream end of the roadless section of the river that begins just below the Norwood Bridge. At Pinyon, a dirt road follows the north side of the river upstream for several miles on BLM and private lands. Camping and fishing are popular on BLM lands at this PCA.

Near the confluence of Cottonwood Creek, riparian vegetation begins to take on more low elevation characteristics. Plant growth on the floodplain is very dense in places, with thick stands of cottonwood, river birch, box elder, Rocky Mountain juniper, clematis, poison ivy, wild rose, Gambel's oak, skunkbrush, thinleaf alder, gray aster and Fendler's barberry. The tall shrubs strapleaf willow, skunkbrush, chokecherry and red-osier dogwood dominate other patches.

In highly disturbed wetlands along the banks of the San Miguel, coyote willow dominates the riparian area. Associated species in these sites were Baltic rush, spike rush, scouring rush, wild licorice, and several sedges. There is some regeneration of cottonwoods in these areas. Some of the area that was formerly placer mined now has weedy gravel bars with hairy golden aster, dogbane, coyote willow and Russian knapweed. Numerous exotic species are present in the PCA. These include Russian olive, Russian knapweed, Canada thistle, oxeye daisy, yellow sweet clover, and meadow timothy.

Highway 90 follows Cottonwood Creek upstream. Vegetation here tends to be somewhat less dense than along the San Miguel, but there are patches with very heavy plant growth. The CNHP riparian survey of 1991 identified a community of narrowleaf cottonwood and skunkbrush that had 80% tree cover and 60% shrub cover. Gambel's oak is common along Cottonwood Creek, sometimes attaining large tree size. Poison ivy

is abundant beneath the oak. Other riparian species here include lanceleaf cottonwood (*Populus acuminata*), the hybrid of the narrowleaf and Fremont cottonwoods, Rocky Mountain juniper, clematis, wild geranium, wild rose, Fender's barberry, red-osier dogwood, and river hawthorn.

Natural Heritage element occurrences at the San Miguel River at Cottonwood Creek PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Rhus trilobata/Salix exigua*** | **Skunkbrush/Coyote willow riparian shrubland** | **G2** | **S2** | | **B** |
| *Populus angustifolia/Rhus trilobata* | Narrowleaf cottonwood/skunkbrush | G3 | S3 | | B |
| *Salix exigua/*mesic graminoid | Coyote willow/mesic graminoid | G5 | S5 | | A |

*EO=Element Occurrence

**Biodiversity comments:** The high significance of this PCA is due to the good occurrence of the globally imperiled skunkbrush riparian woodland. There is also a good occurrence of the globally vulnerable narrowleaf cottonwood/skunkbrush association, and an excellent example of the common coyote willow/mesic graminoid community.

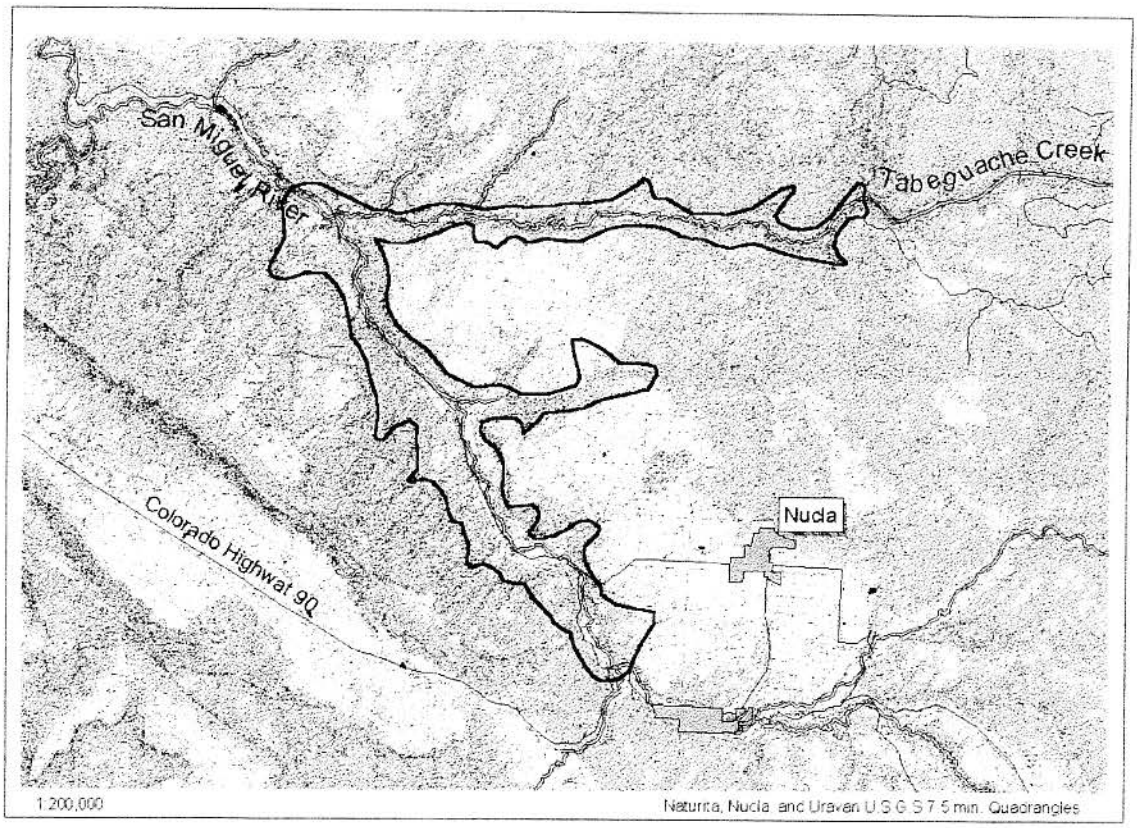
**Boundary Justification:** The boundary circumscribes the riparian zones of the San Miguel River and Cottonwood Creek. Some of the adjacent upland areas were also included, as they contribute significantly to the hydrological functioning of the river. Disturbance in the upland vegetation resulting in increased erosion can negatively impact the quality of the river and its riparian community.

**Protection Rank Comments:** Flow levels of the river downstream from the Calamity Ditch diversion are often extremely low in the summer. However, the riparian vegetation appears to have adjusted to these levels.

**Management Rank Comments:** The BLM lands in this PCA are managed as part of a Special Recreation Management Area (USDI 1993). Recreational use is heavy in this section of the San Miguel. Placer mining, on a small scale, is allowed, and can damage the stream bed and riparian vegetation. Camping in this area is dispersed, and campsite limits imposed on the upstream parts of the river do not apply here. Monitoring of recreation impacts would allow managers to determine whether designated campsites are needed. Weed control, and restoration of former placer mining areas would improve the site.

# San Miguel River at Tabeguache Creek

## Potential Conservation Area




2 0 2 4 6 8 Miles

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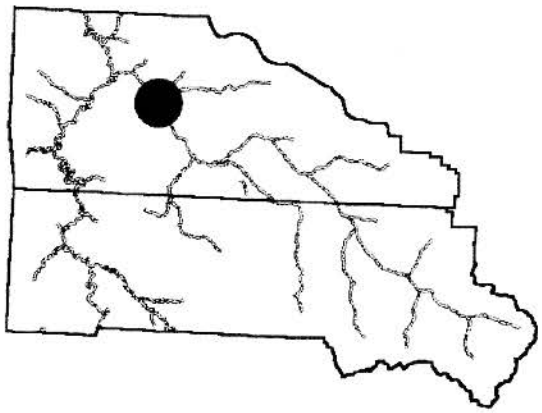


# San Miguel River at Tabeguache Creek

**Biodiversity Rank: B1** (Outstanding Biodiversity Significance) The presence of an excellent example of New Mexico privet riparian shrublands, considered to be critically imperiled on a global scale, makes this one of the highest ranked PCAs in San Miguel and western Montrose counties.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M3** Ongoing, recurrent management action would help to maintain the current quality of element occurrences.

**Location:** This PCA is located 4.0 air miles west of Nucla, Colorado in western Montrose County.

U.S.G.S. 7.5 minute quadrangles: Atkinson Creek, Naturita, Nucla, Uravan

**Legal description:** T46N R16W Sections 2-5, 8-15, 23; T47N R15W Sections 4-6, 14, 15, 18-24, 27-29, 30-33; T47N R16W Sections 1-6; T47N R17W Sections 1-3, 10-14, 24, 25; T48N R15W Sections 31-33; T48N R16W Sections 34-36; T48N R17W Sections 34, 35.

**Elevation range:** 5,000 to 6,900 feet.

**Size:** 15,573 acres

**General Description:**

The San Miguel River at Tabeguache PCA includes the riparian corridor of the San Miguel River and a small amount of the adjacent uplands. It also takes in the riparian zones of the lower part of Tabeguache Creek and Coal Canyon. Mature cottonwoods, both the narrowleaf and Rio Grande species, as well as their hybrids dominate the riparian zone. The understory consists of skunkbrush and coyote willow. The uplands have dry, rocky pinyon and juniper woodland with much exposed sandstone.

Most of the PCA is owned by The Nature Conservancy, having been donated to the organization in 1987 by the State of Colorado, after it was donated to the state by Umetco Minerals Corporation. The Conservancy recently acquired additional private land upstream of the original preserve. A total of 39 element occurrences have been recorded for the PCA, in part reflecting the efforts of The Nature Conservancy to thoroughly document the current vegetation.

The PCA contains numerous high quality examples of riparian plant communities, including the globally imperiled Fremont cottonwood/skunkbrush association, the New Mexico privet riparian shrublands, and the more common Rio Grande cottonwood/coyote willow association. The San Miguel riparian zone varies from narrow and straight in incised canyons, to wide meanders that lead to a multi-layered successional pattern of plant associations on the riverbends. Shrubs generally line the channel, with upland vegetation, including sagebrush, rabbitbrush, rose and serviceberry occurring on the flat meander bends. In some areas, tamarisk has invaded the riparian vegetation, replacing the

native New Mexico privet and skunkbrush. Cottonwoods and willows are reproducing successfully along the river, thanks to the natural flooding processes that can occur on this undammed river.

Natural Heritage element occurrences at the San Miguel River at Tabeguache Creek PCA.

| Element | Common Name | G rank | S rank | Federal/ State status | EO* rank |
|---|---|---|---|---|---|
| ***Forestiera pubescens*** | **New Mexico privet foothills riparian shrubland** | **G1G2** | **S1** | | **A** |
| *Forestiera pubescens* | New Mexico privet foothills riparian shrubland | G1G2 | S1 | | B |
| *Forestiera pubescens* | New Mexico privet foothills riparian shrubland | G1G2 | S1 | | B |
| *Forestiera pubescens* | New Mexico privet foothills riparian shrubland | G1G2 | S1 | | B |
| *Rhus trilobata/Salix exigua* | Skunkbrush/coyote willow riparian shrubland | G2 | S2 | | B |
| *Populus deltoides* ssp. *wislizenii/Rhus trilobata* | Fremont's cottonwood riparian forests | G2 | S2 | | B |
| *Rhus trilobata/Salix exigua* | Skunkbrush/Coyote willow riparian shrubland | G2 | S2 | | B |
| *Populus deltoides* ssp. *wislizenii/Rhus trilobata* | Fremont's cottonwood riparian forests | G2 | S2 | | C |
| *Lupinus crassus* | Payson lupine | G2 | S2 | BLM | D |
| *Lupinus crassus* | Payson lupine | G2 | S2 | BLM | E |
| *Lupinus crassus* | Payson lupine | G2 | S2 | BLM | C |
| *Lupinus crassus* | Payson lupine | G2 | S2 | BLM | H |
| *Astragalus rafaelensis* | San Rafael milkvetch | G3 | S1 | BLM | E |
| *Astragalus rafaelensis* | San Rafael milkvetch | G3 | S1 | BLM | D |
| *Hilaria jamesii* | Western slope grasslands | G3 | S1 | | E |
| *Betula occidentalis/*mesic graminoid | Lower montane riparian shrublands | G3 | S2 | | B |
| *Betula occidentalis/*mesic graminoid | Lower montane riparian shrublands | G3 | S2 | | B |
| *Populus angustifolia/Rhus trilobata* | Narrowleaf cottonwood/skunkbrush | G3 | S3 | | A |
| *Populus angustifolia/Rhus trilobata* | Narrowleaf cottonwood/skunkbrush | G3 | S3 | | B |
| *Populus angustifolia/Rhus trilobata* | Narrowleaf cottonwood/skunkbrush | G3 | S3 | | B |
| *Populus angustifolia/Rhus trilobata* | Narrowleaf cottonwood/skunkbrush | G3 | S3 | | B |
| *Populus angustifolia/Rhus trilobata* | Narrowleaf cottonwood/skunkbrush | G3 | S3 | | B |
| *Shepherdia argentea* | Foothills riparian shrubland | G3G4 | S1 | | B |
| *Shepherdia argentea* | Foothills riparian shrubland | G3G4 | S1 | | B |
| *Sporobolus airoides* | Great plains salt meadows | G3Q | S3 | | A |
| *Pinus edulis/Cercocarpus montanus* | Mesic western slope pinyon-juniper woodlands | G5 | S4 | | B |
| *Salix exigua/bare ground* | Coyote willow/bare ground | G5 | S5 | | A |
| *Populus deltoides* ssp. *Wislizenii/Salix exigua* | Fremont’s cottonwood riparian forests | GU | S1S2 | | B |

| | | | | | |
|---|---|---|---|---|---|
| *Populus deltoides* ssp. *Wislizenii/Salix exigua* | Fremont's cottonwood riparian forests | GU | S1S2 | | B |
| *Populus deltoides* ssp. *Wislizenii/Salix exigua* | Fremont's cottonwood riparian forests | GU | S1S2 | | B |
| *Populus deltoides* ssp. *Wislizenii/Salix exigua* | Fremont's cottonwood riparian forests | GU | S1S2 | | B |
| *Juniperus osteosperma/Amelanchier utahensis/Philadelphus microphyllus/Leymus salinus* | Mesic western slope pinyon-juniper woodlands | GU | SU | | B |
| *Juniperus osteosperma/Leymus salinus* | Mesic western slope pinyon-juniper woodlands | GU | SU | | B |
| *Juniperus osteosperma/Amelanchier utahensis-Philadelphus microphyllus/Leymus salinus* | Mesic western slope pinyon-juniper woodlands | GU | SU | | B |
| *Juniperus osteosperma/Leymus salinus* | Mesic western slope pinyon-juniper woodlands | G1Q | SU | | B |
| *Juniperus osteosperma/Leymus salinus* | Mesic western slope pinyon-juniper woodlands | G1Q | SU | | C |
| *Juniperus osteosperma/Amelanchier utahensis-Philadelphus microphyllus/Leymus salinus* | Mesic western slope pinyon-juniper woodlands | GU | SU | | C |

*EO=Element Occurrence

**Biodiversity comments:** In addition to the critically imperiled New Mexico privet riparian shrubland community, there are twenty-three other targeted riparian communities within the PCA, including riparian forests dominated by both narrowleaf and Fremont cottonwoods (and their hybrids), and montane riparian shrublands dominated by river birch, skunkbrush, coyote willow or silver buffaloberry. There are six occurrences of rare plants in the PCA, four of Payson lupine, and two of San Rafael milkvetch. The rare plant populations have not been updated in recent years. Uplands include nine targeted plant communities, including occurrences of mesic western slope pinyon-juniper woodlands, salt meadows, and western slope grasslands.

**Boundary Justification:** The PCA includes the riparian zones of the San Miguel River, Coal Canyon and Tabeguache Creek in the area owned by The Nature Conservancy and encompassing the element occurrences listed above. The PCA also includes some adjacent uplands with pinyon-juniper communities that are important in maintaining the quality of the riparian zone by limiting erosion and sedimentation.

**Protection Rank Comments:** Approximately 77% of this PCA is owned by BLM, while the remaining 23% is privately owned. The majority of the private land is included within The Nature Conservancy's Lower San Miguel Preserve. This is one of three Nature Conservancy Preserves on the San Miguel River, representing the lowest elevations, while the other two are in middle and high elevation sections. BLM lands at Tabeguache Creek are included in a Wilderness Study Area, but were found not to be suitable for wilderness designation by BLM in 1985 (USDI 1985). The Resource Management Plans points out that the area is sensitive both ecologically and

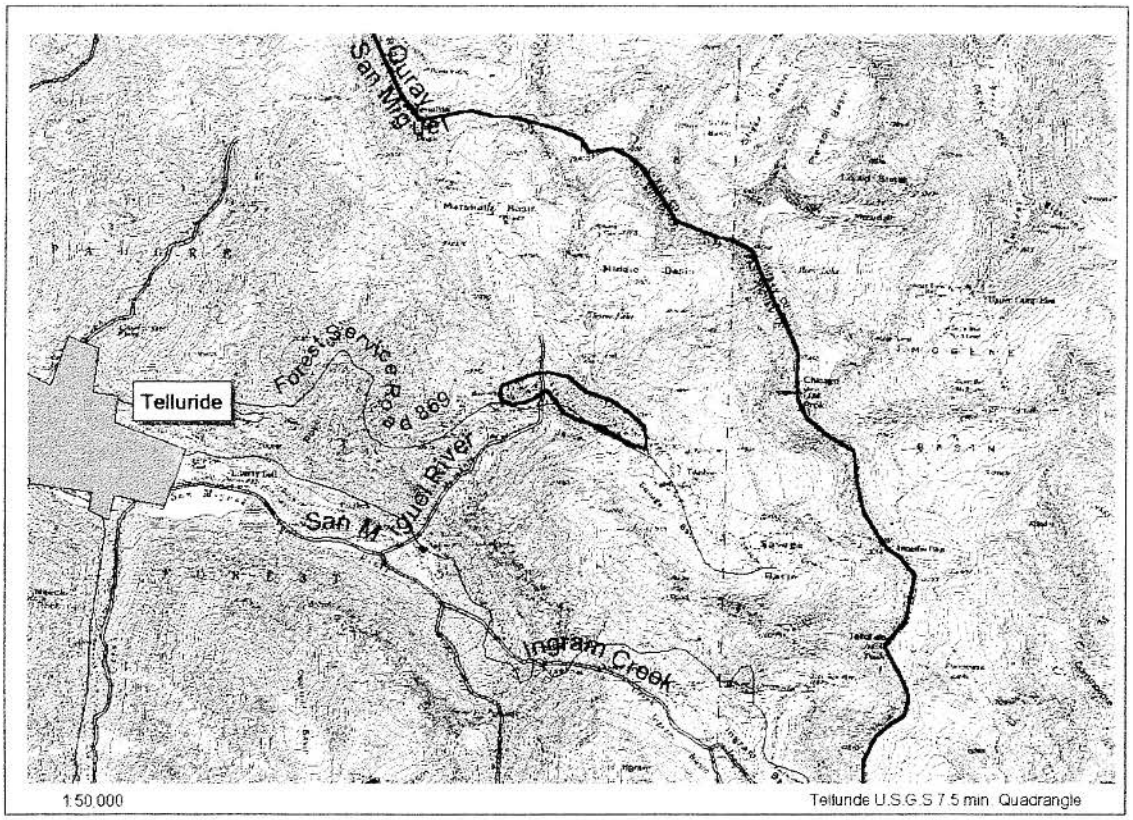
archaeologically, but these values can be better protected by designating the site as an Outstanding Natural Area (ONA).

**Management Rank Comments:** BLM has suggested that the Tabeguache Creek WSA be managed as an Outstanding Natural Area, and that recreation use may be incompatible with this proposed management direction (USDI 1985). If designated an ONA by Congress, visitor use of the area could be limited to educational and scientific purposes. An ORV closure, and no surface occupancy stipulations for oil and gas leasing would protect the integrity of the main canyon. Management on the Nature Conservancy property has included annual removal of tamarisk by volunteers. This has proved successful, although labor intensive.

Further survey effort is needed to update the populations of Payson lupine and San Rafael milkvetch. The Payson lupine populations recorded here are important in connecting the two other major locations known for the species, represented in the Highway 141 and 145 PCA and the three PCAs in the Paradox Valley.

# Savage Basin

## Potential Conservation Area

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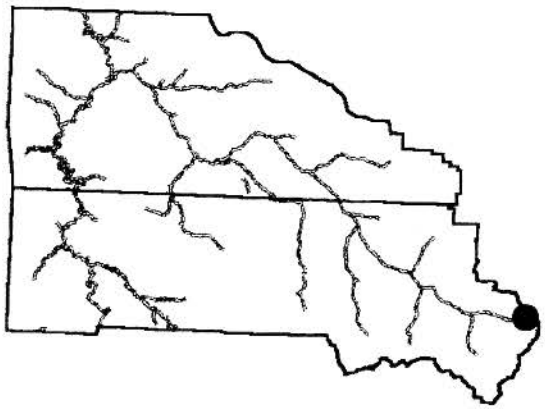


# Savage Basin

**Biodiversity Rank: B4** (Moderate Biodiversity Significance) This PCA contains unranked populations of three moonworts, including the reflected moonwort, which is considered to be imperiled on a global scale.

**Protection Urgency Rank: P3** There is a definable threat to the occurrence, but not expected within the next five years.

**Management Urgency Rank: M3** Ongoing, recurrent management action would help to maintain the current quality of element occurrences.

**Location:** Savage Basin is located 2.75 air miles east of Telluride, Colorado in extreme eastern San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Telluride

**Legal description**: T43N R8W Sections 32, 33.

**Elevation range:** 10,400 to 11,400 feet.

**Size:** 63 acres

**General Description:**

Savage Basin is a large subalpine basin east of Telluride, and includes headwaters of the San Miguel River. The PCA is on an important recreational route for four-wheel drive enthusiasts and sightseers traveling between Telluride and Ouray via Imogene Pass.

Three different species of moonworts were found in Savage Basin in 1999. All occurred on disturbed soils of road cuts. Although the number of above-ground stems was low, several years' observation are needed to determine the size of an occurrence. One reason for the rarity of the moonworts is that they are exceedingly difficult to see, and often overlooked. With more search effort, they may prove to be more common than is now known.

Natural Heritage element occurrences at the Savage Basin PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Botrychium echo*** | **Reflected moonwort** | **G2** | **S2** | | **E** |
| *Botrychium multifidum* ssp. *coulteri* | Leathery grape fern | G5 | S1 | | E |
| *Botrychium lunaria* | Common moonwort | G5 | S2S3 | | E |

*EO=Element Occurrence

**Biodiversity comments:** In addition to the imperiled reflected moonwort, two other species, the leathery grape fern and the common moonwort are found in the PCA. The latter are considered to be secure globally, but rare in Colorado.

**Boundary Justification:** The boundary is drawn to encompass the three occurrences of moonworts in Savage Basin along with adjacent potential habitat.

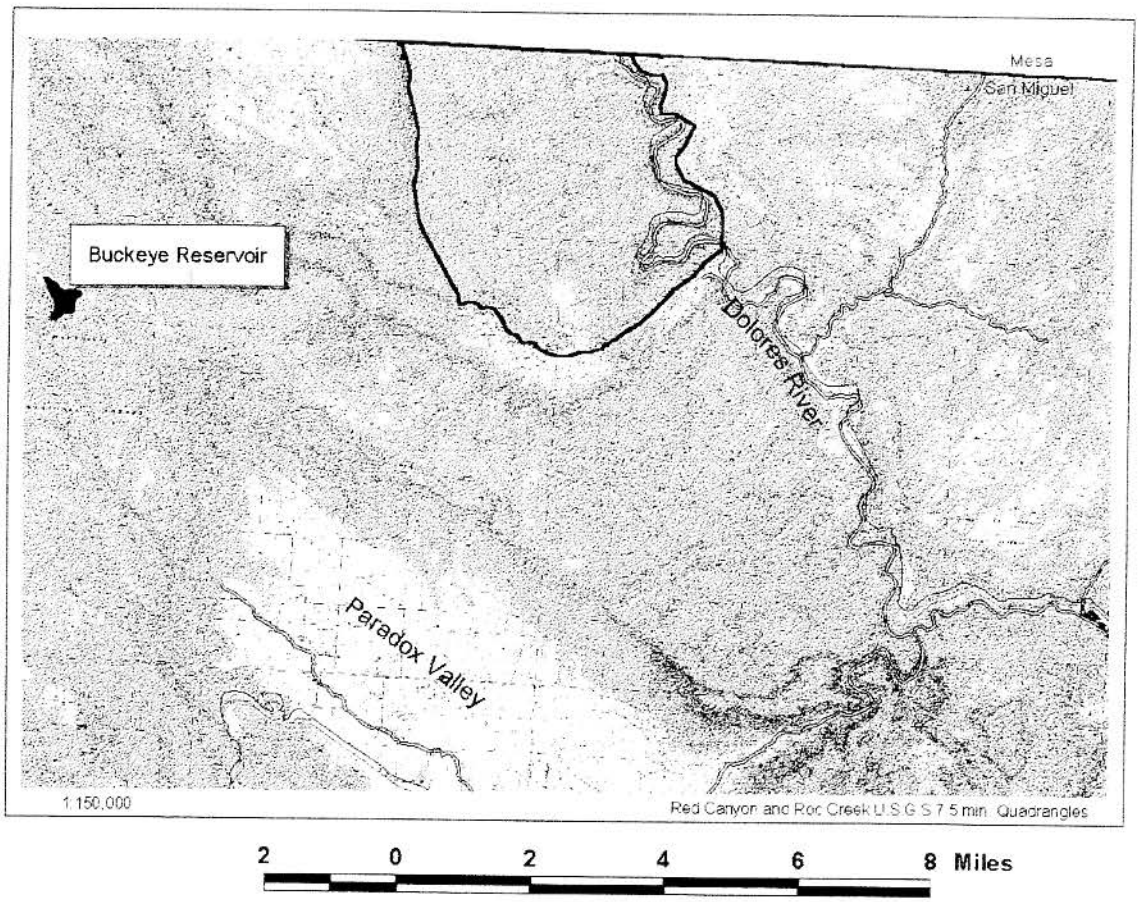
**Protection Rank Comments:** Except for a very small portion at the eastern end, the PCA is privately owned. The Forest Service is pursuing the transfer of these mining claims to public ownership. This would allow the land to be managed to preserve the fragile alpine vegetation by regulating the use of off-road vehicles.

**Management Rank Comments:** Mining and roads have disturbed the entire area. Although the moonworts appear to prefer somewhat disturbed areas, all of the alpine vegetation is extremely fragile, and may be damaged by off-road vehicle use.

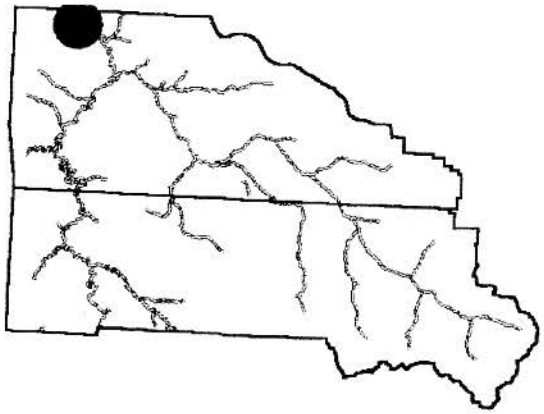
Figure 72. Savage Basin alpine vegetation.

# Sewemup Mesa

## Potential Conservation Area







# Sewemup Mesa

**Biodiversity Rank: B2** (Very high biodiversity significance) The Sewemup Mesa PCA is one of only two locations in Colorado known for the Kachina daisy. This is a good occurrence of a plant that is imperiled on a global scale.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

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

**Location:** Sewemup Mesa is located 5.75 air miles northeast of Paradox, Colorado in northwestern Montrose County.

U.S.G.S. 7.5 minute quadrangles: Red Canyon, Roc Creek

**Legal description**: T48N R18W Sections 4-7; T48N R19W Sections 1, 2, 12; T49N R18W Sections 19-21, 28-34; T49N R19W Sections 23-26; 35, 36.

**Elevation range:** 4,600 to 7,465 feet.

**Size:** 10,203 acres

**General Description:**

This PCA includes Sewemup Mesa and the section of the Dolores River at its base. It is one of only two locations in Colorado of the Kachina daisy, and contains rare hanging garden communities with Mancos columbine and Eastwood's monkeyflower, as well as maidenhair fern and helleborine orchids. These hanging garden species can be easily observed from Highway 145 at the developed roadside spring a few miles south of the Mesa County line.

Uplands on Sewemup Mesa have pinyon and juniper woodlands, with some excellent patches of native bunchgrasses. Because of extensive rains in July and August, grass height and cover was particularly impressive in 1999. Typical grasses here are needle-and-thread, blue grama, alkali sacaton, galleta, Indian ricegrass and sand dropseed. Common shrub species of the mesa are snakeweed, Mormon tea, yucca, four-wing saltbush, single leaf ash, antelope bitterbrush, cliff rose, serviceberry, and mountain mahogany. Herbaceous plants include sand aster, Townsend's Easter daisy, prickly-pear cactus, hairy golden aster, four o'clocks, and many-lobed groundsel. Soil crusts of mosses, lichens and micro-organisms are well developed on the red sandy soils.

A series of parallel drainages end at the cliffs above the Dolores River, where they form seasonal waterfalls or seep into the ground to emerge again in box canyons and alcoves to sustain hanging garden communities.

Roundtail chubs and flannelmouth suckers are known to occupy the Dolores River from around the old townsite of Slick Rock, Colorado to its termination in Utah; a stretch of the river that includes this site.

Plateau striped whiptail lizards were observed here, and have been determined to be common throughout the desert areas of western Montrose and San Miguel counties.

Natural Heritage element occurrences at the Sewemup Mesa PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Erigeron kachinensis*** | **Kachina daisy** | **G2** | **S1** | **BLM** | **B** |
| *Pinus edulis/Stipa comata* | Xeric western slope pinyon-juniper woodlands | G2? | S2 | | B |
| *Gila robusta* | Roundtail chub | G2G3 | S2 | LE/E | E |
| *Aquilegia micrantha-Mimulus eastwoodiae* | Hanging gardens | G2G3 | S2S3 | | E |
| *Mimulus eastwoodiae* | Eastwood monkey-flower | G3? | S1 | BLM | E |
| *Mimulus eastwoodiae* | Eastwood monkey-flower | G3? | S1 | BLM | E |
| *Bouteloua gracilis/Hilaria jamesii* | Blue grama/galleta shortgrass prairie | G2G4 | SU | | B |
| *Catostomus latipinnis* | Flannelmouth sucker | G3G4 | S3 | BLM | E |
| *Sporobolus airoides* | Great plains salt meadows | G3Q | S3 | | B |
| *Astragalus linifolius* | Grand junction milkvetch | G3Q | S3 | BLM | B |
| *Epipactis gigantea* | Helleborine | G4 | S2 | BLM | C |
| *Epipactis gigantea* | Helleborine | G4 | S2 | BLM | B |
| *Epipactis gigantea* | Helleborine | G4 | S2 | | E |
| *Sporobolus flexuosus* | Mesa dropseed | G5 | S1S2 | | E |
| *Pellaea atropurpurea* | Smooth cliff-brake | G5 | S2S3 | | D |
| *Cnemidophorus velox* | Plateau striped whiptail | G5 | S4 | | E |
| *Cnemidophorus velox* | Plateau striped whiptail | G5 | S4 | | |
| *Adiantum capillus-veneris* | Southern maiden-hair | G5 | S2 | BLM, USFS | C |

*EO=Element Occurrence

**Biodiversity comments:** The Sewemup Mesa PCA is of very high biodiversity significance as it is one of only two currently known locations in Colorado for the globally imperiled Kachina daisy. This is a good occurrence of a plant that is imperiled on a global scale, and extremely rare in Colorado. In addition, the PCA has a good occurrence of globally imperiled western slope grasslands, and unranked occurrences of hanging gardens with Eastwood's monkey-flower, a species extremely rare in Colorado. Several other plants that are rare in Colorado occur in the PCA, including helleborine, mesa dropseed, smooth cliff-brake and maidenhair fern. The mesa dropseed record is

based on a single herbarium specimen, and may not represent a viable population. The species is common in Arizona.

The Dolores River throughout the length of the PCA supports populations of the roundtail chub and flannelmouth sucker. These fish are imperiled and vulnerable on a global scale, respectively and the chub is rare within the state, while the sucker is vulnerable. In Colorado, both fish inhabit the Colorado River mainstem and its larger tributaries, including the White, Yampa, Dolores, San Juan, and Gunnison rivers (Woodling 1985). Colorado populations of the chub are at the upstream margin of the species' range and comprise the majority of occurrences for this species. The sucker has disappeared from some water systems like the Gunnison River above Blue Mesa where it was displaced by white and longnose suckers (Woodling 1985).

**Boundary Justification:** The boundary is drawn to include the flat top of Sewemup Mesa to the cliffs on the west side, and down to the Dolores River, including its riparian zone, on the east. It includes Garvey Gulch on the south, and continues into Mesa County on the north. The area and elevations given above are for the Montrose County portion only. It encompasses the cliffsides above the Dolores River that are the known occupied location of the Kachina daisy, as well as addition cliff area, both in the main canyon and several side canyons, that have the hydrologic characteristics suitable for the plant. These currently unoccupied areas may provide sites for the plants to become established in the future. The same sites are potential future locations for the Eastwood monkey-flower. The Dolores River is included because of the presence of the flannelmouth sucker and roundtail chub. Although the riparian vegetation along the Dolores River is in poor condition here, the boundaries allow for future improvement with management.

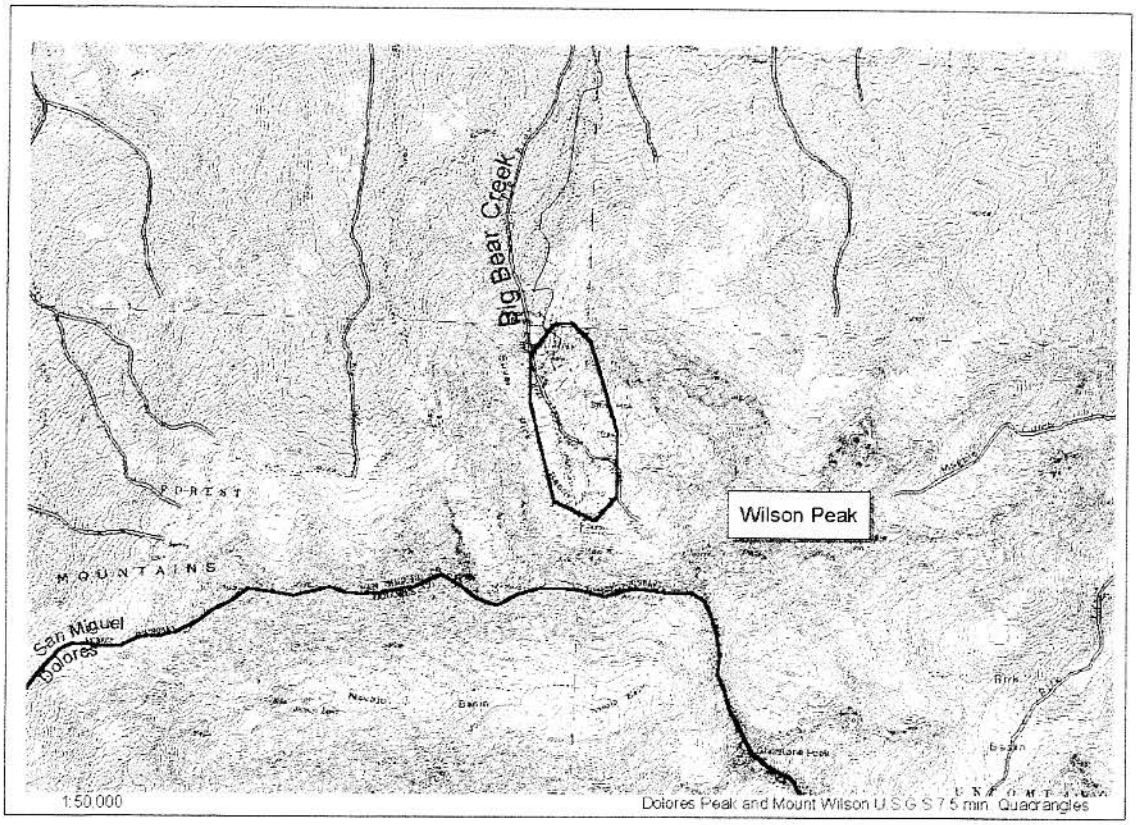
**Protection Rank Comments:** The PCA is located primarily on BLM land with no special protection. Much of the site is remote and undisturbed, and has been considered for wilderness designation. However, the part of the PCA with the greatest biological significance is adjacent to the highway, and would not be included in such designation.

**Management Rank Comments:** The site of the Kachina daisy and maidenhair fern is a popular roadside stop with a developed spring. Nevertheless, the plants have remained undisturbed for many years. The site is easily accessible for periodic monitoring of the Kachina daisy population, and could be a valuable location for further research on the taxonomy and ecology of this extremely rare species. Monitoring would also alert managers to changes in the size and quality of the population that would warrant management action.

Roundtail chubs and flannelmouth suckers have been displaced from many waterways within the Colorado River Basin and current populations of these fish need protection. Both the roundtail chub and flannelmouth sucker are sensitive to disturbance including the blockage of migration routes, introduction of non-native fish, and the alteration of hydrologic and thermal characteristics of the river including channelization, modifications of flow regimes, and increased sedimentation.

# Silver Pick Basin

## Potential Conservation Area

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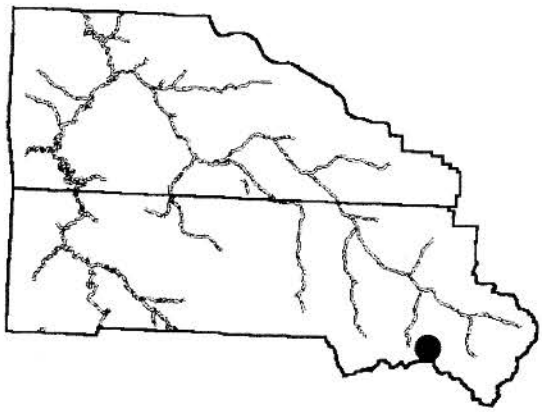


# Silver Pick Basin

**Biodiversity Rank: B2** (Very high biodiversity significance) This PCA has a good occurrence of the San Juan whitlow-grass, a plant that is imperiled on a global scale.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M3** Ongoing, recurrent management action would help to maintain the current quality of element occurrences.

**Location:** Silver Pick Basin is located 9.9 air miles west of Ophir, Colorado near the San Miguel-San Juan County line in San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Dolores Peak, Mount Wilson

**Legal description:** T42N R10W Sections 29-31.

**Elevation range:** 11,000 to 12,200 feet.

**Size:** 195 acres

**General Description:**

Silver Pick Basin is a high alpine basin at the headwaters of Big Bear Creek just below Wilson Peak. The site of extensive former mining activity, the basin is most often visited today by climbers and hikers. An old aerial tramway can still be seen at the site. Access to the PCA is via a closed road leading from a Forest Service trailhead at the end of the Silver Pick Road. The trail leads through forests of spruce and aspen, before the landscape opens out above treeline.

The forested area is rich with mosses, mushrooms, and shade-loving species such as one-sided wintergreen, common juniper, bilberry, meadowrue, wild geranium, heartleaf arnica, sweet cicely and Oregon grape. More open areas and aspen groves have wild rose, white peavine, elk sedge, and osha.

Above timberline, scree slopes with little other vegetation support the Altai chickweed. The few other species in that habitat include Colorado columbine, harbour penstemon, Fremont's groundsel, and thickroot Claytonia. The chickweed, penstemon and groundsel share similar adaptations to this habitat in the form of long, flexible roots that allow them to move with the downhill creep of the rocks. The tiny plants were common in all suitable habitat on the loose rocks, preferring sites with smaller size rocks, a little soil development, and some natural disturbance. In some cases, the Arctic draba was found growing in the same sites with the chickweed. It was also found in more disturbed sites along the road, especially in areas that had been cleared for turning vehicles.

The San Juan whitlow-grass was found in cold, wet tundra near late-melting snowfields. It can be recognized by its narrow leaves, and broad and dark green pods. Each four-petaled yellow flower is subtended by a bract. It occupied a narrow band from about 20 to 80 feet away from the melting edge of the snowbanks. In this zone, grasses

are still brown and soils cold and wet late into July. Farther away from the snow, the tundra is lush with wildflowers like alpine avens, Indian paintbrush, snow-lover, moss campion, three-toothed groundsel, alpine sandwort, and blackhead daisy. The narrow niche that the San Juan whitlow-grass occupies could make it very vulnerable to small changes in climate. Enough warming so that snowbanks did not persist into late summer could eliminate it from this site.

Natural Heritage element occurrences at the Silver Pick Basin PCA.

| Element | Common Name | G rank | | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Draba graminea*** | **San Juan whitlow-grass** | **G2** | **S2** | | **B** |
| Draba fladnizensis | Arctic draba | G4 | S2S3 | | C |
| Stellaria irrigua | Altai chickweed | G4? | S2 | | B |

*EO=Element Occurrence

**Biodiversity comments:** This PCA has high significance due to a good occurrence of San Juan whitlow-grass, considered to be globally imperiled. There are also a fair occurrence of Arctic draba and a good occurrence of Altai chickweed, both rare in Colorado.

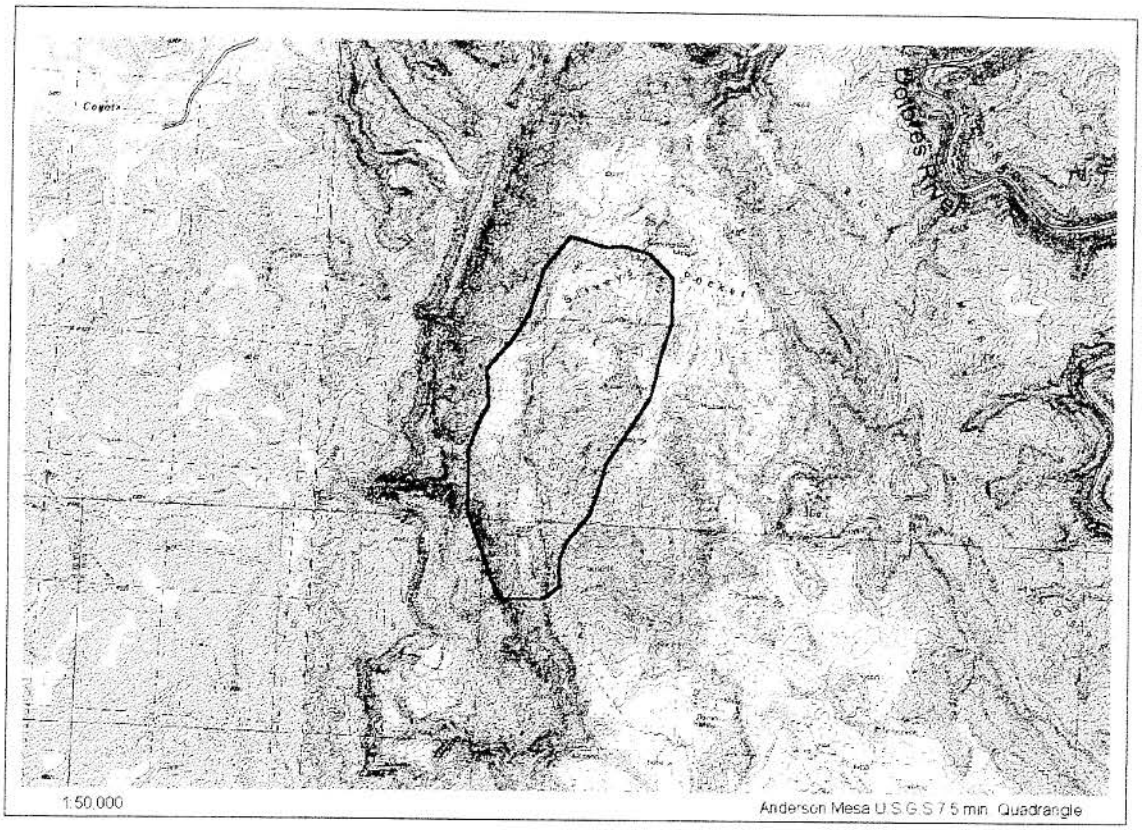
**Boundary Justification:** The PCA includes the known locations of the three rare plant species listed above, with some adjacent potential habitat that is suitable for each. These currently unoccupied areas can provide sites for the plants to become established in the future. Further research on the ecological requirements of these plants could lead to revisions of the boundaries, for example to allow for the habitat needs of pollinators that are as yet unidentified.

**Protection Rank Comments:** The PCA is located primarily on National Forest land and includes a small area of private land.

**Management Rank Comments:** No special management needs for the three rare plant populations at this PCA are known at this time. However, further research is needed on the reproductive ecology of the plant species in this site, and this could lead to better understanding of any management needs. Periodic monitoring of this site could provide valuable information about the response of these species to changes in both short-term weather conditions and long-term climate change.

# SIlvey's Pocket

## Potential Conservation Area

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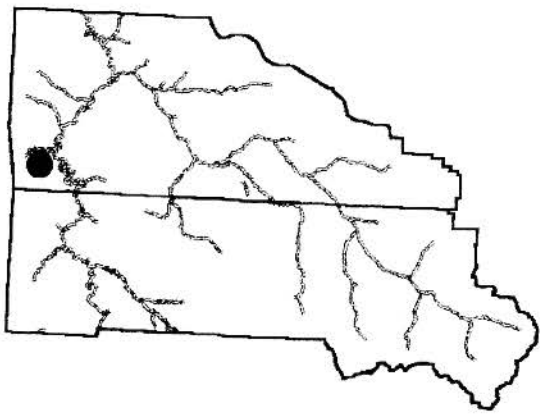


# Silvey's Pocket

**Biodiversity Rank: B3** (High Biodiversity Significance) Silvey's Pocket contains a good occurrence of Naturita milkvetch, considered to be vulnerable on a global scale and an excellent occurrence of needle and thread Great Basin herbaceous vegetation.

**Protection Urgency Rank: P4** No threat is known for the forseeable future.

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

**Location:** Silvey's Pocket is located 8.5 air miles southwest of Bedrock, Colorado in extreme southwestern Montrose County.

U.S.G.S. 7.5 minute quadrangles: Anderson Mesa

**Legal description:** T45N R19W Sections 4, 5; T46N R19W Sections 28, 29, 32, 33.

**Elevation range:** 5,300 to 5,800 feet.

**Size:** 707 acres

**General Description:**

The Silvey's Pocket PCA includes mesa tops and a broad bench south of Coyote Wash. A rough four-wheel drive road leads to the site from Little Gypsum Valley. The area has numerous old uranium mines and is entirely within BLM owned lands. Most of the PCA is in the Morrison and Dakota geologic formations. Vegetation is a mosaic of pinyon-juniper woodland, sagebrush and greasewood flats.

The pinyon-juniper community also contains mountain mahogany, snakeweed, yucca, Mormon tea, and spiny greasebush. Common grasses are galleta, blue grama, needle-and-thread, three-awn and Indian ricegrass. Herbaceous species include Wingate milkvetch, cats-eye, Townsend's Easter daisy, sand aster, scarlet globemallow, prickly-pear cactus, four o'clocks, and many-lobed groundsel. The Naturita milkvetch was found in this community, in soil pockets and crevices of exposed sandstone pavements, often close to the rims of small canyons. The plants were sparsely scattered throughout this habitat. The Paradox breadroot was observed in the area in 1982, but was not seen in 1999.

Sagebrush and greasewood occupied more level areas with deeper soils. Associated species were galleta, six weeks fescue, Eastwood's paintbrush, wooly milkvetch, evening primrose, and skyrocket gilia. Disturbed areas had wooly plantain.

Benches in the Navajo Formation were identified by BLM as high quality, relic examples of the native bunchgrass community that is typical of western Montrose and San Miguel counties.

Natural Heritage element occurrences at the Silvey's Pocket PCA.

| Element | Common Name | G rank | S rank | Federal/State status | EO* rank |
|---|---|---|---|---|---|
| ***Astragalus naturitensis*** | **Naturita milkvetch** | | **S3** | **BLM, USFS** | **B** |
| ***Stipa comata*** | **Needle and thread (Great Basin herbaceous vegetation)** | **G2G4** | **S2?** | | **A** |
| *Pediomelum aromaticum* | Paradox breadroot | G3 | S2 | BLM | E |

*EO=Element Occurrence

**Biodiversity comments:** Silvey's Pocket contains is a good occurrence of Naturita milkvetch, and an excellent example of the needle and thread Great Basin herbaceous vegetation community. There is also an unranked occurrence of Paradox breadroot, a globally vulnerable plant.

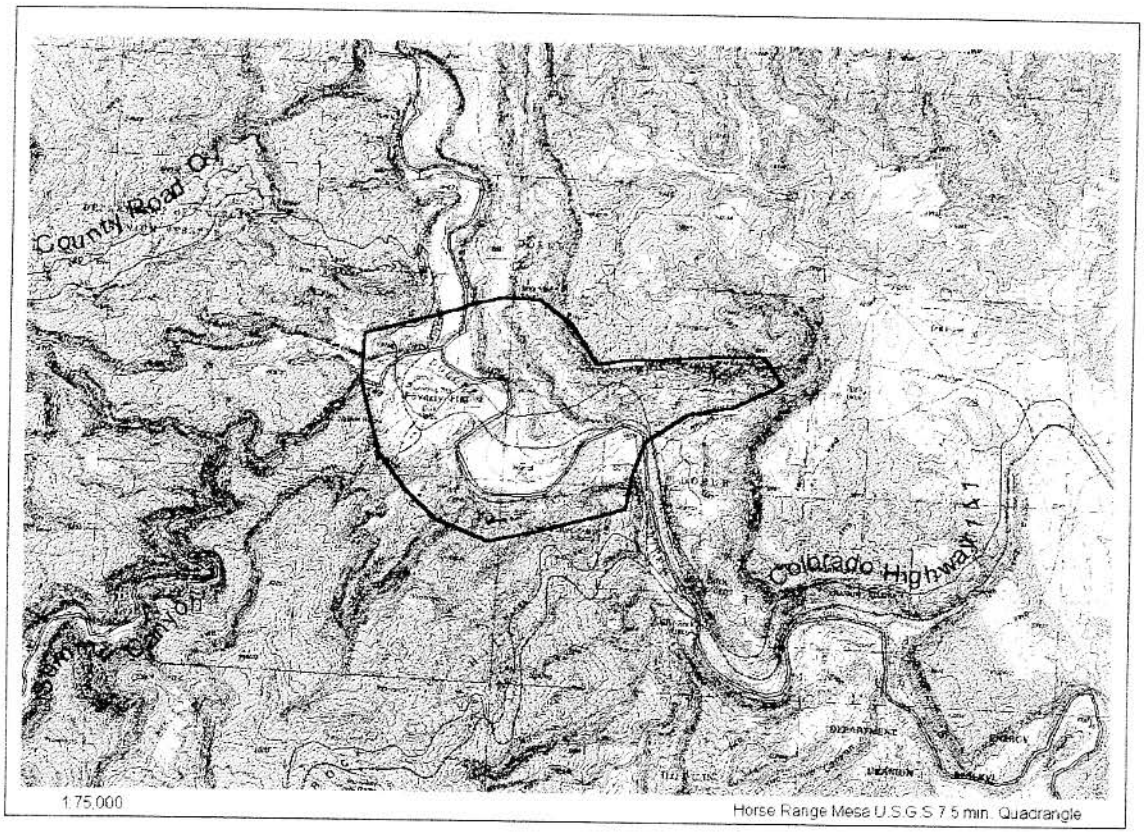
**Boundary Justification:** The boundary was drawn to include the good examples of the Western slope grasslands and circumscribes the occurrences of the Naturita milkvetch and the Paradox breadroot. Unoccupied habitat between the occurrences can serve as a site for expansion of the rare plant populations.

**Protection Rank Comments:** The entire area is under ownership, protection, and management of the BLM. It is too remote for threats of development. If uranium mining becomes economically viable in the future, however, extractive mining operations could be a threat to this PCA.

**Management Rank Comments:** There are no specific designations on the grazing allotment; however, because of remoteness, the area is little used, and no changes in the grazing practices appear to be required. The area is open to location and lease of mineral deposits, and to withdraw the area from such practices is difficult.

# Slick Rock

## Potential Conservation Area

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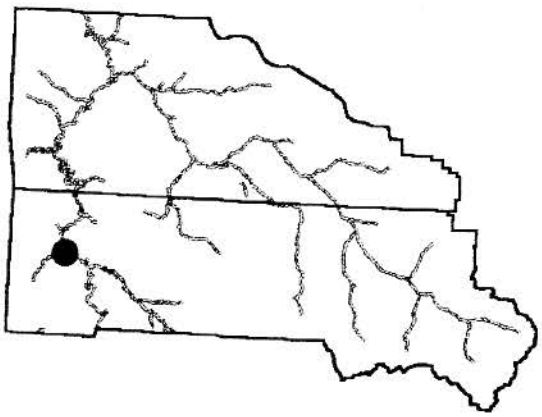


# Slick Rock

**Biodiversity Rank: B3** (High Biodiversity Significance) The Slick Rock PCA has a good occurrence of Naturita milkvetch, a plant that is vulnerable on a global scale.

**Protection Urgency Rank: P4** No threat is known for the forseeable future.

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

**Location:** The Slick Rock PCA circumscribes the old townsite of Slick Rock, Colorado in western San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Horse Range Mesa

**Legal description:** T44N R18W Sections 29-31; T44N R19W Sections 25, 36.

**Elevation range:** 5,440 to 5,800 feet.

**Size:** 918 acres

**General Description:**

Canyon rims above the Dolores River near the old town of Slickrock were the site of three sub-populations of the Naturita milkvetch. The plants were growing in red sandy soils with some soil crust, in pockets of gray slickrock. They were found in both disturbed sites along the road and in undisturbed areas. Vegetation of the area is pinyon-juniper woodland with big sagebrush, galleta, prickly-pear cactus, Indian ricegrass, needle-and-thread grass, banana yucca and blue grama. The slickrock also provides habitat for the Plateau striped whiptail, which appears to be abundant in the area. Approximately 70% of the PCA is held in private ownership with the remainder owned by the BLM. Geologic features of the area include Jurassic Morrison, Summerville, and Entrada formations, Jurassic/Triassic Glen Canyon Group, and Chinle Formation.

Natural Heritage element occurrences at the Slick Rock PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Gila robusta*** | **Roundtail chub** | **S2S3** | **S2** | **BLM/SC** | **B** |
| ***Astragalus naturitensis*** | **Naturita milkvetch** | **G3** | **S3** | **BLM, USFS** | |
| *Catosromus latipinnis* | Flannelmouth sucker | G3G4 | S3 | BLM/SC | B |
| *Cnemidophorus velox* | Plateau striped whiptail | G5 | S4 | | B |

*EO=Element Occurrence

**Biodiversity comments:** The Slick Rock PCA contains a good occurrence of the Naturita milkvetch, a globally vulnerable plant, as well as the Plateau striped whiptail, which appears to be locally common and globally secure.

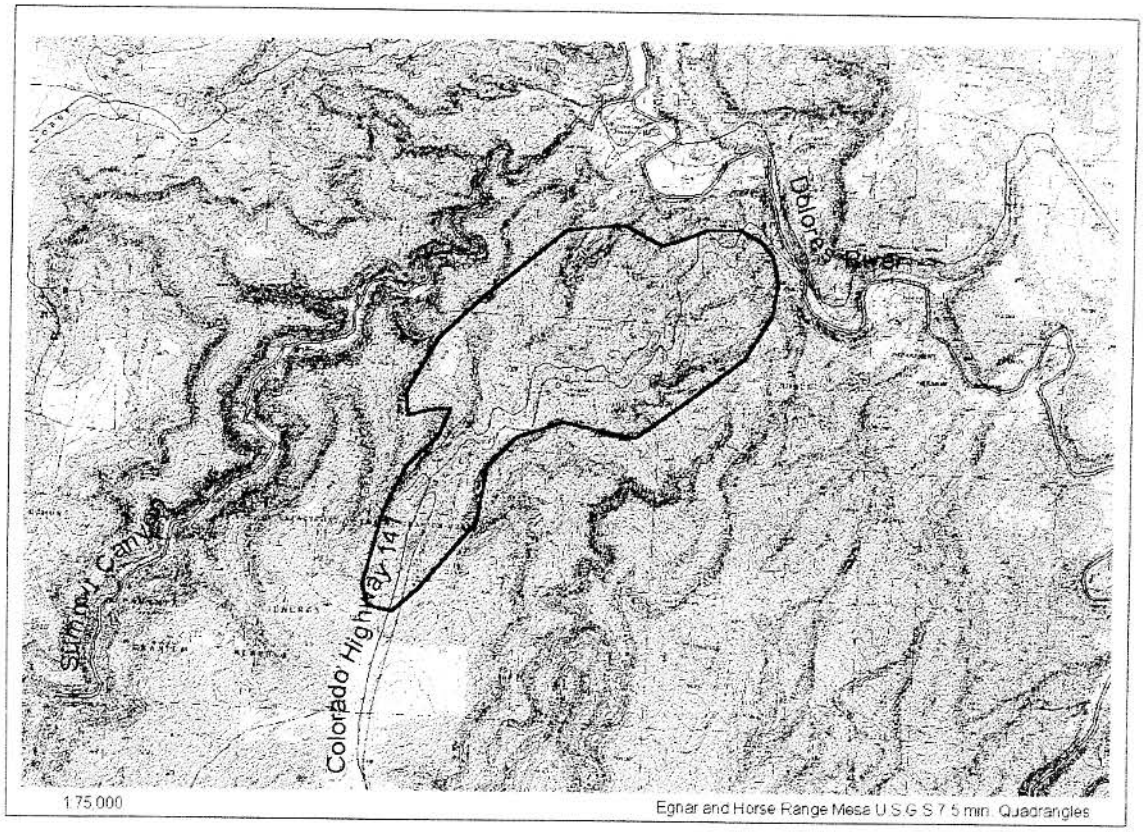
**Boundary Justification:** The boundary is drawn to circumscribe the area in which the Naturita milkvetch was found. Occurrences of the Plateau striped whiptail in the PCA are incidental.

**Protection Rank Comments:** Since the milkvetch is found on disturbed sites, special protection of the area does not seem to be warranted.

**Management Rank Comments:** No particular management needs are known for the protection of the milkvetch.

# Slick Rock Hill

## Potential Conservation Area

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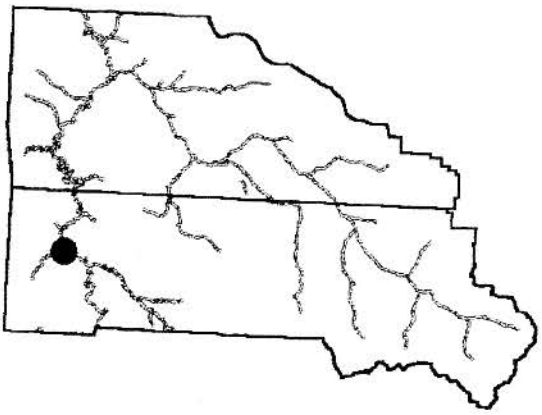


# Slick Rock Hill

**Biodiversity Rank: B3** (Very high biodiversity significance) The Slick Rock Hill PCA has a good occurrence of Great Basin herbaceous vegetation, a plant community that is vulnerable on a global scale.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Slick Rock Hill is located due south of the old townsite of Slick Rock, Colorado along Colorado Highway 141 in western San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Egnar, Horse Range Mesa

**Legal description:** T43N R19W Sections 1, 2, 10, 11, 14, 15; T43N R18W Section 6; T44N R18W Section 31; T44N R19W Sections 35, 36.

**Elevation range:** 5,600 to 7,200 feet

**Size:** 2,413 acres

**General Description:**

This PCA includes within its boundary the canyons west of the Dolores River near Slick Rock, Colorado. The geologic features of this site include Jurassic Morrison (stream sands, shale, gravel, and ash), Jurassic Summerville (marine sequence); and Jurassic Entrada (dune sand, weak calcareous cement). Soils within the PCA vary from loamy, coarse-loamy, to mixed, clayey, mesic shallow soils.

The dominant vegetation in the PCA is pinyon-juniper woodland. There are excellent quality examples of a common plant association typical of western San Miguel County, consisting of pinyon pine (25% cover), Utah juniper (30%) and mountain mahogany (15%). The community occurs on red sandy soils of the Morrison Formation, with well-developed soil crusts. Understory species include Mormon tea, prickly-pear cactus, hairy golden aster, bahia, little-leaved brickelbush, mountain big sagebrush, black sagebrush, snakeweed, three-awn, bitterbrush, cliff rose, needle-and-thread grass, skunkbrush, rabbitbrush, galleta, many lobed groundsel, and woolly milkvetch.

Abajo penstemon was found to be common on bare sandy soils within the pinyon-juniper community, from the top of the hill to about halfway down, along Highway 80. Near the bottom of the hill, along a small dirt road east of the highway at milepost 20, were two other rare plants, the Naturita milkvetch and Little penstemon. Both plants were growing in disturbed areas beside and in the road, as well as in undisturbed sites. Another population of the Naturita milkvetch and a few individuals of the Little penstemon were found near the former gravel pit overlooking the Dolores River west of Slickrock. This location also had a small but high quality example of a needle-and-thread grassland. Needle-and-thread grass provided a 75% cover, with blue grama appearing

between the bunches. The few forbs in the site included prickly-pear cactus, sand aster, and fineleaf hymenopappus. There was no cheatgrass in this part of the PCA.

This PCA contains a population of canyon tree frogs recorded at Corral Draw in 1992. Threats to this species appear to be modest or localized (CNHP 1999).

The PCA is primarily on BLM land with a small amount of private land. Highway 80 cuts through the site, and there are several side roads that create some disturbance and allow for weed invasion.

Natural Heritage element occurrences at the Slick Rock Hill PCA.

| Element | Common Name | G rank | S rank | | EO* rank |
|---|---|---|---|---|---|
| ***Stipa comata*** | **Great Basin herbaceous vegetation** | **G2G4** | **S2?** | | **B** |
| *Astragalus naturitensis* | Naturita milkvetch | G3 | S3 | BLM, USFS | B |
| *Astragalus naturitensis* | Naturita milkvetch | G3 | S3 | BLM, USFS | B |
| *Penstemon breviculus* | Little penstemon | G3Q | S2 | BLM | C |
| *Penstemon lentus* | Abajo penstemon | G4Q | S2 | | B |
| *Penstemon lentus* | Abajo penstemon | G4Q | S2 | | C |
| *Penstemon lentus* | Abajo penstemon | G4Q | S2 | | E |
| *Hyla arenicolor* | Canyon treefrog | G5 | S2 | BLM, CO-SC | E |
| *montanus* | Mesic western slope pinyon-juniper woodlands | G5 | S4 | | A |

*EO=Element Occurrence

**Biodiversity comments:** The Slick Rock Hill PCA has a good occurrence of Western Slope grasslands, a plant community that is imperiled both globally and in Colorado. In addition, this PCA has a good population of the Naturita milkvetch, vulnerable globally and in Colorado. There is a fair occurrence of the Little penstemon, and a good occurrence of the Abajo penstemon, both rare in Colorado. The mesic western slope pinyon-juniper woodlands occupy a large area, and provide a good example of a common plant community. Pinyon may have increased in recent years as a result of fire suppression.

The primary factors justifying a conservation concern for canyon treefrogs are the small number of occurrences, restricted range and relatively low numbers (qualitative judgement) of individuals. There are no quantitative data on population size or trends.

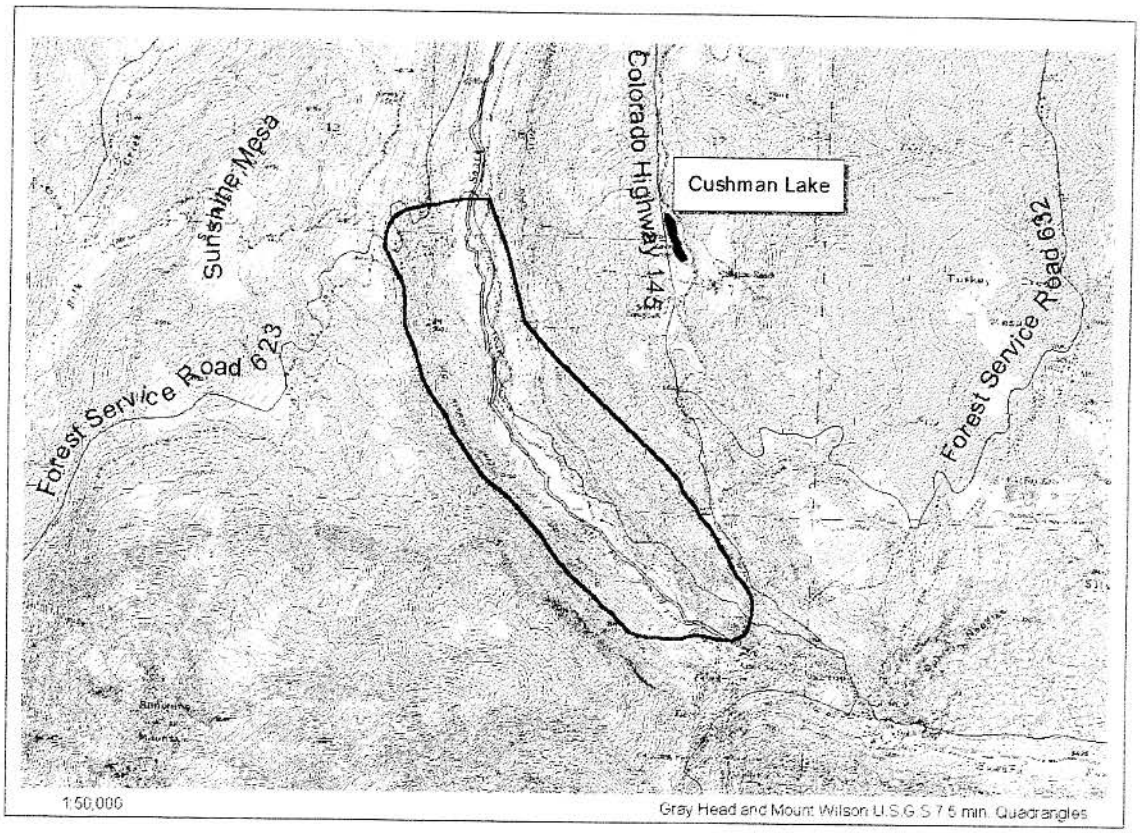
**Boundary Justification:** The boundary encompasses the known occurrences of the rare plants and the grassland, but the extent of the pinyon-juniper woodland community is much larger. Further survey effort would be required to assess the size and quality of this community.

**Protection Rank Comments:** Parts of this PCA are privately owned, and plans for their use are unknown; however, it does not appear that there are imminent threats in the future. Although a major highway passes through the site, and there are numerous side roads, the rare plants in this area appear to tolerate these disturbances.

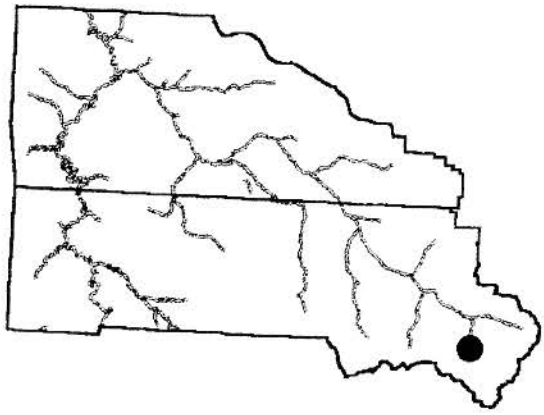
**Management Rank Comments:** Impacts and disturbances in the area are minimal and current management practices appear to be adequate at this time. Prescribed burning may be an appropriate tool to increase the diversity of species and age classes in the pinyon-juniper community. Monitoring of this site will aid in the detection of changes in the number of individuals and the condition of the rare plant populations that would warrant management intervention.

# South Fork San Miguel

## Potential Conservation Area




0.5 0 0.5 1 1.5 2 Miles

# South Fork San Miguel

**Biodiversity Rank: B3** (High Biodiversity Significance) This PCA has several high quality occurrences of riparian plant communities, including the Douglas fir/Rocky Mountain maple association that is considered to be extremely rare in Colorado.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** South Fork San Miguel is located 5.9 air miles southwest of Telluride, Colorado in eastern San Miguel County, along the South Fork of the San Miguel River.
U.S.G.S. 7.5 minute quadrangles: Gray Head, Mount Wilson

**Legal description**: T42N R9W Sections 18-20, 29, 30, 32; T42N R10W Sections 13, 24.

**Elevation range:** 8,320 to 9,200 feet.

**Size:** 1,040 acres

**General Description:**

The riparian zone of the South Fork of the San Miguel River downstream from the old town of Ames has been identified as containing outstanding examples of several plant communities. The area includes both National Forest and private land, part of which is owned by The Nature Conservancy. There is a Forest Service campground in the PCA that has been restricted to day use only. Surveys of the riparian area were conducted in 1991 and 1997 by CNHP (Kittel 1991, Stevens 1997). There are high quality complexes of willows and sedges in areas where the stream has been modified by beaver activity. Aspen, narrowleaf cottonwood and blue spruce dominate forested areas along the river, with Douglas fir in one upstream plot. All ages of trees are represented. Associated understory species include red-osier dogwood, baneberry, Rocky Mountain maple, thinleaf alder, aspen daisy, bedstraw, and several sedges and rushes. Exotic species in the PCA include Kentucky bluegrass and red top.

Natural Heritage element occurrences at the South Fork San Miguel PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Pseudotsuga mensiezii/Acer glabrum*** | **Lower montane forests** | **G4?** | **S1** | | **B** |
| ***Populus angustifolia-Picea pungens/Alnus incana*** | **Montane riparian forests** | **G3** | **S3** | | **A** |
| *Limnorchis ensifolia* | Canyon bog-orchid | G4G5T3? | S3 | | E |
| *Carex utriculata* | Beaked sedge montane wet meadows | G5 | S4 | | A |
| *Salix geyeriana-Salix monticola/*mesic graminoid | Montane riparian willow carr | GU | S3 | | A |
| *Salix geyeriana-Salix monticola/*mesic graminoid | Montane riparian willow carr | GU | S3 | | A |

*EO=Element Occurrence

**Biodiversity comments:** The presence of excellent occurrences of four different riparian plant communities makes this PCA exemplary, although several of the associations are apparently globally secure. The canyon bog-orchid was identified from the shoreline of the San Miguel River at the southern end of the Nature Conservancy's Upper Preserve in 1994. It was not relocated in 1999, and there is still some doubt as to the distinction between this species and the more common northern bog orchid.

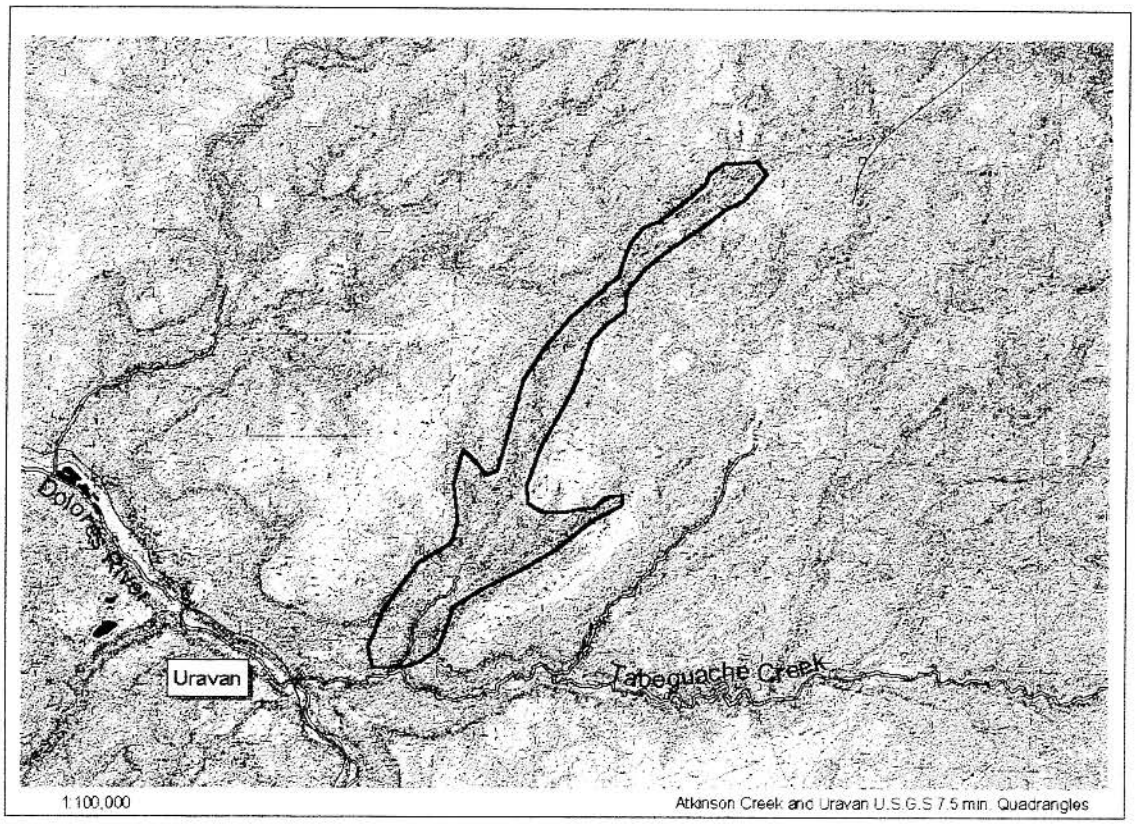
**Boundary Justification:** The boundary includes the occurrences of the riparian communities that are in good to excellent condition along the South Fork. Some of the adjacent upland areas were also included, as they contribute significantly to the hydrological functioning of the river. Disturbance in the upland vegetation resulting in increased erosion can negatively impact the quality of the river and its riparian community.

**Protection Rank Comments:** Ownership by the National Forest and The Nature Conservancy provides excellent protection for this PCA.

**Management Rank Comments:** National Forest campgrounds at this PCA have been closed to overnight use. Both National Forest and Nature Conservancy properties are available for day use only. Continued monitoring of recreation in the PCA would enable managers to assess damage to the riparian vegetation from social trails, and take appropriate action if necessary.

# Spring Creek - Atkinson Mesa

## Potential Conservation Area




1 0 1 2 3 4 Miles

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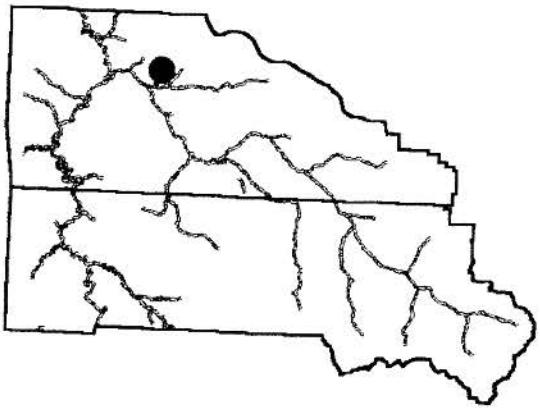


# Spring Creek-Atkinson Mesa

**Biodiversity Rank: B2** (Very high biodiversity significance) This PCA contains a good occurrence of the skunkbrush/coyote willow riparian woodland, a plant community that is considered to be imperiled on a global scale.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Spring Creek-Atkinson Mesa is located 2.0 air miles east of Uravan, Colorado in western Montrose County.

U.S.G.S. 7.5 minute quadrangles: Atkinson Creek, Uravan

**Legal description:** T47N R16W Section 6; T47N R17W Section 1; T48N R17W Section 36; T48N R16W Sections 8-10, 17-20, 29-32.

**Elevation range:** 5,100 to 6,000 feet.

**Size:** 2,007 acres

**General Description:**

Spring Creek occupies a narrow valley with a riparian width of 10 to 25 meters in this PCA. Uplands are pinyon-juniper woodlands with Gambel's oak. High quality riparian vegetation was identified at Spring Creek during a CNHP survey conducted for the BLM in 1997. Researchers noted that the vegetation was unusually lush for the area. The narrowleaf cottonwood/skunkbrush plant association had a range of 20 to 80% tree cover, with all age classes represented, including some very mature trees. Skunkbrush varied from sparse to dominant in the understory. Other species that were common in these communities were Gambel's oak, Wood's rose, coyote willow, virgin's bower, red osier dogwood and poison ivy. There was only a trace of New Mexico privet and tamarisk. Populations of the Gray Vireo and Sage Sparrow were found in the pinyon-juniper uplands during breeding season, suggesting the birds were nesting within the PCA.

Natural Heritage element occurrences at the Spring Creek (Atkinson Mesa) PCA.

| *Element* | **Common Name** | **G rank** | **S rank** | **Federal/State** | **EO* rank** |
|---|---|---|---|---|---|
| ***Rhus trilobata/Salix exigua*** | **Skunkbrush/Coyote willow riparian shrubland** | **G2** | **S2** | | **B** |
| *Populus angustifolia/Rhus trilobata* | Narrowleaf cottonwood/skunkbrush | G3 | S3 | | |
| *Populus angustifolia/Rhus trilobata* | Narrowleaf cottonwood/skunkbrush | G3 | S3 | | B |
| *Populus angustifolia/Rhus trilobata* | Narrowleaf cottonwood/skunkbrush | G3 | S3 | | B |
| *Vireo vicinior* | Gray Vireo | G4 | S2B, SZN | | E |
| *Amphispiza belli* | Sage Sparrow | G5 | S3B, SZN | | E |

*EO=Element Occurrence

**Biodiversity comments:** The high significance of this PCA is based on several good quality occurrences of riparian plant communities. The skunkbrush riparian shrublands are considered globally imperiled, while the narrowleaf cottonwood/skunkbrush community is vulnerable on a global scale. Suspected breeding populations of two bird species of concern were documented here: the Gray Vireo is rare in Colorado, and the Sage Sparrow is vulnerable in Colorado.

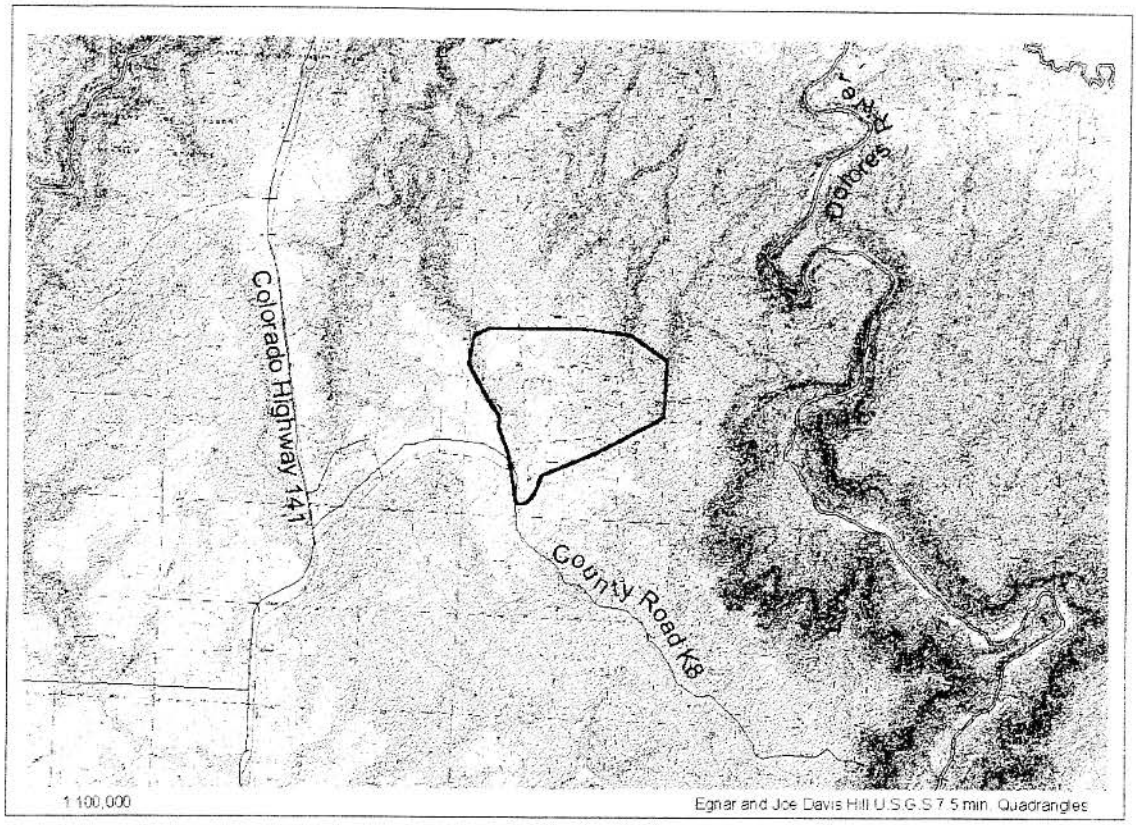
**Boundary Justification:** The PCA includes the good condition plant communities of the riparian zone, as well as the upland locations of the Gray Vireo and Sage Sparrow. In addition to providing habitat for the two bird species, the upland pinyon-juniper dominated areas contribute to the hydrological processes that maintain the riparian vegetation. Disturbances in these areas can be detrimental to the stream through siltation, introduction of exotic species. Any alterations in the current hydrological regime could potentially affect the riparian plant communities. The boundary does not allow for all of the needs of the two bird species.

**Protection Rank Comments:** Except for a small amount of private land at the upper end of the PCA, ownership is BLM. No special protection should be required.

**Management Rank Comments:** The BLM land in this PCA is managed with primary emphasis on livestock. Present management appears to be adequate to maintain the quality of the riparian vegetation. However, periodic monitoring of the site would serve to detect any changes in the condition of the riparian vegetation that would require management action.

# Spud Patch

## Potential Conservation Area




1 0 1 2 3 Miles

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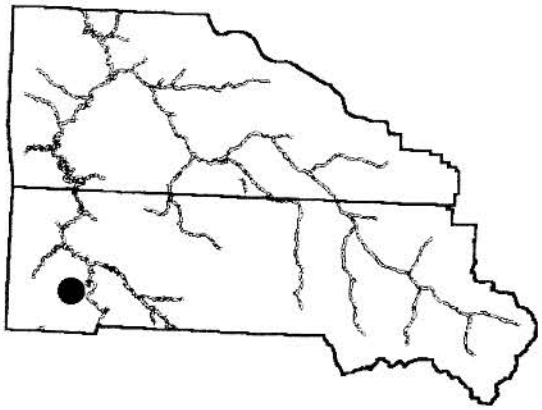


# Spud Patch

**Biodiversity Rank: B5** (General Biodiversity Significance) This PCA has five occurrences of pale lump-nosed bats, a species that is rare in Colorado, although apparently secure on a global scale.

**Protection Urgency Rank: P3** There is a definable threat to the occurrences, but not expected within the next five years.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Spud Patch is 4.0 air miles northeast of Egnar, Colorado, in southwestern San Miguel County

U.S.G.S. 7.5 minute quadrangles: Egnar and Joe Davis Hill

**Legal Description:** T43N R18W Section 29

**Size:** 1,410 acres

**Elevation:** 5,600 to 7,504 feet

**General Description:**

This PCA is located on the Spud Patch flatlands and drops steeply 300 feet to the narrow Blue Canyon. Geologically, this area contains three formations of sedimentary rocks formed during the Jurassic period. These formations are the Morrison: stream sands, shale, gravel, and ash and which contain dinosaur fossils in other areas of western Colorado; the Summerville: dune sand, weak calcareous cement; and the Kayenta: stream sands resistant siliceous cement. The soil composition is Acree characterized by typic argiborolls, fine, montmorillonitic soils. Vegetation of the area consists of grasses associated with dryland agriculture. Pinyon-juniper woodlands surround the site.

Contained within the PCA are the open portals of the Moqui Jug and the Mayday Mines. These open mines and the caverns within supply excellent maternity and hibernation sites for pale lump-nosed bats, and four were recorded here in the winter and spring of 1997.

Natural Heritage element occurrences at the Spud Patch PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Corynorhinus townsendii*** | **Pale lump-nosed bat** | **G4T4** | **S2** | **BLM** | **E** |

*EO=Element Occurrence

**Biodiversity comments:** The pale lump-nosed bat is considered to be rare in Colorado, although apparently secure on a global scale. Throughout much of the known range, they commonly occur in mesic habitats containing pinyon-juniper woodlands and/or semi-desert shrublands. There are only 20 known occurrences of this species in

Colorado documented within the last ten years. These bats prefer relatively cold places for hibernation, often near entrances and in well-ventilated areas. These restrictive requirements are often difficult to find, but the tunnels of these mines apparently meet these requirements. The bats use caves, buildings, and tree cavities for night roosts.

**Boundary Justification:** This PCA includes a known roosting site and potential hibernacula of pale lump-nosed bats. Although the PCA includes all of the surrounding mine portals and associated shafts and some surrounding area, it does not include the surrounding pinyon-juniper woodlands and steep rocky cliffs that are important foraging habitat, and that supply day roosting sites for this bat during its active period. The foraging area of this bat likely extends over Bush Canyon, all of Morrison and Blue Canyons, and could include extensive distances along the Dolores River Canyon. The extent of land used for foraging and day roosts by the bats using the mines for hibernacula or maternity colonies is difficult to define.

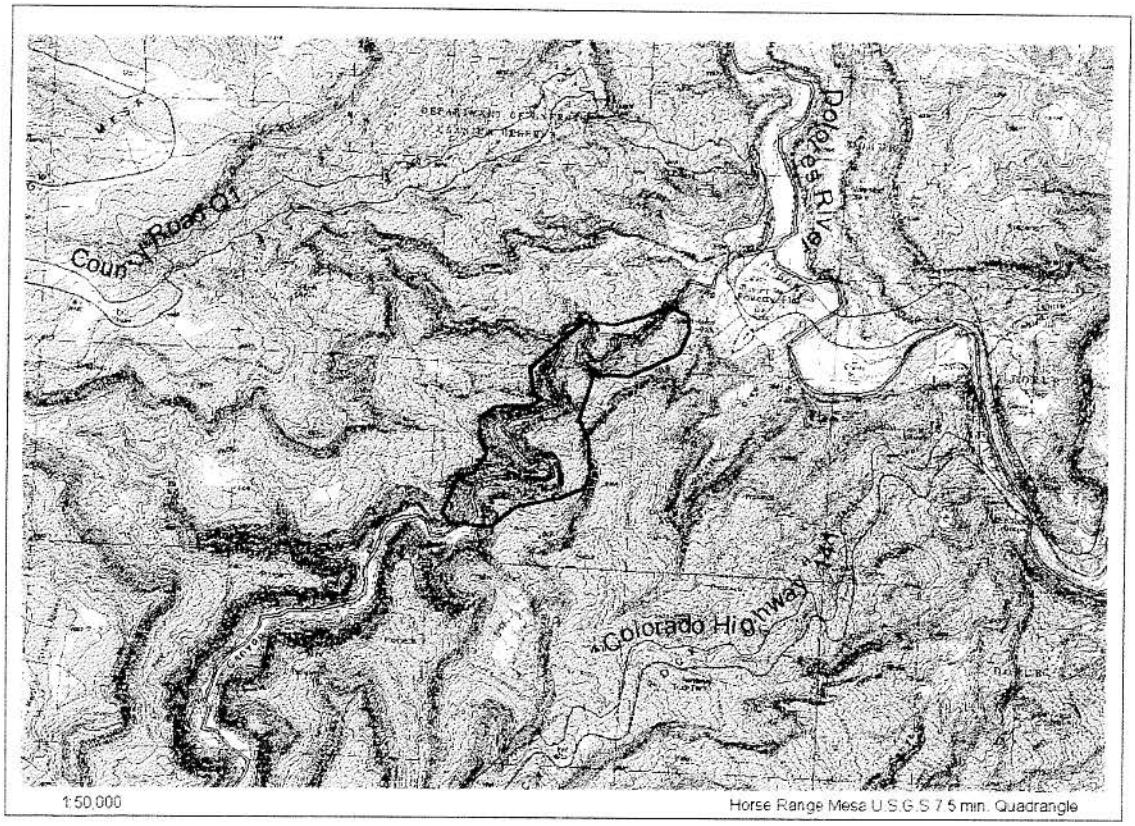
**Protection Rank Comments:** The area is managed by the BLM and is open and easily accessed by curiosity seekers who may enter the mines where pale lump-nosed bats were recorded. Pale lump-nosed bats are extremely fragile and primary threats include loss of habitat (e.g., reclamation of abandoned mines), vandalism, and increased visitation (spelunking) by humans to maternity roosts and hibernacula. Large clusters or colonies are susceptible to disturbance and have been declining (CDOW 1984). Human access to mines and caves disrupts wintering populations, where disturbance needs to be minimal (Armstrong *et al.* 1994, Fitzgerald *et al.* 1994). Protection of natural hibernacula from disturbance is a necessity if this species is to survive in Colorado.

This PCA could be damaged by surface disturbing activities such as new pipelines or powerlines.

**Management Rank Comments:** Management needs for the bats include protection of maternity roosts from disturbance from May to mid-September, and of hibernacula from October to April for hibernacula). Occupied caves or mines should be evaluated for gate installation. See White and Seginak (1987) for gate designs for protecting caves. Gates can successfully limit human access and disturbance but, if poorly designed, gates may restrict bat access and result in population decline (Matthews and Moseley 1990). Conditions for the bats can be improved by maintaining canopy cover in areas surrounding caverns, rock faces, and other sites used for roosting; retaining large diameter snags and stands of old growth; avoiding heavy equipment and blasting near roosts; and avoiding chemical insecticides. Caves and mines should be surveyed prior to any logging or mine closures in suspected occupied habitat.

# Summit Canyon

## Potential Conservation Area

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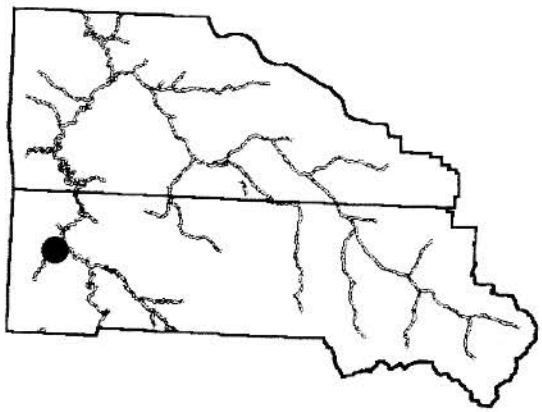


# Summit Canyon

**Biodiversity Rank: B4** (Moderate Biodiversity Significance) This PCA contains a fair occurrence of Naturita milkvetch, a plant that is vulnerable on a global scale.

**Protection Urgency Rank: P4** No threat is known for the forseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Summit Canyon is located 0.5 air miles west of the old townsite of Slick Rock, Colorado in northwestern San Miguel County.

U.S.G.S. 7.5 minute quadrangles: Horse Range Mesa

**Legal description:** T44N R19W Sections 25, 26, 35.

**Elevation range:** 5,500 to 6,000 feet.

**Size:** 328 acres

**General Description:**

Summit Canyon is a spectacular red sandstone canyon that is a tributary of the Dolores River in the pinyon-juniper zone. The area has numerous uranium mines. The Naturita milkvetch was found in isolated soil pockets of exposed Navajo sandstone. Associated species at the site were hairy golden aster, blue grama, and prickly pear cactus.

Natural Heritage element occurrences at the Summit Canyon PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Astragalus naturitensis*** | **Naturita milkvetch** | | **S3** | **BLM, USFS** | **C** |
| *Vireo vicinior* | Gray Vireo | G4 | S2B, SZN | | C |
| *Hyla arenicolor* | Canyon treefrog | | S2 | | E |

*EO=Element Occurrence

**Biodiversity comments:** This PCA contains a fair population of Naturita milkvetch, a globally vulnerable plant, and a fair breeding population of the Gray Vireo, considered to be rare in Colorado. There is also an unranked occurrence of the canyon treefrog, rare in Colorado, although globally secure.

**Boundary Justification:** The PCA is designed to include the portion of Summit Canyon that is the location of the Naturita milkvetch, and adjacent similar habitat. The entire canyon has not been surveyed.

**Protection Rank Comments:** The PCA is entirely within the BLM lands managed by the San Juan Resource Area. No special protection needs are known.

**Management Rank Comments:** The PCA is managed with emphasis on livestock grazing. However, the rocky habitat of the Naturita milkvetch is probably not threatened by grazing. No other management needs are known.

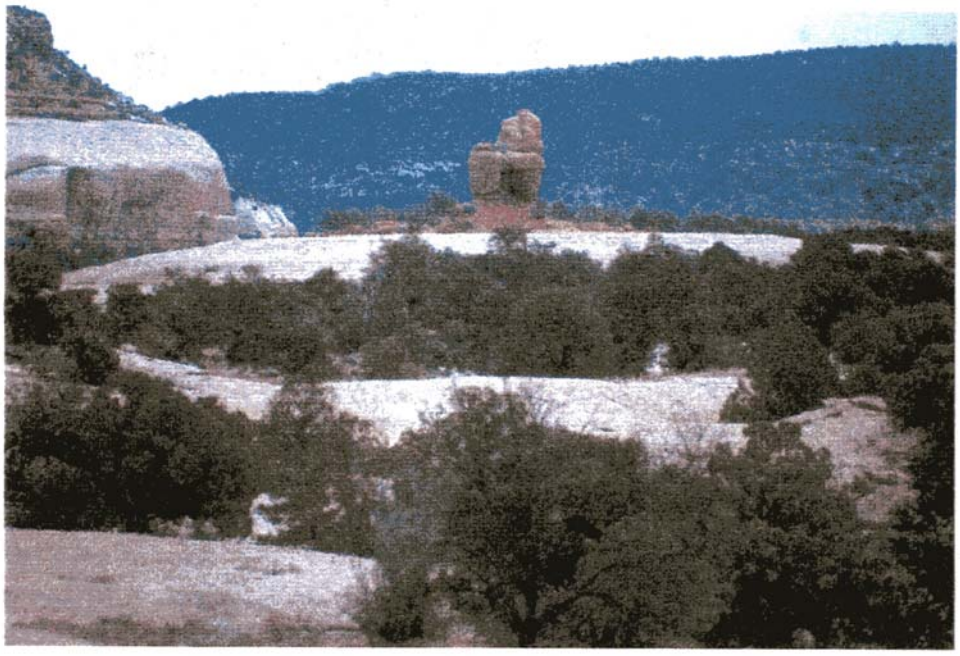
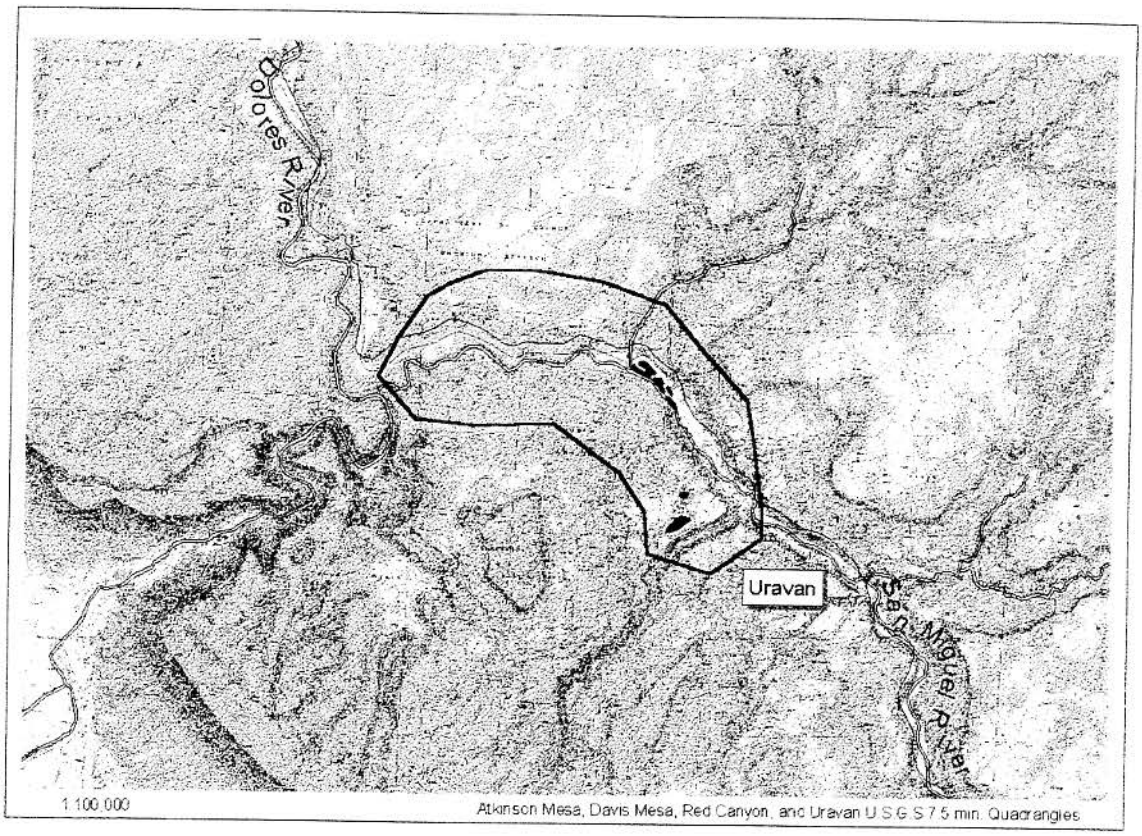


Figure 73. Summit Canyon near confluence with Dolores River.

# Uravan West

## Potential Conservation Area




1 0 1 2 3 4 Miles

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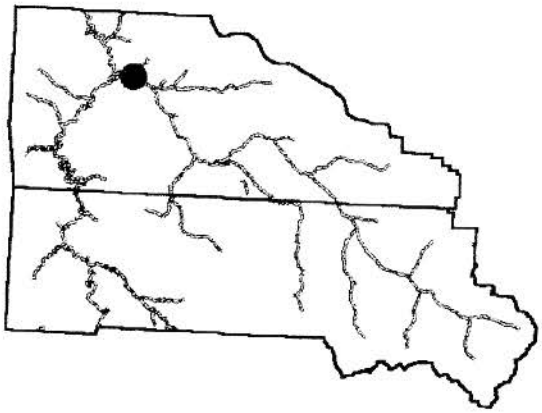


# Uravan West

**Biodiversity Rank: B3** (High Biodiversity Significance) This PCA has a good occurrence of the New Mexico privet riparian shrubland plant community, considered critically imperiled on a global scale, and a good occurrence of San Rafael milkvetch, considered vulnerable on a global scale.

**Protection Urgency Rank: P4** No threat is known for the foreseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** Uravan West is extends along the San Miguel River for 4.5 miles north of Uravan, Colorado in Montrose County.

U.S.G.S. 7.5 minute quadrangles: Atkinson Creek, Red Canyon, Uravan, Davis Mesa

**Legal description:** T48N R17W Sections 19-21, 27, 29-34; T48N R18W Section 25, 36; T47N R17W Sections 3, 4.

**Elevation range:** 5,100 to 5,800 feet.

**Size:** 1,795 acres

**General Description:**

This PCA includes alluvial terraces of the San Miguel River, and the adjacent slickrock of the Entrada Formation, as well as some pinyon-juniper uplands in the Morrison Formation. The narrowly confined riparian zone has a band of New Mexico privet. Other riparian species include river birch and coyote willow. In disturbed areas, upland vegetation such as rabbitbrush mixes with the riparian species. Hillsides and adjacent mesas are vegetated with sparse pinyon, juniper, and sagebrush. San Rafael milkvetch was found to be quite abundant south of the San Miguel River. Associated species at that location included antelope bitterbrush, mountain mahogany, single leaf ash, sand aster, many-lobed groundsel, large-flowered breadroot, and chainpod. The PCA includes the Umetco uranium mine, and has been subject to disturbances associated with mining for over 50 years.

Natural Heritage element occurrences at the Uravan West PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Forestiera pubescens*** | **New Mexico privet foothills riparian** | | **S1** | | **B** |
| *Astragalus rafaelensis* | | G3 | S1 | BLM | A |
| *Astragalus rafaelensis* | San Rafael milkvetch | G3 | S1 | BLM | B |
| *Astragalus rafaelensis* | | G3 | S1 | BLM | E |
| *Astragalus rafaelensis* | San Rafael milkvetch | G3 | S1 | BLM | E |
| graminoid | Lower montane riparian shrublands | G3 | S2 | | B |
| *Corinorhinus townsendii* | Pale lump-nosed bat | G4T4 | S2 | BLM | E |
| *Gomphus intricatus* | Brimstone clubtail | G4 | S2 | | E |

*EO=Element Occurrence

**Biodiversity comments:** There are two historic occurrences of San Rafael milkvetch in this PCA, based on herbarium specimens collected in 1982 and 1983. There is also a more recent occurrence from 1994, ranked as good. This species is considered to be globally vulnerable and extremely rare in Colorado. Another specimen from the PCA was identified as the Grand Junction milkvetch (*A. linifolius*). There is some question as to whether these two species are distinct. The collectors of the latter noted that several plants appeared to be hybrids, while others were pure *A. linifolius*. We have tentatively determined that that specimen should be *A. rafaelensis.* More research is needed to clarify the taxonomy of these two species. The brimstone clubtail, a dragonfly, is secure globally, but rare in Colorado with only three recorded occurrences.

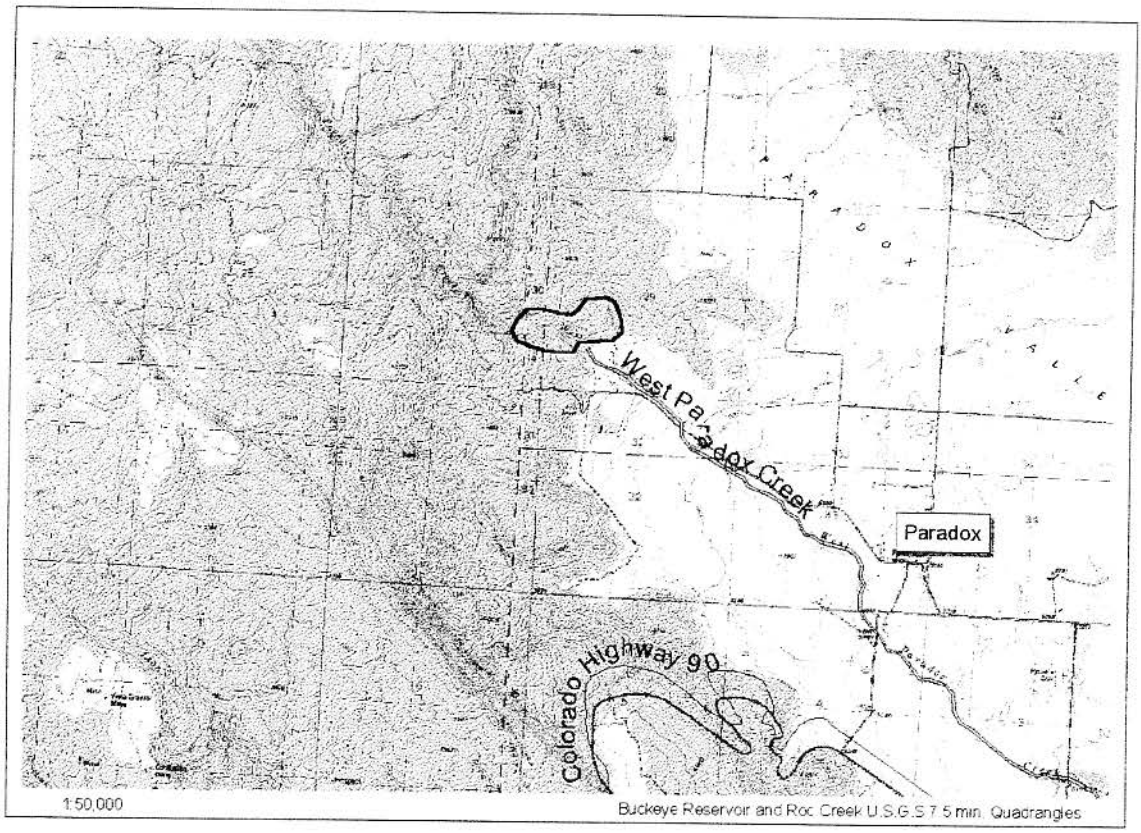
**Boundary Justification:** The boundary encloses the riparian zone of the San Miguel River between Uravan and the confluence with the Dolores River. It also includes adjacent uplands that are the habitat of the San Rafael/Grand Junction milkvetch. The exact location of the brimstone clubtail, a dragonfly, is unknown. It may have been collected from one of the San Miguel's tributaries in this area.

**Protection Rank Comments:** The PCA contains about equal amounts of BLM and private mining land in a complex pattern. Although no uranium mining is taking place currently, the potential remains as a future threat.

**Management Rank Comments:** This section of the San Miguel River has been heavily impacted by mining for many years. Restoration of mined lands is underway. However, restoration of the site to a completely natural condition is probably not feasible.

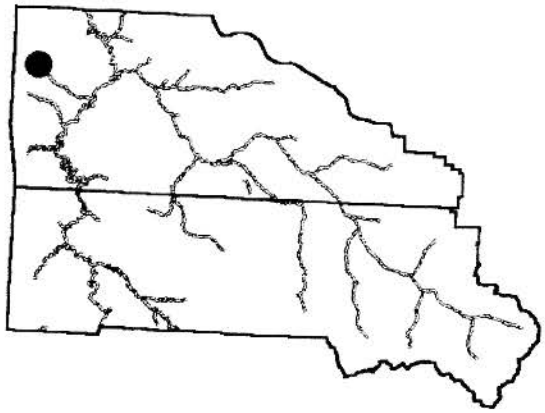
# West Paradox Creek

## Potential Conservation Area




0.5 0 0.5 1 1.5 2 Miles

N



# West Paradox Creek

**Biodiversity Rank: B4** (Moderate Biodiversity Significance) The West Paradox Creek PCA contains a good to excellent occurrence of a lower montane forest plant association considered to be rare in Colorado, although apparently secure on a global scale.

**Protection Urgency Rank: P4** No threat is known for the forseeable future.

**Management Urgency Rank: M4** Although not urgently required, management may be needed in the future to maintain the current quality of element occurrences.

**Location:** West Paradox Creek is located 2.0 air miles northwest of Paradox, Colorado in extreme western Montrose County.

U.S.G.S. 7.5 minute quadrangles: Roc Creek

**Legal description:** T48N R19W Sections 29, 30, 32.

**Elevation range:** 5,300 to 6,000 feet.

**Size:** 42 acres

**General Description:**

The riparian zone of West Paradox Creek was surveyed by CNHP in 1991, as part of the Riparian Classification Project (Kittel *et al.*1991). Researchers reported a very narrow valley with steep banks. Soils are sandy with boulders. Douglas fir provides a canopy cover of 10%, with shrubs along the bank accounting for 40% cover. In addition to red-osier dogwood, shrubs include skunkbrush, coyote willow, Utah juniper, and thinleaf alder. There is a very sparse grass and forb component in the understory of this community.

Natural Heritage element occurrences at the West Paradox Creek PCA.

| Element | Common Name | G rank | S rank | Federal/State | EO* rank |
|---|---|---|---|---|---|
| ***Pseudotsuga menziesii/Cornus sericea*** | **dogwood** | **G4** | **S2** | | **A** |

*EO=Element Occurrence

**Biodiversity comments:** A high quality occurrence of a Douglas fir forest was found at this PCA. The community is rare in Colorado, with fewer than ten stands documented, although it is apparently secure globally. This occurrence is the best one known in Montrose County.

**Boundary Justification:** The boundary of this PCA includes the riparian zone of West Paradox Creek in the section that was surveyed in 1991, as well as some uplands adjacent to the creek. Upland areas contribute significantly to the hydrological functioning of the river. Disturbance in the upland vegetation resulting in increased erosion can negatively impact the quality of the river and its riparian community.

**Protection Rank Comments:** Although small the PCA includes both BLM and National Forest (Manti-La Sal) land, and a small amount of private land. No special protection needs are known at this PCA.

**Management Rank Comments:**. Further inventory is needed to determine the full extent of this community, its wildlife component, and any management needs. This plant association requires minimal management because the steep and rocky terrain provides intrinsic protection. However, red-osier dogwood is considered to be an "ice cream" plant (e.g. it is readily eaten and is a preferred browse species) for livestock and wildlife. Browsing of this species can be high if the stands are open enough for animals to walk through (Hansen *et al*. 1995).

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## Appendix 1. Targeted Inventory Areas and Survey dates. 1-50 Zoology, 001-130 Botany.

| TIA no. | TIA Name | Survey date |
|---|---|---|
| 1 | Paradox Valley East | 04/09/1999 |
| 2 | Dolores River at Bedrock | 04/07/1999 |
| 3 | La Sal Creek | 04/11/1999 |
| 4 | Atkinson Mesa | 06/09/1999 |
| 5 | Dolores River East | 04/10/1999 |
| 6 | Bull Canyon | 04/10/1999 |
| 7 | Monogram Mesa | 04/10/1999 |
| 8 | Carpenter Ridge | 04/11/1999 |
| 9 | Paradox West | 04/11/1999 |
| 10 | Little Gypsum Valley | 4/10/99, 7/12/99 |
| 11 | Big Gypsum Valey South | 09/09/1999 |
| 12 | Tabeguache Creek | 06/15/1999 |
| 13 | Nucla | 06/16/1999 |
| 14 | Spring Creek Mesa | 06/16-17/99 |
| 15 | McKenna Peak | 07/11/1999 |
| 16 | Summit Canyon | 07/12/1999 |
| 17 | Skein Mesa | 07/19/1999 |
| 18 | Atkinson Creek | 06/09/1999 |
| 19 | Desert Claim | 7/20, 21/99 |
| 20 | Camel Gardens | 07/23/1999 |
| 21 | Blue Lake | 07/23/1999 |
| 22 | Bridal Viel Falls | 07/21/1999 |
| 23 | Deep Creek | 08/11/1999 |
| 24 | Silver Lake | 08/11/1999 |
| 25 | Elk Creek | 08/018/99 |
| 26 | Clear Creek | 08/26/1999 |
| 27 | Little Red Canyon | 08/26/1999 |
| 28 | San Miguel Canyon/Norwood | 08/26/1999 |
| 29 | Wilson Mesa | 07/1999 |
| 30 | Bilk Basin | 07/1999 |
| 31 | Sanborn Park | 08/26/1999 |
| 32 | Disappointment Valley | 09/30/1999 |
| 33 | Dolores River-South | 09/30/1999 |
| 34 | Joe Davis Hill | 09/30/1999 |
| 35 | Basin (Town) | 07/21/1999 |
| 36 | Dolores River-Slick Rock | 06/30/1999 |
| 37 | McIntyre Canyon | 06/30/1999 |
| 38 | Fall Creek Falls | 08/23/1999 |
| 39 | Lake Fork Falls | 08/26/1999 |
| 40 | Bear Creek Falls | 08/27/1999 |
| 41 | Ingram Falls | 08/23/1999 |
| 42 | Cornet Falls | 08/24/1999 |
| 43 | Savage Basin | 08/21/1999 |
| 44 | Coventry | 09/08/1999 |
| 45 | Paradox-Long Park Road | 09/30/1999 |
| 46 | Dry Creek Basin-Big Gypsu | 09/30/1999 |
| 47 | Lone Cone | 10/01/1999 |
| 48 | Big Gypsum Valley North | 04/10/1999 |
| 49 | Big Gypsum Valley Central | 4/10, 7/13/99 |
| 50 | Silvey's Pocket | 07/13/1999 |
| 51 | Hastings Ranch | 08/18/1999 |
| 52 | Last Dollar Mountain | 08/18/1999 |
| 53 | Alta Lakes | 08/24/1999 |
| 54 | San Miguel River at Pinon | 07/18/1999 |
| 55 | Dry Creek Basin | 07/07/1999 |
| 001 | Coyote Wash | 5-25, 5-30 |
| 002 | East Paradox Creek | 4-6, 6-8 |
| 003 | Paradox Valley | 4-6, 6-8, 9-17 |
| 004 | Paradox by Carpenter Ridge | 6-9 |
| 005 | Swamp Canyon | 9-16 |
| 006 | Lizard Head trail | 7-28 |
| 007 | Atkinson Mesa | 7-20, 9-1 |
| 008 | Bedrock to LaSal Creek | 4-15 |
| 009 | Big Bear Creek | 6-29 |
| 010 | Black Bear Road | 7-26, 9-6 |
| 011 | Bridal Veil Basin | 9-13 |
| 012 | Miramonte | 3-22, 8-1 |
| 013 | Bilk Creek | 10-1 |
| 014 | Broad Canyon | 6-4 |
| 015 | Alta Lakes, Gold King Basin | 7-15 |
| 016 | Ilium Valley | 10-1 |
| 017 | Silver Pick Basin | 8-19 |
| 018 | Brown Ranch | 8-26 |
| 019 | Buck Canyon | 7-16 |
| 020 | Gurley Canyon | 6-10 |
| 021 | Placerville hot spring | 5-18 |
| 022 | Bridal Veil Falls | 7-8, 9-6 |
| 023 | Specie Mesa | 6-29, 7-24 |
| 024 | Schmidt Ranch | 6-29, 7-5 |
| 025 | Egnar | 7-14 |
| 026 | Buckeye Reservoir, Carpenter Ridge | 6-9 |
| 027 | Bucktail Road | 7-17 |
| 028 | McIntyre Canyon | 5-29, 6-30 |
| 030 | Summit Canyon | 5-28 |
| 031 | Slickrock | 6-30, 7-7, 7-14, 7-15 |
| 032 | Nicholas Wash | 4-15-99 |
| 033 | Big Gypsum Valley | 4-15, 5-25 |
| 034 | Dry Creek Basin | 4-6, 6-30, 7-13, 7-15 |
| 035 | Gypsum Gap | 7-14 |
| 036 | Columbine Pass | 7-18 |
| 037 | Hamilton Mesa | 4-16 |
| 038 | Bear Creek | 9-4 |

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|---|---|---|
| 039 | Cornet Creek Falls | 8-27 |
| 040 | Imogene Pass | 7-29 |
| 041 | Monogram Mesa | 4-6 |
| 042 | Bull Canyon, upper | 4-6, 5-13, 5-30 |
| 043 | Cottonwood Creek | 7-17 |
| 044 | Lower Bull Canyon | 5-31 |
| 045 | Silvey's Pocket | 5-25 |
| 046 | Dave Wood Road | 7-17 |
| 047 | La Sal Creek, upper | 3/27, 4-5, 9-17 |
| 048 | Paradox Switchbacks | 4-6, 9-17 |
| 049 | Delta Nucla Road | 7-17 |
| 050 | Disappointment Valley South arroyos | 4-16 |
| 051 | Divide Road | 7-17 |
| 052 | Little Gypsum Valley | 5-25 |
| 053 | Dolores Canyon meanders (Slick Rock Canyon) | 5-28 to 6-1 |
| 054 | Disappointment Valley | 4-15-99 |
| 055 | Dolores Canyon seeps | 5-12 |
| 056 | Tuttle Draw | 6-8 |
| 057 | Third Park | 6-8 |
| 058 | Dolores Canyon Uravan to Roc Creek | 4-14, 4-16, 5-12 |
| 059 | Dry Park | 7-18 |
| 060 | Egnar Hill | 7-15 |
| 061 | Waterfall Creek | 9-16 |
| 062 | Glencoe Road | 7-18 |
| 063 | Bilk Basin | 10-1 |
| 064 | Wilson Meadows | 8-2 |
| 065 | Lizard Head | 8-2 |
| 066 | LaSal Creek-lower | 6-1 |
| 067 | Goodenough Draw | 7-4 |
| 068 | Dolores from LaSal to Bedrock | 4-15-99 |
| 069 | Greenback Mountain | 8-27 |
| 070 | Gutshall Draw | 7-3 |
| 071 | Dallas Divide | 7-16 |
| 072 | Clay Creek | 4-10-99 |
| 073 | Hieroglyphic Canyon | 9-1 |
| 074 | Tabeguache Basin | 7-16 |
| 075 | Horsefly Creek | 7-4 |
| 076 | Sewemup Mesa south | 8-22 |
| 077 | Naturita Canyon | 6-4, 9-9, 9-15 |
| 078 | The Burn | 9-2 |
| 079 | Hog Park | 9-2 |
| 080 | Joe Davis Hill | 7-15 |
| 081 | Judd Wiebe Tradil | 8-27 |
| 082 | Leopard Creek | several |
| 083 | Little Atkinson Mesa | 9-1 |
| 084 | Little Red Canyon | 7-4 |
| 085 | Lone Cone Lake | 8-28 |
| 086 | Lone Cone, Devil's Chair | 8-1 |
| 087 | Lower McKenzie Creek | 7-3 |
| 088 | Mailbox Park | 5-21 |
| 089 | Campbell Creek | 7-16 |
| 090 | Hanks Valley | 7-4 |
| 091 | Maverick Draw | 6-8 |
| 092 | Tabeguache Basin 2 | 7-17 |
| 093 | Naturita | 5-21 |
| 094 | McKee Draw | 3-22 |
| 095 | McKenna Peak | 7-11 |
| 096 | McKenzie Creek | 7-3 |
| 097 | Mesa Creek | 7-20 |
| 098 | Naturita South hills | 6-8, 9-2 |
| 099 | Old Highway 90 | 7-17 |
| 100 | Roc Creek | 8-22 |
| 101 | Ophir Pass | 7-27 |
| 102 | Horse Mesa | 6-30 |
| 103 | Prospect Basin | 7-8 |
| 104 | Bramiers Draw | 9-2 |
| 105 | Red Canyon | 7-4 |
| 106 | River Road | 5-12 |
| 107 | Road BB16 | 5-14 |
| 108 | San Miguel , Beaver Cr. to Pinyon | 8-2 |
| 109 | San Miguel at Tabeguache | 4-14 |
| 110 | San Miguel Placerville to Beaver Creek | 8-26 |
| 111 | Hastings Mesa | several |
| 112 | Sanborn Park | 7-4, 7-17 |
| 113 | Iron Springs Mesa | 6-29, 7-17 |
| 114 | Savage Basin | 7-30 |
| 115 | Beaver Mesa | 8-27 |
| 116 | Beaver Creek | 8-27 |
| 117 | Sewemup Mesa north | 8-30 |
| 118 | Sneffels Highline Trail | 8-27 |
| 119 | Spring Creek Basin | 4-16 |
| 120 | Sunshine Mesa | 10-1 |
| 121 | Trapper Mesa | 7-17 |
| 122 | Upper Dolores Canyon | 7-13, 7-14 |
| 123 | Uravan area Entrada Sandstone | 4-14 |
| 124 | Ute | 7-18 |
| 125 | West Beaver Creek | 8-28, 9-8 |
| 126 | Wild Steer Mesa | 5-13 |
| 127 | Williams Reservoir | 9-15 |
| 128 | Wilson Mesa | 6-29, 7-5 |
| 129 | Windy Point | 7-16 |
| 130 | Woods Lake | 9-8 |

## Appendix II. Scientific Names of Plants Mentioned in the Text

Plant common names used in the text are listed below, with their scientific names, family, and life form (tree, shrub, herb, grass, sedge, rush, fern). Common names were taken from a variety of sources, including A Utah Flora (Welsh 1993), the NRCS PLANTS database (USDA NRCS 1999), and personal knowledge of common usage. Families are given to aid readers to locate further information on a species in floras, such as Weber's Colorado Flora: Western Slope (Weber 1996), that are organized by family.

The decision to use common names in the text was not a completely satisfactory solution to the problem of nomenclature. Many of the plants below do not truly have common names, and the names listed were derived from the scientific name. However, the alternative, to use scientific names, or both common and scientific names with one of them in parentheses, seemed overly cumbersome for most readers. We hope that providing the scientific names for those readers who are interested will be the least bad solution.

| Common name | Scientific name | Family | Life form |
|---|---|---|---|
| Abajo penstemon | *Penstemon lentus* | Scrophulariaceae | |
| Actinea | *Tetraneuris ivesiana (Hymenoxys acaulis)* | Asteraceae | herb |
| Alder, thinleaf | *Alnus incana* | Betulaceae | tree |
| Alfalfa | *Medicago sativa* | Fabaceae | herb |
| Alkali sacaton | *Sporobolus aeroides* | Poaceae | grass |
| Alpine avens | *Geum rossii* | Rosaceae | herb |
| Alpine bistort | *Bistorta vivipara* | Polygonaceae | herb |
| Alpine bluegrass | *Poa alpina* | Poaceae | grass |
| Alpine fescue | *Festuca brachyphylla* | Poaceae | grass |
| Alpine groundsel | *Senecio holmii* | | herb |
| Alpine parsley | *Oreoxys alpina* | Apiaceae | herb |
| Alpine sagebrush | *Artemisia scopulorum* | Asteraceae | herb |
| Alpine sandwort | *Lidia obtusiloba* | Alsinaceae | herb |
| Alpine smelowskia | *Smelowskia calycina* | Brassicaceae | herb |
| Altai chickweed | *Stellaria irrigua* | Caryophyllaceae | herb |
| Altai cottongrass | *Eriophorum altaicum* | Cyperaceae | sedge |
| American bistort | | Polygonaceae | |
| American rock-brake | *Cryptogramma acrostichoides* | Cryptogrammaceae | |
| American vetch | *Vicia americana* | Fabaceae | herb |
| Arctic draba | *Draba fladnizensis* | | herb |
| Arctic harebell | *Campanula uniflora* | Campanulaceae | herb |
| Arizona fescue | *Festuca arizonica* | Poaceae | grass |
| Arnica, heartleaf | *Arnica cordifolia* | Asteraceae | herb |
| Arrowleaf balsamroot | | Asteraceae | herb |
| Arrowleaf groundsel | *Senecio triangularis* | Asteraceae | |
| Aspen | *Populus tremuloides* | Salicaceae | tree |
| Aspen daisy | *Erigeron speciosus* | Asteraceae | herb |
| Aspen peavine | *Lathyrus leucanthus* | Fabaceae | herb |
| | *Platyschkuhria integrifolia* | Asteraceae | herb |

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|---|---|---|---|
| Baltic rush | *Juncus balticus* | Juncaceae | rush |
| Banana yucca | *Yucca bacata* | Agavaceae | shrub |
| Baneberry | *Actaea rubra* | Helleboraceae | herb |
| Barren ground willow | *Salix brachycarpa* | Salicaceae | shrub |
| Basin wildrye | *Elymus cinereus* | Poaceae | grass |
| Beaked sedge | *Carex utriculata* | Cyperaceae | sedge |
| Big sagebrush | *Artemisia (Seriphidium) tridentata ssp. tridentata* | Asteraceae | shrub |
| Bigelow's sagebrush | *Artemisia (Seriphidium) bigelovii* | Asteraceae | shrub |
| Bilberry | *Vaccinium cespitosum* | Ericaceae | shrub |
| Bindweed | *Convolvulus arvensis* | Convolvulaceae | herb |
| Birch, Western river | *Betula occidentalis* | Betulaceae | tree |
| Bitterbrush | *Purshia tridentata* | Rosaceae | shrub |
| Bittercress | *Cardamine cordifolia* | Brassicaceae | herb |
| Black groundsel | *Senecio atratus* | Asteraceae | |
| Black head daisy | *Erigeron melanocephalus* | | herb |
| | *Artemisia (Seriphidium) nova* | Asteraceae | shrub |
| Black-eyed susan | *Rudbeckia ampla* | Asteraceae | herb |
| Blue flax | *Linum lewisii* | Linaceae | herb |
| Blue gramma | *Bouteloua gracilis* | Poaceae | grass |
| Blue spruce | *Picea pungens* | Pinaceae | tree |
| Blue violet | *Viola adunca* | Violaceae | herb |
| | *Elymus glaucus* | Poaceae | grass |
| Bluebells | *Lupinus* sp. | Fabaceae | herb |
| Bluebunch wheatgrass | *Pseudoroegneria spicata* | Poaceae | grass |
| Bluegrass, Sandburg | *Poa secunda* | Poaceae | grass |
| Bluejoint reedgrass | *Calamagrostis canadensis* | Poaceae | grass |
| Bog birch | *Betula glandulosa* | Betulaceae | shrub |
| Bog orchids | *Habeneria* sp. | Orchidaceae | herb |
| Bottlebrush squirreltail | | Poaceae | grass |
| Box elder | | Aceraceae | |
| Bracken fern | *Pteridium aquilinum* | Polypodiaceae | |
| Breadroot, large flowered | *Pediomelum megalanthum* | Apiaceae | herb |
| Breadroot, Paradox | *Pediomelum aromaticum* | | herb |
| Brittle fern | *Cystopteris fragilis* | | fern |
| Broom snakeweed | | Asteraceae | |
| Buffaloberry, silver | *Shepherdia argentea* | Eleagnaceae | tree |
| Bulbous bluegrass | *Poa bulbosa* | Poaceae | grass |
| Bull thistle | *Cirsium vulgare* | Asteraceae | herb |
| Burdock | | Asteraceae | herb |
| Buttercup | *Ranunculus* sp. | | herb |
| Cactus, hedgehog | *Echinocereus triglochidiatus* | Cactaceae | herb |
| Cactus, prickly-pear | *Opuntia polyacantha or O. erinacea* | Cactaceae | herb |
| Canada goldenrod | *Solidago canadensis* | Asteraceae | herb |
| Canada thistle | *Cirsium arvense* | Asteraceae | herb |
| Canada wildrye | | Poaceae | grass |
| Canadian reedgrass | *Calamagrostis canadensis* | Poaceae | grass |

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|---|---|---|---|
| Canadian violet | *Viola canadensis* | | Herb |
| Candytuft | *Noccaea montana* | Brassicaceae | herb |
| Canyon bog orchid | *Limnorchis ensifolia* | Orchidaceae | |
| Cat's eye, roughseed | *Cryptantha (Oreocarya) flavoculata* | Boraginaceae | herb |
| Cattail, narrowleaf | *Typha latifolia* | Typhaceae | herb |
| Chainpod | *Hedysarum boreale* | Fabaceae | herb |
| Cheatgrass | *Bromus tectorum* | Poaceae | grass |
| Chiming bells | *Mertensia ciliata* | Boraginaceae | herb |
| Chokecherry | *Prunus (Padus) virginiana* | Rosaceae | shrub |
| Cinquefoil | *Potentilla* sp. | Rosaceae | herb |
| Cinquefoil, shrubby | *Potentilla fruticosa (Pentaphylloides floribunda)* | Rosaceae | shrub |
| Clematis, western white | | Ranunculaceae | |
| Cliff fendlerbush | *Fendlera rupicola* | Hydrangaceae | shrub |
| Cliff rose | *Purshia stansburiana* | Rosaceae | shrub |
| White clover | *Trifolium repens* | Fabaceae | herb |
| Cockleburr, rough | *Xanthium strumarium* | Asteraceae | herb |
| Colorado bedstraw | *Galium coloradense* | Rubiaceae | herb |
| Colorado cinquefoil | *Potentilla subjuga* | Rosaceae | herb |
| Colorado columbine | *Aquilegia coerulea* | Helleboraceae | herb |
| Colorado Divide whitlow-grass | *Draba streptobrachia* | Brassicaceae | herb |
| Colorado pinyon | *Pinus edulis* | Pinaceae | tree |
| Colorado ragwort | *Senecio soldanella* | Asteraceae | herb |
| Columbia needlegrass | *Stipa columbiana* | Poaceae | grass |
| Columbine, Mancos | | Helleboraceae | herb |
| Columbine, yellow | *Aquilegia micrantha* | Helleboraceae | |
| Common juniper | *Juniperus communis* | Cupressaceae | shrub |
| Common milkweed | *Asclepias speciosa* | Asclepiadaceae | herb |
| Common moonwort | *Botrychium lunaria* | Ophioglossaceae | fern |
| Common plantain | *Plantago major* | Plantaginaceae | herb |
| Common reed | *Phragmites australis* | Poaceae | grass |
| Common spikerush | *Eleocharis palustris* | Cyperaceae | sedge |
| Coneflower | *Rudbeckia* sp. | Asteraceae | herb |
| Cottonwood, narrowleaf | *Populus angustifolia* | | tree |
| | *Populus deltoides ssp. wislizenii* | Salicaceae | tree |
| Cow parsnip | *Heracleum lanatum* | Apiaceae | herb |
| Cowbane | | Apiaceae | herb |
| Coyote willow | *Salix exigua* | Salicaceae | shrub |
| Cranesbill | *Erodium cicutarium* | Geraniaceae | herb |
| | *Agropyron cristatum* | Poaceae | grass |
| Curly sedge | *Carex rupestris* | Cyperaceae | sedge |
| Cushion phlox | *Phlox condensata* | | herb |
| | *Erigeron pinnatisectus* | Asteraceae | herb |
| Dandelion | | Asteraceae | |
| Diamondleaf saxifrage | *Micranthes (Saxifraga) rhomboidea* | Saxifragaceae | |
| Different leaved groundsel | *Senecio dimorphophyllus* | Asteraceae | herb |
| Dogbane | *Apocynum cannabinum* | Apocynaceae | herb |

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|---|---|---|---|
| Dogwood, red-osier | *Cornus sericea* | Cornaceae | shrub |
| Douglas fir | *Pseudotsuga menziesii* | Pinaceae | tree |
| Drummond's rockcress | *Arabis (Boechera) drummondii* | Brassicaceae | herb |
| Drummond's willow | *Salix drummondii* | Salicaceae | shrub |
| Dwarf bilberry | *Vaccinium myrtillus* | Ericaceae | shrub |
| Dwarf clover | *Trifolium nanum* | Fabaceae | herb |
| Dwarf mountain mahogany | | Rosaceae | shrub |
| Easter daisy | *Townsendia incana* | Asteraceae | herb |
| Eastwood monkey-flower | *Mimulus eastwoodiae* | Scrophulariaceae | herb |
| Eastwood's paintbrush | *Castilleja scabrida* | Scrophulariacea | herb |
| Eastwood-plant (Welsh) | *Chamaechaenactis scaposa* | Asteraceae | herb |
| Edible valerian | *Valeriana edulis* | Valerianaceae | herb |
| Elderberry | *Sambucus racemosa* | Caprifoliaceae | shrub |
| Elephant head | *Pedicularis groenlandica* | Scrophulariaceae | herb |
| Elk sedge | *Carex geyeri* | Cyperaceae | sedge |
| Engelmann's spruce | *Picea engelmannii* | Pinaceae | tree |
| Evening primrose | *Oenothera* sp. | Onagraceae | herb |
| False hellebore | *Veratrum tenuifolium* | Melanthiaceae | herb |
| False solomonseal | *Maianthemum stellatum* | | herb |
| | *Sibbaldia procumbens* | Rosaceae | herb |
| | *Erigeron pinnatisectus* | Asteraceae | herb |
| Felwort | *Swertia perenne* | Gentianaceae | herb |
| Fendler meadowrue | *Thalictrum fendleri* | Ranunculaceae | herb |
| Fendler's ceanothus | *Ceanothus fendleri* | Rhamnaceae | shrub |
| Fendler's spring-parsley | *Cymopterus fendleri* | Apiaceae | herb |
| Fendler's waterleaf | *Hydrophyllum fendleri* | Hydrophyllaceae | herb |
| Fendlerbush | | Hydrangaceae | shrub |
| Fescue, meadow | *Festuca pratensis* | Poaceae | grass |
| Fescue, tall | *Festuca arundinacea* | Poaceae | grass |
| Field mint | *Mentha arvense* | Lamiaceae | herb |
| Fineleaf hymenopappus | *Hymenopappus filifolius* | Asteraceae | herb |
| Fir, Douglas | *Pseudotsuga menziesii* | Pinaceae | tree |
| Fir, subalpine | *Abies lasiocarpa* | Pinaceae | tree |
| Fir, white | *Abies concolor* | Pinaceae | tree |
| Fireweed | *Epilobium angustifolium* | Onagraceae | herb |
| Fleabane, tall | *Erigeron elatior* | Asteraceae | herb |
| Floating buttercup | *Ranunculus* | Ranunculaceae | herb |
| Foothill sagewort | *Artemisia ludoviciana* | Asteraceae | herb |
| Four o'clocks | *Mirabilis multiflora* | Nyctaginaceae | herb |
| Four-wing saltbush | *Atriplex canescens* | Chenopodiaceae | shrub |
| Foxtail muhly | *Muhlenbergia* | Poaceae | grass |
| Fragrant bedstraw | *Galium boreale* | Rubiaceae | herb |
| Fremont barberry | *Berberis fremontii* | Berberidaceae | shrub |
| Fremont's cottonwood | *Populus deltoides* ssp. *wislizenii* | Salicaceae | tree |
| Fremont's groundsel | *Senecio fremontii* | Asteraceae | herb |
| Fringed sage | *Artemisia frigida* | Asteraceae | shrub |
| Galleta | *Hilaria jamesii* | Poaceae | grass |

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|---|---|---|---|
| Gambel's oak | *Quercus gambelii* | Fagaceae | tree |
| Geranium, Richardson's | *Geranium richardsonii* | Geraniaceae | herb |
| Geyer's onion | *Allium geyeri* | Alliaceae | herb |
| Geyer's willow | *Salix geyeriana* | Salicaceae | shrub |
| Giant angelica | *Angelica ampla* | Apiaceae | herb |
| Giant goldenrod | *Solidago canadensis* | Asteraceae | herb |
| Giant helleborine orchid | *Epipactis gigantea* | Orchidaceae | herb |
| Giant reed | *Phragmites australis* | Poaceae | grass |
| Giant wildrye | *Elymus cinereus* | Poaceae | grass |
| Gilia, skyrocket | *Ipomopsis aggregata* | Polemoniaceae | herb |
| Glaber daisy | *Erigeron leiomeris* | Asteraceae | herb |
| Globemallow, scarlet | *Sphaeralcea coccinea* | Malvaceae | herb |
| Golden banner | *Thermopsis montana* | Fabaceae | herb |
| Golden saxifrage | *Hirculus platysepalus* | Saxifragaceae | herb |
| Goldeneye daisy | *Heliomeris multiflora* | Asteraceae | herb |
| Goldenrod, giant | *Solidago canadensis* | Asteraceae | herb |
| | *Petradoria pumila* | Asteraceae | herb |
| Goldenweed, thrift mock | *Stenotus armerioides* | Asteraceae | herb |
| Grand Junction milkvetch | *Astragalus linifolius* | Fabaceae | herb |
| Gray aster | *Aster glaucodes* | Asteraceae | herb |
| Greasewood | *Sarcobatus vermiculatus* | Chenopodiaceae | shrub |
| Greene's daisy | *Erigeron simplex* | Asteraceae | herb |
| Greenleaf manzanita | *Arctostaphylos patula* | Ericaceae | shrub |
| Groundsel | | Asteraceae | herb |
| Groundsel, New Mexican | *Senecio (Packera) neomexicana* | Asteraceae | herb |
| Groundsel, triangle-leaf | *Senecio triangularis* | Asteraceae | herb |
| Gumweed | *Grindelia squarrosa* | Asteraceae | herb |
| Gumweed aster | *Machaeranthera grindelioides* | Asteraceae | herb |
| Hackberry | *Celtis reticulata* | Ulmaceae | tree |
| Hairgrass, tufted | *Deschampsia cespitosa* | Poaceae | grass |
| Hairspine pricklypear | *Opuntia polyacantha* | Cactaceae | herb |
| Hairy arnica | *Arnica mollis* | Asteraceae | herb |
| Hairy golden aster | *Heterotheca villosa* | Asteraceae | herb |
| Harbour penstemon | *Penstemon harbouri* | Scrophulariaceae | herb |
| Hawthorn | *Crataegus* sp. | Rosaceae | tree |
| Heartleaf arnica | *Arnica cordifolia* | Asteraceae | herb |
| Hedgehog cactus | *Echincereus triglochidiatus* | Cactaceae | herb |
| Helleborine orchid, giant | *Epipactis gigantea* | Orchidaceae | herb |
| Hood's phlox | | Polemoniaceae | herb |
| Hooker's evening primrose | *Oenothera hookeri* | Onagraceae | herb |
| Horsetails | *Equisetum arvense* | Equisetaceae | herb |
| Horseweed, Canadian | *Conyza canadensis* | Asteraceae | herb |
| Hound's tongue | *Cynoglossum officinale* | Boraginaceae | herb |
| Hymenoxys, graylocks | *Hymenoxys (Rydbergia) grandiflora* | Asteraceae | herb |
| Indian paintbrush | *Castilleja* sp. | Scrophulariaceae | herb |
| Indian rice grass | *Oryzopsis hymenoides* | Poaceae | grass |
| Inland saltgrass | *Distichlis spicata* | Poaceae | grass |

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|---|---|---|---|
| Intermediate wheatgrass | *Agropyron intermedium* | Poaceae | grass |
| Jacob's ladder | *Polemonium pulcherrimum* | Polemoniaceae | herb |
| Jim Hill mustard | *Sisymbrium altissimum* | Brassicaceae | herb |
| Juniper, common | *Juniperus communis* | Cupressaceae | shrub |
| Juniper, Rocky Mountain | *Juniperus scopulorum* | Cupressaceae | tree |
| Juniper, Utah | *Juniperus osteosperma* | Cupressaceae | tree |
| Kachina daisy | *Erigeron kachinensis* | Asteraceae | herb |
| Kentucky bluegrass | *Poa pratensis* | Poaceae | grass |
| King's clover | *Trifolium kingii* | Fabaceae | herb |
| King's crown | *Rhodiola (Sedum)integrifolia* | Crassulaceae | herb |
| Kinnikinnick | *Arctostaphylos uva-ursi* | Ericaceae | shrub |
| Kittentails | *Besseya ritteriana* | Scrophulariaceae | herb |
| Knapweed, Russian | *Centaurea repens* | Asteraceae | herb |
| Lance-leaved moonwort | *Botrychium lanceolatum* | Ophioglossaceae | fern |
| Lanceleaf cottonwood | *Populus acuminata* | Salicaceae | tree |
| Large flowered breadroot | *Pediomelum megalanthum* | Apiaceae | herb |
| Larkspur, tall | *Delphinium barbeyi* | Ranunculaceae | herb |
| Leathery grape fern | *Botrychium multifidum* | Ophioglossaceae | fern |
| Licorice, wild | *Glycyrrhiza lepidota* | Fabaceae | herb |
| Little penstemon | *Penstemon breviculus* | Scrophulariaceae | herb |
| Little sunflower | *Helianthella quinquenervis* | Asteraceae | herb |
| Little-leaved brickelbush | *Brickellia microphylla* | Asteraceae | shrub |
| Littleleaf mock orange | *Philadelphus microphyllus* | Hydrangaceae | shrub |
| Longleaf phlox | *Phlox longifolia* | Polemoniaceae | herb |
| Lupine | *Lupinus* sp. | Fabaceae | herb |
| Lupine, silvery | *Lupinus argenteus* | Fabaceae | herb |
| Mahogany, mountain | *Cercocarpus montanus* | Rosaceae | shrub |
| Mancos columbine | *Aquilegia micrantha* | Helleboraceae | herb |
| Many-lobed groundsel | *Senecio multilobatus* | Asteraceae | herb |
| Manzanita | *Arctostaphylos patula* | Ericaceae | shrub |
| Maple, Rocky Mountain | *Acer glabrum* | Aceraceae | tree |
| Marsh marigold | *Caltha leptosepala* | Helleboraceae | herb |
| Mat penstemon | *Penstemon cespitosus* | Scrophulariaceae | herb |
| Matted saxifrage | *Cilaria austromontana* | Saxifragaceae | herb |
| McCauley's buttercup | *Ranunculus Macauleyi* | Ranunculaceae | herb |
| Meadow timothy | *Phleum pratense* | Poaceae | grass |
| Meadowrue | *Thalictrum fendleri* | Ranunculaceae | herb |
| Mesa dropseed | *Sporobolus flexuosus* | Poaceae | grass |
| Milkvetch, Grand Junction | *Astragalus linifolius* | Fabaceae | herb |
| Milkvetch, San Rafael | *Astragalus rafaelensis* | Fabaceae | herb |
| Milkvetch, Wetherill | *Astragalus wetherillii* | Fabaceae | herb |
| Milkweed, showy | *Asclepias speciosa* | Asclepiadaceae | herb |
| Milkweed, whorled | *Asclepias subverticillata* | Asclepiadaceae | herb |
| Mingan moonwort | *Botrychium minganense* | Ophioglossaceae | fern |
| Mock orange, littleleaf | *Philadelphus microphylla* | Hydrangaceae | shrub |
| Mojave seablight | *Suaeda torreyana* | Chenopodiaceae | shrub |
| Monkeyflower, Eastwood's | *Mimulus eastwoodiae* | Scrophulariaceae | herb |

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|---|---|---|---|
| Monkshood | *Aconitum columbianum* | Ranunculaceae | herb |
| Mormon tea | *Ephedra viridis* | Ephedraceae | shrub |
| Moss campion | *Silene acaulis* | Caryophyllaceae | herb |
| Mountain ash | *Sorbus scopulina* | Rosaceae | shrub |
| Mountain big sagebrush | *Artemisia (Seriphidium) tridentata ssp. vaseyana* | Asteraceae | shrub |
| Mountain lover | *Paxistima myrsinites* | Celastraceae | shrub |
| Mountain mahogany | *Cerocarpus montanus* | Rosaceae | shrub |
| Mountain thistle | | Asteraceae | herb |
| Mountain whitlow-grass | *Draba rectifructa* | Brassicaceae | |
| Mule's ears | *Wyethia amplexicaulis* | Asteraceae | herb |
| Mullein, wooly | *Verbascum thapsus* | Scrophulariaceae | herb |
| Musk thistle | *Carduus nutans* | Asteraceae | herb |
| Muttongrass | *Poa fendleriana* | Poaceae | grass |
| Narrowleaf cottonwood | *Populus angustifolia* | Salicaceae | tree |
| Naturita milkvetch | *Astragalus naturitensis* | Fabaceae | herb |
| Nebraska sedge | *Carex nebraskensis* | Cyperaceae | sedge |
| Needle and thread | *Stipa comata* | Poaceae | grass |
| Needle grass | *Stipa* sp. | Poaceae | grass |
| Nettle-leaf giant hyssop | *Agastache urticifolia* | Lamiaceae | herb |
| Nettles, stinging | *Urtica gracilis* | Urticaceae | herb |
| New Mexican cliff fern | *Woodsia neomexicana* | Polypodiaceae | fern |
| New Mexican groundsel | *Senecio neomexicana* | Asteraceae | herb |
| New Mexican privet | *Forestiera pubescens* | Oleaceae | shrub |
| Nodding brome | *Bromus ciliatus* | Poaceae | grass |
| Nodding onion | *Allium cernuum* | Alliaceae | herb |
| Northern bedstraw | *Galium boreale* | Rubiaceae | herb |
| Northern bog orchid | *Habenaria hyperborea* | Orchidaceae | herb |
| Northern moonwort | *Botrychium pinnatum* | Ophioglossaceae | fern |
| Northern sweetvetch | *Hedysarum boreale* | Fabaceae | herb |
| Nuttall's sunflower | *Helianthus nuttallii* | Asteraceae | herb |
| Oak, Gambel's | *Quercus gambelii* | Fagaceae | tree |
| Oatgrass, Parry's | *Danthonia parryi* | Poaceae | grass |
| Old man of the mountain | *Hymenoxys (Rydbergia) grandiflora* | Asteraceae | herb |
| Olive, Russian | *Eleagnus angustifolia* | Eleagnaceae | |
| One-sided wintergreen | *Orthelia secunda* | Pyrolaceae | herb |
| Orange sneezeweed | *Dugaldia hoopsii* | Asteraceae | herb |
| Orchard grass | *Dactylis glomerata* | Poaceae | grass |
| Oregon grape | *Mahonia repens* | Ericaceae | shrub |
| Osha | *Ligusticum porteri* | Apiaceae | herb |
| Owl clover | *Orthocarpus luteus* | Scrophulariaceae | herb |
| Oxeye daisy | *Leucanthemum vulgare* | Asteraceae | herb |
| Pale moonwort | *Botrychium pallidum* | Ophioglossaceae | fern |
| Paradox breadroot | *Pediomelum aromaticum* | Apiaceae | herb |
| Parish's alkali grass | *Puccinnellia parishii* | Poaceae | |
| Parrot's beak | *Pedicularis racemosa* | Scrophulariaceae | herb |
| Parry's oatgrass | *Danthonia parryi* | Poaceae | grass |

| | | | |
|---|---|---|---|
| Parry's primrose | *Primula parryi* | Primulaceae | herb |
| Parsley, wild mountain | *Pseudocymopterus montanus* | Apiaceae | herb |
| Payson lupine | *Lupinus crassus* | Fabaceae | herb |
| Pepperweed | *Lepidium* sp. | Brassicaceae | herb |
| Pinnate daisy | *Erigeron pinnatisectus* | Asteraceae | |
| Pinyon pine | *Pinus edulis* | Pinaceae | tree |
| Planeleaf willow | *Salix planifolia* | Salicaceae | shrub |
| Plantain goldenweed | *Pyrrochoma uniflora* | Asteraceae | herb |
| Plantain, common | *Plantago major* | Plantaginaceae | |
| Poison ivy | *Toxicodendron rydbergii* | Anacardiaceae | |
| Ponderosa pine | *Pinus ponderosa* | Pinaceae | tree |
| Prairie junegrass | *Koeleria macrantha* | Poaceae | |
| Prickly pear cactus | *Opuntia erinacea* | Cactaceae | herb |
| Pricklypear cactus, hairspine | *Opuntia polyacantha* | Cactaceae | herb |
| Prince's plume | *Stanleya pinnata* | Brassicaceae | herb |
| Purple cliffbrake | *Pellaea atropurpurea* | Polypodiaceae | fern |
| Purple loosestrife | *Lythrum salicaria* | Lythraceae | herb |
| Purple mustard | *Chorispora tenella* | Brassicaceae | |
| Pussytoes | *Antennaria* sp. | Asteraceae | |
| Pygmy sagebrush | *Seriphidium pygmaeum* | Asteraceae | shrub |
| Rabbitbrush | *Chrysothamnus* sp. | Asteraceae | shrub |
| Rabbitbrush, low | *Chrysothamnus viscidiflorus* | Asteraceae | shrub |
| Rabbitbrush, rubber | *Chrysothamnus nauseosus* | Asteraceae | shrub |
| Rabbitbrush, spearleaf | *Chrysothamnus linifolius* | Asteraceae | shrub |
| Ragwort, tall | *Senecio* | Asteraceae | |
| Raspberry | *Rubus idaeus* | Rosaceae | |
| Rattlesnake plantain | *Goodyera oblongifolia* | Orchidaceae | herb |
| Red clover | *Trifolium pratense* | Fabaceae | herb |
| Red top | *Agrostis alba* | Poaceae | grass |
| | *Cornus sericea* | Cornaceae | shrub |
| Reed canary grass | *Phalaris arundinacea* | Poaceae | grass |
| Reflected moonwort | *Botrychium echo* | Ophioglossaceae | fern |
| Richardson's geranium | *Geranium richardsonii* | Geraniaceae | herb |
| Rio Grande cottonwood | *Populus deltoides ssp. wislizenii* | Salicaceae | tree |
| River birch | *Betula occidentalis* | Betulaceae | tree |
| Rock cress | *Boechera (Arabis)* sp. | Brassicaceae | herb |
| Rock goldenrod | *Petradoria pumila* | Asteraceae | |
| Rock jasmine | *Androsace septentrionalis* | Primulaceae | herb |
| Rock spirea | *Holodiscus dumosus* | Rosaceae | shrub |
| Rocky Mountain juniper | *Juniperus scopulorum* | Cupressaceae | tree |
| Rocky Mountain lousewort | *Pedicularis scopulorum* | Scrophulariacea | herb |
| Rocky Mountain maple | *Acer glabrum* | Aceraceae | tree |
| Rocky Mountain willow | *Salix monticola* | Salicaceae | shrub |
| Rose crown | *Clementsia (Sedum) rhodantha* | Crassulaceae | herb |
| Rose paintbrush | *Castilleja rhexifolia* | Scrophulariacea | herb |
| Rose, wild | *Rosa woodsii* | Rosaceae | shrub |
| Rough brickellbush | *Brickellia microphylla* | Asteraceae | shrub |

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|---|---|---|---|
| Rough cockleburr | *Xanthium strumarium* | Asteraceae | herb |
| Roughseed cat's-eye | | Boraginaceae | herb |
| Rubber rabbitbrush | *Chrysothamnus nauseosus* | Asteraceae | shrub |
| Russet buffaloberry | *Shepherdia canadensis* | Eleagnaceae | shrub |
| Russian knapweed | | Asteraceae | herb |
| Russian olive | *Eleagnus angustifolia* | Eleagnaceae | tree |
| Russian thistle | *Salsola australis* | Chenopodiaceae | herb |
| Sagebrush, big | *Artemisia tridentata* ssp. *tridentata* | Asteraceae | shrub |
| Sagebrush, Bigelow's | *Artemisia(Seriphidium) bigelovii* | Asteraceae | shrub |
| Sagebrush, black | *Artemisia (Seriphidium) nova* | Asteraceae | shrub |
| Sagebrush, mountain big | *Artemisia (Seriphidium) tridentata ssp. vaseyana* | Asteraceae | shrub |
| Salina wildrye | *Leymus salinus* | Poaceae | grass |
| Salsify | *Tragopogon dubius* | Asteraceae | herb |
| Salt cedar | *Tamarix ramosissima* | Tamaricaceae | shrub |
| Saltbush, four-wing | *Atriplex canescens* | Chenopodiaceae | shrub |
| San Juan whitlow-grass | *Draba graminea* | Brassicaceae | herb |
| San Rafael milkvetch | *Astragalus rafaelensis* | Fabaceae | herb |
| Sand aster | *Chaetopappa ericoides* | Asteraceae | herb |
| Sand bar willow | *Salix exigua* | Salicaceae | shrub |
| Sand dropseed | *Sporobolus cryptandrus* | Poaceae | grass |
| Sand verbena | *Abronia elliptica* | Nyctaginaceae | herb |
| Sandberg bluegrass | *Poa secunda* | | grass |
| Sandstone milkvetch | *Astragalus sesquiflorus* | Fabaceae | herb |
| Scarlet globemallow | *Sphaeralcea coccinea* | Malvaceae | herb |
| Scouring rush | *Equisetum arvense* | Equisetaceae | herb |
| Sea-blight | *Suaeda torreyana* | Chenopodiaceae | shrub |
| Sedge, beaked | *Carex utriculata* | Cyperaceae | sedge |
| Sedge, elk | *Carex geyeri* | Cyperaceae | sedge |
| Sedge, Nebraska | *Carex nebraskensis* | | sedge |
| Sedge, water | *Carex aquatilis* | | sedge |
| Sedge, western | *Carex occidentalis* | Cyperaceae | sedge |
| Sedge, wooly | *Carex lanuginosa* | Cyperaceae | sedge |
| Seep monkeyflower | *Mimulus eastwoodiae* | Scrophulariaceae | herb |
| Seep willow | *Baccharis salicina* | Asteraceae | shrub |
| Sego lily | *Calochortus nuttallii* | Calochortaceae | herb |
| Serviceberry, Utah | *Amelanchier utahensis* | Rosaceae | shrub |
| Shadscale | *Atriplex confertifolia* | Chenopodiaceae | shrub |
| Sharpleaf twinpod | *Physaria acutifolia* | Brassicaceae | herb |
| Sheep sorrel | *Rumex acetosella* | | herb |
| Shepherd's purse | *Capsella bursa-pastoris* | | herb |
| Showy goldeneye | *Heliomeris multiflora* | Asteraceae | herb |
| Showy milkweed | *Asclepias speciosa* | Asclepiadaceae | herb |
| Showy whitlow-grass | *Draba spectabilis* | Brassicaceae | herb |
| Shrubby cinquefoil | *Potentilla fruticosa (Pentaphylloides)* | Rosaceae | shrub |
| Siberian elm | *Ulmus pumilus* | Ulmaceae | tree |
| Silver buffaloberry | *Shepherdia argentea* | | tree |

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|---|---|---|---|
| Silver sage | *Artemisia (Serephidium) cana* | | shrub |
| Silvery lupine | *Lupinus argenteus* | Fabaceae | herb |
| Single leaf ash | *Fraxinus anomala* | | tree |
| Six weeks fescue | *Festuca octoflora* | Poaceae | grass |
| Skunkbrush | *Rhus trilobata* | Anacardiaceae | shrub |
| Sky pilot | *Polemonium viscosissimum* | Polemoniaceae | herb |
| Skyrocket gilia | *Ipomopsis aggregata* | Polemoniaceae | herb |
| Slender rock-brake | *Cryptogramma stelleri* | | fern |
| Slender wheatgrass | *Elymus trachycaulis* | Poaceae | grass |
| Small ricegrass | *Oryzopsis micrantha* | Poaceae | grass |
| Smallwing sedge | | Cyperaceae | sedge |
| Smooth aster | *Aster laevis* | Asteraceae | herb |
| Smooth brome | *Bromus inermis* | Poaceae | grass |
| | *Pellaea glabella* | Sinopteridaceae | fern |
| Snakeweed | *Gutierrezia sarothrae* | Asteraceae | herb |
| Sneezeweed, orange | *Dugaldia hoopsii* | | herb |
| Snow lover | *Chionophylla jamesii* | Scrophulariaceae | herb |
| Snow willow | *Salix reticulata* | Salicaceae | shrub |
| Snowberry | *Symphoricarpos oreophilus* | Caprifoliaceae | shrub |
| Snowbrush ceanothus | *Ceanothus velutinus* | | shrub |
| Southern maidenhair fern | *Adiantum capillis-veneris* | Adiantaceae | |
| Spanish bayonet | *Yucca harrimaniae* | Agavaceae | shrub |
| Spearleaf buckwheat | *Eriogonum lonchophyllum* | Polygonaceae | shrub |
| Spearleaf rabbitbrush | *Chrysothamnus linifolius* | | shrub |
| Spike pappus grass | *Enneapogon desvauxii* | Poaceae | |
| Spike trisetum | *Trisetum spicatum* | Poaceae | grass |
| | *Eleocharis palustris* | Cyperaceae | sedge |
| Spiny greasebush | *Forsellesia meionandra* | Celastraceae | shrub |
| Spiny horsebrush | *Tetradymia spinosa* | Asteraceae | shrub |
| | *Holodiscus dumosus* | Rosaceae | shrub |
| Spreading fleabane | *Erigeron flagellaris* | Asteraceae | herb |
| Spruce, blue | *Picea pungens* | Pinaceae | tree |
| Spruce, Engelmann's | *Picea engelmannii* | Pinaceae | tree |
| Squaw apple | *Peraphyllum ramosissimum* | Rosaceae | shrub |
| Stemless townsendia | | Asteraceae | herb |
| Stinging nettles | *Urtica gracilis* | Urticaceae | herb |
| Stonecrop | *Sedum lanceolatum* | Crassulaceae | herb |
| Strapleaf willow | *Salix ligulifolia* | Salicaceae | shrub |
| Strawberry | | Rosaceae | herb |
| Strawberry, false | *Sibbaldia procumbens* | Rosaceae | herb |
| Subalpine fir | *Abies lasiocarpa* | Pinaceae | tree |
| Sunflower, common | *Helianthus annuus* | Asteraceae | herb |
| Sunflower, little | *Helianthella quinquenervis* | Asteraceae | herb |
| Sunflower, nuttall's | *Helianthus nuttallii* | Asteraceae | herb |
| Sweet cicely | | Apiaceae | herb |
| Sweet clover | *Melilotus* sp. | Fabaceae | herb |
| Swordleaf rush | *Juncus ensifolia* | Juncaceae | rush |

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|---|---|---|---|
| Tall fleabane | *Erigeron elatior* | Asteraceae | herb |
| Tall larkspur | *Delphinium barbeyi* | Ranunculaceae | herb |
| Tall ragwort | *Solidago canadensis* | Asteraceae | herb |
| Tamarisk | *Tamarix ramosissima* | Tamaricaceae | shrub |
| Tansy mustard | | Brassicaceae | herb |
| Thickleaf clover | | Fabaceae | herb |
| Thickleaf whitlow-grass | *Draba crassa* | Brassicaceae | herb |
| Thickroot claytonia | | Portulacaceae | herb |
| Thimbleberry | | Rosaceae | shrub |
| Thinleaf alder | | Betulaceae | tree |
| Thistle, Canada | *Cirsium arvense* | | herb |
| Thistle, musk | *Carduus nutans* | Asteraceae | herb |
| Thistle, Tracy's | *Cirsium tracyi* | Asteraceae | herb |
| Three-toothed groundsel | *Senecio tridenticulata* | Asteraceae | herb |
| Thrift mock goldenweed | *Stenotus armerioides* | Asteraceae | herb |
| Thurber fescue | *Festuca thurberi* | Poaceae | grass |
| Timothy, meadow | *Phleum pratense* | Poaceae | grass |
| | *Linaria vulgare* | Scrophulariaceae | herb |
| Towering Jacob's ladder | *Polemonium foliosissimum* | Polemoniaceae | herb |
| Townsend's Easter daisy | | Asteraceae | herb |
| Tracy's thistle | *Cirsium tracyi* | Asteraceae | herb |
| Tree-awn | *Aristida purpurea* | Poaceae | grass |
| Triangle-leaf groundsel | *Senecio triangularis* | Asteraceae | herb |
| Tufted hairgrass | *Deschampsia cespitosa* | Poaceae | grass |
| Tumble mustard | *Sisymbrium altissimum* | Brassicaceae | herb |
| Twin bladderpod | *Physaria acutifolia* | Brassicaceae | herb |
| Twinberry honeysuckle | *Lonicera (Distegia) involucrata* | Caprifoliaceae | herb |
| Twinflower | *Linnaea borealis* | Ericaceae | herb |
| Utah juniper | *Juniperus osteosperma* | Cupressaceae | tree |
| Utah serviceberry | *Amelanchier utahensis* | Rosaceae | shrub |
| Variegated scouring rush | *Hippochaete variegata* | | herb |
| Vernal daisy | *Erigeron concinna* | Asteraceae | herb |
| Virgin's bower | *Clematis ligusiticifolia* | Ranunculaceae | shrub |
| Wallflower | *Erysimum capitatum* | Brassicaceae | herb |
| Water sedge | *Carex aquatilis* | Cyperaceae | sedge |
| Weak-stemmed mariposa lily | *Calochortus flexuosus* | Calochortaceae | herb |
| Western paintbrush | *Castilleja occidentalis* | | herb |
| Western sedge | *Carex occidentalis* | Cyperaceae | sedge |
| Western wheatgrass | *Pascopyrum (Agropyron) smithii* | Poaceae | grass |
| Wetherill milkvetch | *Astragalus wetherillii* | Fabaceae | herb |
| Wheatgrass, crested | *Agropyron cristatum* | Poaceae | grass |
| Wheatgrass, western | *Pascopyrum (Agropyron) smithii* | | grass |
| Whipple penstemon | *Penstemon whippleanus* | Scrophulariaceae | herb |
| | *Abies concolor* | Pinaceae | tree |
| White peavine | *Lathyrus leucanthus* | Fabaceae | herb |
| White sweet clover | *Melilotus alba* | Fabaceae | |
| White top | *Cardaria* sp. | Brassicaceae | herb |

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|---|---|---|---|
| Whorled milkweed | *Asclepias subverticillata* | Asclepiadaceae | herb |
| Whortleberry | *Vaccinium cespitosum* | Ericaceae | shrub |
| Widewing spring-parsley | *Cymopterus purpurascens* | Apiaceae | herb |
| Wild geranium | *Geranium richardsonii* | Geraniaceae | herb |
| Wild mountain parsley | *Pseudocymopterus montanus* | Apiaceae | herb |
| Wild rose | *Rosa woodsii* | Rosaceae | |
| Wildrye, Canada | *Elymus canadensis* | Poaceae | grass |
| Willow herb | *Epilobium* sp. | Onagraceae | herb |
| Willow, barren ground | *Salix brachycarpa* | Salicaceae | shrub |
| Willow, coyote | *Salix exigua* | Salicaceae | shrub |
| Willow, Drummond's | *Salix drummondiana* | Salicaceae | shrub |
| Willow, planeleaf | *Salix planifolia* | Salicaceae | shrub |
| Willow, Rocky Mountain | *Salix monticola* | Salicaceae | shrub |
| Willow, strapleaf | *Salix ligulifolia* | Salicaceae | shrub |
| Wingate milkvetch | *Astragalus wingatanus* | | herb |
| Winterfat | *Krascheninnikovia (Ceratoides) lanata* | Chenopodiaceae | shrub |
| Wolf currant | *Ribes wolfii* | Grossulariaceae | shrub |
| Wooly milkvetch | *Astragalus molissimus* | Fabaceae | herb |
| Wooly plantain | *Plantago patagonica* | Plantaginaceae | herb |
| Wooly sedge | *Carex lanuginosa* | Cyperaceae | sedge |
| Wyoming paintbrush | *Castilleja linariifolia* | Scrophulariaceae | herb |
| Yarrow | | Asteraceae | |
| Yellow cat's-eye | *Cryptantha flava* | Boraginaceae | |
| Yellow columbine | *Aquilegia micrantha* | Helleboraceae | herb |
| Yellow milkvetch | *Astragalus flavus* | | herb |
| Yellow toadflax | *Linaria vulgare* | Scrophulariaceae | herb |
| Yucca | *Yucca harrimaniae* | Agavaceae | shrub |

**Appendix III. Scientific Names of Animals Mentioned in the Text and/or Observed in the San Miguel Basin.**

| Common Name | Scientific Name | Life Form |
|---|---|---|
| American beaver | *Castor candensis* | mammal (rodent) |
| American Peregrine Falcon | *Falco peregrinus anatum* | |
| American Robin | *Turdus migratorius* | bird (thrush) |
| Ash-throated Flycatcher | *Myiarchus cinerascens* | bird (tyrant flycatcher) |
| Banded physa | *Physa utahensis* | mollusc (snail) |
| Becker's white | *Pontia beckerii* | insect (butterfly) |
| Black Swift | *Cypseloides niger* | bird (swift) |
| Black-tailed jackrabbit | *Lepus californicus* | mammal (hare) |
| Blue Grouse | *Dendragapus obscurus* | bird (grouse) |
| Boreal Owl | *Aegolius funereus* | bird (owl) |
| Brewer's Sparrow | *Spizella breweri* | bird (sparrow) |
| brimstone clubtail | *Stylurus intricatus* | insect (dragonfly) |
| Broad-tailed Hummingbird | *Selasphorus platycercus* | bird (hummingbird) |
| Bushtit | *Psaltriparus minimus* | bird (bushtit) |
| Canyon treefrog | *Hyla Arenicolor* | amphibian (frog) |
| Cedar hairstreak | *Callophrys gryneus* | insect (butterfly) |
| Clouded Sulphur/Common | *Colias philodice* | insect (butterfly) |
| Colorado River cutthroat trout | *Oncorhynchus clarki plueriticus* | fish (trout) |
| Common Raven | *Corvus corax* | bird (raven) |
| Coyote | *Canis latrans* | mammal (canid) |
| Downy Woodpecker | *Picoides pubescens* | bird (woodpecker) |
| Eastern fence lizard | *Sceloporus undulatus elongatus* | reptile (lizard) |
| Elk | *Cervus elaphus* | mammal (ungulate) |
| Field cresent | *Phycoides campestris campestris* | |
| Flannelmouth sucker | *Catastomus latipinnis* | |
| Grace's Warbler | *Dendroica graciae* | bird (warbler) |
| Gray Vireo | *Vireo vicinior* | bird (vireo) |
| Gray Wolf | *Lupus cannis* | mammal (wolf) |
| Grissly bear | *Ursus arctos* | mammal (bear) |
| Gunnison's prairie dog | *Cynomys gunnisoni* | mammal (rodent) |
| House Finch | *Carpodacus mexicanus* | bird (finch) |
| Lark Sparrow | *Chondestes grammacus* | bird (sparrow) |
| Lazuli Bunting | *Passerina cyanea* | |
| Lewis's Woodpecker | *Melanerpes lewisi* | bird (woodpecker) |
| Loggerhead Shrike | *Lanius ludovicianus* | bird (shrike) |
| Lynx | *Felix canadensis* | mammal (cat) |
| Melissa blue | *Lycaeides melissa* | insect (butterfly) |
| Mexican Spotted Owl | *Strix occidentalis lucida* | bird (owl) |
| Midget faded rattlesnake | *Crotalis viridis concolor* | reptile (snake) |
| Mountain Bluebird | *Sialia currucoides* | bird (thrush) |
| Mountain cottontail | *Sylvilagus nuttalii* | mammal (rabbit) |
| Mourning cloak | *Nymphalis antiopa antiopa* | insect (butterfly) |
| | *Zenaida macroura* | |

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|---|---|---|
| Mule deer | *Odocoileus hemiomus* | mammal (deer) |
| Nokomis fritillary | *Speyeria nokomis nokomis* | insect (butterfly) |
| Northern Flicker | *Colaptes auratus* | bird (woodpecker) |
| Northern Goshawk | *Accipiter gentilis* | bird (hawk) |
| Northern leopard frog | *Rana pipiens* | amphibian (frog) |
| Northern Rough-winged Swallow | *Stelgidopteryx serripennis* | bird (swallow) |
| Ox-eyed Satyr | *Cercyonis pegala boopis* | insect (butterfly) |
| Pale lump-nosed bat | *Corynorhinus townsendii* | mammal (bat) |
| Peregrine Falcon | *Falco peregrinus anatum* | bird (falcon) |
| Pinyon Jay | *Gymnorhinus cyanocephalus* | bird (jay) |
| Plateau striped whiptail | *Cnemidophorus velox* | reptile (whiptail) |
| Pygmy blue | *Brephidium exilis* | insect (butterfly) |
| Red spotted toad | *Bufo punctatus* | amphibian (toad) |
| Rock Wren | *Salpinctes obsoletus* | bird (wren) |
| Roundtail chub | *Gila robusta* | fish (chub) |
| Rufus-sided Towhee (westrern) | *Pipilo erythrophthalmus* | bird (sparrow) |
| Sage Sparrow | *Amphispiza belli* | bird (sparrow) |
| Sagebrush lizard | *Sceloporus graciosus* | reptile (lizard) |
| Savannah Sparrow | *Passerculus sandwichensis* | bird (sparrow) |
| Say's Phoebe | *Sayornis saya* | bird (tyrant flycather) |
| Sharp-shinned Hawk | *Accipiter striatus* | bird (hawk) |
| Short-eared Owl | *Asio flammeus* | bird (owl) |
| Side-blotched lizard | *Uta stansburiana* | reptile (lizard) |
| Silvery blue | *Glaucopsyche lygdamus* | insect (butterfly) |
| Spotted bat | *Euderma maculatum* | mammal (bat) |
| Striped skunk | *Mephitis mephitis* | mammal (mustelid) |
| Theano alpine | *Erebia theano* | insect (butterfly) |
| Tree lizard | *Urosaurus ornatus* | reptile (lizard) |
| Two-banded skipper | *Pyrgus ruralis* | insect (butterfly) |
| Veined white | *Artogeia napi* | insect (butterfly) |
| Violet Green Swallow | *Tachycineta thalassina* | bird (swallow) |
| Weidemeyer's admiral | *Basilarchia weidemeyerii* | insect (butterfly) |
| Western harvester ant | *Pogonomyrmex spp.* | insect (ant) |
| Western Meadowlark | *Sternella neglecta* | bird (blackbird) |
| Western Tanager | *Piranga ludoviciana* | bird (oriole) |
| White-throated woodrat | *Neotoma albigula brevicauda* | mammal (rodent) |
| Wilson's Warbler | *Wilsonia pusilla* | bird (warbler) |
| Wolverine | *Gulo gulo* | mammal (canid) |
| Yuma skipper | *Ochlodes yuma* | insect (butterfly) |