

**Survey of Rare Plants
San Juan Public Lands in Dolores and
Montezuma Counties, Colorado**



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**Colorado
State**
University

Knowledge to Go Places

Prepared for
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EXECUTIVE SUMMARY

The San Juan Public Lands agencies—Bureau of Land Management and San Juan National Forest—are in the process of revising their management plan. Since one of their missions has been to preserve the biodiversity of the public lands, and particularly to manage to preserve species that have been designated as sensitive, a survey of plant species of special concern is timely.

This project is a continuation of surveys conducted by CNHP on the San Juan National Forest from 2001 to 2003, in Archuleta, San Juan and La Plata counties, funded by the San Juan National Forest. Colorado State University contributed by waiving the usual indirect costs associated with the project.

CNHP began work in the spring of 2004, by compiling existing data and selecting areas to be inventoried during the field season. Fieldwork was completed from June through September 2004. Thirty-seven new or updated occurrences of plants were documented and evaluated, and added to the CNHP data system. Twenty-three new Potential Conservation Areas (PCAs) were identified, evaluated and mapped to represent the area deemed essential for the protection of these plant occurrences. Three previously identified PCAs are also included in this report.

Biodiversity significance of the 26 PCAs is as follows:

B1 (Outstanding Significance):	0
B2 (Very High Significance):	5
B3 (High Significance):	10
B4 (Moderate Significance):	6
B5 (General Significance):	5

A profile of each plant species and each PCA is included here, with a map, brief description, ranks and comments regarding urgency of protection and management. This report is accompanied by a GIS coverage of the Potential Conservation Areas.

ACKNOWLEDGEMENTS

We owe the existence of this project to many organizations and individuals.

Jeff Redders (San Juan National Forest) and Gary Thrash (BLM) have continued to be major supporters of our projects. They have supplied invaluable guidance and advice. Leslie Stewart, USFS botanist, and Marilyn Colyer, Mesa Verde National Park, have generously shared their intimate knowledge of the Four Corners area. Botanists Ken Heil and Arnold Clifford at San Juan College, Farmington, shared results from their extensive surveys in the San Juan Basin.

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We were fortunate to have the help of a volunteer, Julie Crawford, on vacation from her position with the National Park Service in Flagstaff during the field season. Karin Freeman, formerly with Colorado Natural Areas Program, volunteered to help with writing PCA profiles.

We appreciate the support of our families: Julia's husband Matthias took over child care of their infant and toddler and household duties while Julia was in the field, and Peggy's husband Rick was uncomplaining about all the time she spent away from home.

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CHAPTER I. THE NATURAL HERITAGE NETWORK AND BIODIVERSITY

Colorado Natural Heritage Program performed a survey of rare plants of the San Juan Public Lands in Dolores and Montezuma counties in 2004. Support for the project came from the San Juan National Forest. This report presents the results of that survey.

The Natural Heritage Network and Biodiversity

Colorado is well known for its rich diversity of landscape, 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, 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. Preserving representative plant communities provides a “coarse filter” for attending to species that depend on a particular ecosystem, but may be insufficiently known to be addressed as individual species, in addition to the “fine filter” of preserving rare plants and animals.

The Natural Heritage Methodology is used by Natural Heritage Programs throughout North, Central, and South America, forming an international database network under the umbrella of NatureServe (www.natureserve.org). 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 is clear 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.

The Colorado Natural Heritage Program

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

CNHP is the state's primary comprehensive biological diversity data center, gathering information and field observations to help develop statewide conservation priorities. After operating in the Colorado Division of Parks and Outdoor Recreation for 14 years, the Program was relocated to the University of Colorado Museum in 1992, and then to the College of Natural Resources at Colorado State University in 1994, where it has operated since.

The multi-disciplinary team of scientists, planners, and information managers at CNHP gathers comprehensive information on the rare, threatened, and endangered species and significant plant communities of Colorado. Life history, status, and locational data are incorporated into a continually updated data system. Sources include published and unpublished literature, museum and herbaria labels, and field surveys conducted by knowledgeable naturalists, experts, agency personnel, and our own staff of botanists, ecologists, and zoologists.

All Natural Heritage Programs that house data about imperiled species are implementing use of the Biotics 4 data system developed by NatureServe. This database includes taxonomic group, global and state rarity rank, federal and state legal status, observation source, observation date, county, township, range, watershed, and other relevant facts and observations. Biotics 4 also has an ArcView based mapping program for digitizing and mapping occurrences of rare plants, animals, and plant communities. These rare species and plant communities are referred to as “elements of natural diversity” or simply “elements.”

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

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

- What species and ecological communities exist in the area of interest?
- Which are at greatest risk of extinction or are otherwise significant from a conservation perspective?
- What are their biological and ecological characteristics, and where are these priority species or communities found?
- What is the species' condition at these locations, and what processes or activities are sustaining or threatening them?
- Where are the most important sites to protect?

- Who owns or manages those places deemed most important to protect, and what is threatening those places?
- What actions are needed for the protection of those sites and the significant elements of biological diversity they contain?
- How can we measure our progress toward conservation goals?

CNHP has effective working relationships with several state and federal agencies, including the Colorado Department of Natural Resources, the Colorado Division of Wildlife, the Bureau of Land Management, and the U.S. Forest Service. Numerous local governments and private entities, such as consulting firms, educators, landowners, county commissioners, and non-profit organizations, also work closely with CNHP. Use of the data by many different individuals and organizations encourages a cooperative and proactive approach to conservation, thereby reducing the potential for conflict.

The Natural Heritage Ranking System

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 only one place is more imperiled than something found numerous 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 (*Astragalus naturitensis*), which is known from 43 locations in western Colorado, is ranked G3S3. Further, a tiger beetle that is only known from one location in the world at the Great Sand Dunes National Monument is ranked G1S1. CNHP actively collects, maps, and electronically processes specific occurrence information for elements considered extremely imperiled to vulnerable (S1 - S3). Those with a ranking of S3S4 are "watchlisted," meaning that specific occurrence data are collected and periodically analyzed to determine whether more active tracking is warranted. A complete description of each of the Natural Heritage ranks is provided in Table 1.

This single rank system works readily for all species except those that are migratory. Those animals that migrate may spend only a portion of their life cycles within the state. In these cases, it is necessary to distinguish between breeding, non-breeding, and resident species. As noted in Table 1, ranks followed by a "B", e.g., S1B,

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

Table 1. Definition of Colorado Natural Heritage Imperilment Ranks.

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

Legal Designations for Rare Species

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.

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: <ul style="list-style-type: none">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 are single organisms, populations, or plant communities, are referred to as element occurrences. The element occurrence is considered the most fundamental unit of conservation interest and is at the heart of the Natural Heritage Methodology. 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 considered 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 | Viability has not been assessed. |
| H | Historically known, but not verified for an extended period of time |
| X | Extirpated |

Potential Conservation Areas and Their Ranking

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

The goal of the PCA 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 about each species' life history is used in conjunction with information about topographic, geomorphic, and hydrologic features; vegetative cover; and current and potential land uses. In developing the boundaries of a Potential Conservation Area, CNHP scientists consider a number of factors that include, but are not limited to:

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

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

Off-Site Considerations

Frequently, all 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

CNHP uses element and element occurrence ranks to assess the overall biological diversity significance of a PCA, which may include one or many element occurrences. Based on these ranks, each PCA is assigned a biological diversity rank (or B-rank). See Table 3 for a summary of these B-ranks.

Table 3. Natural Heritage Program Biological Diversity Ranks and their Definitions.

B1	<p>Outstanding Significance (irreplaceable):</p> <ul style="list-style-type: none"> only known occurrence of an element A-ranked occurrence of a G1 element (or at least C-ranked if best available occurrence) concentration of A- or B-ranked occurrences of G1 or G2 elements (four or more)
B2	<p>Very High Significance (nearly irreplaceable):</p> <ul style="list-style-type: none"> B- or C-ranked occurrence of a G1 element A- or B-ranked occurrence of a G2 element One of the most outstanding (for example, among the five best) occurrences rangewide (at least A- or B-ranked) of a G3 element. Concentration of A- or B-ranked G3 elements (four or more) Concentration of C-ranked G2 elements (four or more)
B3	<p>High Significance:</p> <ul style="list-style-type: none"> C-ranked occurrence of a G2 element A- or B-ranked occurrence of a G3 element D-ranked occurrence of a G1 element (if best available occurrence) Up to five of the best occurrences of a G4 or G5 community (at least A- or B-ranked) in an ecoregion (requires consultation with other experts)
B4	<p>Moderate Significance:</p> <ul style="list-style-type: none"> Other A- or B-ranked occurrences of a G4 or G5 community C-ranked occurrence of a G3 element A- or B-ranked occurrence of a G4 or G5 S1 species (or at least C-ranked if it is the only state, provincial, national, or ecoregional occurrence) Concentration of A- or B-ranked occurrences of G4 or G5 N1-N2, S1-S2 elements (four or more) D-ranked occurrence of a G2 element At least C-ranked occurrence of a disjunct G4 or G5 element Concentration of excellent or good occurrences (A- or B-ranked) of G4 S1 or G5 S1 elements (four or more)
B5	<p>General or State-wide Biological Diversity Significance: good or marginal occurrence of common community types and globally secure S1 or S2 species, sites of local interest.</p>

Protection Urgency Ranks

Protection urgency ranks (P-ranks) refer to the timeframe in which it is recommended that conservation protection occur. In most cases, this rank refers to the need for a major change of protective status (for example agency special area designations or ownership). The urgency for protection rating reflects the need to take legal, political, or other administrative measures to protect the area. Table 4 summarizes the P-ranks and their definitions.

Table 4. Natural Heritage Program Protection Urgency Ranks and their Definitions.

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

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

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

Management Urgency Ranks

Management urgency ranks (M-ranks) indicate the timeframe in which it is recommended that a change occur in management of the element or PCA. This rank refers to the need for management in contrast to protection (for example, increased fire frequency, decreased grazing, weed control, etc.). The urgency for management rating focuses on land use management or land stewardship action required to maintain element occurrences at the potential conservation area.

A management action may include biological management (prescribed burning, removal of exotics, mowing, etc.) or people and site management (building barriers, rerouting trails, patrolling for collectors, hunters, or trespassers, etc.). Management

action does not include legal, political, or administrative measures taken to protect a potential conservation area. Table 5 summarizes M-ranks and their definitions.

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

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

CHAPTER II. ASSESSMENT OF CRITICAL BIOLOGICAL RESOURCES OF LA PLATA COUNTY

Purpose of the Study

The project goals were to update existing records and survey for new occurrences of plants that are on the Sensitive Species lists for the San Juan National Forest and San Juan Resource Area of the BLM, as well as other plants tracked by Colorado Natural Heritage Program.

Inventory Methods

The methods for assessing and prioritizing conservation needs are diverse. CNHP follows a general method that is continuously being developed specifically for this purpose. The Natural Heritage Inventory described in this report was conducted in several steps summarized below.

Collecting Information

CNHP biological conservation databases were updated with information regarding the known locations of species within the study area. A variety of information sources were searched for this information. The Colorado State University museums and herbarium were searched, as were plant collections at the University of Colorado, San Juan College and Fort Lewis College. Both general and specific literature sources were incorporated into CNHP databases, either in the form of locational information or as biological data pertaining to a species in general. Other information was gathered to help locate additional occurrences of natural heritage elements. Such information covers basic plant biology including range, habitat, phenology (reproductive timing), and substrates. This information was also entered into CNHP databases.

Identifying Rare or Imperiled Species and Significant Plant CommunitiesPotentially Occurring in the Project Area

The information collected in the previous step was used to refine a list of potential plant species and to refine our search areas. In general, species that had been recorded from Dolores and Montezuma counties or from adjacent areas are included in this list. Seven rare plant species had previously been documented from the San Juan National Forest in the study area, while 19 species had been documented from BLM lands. Given a limited amount of time and funding for this research, a specific subset of species were the priority of our inventory efforts. These elements were considered to be a priority because of their high level of biological significance (critically imperiled to vulnerable, G1-G3 or their inclusion on the sensitive species lists for the USFS and/or BLM.

The amount of effort given to the inventory for each of these elements is prioritized according to the element's rank. Globally imperiled to vulnerable (G1-G3) elements are given highest priority, while state-rare (S1-S3) elements are of a lower priority.

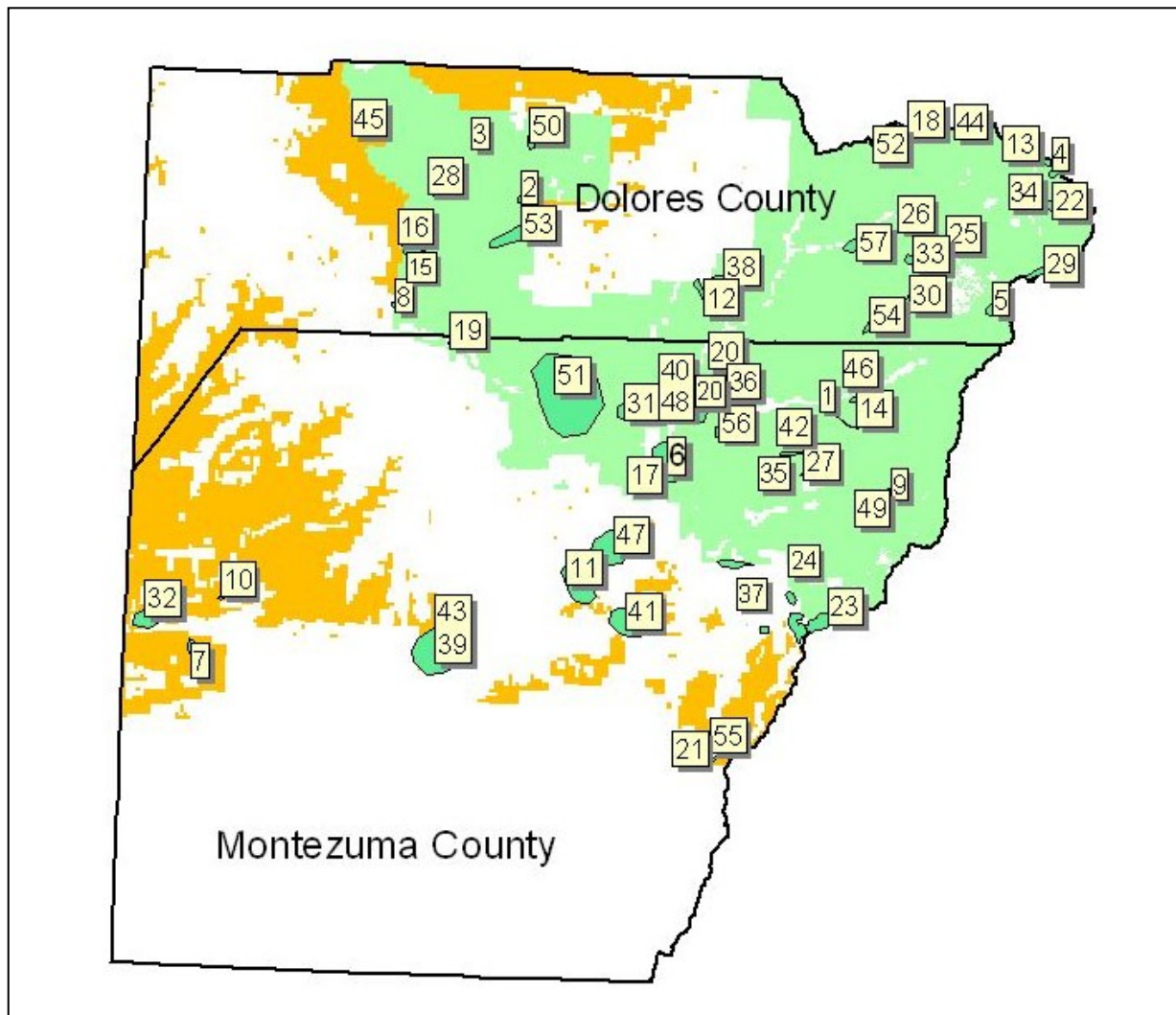
Identifying Targeted Inventory Areas

Sites to survey in the field were chosen based on their likelihood of harboring rare or imperiled plant species. Previously documented locations were targeted, and additional potential areas were chosen using available information sources. Element occurrences with precisely known locations were always included so that they could be verified and updated. Many locations were not known due to ambiguities in the original data. In such cases, sites to survey for that element were chosen in likely areas in the general vicinity. Areas with potentially high natural values were selected using aerial photographs, geology maps, vegetation surveys, personal recommendations from knowledgeable local residents, and roadside surveys by our field scientists. Using the biological information stored in the CNHP database, areas having the highest potential for supporting specific elements were identified.

The above information was used to delineate 30 targeted inventory areas (TIAs) that were believed to have relatively high probability of harboring significant natural resources (Fig. 1). These areas vary in size from 28 acres to over 12,000 acres and include all major habitat types in the study area. In some cases several areas can be surveyed in a day, and other areas required major hiking and several days. During the field season an additional 27 areas were added to the list, and 57 locations were surveyed altogether (Figure 1).

Because there were limited resources to address an overwhelming number of potential sites, surveys for all elements were prioritized by the degree of imperilment. For example, the species with Natural Heritage ranks of G1-G3 were the primary target of our inventory efforts. Although species with lower Natural Heritage ranks were not the main focus of inventory efforts, many of these species occupy similar habitats as the targeted species, and were documented as they were encountered. In addition, even when no targeted species were found, a species list for each site was prepared (Appendix A).

Figure 1. Targeted Inventory Areas Surveyed 2004. San Juan National Forest lands are shaded green; BLM San Juan Resource Area lands are yellow.



Map number	TIA name	Survey Date	Targets
1	Bear Creek Trail	6/24/2004	Riparian species
2	Benchmark Lookout	7/2/2004	Trifolium kingii
3	Black Snag Road	7/2/2004	Penstemons, Gilia
4	Blackface	7/22/2004	Stellaria irrigua
5	Blackhawk Basin, Colo. Trail	7/28/2004	Machaeranthera coloradoensis
6	Boggy Draw Reservoir	6/10/2004	Ponderosa pine comm, Triteleia.
7	Bowdish Canyon	6/3/2004	Desert spp
8	Bradfield Bridge and Campground	7/2/2004	Riparian
9	Burrow Mountain	6/24/2004	Botrychiums/Stellaria /Draba
10	Canyons of the Ancients-Risley	6/3/2004	Townsendia strigosa
11	Cash Canyon	6/3/2004	Penstemons
12	Cottonwood Creek	6/10/2004	Trifolium kingii
13	Cross Mountain	7/28/2004	Stellaria irrigua
14	Cushman Gulch	6/24/2004	General exploration
15	Doe Canyon	6/29/2004	Hippochaete, Trifolium kingii
16	Doe Point Reservoir	7/17/2004	Hippochaete, Trifolium kingii
17	Dolores Fish Hatchery	7/23/2004	Carex retrorsus
18	Dolores Peak	7/17/2004	Drabas

19	Dolores River at Ferris Canyon	6/9/2004	Epipactis, wetlands
20	Dry Lake	6/23/2004	Plant communities
21	East Canyon-Menefee Mountain	6/25/2004	Penstemon lentus/Gilia haydenii
22	East Fork Trail -Sheep Mt.	7/29/2004	Wetland
23	East Mancos River	6/5/2004	Penstemon parviflorus
24	Echo Basin	6/5/2004	Penstemon parviflorus
25	Elliott Mountain, Calico Trail	7/16/2004	Alpine species
26	FS Road 471 Below Sockrider Peak	7/2/2004	Botrychium sp.
27	Fish Creek-Turkey Creek	6/24/2004	Riparian comm
28	Garbarena spring	7/1/2004	Hippochaete, Trifolium kingii
29	Hermosa Peak -Colorado Trail	7/28/2004	Drabas, Machaeranthera
30	Highline Trail Storm Peak	8/28/2004	Machaeranthera coloradoensis
31	House Creek	6/4/2004	Triteleia grandiflora
32	Ismay Trading Post	6/9/2004	Calochortus flexuosus
33	Johnny Bull Peak	7/20/2004	Alpine species
34	Lizard Head Pass	6/22/2004	Besseyia ritteriana, wetlands
35	Lost Canyon	6/24/2004	Riparian species
36	Lower Stoner Trail	6/24/2004	Rock outcrop/ferns
37	Mancos	6/23/2004	Penstemon parviflorus
38	Mavreeso Creek	6/11/2004	Trifolium kingii
39	McElmo Stone Crusher Site	6/3/2004	Astragalus naturitensis
40	McPhee Park	6/10/2004	Old growth ponderosa pine
41	Mesa Verde Entrance	5/14/2004	Townsendia, Gilia
42	Morgan Gulch	6/23/2004	Trifolium kingii
43	Mud Creek	6/3/2004	Penstemons, Gilia
44	Navajo Lake	7/21/2004	Eriophorum, wetlands
45	North Rim of Dolores Canyon	7/1/2004	Cliffs/ferns
46	Priest Gulch Trailhead	6/24/2004	Trifolium kingii
47	School Section Reservoir	6/9/2004	Ponderosa pine comm, Triteleia
48	South Rim Dolores Canyon	6/23/2004	Trifolium kingii
49	Spruce Mill Park	6/24/2004	Spruce-fir comm
50	The Hogback	7/1/2004	Sagebrush comm, Penstemon
51	USFS PJ above McPhee	6/11/2004	Pinyon-juniper on NF
52	Upper Fish Creek drainage	7/17/2004	Drabas
53	Upper Narraguinnep Canyon	6/30/2004	PJ-sagebrush comm
54	Upper Priest Gulch	8/27/2004	Riparian, Spruce-fir aspen
55	Weber Canyon	6/25/2004	Penstemons, Gilia
56	Wesley Reservoir	6/23/2004	Ponderosa Pine comm.
57	West Dolores Road	6/11/2004	Riparian, mixed conifer

Conducting Field Surveys

Survey sites were visited at the appropriate time as dictated by the phenology of the individual plants. It is essential that surveys take place during a time when the targeted elements are detectable. Plants are often not identifiable without flowers or fruit that are only present during certain times of the year.

When a rare plant was discovered, its precise location and known extent was determined by GPS and recorded on 1:24,000 scale topographic maps. Other data recorded at each occurrence include numbers observed, habitat description, disturbance features, observable threats, and potential protection and management needs. The overall significance of each occurrence, relative to others of the same element, was estimated by rating the size of the population, the condition or naturalness of the habitat, and the landscape context (ease or difficulty of protecting) of the occurrence. These factors are combined into an element occurrence rank, useful in refining conservation priorities. See the previous section on Natural Heritage Methodology for more about element occurrence ranking.

Results of Biological Inventory

There are several extremely rare plants that depend on these areas for survival. Altogether, 29 rare or imperiled plant species have been recently documented in on public lands of Dolores and Montezuma counties (Chapter IV). Thirty-seven new or updated occurrences of plants were documented and evaluated, and added to the CNHP data system. Twenty-three new Potential Conservation Areas (PCAs) were identified, evaluated and mapped to represent the area deemed essential for the protection of these plant occurrences. Three previously identified PCAs are also included in this report.

Delineating Potential Conservation Areas

As the objective for this inventory is to prioritize specific areas for conservation efforts, Potential Conservation Area (PCA) boundaries were delineated. Such a boundary is an estimation of the minimum area needed to ensure persistence of the plant. In order to ensure the preservation of an element, the ecological processes that support that element 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 PCA or the element may call for alterations to the boundaries.

The Colorado Natural Heritage Program identified 26 Potential Conservation Areas (PCAs) in Dolores and Montezuma counties. Sixteen occur on National Forest land and 10 occur on BLM land. Each PCA was ranked according to its biodiversity significance. Of the 26 PCAs identified, five are of very high significance (B2), 10 are of high significance (B3), 6 are of moderate significance (B4), and 5 are of general significance (B5). The Potential Conservation Areas are profiled in Chapter V.

Although this report does not include PCAs that were previously drawn for animals or plant communities, where those elements fall within a PCA containing a rare plant, they are listed in the table.

CHAPTER III. DESCRIPTION OF STUDY AREA

Location and Ecoregion

Montezuma and Dolores counties are located in southwestern Colorado, in the Four Corners area and the San Juan and La Plata Mountain ranges. The north-eastern part of the study area falls within the Colorado Rocky Mountains Ecoregion, and the south-western part in the Colorado Plateau Ecoregion, as defined by Bailey (1995, Figure 2). It is bordered by San Miguel County to the north, San Juan and La Plata Counties on the east. The Utah border delineates the western boundary of the study area, and the New Mexico border on the south.

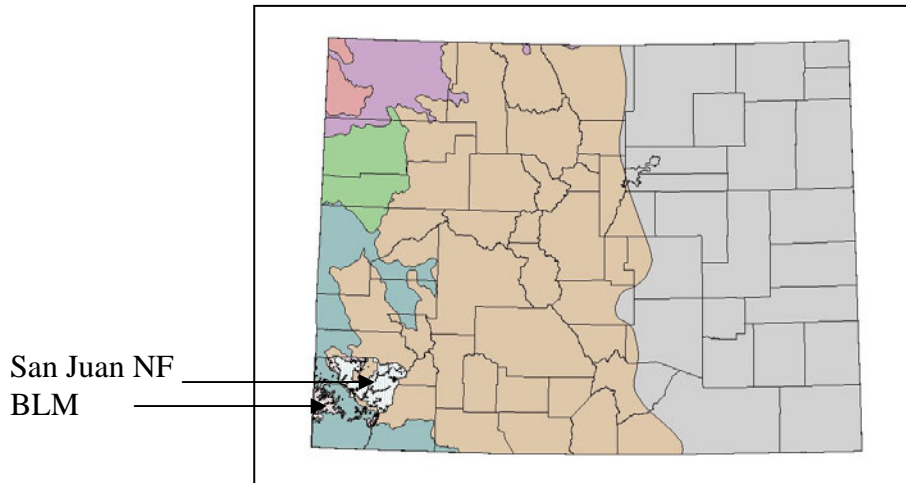


Figure 2. Ecoregions of Colorado. In general, San Juan National Forest lands are located in the Southern Rocky Mountains Ecoregion (beige), while BLM lands are in the Colorado Plateau Ecoregion (blue). Figure 2. Ecoregions of Colorado. In general, San Juan National Forest lands are located in the Southern Rocky Mountains Ecoregion (beige), while BLM lands are in the Colorado Plateau Ecoregion (blue).

Size and Elevation

San Juan Public Lands in Dolores and Montezuma counties include about 929 square miles or 594,424 acres of National Forest and 420 square miles or 269,325 acres of BLM land. Elevations in the study area generally decline from northeast to southwest. They range from over 14,000 feet at El Diente Peak and Mount Wilson, to below 4900 ft. at the Utah border.

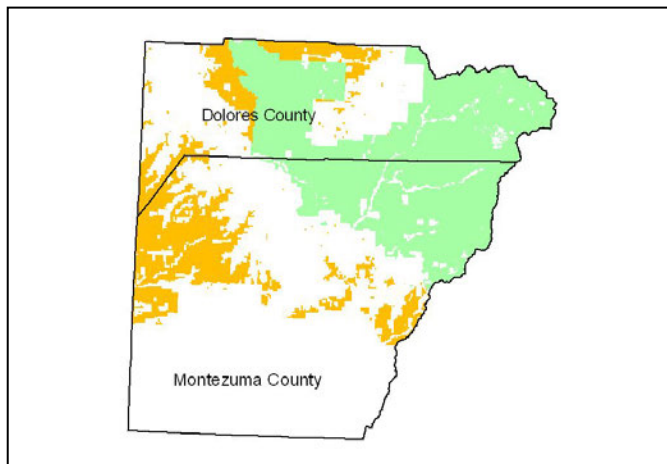


Figure 3. Public lands in Dolores and Montezuma counties, Colorado. San Juan National Forest Lands are shaded green; BLM lands are shaded yellow.

Hydrologic Units

Dolores River drainage (to Colorado River)

San Juan River drainage (Mancos River and McElmo Creek)

The San Juan Public Lands in the study area fall into two major drainages. The Dolores River has its headwaters at Lizard Head Pass, and runs south to the town of Dolores, where it turns east, then north to join the Colorado River in Utah. Most of the National Forest lands are in this drainage. The Mancos River and McElmo Creek drain into the San Juan River in Utah. This drainage encompasses most of the BLM lands in the study area.

Municipalities

Municipalities in the study area include Cortez, Mancos, Dolores, Rico and Dove Creek.

Climate

Climate records including average maximum and minimum temperatures are available for Cortez, Yellowjacket, Mancos and Rico. Average maximum daily temperatures range from a high of 88.8 degrees F. in Cortez in July to 75.4 in Rico in July. Average minimum daily temperatures in January average 13.1 in Cortez and 5.2 in Rico. Other stations are intermediate to these two. Average total annual precipitation in Cortez is 12.97 inches and in Rico 26.24 inches. The driest month is June, while the wettest month is August (Western Regional Climate Center 2005).

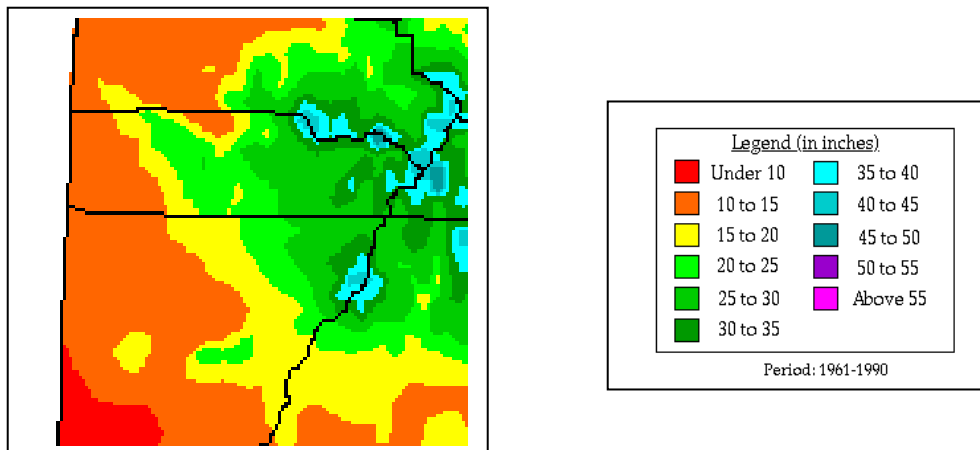


Figure 4. Annual precipitation in Dolores and Montezuma counties. From Western Regional Climate Center, www.wrcc.dri.edu/pcp

Geology

Montezuma and Dolores County contain a wide variety of geological sp (substrates), ranging from Precambrian metamorphic and granitic rocks, through Triassic, Jurassic and Cretaceous sedimentary shales, limestones and sandstones, Tertiary uplifts

and glaciated valleys to the Quaternary alluvium deposits.

While the San Juan Mountains in the northern part of the study area originated from volcanic activity in the Tertiary Period, the La Plata mountains on the eastern side formed from multiple intrusions of magma from a point source 65 million to 67 million years ago.

Vegetation/Plant Communities

Vegetation in San Juan Resource Area varies primarily with elevation. It is also influenced by soils, moisture, slope, and aspect. It can be classified hierarchically by Climatic Zone (e.g. alpine, upper montane); then subdivided into Ecological Systems (e.g. ponderosa pine forest); and then by plant associations described by the dominant overstory and understory species (e.g. Ponderosa pine/Gambel oak). Each zone also has corresponding riparian and wetland vegetation. From the semi-desert shrublands in Canyons of the Ancients National Monument to the high alpine peaks in the San Juans, the area contains a rich variety of vegetation.

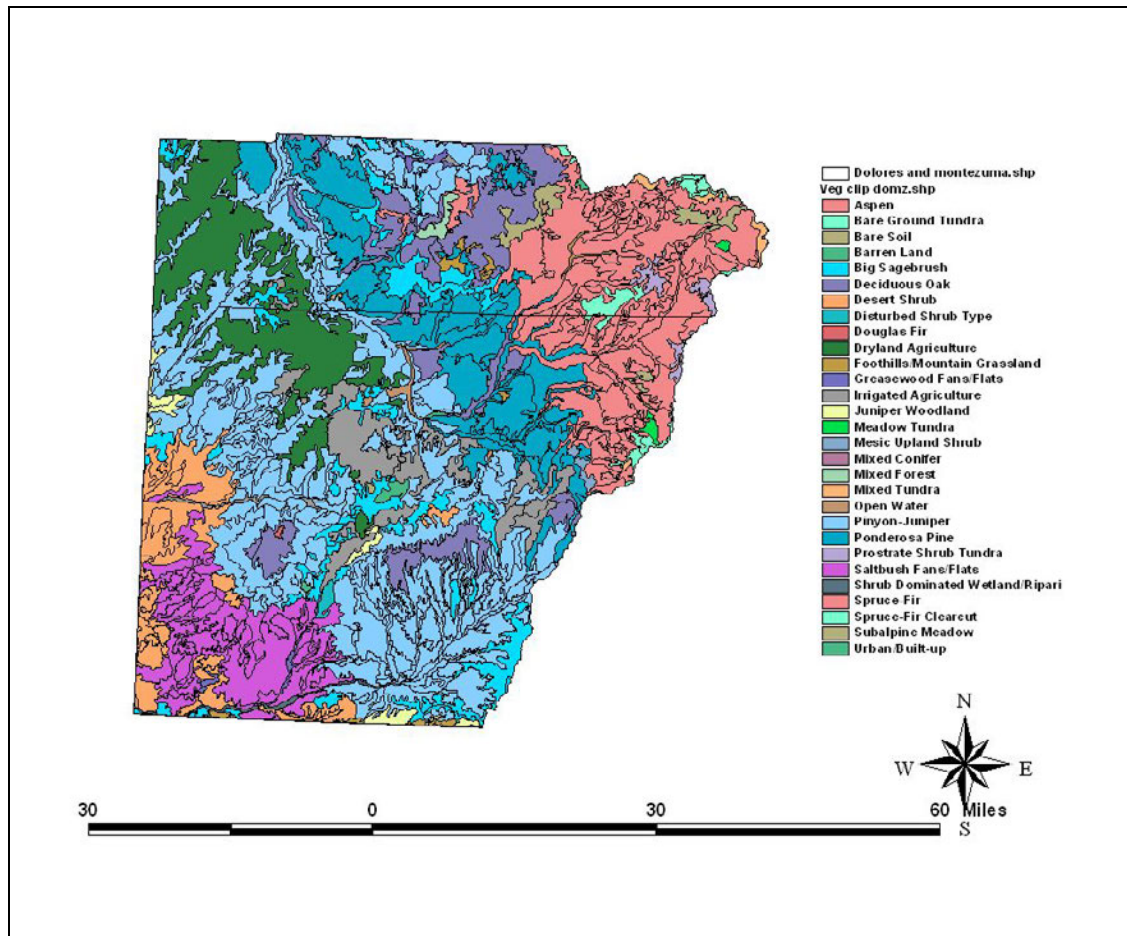


Figure 5. Vegetation Map of Dolores and Montezuma counties (USGS GAP Analysis Program)

Climatic Zones

Alpine zone. Typically this zone is located above 11,500 ft. in the San Juan National Forest. It includes the highest peaks of the San Juan and La Plata Mountains. Snow and ice fields, fellfields, dry alpine tundra, moist to wet alpine meadows, cold alpine streams and small cirque lakes characterize the alpine zone. It is subject to cold and wind most of the year, and receives intense ultra-violet radiation. Many of the plants and animals found in the alpine zone have special adaptations to this harsh environment, such as the cushion form of



Figure 6. Alpine landscape at Lizard Head . Cross Mountain Trail PCA, with a mosaic of ecological systems, including dry tundra, wet meadow, fellfields, dwarf shrublands and bedrock and scree.

plants that resists desiccation, large root systems to store nutrients, and very short flowering seasons. Common alpine plant species in Dolores and Montezuma County are Ross's avens (*Geum rossii*), arctic willow (*Salix arctica*), false strawberry (*Sibbaldia procumbens*), Colorado columbine (*Aquilegia coerulea*), and marsh marigold (*Caltha leptosepala*). Rare plants found in the alpine include San Juan whitlow-grass (*Draba graminea*), Colorado Divide whitlow-grass (*Draba streptobrachia*), Boreal whitlow-grass (*Draba borealis*), Altai chickweed (*Stellaria irrigua*), House's stitchwort (*Alsianthe macrantha*), Colorado tansy-aster (*Machaeranthera coloradoensis*), and Altai cottongrass (*Eriophorum altaicum* var. *neogaeum*). Mammals that inhabit the alpine include bighorn sheep, pika, and yellow-bellied marmot. Birds include American pipit, horned lark and brown-capped rosy finch.

Subalpine zone. This zone occurs roughly between 9000 and 11,500 ft. , and includes large areas of forest dominated by Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*), interspersed with subalpine meadows and grasslands. Douglas fir



Figure 7. Subalpine spruce fir forest and meadow.

(*Pseudotsuga menziesii*) and aspen (*Populus tremuloides*) may also be found in this zone, as well as in the Upper Montane zone. Common understory species include mountain lover (*Paxistima myrsinites*), currants (*Ribes* sp.), heartleaf arnica (*Arnica cordifolia*), Jacob's ladder (*Polemonium pulcherrimum*), dwarf blueberry (*Vaccinium myrtillus*), spruce-fir fleabane (*Erigeron eximius*) and Parry's goldenrod (*Oreochrysum parryi*). Rare plants found in this zone include kittentails (*Besseya ritteriana*),

showy whitlow-grass (*Draba spectabilis* var. *oxyloba*), and moonworts (*Botrychium* spp). Both kittentails and showy whitlow-grass have been found to be more common than formerly known, and have been placed on CNHP's watchlist. Grasslands of the subalpine zone are usually dominated by Thurber fescue (*Festuca thurberi*), while wet meadows may contain false hellebore (*Veratrum tenuipetalum*) and a rich mixture of sedges and forb species. Common mammals of this zone include Rocky Mountain elk, snowshoe hare, pine marten and yellow-bellied marmot. Rare mammals include lynx and wolverine. Streams that support Colorado River cutthroat trout are most often found in this zone.

Upper montane zone. Generally between 7,500 and 9000 ft., the upper montane zone includes forests dominated by mixed conifers and aspen. Conifers include white fir (*Abies concolor*), ponderosa pine (*Pinus ponderosa*), Douglas fir (*Pseudotsuga menziesii*), New Mexico white pine (*Pinus strobiformis*) and Rocky mountain juniper (*Juniperus scopulorum*). Lodgepole pine (*Pinus contorta*), which is characteristic of the Upper Montane zone in Colorado from the Gunnison Basin north and east, is absent from this area. Aspen forests are often a seral or pioneering community following disturbance such as fire, and are rich in species of both plants and animals. They may also be a stable community with multi-aged trees. Common understory species in this zone include mountain lover (*Paxistima myrsinites*), serviceberry (*Amelanchier utahensis*), snowberry (*Symphoricarpos oreophilus*), Rocky Mountain maple (*Acer glabrum*), Thurber fescue (*Festuca thurberi*) and elk sedge (*Carex geyeri*). Rare plants found in the upper montane zone include King's clover (*Trifolium kingii*) and large-flower Triteleia (*Triteleia grandiflora*.)



Figure 8. Upper Montane Zone Aspen forest

Lower Montane Zone: This zone is found below 7,500 ft. and includes a large part of the BLM land in the San Juan Resource Area. Characteristic communities of this zone are lower elevation ponderosa pine forests, Gambel oak shrubland, and pinyon-juniper (*Pinus edulis* and *Juniperus osteosperma*) woodlands. Common shrub species are Gambel oak (*Quercus gambellii*), snowberry (*Symphoricarpos oreophilus*), mountain mahogany (*Cercocarpus montanus*), bitterbrush (*Purshia tridentata*), squaw-apple (*Peraphyllum ramosissimum*) and sagebrush (*Artemisia tridentata* ssp.



Figure 9. Lower Montane Zone Ponderosa Pine Woodland.

tridentata). Rare plants known from this zone include Jones' blue-star, Naturita milkvetch, helleborine, Palmer buckwheat, Westwater buckwheat, San Juan gilia, little penstemon, Abajo penstemon, Utah penstemon and Gray's townsend-daisy (*Amsonia jonesii*, *Astragalus naturitensis*, *Epipactis gigantea*, *Eriogonum palmerianum*, *E. scabrellum*, *Gilia haydenii*, *Penstemon breviculus*, *P. lentus*, and *Townsendia glabella*.)



Figure 10. Sagebrush shrublands

Sagebrush and Semi-desert shrublands:

The lowest elevations in the study area, primarily found on BLM land in Canyons of the Ancients National Monument, are dominated by sagebrush and species of the goosefoot family (Chenopodiaceae), including shadscale (*Atriplex confertifolia*) and four-wing saltbush (*A. canescens*). This zone is found below the limit of the pinyon-juniper, although scattered junipers may be present. Common shrubs include big sagebrush (*Artemisia tridentata* ssp. *tridentata*), black sagebrush (*Artemisia nova*), rabbitbrush (*Chrysothamnus* spp),

winterfat (*Krascheninnikovia lanata*), cliffrose (*Purshia stansburiana*), spiny horsebrush (*Forsellesia meionandra*), and greasewood (*Sarcobatus vermiculatus*). Common grasses are galleta (*Pleuraphis jamesii*), Indian rice grass (*Oryzopsis hymenoides*), needle and thread (*Hesperostipa comata*) and blue gramma (*Bouteloua gracilis*). Rare plants of this zone include Utah penstemon (*Penstemon utahensis*), hairy townsend-daisy (*Townsendia strigosa*) and weak-stemmed mariposa lily (*Calochortus flexuosus*).

Ecological Systems of San Juan Public Lands

Within each climatic zone, vegetation can be classified into ecological systems. Thirty-three ecological systems have been identified for the San Juan Public Lands in Dolores and Montezuma counties. These will be described fully in another document (San Juan Public Lands Biodiversity Assessment, in progress).

Note that placement in zones is somewhat arbitrary, and many systems fall in more than one zone.; e.g. big sagebrush may be included in the lower montane and the semi-desert shrub zones.

Alpine Zone:

Major:

Rocky Mountain Dry Tundra

Small patches:

Rocky Mountain Alpine Bedrock and Scree

Rocky Mountain Alpine Fell-Field

Rocky Mountain Alpine-Montane Wet Meadow

Rocky Mountain Dwarf Shrublands (not mapped)

Subalpine Zone:

Major:

Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland

Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland

Small Patches:

Rocky Mountain Subalpine Mesic Meadow

Southern Rocky Mountain Montane-Subalpine Grassland

Rocky Mountain Montane-Subalpine fen

Rocky Mountain Subalpine-Montane Riparian Shrubland

Rocky Mountain Cliff and Canyon

Upper Montane Zone:

Major:

Rocky Mountain Aspen Forest and Woodland

Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland

Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland

Lower Montane Zone-Ponderosa pine:

Major:

Rocky Mountain Gambel Oak-Mixed Montane Shrubland

Rocky Mountain Ponderosa Pine Woodland

Rocky Mountain Lower Montane Riparian Woodland and Shrubland

Small patches:

Inter-Mountain Basins Montane Sagebrush Steppe

Rocky Mountain Lower Montane-Foothill Shrubland

Lower Montane Zone-Pinyon-Juniper

Major:

Colorado Plateau Pinyon-Juniper Woodland

Colorado Plateau Pinyon-Juniper Shrubland

Inter-Mountain Basins Big Sagebrush Shrubland

Colorado Plateau Hanging Gardens

Desert Shrub Zone

Major:

Inter-Mountain Basins Mixed Salt Desert Scrub

Colorado Plateau Mixed Bedrock Canyon and Tableland

Small patches:

Colorado Plateau Blackbrush-Mormon-tea Shrubland

Colorado Plateau Mixed Low Sagebrush Shrubland

Inter-Mountain Basins Greasewood Flat

Inter-Mountain Basins Mat Saltbush Shrubland

Inter-Mountain Basins Semi-Desert Grassland

Inter-Mountain Basins Shale Badland

Inter-Mountain Basins Semi-desert Shrub Steppe

CHAPTER IV. RARE AND IMPERILED PLANTS OF SAN JUAN PUBLIC LANDS IN DOLORES AND MONTEZUMA 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, climate change, detrimental land uses, and other causes. Likewise, threats to rare species vary. For instance, in Hawaii, where 90% of native plants are considered rare, a major threat is displacement by exotic species. Several of the rare plants of the SJRA, such as San Juan whitlow-grass (*Draba graminea*) are survivors of a former cooler climate and are threatened by global warming. Others, like giant helleborine (*Epipactis gigantea*) are restricted to a very specific habitat that is uncommon in Colorado. 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. Twenty-nine plants tracked by CNHP are currently known from the San Juan Resource Area (Table 6), and are described below.

Several ranks were changed in 2004 as a result of new occurrences found in La Plata County (2003) and Dolores and Montezuma counties (2004). *Besseyia ritteriana*, formerly G2?S2? was moved to a watchlist, with the rank G3G4 S3S4. *Alsinanthe macrantha* was changed from S3? To S3. *Utricularia minor* was added to the tracking list as G5 S2. *Draba spectabilis* var. *oxyloba* was removed from the tracked list. *Calochortus flexuosus* was changed from S1 to S2. *Penstemon lentus* was changed from S2 to S3.

Several other rare plants occur in Montezuma and Dolores counties, but have not been located on public lands. These species are known from Ute Mountain Ute lands or Mesa Verde National Park (Table 6).

Table 6. Rare plants known from Mesa Verde National Park or Ute Mountain Ute Tribal Lands in Dolores and Montezuma counties, not on Public Lands.

Scientific Name	Common Name	Global Rank	State Rank
<i>Asclepias macrosperma</i>	Large-seeded Milkweed	G4	S1
<i>Eriogonum leptocladon</i> var. <i>ramosissimum</i>	Eastwood Sand Buckwheat	G5T5	S1
<i>Collomia grandiflora</i>	Large-flower Collomia	G5	S1
<i>Astragalus schmolliae</i>	Schmoll Milkvetch	G1	S1
<i>Aquilegia micrantha</i> var. <i>mancosana</i>	Mancos Columbine	G5THQ	SH
<i>Astragalus humillimus</i>	Mancos Milk-vetch	G1	S1
<i>Phlox caryophylla</i>	Pagosa Phlox	G4	S3
<i>Eriogonum clavellatum</i>	Comb Wash Wild Buckwheat	G2	S1
<i>Astragalus tortipes</i>	Sleeping Ute Milkvetch	G1	S1
<i>Sclerocactus mesae-verdae</i>	Mesa Verde Cactus	G2	S2
<i>Aletes macdougallii</i> ssp.	Mesa Verde Aletes	G3T2T3	S1

<i>breviradiatus</i>			
<i>Hackelia gracilentia</i>	Colorado Stickseed	G1	S1
<i>Proattriplex pleiantha</i>	Mancos Saltbush	G3	S1

Species that have been reported from San Juan Public Lands, but were searched for and not found in 2004 are *Hippochaete variegata*, *Sporobolus flexuosus* and *Penstemon parviflorus* (historical record from 1890). *Carex diandra* was reported from Grindstone Fens in 2004 and will be verified in 2005.

Table 7 . Rare plants of San Juan Public Lands in Dolores and Montezuma counties

Scientific Name	Common Name	Global rank	State Rank	Federal status
<i>Adiantum capillus-veneris</i>	Southern Maidenhair-fern	G5	S2	
<i>Alsianthe macrantha</i>	House's stitchwort	G3	S3	
<i>Amsonia jonesii</i>	Jones Blue-star	G4	S1	
<i>Astragalus cronquistii</i>	Cronquist's Milkvetch	G2	S2	BLM
<i>Astragalus deterior</i>	Cliff-palace Milk-vetch	G2	S2	
<i>Astragalus naturitensis</i>	Naturita Milkvetch	G2G3	S2S3	BLM
<i>Astragalus newberryi</i>	Newberry's Milk-vetch	G5	S1	
<i>Botrychium echo</i>	Reflected Moonwort	G3	S3	
<i>Calochortus flexuosus</i>	Weak-stemmed Mariposa Lily	G4	S2	FS
<i>Draba borealis</i>	Boreal whitlow-grass	G4	S2	
<i>Draba graminea</i>	San Juan Whitlow-grass	G2	S2	
<i>Draba streptobrachia</i>	Colorado Divide whitlow-grass	G3	S3	
<i>Epipactis gigantea</i>	Giant Helleborine	G3	S2	FS
<i>Eriogonum palmerianum</i>	Palmer Buckwheat	G4	S1	
<i>Eriogonum scabrellum</i>	A Wild-buckwheat	G3	S1	
<i>Eriophorum altaicum</i> var. <i>neogaeum</i>	Altai Cotton-grass	G4?T3?	S3	FS
<i>Gilia haydenii</i>	San Juan gilia	G3	S2	
<i>Iliamna grandiflora</i>	Large-flower Globe-mallow	G3?Q	S1	
<i>Machaeranthera coloradoensis</i>	Colorado tansy aster	G2	S2	FS
<i>Penstemon breviculus</i>	Short-stem Beardtongue	G3	S2	
<i>Penstemon lentus</i>	Abajo penstemon	G4Q	S3	
<i>Penstemon utahensis</i>	Utah Beardtongue	G4	S2	
<i>Stellaria irrigua</i>	Altai Chickweed	G4?	S2	
<i>Townsendia glabella</i>	Gray's Townsend-daisy	G2	S2	
<i>Townsendia strigosa</i>	Hairy Townsend-daisy	G4	S1	
<i>Trifolium kingii</i>	King's clover	G5	S1	
<i>Triteleia grandiflora</i>	Large-flower Tritelia	G4G5	S1	FS
<i>Utricularia minor</i>	Lesser bladderpod	G5	S2	FS

Adiantum capillus-veneris (Southern maidenhair fern)

Taxonomy

Class: *Filicopsida*

Order: *Filicales*

Family: *Pteridaceae*

Genus: *Adiantum*

Taxonomic Comments: Southern maidenhair fern, *Adiantum capillus-veneris* L. (Linnaeus. 1753. Species Plantarum 2. 1096.), is classified as a true fern in the Phylum Pteridophyta, Family Pteridaceae (Adiantaceae) (Flora of North America Editorial Committee 1993). The species' form varies from region to region. North American and European *Adiantum capillus-veneris* were originally thought to be distinct varieties (Fernald 1950), but none are currently accepted (Paris 1993). Although the genus *Adiantum* is well defined, relationships between species of *Adiantum* are not well understood (Paris 1993).

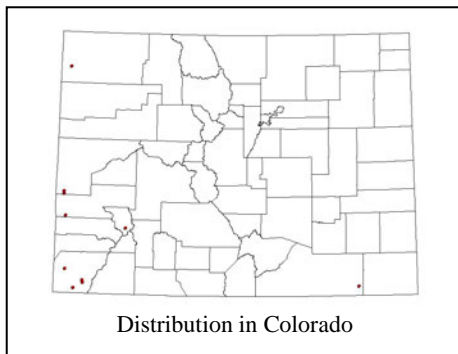
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CNHP Ranking: G5 S3 (globally common, rare in Colorado)

Figure 11. *Adiantum capillus-veneris*.

State/Federal Status: None

Description and Phenology: The delicate fronds of this small fern are pinnately compound with broad fan-shaped pinnules. The slender, dark rachis (stem) is smooth and shiny. Spores are borne on the reflexed margins of the leaves.



Habitat Comments: In Colorado, suitable habitat for the maidenhair fern is quite rare. It prefers warm, moist habitats and expands via rhizomatous growth and by wind- or water-dispersed propagules (Hornbeck et al 2003). It grows in seeps and hanging gardens, usually in sandstone. Other species often found in the same location include the yellow Mancos columbine, Eastwood monkey-flower, and helleborine orchid. In Montezuma County, it was found in an open, southeast-facing exposure at 5880 ft., occupying most of a horizontal crack in Dakota sandstone.

Global Range: The fern is widespread in North America, known from British Columbia east to South Dakota and south to Texas, as well as from Missouri, Virginia, and Florida (Welsh et al. 1993).

State Range: All occurrences are in western Colorado (Moffatt, Mesa, Montrose, Ouray, and Montezuma counties), except for one occurrence in Las Animas County.

Distribution/Abundance: There are 10 occurrences documented in the CNHP database in Colorado.

Known Threats and Management Issues: Habitat for the southern maidenhair fern is often fairly inaccessible. However, any changes in the hydrology of the area affecting the seeps where it is found could be detrimental. The rarity of the species in Colorado makes its persistence vulnerable to random events such as drought.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Adiantum capillus-veneris*: East Fork Rock Creek.

Alsinanderthe macrantha (House's stitchwort)

Taxonomy

Class: *Dicotyledoneae*
Order: *Caryophyllales*
Family: *Caryophyllaceae*
Genus: *Alsinanderthe* or *Minuartia*

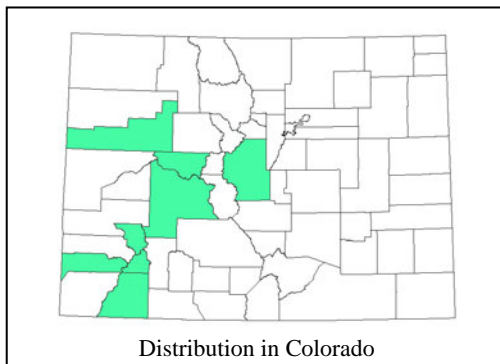
Taxonomic Comments: *Alsinanderthe macrantha* (Rydb.) Weber was originally described by Rydb. as *Alsineropsis macrantha*. It has also been known as *Arenaria macrantha* and *Minuartia macrantha* (Rydb.) House. The type locality, where it was first collected by Baker, Earle and Tracy in 1898, is in the La Plata Mountains at Little Kate Basin.

CNHP Ranking: G3 S3 (changed from G2 S2 in 2004)

State/Federal Status: None



Figure 12. *Alsinanderthe macrantha*
Photograph © CNHP, by M. J. Lyon



Description and Phenology: *A. macrantha* is a small caespitose perennial plant with glabrous foliage. Stems are 4 to 10 cm., and leaves are about 5 to 10 mm. Flowers are white, with the petals exceeding the sepals. Sepals are acute to acuminate, and three-nerved.

Habitat Comments: *Alsinanderthe macrantha* is found in alpine tundra cushion plant communities and rocky areas both above and below timberline, from 10,000 to 13,500 ft. (Figure 12). Frequent associates are *Silene acaulis*, *Phlox condensata* and *Lidia obtusiloba*. Soils are shallow and rocky.

Global Range: This species is known only from Colorado and Utah. It is ranked S1, or imperiled, in Utah.

State Range: It is found in the high mountains of Colorado in Dolores, Garfield, Gunnison, La Plata, San Juan, Pitkin, Park and Ouray counties. It is expected in alpine areas of adjacent counties in the San Juans.

Distribution/Abundance: The species appears to be quite common in the alpine areas of the San Juans. There are 37 specimens from seven counties at the University of Colorado Herbarium.

Known Threats and Management Issues: The species does not seem to be threatened by current uses, although potential threats include sheep grazing, ORV use and global warming.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Alsinanderthe macrantha*: Navajo Basin, Elliott Mountain, Cross Mountain Trail and Storm Peak.



Figure 13. Habitat of *Alsinanderthe macrantha* at Elliott Mountain-Sockrider Peak PCA.

Amsonia jonesii (Jones blue-star)

Taxonomy

Class: *Dicotyledoneae*

Order: *Genianales*

Family: *Apocynaceae*

Genus: *Amsonia*

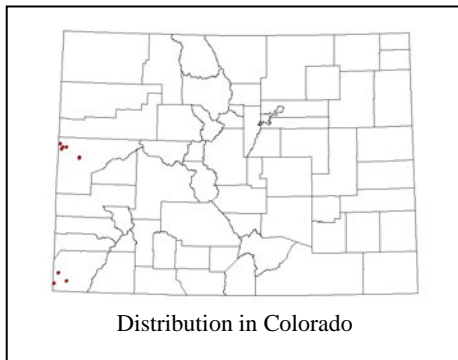
Taxonomic Comments: *A. jonesii* Woodson was described in 1928. Synonyms include *A. latifolia* M. E. Jones and *A. texana*.

CNHP Ranking: G4 S1

State/Federal Status: None

Description and Phenology: *A. jonesii* is a glabrous perennial plant with a thickened or woody root. Stems are 20 to 50 cm. tall, with leaf blades 3 to 6 cm long. The inflorescence is a dense cluster of powder-blue flowers.

Habitat Comments: Jones blue star grows in sandy or gravelly soils in rocky draws in the sagebrush and pinyon-juniper zones. Several of the occurrences were on Mancos shale.



Global Range: *Amsonia jonesii* is known from the Four Corners states: Colorado, Utah, New Mexico and Arizona. It is ranked S2 in Arizona, S3 in Utah, and is present, but unranked, in New Mexico.

State Range: Jones blue star occurs in Mesa and Montezuma counties.

Distribution/Abundance: There are nine occurrences in the CNHP database. Two are ranked “good” (B), one poor (D), one is historic (H) and the remainder are not ranked.



Figure 14. *Amsonia jonesii*.
Photograph by P. Lyon

Known Threats and Management Issues: Weed invasion and off-road vehicle use are potential threats.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support Jones blue star: Rincon Canyon.

Astragalus cronquistii (Cronquist's milkvetch)

Taxonomy

Class: *Dicotyledoneae*

Order: *Fabales*

Family: *Fabaceae*

Genus: *Astragalus*

Taxonomic Comments: *Astragalus cronquistii*

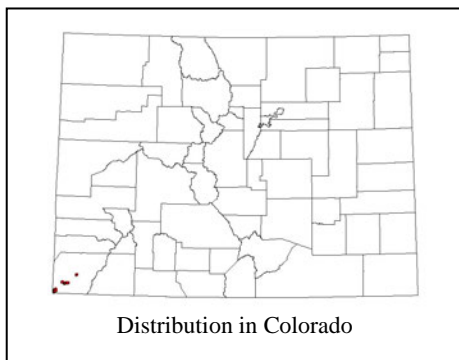
Barneby is named for Arthur Cronquist, a contemporary American botanist.

CNHP Ranking: G2 S2 (Globally imperiled)

State/Federal Status: BLM sensitive

Description and Phenology: *A. cronquistii* is wiry-stemmed, spreading, and few-branched. Heads are loose, and the flowers are about 8 mm. long. It is distinguished from similar species by its ample foliage and subsessile, trigonously compressed and partially bilocular pods.

Habitat Comments: Sandy and gravelly ridges on red sandstone. Also on Mancos Shale and on substrates derived from the Morrison Formation in the eastern part of its range. Elev. 4800-5800 ft.



Global Range: *Astragalus cronquistii* is known from Colorado, Utah and the Navajo Nation. It is ranked S1 in Utah and the Navajo Nation.

State Range: Known in Colorado only from Montezuma County. All but one are on Ute Mountain Ute tribal land.

Distribution/Abundance: There are 13 occurrences in the CNHHP database. Two are ranked excellent (A).

Known Threats and Management Issues: No immediate threats are known, although off-road vehicle use and weed

invasion are potential.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Astragalus cronquistii*: North Rim Mesa Verde.



Figure 15. *Astragalus cronquistii*
Photo by Bill Jennings

Astragalus deterior (Cliff Palace milkvetch)

Taxonomy

Class: *Dicotyledoneae*

Order: *Fabales*

Family: *Fabaceae*

Genus: *Astragalus*

Taxonomic Comments: *Astragalus deterior* Barneby has also been called *Astragalus naturitensis* var. *deterior*. The type locality is in Mesa Verde National Park.

CNHP Ranking: G2 S2

State/Federal Status: BLM sensitive

Description and Phenology: *A. deterior* is similar in appearance to *A. naturitensis*. It is distinguished from that species by its smaller ochroleucous flowers and papery rather than leathery pods. It flowers and fruits in May and early June.



Figure 16. *Astragalus deterior*
Photograph © Bill Jennings 1999



Habitat Comments: Plants are found on sandstone rimrock edges of mesas, in cracks and depressions in shallow soil in the pinyon-juniper zone at elevations from 6,400 to 7,000 ft. The populations in Mesa Verde National Park occur only on a narrow deposit of the upper reach of the Cliff House Sandstone (Floyd and Colyer 2003). The historic occurrence on BLM land is mapped on Dakota sandstone.

Global Range: *Astragalus deterior* is known only from Colorado and the Navajo Nation. It is unranked in the Navajo Nation.

State Range: All Colorado occurrences are within an eight-mile radius in Montezuma County. All but one are within Mesa Verde National Park. The single occurrence on BLM land has not been observed since 1948. However, there is potential habitat for the species on BLM lands in the San Juan Resource Area, and additional survey is warranted.

Distribution/Abundance: There are 14 occurrences in Colorado. Thirteen of these are in Mesa Verde National Park, where twelve occurrences are clustered within a half mile of each other, and so could be considered a single occurrence. The other two Colorado occurrences are only five and twelve miles from this cluster. Two are ranked excellent (A). One is ranked good (B), one fair (C), three are historic (H), and 7 are unranked (E).

Known Threats and Management Issues: The extremely restricted habitat and range, and few occurrences of this species make it extremely vulnerable to numerous threats such as disturbance, fire and disease.

Potential Conservation Areas on BLM land in Dolores and Montezuma counties that may contain *Astragalus deterior*: Mud Canyon

Astragalus naturitensis (Naturita milkvetch)

Taxonomy

Class: *Dicotyledoneae*

Order: *Fabales*

Family: *Fabaceae*

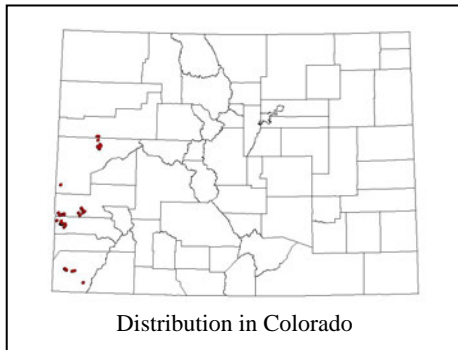
Genus: *Astragalus*

Taxonomic Comments: Naturita milkvetch was first described by Edwin Payson in 1915 as a “new and noteworthy” species.

CNHP Ranking: G3S3 (as of 3-2005)

State/Federal Status: BLM sensitive

Description and Phenology: 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.



Habitat Comments: 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 crust.

Global Range: *Astragalus naturitensis* is known from Colorado, New Mexico, Utah and the Navajo Nation. It is ranked S2 in New Mexico and S1 in Utah and the Navajo Nation.

State Range: The species has been found in five counties in Colorado: Garfield, Mesa, Montezuma, Montrose and San Miguel. It is known from two counties in New Mexico and only San Juan County in Utah.

Distribution/Abundance: There are 40 occurrences documented in the CNHP database.

Known Threats and Management Issues: Naturita 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.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Astragalus naturitensis*: Mud Canyon and Sand Canyon at McElmo.



Figure 17. *Astragalus naturitensis*
Photograph © CNHP, by M. J. Lyon

Astragalus newberryi (Newberry's milkvetch)

Taxonomy

Class: *Dicotyledoneae*

Order: *Fabales*

Family: *Fabaceae*

Genus: *Astragalus*

Taxonomic Comments: *Astragalus newberryi* var. *castoreus* M. E. Jones is in sect. *Argophylli*.

Five varieties of *A. newberryi* have been recognized: var. *aquarii* and *blyae* in Arizona, var. *castoreus* in California, Idaho, Nevada, Oregon and Utah; and var. *newberryi* in Arizona, California, Idaho, New Mexico, Oregon and Utah.



Figure 18. *Astragalus newberryi*

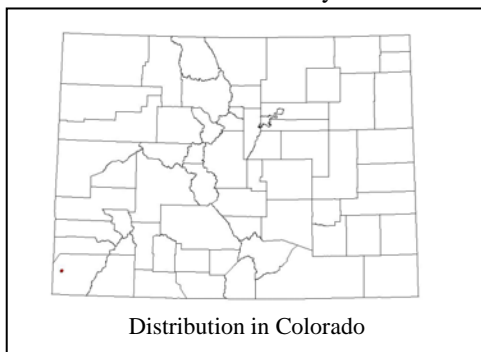
Photograph © James Reveal, used with permission

CNHP Ranking: G5 S1

State/Federal Status: None

Description and Phenology: Newberry's milkvetch is characterized by its lack of aerial stems, tufted habit, densely tomentulose leaves and pilose pod.

Habitat Comments: Newberry's milkvetch is found in sagebrush and pinyon-juniper communities between 4000 and 6500 ft. Montezuma County records indicate that the plants are on low hills of Mancos shale with cobbles, in a semi-desert shrub community dominated by shadscale (*Atriplex confertifolia*) and galleta (*Pleuraphis jamesii*).



Global Range: Colorado, Arizona, California, Idaho, New Mexico, Oregon and Utah. It is ranked S1 in Arizona, S2 in Idaho, S5 in New Mexico, and is not ranked in the other four states.

State Range: The species is known in Colorado from only two locations in Montezuma County. One is about two miles north of McElmo Creek on BLM land, and the second is on Ute Mountain Ute Tribal land.

Distribution/Abundance: Of the two known occurrences in Montezuma County, one occurrence had three individuals, and no information on abundance is given for the other.

Known Threats and Management Issues: No threats are known.

Potential Conservation Areas in San Juan Public Lands in Dolores and Montezuma counties that support *Astragalus newberryi*: Tozer Canyon

***Botrychium echo* (Reflected moonwort)**

Taxonomy

Class: Ophioglossopsida

Order: *Ophioglossales*

Family: *Ophioglossaceae*

Genus: *Botrychium*

Taxonomic Comments: *Botrychium echo* was described in 1983 by Drs. Herb and Florence Wagner along with *B. hesperium* (Wagner and Wagner 1983b). Before this, specimens of this species were usually identified as *B. matricariifolium* ssp. *hesperium* or *B. lanceolatum*

CNHP Ranking: G3 S3

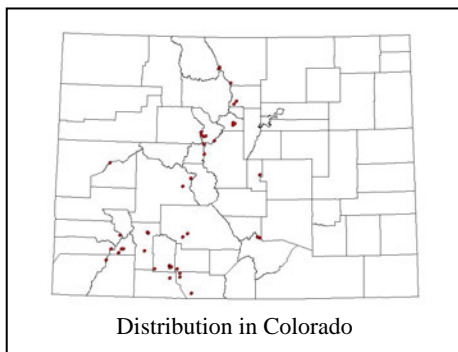
State/Federal Status: None (formerly Region FS sensitive)

Description and Phenology: A perennial fern that produces a shiny green leaf (the trophophore) and a taller, erect spore-bearing spike (the sporophore). Both arise from a common stalk and can be thought of as a single, highly modified fern frond. This species tends to have a reddish brown stripe along the common stalk from the base of the trophophore stalk. Mature plants are 3-15 cm tall. *B. echo* produces clusters of minute, spheric gemmae at the root bases. Leaves appear in June and die in September (Flora of North America 1993).



Figure 19. *Botrychium echo*
Photograph © CNHP by Dave Anderson

Habitat Comments: Wagner and Wagner (1993) describe the habitat of *B. echo* as grassy slopes, roadsides, and edges of lakes in rocky soil, often derived from granitic parent material. Similarly, Spackman et al. (1997) describe the habitats of *B. echo* as gravelly soils near roads and trails, rocky hillsides, grassy slopes, and meadows. Colorado Natural Heritage Program element occurrence records commonly cite the presence of coarse, gravelly soil and little or no tree cover. Element occurrence records from Colorado document occurrences in numerous settings including gravelly hillsides, disturbed trailsides through meadows, small openings in lodgepole or spruce forest, roadcuts, adjacent to roads, and near an old fire ring (Colorado Natural Heritage Program 2004). Throughout most of Colorado *Botrychium echo* is found on soils derived from granitic parent material. In the San Juan Mountains this species occurs in soils derived from extrusive volcanics, such as tuff and andesite. It has also been found on sedimentary rocks in San Juan and Summit counties. Natural habitats identified by Kolb and Spribille (2000), Thompson (2000 and 2001), and Buell (2001) include areas where catastrophic fire has occurred, and persistent sites such as grassy or stony exposures near treeline in the krummholz zone and avalanche chutes. *Botrychium echo* occurs at high elevations. Wagner and Wagner (1993) report an elevation range of 8,200 to 12,140 feet, which concurs closely with Colorado Natural Heritage Program (2004) element occurrence records (8,500 to 12,080 feet) (Anderson 2003).



Global Range: In the United States, *Botrychium echo* is known from Colorado, Utah and Arizona.. It is ranked S1 in Utah, and not ranked in Arizona.

State Range: Colorado records are scattered through the central mountains and the San Juan Mountains.

Distribution/Abundance: *Botrychium echo* is known from approximately 58 occurrences which are scattered across northern Utah and central Colorado. Forty-three of these occurrences are in Colorado. A report for northern Arizona needs verification. Many occurrences consist of fewer than ten individuals and the total number of individuals documented at all extant sites is less than 50. This species may occasionally hybridize with western moonwort (*B. hesperium*).

Known Threats and Management Issues: The primary threats are habitat loss, recreation, succession, overgrazing, effects of small population size, sedimentation, timber harvest, exotic species invasion, global climate change, and pollution. However, these threats and their hierarchy are highly speculative because there is very little known about this species in Colorado. Because most of the known occurrences are small, they are also threatened by stochastic processes (Anderson 2003).

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Botrychium echo*: Orphan Butte and Flattop Mountain South.



Figure 20. Searching for *Botrychiums* in potential habitat.

Calochortus flexuosus (Weak-stemmed or winding mariposa lily)

Taxonomy

Class: *Monocotyledoneae*

Order: *Liliales*

Family: *Liliaceae* (or *Calochortaceae*)

Genus: *Calochortus*

Taxonomic Comments: *Calochortus flexuosus* S. Watson

CNHP Ranking: G4 S2

State/Federal Status: Forest Service Sensitive

Description and Phenology: An attractive relative of the more common sego lily, the weak-stemmed mariposa lily varies from white to pink, and has wildly contorted stems. Petals have a yellow band at the gland, which is densely covered with short processes and surrounded by sparse hairs (Figure 21)

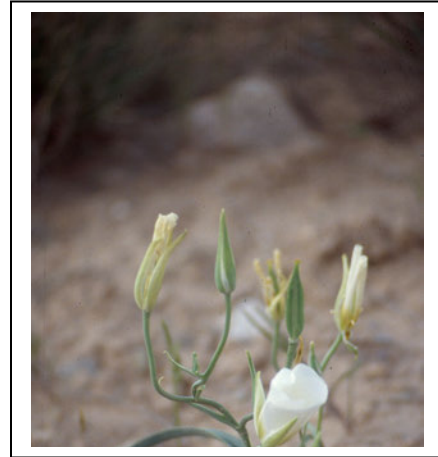
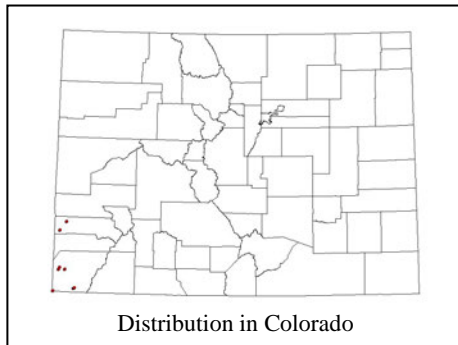


Figure 21. *Calochortus flexuosus*
Photograph © CNHP, by M. J. Lyon

Habitat Comments: Throughout its range, it occurs in a number of habitats including deserts, pinyon-juniper, Joshua tree and chaparral. In Montezuma County, it was found in a desert shrub community with shadscale (*Atriplex confertifolia*) and galleta (*Pleuraphis jamesii*) and in grasslands with galleta and alkali sacaton (*Sporobolus airoides*).



Global Range: Colorado, California, Nevada, Utah, New Mexico, Arizona and northern Baja California. It is unranked in all states but Colorado. It apparently reaches its eastern limit in western Colorado.

State Range: Of the eight Colorado records in the CNHP database, six are from Montezuma County. Three of these are on BLM land in the Canyon of the Ancients National Monument. The other three are on Ute Mountain Ute land. There are two records from San Miguel County, one of which is on private land, and one is in Big Gypsum Valley on BLM land managed by the San Juan Resource Area.

Distribution/Abundance: There are 8 documented occurrences in Colorado. Of these, two are ranked A, with hundreds of plants in extensive, good condition habitat. One is ranked B, 1 C, and 4 are unranked due to insufficient information.

Known Threats and Management Issues: Threats to the species include improper grazing, off-road vehicle use and oil and gas exploration and drilling.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Calochortus flexuosus*: Sand Canyon and Cannonball Mesa.

Draba borealis (Boreal whitlow-grass)

Taxonomy

Class: *Dicotyledoneae*

Order: *Capparales*

Family: *Brassicaceae*

Genus: *Draba*

Taxonomic Comments: *Draba borealis* De Candolle

CNHP Ranking: G4 S2

State/Federal Status: None



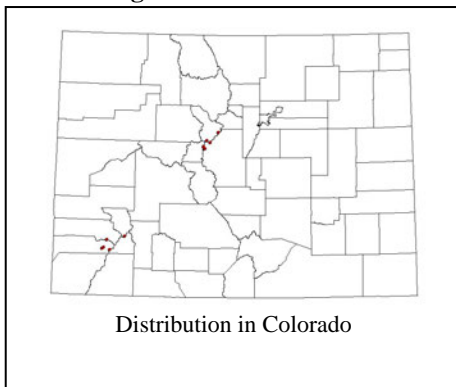
Figure 22. *Draba borealis*
Photograph © CNHP, by M. J. Lyon

Description and Phenology: *Draba borealis* has one to several leafy stems, erect to drooping, pubescent with simple or branched hairs. Leaves are oval, sometimes coarsely toothed, and pubescent. Flowers are white or pale yellow with four petals. Fruits are pubescent and sometimes twisted. Flowering/Fruiting Period: June-August/July-September

Habitat Comments: **Habitat** in Wyoming is described as moist, north-facing limestone slopes and cliffs and shady streamsides at elevations from 6200 to 8600 ft. In Dolores County, it was found growing in soil pockets in cliffs and in shallow soils of tundra ridges at 12,000 to 12,500 ft.

Global Range: *Draba borealis* is known from five Canadian provinces, Alaska, Washington, Montana, Wyoming and Colorado. It is ranked S2 in Colorado and Wyoming and unranked in the other states. Colorado represents the southernmost location for the species.

State Range: *D. borealis* is known in Colorado from the central Rockies in Summit and Park counties, and the San Juan Mountains in Ouray, San Juan and Dolores counties. The four Dolores County occurrences were first located in 2004.



Distribution/Abundance: There are 10 occurrences in the CNHP database. There are four specimens at the University of Colorado Herbarium, from Summit and Park counties. The four occurrences found in Dolores County in 2004 ranged from two to over 100 individuals.

Known Threats and Management Issues: Hiking, horse packing and sheep grazing may pose threats at sites along alpine ridges.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Draba borealis*: Navajo Basin, Elliott Mountain, Hermosa Peak.

Draba graminea (San Juan whitlow-grass)

Taxonomy

Class: *Dicotyledoneae*

Order: *Capparales*

Family: *Brassicaceae*

Genus: *Draba*

Taxonomic Comments: *D. graminea* Greene was first described by Baker in 1901. The type locality is in Hinsdale County, Colorado.

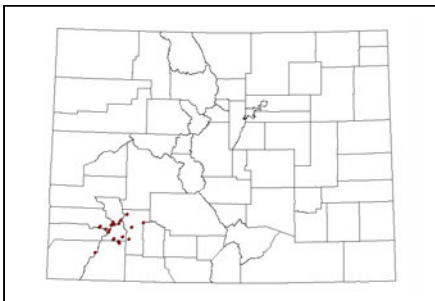
CNHP Ranking: G2 S2

State/Federal Status: None. Currently on list of species considered for inclusion on Forest Service sensitive species list for Region 2, but for which more information is needed.

Description and Phenology: San Juan whitlow-grass is a yellow flowered perennial with small green leaflike bracts beneath each flower. Its basal leaves are narrow with ciliate margins and glabrous surfaces. It may have up to two reduced leaves on its flower stem.

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.

Habitat Comments: gravelly tundra, shaded areas in crevices or base of cliffs, late snowmelt areas, 12,400 to 13,500 ft. San Juan whitlow-grass is nearly always found above 12,000 feet in elevation. It often grows near the melting edge of a snow bank, or at the shaded base of cliffs in cold wet tundra. The plants depend on the depth and longevity of the snowpack, stability of the soil, and presence or absence of appropriate pollinators.



Distribution in Colorado



Figure 23. *Draba graminea*. Photograph © CNHP by P. Lyon

Global Range: This species is endemic to Colorado.

State Range: *D. graminea* is endemic to the San Juan Mountains, known from five counties: Ouray, San Miguel, San Juan, Hinsdale, La Plata, and Montezuma.

Distribution/Abundance: There are 23 occurrences of the species, including two found in 2004.

Known Threats and Management Issues: Concern for the viability of the species is based on its limited abundance and restricted global distribution. Most

occurrences are on National Forest land, at high elevations and in habitats that are not subject to much disturbance. Climate change could cause the extinction of this species, along with other endemic high elevation species, as there is little room for it to move upward if the global climate becomes warmer.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Draba graminea*: Navajo Basin, Centennial Peak.

Draba streptobrachia (Colorado Divide whitlow-grass)

Taxonomy

Class: *Dicotyledoneae*

Order: *Capparales*

Family: *Brassicaceae*

Genus: *Draba*

Taxonomic Comments: The species was first described in 1980.

CNHP Ranking: G3 S3

State/Federal Status: None. Currently on list of species considered for inclusion on Forest Service sensitive species list for Region 2, but for which more information is needed.

Description: Colorado Divide whitlow-grass is one of several *Draba* species found in the high mountains of Colorado. All are diminutive yellow or white flowered plants with four petals.

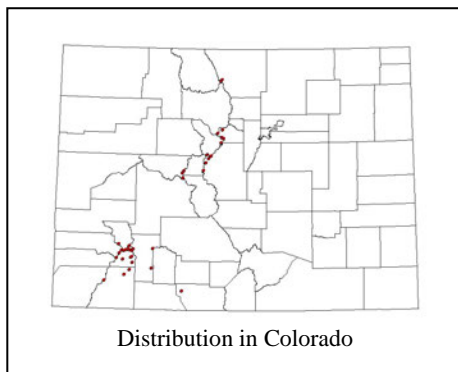
The Colorado Divide whitlow-grass is a tap-rooted perennial plant with a rosette of stellate-pubescent basal leaves and yellow flowers.

It resembles the San Juan whitlow-grass (*Draba graminea*), but can be distinguished from it by the absence of bracts below the flowers, and the presence of stellate hairs on the leaves.



Figure 24. *Draba streptobrachia*.

Photo CNHP by P. Lyon



Habitat Comments: Alpine zone, usually in rock outcrops, at elevations from 10,800 to 13,500 ft. The plants grow on weathered rock and loose soil in the alpine tundra, on scree margins and in fell-fields. Associated species often include alpine avens (*Geum rossii*), snow willow (*Salix reticulata*), false strawberry (*Sibbaldia procumbens*), and alpine bistort (*Bistorta bistortoides*).

Global Range: Endemic to Colorado.

State Range: Found in 15 counties, in the San Juan Mountains and also in the Sawatch, Mosquito, and Front Ranges.

Distribution/Abundance: There are 42 known occurrences in Colorado. Several have over 1000 individuals, although a typical location usually has fewer than 200.

Known Threats and Management Issues: Most occurrences are in National Forests, with several in designated wilderness areas. This species is found at high elevations, often in fairly inaccessible locations, and therefore enjoys some natural protection. However, some plants are still vulnerable to direct disturbances such as trampling.

Potential Conservation Areas on San Juan National Forest in Dolores and Montezuma counties that support *Draba streptobrachia*: Elliott Mountain-Sockrider Peak; Navajo Basin.

Epipactis gigantea (Giant helleborine)

Taxonomy

Class: *Monocotyledoneae*

Order: *Orchidales*

Family: *Orchidaceae*

Genus: *Epipactis*

Taxonomic Comments: Stream orchid, *Epipactis gigantea* Dougl. ex Hook. (David Douglas 1798-1834, Royal Horticultural Society; Sir William Jackson Hooker, 1785-1865, Flora Boreali-Americana, 2: 202. 1839) (Kaul 1986). There are 20 species of *Epipactis* across the temperate regions of Europe and North America (Luer 1975).

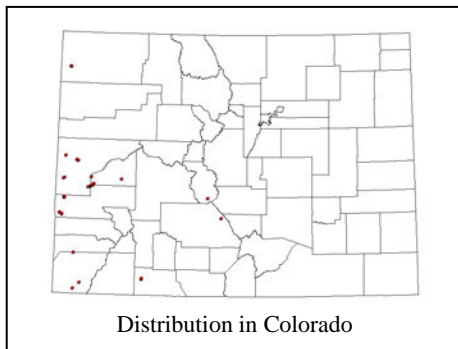
CNHP Ranking: G3 S2

State/Federal Status: Forest Service Sensitive

Description and Phenology: The greenish-purple flowers of the giant helleborine orchid have the familiar orchid shape, about an inch across and grow several to a stalk. Flowers appear in June and July, and fruit is produced in August and September.

Habitat Comments: The giant helleborine orchid is often associated with hanging gardens in sandstone canyons. It may also be found in seeps, around springs and occasionally along stream banks.

Global Range: *Epipactis gigantea* is known from fifteen western U. S. states and British Columbia. It is ranked S1 in South Dakota, Wyoming and Oklahoma; S2 in Colorado, New Mexico, Utah, Montana and British Columbia; S3 in Washington, Idaho and Texas; and unranked in Oregon, Nevada, California, Arizona and Nebraska.



State Range: The species occurs in nine western Colorado counties: Moffatt, Mesa, Delta, Montrose, Montezuma, Archuleta, Saguache and Chaffee.

Distribution/Abundance: There are 37 occurrences in the CNHP database. Abundance data are scarce for this species, and the data that do exist are based upon casual field estimates. Based on the available EOR and herbarium label data, it is estimated that approximately 4,000 or more individuals make up the known abundance of this species. This number is based on general field observations and not on actual counts. The precision of the estimate may over or

underestimate the actual population number by thousands. No population trend data or inferences of population trend are known (Moore and Friedley 2004).

Known Threats and Management Issues: Threats to the plants include diversion of the water feeding the seeps, and trampling. Its limited habitat and dependence on moist conditions make it susceptible to random events such as drought and disease.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Epipactis gigantea*: Dolores River Canyon below McPhee Reservoir.



Figure 25. *Epipactis gigantea*
Photograph © CNHP, by R. Rondeau

Eriogonum palmerianum (Palmer buckwheat)

Taxonomy

Class: *Dicotyledoneae*

Order: *Polygonales*

Family: *Polygonaceae*

Genus: *Eriogonum*

Taxonomic Comments: *Eriogonum palmerianum* Reveal in P. A. Munz, Suppl. Calif. Fl. 58. 1968 • Palmer's wild buckwheat

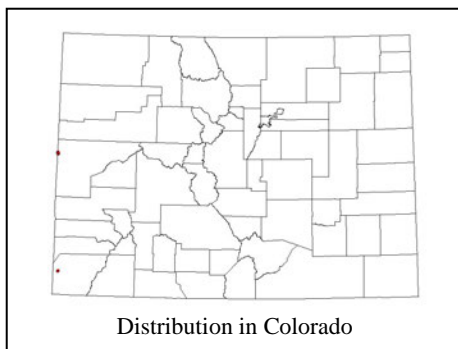
Eriogonum plumatella Durand & Hilgard var. *palmeri* Torr. & A. Gray, Proc. Amer. Acad. Arts 8: 180. 1870, non *E. palmeri* S. Watson

CNHP Ranking: G4 S1

State/Federal Status: None

Description and Phenology: Plants are low spreading to erect annuals (0.5-)1-3 dm, mostly floccose to tomentose.

Leaves basal; leaf-blades suborbicular to cordate, 0.5-1.5 × 0.5-2 cm, densely white to grayish tomentose abaxially, less so to glabrate and often greenish adaxially; petioles 1-4 cm, floccose. Flowering stems mostly erect, 3-8 cm. Inflorescences forming open crowns of few branches, 0.5-2.5 dm with tips curved outwardly; bracts 3, scalelike, 0.5-3 mm × 1-3 mm. Peduncles lacking. Involucres campanulate, 1.5-2 × 1.5-2 mm; teeth 5, 0.2-0.3 mm. Flowers white to pink or rarely pale yellowish, 1.5-2 mm, glabrous; perianth lobes dimorphic, those of the outer whorl narrowly obovate and narrowly fan-shaped apically, those of the inner whorl oblanceolate. Stamens included, 1-1.5 mm; filaments pilose. Achenes trigonous, brown, 1.5-1.8 mm, glabrous. *n* = 20. Flowering is from spring to fall (Mar-Oct).



Habitat Comments: Sandy to gravelly washes, flats and slopes in saltbush, greasewood, creosote bush, blackbrush and sagebrush communities, and in pinyon and/or juniper woodlands, from 2000 to 7500 ft.

Global Range: *Eriogonum palmerianum* occurs in six western states: Arizona, California, Colorado, New Mexico, Nevada and Utah. It is unranked in all states but Colorado.

State Range: Mesa and Montezuma counties.

Distribution/Abundance: There are 3 occurrences in the CNHP database. However, Reveal (2003) considers the species to be globally common.

Known Threats and Management Issues: Weed invasion and off-road vehicle use are potential threats.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Eriogonum palmerianum*: Cannon Ball Mesa



Figure 26. *Eriogonum palmerianum*
Photograph © CNHP, by M. J. Lyon

Eriogonum scabrellum (Westwater wild buckwheat)

Taxonomy

Class: *Dicotyledoneae*

Order: *Polygonales*

Family: *Polygonaceae*

Genus: *Eriogonum*

Taxonomic Comments: *Eriogonum scabrellum* Reveal, Ann. Missouri Bot. Gard. 55: 74. 1968

CNHP Ranking: G3 S1

State/Federal Status: None

Description and Phenology: *Eriogonum scabrellum* is a spreading annual 1-3(-5) dm high. Stems are floccose and scabrellous, leaves are basal and sheathing up the stems 1-3 cm. leaf-blades are cordate, 1-3(-4) × 1-3(-4) cm, densely white tomentose abaxially, sparsely floccose and green adaxially; margin crisped and wavy; petioles 1-4(-5) cm, floccose. Flowering stems are mostly 1, erect, 0.5-1.5 dm. Inflorescences cymose, open, spreading, 0.5-4 × 2-15 dm high; bracts 3, scalelike, 1-1.5 × 0.4-0.9 mm. Peduncles lacking. Involucres horizontal, turbinate, 1.5-2.5 × 1.5-2 mm; teeth 5, 0.4-0.6 mm. Flowers white with greenish midribs, becoming pink to rose or deep red in fruit, 1-1.5 mm, minutely pustulose; perianth lobes dimorphic, those of the outer whorl obovate with truncate bases, those of the inner whorl ovate. Stamens excluded, 1-1.5 mm; filaments glabrous. Achenes trigonous, light brown to brown, 2 mm, glabrous. *n* = 20. Flowering is in fall (Sep-Nov). (Reveal 2003)

Habitat Comments: Clayey to gravelly washes, flats and slopes in saltbush, blackbrush and sagebrush communities, and in pinyon-juniper woodlands; 1400-2300 m; nw & sw Colo., nw N.Mex., e Utah.



Global Range: *Eriogonum scabrellum* is known from Colorado, New Mexico, Utah and the Navajo Nation. The species is widely scattered along the Colorado and San Juan river systems. It occurs from Grand Valley in Utah and Colorado, southward to the Lake Powell region of Utah, and then from the Four Corners area of Colorado, toward Farmington in San Juan Co., New Mexico. The plant has also been gathered in Chaco Canyon National Park. The full extent of the range remains to be determined (surely the plant is in northeastern Arizona), but has escape attention no doubt due to its late flowering time (Reveal 2003).

State Range: Mesa and Montezuma counties

Distribution/Abundance: There are 3 occurrences in the CNHP database. It is expected that there are more undocumented occurrences.

Known Threats and Management Issues: Weed invasion and off-road vehicle use are potential threats.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Eriogonum scabrellum*: Hovenweep.

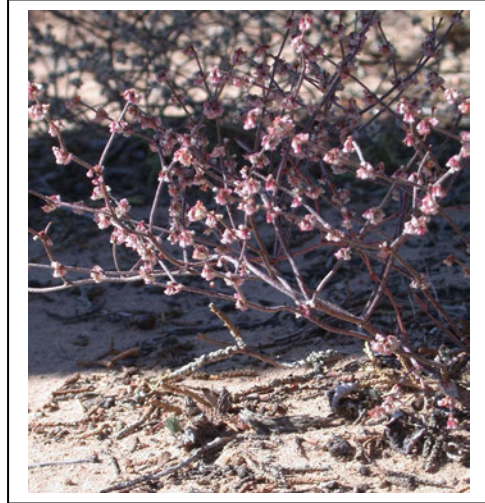


Figure 27. *Eriogonum scabrellum*
Photograph © CNHP, by M. J.. Lyon

Eriophorum altaicum ssp. *neogaeum* (Altai cottongrass)

Taxonomy

Class: *Monocotyledoneae*

Order: *Cyperales*

Family: *Cyperaceae*

Genus: *Eriophorum*

Taxonomic Comments: A more common, closely related plant, the narrowleaf cottongrass (*E. angustifolia*), has multiple heads and leaf blades nearly as long as the stems. It is closely related to plants found in Siberia (Weber and Wittman 1986).

CNHP Ranking: G4?T3? S3

State/Federal Status: Forest Service Sensitive

Description: The plants are rhizomatous, with solitary white fleecy heads on the tops of the stems, and lacking well-developed leaf blades (Weber and Wittman 1996).

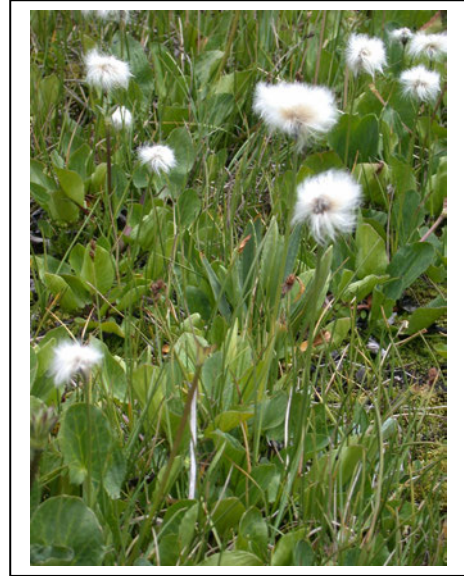
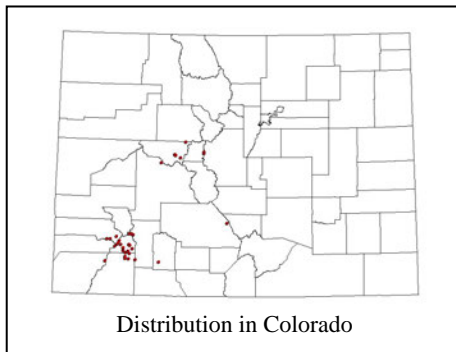


Figure 28. *Eriophorum altaicum* var. *neogaeum*
Photograph by P. Lyon



Habitat Comments: Altai cottongrass grows in wet meadows, fens, and around ponds, usually above or at treeline. It is often associated with elephant-head Pedicularis (*Pedicularis groenlandica*), tufted hairgrass (*Deschampsia cespitosa*), marsh marigold (*Caltha leptosepala*), mosses and sedges. It grows in patches in wetlands at high elevations, often associated with water sedge (*Carex aquatilis*), marsh marigold (*Caltha leptosepala*), elephant head (*Pedicularis groenlandica*) and tufted hairgrass (*Deschampsia cespitosa*). In San Juan County, it is sometimes associated with iron fens.

Global Range: *Eriophorum altaicum* var. *neogaeum* is the New World variety of a circumpolar species. In North America, it occurs in Colorado, Montana, Utah, Wyoming and British Columbia. It is unranked in all but Colorado.

State Range: Altai cottongrass occurs in 10 counties: Eagle, Gunnison, La Plata, Mineral, Park, Pitkin, Saguache, San Juan and San Miguel.

Distribution/Abundance: There are 38 known occurrences in Colorado, in ten counties. Several locations have over a thousand individuals.

Known Threats and Management Issues: Threats appear to be limited for this species; however, local trampling may affect easily accessed occurrences. The primary management issue is maintaining the natural hydrologic regime of the wetlands in which it occurs.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Eriophorum altaicum*: Grindstone Lake and Navajo Basin.

Gilia haydenii (San Juan Gilia)

Taxonomy

Class: Dicotyledoneae
Order: Solanales
Family: *Polemoniaceae*
Genus: *Gilia*

Taxonomic Comments:

CNHP Ranking: G3 S2

State/Federal Status: None

Description: San Juan gilia has a basal rosette and pink tubular flowers clustered near the ends of the stems. Unlike several other *Gilia* species, the anthers are not exserted.

Habitat Comments: Plants grow in soils derived from sandstone and shale, from 5100 to 8000 ft., in canyonsides, pinyon-juniper or desert shrub (*Atriplex*) communities.



Figure 29. *Gilia haydenii*.
Photograph by P. Lyon

Global Range:

Colorado, New Mexico and Utah.

State Range: There are 10 specimens at the University of Colorado from Dolores, La Plata, Mesa, Montezuma and Montrose counties. The three occurrences in Montezuma County were first documented in 2004.

Distribution/Abundance: In suitable habitats, such as the three locations documented in Montezuma County in 2004, San Juan gilia can be extremely abundant, with thousands of individuals dominating a site (Figure 30.).

Known Threats and Management Issues: This species occurs in areas that are within existing or proposed oil and gas development areas. Although the threats from oil and gas development are unknown at this time, there are certain attributes associated with development that may impact the native species, for example surface disturbance is often associated with a change in floral composition. Any changes in the native flora composition has the potential to impact rare species.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Gilia haydenii*: Mesa Verde Entrance; Menefee Mountain.



Figure 30. Hillside dominated by *Gilia haydenii* above Highway 160 near Mesa Verde entrance.
Photo CNHP P. Lyon

Iliamna grandiflora (Large-flower globe-mallow; wild hollyhock)

Taxonomy

Class: Dicotyledoneae

Order: Malvales

Family: *Malvaceae*

Genus: *Iliamna*

Taxonomic Comments: The relationship of this species to *Iliamna rivularis* and *I. crandallii* has been questioned by some botanists, and there is some doubt about their distinctness (Weber 2001). This is reflected in the Q of the CNHP rank.

CNHP Ranking: G3?Q S1

State/Federal Status: None

Description and Phenology: The large-flower globemallow, or wild hollyhock, is one of the most striking

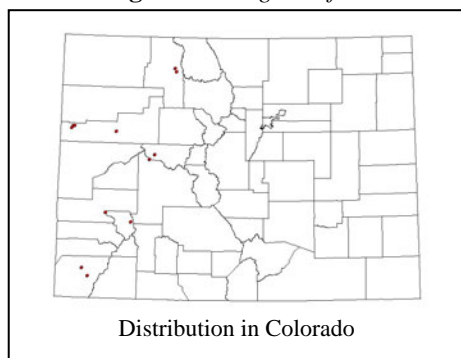
plants of moist sites. The bushy plant grows as tall as six feet, with hollyhock-like flowers in shades of pink and white.



Figure 31. *Iliamna grandiflora*
Photograph © CNHP, by P. Lyon

Habitat Comments: *Iliamna grandiflora* has been found in pinyon-juniper, mountain shrub, aspen and spruce-fir zones. In Montezuma County, it was in a mature to old growth mixed pinyon-juniper and mountain shrub community between 7000 and 7800 ft. It was on an open north to northeast facing slope of colluvium derived from Mancos Shale and Point Lookout sandstone. Associated species were muttongrass (*Poa fendleriana*), and scarlet gilia (*Ipomopsis aggregata*).

Global Range: *Iliamna grandiflora* is known only from the Four Corners states: Colorado, Utah, Arizona and New Mexico. It is ranked S3 in New Mexico, and not ranked in Arizona and Utah.



State Range: Western Colorado, in Routt, Garfield, Pitkin, Ouray, Montrose and Montezuma counties.

Distribution/Abundance: There are 12 known occurrences in Colorado. The only currently known location in Montezuma County was found by Marilyn Colyer within Mesa Verde National Park in 1994, and contained only eight plants. There is a historic record, based on a 1954 specimen collection at the University of Colorado herbarium, from three miles south of Dolores, but this has not been seen recently.

Known Threats and Management Issues: Some soil disturbance appears to benefit the plant. It has been found in areas of small landslides and adjacent to roads. Road maintenance activities at the Mesa Verde site could threaten the plants. It is apparently palatable to cattle (personal observation), and the long-term effects of grazing on the plant are as yet unknown.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Iliamna grandiflora*: Mesa Verde Entrance.

Machaeranthera coloradoensis (Colorado tansy-aster)

Taxonomy

Class: Dicotyledoneae

Order: Asterales

Family: Asteraceae

Genus: *Townsendia*

Taxonomic Comments: Two formerly recognized varieties, var. *brandegei* and var. *coloradoensis*, are no longer considered distinct by experts (Beatty et al 2004). Reclassification of the genus to *Xanthisma* has been proposed (Beatty et al. 2004).

CNHP Ranking: G2 S2

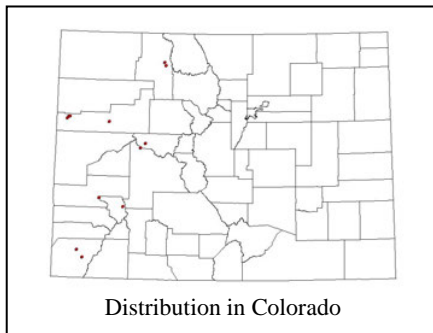
State/Federal Status: Forest Service Sensitive

Description and Phenology: Colorado tansy-aster is a striking member of the sunflower family (Asteraceae). It is a low-growing perennial cushion plant with a large taproot, short stems, a large head with rose-colored ray flowers and shallowly to coarsely toothed leaves. The plants flower from early July through mid-August, and set seed from August through September.



Figure 32. *Machaeranthera coloradoensis*.

Photograph copyright CNHP by P. Lyon



Habitat Comments: Colorado tansy aster is found in gravelly places or rock outcrops, often on sandstone or limestone, from ponderosa pine communities to alpine tundra. It is reported from elevations between 7675 to 12,940 ft. (Beatty et al. 2004) in both moist and dry sites, often on gravelly soils with sparse vegetation. In the San Juan National Forest in Dolores County, it was found on eroded sandstone of the Dolores Formation above timberline.

Global Range: The species is restricted to the Rocky Mountains in south-central Wyoming and western Colorado. It is ranked very rare (S1) in Wyoming. There is a large gap

between the southern Colorado and southern Wyoming populations.

State Range: In Colorado it is known from Dolores, Gunnison, Hinsdale, Lake, La Plata, Park, Pitkin, Rio Grande, Saguache, and San Juan counties. There are five occurrences on the San Juan National Forest: three in San Juan County and one each in La Plata and Dolores counties.

Distribution/Abundance: There are 25 known occurrences in Colorado, several with over 1000 individuals. There are 18 specimens at the University of Colorado Herbarium.

Known Threats and Management Issues: No immediate threats are known. Potential threats include trampling and herbivory by domestic sheep or direct disturbance by recreationists. Invasion of non-native species could threaten some habitats. Trails at the site in Dolores County near Storm Peak are open to motorized vehicles, and heavy motorcycle traffic was observed. This could lead to some direct disturbance to plants, but cyclists usually stay on the established trails.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Machaeranthera coloradoensis*: Storm Peak.

Penstemon breviculus (Short-stem beardtongue)

Taxonomy

Class: Dicotyledoneae
Order: Scrophulariales
Family: Scrophulariaceae
Genus: *Penstemon*

Taxonomic Comments: Synonym: *Penstemon jamesii* Benth
ssp. *breviculus* Keck. Its closest relatives are *P. ophianthus* and *P. jamesii* (NMRP).

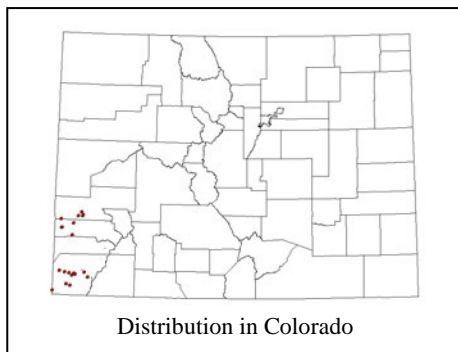
CNHP Ranking: G3 S2

State/Federal Status: None

Description and Phenology: *Penstemon breviculus* is a perennial with stems 0.8-2.0 dm tall, erect, or slightly upward-curving, retrorsely puberulent; leaves are mostly basal, opposite, entire or rarely few toothed, lanceolate, elliptic, or spatulate. Basal leaves are somewhat petiolate, and stem leaves sessile. The inflorescence is short, 4-12 cm long; calyx 5-8 mm long in flower, lobes lanceolate, glandular hairy; corollas 10-15 mm long, throat 3.5-6 mm wide, dark blue to purple with dark violet-purple guidelines, glandular, pubescent externally. The staminode is included within the throat or barely projecting but clearly visible, bearded with yellow thread-like hairs its full length, the hairs pointing back down the throat. Fertile stamens are exsertate (open up flat). The plants flowers in May and June. (New Mexico Rare Plants)



Figure 33. *Penstemon breviculus*
Photograph courtesy Southwest Colorado
Wildflowers. www.swcoloradowildflowers.com



Distribution in Colorado

Habitat Comments: Sandy or clay soils in sagebrush, semi-desert shrub and pinyon-juniper communities from 4,800 to 6,000 ft. (NMRP)

Global Range: *Penstemon breviculus* is found in the Four Corners states: Colorado, Arizona, New Mexico and Utah. In Utah it is ranked S1, In New Mexico S3, and is not ranked in Arizona. This species has a patchy distribution throughout its range, from Grand County, Utah, to the Four Corners region.

State Range: In Colorado, it has been documented in Montrose, San Miguel and Montezuma counties.

Distribution/Abundance: There are 21 occurrences in Colorado. Ten of these are on BLM lands within the San Juan Resource Area, in Montrose, San Miguel and Montezuma counties. It is expected that with further survey this species will be found to fairly common and its state rank lowered.

Known Threats and Management Issues: The New Mexico Rare Plants website states that the species is not significantly threatened by the prevailing land uses within its habitat. Small portions of some populations have been eliminated by energy development activities, including pipelines, well pads, and road building. (New Mexico Rare Plants 2004)

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Penstemon breviculus*: Mesa Verde Entrance, Mud Canyon, Sand Canyon, Cannonball Mesa.

Penstemon lentus (Abajo penstemon)

Taxonomy

Class: Dicotyledoneae
Order: Scrophulariales
Family: *Scrophulariaceae*
Genus: *Penstemon*

Taxonomic Comments: Very similar to *Penstemon osterhoutii*, and considered to be synonymous by Weber (2001). Others find that it is distinct, based on its broader leaf shape and geographic separation (Cronquist *et al.* 1984).

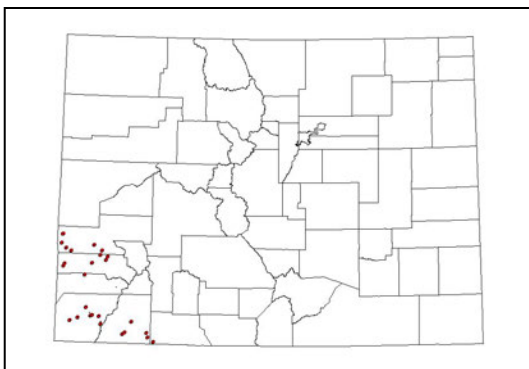
CNHP Ranking: G4Q S3 (watchlisted as of 2004)

State/Federal Status: None

Description and Phenology: A tall, unbranched plant with broad, glaucous leaves and blue to magenta flowers in a raceme. 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.

Habitat Comments: Abajo penstemon is found in pinyon-juniper woodlands, often on eroded soils.

Association species include mountain mahogany, cliff rose, Mormon tea, and Gambel oak. Elevations range from 5,200 to 7,600 feet. The plants we observed were growing on eroding soils, and seem to be well adapted to this situation by their long, elastic roots.



occurrences. Several are reported to have over 1000 individuals. Many others are based on herbarium specimens with no abundance information given.

Known Threats and Management Issues: The plants are evidently palatable to cattle and/or wildlife. The tops of many flowering stems observed in Montezuma County had been eaten. Whether this has a positive or negative impact on an occurrence is unknown at this time. Direct disturbances associated with roads and oil and gas development may threaten some populations.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Penstemon lentus*: Menefee Mountain, Mud Canyon, Black Snag Road.



Figure 34. *Penstemon lentus*.
Photograph copyright CNHP by P. Lyon

Global Range: Four Corners states: Colorado, New Mexico, Arizona and Utah. Ranked S3 (vulnerable) in New Mexico and SR (reported) in Arizona and Utah.

State Range: Archuleta, Dolores, La Plata, Montezuma, Montrose and San Miguel counties.

Distribution/Abundance: There are now 30 known

Penstemon utahensis (Utah beardtongue)

Taxonomy

Class: Dicotyledoneae
Order: Scrophulariales
Family: *Scrophulariaceae*
Genus: *Penstemon*

Taxonomic Comments: *Penstemon utahensis* Eastwood

CNHP Ranking: G4 S2

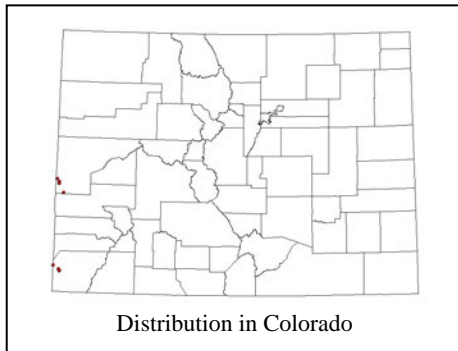
photo not available

State/Federal Status: None

Description and Phenology: *Penstemon utahensis* is unique among the *Penstemons* of the Four Corners area in its bright magenta flower color. Its flowers are large with spreading corolla lobes, and tend to be horizontal rather than ascending. Its leaves are glaucous, although less so than those of *P. lentus*.

Habitat Comments: *Penstemon utahensis* grows on hot sunny rocky slopes in the semi-desert shrub zone. At the Cannon Ball Mesa site, plants were growing on rocky slopes with scattered junipers (*Juniperus osteosperma*), shadscale (*Atriplex confertifolia*) and snakeweed (*Gutierrezia sarothrae*). Other associated species were twin bladderpod (*Physaria acutifolia*), mock thrift goldenweed (*Streptanthus armerioides*) and yucca (*Yucca harrimaniae*).

Figure 35. *Penstemon utahensis*



Global Range: *Penstemon utahensis* is known from five southwestern states: Colorado, California, Arizona, Nevada and Utah. It is ranked S2 in California, and not ranked in Arizona, Nevada or Utah.

State Range: In Colorado it is found close to the Utah border in Mesa and Montezuma counties.

Distribution/Abundance: There are 7 occurrences in Colorado in the CNHP database.

Known Threats and Management Issues: Herbivory by livestock has been observed. Weed invasion and direct disturbance from roads or OHVs are potential threats to some occurrence.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Penstemon utahensis*: Cannon Ball Mesa, Hovenweep.

Stellaria irrigua (Altai chickweed)

Taxonomy

Class: Dicotyledoneae

Order: Caryophyllales

Family: *Alsiniaceae*

Genus: *Stellaria*

Taxonomic Comments: none.

CNHP Ranking: G4? S2

State/Federal Status: None

Descriptions: The flowers of *Stellaria irrigua*, only about a quarter of an inch in diameter, are exquisite when viewed closely. 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 in the talus areas where it grows.



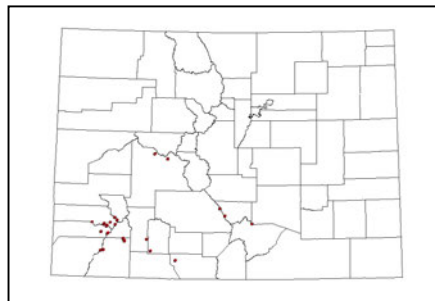
Figure 36. *Stellaria irrigua*.

Photograph copyright CNHP by P. Lyon

Habitat Comments: This tiny plant grows in one of the most inhospitable habitats imaginable: barren scree slopes high in the mountains. It is usually found in places where it is shaded by the rocks, and there is some soil between rocks.

Global Range: Colorado and New Mexico. This plant is found in North America only in Mexico, but is also found in the Altai where it is rare. It is one of several plants disjunct distribution, suggesting that the once connected by habitat suitable to those (Weber 1986).

State Range: Gunnison, Hinsdale, La Montezuma, Mineral, Conejos, San Juan counties.



Distribution in Colorado

Mexico. This Colorado and New Mexico region of Siberia, that share this two areas were species (Weber

Plata, Dolores, and San Miguel

Distribution/Abundance: There are 29 occurrences in the CNHP database, including five new ones found in Dolores County in 2004. However, only 13 are ranked: 4 as A (excellent) and 7 as B (good) and 2 as C (fair). Eleven are historic occurrences. The species may be locally abundant but is easily overlooked. It is ranked S2 in New Mexico.

Known Threats and Management Issues: *Stellaria irrigua* grows in talus areas, a habitat that is seldom disturbed, except by natural movement of rock, for which the species is well adapted. However, roads and mining could threaten some populations.

Potential Conservation Areas on San Juan Public Lands in Dolores County that support *Stellaria irrigua*: Hermosa Peak, Elliott Mountain – Sockrider Ridge, Cross Mountain Trail, Navajo Basin.

Townsendia glabella (Gray's townsend-daisy)

Taxonomy

Class: Dicotyledoneae

Order: Asterales

Family: Asteraceae

Genus: *Townsendia*

Taxonomic Comments: *Townsendia glabella* A. Gray was first described as *T. bakeri* Greene in 1900. The type specimen was collected at Los Pinos in Archuleta County in 1899.

CNHP Ranking: G2 S2

State/Federal Status: None. Currently on list of species considered for inclusion on Forest Service sensitive

species list for Region 2, but for which more information is needed.

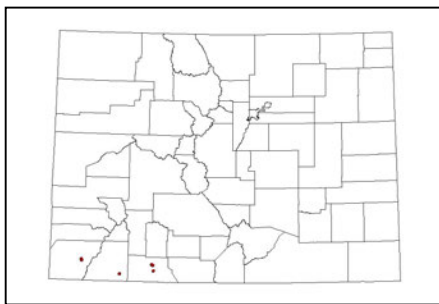


Figure 37. *Townsendia glabella*.

Photograph copyright CNHP by P. Lyon

Description and Phenology:

T. glabella is an herbaceous caespitose perennial, with bluish-white flowers. Leaves are mostly glabrous, or with a few sparse hairs, distinguishing it from the more common *T. incana*, which has cinereous leaves. Its phyllaries (bracts at the base of the flower head) are narrower and more sharp pointed than the similar Rothrock townsend-daisy. Plants flower in May and June.



Distribution in Colorado

Habitat Comments: *Townsendia glabella* grows on level to steeply sloping shale slopes with clay soils derived from Mancos Shale. In Montezuma County, it was found in the pinyon-juniper zone on a relatively rare member of the Mancos formation known as the Smoky Hill oyster bench. Fragments of fossil oyster shells can be seen in this member.

Global Range: This species is endemic to Colorado in Montezuma, La Plata, and Archuleta counties, Colorado, and is known from at most 10 to 20 locations.

State Range: In Colorado the total range of *Townsendia glabella* is very small, extending from Pagosa Springs to Mesa Verde N.P. A record from Grand Junction is suspected to be a mis-identification.

Distribution and Abundance: *Townsendia glabella* has a very limited distribution, and it is rare throughout its limited range. There are three records from Archuleta County, one from La Plata County, and now two from Montezuma County in the CNHP database. There are 13 specimens at the University of Colorado Herbarium, 8 from Archuleta County, 2 from La Plata and 3 from Montezuma. However, several of these may represent a single occurrence. One Archuleta County location was found by Steve O'Kane in 1985, and two more were found during the CNHP Rare Plant Survey in 2002. Two historic records from La Plata County are represented by specimens at the University of Colorado Herbarium but these were not found during the CNHP survey in 2003. They are from "east of Mancos Hill" and "west of Hesperus". Prior to 2004, it was last observed in Montezuma County in 1930, when it was collected by Aven Nelson. Further survey in Montezuma County is planned for 2005, where the Smoky Hill oyster bed areas will be specifically targeted.

Known Threats and Management Issues: Threats to *Townsendia glabella* include direct disturbance on individuals from human activities (recreation, road and trail maintenance activities, selection of grazing areas) and invasion by exotic plant species.

Potential Conservation Areas in Montezuma County that support *Townsendia glabella*: Mesa Verde Entrance



Figure 38. *Townsendia glabella* near Mesa Verde Entrance, 2004. Photo CNHP by P. Lyon



Figure 39. Habitat of *Townsendia glabella* on Smoky Hills Oyster Bed member of the Mancos Shale near Mesa Verde, 2004. Photo CNHP by P. Lyon

***Townsendia strigosa* (Hairy townsend-daisy)**

(No photo available)

Taxonomy

Class: Dicotyledoneae

Order: Asterales

Family: *Asteraceae*

Genus: *Townsendia*

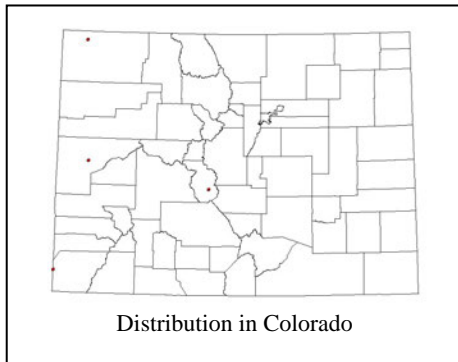
Taxonomic Comments: *T. strigosa* Nuttall has also been known as *T. incana* var. *prolixa* (Welsh 1993).

CNHP Ranking: G4 S1

State/Federal Status: None

Description and Phenology: *Townsendia strigosa* is a winter annual or biennial from a taproot. Ray flowers are white to pink, often exceeded by the crowded stem leaves. The stems have stiff, short (strigose) hairs, and withered basal leaves are often present. Leaves and achenes are conspicuously pubescent (Weber 2001; Welsh 1993).

Habitat Comments: *T. strigosa* grows on clay hills in the semi-desert shrub zone. Associated species in the Cannon Ball Mesa PCA were snakeweed (*Gutierrezia sarothrae*), sand dropseed (*Sporobolus cryptandrus*), galleta (*Hilaria jamesii*), wooly plantain (*Plantago patagonica*), cranesbill (*Erodium cicutarium*) and scarlet globemallow (*Sphaeralcea coccinea*).



Global Range: *Townsendia strigosa* is known from Colorado, New Mexico, Utah, Arizona and Wyoming. It is ranked S3 in Wyoming, and not ranked in the other three states. Utah occurrences are clustered in the northeast part of the state, closer to Moffatt County in Colorado than to Montezuma County (Utah State Univ. 2004).

State Range: In Colorado, there are records from Montezuma, Moffatt, Mesa and Chaffee counties.

Distribution/Abundance: There are four known occurrences in Colorado. The species is apparently quite common in Utah.

Known Threats and Management Issues: Improper grazing and off road vehicle use may threaten the Colorado populations.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Townsendia strigosa*: Cannon Ball Mesa.

Trifolium kingii (King's clover)

Taxonomy

Class: Dicotyledoneae

Order: Fabales

Family: *Fabaceae*

Genus: *Trifolium*

Taxonomic Comments: *Trifolium kingii* ssp. *macilentum* - (Greene) J. Gillett. Other Related Names: *Trifolium kingii* var. *macilentum* (Greene) Isely ; *Trifolium macilentum* Greene

CNHP Ranking: G5 S1

State/Federal Status: None

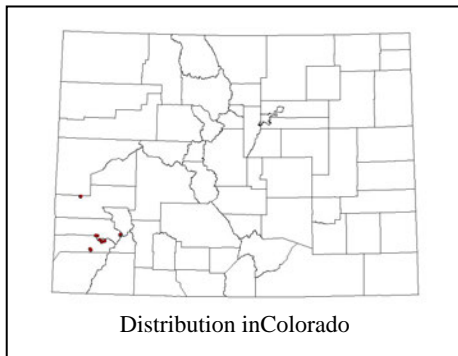
Description and Phenology: This attractive tall pink clover has bright green three-parted toothed leaves and down-turned flowers that soon turn brown.



Figure 40. *Trifolium kingii*
Photograph © CNHP, by M. J.. Lyon

Habitat Comments: *Trifolium kingii* is found in wet meadows and streambanks in aspen and mixed conifer communities.

Global Range: *Trifolium kingii* is known from Colorado, Arizona, Idaho, Nevada and Utah. It is ranked S1 in Arizona, and unranked in Idaho, Nevada and Utah..



Distribution in Colorado

State Range: In Colorado, there are records from Montrose, San Miguel and Dolores counties.

Distribution/Abundance: There are now 14 known occurrences in Colorado, including six found in 2004 in Dolores County. There are five A ranked occurrence, 5 B-ranked, 1 C and 3 D.

Known Threats and Management Issues: Survival of *Trifolium kingii* populations is dependent on continuing the existing moisture regime. Any upstream diversions would negatively impact the plants. Direct disturbance from grazing or roads are additional threats.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Trifolium kingii*: Mavreeso Creek-Cottonwood Canyon; Upper Fish Creek; Willow Creek at Groundhog Mountain; Navajo Lake Trail.

Triteleia grandiflora (Large-flower triteleia)

Taxonomy

Class: Monocotyledonae

Order: Liliales

Family: Liliaceae

Genus: *Triteleias*

Taxonomic Comments:

photo not available

CNHP Ranking: G4G5 S1

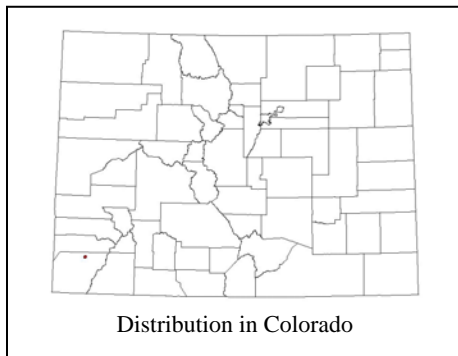
Figure 41. *Triteleia grandiflora*

State/Federal Status: USFS sensitive

Description and Phenology: *Triteleia grandiflora* is a perennial plant that grows from a corm, with linear basal leaves. There are several light blue flowers in an open umbel. The six light blue tepals are joined in a narrowly bell-shaped tube.

Habitat Comments: Throughout its range, the plant can be found in sagebrush, grasslands and forests. In the only known location in Colorado, it is growing in ponderosa pine/Gambel oak forest at 7761 ft. It was found both in grassy openings and under shrubs. Associated species included *Artemisia ludoviciana*, *Erigeron flagellaris*, *Delphinium nuttallianum*, *Poa pratensis*, *Purshia tridentata*, *Amelanchier utahensis*, *Senecio multilobatus*, *Pseudocymopterus montanus*, *Wyethia X magna* and *Symphoricarpos oreophilus*.

Global Range: The species is known from British Columbia and eight western states: California, Idaho, Montana, Oregon, Utah, Washington, Wyoming and Colorado.



State Range: There is only one known location in Colorado, in the San Juan National Forest, about 7.5 miles northeast of Dolores.

Distribution/Abundance: Although a complete census has not been made, estimates of the population size in Colorado are from 1000 to 2000 plants.

Known Threats and Management Issues: Potential threats to the species in Colorado include inappropriate grazing and exotic species invasion. *Poa pratensis* is present at the single Colorado site, and other exotics are nearby.

Potential Conservation Areas in La Plata County that support House Creek PCA

Utricularia minor (Lesser bladderwort)

Taxonomy

Class: Dicotyledoneae
Order: Scrophulariales
Family: Lentibulariaceae
Genus: *Utricularia*

Taxonomic Comments: *Utricularia minor*

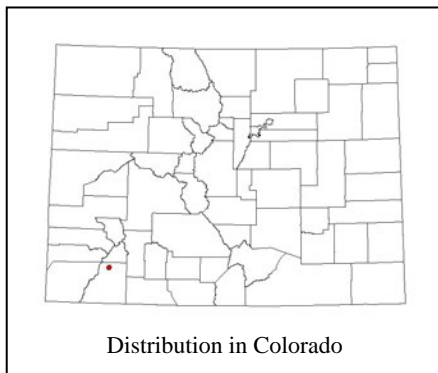
CNHP Ranking: G5 S2 (as of 2004)

State/Federal Status: USFS sensitive

Description and Phenology: This perennial carnivorous aquatic plant is recognizable by its yellow flowers and bladders that trap and digest prey. Bladders are small (1 -2 mm) and pear-shaped, one to 5 per leaf. When disturbed, trigger hairs open the bladders and suck in water and aquatic creatures that are then digested. When digestion is complete, special cells extract the water and reset the trap by restoring a vacuum inside the bladders.

Figure 42. *Utricularia minor*.

Habitat Comments: *Utricularia minor* grows in shallow water or on wet soils in fens or other wetlands that are often calcium-rich. *Utricularia* species are generally found in quiet, pollution-free, acidic ponds and bog-associated waters (Juniper et al. 1989).



Global Range: The species is circum-boreal and extends in the U. S. as far south as California. It is known from 28 states.

State Range: In Colorado it is known from nine locations in Delta, Montezuma, Boulder, Jackson, Larimer and Park counties. A possible location in La Plata County will be checked in 2005. The species is easily overlooked, and may be more common in Colorado than is presently known. Efforts in 2005 to inventory fens on the San Juan National Forest may turn up more occurrences.

Distribution/Abundance: Little is known of the abundance of the species in Colorado. CNHP added the species to its list of tracked plants in 2004. Most existing records have no census of number of individuals, although some mention that it is “common”, “locally abundant” or “rare”. More research is needed to determine its status in Colorado.

Known Threats and Management Issues: Primary threats to *Utricularia minor* are degradation of water quality, habitat loss, and invasive species. These threats directly impact populations of *U. minor*; it is sensitive to habitat perturbations, both on local and more general scales. Further, its primary habitat, peatlands, is sensitive to environmental change and is restricted in distribution and abundance (Neid 2004).

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Utricularia minor*: Grindstone Fens.

CHAPTER V. POTENTIAL CONSERVATION AREAS

Twenty-six Potential Conservation Areas (PCAs) containing rare plants were identified on San Juan Public Lands in Dolores and Montezuma counties (Figure 43). Potential Conservation Areas represent our best estimate of the primary area needed to support the plants, animals or communities on which the PCA is based. Each Potential Conservation Area is described in a standard site profile reflecting data fields in CNHP's Biotics Data System. They are arranged below in the approximate order of their need for conservation attention, i.e. by Biodiversity Rank, and then alphabetically within each rank. This report does not include PCAs that were drawn for animals or natural communities. However, when natural community occurrences fall within the boundaries of the PCA, they are included.

The sections of this report and the contents are outlined and explained below.

Biodiversity Rank (B-rank): The overall significance of the site in terms of rarity of the Natural Heritage resources and the quality (condition, abundance, etc.) of the occurrences. For rank definitions, please see the **Natural Heritage Ranking System** section of this report.

Protection Urgency Rank (P-rank): An estimate of the urgency of conservation protection. This rank generally refers to the need for a major change of protective status (i.e., ownership or designation as a natural area). For rank definitions, please see the **Natural Heritage Ranking System** section of this report (Chapter I)

Management Urgency Rank (M-rank): An estimate of the time frame in which conservation management must occur. Using best scientific estimates, this rank refers to the need for management such as weed control, trail closures, etc. For rank definitions, please see the **Natural Heritage Ranking System** section of this report (Chapter I).

Location: County, general location, usually in approximate air miles from the nearest town, and USGS 7.5 minute topographic map name.

Legal Description: Township, range and section(s).

Elevation Range: Lowest and highest elevations within the site boundaries, as drawn on U.S.G.S. topographic maps.

Size: Number of acres within the site boundary, as determined from GIS mapping (ArcView).

General Description: A brief narrative of the topography, vegetation, and current use of the potential conservation area. Common names are used in the text, followed by scientific names in parentheses.

Biodiversity Rank Justification: A synopsis of the significant elements occurring in the site. A table within the site profile lists the element occurrences found within the site, their rarity ranks, the occurrence ranks and federal and state agency special designations. The species or communities that are the primary element of concern are printed in bold type within the table. When several entries are in bold type, any one of the occurrences would be sufficient to justify the site rank. See Table 1, Chapter I, for explanations of ranks, and Table 2, Chapter I, for legal designations.

Table of elements found in the PCA: Includes scientific name, common name, global and state ranks, federal or state status and element occurrence rank.

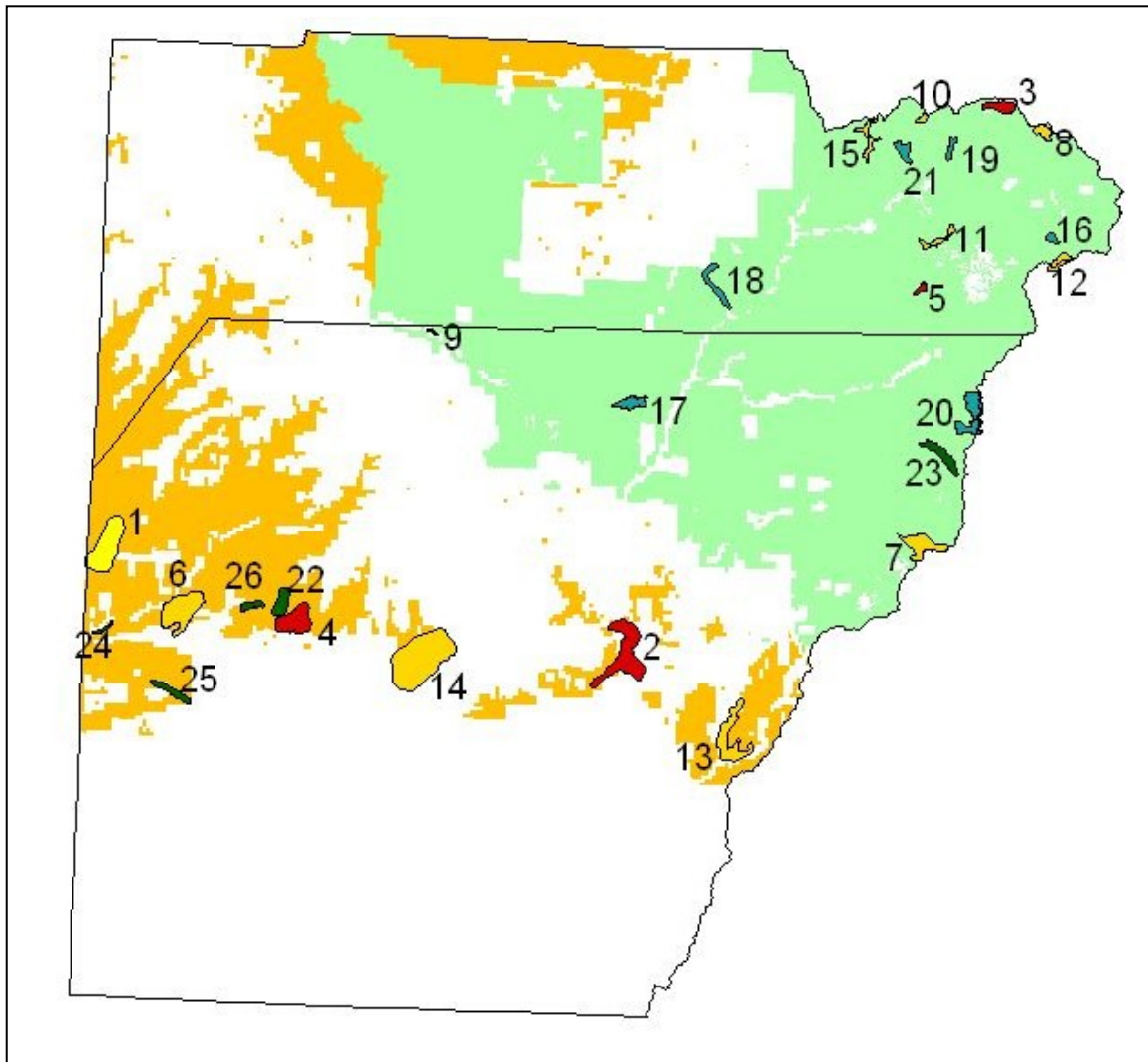
Boundary Justification: Justification for the location of the potential conservation site planning boundary delineated in this report, including all known

occurrences of natural heritage resources and, in some cases, adjacent lands required for their protection.

Protection rank comments: Any additional pertinent information regarding the need for protection of the site.

Management rank comments: Any additional pertinent information regarding the need for management actions at the site.

Figure 43. Potential Conservation Areas for Plants on San Juan Public Lands in Dolores and Montezuma counties.



B2 sites: (5)

1. Hovenweep (existing site)
2. Mesa Verde Entrance
3. Navajo Basin
4. Sand Canyon at McElmo (existing site)
5. Storm Peak

B3 Sites: (10)

6. Cannon Ball Mesa
7. Centennial Peak
8. Cross Mountain Trail
9. Dolores Canyon below McPhee Reservoir
10. Dolores Peak
11. Elliott Mountain-Sockrider Peak
12. Hermosa Peak
13. Menefee Mountain
14. Mud Canyon
15. Upper Fish Creek at Dunn Peak

B4 sites: (6)

16. Flattop Mountain South
17. House Creek
18. Mavreeso Creek-Cottonwood Canyon
19. Navajo Lake Trail
20. Orphan Butte (existing site)
21. Willow Creek at Groundhog Mountain

B5 sites (5)

22. East Fork Rock Creek
23. Grindstone Fens
24. Ismay Trading Post
25. Rincon Canyon
26. Tozer Canyon

Hovenweep PCA

Biodiversity Rank: B2: Very high biodiversity significance. This PCA supports good (B-ranked) and excellent (A-ranked) occurrences of two globally rare plant communities, and two unranked (E) occurrences of plants that are rare in Colorado (S1, S2).

Protection Urgency Rank: P4: No protection actions are needed in the foreseeable future.

Management Urgency Rank: M2: New management actions may be needed within 5 years to prevent the loss of the element occurrences within the PCA.

Location: The Hovenweep PCA is located in western Montezuma County on the Colorado/Utah border, about 25 miles WNW of Cortez. To access the PCA, drive County Road CC 5 miles west from Highway 666 at Pleasant View. Turn south onto County Road 10, which accesses the Canyons of the Ancients National Monument, and drive about 13 miles to the PCA.

U.S.G.S. 7.5minute quadrangles: Ruin Point

Legal Description: T36N R20W, Sections 1-3, 10 and 11;
T37N R20W, Sections 23-26, and 34-36

Elevation: 5,200 to 5,640 feet

Size: Approximately 3,040 acres

General Description: The Hovenweep PCA includes some of the best preserved and most interesting ancestral Puebloan sites in the Canyons of the Ancients National Monument/Hovenweep National Monument. The rugged sandstone canyons of Hackberry, Keely, and Bridge Creeks dominate this area, running roughly northeast to southwest, and contiguous, sparsely forested uplands of Utah juniper occur to the north. Included within the PCA boundary is an access road to two units of the NPS-Hovenweep National Monument, which are surrounded by the BLM-managed Canyons of the Ancients National Monument.

The Hackberry, Keely, and Bridge Creek drainages and their tributaries support three known occurrences of rare or vulnerable natural plant communities. All three of these natural community occurrences are in good condition, diminished only by their small size and the presence of cheat grass (*Bromus tectorum*) in their understories. A tributary to Hackberry Creek supports an occurrence of the Fremont's cottonwood/Gooddings black willow (*Populus fremontii*/ *Salix gooddingii*) plant community, considered globally rare. Associated species observed at this occurrence include Utah juniper (*Juniperus osteosperma*), Sandburg bluegrass (*Poa secunda*), tamarisk (*Tamarix ramosissima*), muttongrass (*Poa fendleriana*), Stansbury cliffrose (*Purshia stansburiana*), mountain mahogany (*Cercocarpus* sp.), skunkbush sumac (*Rhus trilobata*), Mormon tea (*Ephedra* sp.), and singleleaf ash (*Fraxinus anomala*).

Springs at the headwaters of Keely Creek and Hackberry Creek support a globally vulnerable community classified as hackberry/bluebunch wheatgrass (*Celtis laevigata* var. *reticulata*/ *Pseudoroegneria spicata*), although the presence of bluebunch wheatgrass is questionable and needs confirmation. Large hackberries dominate the overstory, with saplings and seedlings evidencing regeneration of the species. The adjacent landscape has a high amount of cryptobiotic soils preserved by the lack of grazing;



Figure 44. *Celtis reticulata* plant community at Hovenweep. Photo CNHP D. Anderson

however, cheat grass is very abundant. The drainages both appear to be ephemeral but influenced by periodic seasonal high flows, and the hydrologic regimes appear unaltered, with no documented upstream diversions. Puebloan ruins and rubble adorn the canyon rim and slopes above the channels, and a moderately used trail follows the rim along one canyon. Other plants at these sites include narrowleaf cattail (*Typha angustifolia*), and musk thistle (*Carduus nutans*), which occur around pools and within the channels. Utah juniper and spearleaf rabbitbrush (*Chrysothamnus linifolius*) occur on canyon slopes, and singleleaf ash and Rio Grande cottonwood (*Populus deltoides* ssp. *wislizenii*) are documented further down each canyon from the element occurrences.

Level, bare areas in openings of pinyon-juniper (*Pinus edulis* and *Juniperus osteosperma*) woodland support Utah beardtongue (*Penstemon utahensis*), along with galletagrass (*Hilaria jamesii*), four-wing saltbush (*Atriplex canescens*), and globemallow (*Sphaeralcea* sp.). The element occurrence for Utah beardtongue was documented in 1998, but was not revisited in the 2000 visit to the site. It is near a road and thus potentially threatened by weeds, but no imminent threats were documented in the original 1998 report.

Scattered occurrences of Westwater buckwheat (*Eriogonum scabrellum*) are found on open or partially shaded slopes facing south and southwest, dominated by good stands of Utah juniper and Stansbury cliffrose. Soils are fine, sandy loams from parent sandstone with periodic shallow rock outcrops. Associated species include snakeweed (*Gutierrezia sarothrae*), cheat grass (*Bromus tectorum*), and six-week fescue (*Festuca octoflora*).

Two CNHP-tracked avian species, the gray vireo (*Vireo vicinior*) and the sage sparrow (*Amphispiza belli*), have also been historically documented on the site. Although the boundary was not drawn in consideration of these species, the site does contain significant areas of suitable habitat. Additionally, a historical documentation for desert spiny lizard (*Sceloporus magister*) is worth noting, since it is tracked by CNHP and listed by the state as a species of special concern, and suitable habitat for this species also remains within the PCA boundary.

Biodiversity Rank Justification and Comments: The Hovenweep PCA biodiversity significance rank is based on one good (B-ranked) occurrence of the globally imperiled

(G2) Fremont's cottonwood-Goodding's black willow community, and one excellent (A-ranked) and one good (B-ranked) occurrences of the globally vulnerable (G3) hackberry community.

Natural Heritage element occurrences at Hovenweep PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plant Communities					
<i>Populus fremontii</i> / <i>Salix gooddingii</i>	Fremont's cottonwood-Gooddings black willow	G2	S1		B
<i>Celtis laevigata</i> var. <i>reticulata</i> / <i>Pseudoroegneria spicata</i>	Hackberry	G2G3	S1S2		A
<i>Celtis laevigata</i> var. <i>reticulata</i> / <i>Pseudoroegneria spicata</i>	Hackberry	G2G3	S1S2		B
Plants					
<i>Eriogonum scabrellum</i>	Westwater buckwheat	G3	S1		E
<i>Penstemon utahensis</i>	Utah beardtongue	G4	S2		E

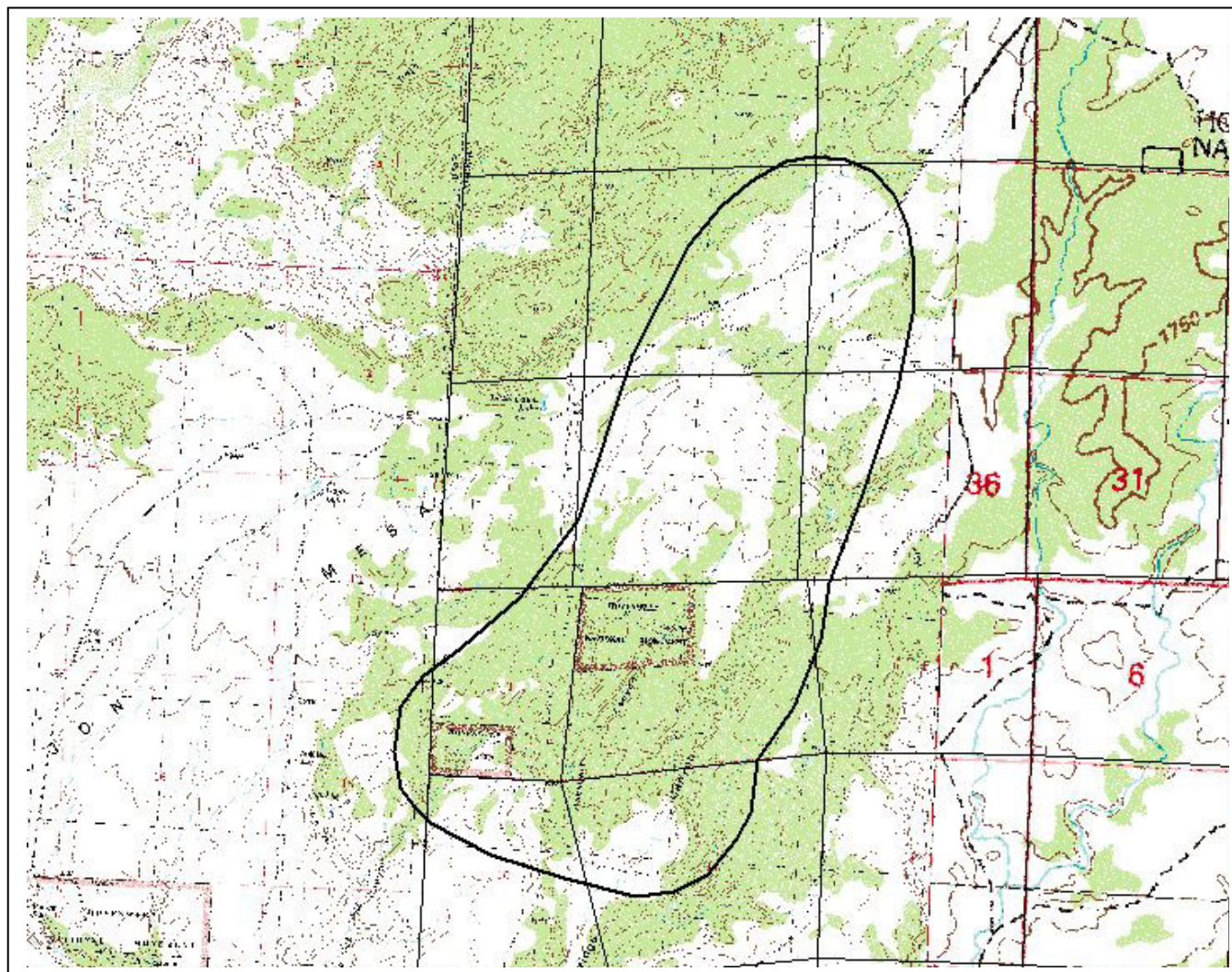
*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: This site includes the headwaters of Hackberry Creek and Bridge Creek, which support the hackberry and the Fremont's cottonwood/ Goodding's black willow community occurrences. It also includes an occurrence of Utah penstemon and significant areas of potential habitat for the species. Occurrences of three uncommon animals, the gray vireo, sage sparrow, and desert spiny lizard, have also been documented in the PCA though the boundary has not been drawn in consideration of these species. Nonetheless, appropriate habitat for these species is present.

Protection Comments: The entire PCA lies within the boundaries of the BLM's Canyons of the Ancients National Monument, and additionally, two units of the National Park System's Hovenweep National Monument also occur within the PCA boundary itself.

Management Rank Comments: Management may be needed at the PCA within 5 years to maintain the current quality of element occurrences. Recreational use is moderate, and cattle grazing is excluded from portions of the PCA, however existing on-site weed populations are problematic and have degraded the three plant community element occurrences. As of 1998, musk thistle was found within several of the channels in the canyons providing up to 20% of the cover material, and cheat grass was documented as occupying as much as 90% of the understory on the canyon slopes. Tamarisk (*Tamarix ramosissima*) is also present at one community occurrence and has the potential to impact other element occurrence communities. Human impacts in the form of increased recreation, road and trail maintenance, and the subsequent potential for introduction of additional exotic species threaten the occurrences at this location. The likelihood of destructive fires is also significantly increased due to the spread and dominance of cheat grass in much of the area.

Hovenweep. B2: Very High Biodiversity Significance



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PCA BOUNDARY

Ruin Point
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Mesa Verde Entrance PCA

Biodiversity Rank: B2: Very high biodiversity significance. This PCA supports excellent (A-ranked) occurrences of globally imperiled (G2) and vulnerable (G3) plants.

Protection Urgency Rank: P2: High urgency. Protection actions may be needed within 5 years. It is estimated that stresses may reduce the viability of the elements in the PCA within this approximate timeframe. Private land in the site has no protection.

Management Urgency Rank: M2: High urgency. New management actions may be needed within 5 years to prevent the loss of the element occurrences within the PCA. Control of exotic species is needed on BLM land.

Location: Montezuma County, about 8 miles east of Cortez and 7 miles west of Mancos. The site is located both north and south of Highway 160.

U.S.G.S. 7.5 minute quadrangle: Point Lookout

Legal Description: T36N,R14W, Sections 19, 20, 28 -33; T35N, R14W, Sections 4-7 and 9; T35N R15W Sections 1 and 12

Elevation: 6,800 to 8,427 feet

Size: Approximately 3,455 acres

General Description: This PCA, located near the entrance to Mesa Verde National Park, includes private, BLM and National Park Service lands. It extends north of Highway 160 on BLM land, and south into BLM land and the National Park. Vegetation is primarily Pinyon-Juniper (*Pinus edulis* and *Juniperus osteosperma*) woodland, although much of the pinyon pine in the park has been decimated by fire and a recent pine beetle infestation. There are small patches of sagebrush (*Artemisia tridentata*), rabbitbrush (*Chrysothamnus nauseosus*), grassland and oakbrush (*Quercus gambelii*) within the site.

BLM land north of the highway, where Abajo Penstemon (*Penstemon lentus*) and short-stem beardtongue (*Penstemon breviculus*) were found, is apparently a firewood cutting area, with much slash on the ground. Multiple use has taken a heavy toll in this area, and it is evidently used as a garbage dump by some of the public. Numerous roads run through the site and are heavily used by off road vehicles.

Exotic species are abundant, especially in wetter areas. Native species associated with the two *Penstemons* include sand aster (*Chaetopappa ericoides*), winged buckwheat (*Eriogonum alatum*), actinea (*Tetranneuris ivesiana*), wingate milkvetch (*Astragalus wingatanus*), and mountain mahogany (*Cercocarpus montanus*).

San Juan gilia (*Gilia haydenii*) occurs on barren clay slopes with little other vegetation just north of Highway 160 and again on the National Park access road between the entrance station and Morehead Village.

Gray's townsend-daisy (*Townsendia glabella*) was first collected in this area by Aven Nelson in 1930. A specimen resides at Rocky Mountain Herbarium in Laramie Wyoming. However, little information was recorded and the exact location was not known. It was not documented again until 2004, when it was found on private land

adjacent to the National Park. It is expected that it also occurs within the park and other nearby BLM land on the same unique substrate, a member of the Mancos shale known as the Smoky Hill oyster bench that contains abundant shell fragments.

Biodiversity Rank Justification and Comments: The rank of Very High Significance (B2) is based on an excellent (A-ranked) occurrence of Gray's townsend-daisy, a plant that is globally imperiled (G2). Other rare plants in the PCA include excellent and good (B-ranked) occurrences of San Juan gilia and short-stem beardtongue, globally vulnerable (G3), a fair (C-ranked) occurrence of large-flower globemallow (*Iliamna grandiflora*), believed vulnerable (G3?Q) globally and very rare (S1) in Colorado; and a fair occurrence of Abajo Penstemon, now watchlisted (S3) in Colorado.

Natural Heritage element occurrences at Mesa Verde Entrance PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Townsendia glabella</i>	Gray's townsend-daisy	G2	S2		A
<i>Gilia haydenii</i>	San Juan gilia	G3	S2		A
<i>Gilia haydenii</i>	San Juan gilia	G3	S2		B
<i>Penstemon breviculus</i>	Short-stem beardtongue	G3	S2		B
<i>Iliamna grandiflora</i>	Large-flower globe-mallow	G3?Q	S1		C
<i>Penstemon lentus</i>	Abajo Penstemon	G4Q	S3		C

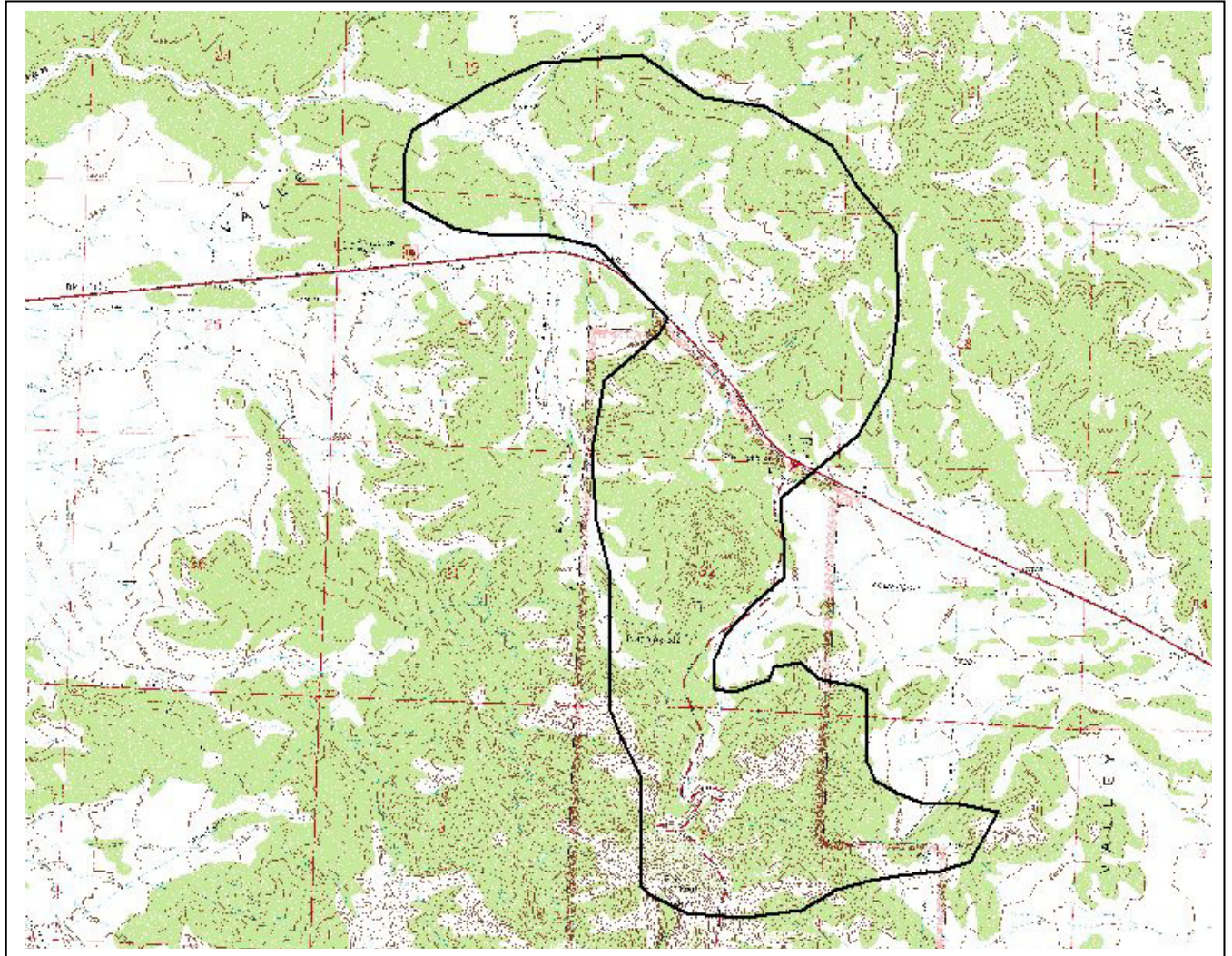
*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary encompasses six element occurrences within the pinyon-juniper woodlands and barren eroded slopes near the Mesa Verde National Park entrance. It includes all areas on the Point Lookout quadrangle mapped as the Smoky Hill oyster bench member of the Mancos Shale, including those that have not yet been surveyed, but are potential habitat for Gray's townsend-daisy. Intermingled with these areas are steep erodable slopes that support San Juan gilia and Abajo Penstemon, and a small mesic site that is the home of large-flowered globemallow.

Protection Comments: Part of the site is well protected within the park, but BLM lands have no special designation, and private lands are unprotected. A conservation easement on the private land that supports Gray's townsend-daisy would help to ensure the persistence of that population.

Management Rank Comments: Exotic species are abundant on the BLM land north of Highway 160. They include cheatgrass, musk thistle, Canada thistle, Russian knapweed and white top (*Bromus tectorum*, *Carduus nutans*, *Cirsium arvense*, *Acroptilon repens*, and *Cardaria* sp.) Control of these weeds could help to preserve the rare plant occurrences. Road work may pose a threat to San Juan gilia, both along Highway 160 and in the park. More survey for Gray's townsend daisy is planned for 2005.

Mesa Verde Entrance: B2. Very High Biodiversity Significance



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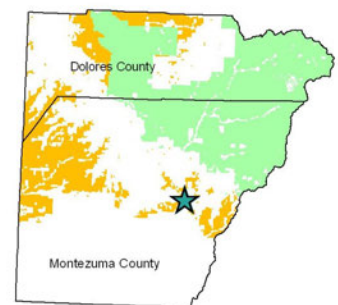


PCA BOUNDARY

Point Lookout
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Navajo Basin PCA

Biodiversity Rank: B2: Very high biodiversity significance. The PCA supports a globally imperiled (G2) plant in good condition (B-ranked).

Protection Urgency Rank: P4: Low urgency. No protection actions are needed in the foreseeable future. The PCA is within the Lizard Head Wilderness.

Management Urgency Rank: M3: Moderate urgency. New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Continued monitoring to assess impacts of hiker travel will inform future management needs.

Location: Northern Dolores County, about 11 miles north of Rico. To reach the site, drive north past Dunton on the West Fork of the Dolores River to the Navajo Lake trailhead. Hike to Navajo Lake and continue on the trail through talus toward El Diente Peak

U.S.G.S. 7.5 minute quadrangle: Dolores Peak and Mount Wilson
Legal Description: T41N,R10W, Sections 5 and 6; T42N R10W Sections 31 and 32; T41N R11W, Section 1; T42N R11W, Section 36.

Elevation: 11,200 to 12,800 feet

Size: Approximately 712 acres

General Description: This PCA is in a high alpine region north of El Diente Peak and Mount Wilson, which contains the headwaters of the West Dolores River. The site encompasses a steep upper basin of talus slopes, rocky outcrops and small patches of vegetation. Snow fields feed a high alpine lake and wetland below the talus slopes. Three species of alpine *Draba*: San Juan whitlow-grass, Boreal whitlow-grass and Colorado Divide whitlow-grass (*Draba graminea*, *D. borealis* and *D. streptobrachia*) are found in the sparsely vegetated crevices of rock outcrops. Altai cotton-grass (*Eriophorum altaicum* var. *neogaeum*) occurs in the flat boggy area at the upper end of the lake with planeleaf willow (*Salix planifoli*) and water sedge (*Carex aquatilis*), and in another wet area farther up the drainage. Other associated taxa include: thickleaf groundsel, elephantella, subalpine fleabane, dwarfed Engelmann spruce, black sedge, bistort, Eastwood's podistera, marsh marigold, tufted hairgrass and different leaved groundsel (*Senecio crassulus*, *Pedicularis groenlandica*, *Erigeron peregrinus*, *Picea engelmannii*, *Carex nova*, *Bistorta vivipara*, *Podistera eastwoodiae*, *Caltha leptosepala*, *Deschampsia cespitosa* and *Senecio dimorphophyllus*). Altai chickweed (*Stellaria irrigua*) is found in the talus with sparse vegetation including harbour Penstemon, wallflower, Colorado columbine, Rocky Mountain clover and purple fringe (*Penstemon harbourii*, *Erysimum capitatum*, *Aquilegia coerulea*, *Trifolium attenuatum*, and *Phacelia sericea*).

Biodiversity Rank Justification and Comments: The Navajo Basin PCA supports a good (B-ranked) occurrence of San Juan whitlow-grass, a globally imperiled (G2) plant

that is endemic to the San Juan Mountains in Colorado. There are also good occurrences of the globally vulnerable (G3) Colorado Divide whitlow-grass and House's stitchwort (*Alsinoanthe macrantha*), state rare (S2) boreal whitlow-grass, Altai chickweed and Altai cottongrass.

Natural Heritage element occurrences at Navajo Basin PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Draba graminea</i>	San Juan whitlow-grass	G2	S2		B
<i>Alsinoanthe macrantha</i>	House's stitchwort	G3	S3		B
<i>Draba streptobrachia</i>	Colorado Divide whitlow-grass	G3	S3		B
<i>Draba borealis</i>	Boreal whitlow-grass	G4	S2		B
<i>Stellaria irrigua</i>	Altai Chickweed	G4?	S2		C
<i>Eriophorum altaicum</i> var. <i>neogaeum</i>	Altai Cotton-grass	G4?T3?	S2		B
<i>Eriophorum altaicum</i> var. <i>neogaeum</i>	Altai Cotton-grass	G4?T3?	S2		B

*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary is drawn to take in the alpine basin above Navajo Lake, including the location of six rare plant occurrences. All five species are dependent on hydrological and geological processes within the basin such as snow accumulation and melting and weathering of bedrock. The mosaic of microsites within the basin includes talus slopes that support Altai chickweed, small rock outcrops that are home to the two drabas, and the wetlands that support Altai cotton-grass.

Protection Comments: The PCA is well protected within the Lizard Head Wilderness of the San Juan National Forest.

Management Rank Comments: The area is popular as a hiking destination and access route to high peaks. Colorado Fourteeners Initiative members are monitoring effects of hiker use along the access trail to Wilson Peak, Mount Wilson and El Diente Peak. Monitoring trails and the camping areas around Navajo Lake will help to determine whether any management actions are necessary.

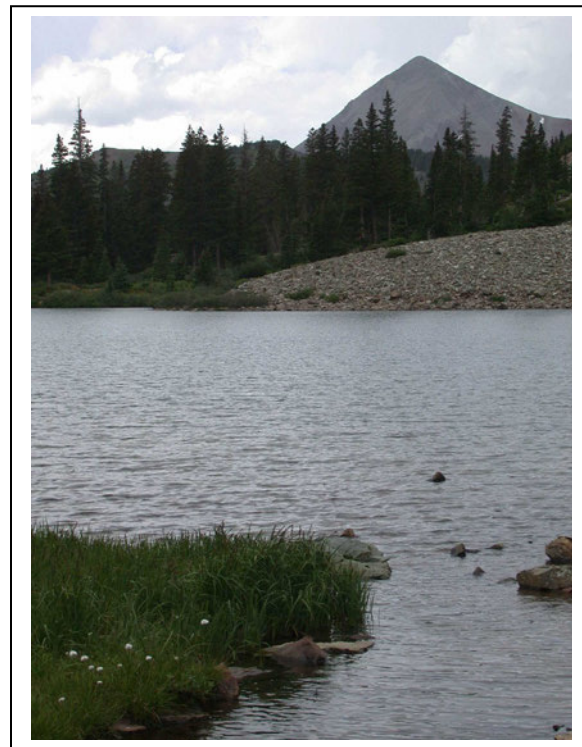
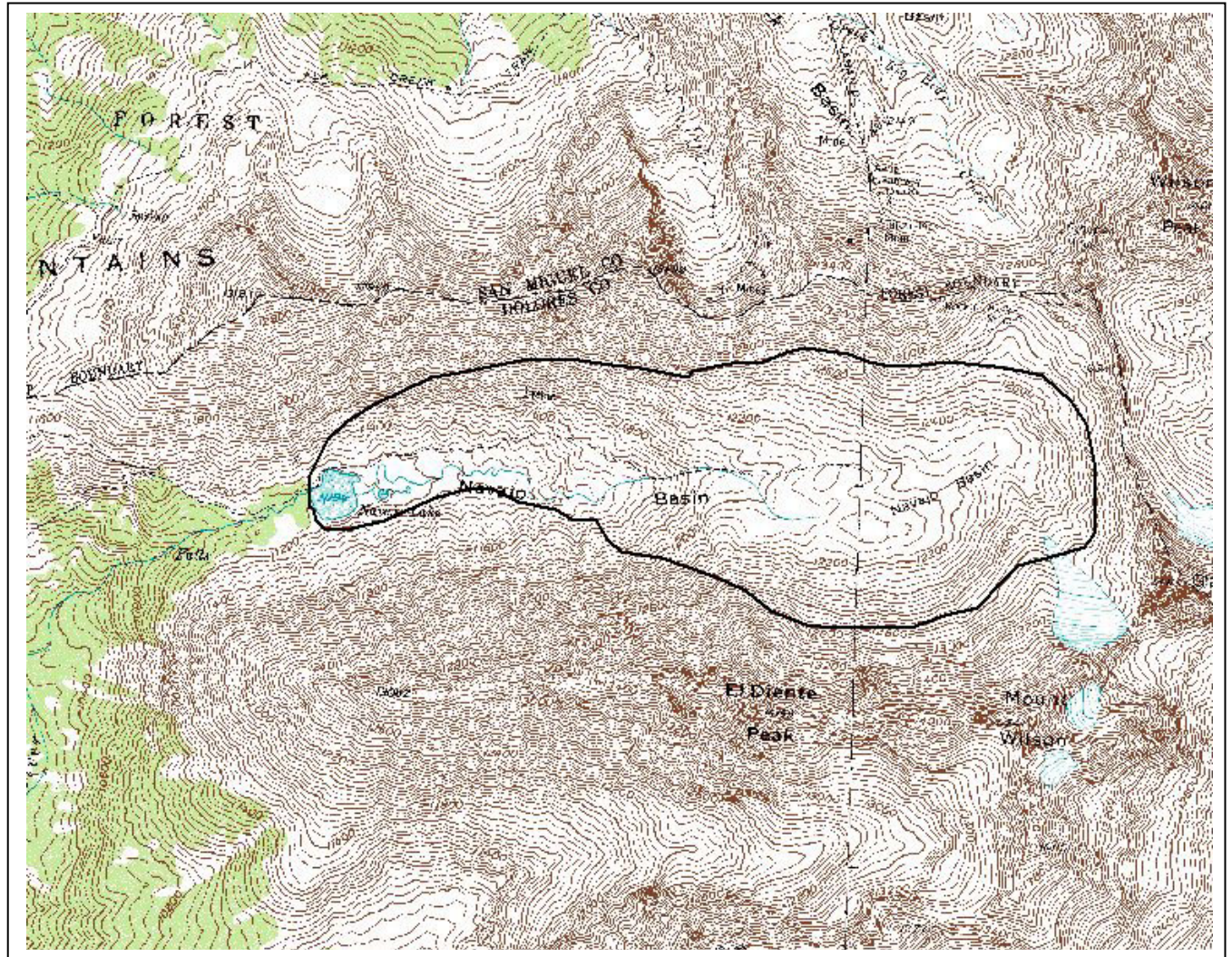


Figure 45. Navajo Lake, with Altai cottongrass.

Navajo Basin B2: Very High Biodiversity Significance



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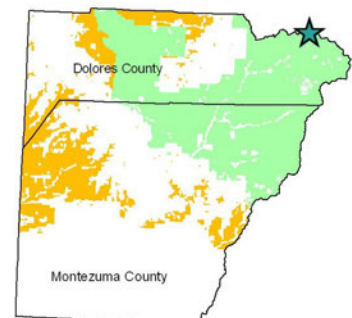


PCA BOUNDARY

Dolores Peak
Mount Wilson
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Sand Canyon at McElmo PCA

Biodiversity Rank: B2: Very high biodiversity significance. The PCA supports an excellent (A-ranked) occurrence of a globally imperiled (G2G3) plant.

Protection Urgency Rank: P3: Protection actions may be needed, but probably not within the next 5 years. Although the majority of the PCA is well protected within the Canyons of the Ancients National Monument, areas on the east side are privately owned.

Management Urgency Rank: M2: New management actions may be needed within 5 years to prevent the loss of the element occurrences within the PCA. Heavy recreational use threatens the fragile cryptobiotic crust and rare plant habitat.

Location: The Sand Canyon at McElmo PCA is located in Montezuma County in McElmo Canyon, in the Canyons of the Ancients National Monument, about 12 miles west of Cortez.

U.S.G.S. 7.5 minute quadrangles: Battle Rock

Legal Description: T 36N, R18 W, Sections 22- 27, 34 and 35

Elevation: 5,600 to 6,200 feet

Size: Approximately 1,864 acres

General Description: The Sand Canyon at McElmo PCA includes the lower reaches of Sand Canyon and parts of the surrounding uplands, including the Sand Canyon trailhead on McElmo Road. Sand Canyon is an area rich in scenic beauty and cultural heritage. It currently receives heavy visitation from hikers and mountain bikers relative to most other areas within the Canyons of the Ancients National Monument. Sand Creek flows between dramatic Entrada sandstone canyon walls in this rugged and beautiful reach. Many Ancestral Puebloan cliff dwellings can be seen in alcoves along the canyon walls.

Most of the site is dominated by open pinyon-juniper (*Pinus edulis* and *Juniperus osteosperma*) woodlands, interspersed with areas of rimrock sandstone devoid of soil. Patches of heavily crusted soil were found in concavities in the sandstone on the canyon rim. These patches often appeared to be defying the laws of gravity, having evidently been washed into these concavities from above. The soil in these patches is only a few inches deep. It appears likely that the only thing preventing rapid erosion of these soil patches is the presence of the cryptobiotic crust.

Most of the Naturita milkvetch (*Astragalus naturitensis*) individuals found were growing in these patches of soil. A good occurrence of short-stem beardtongue (*Penstemon breviculus*) was found in this area, with hundreds of individuals scattered along the trail from near the trailhead at McElmo Road for approximately one mile into Sand Canyon. This population is estimated to contain at least 1,000 plants. A fair occurrence of the weak-stemmed mariposa lily (*Calochortus flexuosus*) was found on the west canyon rim in which only four individuals were counted. The longnose leopard lizard (*Gambelia wislizenii*), a lizard critically imperiled in Colorado, was observed in 1993. Although the site was not drawn to address its needs, the area contains much

suitable habitat for this species. Silky pocket mouse (*Perognathus flavus hopiensis*) has also been documented in the area.

Biodiversity Rank Justification and Comments: This site supports two excellent (A-ranked) occurrences of Naturita Milkvetch, a globally imperiled (G2G3,S2S3) species and an excellent (A-ranked) occurrence of short-stem beardtongue, a globally vulnerable (G3,S2) species. Weak-stemmed mariposa lily, a critically imperiled species (S1) was found in fair condition (C-ranked).

Natural Heritage element occurrences at Sand Canyon at Mc Elmo PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Astragalus naturitensis</i>	Naturita Milkvetch	G2G3	S2S3		A
<i>Astragalus naturitensis</i>	Naturita Milkvetch	G2G3	S2S3		A
<i>Penstemon breviculus</i>	Short-stem Beardtongue	G3	S2		A
<i>Calochortus flexuosus</i>	Weak-stemmed mariposa lily	G4	S2		C
<i>Astragalus naturitensis</i>	Naturita Milkvetch	G2G3	S2S3		E

*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary includes the known extent of the occurrences of the Naturita milkvetch, the shrot-stem beardtongue, and the weak-stemmed mariposa lily. Its large size should contain sufficient suitable habitat to allow for future movement or expansion of these populations.

Protection Comments: This site is primarily located within the Canyons of the Ancients National Monument boundary. The lower portion of Sand Creek is on private land. As part of a National Monument, the area has a high degree of protection but increased enforcement may be necessary to manage pedestrian, vehicle and bicycle traffic. Several gas wells and an access road are located in the eastern portion of the site.

Management Rank Comments: This site was given a high management urgency rank due to the fragility of the desert environment and the intensity of human use within the area. Presently the area is heavily used by hikers, bicyclists, and equestrians, and visitors evidently stray from the trails often. As visitation resulting from its new status as a National Monument increases, human impacts to this area will likely increase more than in less accessible and scenic parts of the Monument. Heavy impacts to cryptobiotic crusts were observed throughout the canyon resulting from off-trail mountain bike use, horses, and hiking. In some areas social trails are quite dense and have resulted in considerable degradation of the cryptobiotic crusts. Educational signs posted strategically may help encourage people not to stray from the trails. Many of the Naturita milkvetch plants are seemingly dependent on shallow soil patches sitting on bedrock that are glued together and shielded from rapid erosion by the cryptobiotic crusts. Thus, this species may be particularly vulnerable to disturbance of the cryptobiotic crusts.

The area is presently almost entirely weed free, at least on the west side of Sand Creek which was visited in April 2000. Special management attention to this weed free

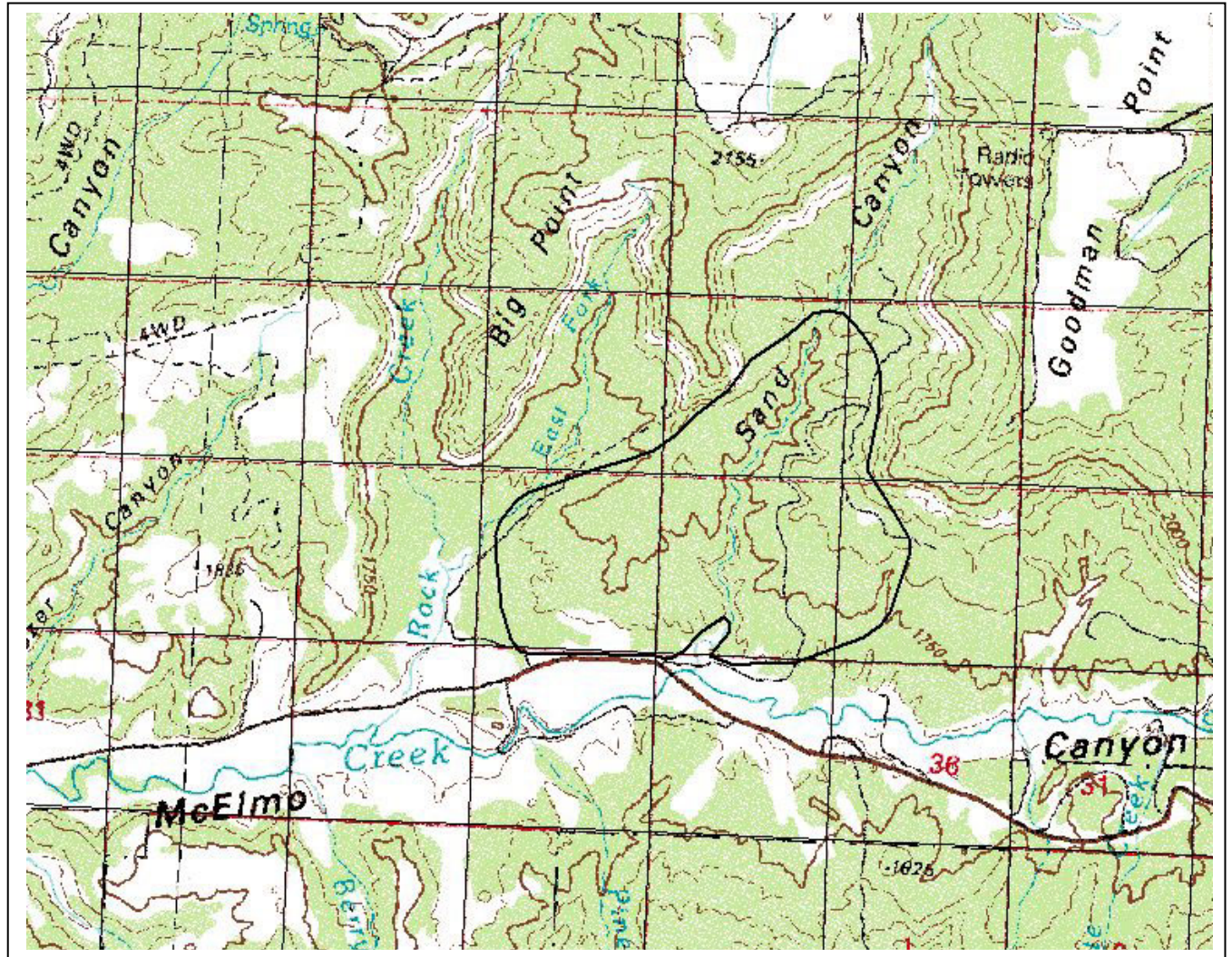
area is encouraged. Near the trailhead at McElmo Road, three weed species were observed that pose a significant threat if they are allowed to spread. Cheat grass (*Bromus tectorum*) poses the greatest threat, followed by bur buttercup (*Ceratocephala orthoceras*) and cranesbill (*Erodium cicutarium*). Managing for preservation of the cryptobiotic crusts will give the area a natural defense against these weeds by maintaining the integrity of the soil.

To the east of Sand Creek, several gas pads are located within the site. The anthropogenic disturbance regime of gas pads creates ideal habitat for noxious weeds, and they are often areas from which weeds can spread into natural habitat. Bur buttercup does particularly well in such places. Although these areas were not accessible to us in 2000 and we do not have data on rare plant interactions from this area, it is an area of concern within the site. The Naturita milkvetch is also known from the east side of Sand Canyon.



Figure 46. Trailhead at Sand Canyon

Sand Canyon at McElmo: B2. Very High Biodiversity Significance



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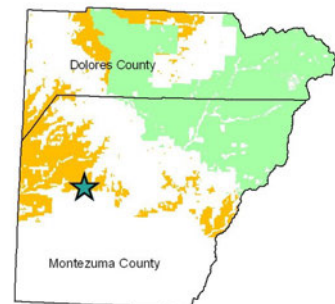


PCA BOUNDARY

Battle Rock
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Storm Peak PCA

Biodiversity Rank: B2: Very high biodiversity significance. This PCA supports an A ranked occurrence of an imperiled plant (G2,S2).

Protection Urgency Rank: P3: Protection actions may be needed, but probably not within the next 5 years. The site is within the San Juan National Forest, but has no additional protection.

Management Urgency Rank: M3: New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Monitoring for off-road vehicle impacts is recommended.

Location: The Storm Peak PCA is located in Dolores County, about three miles west of Rico. To reach the site take Highway 145 north of Stoner to FS Road 545. Continue on road 545 to the end and hike the Highline Stock trail along the ridge to Storm Peak.

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

Legal Description: T39 N, R11W, Section 5; T40N R11W Section 32

Elevation: 11,200 to 11,900 feet

Size: Approximately 113 acres

General Description: The Storm Peak PCA comprises high alpine tundra with several talus slopes and rock outcrops. It occupies south and east facing slopes south of Storm Peak. Colorful red, purple and white soils at the site are derived from the Dolores formation. The Highline Stock Trail runs along the ridge and is a popular hiking, horse packing, and ATV route. Several trails converge near the site. Colorado tansy aster (*Machaeranthera coloradoensis*) was found growing in alpine meadows as well as areas with eroded purple-red soil. Plants were flowering and appeared to be successfully regenerating in September. They appeared to thrive in areas with little competition from other plants where natural erosion of the soft red soils creates suitable sites. Associated species included Holm's ragwort, bottle gentian, kittentails, Thurber fescue, Rocky Mountain clover and spike trisetum (*Senecio holmii*, *Pneumonanthe parryi*, *Besseyia ritteriana*, *Festuca thurberi*, *Trifolium attenuatum* and *Trisetum spicatum*.)

Biodiversity Rank Justification and Comments: The Storm Peak PCA supports an excellent (A-ranked) occurrence of Colorado tansy aster, a globally imperiled (G2) plant.

Natural Heritage element occurrence at Storm Peak PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Machaeranthera coloradoensis</i>	Colorado tansy aster	G2	S2		A
<i>Alsinanthe macrantha</i>	House's stitchwort	G3	S3		E

*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary was drawn to encompass the occurrence of Colorado tansy aster and adjacent land above treeline within the same dark purple-red soil type.

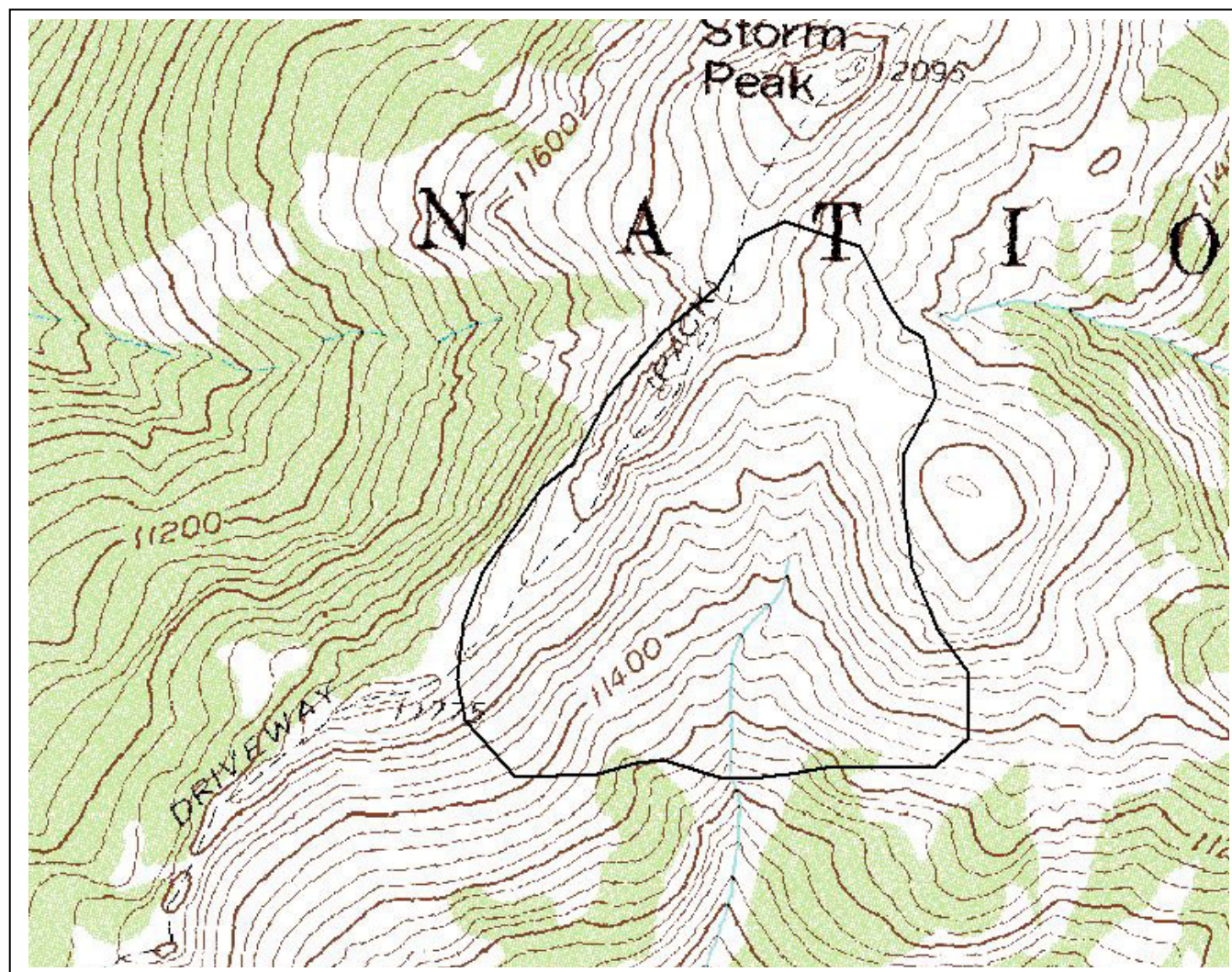
Protection Comments: The PCA is located within the San Juan National Forest, but has no additional protection.

Management Rank Comments: The Highline stock trail is open to motorized recreation and receives heavy use during the summer months. Most vehicles stay on established trails, but the Colorado tansy aster is located near trails and may be affected by dust deposit. Monitoring of this area for off-trail impacts is warranted.



Figure 47. Habitat of Colorado tansy-aster at Storm Peak

Storm Peak: B2. Very High Biodiversity Significance



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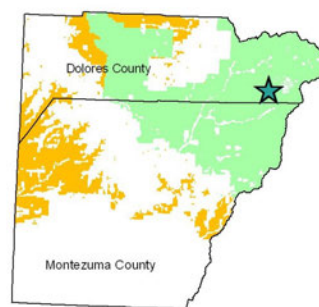


PCA BOUNDARY

Rico
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Cannon Ball Mesa PCA

Biodiversity Rank: B3: High biodiversity significance. This PCA has good (B-ranked) and excellent (A-ranked) occurrences of three plants that are rare in Colorado (S1, S2).

Protection Urgency Rank: P4: No protection actions are needed in the foreseeable future. The PCA is within the Canyons of the Ancients National Monument.

Management Urgency Rank: M2: New management actions may be needed within 5 years to prevent the loss of the element occurrences within the PCA. Control of noxious weeds will help preserve the quality of the rare plant and community occurrences.

Location: Cannon Ball Mesa is located in western Montezuma County, about 24 miles west of Cortez. Drive County Road G 19 miles west from Highway 789 (was US Highway 666) at Cortez, toward Ismay Trading Post. Here an unnamed gravel road heads north into the Canyons of the Ancients National Monument and the Cannon Ball Mesa PCA.

U.S.G.S. 7.5-minute quadrangle: Bowdish Canyon

Legal Description: T36N R19W, Sections 14, 15, 21-23, 27-29, 33, 34

Elevation: 5,200 to 5,600 feet

Size: Approximately 2,773 acres

General Description: Cannon Ball Mesa PCA lies within the Canyons of the Ancients National Monument boundary and incorporates parts of many drainages and mesas within a highly heterogeneous landscape in the Morrison and Dakota geological formations. The dominant landscape feature is Cannon Ball Mesa, the eastern portion of which has an excellent example of a shrubland dominated by shadscale saltbush (*Atriplex confertifolia*), greasewood (*Sarcobatus vermiculatus*), and galletagrass (*Pleuraphis jamesii*), classified as a cold desert shrubland (*Atriplex confertifolia*/ *Pleuraphis jamesii*). Here the mesa top is very slightly concave and poorly drained, creating unusually mesic conditions. Two tributaries of Yellowjacket Canyon, Risley Canyon and Moccasin Canyon, run east to west within the PCA.

Open pinyon-juniper woodlands, with a diverse and interesting herbaceous understory, dominate most of the area. Some of the many understory species noted are desert fraseria (*Frasera albomarginata*), bulbous spring parsley (*Cymopterus bulbosus*), sharp-leaf twinpod (*Physaria acutifolia*), heartleaf twistflower (*Streptanthus cordatus*), crescent milkvetch (*Astragalus amphioxys*), thrift mock goldenweed (*Stenotus armerioides*), tufted evening primrose (*Oenothera caespitosa*), and Whipple's fishhook cactus (*Sclerocactus whipplei*).

The eastern flanks of Cannonball Mesa support an unusual woodland dominated by Utah greasewood (*Forsyellia meionandra*), Utah juniper (*Juniperus osteosperma*), and mountain mahogany (*Cercocarpus montanus*). This community is similar to the

Utah juniper/ mountain mahogany (*Juniperus osteosperma*/ *Cercocarpus montanus*) woodland community, but with the notable addition of Utah greasebush, which is unusually large and robust at this site.

An access road for part of the Canyons of the Ancients National Monument passes through the PCA and is acting as a major corridor for weed invasion into the area. The tenacious Russian knapweed (*Acroptilon repens*) was the dominant roadside weed along much of the road. It was seen along the road within the occurrences of Utah beardtongue (*Penstemon utahensis*) and weak-stemmed mariposa lily (*Calochortus flexuosus*). It was also observed spreading into the species' occurrences, particularly within the Utah beardtongue occurrence, where it is moving downslope from a road cut. Tamarisk (*Tamarix ramosissima*) was found in low to moderate densities in the dry washes throughout the PCA. Hoary cress (*Cardaria draba*) was found where the road crosses Moccasin Creek, and it appears to be spreading along the wash in areas disturbed by periodic flows. Cheat grass (*Bromus tectorum*) was most abundant near roadsides, particularly in the southern portion of the site. However, many areas across the rest of the site have little or no cheat grass and remain in excellent condition. Evidence of illegal off-road activity that could spread cheat grass was observed.

Biodiversity Rank Justification and Comments: The Cannon Ball Mesa PCA supports occurrences of four rare plant species. There is one good (B-ranked) and one excellent (A-ranked) occurrence of weak-stemmed mariposa lily, rare (S2) in Colorado; a good (B-ranked) occurrence of short-stem beardtongue (*Penstemon breviculus*), vulnerable globally (G3), a good (B-ranked) occurrence of Utah beardtongue, rare (S2) in Colorado, and an unranked (E) occurrence of Palmer buckwheat (*Eriogonum palmerianum*), rare (S1) in Colorado. There are also two plant communities documented within the site: a good (B-ranked) occurrence of cold desert shrublands, and an unranked (E) occurrence of Utah juniper/Utah Greasebush.

Natural Heritage element occurrences at Cannon Ball Mesa PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Calochortus flexuosus</i>	Weak-stemmed mariposa lily	G4	S2		A
<i>Calochortus flexuosus</i>	Weak-stemmed mariposa lily	G4	S2		B
<i>Penstemon breviculus</i>	Short-stem beardtongue	G3	S2		B
<i>Penstemon utahensis</i>	Utah beardtongue	G4	S2		B
<i>Eriogonum palmerianum</i>	Palmer buckwheat	G4	S1		E
Plant communities					
<i>Atriplex confertifolia</i> / <i>Pleuraphis jamesii</i>	Cold desert shrublands	G3G5	S2		B
<i>Juniperus osteosperma</i> / <i>Forsellesia meionandra</i>	Utah juniper/Utah greasebush	GU	SU		E

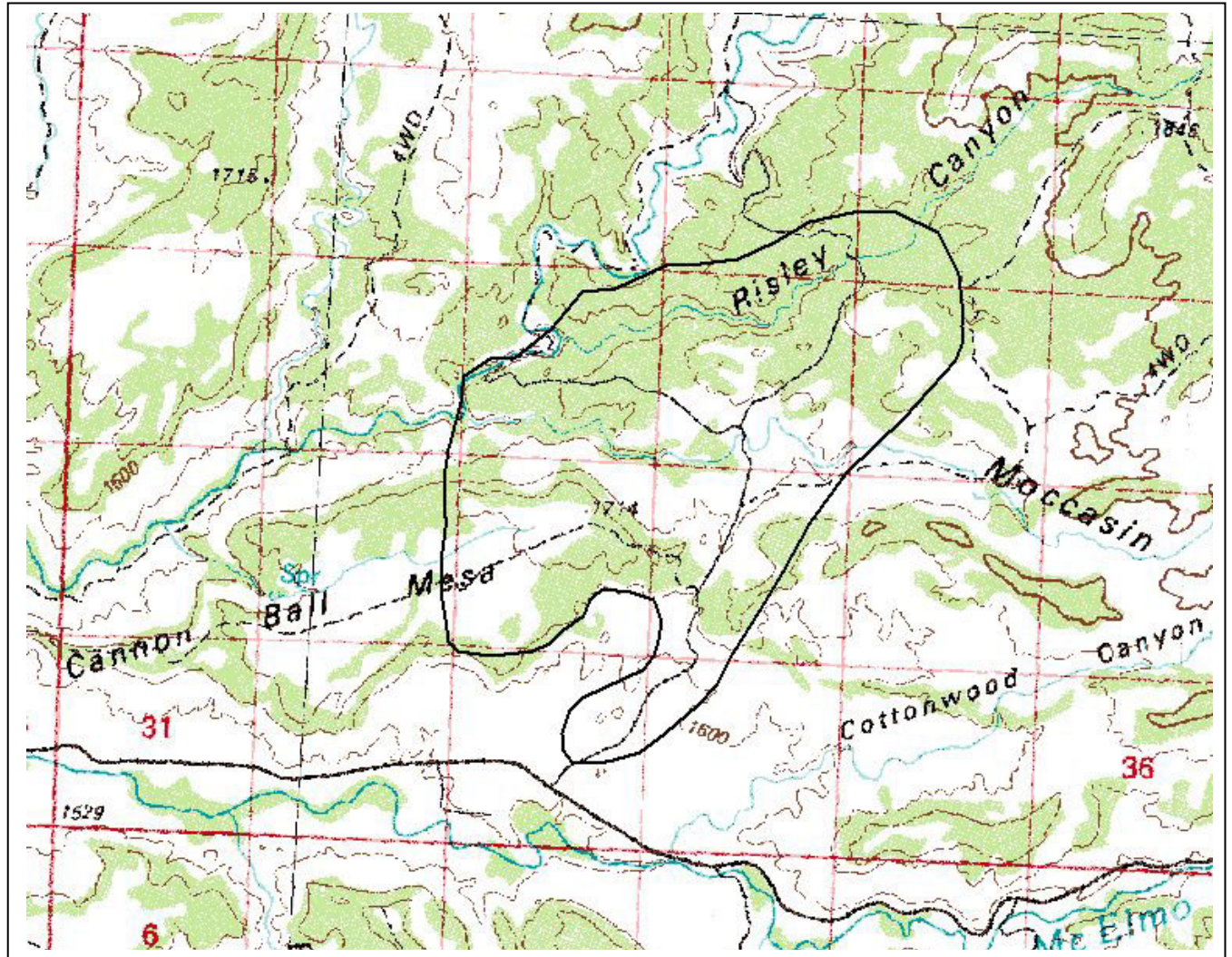
*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary is drawn to include all of the element occurrences in the vicinity of Cannon Ball Mesa, including occurrences near Risley and Moccasin Canyons. Further refinement of this planning boundary may be warranted if survey work is done in the vicinity in the future, since other rare plant occurrences may remain to be found nearby in unsurveyed areas.

Protection Comments: The core of the PCA is owned and managed by the BLM, but adjacent areas at the edges of the PCA are privately owned.

Management Rank Comments: Most of the site contains few weeds at present, however noxious weeds are invading the occurrence of Utah penstemon. Focused weed management in this area would benefit the element occurrence. Additionally, off-road vehicle traffic is impacting rare plant habitat in many areas, and increased enforcement may be necessary to manage vehicle traffic.

Cannon Ball Mesa. B3: High Biodiversity Significance



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PCA BOUNDARY

Bowdish Canyon
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Centennial Peak PCA

Biodiversity Rank: B3: High biodiversity significance. The PCA supports a plant that is globally imperiled (G2).

Protection Urgency Rank: P4: No protection actions are needed in the foreseeable future. The site is within the San Juan National Forest.

Management Urgency Rank: M3: New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Although no specific management needs are known, further surveys are warranted.

Location: The Centennial Peak PCA is located in eastern Montezuma County, at the La Plata County border, about 13 miles northeast of Mancos. The site can be accessed from the Sharktooth Trail beginning at Forest Road 346.

U.S.G.S. 7.5 minute quadrangles: La Plata

Legal Description: T37N, R11W, Sections 20, 21, 22, 27, 28, 29, 32, 33

Elevation: 11,600 to 13,792 feet

Size: Approximately 1,466 acres

General Description: The Centennial Peak PCA encompasses a high alpine region in the La Plata Mountains west of Durango. Three high peaks, Hesperus Peak, Centennial Peak and Mount Moss, surround the occurrence of San Juan Whitlow-grass (*Draba graminea*). The site was described as an alpine meadow with poorly developed vegetation. The PCA is based on a specimen collected by Dr. David Jamieson in 1990. Although the population is expected to be extant, it should be re-visited to confirm this and to evaluate its extent and condition.

Biodiversity Rank Justification and Comments: The PCA rank is based on an unranked (E) occurrence of a globally imperiled (G2) plant. Further survey to determine the extent and quality of this occurrence could result in a change to the site rank.

Natural Heritage element occurrence at the Centennial Peak PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Draba graminea</i>	San Juan whitlow-grass	G2	S2		E

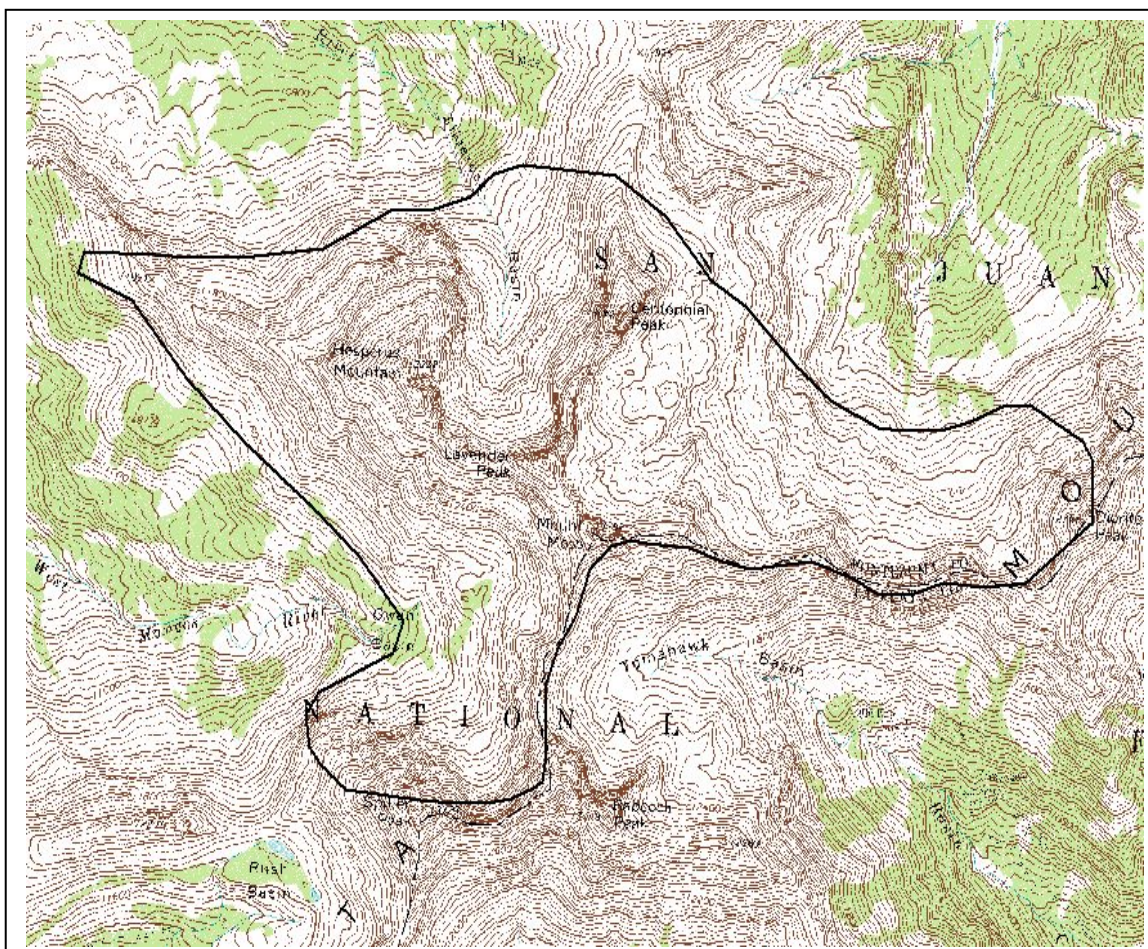
*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The PCA boundary was drawn to encompass the location of San Juan whitlow-grass and adjacent high alpine areas that may provide additional habitat for this species. Future surveys may help to further define this boundary.

Protection Comments: The site is within the San Juan National Forest, but has no further protective designation.

Management Rank Comments: No specific management needs are known at this time. Further survey of the area is needed to determine the size and quality of the San Juan whitlow-grass occurrence.

Centennial Peak. B3: High Biodiversity Significance



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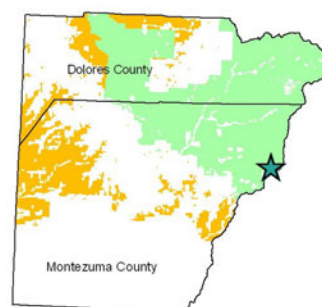


PCA BOUNDARY

La Plata
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Cross Mountain Trail PCA

Biodiversity Rank: B3: High biodiversity significance. This PCA supports an excellent (A-ranked) example of a globally vulnerable (G3) plant, and a good (B-ranked) example of a state rare (S2) plant.

Protection Urgency Rank: P4: No protection actions are needed in the foreseeable future. The PCA is within the Lizard Head Wilderness in the San Juan National Forest.

Management Urgency Rank: M4: Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences.

Location: Cross Mountain Trail PCA is located in eastern Dolores County, just south of the Dolores/San Miguel County border. It lies approximately 10 miles southwest of Telluride, or about two miles northwest of Lizard Head Pass on Colorado State Highway 145. To access this PCA, drive highway 145 to Lizard Head Pass and Cross Mountain Trailhead. Hike the Cross Mountain trail to below Lizard Head Peak.

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

Legal Description: T41N R10W, Sections 10, 11, 14 and 15

Elevation: 11,200 to 12,400 feet

Size: Approximately 489 acres

General Description: This PCA, on the border of San Miguel and Dolores Counties, lies on the south-facing, high alpine slopes of Cross Mountain and Lizard Head Peak, an area dominated by alpine tundra and talus fields. A good occurrence of the state-rare Altai chickweed (*Stellaria irrigua*) is found in the very unstable, smaller-diameter (< 1”) talus, underlain by thin, dark, coarse-textured soils. The predominant associated species on these talus fields are Harbour beardtongue (*Penstemon harbourii*), thickroot claytonia (*Claytonia megarhiza*) and brittle bladderfern (*Cystopteris fragilis*).

The Altai chickweed element occurrence is on the north side of the trail along the edges of talus below the peak at treeline. The surrounding area is spruce -fir (*Picea-Abies*) forest, and alpine tundra. Although the population surveyed was fairly small, there are thousands of acres of potential habitat in the area.

An excellent occurrence of House’s stitchwort (*Alsinothe macrantha*), though not fully surveyed, was documented in 2004 in the alpine tundra cushion plant communities along Cross Mountain trail and on south-facing slopes of Lizard Head Peak. Cross Mountain trail is a popular hiking trail, but no damage off-trail was noted, and the species appears to be abundant on the tundra.

Biodiversity Rank Justification and Comments: The biodiversity rank for the PCA is based on an excellent (A-ranked) occurrence of House’s stitchwort, a plant that is both globally vulnerable (G3) and vulnerable in Colorado (S3). In addition, the PCA also supports a good (B-ranked) occurrence of the statewide rare (G4/S2) Altai chickweed.

Natural Heritage element occurrences at Cross Mountain Trail PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Alsianthe macrantha</i>	House's stitchwort	G3	S3		A
<i>Stellaria irrigua</i>	Altai chickweed	G4	S2		B

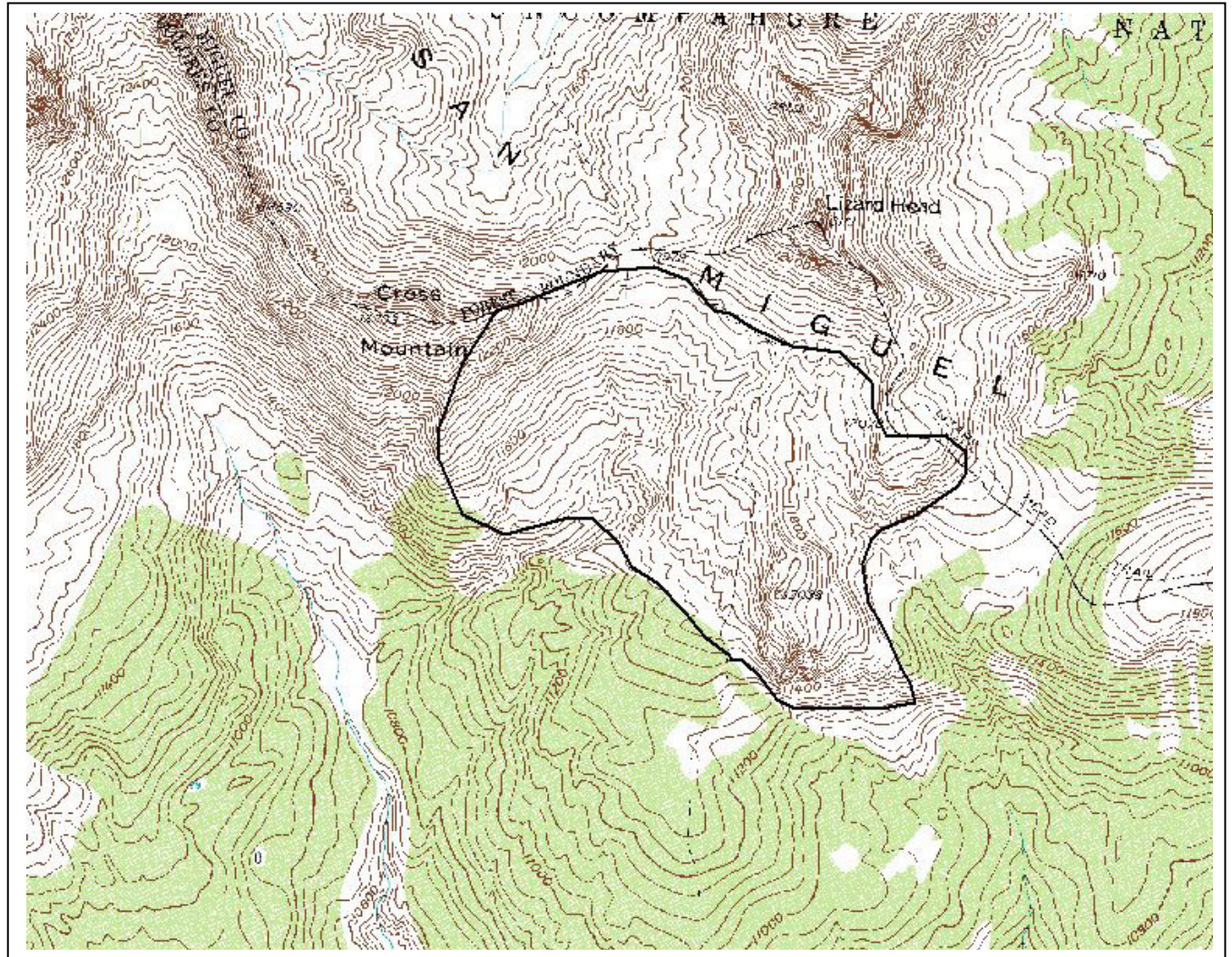
*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary is drawn to incorporate the area known to be occupied by House's stitchwort, as well as adjacent areas that share the same aspect, elevation and vegetation that may be occupied, and that will provide area for expansion and movement of the rare plant populations.

Protection Comments: The PCA is within the Lizard Head Wilderness Area, and adequate protection is afforded by the wilderness designation.

Management Rank Comments: The PCA occurs within a designated wilderness and no serious management needs are currently known or anticipated. Although a popular trail used by hikers runs through the site, no off-trail damage was noted or any exotic species observed.

Cross Mountain Trail. B3: High Biodiversity Significance



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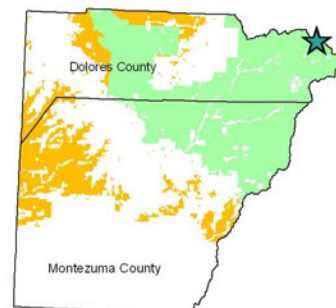


PCA BOUNDARY

Mount Wilson
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Dolores Canyon below McPhee Reservoir PCA

Biodiversity Rank: B3: High biodiversity significance. The PCA supports a good (B-ranked) occurrence of a globally vulnerable plant (G3).

Protection Urgency Rank: P4: No protection actions are needed in the foreseeable future. The site is located within the San Juan National Forest and the Lone Dome Recreation and Wildlife Area.

Management Urgency Rank: M4: Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences.

Location: The Dolores River Canyon below McPhee Reservoir PCA is located 10 miles northwest of Dolores and 4 miles south of the Bradfield Bridge.

U.S.G.S. 7.5 minute quadrangle: Doe Canyon
Legal Description: T 39N, R 16W, Section 19

Elevation: 6,584 to 6,590 feet

Size: Approximately 57 acres

General Description: This PCA is located within the Lone Dome State Recreation and Wildlife Area and the National Forest. Steep cliffs rise out of the Dolores Canyon and create overhangs, some with seeps. Seeps are formed when water from above permeates the upper rock layers, and then moves horizontally as it encounters an impermeable layer. At this site it emerges at the base of a vertical cliff, and provides an ideal, shaded habitat for giant helleborine (*Epipactis gigantea*). Over 200 individuals were counted behind a dense screen of poison ivy (*Toxicodendron rydbergii*) and Gambel oak (*Quercus gambelii*).

Biodiversity Rank Justification and Comments: This PCA supports a good (B-ranked) occurrence of giant helleborine, a plant that is globally vulnerable (G3).

Natural Heritage element occurrence at Dolores Canyon below McPhee reservoir PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Epipactis gigantea</i>	Giant Helleborine	G3	S2		B

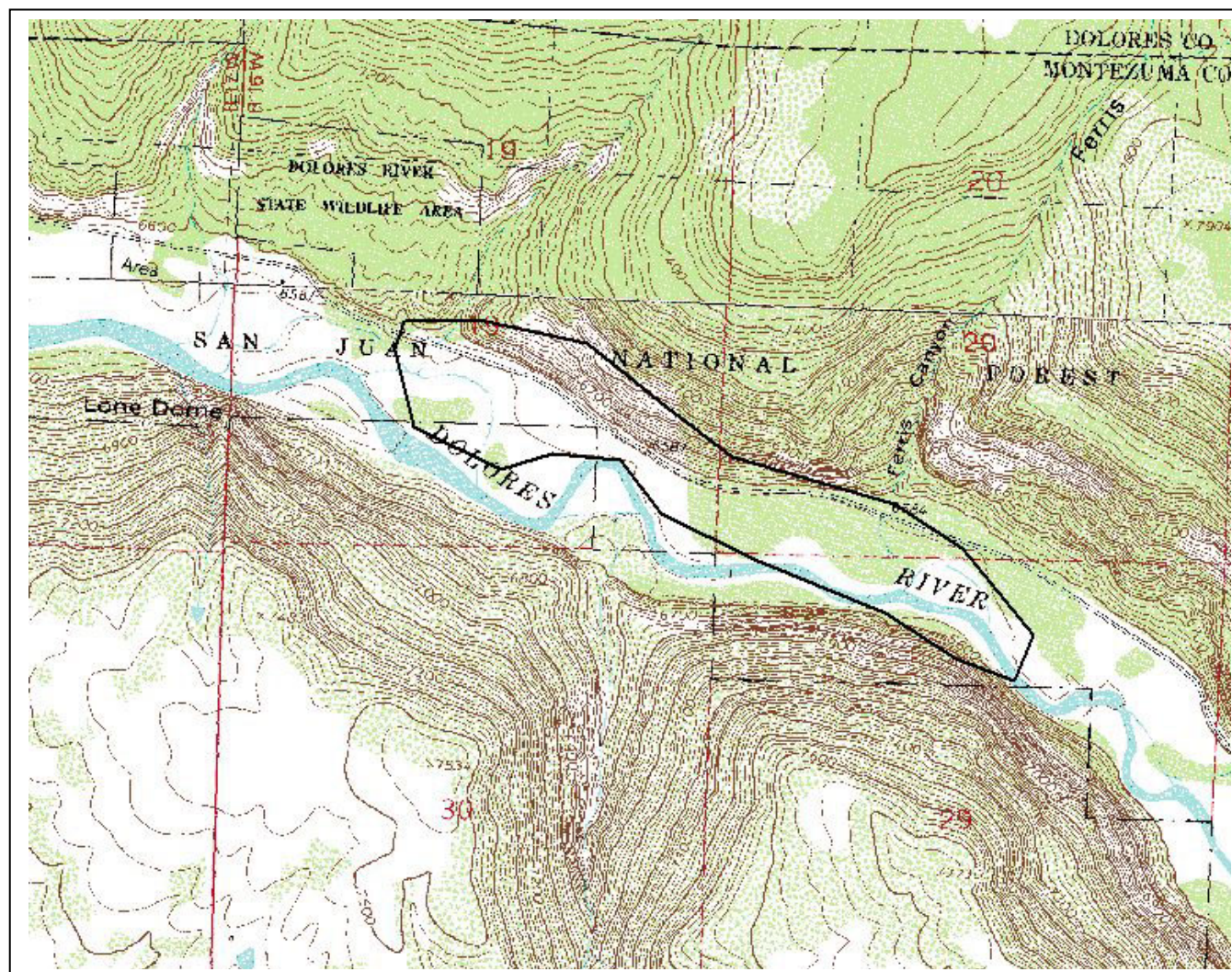
*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary is drawn to encompass the occurrence of giant helleborine. The habitat for the plants in this area is limited, and although adjacent cliff bases were searched, the necessary moist conditions were not present. Further survey several miles downstream, however may yield positive results.

Protection Comments: The PCA is well protected within the San Juan National Forest and the Lone Dome Recreation Area. Although the rare plant population is close to a well-traveled road, it is well protected from direct human disturbance by the difficulty of climbing through dense vegetation with much poison ivy.

Management Rank Comments: Any alteration to the hydrology above the occurrence could affect the rare plant population. Exotic species are common along the Dolores River; however, without some major disturbance they are unlikely to invade this site.

Dolores Canyon Below McPhee. B3: High Biodiversity Significance



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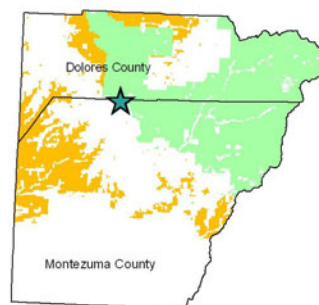


PCA BOUNDARY

Yellow Jacket
Doe Canyon
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Dolores Peak PCA

Biodiversity Rank: B3: The PCA supports an excellent (A-ranked) occurrence of a globally vulnerable (G3) plant.

Protection Urgency Rank: P4: Low urgency. No protection actions are needed in the foreseeable future. The site is within the Lizard Head Wilderness.

Management Urgency Rank: M4: Low urgency. Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. No management needs were noted in the PCA, although there are some exotic plants in wet meadows below the PCA boundary.

Location: Dolores County, on southeast side of Dolores Peak, in Lizard Head Wilderness. About 11 miles north-northwest of Rico. Access from Fish Creek Trail.

U.S.G.S. 7.5 minute quadrangles: Dolores Peak

Legal Description: T41N, R11W, Sections 4, 5, 7 and 9

Elevation: 11,400 to 13,000 feet

Size: Approximately 169 acres

General Description: The PCA begins at timberline on the southeast slopes of Dolores Peak, and extends to 13,000 feet, just below the summit. A mixture of barren talus, dry tundra and wet meadows comprises the site. Snowfall from the site feeds the West Dolores River. A hiking trail approaches the site from the Fish Creek drainage, but once above treeline, travelers tend to find their own routes.

House's stitchwort (*Alsinnanthe macrantha*) was found in both dry tundra and talus, at all elevations in the PCA. Other plants growing in and adjacent to the talus just above timberline include American rock-brake, stinging nettles, Colorado columbine, black groundsel, Thurber fescue, twinberry honeysuckle, brittle fern, raspberry, thickroot claytonia, and Gray's angelica (*Cryptogramma acrostichoides*, *Urtica gracilis*, *Aquilegia coerulea*, *Senecio atratus*, *Festuca thurberi*, *Distegia involucrata*, *Cystopteris fragilis*, *Rubus idaeus*, *Claytonia megarhiza*, and *Angelica grayi*). At higher elevations, there is a very high diversity of common tundra plants such as cushion phlox, moss campion, alpine fescue, Rocky Mountain clover, false strawberry, dwarf clover, pygmy goldenweed, golden whitlow-grass, alpine avens, lanceleaf bluebells, blackhead daisy, Holm's ragwort, purple fringe, wallflower, old man of the mountains, sky pilot, arctic bluegrass, slender wheatgrass, bistort, cutleaf daisy, and Hayden's Indian paintbrush (*Phlox condensata*, *Silene acaulis*, *Festuca brachyphylla*, *Trifolium attenuatum*, *Sibbaldia procumbens*, *Trifolium nanum*, *Tonestus pygmaeus*, *Draba aurea*, *Geum rossii*, *Mertensia lanceolata*, *Erigeron melanocephalus*, *Senecio amplexans* var. *holmii*, *Phacelia sericea*, *Erysimum capitatum*, *Rydbergia grandiflora*, *Polemonium confertum*, *Poa arctica*, *Elymus trachycaulus*, *Bistorta bistortoides*, *Erigeron compositus*, and

Castilleja haydenii). Small moist depressions in the site contain a diversity of alpine and subalpine graminoids and forbs, including thistle groundsel, Holm sedge, chiming bells, rose crown and fleshy starwort (*Senecio crassulus*, *Carex chalcoplepis*, *Mertensia ciliata*, *Rhodiola integrifolia*, and *Stellaria crassifolia*. A more complete species list is included in Appendix.

Biodiversity Rank Justification and Comments: The site rank is based on an excellent (A-ranked) occurrence of a globally vulnerable (G3) plant. At this time, House's stitchwort appears to be locally abundant but little documented. Further survey and documentation of additional populations may lower the species rank, thus lowering the biodiversity rank of this site.

Natural Heritage element occurrences at the Dolores Peak PCA

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Alsinanthe macrantha</i>	House's stitchwort	G3	S3		A

*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary is drawn to encompass the talus slopes and dry rocky tundra that support House's stitchwort. It includes the south facing slopes of Dolores Peak at and above timberline.

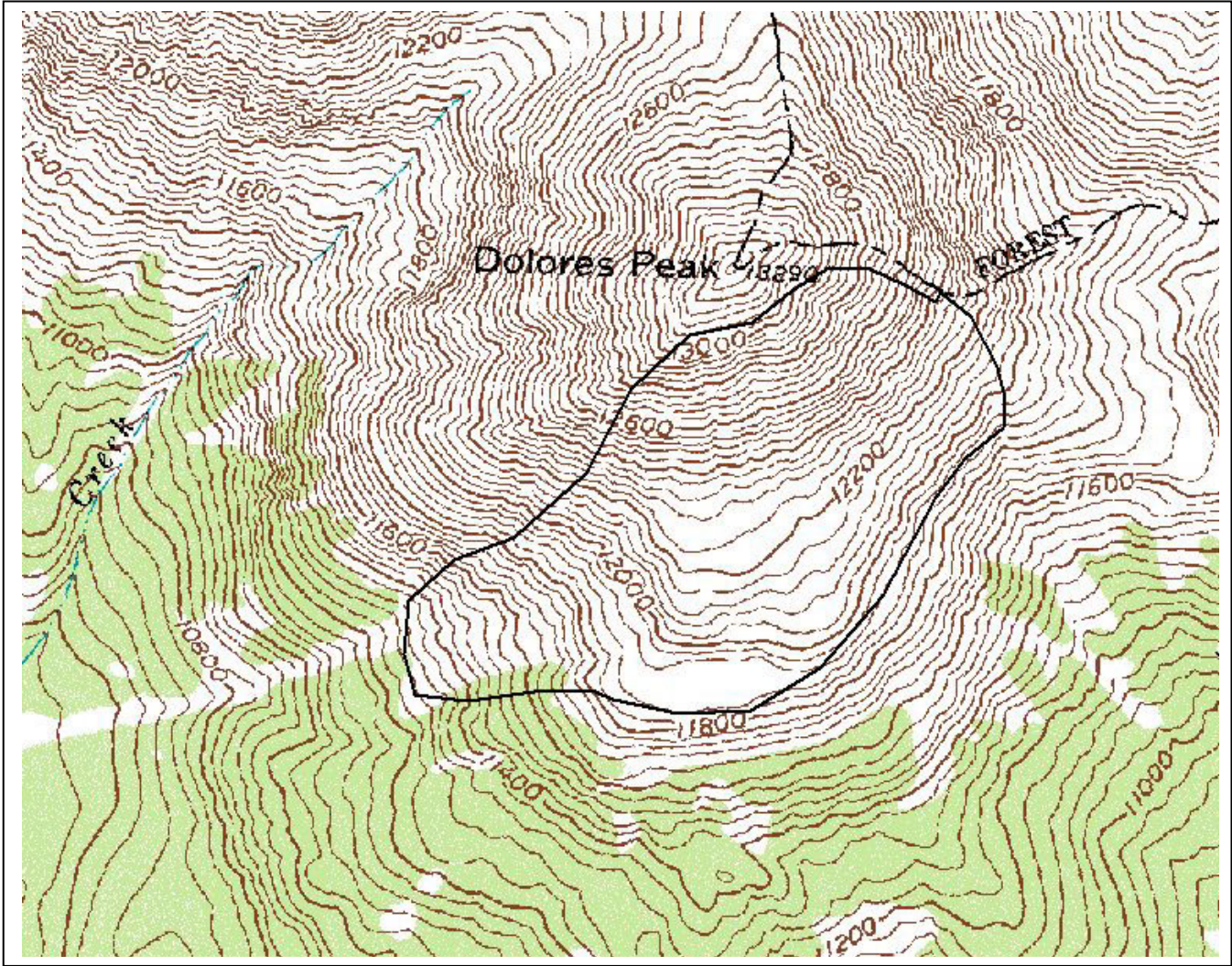
Protection Comments: The PCA is well protected within the Lizard Head Wilderness of the San Juan National Forest.

Management Rank Comments: Although there are some exotic species, including *Cirsium arvense* and *Bromus inermis*, in the wet meadow openings of the spruce fir forest below the PCA, none were observed above timberline.



Figure 48. Dolores Peak with talus at timberline.

Dolores Peak. B3: High Biodiversity Significance



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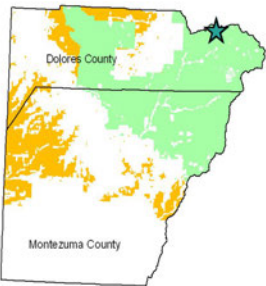


PCA BOUNDARY

Dolores Peak
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Elliott Mountain - Sockrider Peak PCA

Biodiversity Rank: B3: High biodiversity significance. This PCA supports excellent (A-ranked) and good (B-ranked) occurrences of globally vulnerable (G3) and state rare (S2) plants.

Protection Urgency Rank: P4: Low urgency. No protection actions are needed in the foreseeable future. The site is within the San Juan National Forest.

Management Urgency Rank: M3: Moderate urgency. New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Recreational use is heavy and warrants monitoring.

Location: Dolores County, about 3 miles northwest of Rico. To access the PCA, take highway 145 north of Rico about 7 miles, to FS road 535 and then go south on FS road 471 to the Calico Trail Head or continue farther south to the East Fork trailhead.

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

Legal Description: T40N, R11W, Sections 10, 15, 16, 17, 20 and 21

Elevation: 11,400 to 12,340 feet

Size: Approximately 522 acres

General Description: The Highline Stock Trail follows this long ridge of Precambrian rock connecting the high Peaks of Elliott Mountain, Sockrider Peak and Johnny Bull Peak. An extensive network of hiking and horse trails lead to the Highline Stock Trail from various access points. The PCA encompasses high alpine talus slopes and rock outcrops, moist alpine meadows and dry tundra. The highlands of the PCA rise above rich spruce fir and aspen forests and broad wet meadows. The rare plants found at the site were found in a variety of habitats: House's stitchwort (*Alsinothe macrantha*) and Boreal whitlow-grass (*Draba borealis*) grow both in rocky areas and cushion plant communities, while Altai chickweed (*Stellaria irrigua*) is confined to talus slopes. Colorado Divide whitlow-grass (*Draba streptobrachia*) was found in crevices of solid rock outcrops. Some common alpine species that occupy the talus slopes of the PCA include Fremont's groundsel, Holm's ragwort, Colorado columbine, and brittle fern (*Senecio fremontii*, *Senecio amplexans* var. *holmii*, *Aquilegia coerulea*, and *Cystopteris fragilis*.) Rocky alpine tundra supports a high diversity of plants including House's stitchwort, cushion phlox, Rocky Mountain lousewort, alpine avens, Franciscan bluebells, Bering chickweed, Rocky Mountain clover, alpine timothy, alpine sagebrush, alpine clover, golden saxifrage and Rocky Mountain snowlover (*Alsinothe macrantha*, *Phlox condensata*, *Pedicularis scopulorum*, *Geum rossii*, *Mertensia franciscana*, *Cerastium beeringianum*, *Trifolium attenuatum*, *Phleum commutatum*, *Artemisia scopulorum*, *Trifolium nanum*, *Hirculus platysepalus*, and *Chionophila jamesii*.)

The trail is open to both hikers and motorcycles, although parts of it are dangerously steep and rocky for motorized use. Use of horses is popular from the Calico trailhead, both during the summer and in hunting season.

Biodiversity Rank Justification and Comments: The PCA rank is based on two excellent (A-ranked) occurrences of House's stitchwort, a plant currently considered globally vulnerable (G3). At this time, House's stitchwort appears to be locally abundant but little documented. Further survey and documentation of additional populations may lower the species rank, thus lowering the biodiversity rank of this site. The site also supports a fair (C, due to small size) occurrence of Colorado Divide whitlow-grass, ranked globally vulnerable (G3), a good (B-ranked) occurrence of Altai chickweed, and fair (C-ranked) occurrences of boreal whitlow-grass, globally common (G4) but rare in Colorado (S2). Although the small population size observed determined ranks of fair (C) for three occurrences, all occurrences were ranked excellent (A) for condition and landscape context.

Natural Heritage element occurrences at Elliot Mt.-Sockrider Peak PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Alsinarthe macrantha</i>	House's stitchwort	G3	S3		A
<i>Alsinarthe macrantha</i>	House's stitchwort	G3	S3		A
<i>Draba streptobrachia</i>	Colorado Divide whitlow-grass	G3	S3		C
<i>Stellaria irrigua</i>	Altai Chickweed	G4?	S2		B
<i>Draba borealis</i>	Boreal whitlow-grass	G4	S2		C
<i>Draba borealis</i>	Boreal whitlow-grass	G4	S2		C

*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary is drawn to include the alpine areas along the ridge from Calico Peak to Johnny Bull Peak. It encompasses a mosaic of intermingling microsites suitable to the species above. The rocky ridgetop supports House's stitchwort and Boreal whitlow-grass, while scattered outcrops of solid rock are home to Colorado Divide whitlowgrass, and associated talus slopes just below the ridge have Altai chickweed. Surveys in 2004 covered the area between Calico Peak and Sockrider Mountain, and from another access point, the summit of Johnny Bull Mountain. It is expected that the unsurveyed areas in the PCA contain more of the same rare plants. The site is intended to include sufficient area to support potential pollinators and movement of the plant populations over time.

Protection Comments: The PCA is located within the San Juan National Forest, but has no additional designation.

Management Rank Comments: The PCA appears to be in excellent condition. No exotic species were encountered. Disturbance appears to be limited to the established trails at present, but there are some flat areas along the ridge where off-trail use could occur. Monitoring periodically would help to detect any changes in condition.

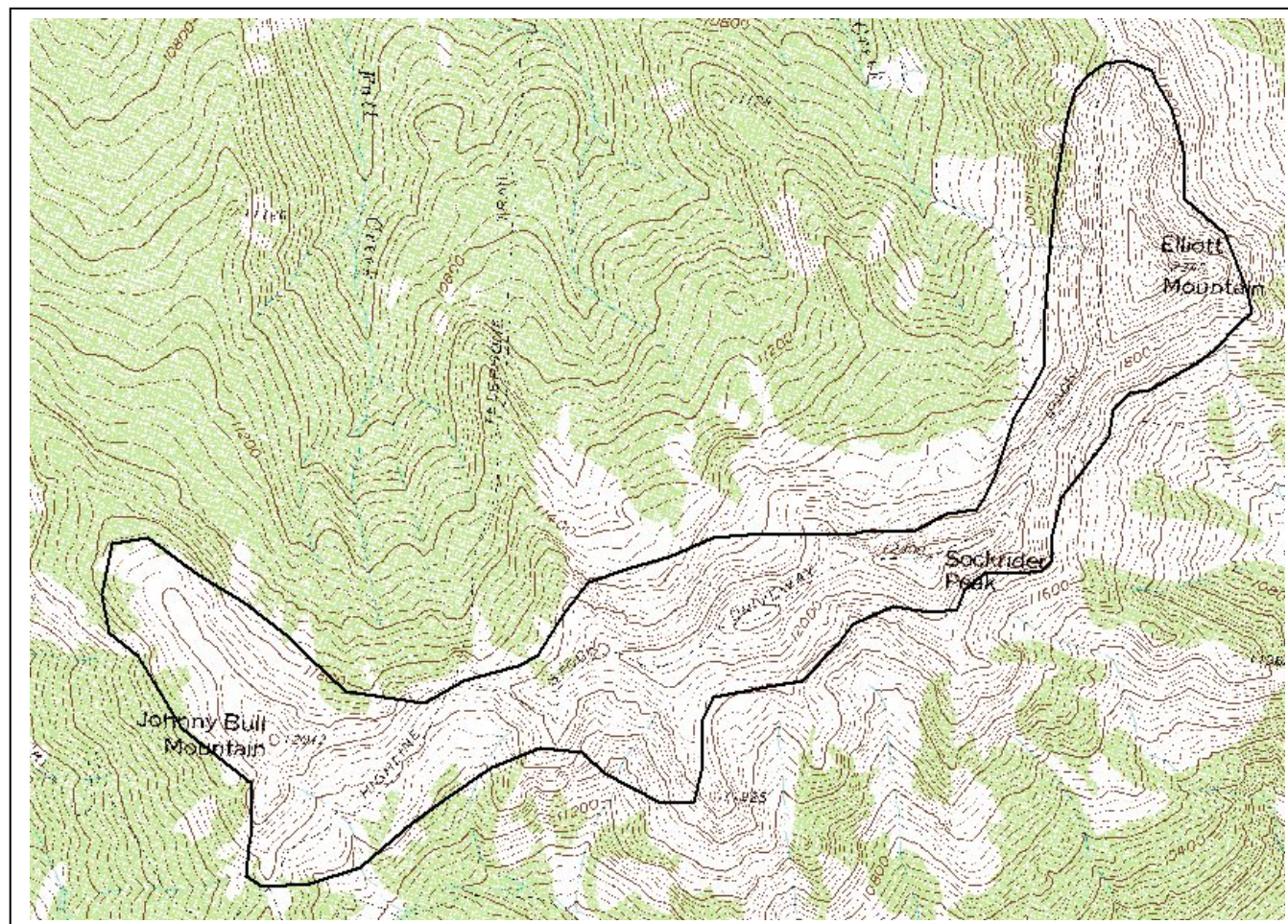


Figure 49. Ridge between Elliott Mountain and Sockrider Peak



Figure 50. Landscape below Sockrider Peak

Elliott Mountain-Sockrider Peak. B3: High Biodiversity Significance



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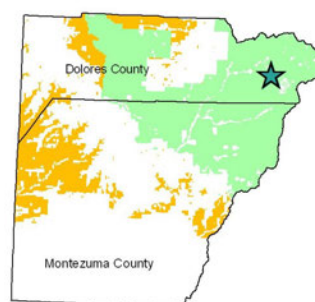


PCA BOUNDARY

Rico
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Hermosa Peak PCA

Biodiversity Rank: B3: High biodiversity significance. This PCA supports an excellent (A-ranked) occurrence of a globally vulnerable plant, and two state imperiled (S2) plants in good condition (B-ranked).

Protection Urgency Rank: P4: Low urgency. No protection actions are needed in the foreseeable future. The PCA is located in the San Juan National Forest, with no additional protection.

Management Urgency Rank: M4: Low urgency. Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. The site is in good condition. Periodic monitoring would help to detect any changes.

Location: San Juan and Dolores counties, about five miles east of Rico. To access the PCA, travel north from Rico on highway 145. Turn right on Forest Service Road 578 and go to the end of the road. Park and hike south on the Colorado Trail.

U.S.G.S. 7.5 minute quadrangle: Hermosa Peak

Legal Description: T40N,R10W, Sections 23, 24, 25, and 26

Elevation: 11,400 to 12,579 feet

Size: Approximately 577 acres

General Description:

This PCA, located on the border of San Juan and Dolores Counties, is a region of high alpine peaks, meadows, rock outcrops, talus slopes and creeks fed by gradual snow melt. Uplifted Jurassic sandstones and Tertiary intrusive rocks form the high ridge that divides the Animas River drainage from the Dolores River drainage. Rising above the spruce-fir forests, the lower slopes have grassy areas dominated by Thurber fescue (*Festuca thurberi*) and osha (*Ligusticum porteri*), grading into alpine tundra and talus slopes at the highest elevations.

The alpine community includes diverse species, including Gray's angelica, black-headed daisy, purple fringe, weak saxifrage, Colorado columbine, sulphur Indian paintbrush, alpine sagebrush, bistort, Holm's ragwort, thickroot claytonia, alpine sorrel and arctic willow (*Angelica grayi*, *Erigeron melanocephalus*, *Phacelia sericea*, *Saxifraga hyperborea* ssp. *debilis*, *Aquilegia coerulea*, *Castilleja sulphurea*, *Artemisia scopulorum*, *Bistorta bistortoides*, *Senecio holmii*, *Claytonia megarhiza*, *Oxyria digyna* and *Salix arctica*) See Appendix – for a more complete species list.

House's stitchwort (*Alsianthe macrantha*) was widespread and abundant in this community. The occurrence of Altai chickweed (*Stellaria irrigua*) was located on the edge of a talus slope below Hermosa Peak, in areas of smaller size rock. boreal whitlow-grass (*Draba borealis*) was found just below a ridge top in crevices of a rock outcrop.

Biodiversity Rank Justification and Comments: The site rank is based on an excellent (A-ranked) occurrence of House's stitchwort, a globally vulnerable (G3) plant. At this time, House's stitchwort appears to be locally abundant but little documented. Further survey and documentation of additional populations may lower the species rank, thus lowering the biodiversity rank of this site.

Natural Heritage element occurrences at Hermosa Peak PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Alsinanthe macrantha</i>	House's stitchwort	G3	S3		A
<i>Draba borealis</i>	Boreal whitlow-grass	G4	S2		B
<i>Stellaria irrigua</i>	Altai Chickweed	G4?	S2		B,C

*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary is drawn to include the rare plant occurrences, with additional potential habitat that may be occupied but unsurveyed, or will allow for expansion of the plant populations in the future. It encompasses intermingling microsites of rocky tundra and talus. It is intended to be sufficiently large to accommodate pollinators of the plants.

Protection Comments: The site is in the San Juan National Forest, and has no additional protection.

Management Rank Comments: The Colorado Trail is open to hiking, horseback riding and non-motorized bicycles. Although no damage was noted, periodic monitoring along the trail would help to detect any changes in condition.

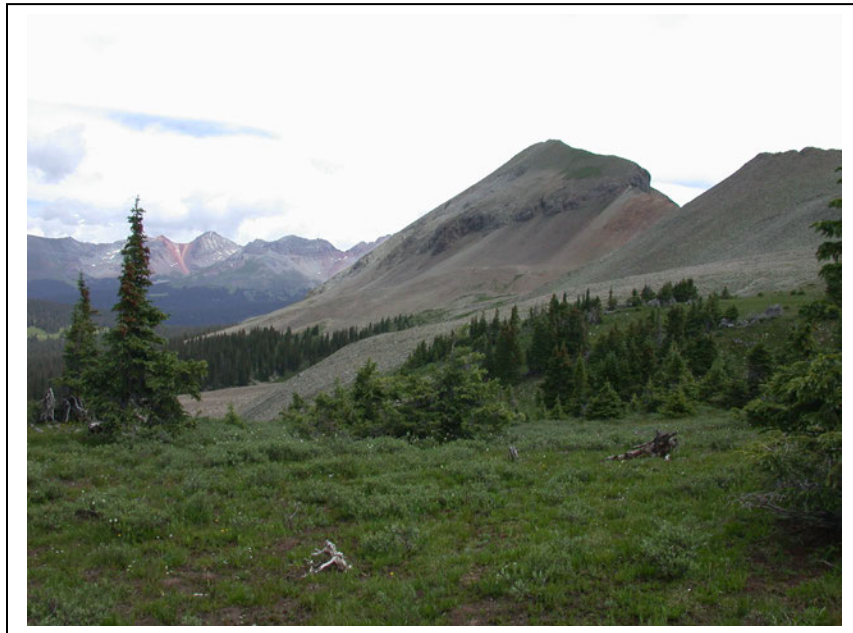
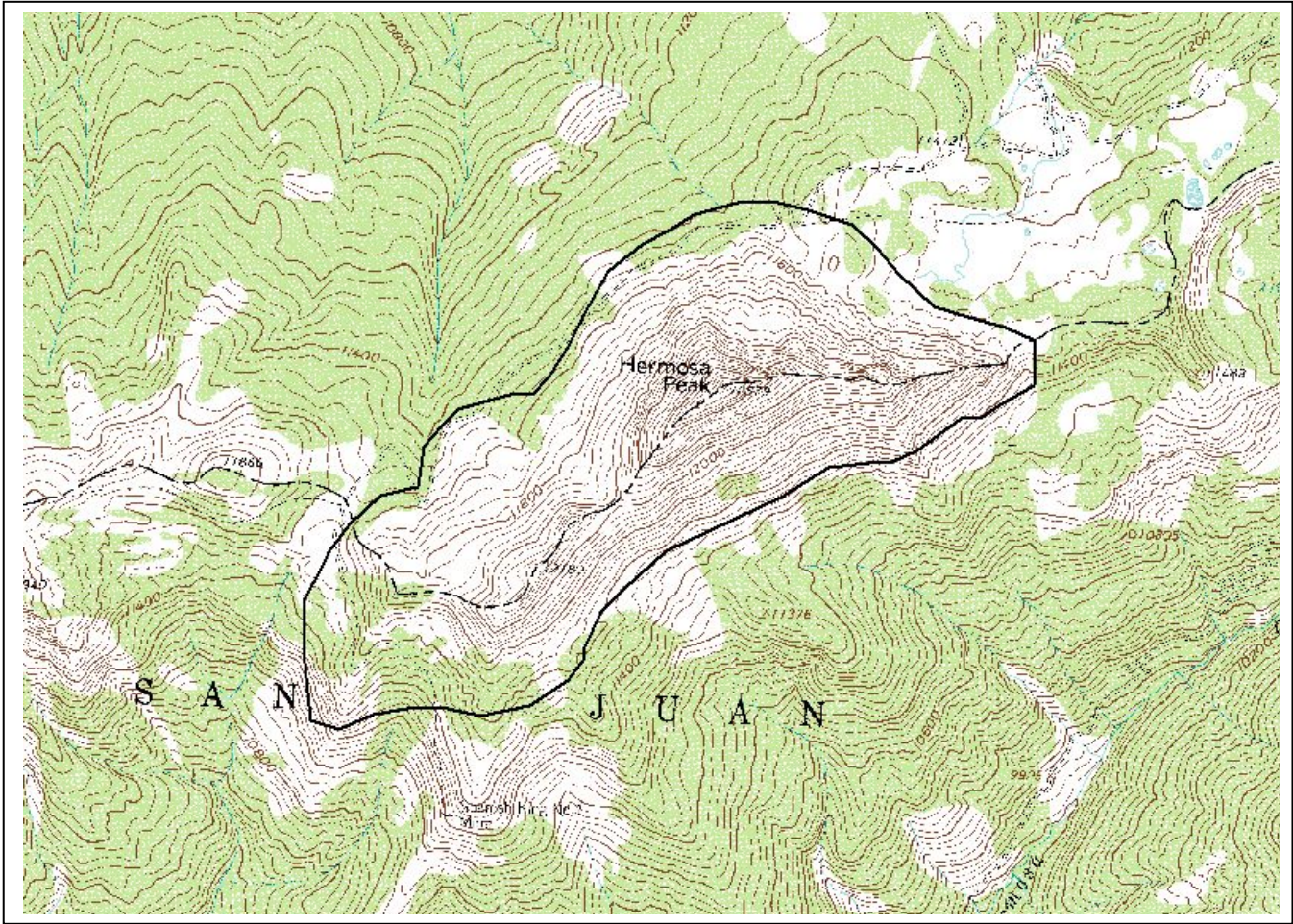

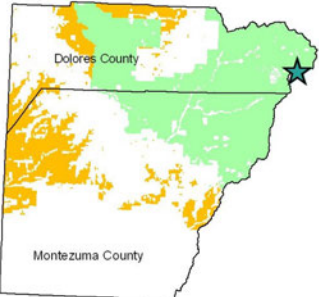


Figure 51. Wet meadows below Hermosa Peak

Hermosa Peak. B3: High Biodiversity Significance



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Menefee Mountain PCA

Biodiversity Rank: B3: High biodiversity significance. This PCA supports an excellent (A-ranked) occurrence of a plant that is globally vulnerable (G3).

Protection Urgency Rank: P3: Moderate urgency. Protection actions may be needed, but probably not within the next 5 years. It is estimated that stresses may reduce the viability of the elements in the PCA if protection action is not taken. Although designated a Wilderness Study Area, the site was not recommended for wilderness, and its future status is in question.

Management Urgency Rank: M2: High urgency. New management actions may be needed within 5 years to prevent the loss of the element occurrences within the PCA. Monitoring and control of exotic species is needed to maintain the quality of the site.

Location: Montezuma County, about four miles south of Mancos. To reach the site, go south on the Weber Canyon Road. Most access to the site is blocked by private land, but BLM land touches the county road at a few places.

U.S.G.S. 7.5 minute quadrangles: Mancos and Trail Canyon

Legal Description: T35N, R13W, Sections 16, 20, 21, 27, 28, 29, 32, 33 and 34

Elevation: 6,600 to 7,000 feet

Size: Approximately 2,177 acres

General Description: This PCA comprises pinyon and juniper covered hillsides of Menefee Mountain immediately above Weber Canyon and East Canyon. The entire mountain of 7,089 acres has been designated a Wilderness Study Area by the BLM. Steep canyons radiate out from the 6-mile long ridge of Menefee Mountain. While Pinyon-juniper woodland is the dominant vegetation type at the lower elevations, there are oakbrush and pockets of ponderosa pine and spruce/fir at the higher elevations. The BLM states that “The WSA provides outstanding recreation opportunities for the hiker, backpacker and rock climber.” (BLM 2004). A “sister” WSA is located to the west at Weber Mesa, and is scheduled to be surveyed in 2005.

The highly erodable south facing slopes of Mancos shale support excellent occurrences of two rare plants that are well adapted to this environment. Abajo Penstemon (*Penstemon lentus*) occupies protected areas in gullies and along the canyon rim. It is most abundant on the lower eroded slopes, along the canyon rim and extending down about 50 feet from the top. About five hundred individuals were counted, but it is expected that the population extends to all similar habitat in the area and may have thousands of plants. San Juan gilia (*Gilia haydenii*) was found on very steep, eroding clay slopes above East Creek, where it was the dominant species, with numbers estimated in the thousands.

Biodiversity Rank Justification and Comments: The site rank is based on excellent (A-ranked) occurrences of two plants: San Juan gilia is globally vulnerable (G3) and rare in Colorado (S2); Abajo Penstemon, formerly considered rare in Colorado, has been found to be more common as a result of new surveys, and has been watchlisted (S3).

Natural Heritage element occurrences at Menefee Mt. PCA

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Gilia haydenii</i>	San Juan gilia	G3	S2		A
<i>Penstemon lentus</i>	Abajo penstemon	G4Q	S3		A
<i>Penstemon lentus</i>	Abajo penstemon	G4Q	S3		A

*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary incorporates the habitat of San Juan gilia and Abajo penstemon on the lower erodable slopes of Mancos shale. Both species are dependent on the erosion and downhill creep of the soft soils. Sufficient area has been incorporated to allow expansion of the plants into adjacent suitable habitat over time.

Protection Comments: The area is designated by BLM as a Wilderness Study Area, and therefore currently enjoys the same protection as wilderness. However, none of the site has been recommended by BLM as wilderness, so its future status is questionable.

Management Rank Comments: There are many exotic species along the roads, including: cheatgrass, musk thistle, sweetclover, smooth brome, Russian knapweed, tumble mustard, Russian thistle, horehound, and prickly lettuce (*Bromus tectorum*, *Carduus nutans*, *Melilotus officinalis*, *Bromus inermis*, *Acroptilon repens*, *Sisymbrium altissimum*, *Salsola australis*, *Marrubium vulgare*, and *Lactuca serriola*). (See Appendix – for complete species list.) Although they are mainly confined to the roadsides and adjacent private land, monitoring and control where they encroach onto public land would benefit the condition of the WSA. Also, working with the county road department and the adjacent landowner to control weeds could be worthwhile.

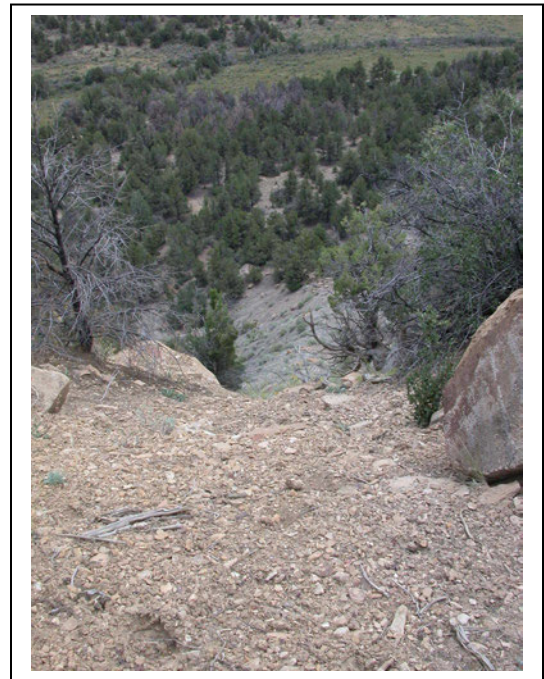
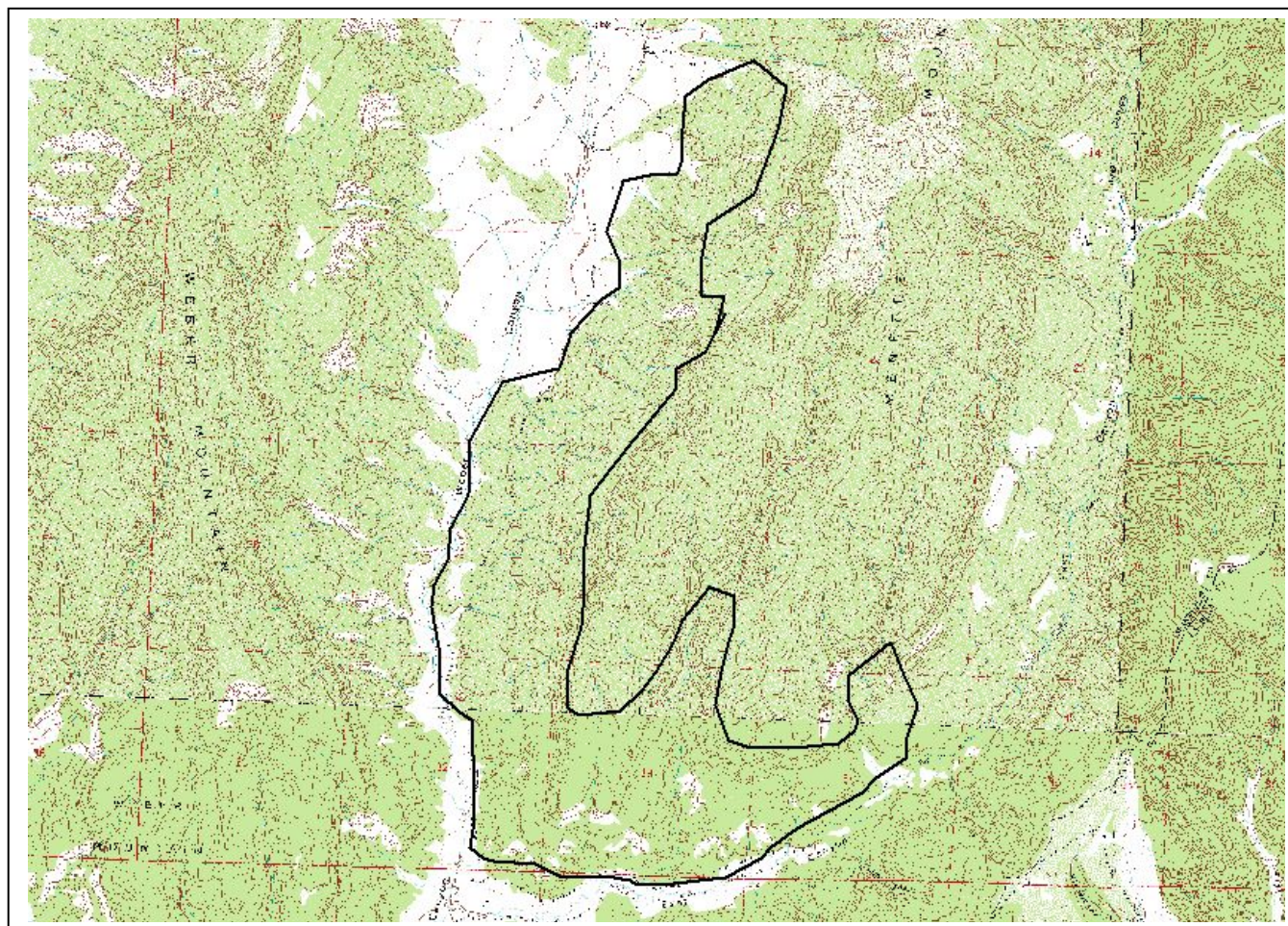


Figure 52. Menefee Mountain PCA

Menefee Mountain. B3: High Biodiversity Significance



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PCA BOUNDARY

Mancos
Trail Canyon
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Mud Canyon PCA

Biodiversity Rank: B3: High biodiversity significance. The PCA supports an excellent (A-ranked) occurrence of a globally vulnerable (G3) plant.

Protection Urgency Rank: P2: Protection actions may be needed within 5 years. It is estimated that stresses may reduce the viability of the elements in the PCA within this approximate timeframe. Private land in the site has no special protection.

Management Urgency Rank: M2: New management actions may be needed within 5 years to prevent the loss of the element occurrences within the PCA. Weed control is needed to prevent exotic species spread into rare plant populations.

Location: Mud Canyon PCA is located in Montezuma County, north and south of McElmo Creek, about one mile west of Cortez. To reach the southern part of the PCA from the McElmo Creek Road, turn south on Road 21 at the sign to “Stone Crusher”. Turn west on dirt roads at 0.5 mi. or 0.75 miles. The northern part of the site can be accessed on foot from the McElmo Creek Road just east of Majors Cemetery.

U.S.G.S. 7.5 minute quadrangle: Mud Creek

Legal Description: T35N,R17W, Sections 1, 2, 11, 12, 13 and 14; T35N R16W Sections 4, 5, 6, 7, 8, and 18; T36N R17W Sections 35 and 36; T36N R16W Sections 28-33

Elevation: 5,800 to 6,000 feet

Size: Approximately 6,369 acres

General Description: This PCA is located south of Mc Elmo Canyon. It contains a mosaic of pinyon - juniper (*Pinus edulis* - *Juniperus osteosperma*) woodland on the north facing hillsides, and excellent examples of sagebrush/grass communities on south slopes and in low lying areas. A high diversity of plants occupies the red sandy soil of this PCA. In addition to big sagebrush, shrubs include bitterbrush (*Purshia tridentata*), low rabbitbrush (*Chrysothamnus viscidiflorus*), longflower rabbitbrush (*Chrysothamnus depressus*), and black sagebrush (*Artemisia nova*). Major grasses include needle and thread (*Hesperostipa comata*), Indian rice grass (*Oryzopsis hymenoides*), blue gramma (*Bouteloua gracilis*), galleta (*Pleuraphis jamesii*), six weeks fescue (*Vulpia octoflora*), prairie junegrass (*Koeleria macrantha*) and bottlebrush squirreltail (*Elymus elymoides*). Forbs include prince’s plume (*Stanleya pinnata*), scarlet globemallow (*Sphaeralcea coccinea*), western tansy-mustard (*Descurainia pinnata*), scorpionweed (*Phacelia crenulata*), sand aster (*Chaetopappa ericoides*), New Mexico thistle (*Cirsium neomexicanum*), rock goldenrod (*Petradoria pumila*), thrift mock goldenweed (*Stenotus armerioides*), and granite prickly phlox (*Leptodactylon pungens*). A stone-crushing facility is located on the western side of the PCA. Several road run through the site, and there is at least one stock pond. Exotic species are prevalent around disturbed areas. However, there are also large patches of pinyon-juniper woodland and sagebrush shrublands that are in excellent condition.

Biodiversity Rank Justification and Comments: This PCA rank is based on an excellent (A-ranked) occurrence of short-stem beardtongue (*Penstemon breviculus*), a globally vulnerable (G3) plant. Hundreds of plants were found flowering throughout both the pinyon-juniper woodland and the sagebrush shrublands. The site also supports unranked (E) occurrences of short-stem beardtongue and Naturita milkvetch (*Astragalus naturitensis*), a plant that is globally imperiled (G2G3) and on both the National Forest and BLM sensitive species lists. There is a fair (C-ranked) occurrence of Abajo penstemon (*Penstemon lentus*), now watch listed (S3) in Colorado, and historic (H) occurrences of the globally imperiled (G2) Cliff Palace milkvetch (*Astragalus deterior*), and Abajo Penstemon. Cliff Palace milkvetch was collected in this area by Penland in 1948 and has not been observed since. Additional survey for this species is planned for 2005.

Natural Heritage element occurrences at Mud Canyon PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Penstemon breviculus</i>	Short-stem beardtongue	G3	S2		A
<i>Astragalus naturitensis</i>	Naturita Milkvetch	G2G3	S2S3	BLM/FS	E
<i>Penstemon breviculus</i>	Little Penstemon	G3	S2		E
<i>Penstemon lentus</i>	Abajo Penstemon	G4Q	S3		C
<i>Penstemon lentus</i>	Abajo Penstemon	G4Q	S3		H
<i>Astragalus deterior</i>	Cliff-palace Milkvetch	G2	S2		H
<i>Astragalus naturitensis</i>	Naturita milkvetch	G2G3	S2S3	BLM	H

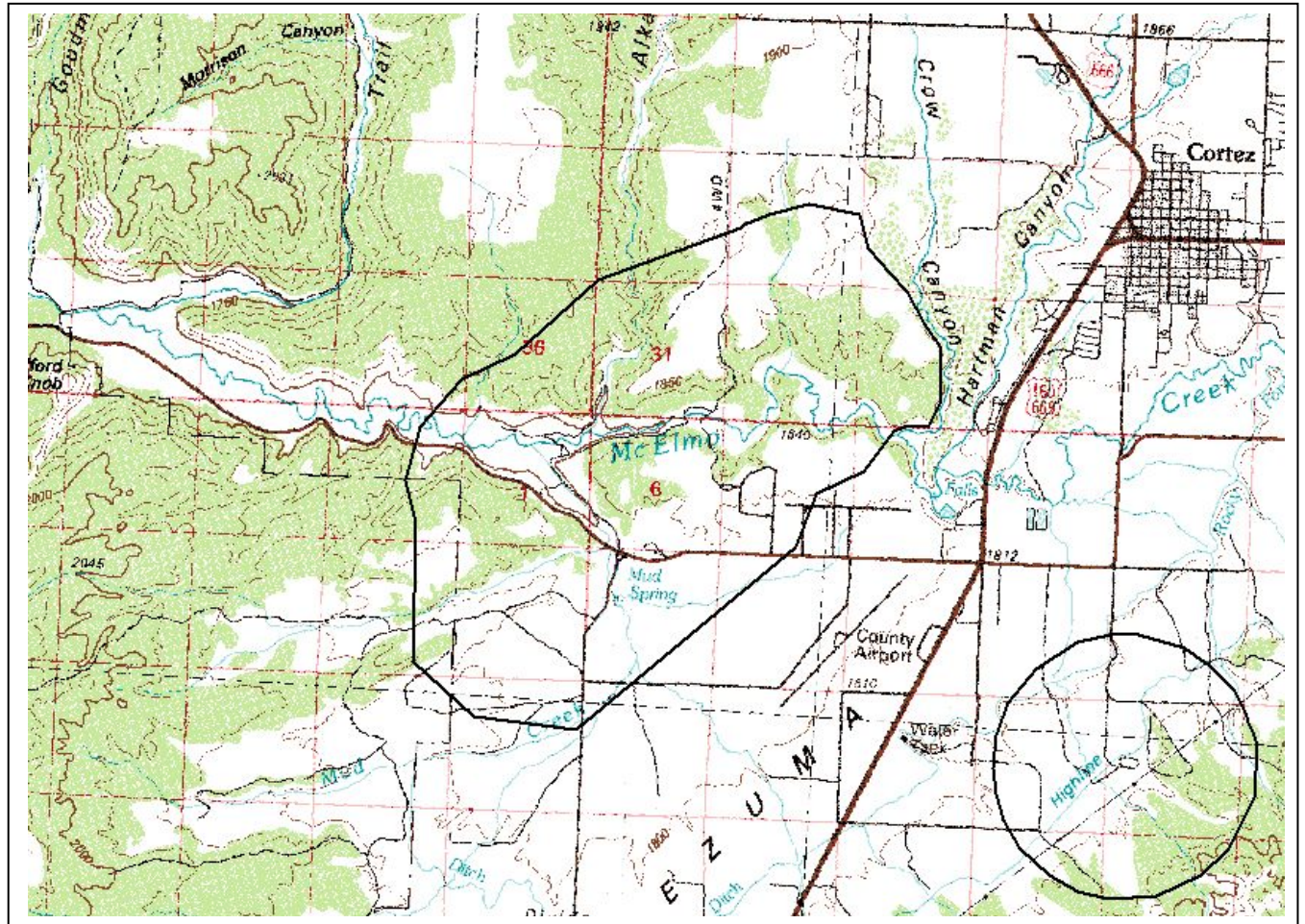
*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary was drawn to encompass all of the rare plant occurrences in the site, and includes sufficient suitable habitat within the pinyon-juniper and sagebrush communities to allow for expansion of their populations. The uncertainty of the exact locations of the historic occurrences is reflected in the boundary.

Protection Comments: The PCA consists of approximately equal areas of private and BLM lands, and extends slightly into the Ute Mountain Reservation on the west. The BLM land has no special designation, and is subject to oil and gas drilling.

Management Rank Comments: There are some serious weedy areas in the site, especially along roads and around the stock pond. Weeds observed include halogeton (*Halogeton glomeratus*), cheat grass (*Bromus tectorum*), cranesbill (*Erodium cicutarium*), tumble mustard (*Sisymbrium altissimum*), salsify (*Tragopogon dubius*), flatspine stickseed (*Lappula redowskii*), margined stickseed (*Lappula marginata*), herb sophia (*Descurainia sophia*), and smooth brome (*Bromus inermis*). A large Russian knapweed (*Acroptilon repens*) infestation was found at a stock pond in the southwest corner of section 12. Control of these species would prevent further spreading into the rare plant populations.

Mud Canyon. B3: High Biodiversity Significance



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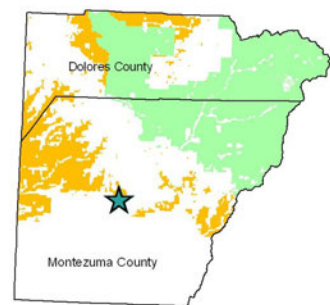


PCA BOUNDARY

Mud Creek
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Upper Fish Creek below Dunn Peak PCA

Biodiversity Rank: B3: High biodiversity significance. The PCA supports good and fair (B- and C-ranked) occurrences of two globally vulnerable (G3) riparian plant communities and an excellent (A-ranked) occurrence of a plant that is rare in Colorado. (S1).

Protection Urgency Rank: P4: No protection actions are needed in the foreseeable future. The site is within the San Juan National Forest.

Management Urgency Rank: M3: New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Road maintenance activities could threaten the plant population.

Location: The Upper Fish Creek PCA is located in northern Dolores County, about 12 miles northwest of Rico. To access the site drive Forest Service Road 611 North from Dunton to Fish Creek.

U.S.G.S. 7.5 minute quadrangle: Groundhog Mountain

Legal Description: T41N,R12W, Sections 10, 11, 12, 14, and 15

Elevation: 9,600 to 10,600 feet

Size: Approximately 325 acres

General Description: With Dolores Peak as its headwaters, Fish Creek descends through a forest of Engelmann spruce and aspen (*Picea engelmannii* and *Populus tremuloides*) to a moderately wide valley with extensive willow carrs and beaver activity. Mesic graminoids, especially sedges, dominate the understory. Associated plants at the site of the King's clover (*Trifolium kingii*) occurrence include tufted hairgrass (*Deschampsia cespitosa*), elephant head (*Pedicularis groenlandica*), northern bog orchid (*Habenaria hyperborea*), water sedge (*Carex aquatilis*), cowbane (*Oxypolis fendleri*), bittercress (*Cardamine cordifolia*), arrowleaf groundsel (*Senecio triangularis*), and chiming bells (*Mertensia ciliata*). The PCA is in a popular recreation area, and is grazed.

Biodiversity Rank Justification and Comments: The site supports a good occurrence (B-ranked) of the globally vulnerable (G3S3) riparian willow carr, *Salix monticola* / Mesic graminoids; a good (B-ranked) occurrence of the globally vulnerable (G3S3) riparian willow carr *Salix monticola* / *Carex utriculata* plant association; an excellent (A-ranked) occurrence of the state rare (S1), globally secure (G5) King's clover ; and a fair (C-ranked) occurrence of the apparently globally secure (G4) riparian willow carr, *Salix monticola* / Mesic Forbs.

Natural Heritage element occurrence at Upper Fish Creek PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plant Communities					
<i>Salix monticola/Carex utriculata shrubland</i>	Montane Riparian Willow Carr	G3	S3		B
<i>Salix monticola/Mesic graminoids shrubland</i>	Montane Riparian Willow Carr	G3	S3		B
<i>Salix monticola/Mesic graminoids shrubland</i>	Montane Riparian Willow Carr	G4	S3		C
Plants					
<i>Trifolium kingii</i>	King's clover	G5	S1		A

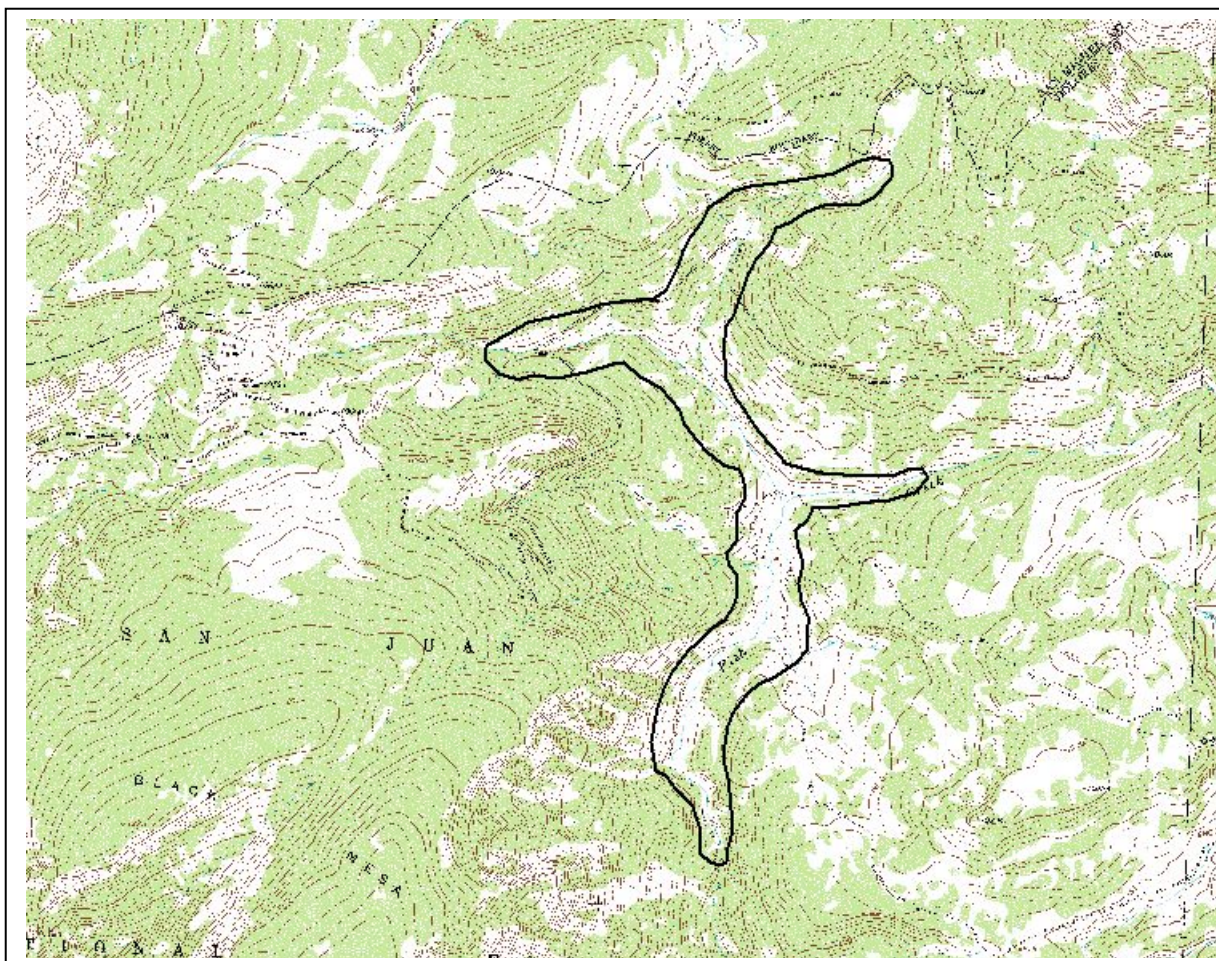
*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary was drawn to incorporate the king's clover occurrence, along with some additional area that is suitable for the plants, into which the population may expand, and the riparian plant communities along the creek.

Protection Comments: The site is within the San Juan National Forest, but enjoys no further protection.

Management Rank Comments: This occurrence is located close to a well traveled forest road. Alerting road crews to the presence of the plants and refraining from spraying the area would benefit the population.

Upper Fish Creek below Dunn Peak. B3: High Biodiversity Significance



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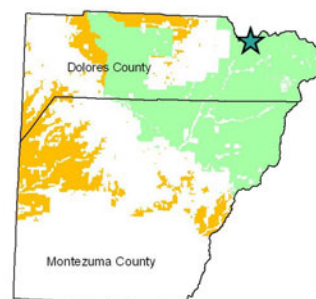


PCA BOUNDARY

Groundhog Mountain
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Flattop Mountain South PCA

Biodiversity Rank: B4: Moderate biodiversity significance. The PCA has a fair (C-ranked) occurrence of a statewide and globally vulnerable (G3) plant.

Protection Urgency Rank: P4: No protection actions are needed in the foreseeable future. The site is entirely within the San Juan National Forest.

Management Urgency Rank: M3: New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA.

Location: Eastern Dolores County, about five miles northeast of Rico. To access the PCA, take Highway 145 north of Rico about 6 miles, to FS Road 578 (Barlow Creek Road). Drive approximately 4 miles south on FS Road 578; continue 1.5 miles past the intersection with FS Road 496.

U.S.G.S. 7.5minute quadrangle: Hermosa Peak

Legal Description: T40N R10W, Sections 14, 15, 22 and 23

Elevation: 10,240 to 11,400 feet

Size: Approximately 275 acres

General Description: Flattop Mountain South PCA lies within San Juan National Forest and incorporates both sides of a portion of upper Barlow Creek, a tributary to the Dolores River, and several other small, unnamed tributary drainages. The majority of the PCA is on the south-facing lower slopes of a 1300 foot un-named rise adjacent to Flattop Mountain on the north side of Barlow Creek. Forest Service Road 578 passes through the site, and is within a Forest Service use area that allows year-round motorized vehicle use. Vegetation of the site is primarily spruce-fir (*Picea engelmannii*-*Abies lasiocarpa*) forest, with some openings of alpine meadows and rock outcrops.

A small population of the globally vulnerable reflected moonwort (*Botrychium echo*) occurs along the flat margins of the road and the lower portions of the steep, open, dry talus slopes. The population is found in conjunction with two other CNHP watch-listed moonworts, lance-leaved moonwort (*Botrychium lanceolatum*), and common moonwort (*Botrychium lunaria*). Other associated species include black groundsel, dandelion, Thurber fescue, strawberry, bluntleaf sandwort, and spreading sandwort (*Senecio atratus*, *Taraxacum officinale*, *Festuca thurberi*, *Fragaria virginiana*, *Moehringia lateriflora*, and *Arenaria lanuginosa* ssp. *lanuginosa*).

Biodiversity Rank Justification and Comments: This site supports a fair (C-ranked) example of reflected moonwort, a plant that is both globally and statewide vulnerable (G3/S3). Although only a few individuals were seen when the population was located in 2002, the drought of that year may have precluded a larger population. Since moonworts

do not appear above the surface every year, but may survive several years underground, additional survey in a less dry year is warranted.

Natural Heritage element occurrence at Flattop Mountain South PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Botrychium echo</i>	Reflected moonwort	G3	S3		C

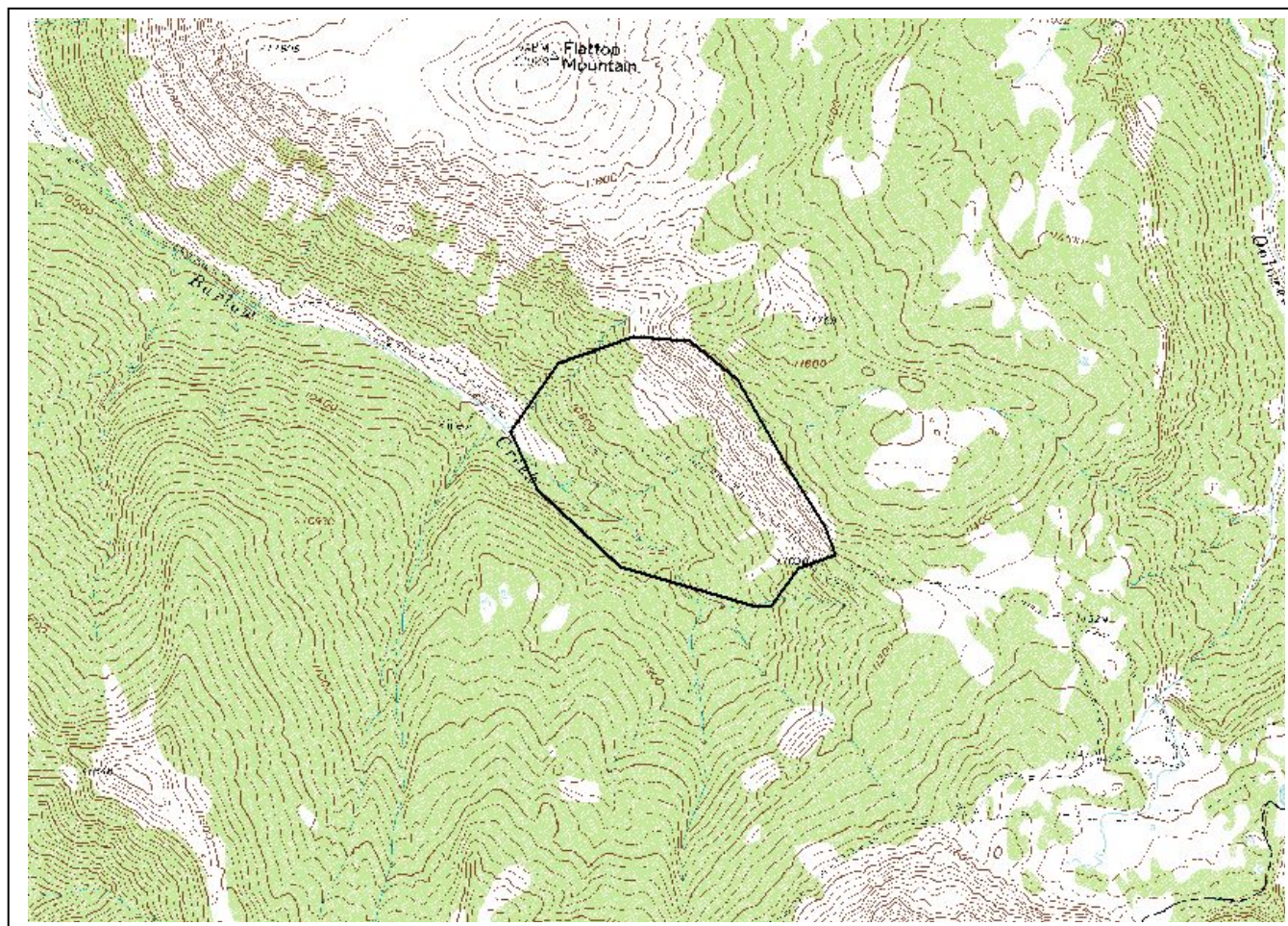
*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary is drawn to incorporate the occurrence of reflected moonwort and some adjacent area that provides potential habitat for the species, based on its similar vegetation, soil, slope, and elevation.

Protection Comments: The PCA is entirely within the San Juan National Forest.

Management Rank Comments: Although a Forest Service road runs through the site, no exotic species were documented. However, the road is rated for year-round motorized vehicle use, and road maintenance activities have the potential to destroy the population if it changes from current level of maintenance.

Flattop Mountain South. B4: Moderate Biodiversity Significance



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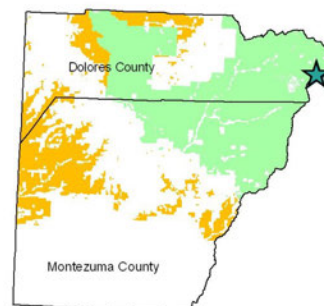


PCA BOUNDARY

Hermosa Peak
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



House Creek PCA

Biodiversity Rank: B4: Moderate biodiversity significance. The PCA has an excellent (A-ranked) occurrence of a plant that is globally secure but disjunct and very rare in Colorado (G4G5 S1).

Protection Urgency Rank: P4: Low urgency. No protection actions are needed in the foreseeable future. The site is within the San Juan National Forest, but has no further designation. There is no protection from multiple uses such as logging, powerlines, pipelines and roads.

Management Urgency Rank: M3: Moderate urgency. New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Control of exotic species along roads and the powerline may be beneficial to the rare plants.

Location: Montezuma County, about 7.5 air miles northeast of Dolores. To reach the site, take Road 526 (Dolores-Norwood Road) north from Dolores to House Creek, turn right on Road 528 and right again on a powerline road. Continue through 2 gates, then turn left on small road after the second gate, and go about 0.25 miles.

U.S.G.S. 7.5 minute quadrangle: Boggy Draw

Legal Description: T 38N, R14 W, Sections 7, 8, 9, 17 and 18

Elevation: 7,761 to 7,800 feet

Size: Approximately 721 acres

General Description: This PCA is in a ponderosa pine/Gambel oak (*Pinus ponderosa/Quercus gambelii*) forest community that is typical of the area. The site is unique because of the presence of large flower triteleia (*Triteleia grandiflora*), which unlike many of our state rare plants that are peripheral from Utah or New Mexico, is disjunct from the Pacific Northwest. How the species became established this far from its source is a puzzle to botanists. The population was first discovered by Leslie Stewart in 1998, when it was estimated that there were 1500 to 2000 individuals at the site. This was confirmed in a site visit in 2004. The tall, wand-like plants occupy a gentle south to southwest slope of about 3% in rolling uplands, in sandy-loam soils. They were found both under trees and shrubs and in grassy openings. Total tree cover was estimated at 30%, with forbs accounting for 40% and graminoids 25%. Bare ground was only 10%. Associated species include ponderosa pine, Gambel oak, Louisiana sagewort, spreading fleabane, Nuttall's larkspur, bitterbrush, Utah serviceberry, many-lobed groundsel, mountain parsley, mule's ears, and snowberry (*Pinus ponderosa*, *Quercus gambelii*, *Artemisia ludoviciana*, *Erigeron flagellaris*, *Delphinium nuttallianum*, *Purshia tridentata*, *Amelanchier utahensis*, *Senecio multilobatus*, *Pseudocymopterus montanus*, *Wyethia*, *Symphoricarpos oreophilus*). Wetter areas support iris, golden banner, mullein, coyote willow and shrubby cinquefoil (*Iris missouriensis*, *Thermopsis montana*, *Verbasum thapsus*, *Salix exigua* and *Potentilla fruticosa*). The area was logged in the

early 20th century. There is also evidence of a previous fire in the area, but it was apparently of low intensity.

Biodiversity Rank Justification and Comments: The B4 site rank is based on an excellent (A-ranked) occurrence of large-flower *Triteleia*, a plant that is globally common (G4G5) but very rare (S1) in Colorado. In fact, this is the only occurrence known in the state.

Natural Heritage element occurrence at House Creek PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Triteleia grandiflora</i>	Large flower Triteleia	G4G5	S1		A

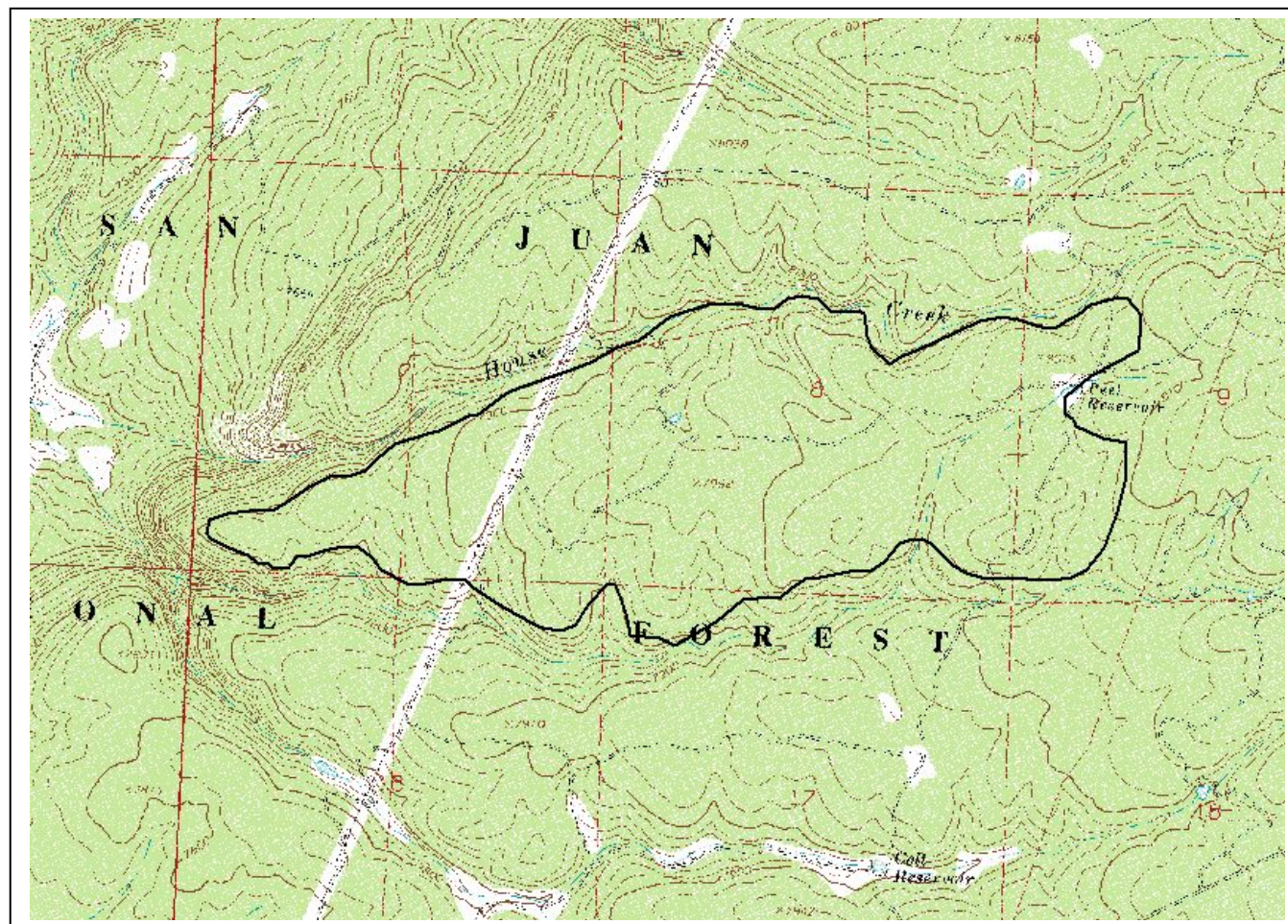
*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary encompasses the rare plant population, and includes additional adjacent area in the same habitat to allow for future expansion of the population. The PCA was limited to an area mapped as ponderosa pine forest on Dakota sandstone, in the fairly level area surrounding the occurrence, between the elevations of 7,700 and 7,800 feet.

Protection Comments: The site is within the San Juan National Forest, but has no further protection. Timber sales and prescribed burns pose potential threats to the rare plants.

Management Rank Comments: Disturbed areas along roads and the power line have been invaded by cheatgrass (*Bromus tectorum*), and bindweed (*Convolvulus arvensis*). Non-native species, presumably seeded, include western wheatgrass (*Pascopyrum smithii*), Kentucky bluegrass (*Poa pratensis*) and smooth brome (*Bromus inermis*).

House Creek. B4: Moderate Biodiversity Significance



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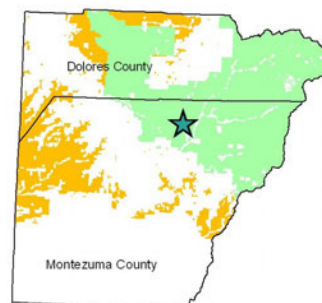


PCA BOUNDARY

Boggy Draw
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Mavreeso Canyon -Cottonwood Creek PCA

Biodiversity Rank: B4: Moderate biodiversity significance. This PCA has an excellent occurrence (A-ranked) and a good occurrence (B-ranked) of a plant that is very rare (S1) in Colorado.

Protection Urgency Rank: P4: No protection actions are needed in the foreseeable future. The PCA is within the San Juan National Forest.

Management Urgency Rank: M3: Weed control and monitoring of grazing and recreational impacts would help to maintain the quality of the riparian area that supports the rare plants.

Location: Mavreeso Creek-Cottonwood Canyon PCA is located in Dolores County, approximately 16 miles west of Rico. Access the PCA from Hwy 145 about 13 miles north of Dolores. Travel north on FR 535/West Dolores River Road 5 miles, then northwest on FR 532 about 1 mile.

U.S.G.S. 7.5minute quadrangle: Nipple Mountain

Legal Description: T39N R13W, Sections 5 – 8;
T39N R14W, Section 1;
T40N R13W, Sections 30, 31;
T40N R14W, Sections 25, 36

Elevation: 7,700 to 8,600 feet.

Size: Approximately 747 acres

General Description: This PCA within the San Juan National Forest lies in a narrow valley formed by lower Mavreeso Creek and upper Cottonwood Creek and their associated floodplains.

Mavreeso Creek is a tributary to Cottonwood Creek. Just above the Cottonwood Guard Station, a trail follows the creek closely for about a mile before it climbs the slope above the creek and continues northeast atop a hill. Mavreeso Canyon is narrower and shadier than the canyon formed by Cottonwood Creek downstream, and provides excellent habitat for the state-rare King's clover (*Trifolium kingii*). The species occurs along both sides of the creek in moist, level areas, and especially along a small side drainage. Species associated with the King's clover occurrence include an overstory of narrowleaf cottonwood (*Populus angustifolia*), ponderosa pine (*Pinus ponderosa*), and aspen (*Populus tremuloides*), and an understory comprised of red osier dogwood (*Cornus sericea*), mountain snowberry (*Symphoricarpos oreophilus*), western sweetroot (*Osmorhiza occidentalis*), golden banner (*Thermopsis montana*), osha (*Ligusticum porteri*), and cutleaf coneflower (*Rudbeckia laciniata*). The riparian corridor along Mavreeso Creek is in good condition, with a combination of narrowleaf cottonwood, aspen, and Douglas fir (*Pseudotsuga menziesii*), and an understory comprised of black chokeberry (*Prunus virginiana* var. *melanocarpa*), red osier dogwood, twinberry

honeysuckle (*Distegia involucrata* var. *involucrata*), thinleaf alder (*Alnus incana* ssp. *tenuifolia*), and mountain snowberry. The more xeric fringes of the riparian zone support ponderosa pine and Gambel oak (*Quercus gambelii*). Additional forb species associated with the riparian community include subalpine larkspur (*Delphinium barbeyi*), Canadian white violet (*Viola canada*), hookedspur violet (*Viola adunca*), orange sneezeweed (*Dugaldia hoopesii*), and western red columbine (*Aquilegia elegantula*).

Upland meadow areas within parts of Mavreeso Canyon support a variety of wildflowers. Species noted from a June 2004 site visit include mule ears (*Wyethia x magna*), Rocky Mountain iris (*Iris missouriensis*), alsike clover (*Trifolium hybridum*), blue flax (*Linum lewisii*), black medic (*Medicago lupulina*), Rocky Mountain groundsel (*Packera streptanthifolia*), twolobe larkspur (*Delphinium nuttallianum*), and tailcup lupine (*Lupinus caudatus*).

Cottonwood Creek, in the lower portion of the PCA, is a tributary to the Dolores River. It is generally wider, and its banks tend to be drier and less shaded than Mavreeso Creek. Its riparian corridor runs parallel with and close to well-traveled Forest Service Road 532 on the north bank of the creek. A few shaded, flat, wet areas along Cottonwood Creek provide habitat for small populations of King's clover. Narrowleaf cottonwood dominates this forested region, with an understory of twinberry honeysuckle, cutleaf coneflower, golden banner, red clover (*Trifolium pratense*), false Solomon seal (*Maianthemum stellatum*), feathery false Solomon seal (*Maianthemum racemosum* var. *amplexicaule*), osha, and wild mountain parsley (*Pseudocymopterus montanus*) are associated species. King's clover is often found mixed with the other *Trifolium* species in the locality.

Biodiversity Rank Justification and Comments: The Mavreeso Creek-Cottonwood Canyon PCA supports excellent (A-ranked) and good (B-ranked) occurrences of King's clover, a plant that is globally common, but very rare (S1) in Colorado. The species is likely present all along both creeks mentioned, in suitable habitat (level, moist, shady); however, this habitat is fairly scarce along the lower portion of the PCA. The larger population in Mavreeso Canyon is estimated to be over 1000 plants; the smaller population along Cottonwood Creek is roughly 100 plants.

Natural Heritage element occurrences at Mavreeso Creek-Cottonwood Canyon PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Trifolium kingii</i>	King's clover	G5	S1		A
<i>Trifolium kingii</i>	King's clover	G5	S1		B

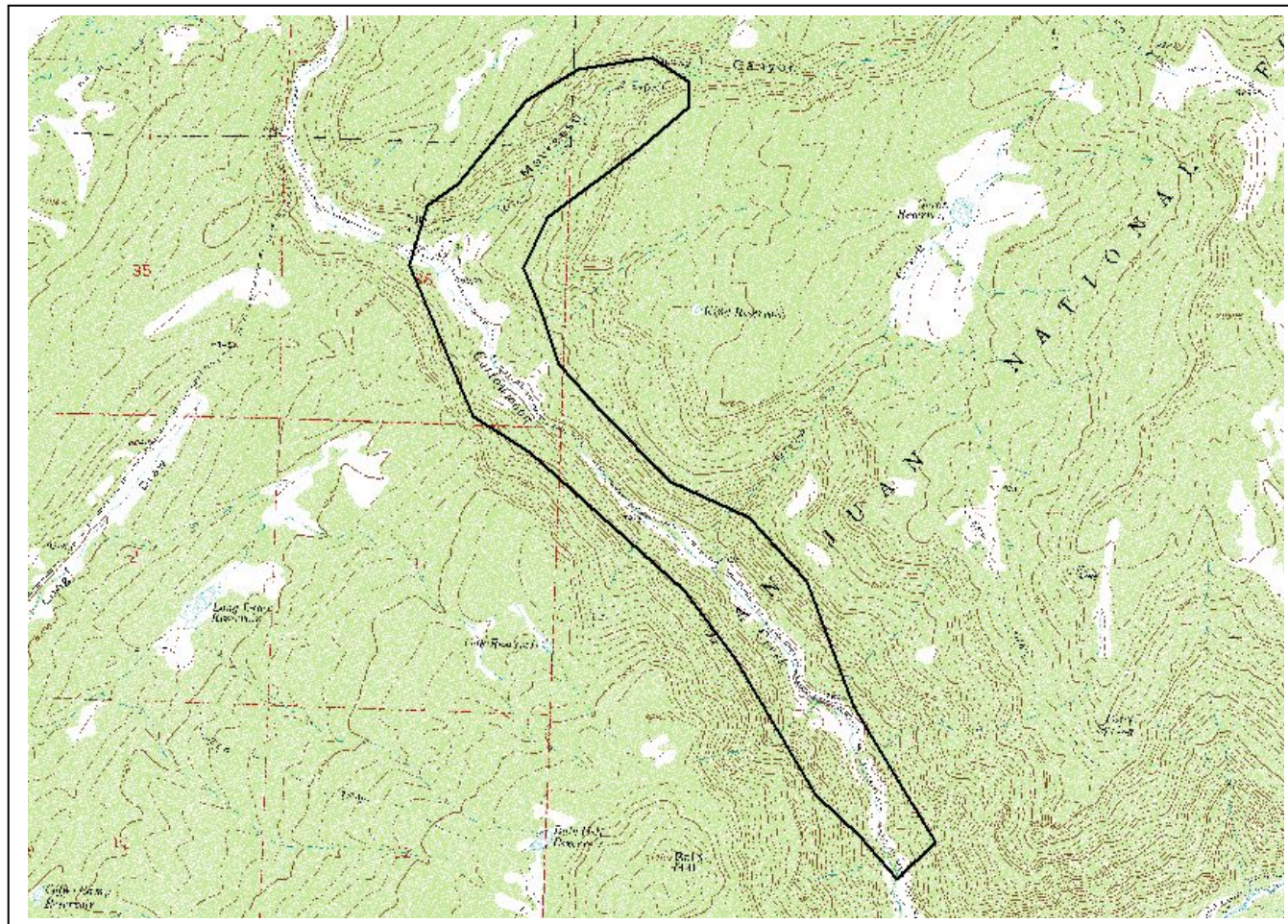
*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary surrounds the riparian areas of Mavreeso Creek and Cottonwood Canyon where King's clover was found, as well as the area between the two occurrences, allowing for expansion of the populations.

Protection Comments: The PCA is almost entirely within San Juan National Forest. There is a small 40 acre parcel of BLM land partially included in the northern part of the site, and a large area of private land abuts the PCA on the north. Development pressure in the local area may influence land use decisions on the private lands in the future.

Management Rank Comments: In Cottonwood Canyon the occurrence of King's clover is found near the forest road, but on the opposite side of the creek. Some exotic species are found along the creek, likely introduced by road travel on the Forest Service roads, and other weed problems are known in the surrounding area. No exotic species were observed in the Mavreeso Creek riparian area, other than common dandelion (*Taraxacum officinale*). Adjacent upland areas showed impacts from cattle grazing and horse travel. Development on adjacent private lands and road improvements could impact the riparian communities. Population in the area is increasing, and recreation pressure may also increase.

Mavreeso Canyon-Cottonwood Creek. B4: Moderate Biodiversity Significance



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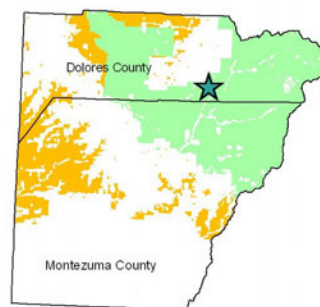


PCA BOUNDARY

Nipple Mountain
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Navajo Lake Trail- West Dolores River PCA

Biodiversity Rank: B4: Moderate biodiversity significance. The PCA supports a good (B-ranked) occurrence of a plant that is very rare in Colorado (S1) and an excellent (A-ranked) occurrence of a common willow community.

Protection Urgency Rank: P4: Low urgency. No protection actions are needed in the foreseeable future. The site is within the Lizard Head Wilderness

Management Urgency Rank: M3: Moderate urgency. New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Monitoring for early detection of invasive species would allow timely management for their control.

Location: Northern Dolores County, Lizard Head Wilderness, about three miles northeast of Dunton. To reach the site, drive north past Dunton on the West Fork of the Dolores River to the Navajo Lake trailhead. Hike along the Navajo Lake Trail to the Lizard Head Wilderness boundary.

U.S.G.S. 7.5 minute quadrangle: Dolores Peak

Legal Description: T41N,R11W, Sections 14, 15 and 22

Elevation: 9,249 to 10,000 feet

Size: Approximately 300 acres

General Description: The Navajo Lake trail follows the meandering upper reaches of the West Dolores River at this PCA near the Lizard Head Wilderness boundary. The valley is moderately wide and largely undisturbed. A good condition riparian plant community dominated by Rocky Mountain willow was documented on the west side of the river in 1993 during the CNHP riparian survey (Carsey and Aitken 1993). The ecologists noted that the community occurred in a lateral seep area with a gravelly, uneven ground surface. This occurrence was updated in 2004. Several hundred individuals of King's clover (*Trifolium kingii*) were found along the trail on the east side of the river, forming an almost solid ground cover with wild strawberry (*Fragaria virginiana*). Other species in the area were Rocky Mountain willow, Engelmann spruce, aspen, Richardson's geranium, Douglas fir and horsetails (*Salix monticola*, *Picea engelmannii*, *Populus tremuloides*, *Geranium richardsonii*, *Pseudotsuga menziesii*, and *Equisetum arvense*).

Biodiversity Rank Justification and Comments: This site contains good (B-ranked) examples of a riparian Drummond's willow/Mesic forb (*Salix drummondiana*/Mesic forbs) community which is apparently secure globally and in Colorado (G4S4), and an excellent (A-ranked) occurrence of King's clover, globally secure but very rare (S1) in Colorado.

Natural Heritage element occurrences at Navajo Lake Trail PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Trifolium kingii</i>	King's clover	G5	S1		B
Plant communities					
<i>Salix drummondiana</i> /Mesic forbs	Drummond's willow/Mesic forb	G4	S4		B

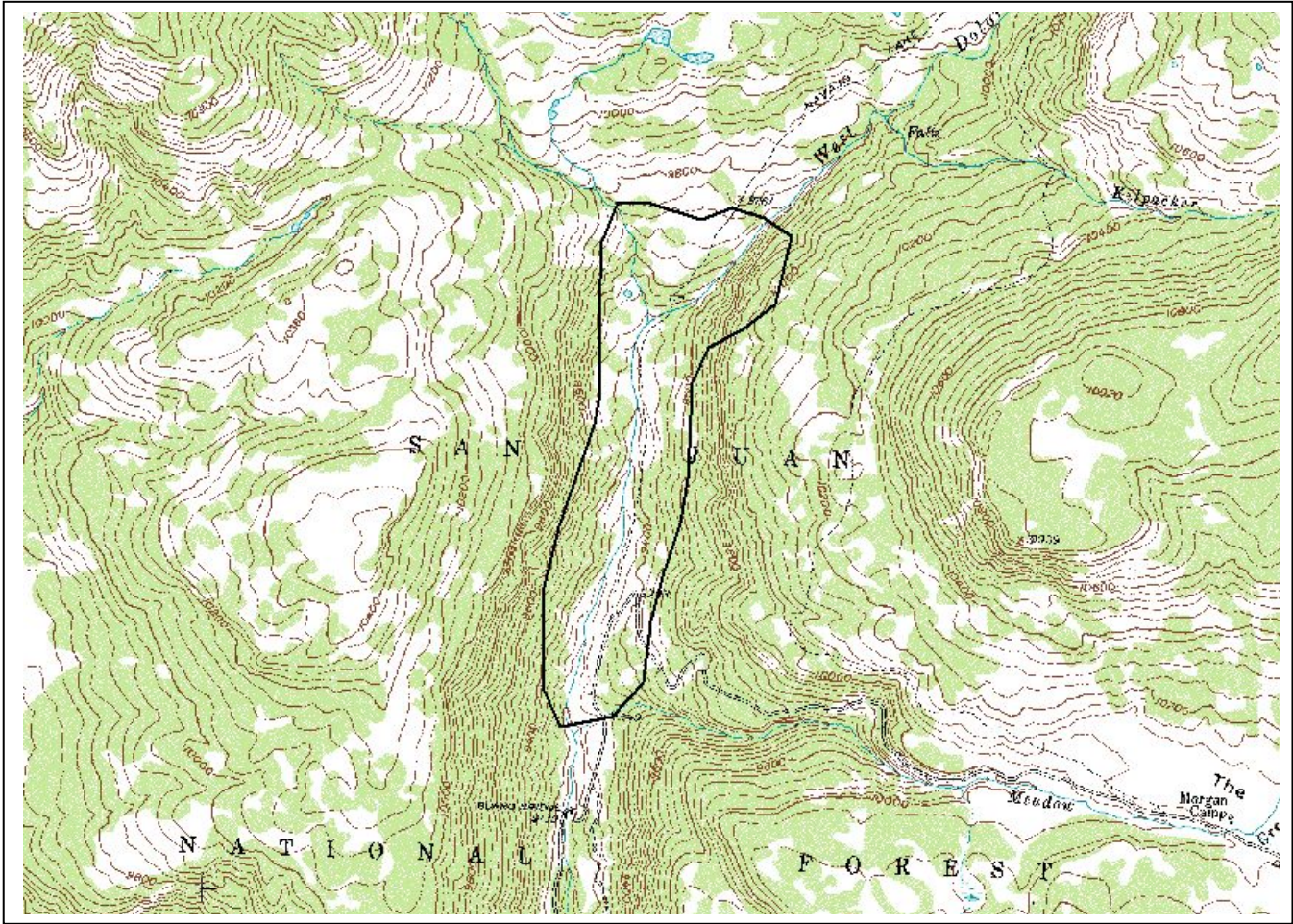
*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary was drawn to incorporate the King's clover occurrence and the associated riparian community. The clover is dependent on the same hydrological processes that shape the riparian zone. Additional areas upstream that are essential to maintain the good condition of the plant community are also included.

Protection Comments: The site is well protected within the Lizard Head Wilderness.

Management Rank Comments: The Navajo Lake Trail receives high recreational use. A fairly large amount of common dandelion (*Taraxacum officinale*) was noted. Monitoring to detect further invasion of exotic species would benefit the site.

Navajo Lake Trail. B4: Moderate Biodiversity Significance



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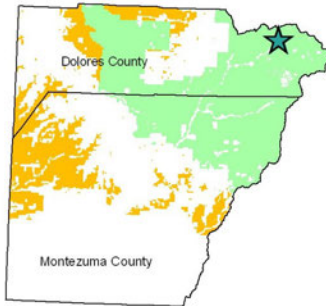


PCA BOUNDARY

Dolores Peak
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Orphan Butte PCA

Biodiversity Rank: B4: Moderate biodiversity significance. The PCA supports a fair (C-ranked) occurrence of a globally vulnerable (G3) fern.

Protection Urgency Rank: P3: Protection actions may be needed, but probably not within the next 5 years. The PCA is within the San Juan National Forest, but has no additional protection.

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 Orphan Butte PCA is located in northwestern La Plata County and northeastern Montezuma County, along the ridge that defines the county lines. It is approximately 20 miles north-northwest of Durango.

U.S.G.S. 7.5min. quadrangles: Orphan Butte

Legal Description: T38N R11W Sections: 1, 2, 11-14, 23, 24; T38N R10W, Sections 7,18,19

Elevation: 9,600 to 11,121 feet

Size: Approximately 1,679 acres

General Description: The site occupies a dry, open clearcut on a glaciated mountain slope. Spruce and fir were cut in the 1960's, and there are now some young Engelmann spruce (*Picea engelmannii*) accounting for about 1% tree cover. Shrubs cover about 5%, forbs 60% and graminoids 30%. Associated species include gooseberry currant (*Ribes montigenum*), elderberry (*Sambucus racemosa*), Franciscan bluebells (*Mertensia franciscana*), sedges (*Carex spp.*), strawberry (*Fragaria virginiana*), and false strawberry (*Sibbaldia procumbens*). The rare moonworts inhabited old skid roads that were created during the timber harvest. Reflected moonwort (*Botrychium echo*) occurred on the west side of the ridge, in Montezuma County, while northern moonwort (*Botrychium pinnatum*) was on the east side in La Plata County. However, it is common for several species of moonworts to grow together, and either one may also occur on the opposite side of the divide. In fact, two other species of moonwort, lance-leaved moonwort (*Botrychium lanceolatum*) and common moonwort (*Botrychium lunaria*), both on CNHP's watchlist, were found at the site. Boreal owls (*Aegolius funereus*) were observed at this location in 1997, but breeding has not been confirmed.

Biodiversity Rank Justification and comments: The Orphan Butte PCA supports a fair (C-ranked) occurrence of reflected moonwort, a globally vulnerable (G3) fern, and an unranked (E) occurrence of northern moonwort, a species that is globally common but extremely rare (S1) in Colorado.

Table #. Natural Heritage element occurrences at Orphan Butte PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Botrychium echo</i>	Reflected moonwort	G3	S3		C
<i>Botrychium pinnatum</i>	Northern moonwort	G4?	S1		E

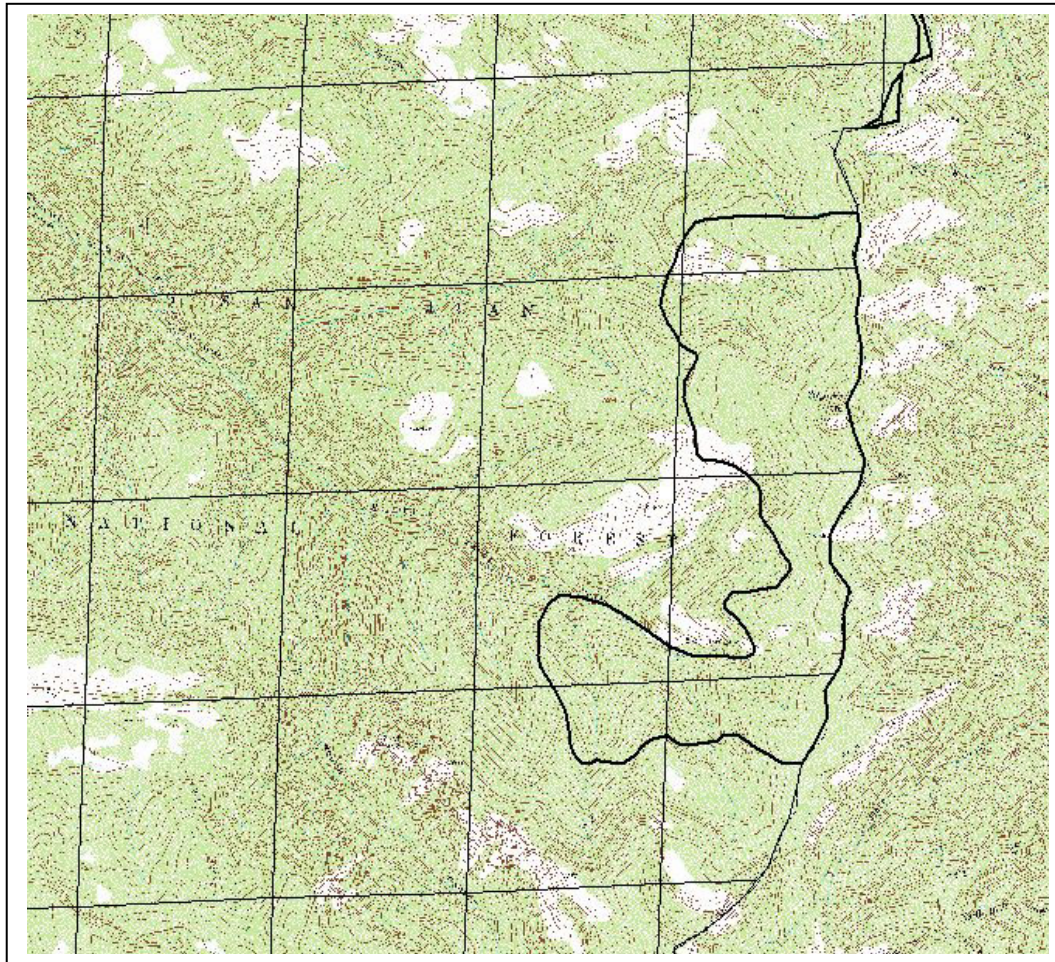
*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The site includes the occurrences of two rare moonworts and adjacent similar habitat. Limiting direct disturbances to the plants, but allowing natural disturbance such as erosion, fire, and tree-fall in this area would help to maintain the habitat and allow for movement of the species over time.

Protection Comments: The PCA is within the San Juan National Forest.

Management Comments: Moonworts prefer naturally or human disturbed sites; however, trampling, road/ trail maintenance, or other continued impacts could threaten the occurrence. The PCA site was scheduled to be planted in 1996. Digging and vehicles may disturb the site; however, the plants were tagged so that crews could avoid them. No information is known on the success of this attempt.

Orphan Butte. B4: Moderate Biodiversity Significance



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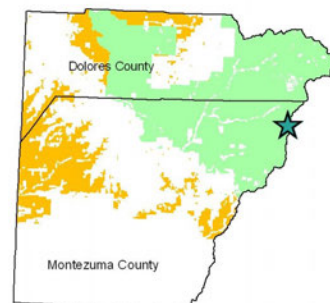


PCA BOUNDARY

Orphan Butte
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Willow Creek at Groundhog Mountain PCA

Biodiversity Rank: B4: Moderate biodiversity significance. This PCA supports fair (C- ranked) occurrences of riparian plant communities, and two occurrences (A- and B-ranked) of a riparian plant that is very rare (S1) in Colorado.

Protection Urgency Rank: P4: No protection actions are needed in the foreseeable future.

Management Urgency Rank: M4: Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences.

Location: The Willow Creek at Groundhog Mountain PCA is located in northeastern Dolores County, about 9 miles NNW of Rico, 2 miles NW of Dunton, and 2.5 miles SSW of Dolores Peak. From Rico, drive nine miles north on Highway 145 to Forest Service Road 535 at Cayton Campground. Continue northwest on FR 535 about 9 miles and turn north onto FR 611. The PCA starts about 1.5 miles from the road junction.

U.S.G.S. 7.5 minute quadrangles: Groundhog Mountain, Dolores Peak
Legal Description: T41N R11W, Sections 7, 8, 17-20.

Elevation: 9,560 to 10,520 feet

Size: Approximately 565 acres

General Description: The Willow Creek at Groundhog Mountain PCA encompasses three drainages. The upper portion of Willow Creek approximately 2.5 miles above its confluence with Fish Creek, a tributary to the Dolores River, and an un-named branch of Cold Creek, also a tributary to the Dolores span the PCA site. Generally, the PCA is dominated by large stands of aspen (*Populus tremuloides*) on the hillsides, with Willow Creek lying in the bottom of the small valley, running southeast.

The upper stretch of Willow Creek was surveyed by CNHP during the wetland survey of the San Miguel and Dolores River drainages in 1991. It contains a series of beaver ponds, and supports an element occurrence of a beaked sedge (*Carex utriculata*) wet meadow plant community. Associated species found in the wet meadow include Drummond's willow (*Salix drummondiana*), Rocky Mountain willow (*Salix monticola*), Rocky Mountain rush (*Juncus saximontanus*), fewseeded bog sedge (*Carex microglochin*), fowl mannagrass (*Glyceria striata*), false hellebore (*Veratrum tenuipetalum*), water speedwell (*Veronica anagallis-aquatica*), willow herb (*Epilobium* sp), seep monkeyflower (*Mimulus guttatus*), Fendler's cowbane (*Oxypolis fendleri*), Rocky Mountain hemlockparsley (*Conioselinum scopulorum*), and arrowleaf groundsel (*Senecio triangularis*). A 1% cover of bristly locust (*Robinia hispida* var. *hispida*) was reported. This species, which is native to Appalachian Mountains, apparently is an escape from cultivation.

Another riparian community surveyed by CNHP in 1991 is a dense montane riparian willow carr (*Salix monticola*/Mesic graminoid) association, on the un-named branch of Cold Creek. This extensive element occurrence is a good quality example of the community and, at the time of the survey, had not been heavily impacted by grazing practices. Dominant species within the occurrence include Rocky Mountain willow, whitestem gooseberry (*Ribes inerme*), chiming bells (*Mertensia ciliata*), and Richardson's geranium (*Geranium richardsonii*).

The old Groundhog Stock Driveway, which now serves predominantly as a hiking trail, passes through the PCA from east to west, and a well-maintained Forest Service road follows Willow Creek northward along the east bank. Impacts from historic cattle grazing in the area, especially near the old stock trail, are still apparent, and hikers tend to trample areas near the trails; however, the wet meadows and willow carrs appear to be relatively intact.

Two element occurrences of king's clover (*Trifolium kingii*) are located on the flat areas above the creek, in locations near the Forest Service road that follows Willow Creek. In the northern element occurrence, the species is exhibited in wet areas along the roadside, and additional patches are located nearby along a small tributary stream, continuing up the hillside on north-facing slopes. Taxa associated with the occurrence at this northern location include tufted hairgrass (*Deschampsia cespitosa*), elephant heads (*Pedicularis groenlandica*), northern bog orchid (*Habenaria hyperborea*), water sedge (*Carex aquatilis*), and Fendler's cowbane (*Oxypolis fendleri*).

In the larger, southern occurrence of King's clover, thousands of individuals are again located along the road, both sides, and continue up the hillside approximately 50 meters before transitioning into an adjacent false hellebore (*Veratrum tenuipetalum*) community. An overstory of Engelmann spruce (*Picea engelmannii*), subalpine fir (*Abies lasiocarpa*), and aspen is associated with this King's clover occurrence, intermixed with other taxa including wild mountain parsley (*Pseudocymopterus montanus*), false hellebore, large mountain fleabane (*Erigeron coulteri*), sulphur paintbrush (*Castilleja sulphurea*), and strawberry (*Fragaria virginiana*).

Biodiversity Rank Justification and Comments: The Willow Creek at Groundhog Mountain PCA supports a fair (C-ranked) occurrence of the globally vulnerable (G3) montane riparian willow carr plant community, and an excellent (A-ranked) occurrence and good (B-ranked) occurrence of King's clover, a plant that is very rare (S1) in Colorado.

Natural Heritage element occurrences at Willow Creek at Groundhog Mountain PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plant Communities					
<i>Salix monticola</i>/Mesic graminoid	Montane riparian willow carr	G3	S3		C
<i>Carex utriculata</i>	Beaked sedge	G5	S4		C
Plants					
<i>Trifolium kingii</i>	King's clover	G5	S1		A
<i>Trifolium kingii</i>	King's clover	G5	S1		B

*EO=Element Occurrence. Multiple listings represent separate locations.

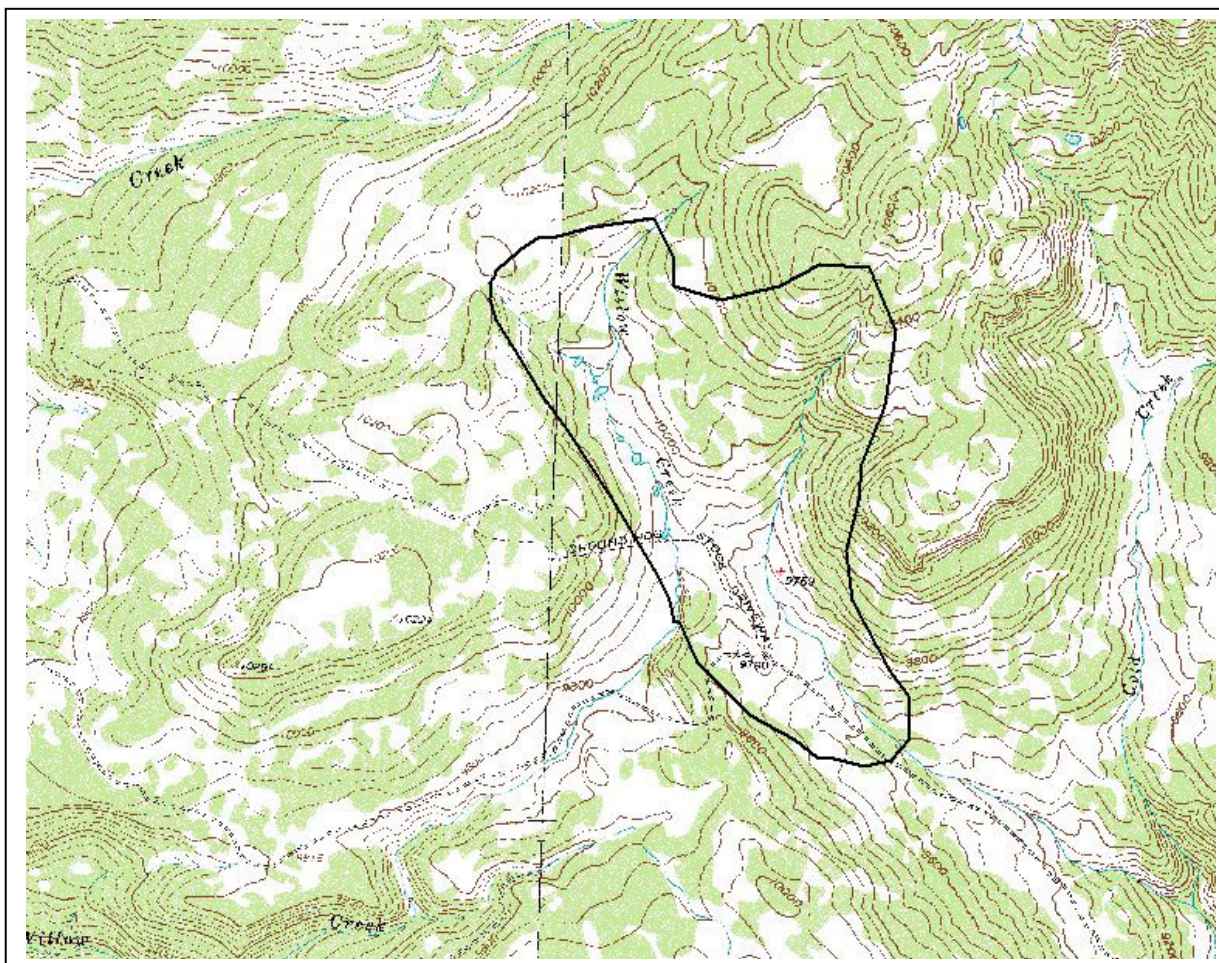
Boundary Justification: The PCA boundary includes the riparian areas of Willow Creek and an un-named tributary of Cold Creek, both of which support occurrences of King's clover. The PCA also incorporates additional riparian habitat that is suitable for the expansion of these populations.

Protection Comments: The PCA is owned and managed by the San Juan National Forest. There is no other special designation.

Management Rank Comments: Although a Forest Service road and a public trail used by hikers both run through the site, no exotic species were observed. However, other road maintenance activities on the Forest Service road have the potential to affect the riparian and wetland communities, including but not limited to road grading and roadside weed-control spraying.

Any alterations to the hydrology of the site, such as upstream water diversions, could have detrimental effects on the riparian and wetland communities as well as the King's clover populations. Although not currently threatened, a review of current management practices for grazing, recreation activities, and road maintenance activities may be warranted in the future to maintain current quality of the element occurrences.

Willow Creek at Groundhog Mountain. B4: Moderate Biodiversity Significance



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PCA BOUNDARY

Dolores Peak
Groundhog Mountain
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S. Geological
Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



East Fork Rock Creek PCA

Biodiversity Rank: B5: General biodiversity significance. This PCA supports an unranked occurrence of a plant that is demonstrably secure globally (G5) but rare in Colorado (S2).

Protection Urgency Rank: P4: Low urgency. No protection actions are needed in the foreseeable future. The site is well protected within the Canyons of the Ancients National Monument.

Management Urgency Rank: M2: High urgency. New management actions may be needed within 5 years to prevent the loss of the element occurrences within the PCA. Further field survey is required to determine the size and condition of the occurrence.

Location: Montezuma County, north of McElmo Creek, about 13 miles west of Cortez. The PCA can be accessed from the Sand Canyon trailhead, following trails as far as possible up the East Fork of Rock Creek, and then continuing cross country.

U.S.G.S. 7.5 minute quadrangles: Battle Rock

Legal Description: T36N, R18W, Sections 15, 21 and 22

Elevation: 5,520 to 6,400 feet

Size: Approximately 855 acres

General Description: The PCA comprises steep slickrock cliffs of Jurassic sandstones above the East Fork of Rock Creek. The southern maidenhair fern at this site was documented in 2002. It was not visited in 2004, and needs further inventory to determine the full extent of the occurrence. The botanists noted that a dense colony of the ferns occupied 100% of a crevice in Dakota sandstone, just above a talus slope. The plants were associated with a seasonal seep which was not flowing at the time of the survey. The site is on a southeast facing slope with open exposure to light. Associated species could not be determined as the visit was made off-season. Further survey is planned for summer of 2005.

Biodiversity Rank Justification and Comments: The PCA supports an unranked (E) occurrence of southern maidenhair fern (*Adiantum capillus-veneris*), a plant that is globally secure (G5), but rare in Colorado (S2).

Natural Heritage element occurrence at East Fork Rock Creek PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Adiantum capillus-veneris</i>	Southern Maidenhair fern	G5	S2		E

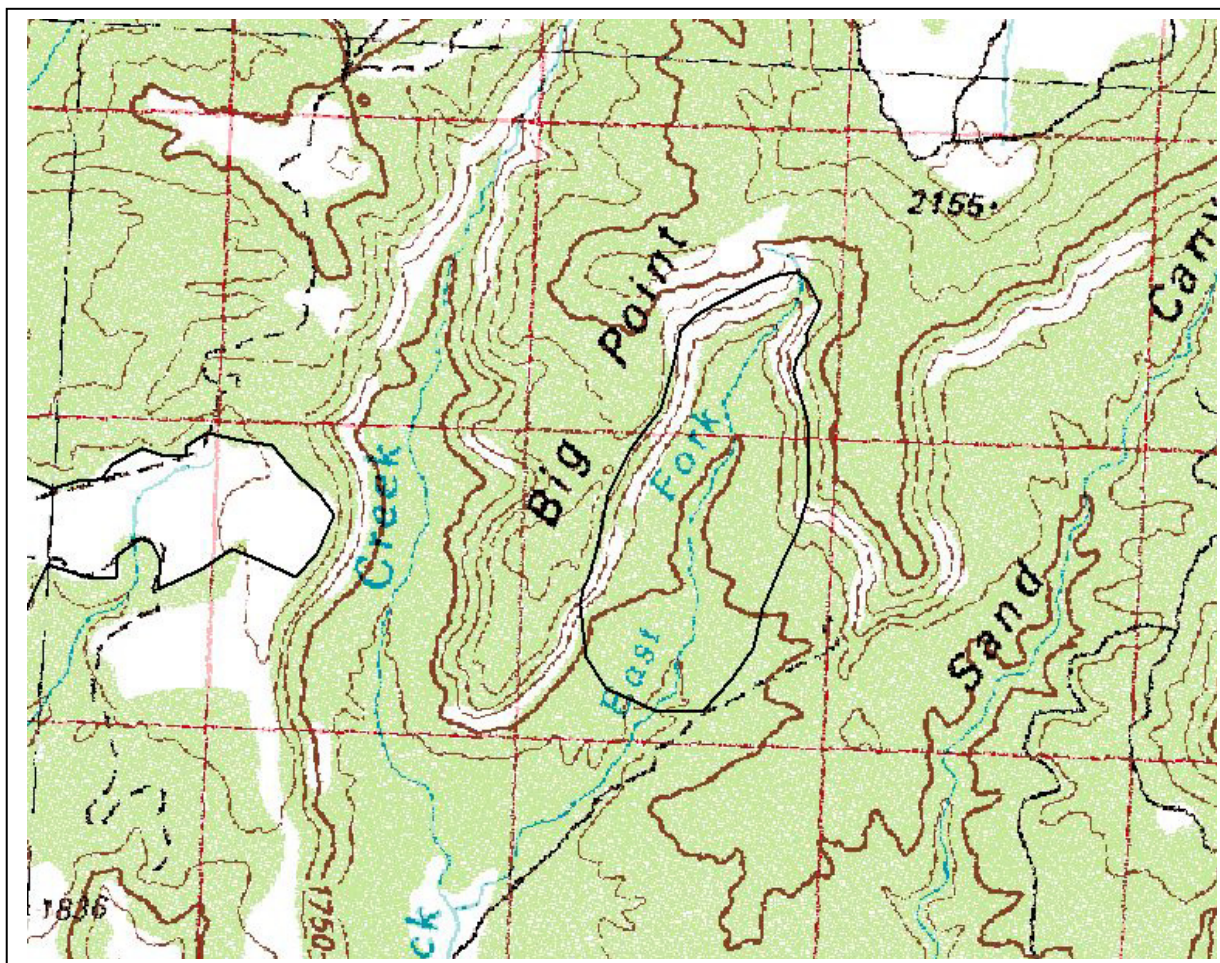
*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary was drawn to include the cliff areas above East Fork of Rock Creek where the southern maidenhair fern was found. Additional area of potential habitat and uplands known as Big Point, which are the source of the water in the seep, are included.

Protection Comments: The site is well protected within the Canyons of the Ancients National Monument

Management Rank Comments: The area is becoming popular for hiking, but this remote area away from established trails is not heavily used at this time. Further survey is needed and is planned for 2005, to determine the extent and condition of the southern maidenhair fern occurrence.

East Fork Rock Creek. B5: General Biodiversity Significance



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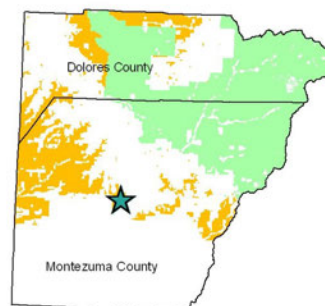


PCA BOUNDARY

Battle Rock
Woods Canyon
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005

LOCATION IN STUDY AREA



Grindstone Fens PCA

Biodiversity Rank: B5: General biodiversity significance. This PCA has unranked occurrences of two plants that are rare (S2) or vulnerable (S3) in Colorado.

Protection Urgency Rank: P3: Moderate urgency. Protection actions may be needed, but probably not within the next 5 years. It is estimated that stresses may reduce the viability of the elements in the PCA if protection action is not taken. The PCA is within the San Juan National Forest, and has no additional protection. However, it may be worthy of special designation.

Management Urgency Rank: M2: High urgency. New management actions may be needed within 5 years to prevent the loss of the element occurrences within the PCA. Management of grazing may be necessary to maintain the Altai cottongrass occurrence.

Location: Eastern Montezuma County, near summit of La Plata Mountains, about 11 miles south of Rico and 18 miles northeast of Mancos. The site can be accessed by turning south from Highway 145A onto Hillside Drive, driving about 17 miles and then hiking five to ten minutes to the south of the road.

U.S.G.S. 7.5 minute quadrangles: Orphan Butte

Legal Description: T38N, R11W, Sections 21, 22, 26, 27, 28, 34 and 35

Elevation: 10,920 to 11,200 feet

Size: Approximately 977 acres

General Description: The Grindstone fens occupy a series of depressions and benches in the uppermost part of the Rough Canyon branch of Roaring Fork Creek. Rough Canyon drains to the Dolores River in Montezuma County of southwestern Colorado. The valley is cut through flat-lying layers of Dakota sandstone, Morrison Formation, Entrada sandstone and Dolores Formation. Below the site, red sandstone and shale cliffs form a spectacular canyon.

The topography of the area is formed primarily of landslide debris and is rolling and rocky. The surrounding vegetation was formerly upper sub-alpine wet spruce-fir forest, but was logged approximately 40 years ago. The site includes over 30 individual wetlands, representing several different types. Several wetlands have pools, floating mats and a flora unique to that particular habitat. This site represents an excellent collection of diverse wetlands concentrated in a small area (CNAP 1999).

The area supports a dense cover of mosses and lichens under the dominant sedge community. About 10% of the area is occupied by forbs, including star gentian, elephantella, tufted hairgrass, rough bentgrass and king's crown (*Swertia perrenis*, *Pedicularis groenlandica*, *Deschampsia caespitosa*, *Agrostis scabra* and *Rhodiola integrifolia*.) Altai cottongrass (*Eriophorum altaicum* var. *neogaeum*) was found here in 1999. The species is known to occupy at least four of the fens, and possibly more (Stewart, pers. comm.) Bladderwort (*Utricularia minor*) was found to be fairly common in shallow water in one fen, and although it is expected in others, this has not been

confirmed. A state-rare species, mud sedge (*Carex limosa*) has been documented from the site. Lesser panicled sedge (*Carex diandra*) has also been reported, but details are not known at this time. Other plants of interest include Sphagnum mosses (*Sphagnum* spp.), bog buckbean (*Menyanthes trifoliata*) and dwarf burr-reed (*Sparganium minimum*.)

Grindstone wetlands may also provide important foraging habitat for two state-rare birds, the long-billed curlew (*Numenius americanus*) and the mountain plover (*Charadrius montanus*), known to breed in areas near the site (CNAP 1999).

Biodiversity Rank Justification and Comments: The B5 rank of the site is based on unranked (E) occurrences of two plants that are rare (S2) or vulnerable (S3) in Colorado. Further survey of this site should enable better evaluation of these occurrences and could lead to changing the site rank.

Natural Heritage element occurrences at Grindstone Fens PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Eriophorum altaicum</i> var. <i>neogaeum</i>	Altai Cotton-grass	G4?T3T4	S3	FS sensitive	E
<i>Utricularia minor</i>	Bladderwort	G5	S2	FS sensitive	E

*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary is drawn to include the Altai cottongrass occurrence, as well as several other wetlands in the vicinity, where the species could become established in the future. Included within this complex of fens are those that support *Utricularia minor*. The boundaries incorporate land that displays several natural processes, such as landslide terrace development, pond infilling and solifluction. Although there is no sign of recent landslide activity, such processes have shaped the wetlands at this site and could be a source of natural disturbance in the future (CNAP 1999).

Protection Comments: The PCA is located in the San Juan National Forest, and has no additional designation. However, it may be worthy of special status to conserve this unique habitat. The site was surveyed by Colorado Natural Areas Program (CNAP) in 1999 and was recognized as an excellent representation of several diverse wetland types.

Management Rank Comments: The botanist who documented the Altai cottongrass occurrence noted that other fens in the area have been damaged by cattle. Elk using the fens as wallows have also caused damage. The fen containing the cottongrass showed less impact, and it was suggested that this may account for the presence of the plants at this location and not at the 24 other fens that were visited by the same researchers. A report by CNAP (1999) also noted that cattle are affecting the wetlands, both through grazing and the breakdown of peat ramparts used by animals to cross wetlands. Logging roads contribute to recreational use, including motorized recreation, and are also potential vectors for weed establishment. Grazing, trampling and motorized recreation also threaten to introduce unnatural levels of erosion, which could disrupt the natural surface and groundwater flow patterns that currently support the wetlands.

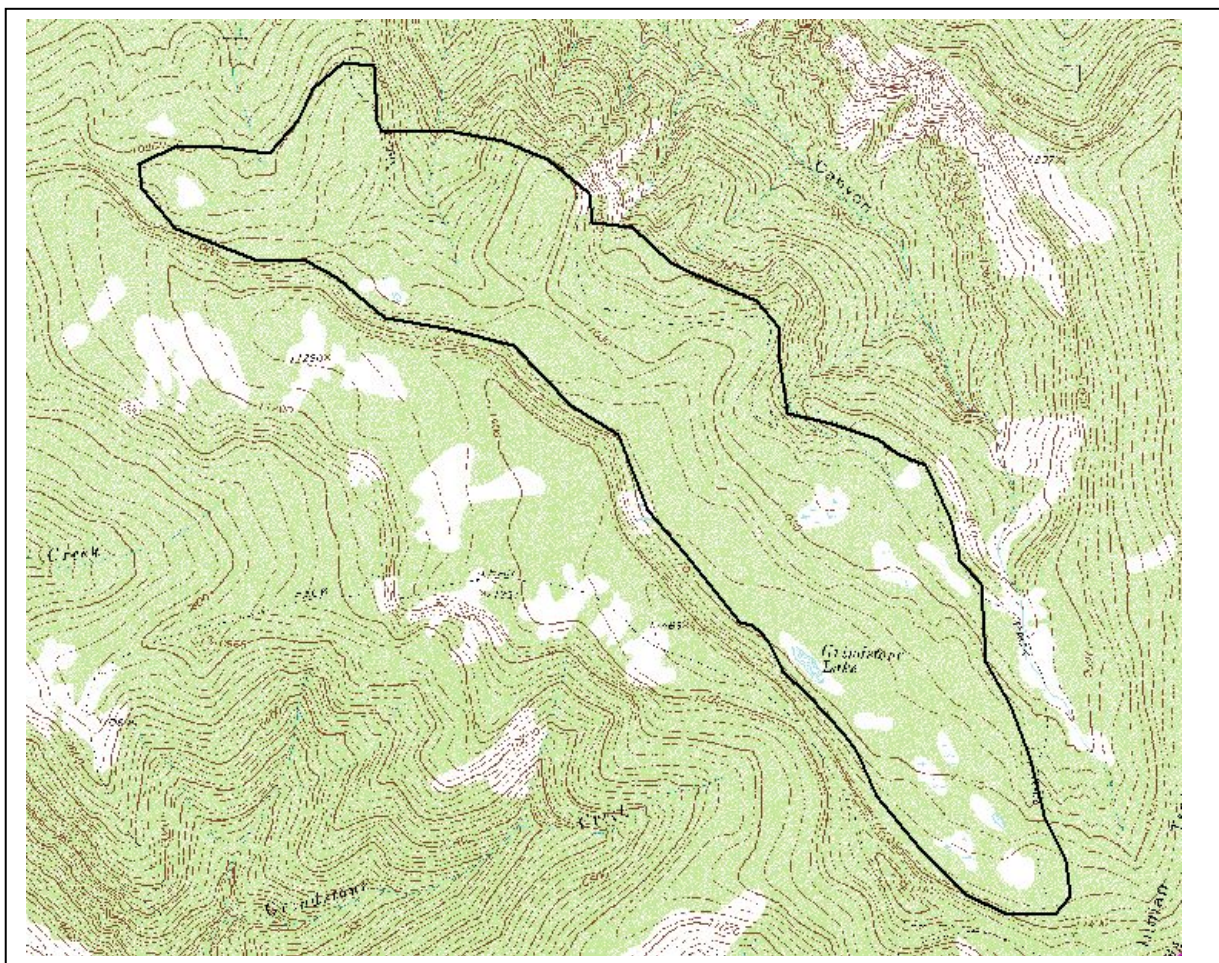
The Forest Service has attempted to stabilize the damaged fens. They are monitoring the fens' condition and water levels, and have installed electric fence to keep cattle out of two of the fens. An environmental assessment is in progress for the grazing allotment, and the Forest Service has recommended eliminating grazing from the area of the fens. Further survey is needed to determine the extent of all three elements in this system of fens. A high potential exists for additional rare plants to be discovered at this site (CNAP 1999).



Figure 53. Grindstone fens. Photo courtesy of Colorado Natural Areas Program.

>

Grindstone Fens. B5: General Biodiversity Significance



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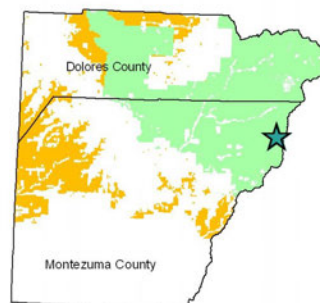


PCA BOUNDARY

Orphan Butte
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Ismay Trading Post PCA

Biodiversity Rank: B5: General biodiversity significance. This PCA supports two occurrences of critically imperiled plants in Colorado (S1).

Protection Urgency Rank: P3: Moderate urgency. Protection actions may be needed, but probably not within the next 5 years. It is estimated that stresses may reduce the viability of the elements in the PCA if protection action is not taken. The PCA is located within the Canyons of the Ancients National Monument. However, private land in the site is not protected.

Management Urgency Rank: M2: High urgency. New management actions may be needed within 5 years to prevent the loss of the element occurrences within the PCA. Control of exotic species and grazing management would benefit the rare plants in the site.

Location: Montezuma County, near the Utah border, about 24 miles west of Cortez. To reach the site from Highway 666 just south of Cortez, go west on the McElmo Canyon Road, and turn north on an unmarked road at Ismay Trading Post.

U.S.G.S. 7.5minute quadrangle: Wickiup Canyon

Legal Description: T36N,R20W, Sections 26, 34, and 35

Elevation: 4,920 to 5,000 feet

Size: Approximately 168 acres

General Description: This PCA is located in lower Yellowjacket Canyon. It is characterized by a desert shrub community dominated by shadscale, galleta and snakeweed (*Atriplex confertifolia*, *Pleuraphis jamesii* and *Gutierrezia sarothrae*). Greasewood flats of *Sarcobatus vermiculatus* occupy lower areas. Other common native plants in the site include scarlet globemallow, wooly plantain, Wright's clubflower, Nuttall's milkvetch, stickseed, scorpionweed and prickly pear (*Sphaeralcea coccinea*, *Plantago patagonica*, *Cordylanthus wrightii*, *Astragalus nuttallianus*, *Lappula marginata*, *Phacelia crenulata* and *Opuntia polyacantha*.) The site was extremely dry when visited in June 2004. Most plants had completed their life cycle and were crisp and disintegrating, making an accurate survey impossible. Hairy townsend-daisy and winding mariposa lily (*Townsendia strigosa* and *Calochortus flexuosus*) were recognizable, but population size and condition could not be evaluated. The overall site condition was poor, heavily grazed and trampled, with an abundance of weedy species such as cheatgrass, halogeton, cranesbill, and stickseeds (*Bromus tectorum*, *Halogeton glomerata*, *Erodium cicutarium*, *Lappula marginata* and *L. redowskii*). The area is known as habitat for the desert spiny lizard (*Sceloporus magister cephalaflavus*) and long-nose leopard lizard (*Gambelia wislizenii*).

Biodiversity Rank Justification and Comments: The rank of the PCA is based on the presence of two plants that are globally common (G4) but very rare in Colorado (S1). Further survey in 2005 should enable better evaluation of the occurrence, and could change this biodiversity rank.

Natural Heritage element occurrences at Ismay Trading Post PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Calochortus flexuosus</i>	Weak stemmed mariposa Lily	G4	S1		E
<i>Townsendia strigosa</i>	Hairy Townsend-daisy	G4	S1		E

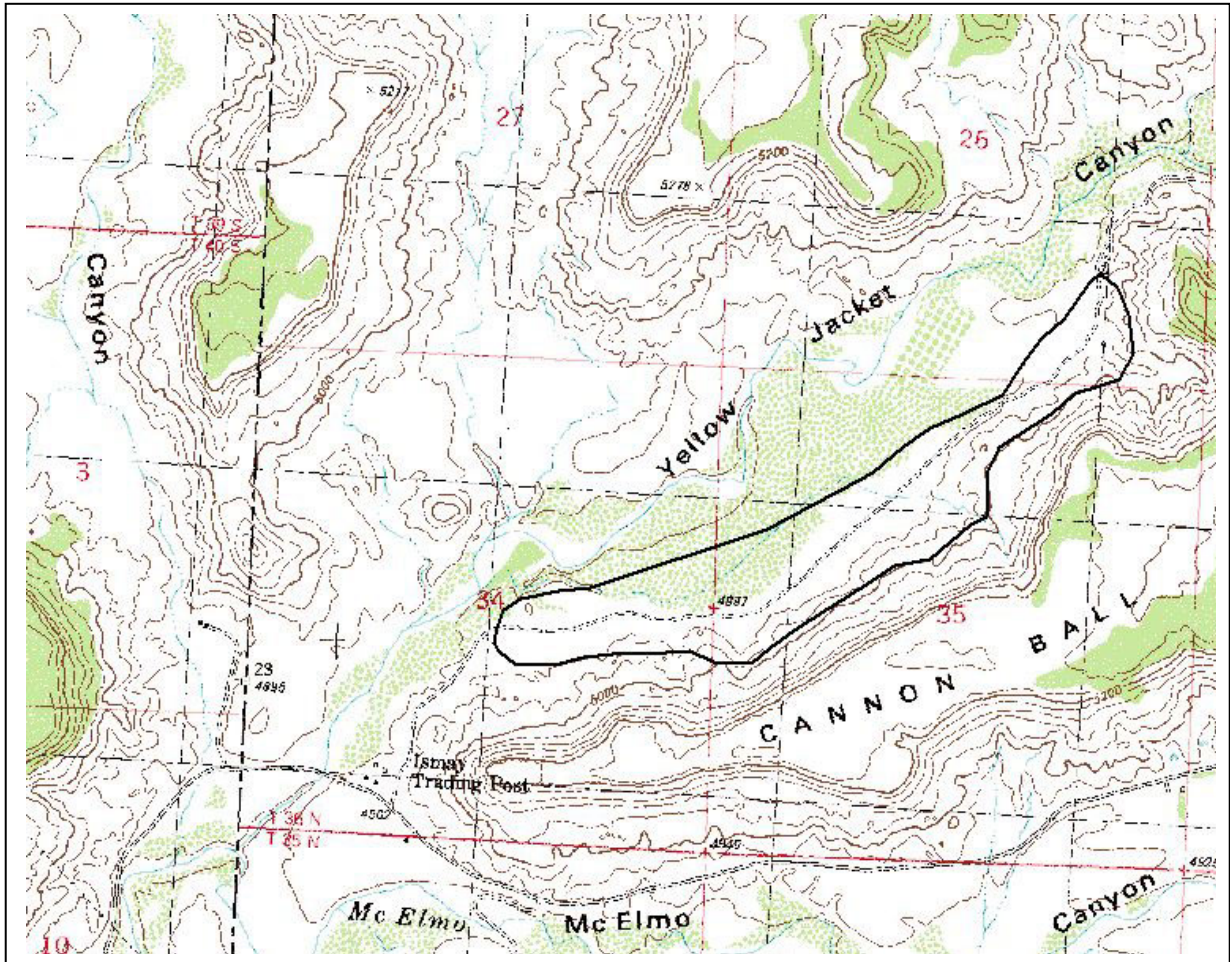
*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The PCA includes the two rare plant occurrences and some additional area in the same habitat that is suitable for the plants. 1:24,000 scale topographic maps and on-site surveys were used to determine suitable habitat: level areas in the semi-desert shrub zone, excluding the areas dominated by greasewood.

Protection Comments: The site comprises both BLM and adjacent private lands along the road. The BLM portion is within the Canyons of the Ancients National Monument.

Management Rank Comments: The site appears to have been very heavily grazed and trampled. Alien species and increaser species are abundant. Alien species include cheatgrass, cranesbill, and halogeton. . Weedy increasers include wooly plantain, Nuttall's milkvetch , and stickseed. Further survey of the area is planned for early spring 2005 when the targeted species are in bloom.

Ismay Trading Post. B5: General Biodiversity Significance



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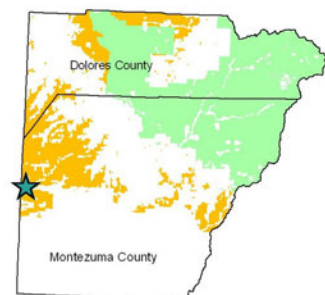


PCA BOUNDARY

Wickiup Canyon
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Rincon Canyon PCA

Biodiversity Rank: B5: General biodiversity significance. The PCA supports a plant that is rare (S1) in Colorado.

Protection Urgency Rank: P3: Protection actions may be needed, but probably not within the next 5 years. The PCA is primarily within the Canyons of the Ancients National Monument, but includes some private land with no protection.

Management Urgency Rank: M3: New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Although no urgent management needs are known at this time, further survey is warranted and planned for 2005.

Location: The Rincon Canyon PCA is located in western Montezuma County, about 18 miles west of Cortez and five miles from the Utah border. The site can be accessed from the Hamilton Mesa Road, south of McElmo Creek east of Ismay. A small side road leading to Horny Toad Mesa diverges from the Hamilton Mesa Road and crosses Rincon Canyon.

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

Legal Description: T35N, R19 W, Sections 16, 17, 21, 22 and 23

Elevation: 5,320 to 5,800 feet

Size: Approximately 728 acres

General Description: Rincon Canyon, a tributary of McElmo Creek, contains headwaters of the San Juan River. An intermittent creek runs northwest, forming a shallow canyon through the Dakota and Morrison formations. The PCA is situated within a salt desert shrub community and includes patches of sparse juniper, sagebrush and grass dominated areas. Rocky benches on an east facing slope in the canyon support a small population of Jones blue star (*Amsonia jonesii*). Twenty to thirty plants were documented here by BLM in 2001. Associated species include spiny horsebrush (*Forsellesia meionandra*) and galleta (*Pleuraphis jamesii*). Cryptobiotic crust covered about 20 to 30 percent of the unvegetated areas. Although not yet documented for this site, other plants tracked by CNHP that may be expected here include little penstemon (*Penstemon breviculus*) and weak-stemmed mariposa lily (*Calochortus flexuosus*).

Biodiversity Rank Justification and Comments: The Rincon Canyon PCA supports an unranked (E) occurrence of Jones Blue-star, a plant that is globally secure (G4) but rare in Colorado (S1).

Natural Heritage element occurrence at Rincon Canyon PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Amsonia jonesii</i>	Jones blue-star	G4	S1		E

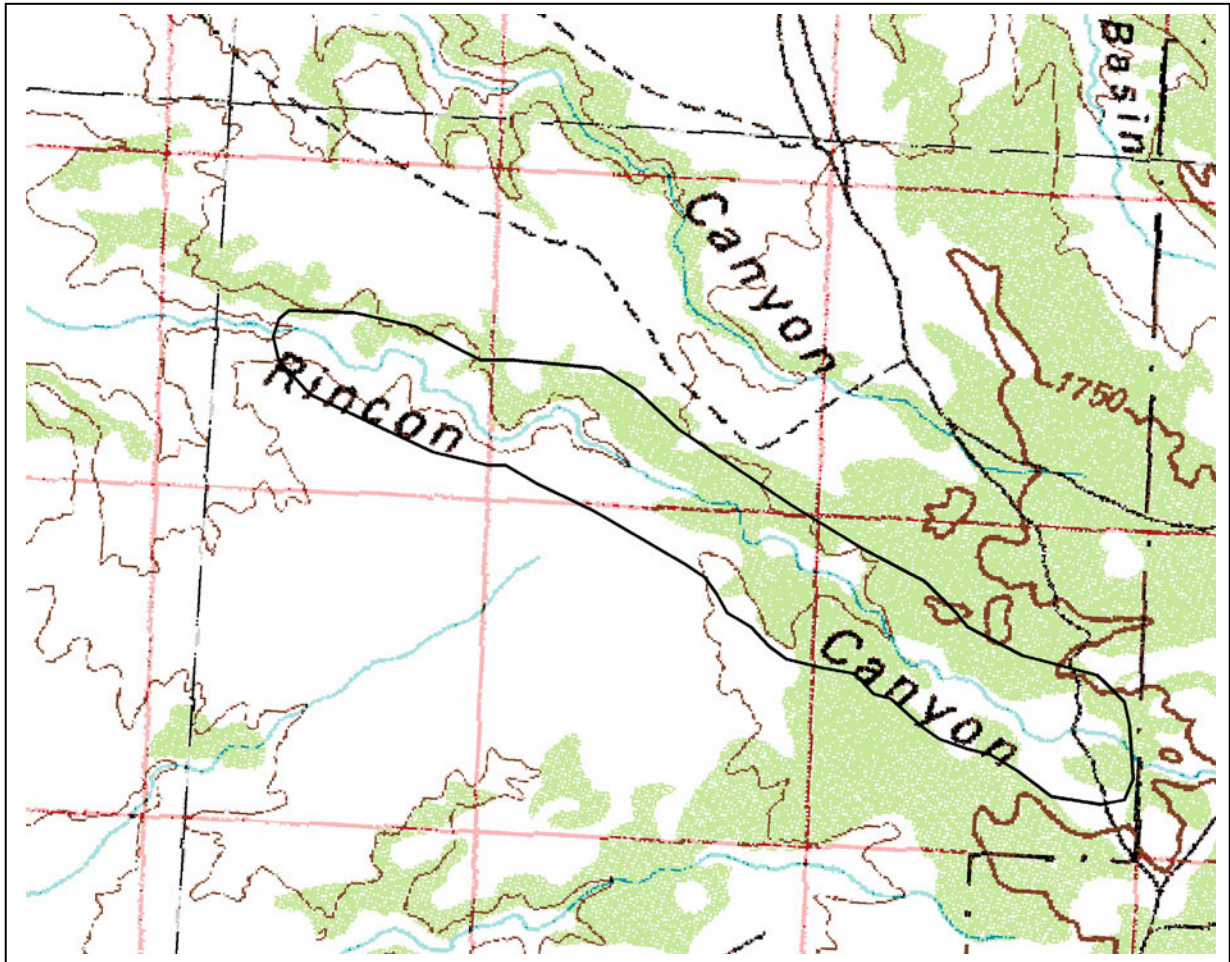
*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary was drawn to encompass the site of Jones blue star, along with a section of the canyon both upstream and downstream that includes unsurveyed areas expected to contain suitable habitat for movement or expansion of the Jones blue star population.

Protection Comments: The PCA is located primarily on BLM land within the southern part of the Canyons of the Ancients National Monument, with about a half mile of private land at the lower end. The area within the monument is adequately protected.

Management Rank Comments: No management needs are known at this time. Further survey of the canyon is warranted, and is planned for 2005.

Rincon Canyon. B5: General Biodiversity Significance



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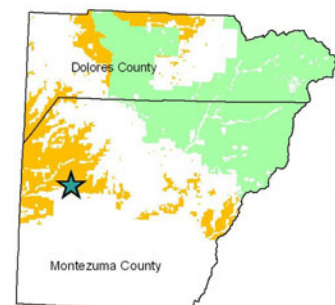


PCA BOUNDARY

Bowdish Canyon
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



Tozer Canyon PCA

Biodiversity Rank: B5: General biodiversity significance. The PCA supports a plant that is globally common (G5) but very rare in Colorado (S1).

Protection Urgency Rank: P4: No protection actions are needed in the foreseeable future. The PCA is located within the Canyons of the Ancients National Monument.

Management Urgency Rank: M3: New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Additional survey is needed to assess the size and condition of rare plant occurrences.

Location: The Tozer Canyon PCA is located in Montezuma County, about two miles north of McElmo Creek, about 14 miles west of Cortez. The area can be accessed from County Road P. Continue past Moque Lake and turn at the first left.

U.S.G.S. 7.5 minute quadrangles: Battle Rock

Legal Description: T36N, R18W, Sections 19, 20, and 21

Elevation: 6,000 to 5,323 feet

Size: Approximately 360 acres

General Description: The Tozer Canyon PCA occupies an open, level area in a desert shrub community dominated by four-wing saltbush, galleta and alkali sacaton (*Atriplex canescens*, *Pleuraphis jamesii* and *Sporobolus airoides*). Although the parent material is mapped as the Jurassic Morrison, Summerville and Entrada formations, soils appear to be clay derived from Mancos shale. Newberry's milkvetch (*Astragalus newberryi*) was observed here in 1998. Although only a few plants were seen, further survey is needed to determine the full extent of the population.

Biodiversity Rank Justification and Comments: This PCA supports an unranked (E) occurrence of Newberry's milkvetch a plant that is very rare (S1) in Colorado although globally common (G5). This occurrence is one of only two known in Colorado.

Natural Heritage element occurrence at Tozer Canyon PCA.

Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
<i>Astragalus newberryi</i>	Newberry's Milk vetch	G5	S1		E

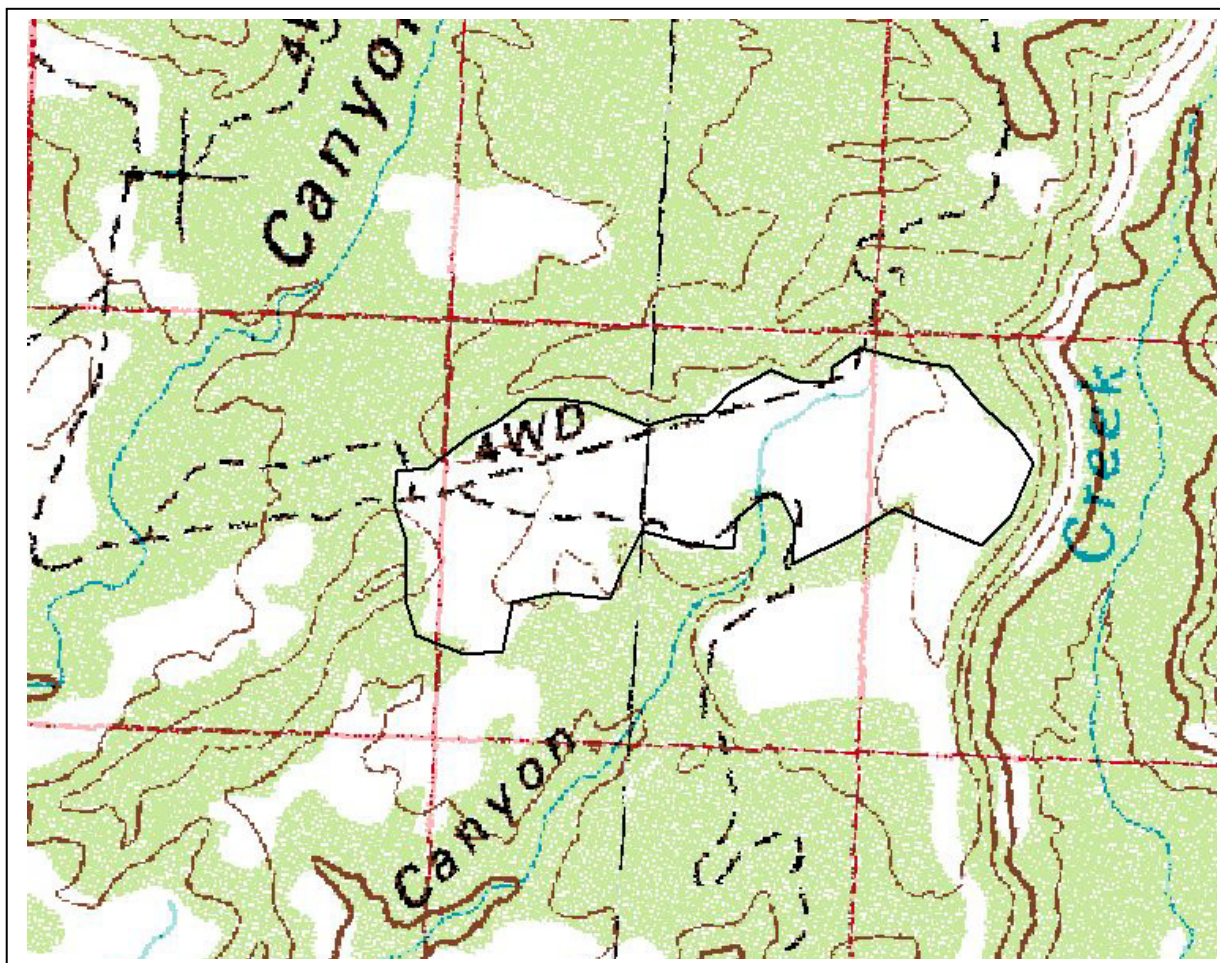
*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary is drawn to include the treeless area surrounding the Newberry's milkvetch occurrence, and includes sufficient area within the same habitat to allow for future colonization.

Protection Comments: The PCA is within the Canyons of the Ancients National Monument and is thereby adequately protected.

Management Rank Comments: No management needs are known at present. Further survey is planned for 2005 to assess the size, condition and landscape context of the Newberry's milkvetch occurrence.

Tozer Canyon. B5: General Biodiversity Significance



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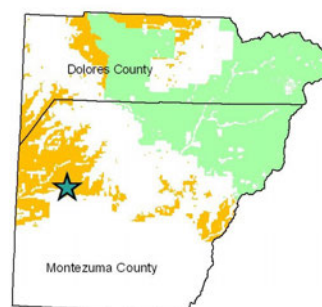


PCA BOUNDARY

Battle Rock
7.5 Minute Series

Digital Raster Graphics
Produced by the U. S.
Geological Survey
Map created 31 January 2005
UTM Zone 12 NAD 27

LOCATION IN STUDY AREA



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APPENDIX A. PLANT SPECIES LISTS FROM SELECTED SITES

Species Lists from selected representative locations in Dolores and Montezuma Counties

Plants are listed alphabetically under life form (tree; shrub and sub-shrub (including cacti); graminoid, (including grasses, sedges, rushes); and forb (or herbaceous plants).

Non-native species are in italics

Species tracked by CNHP are in bold type

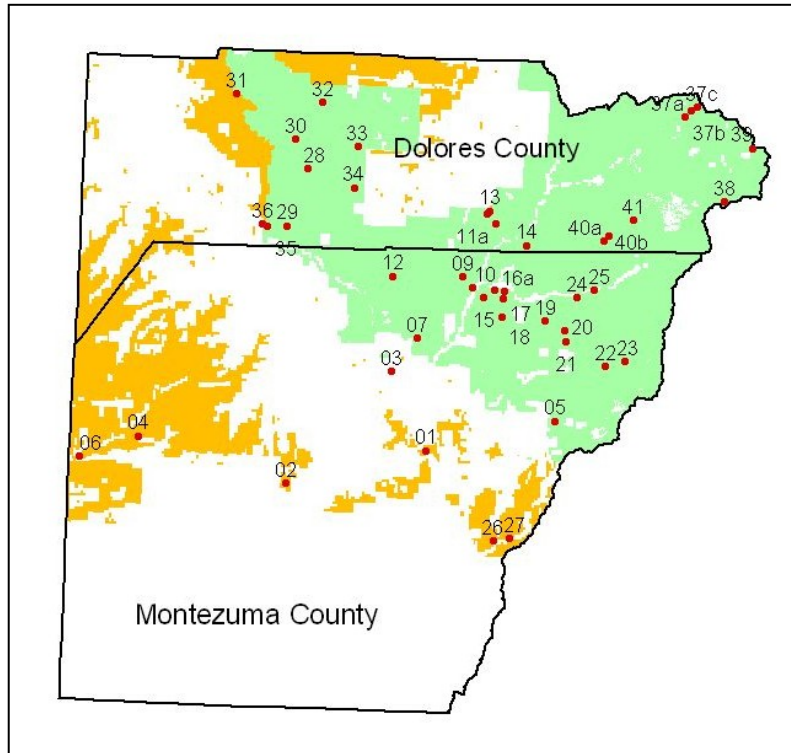


Figure 54. Locations of species lists in Dolores and Montezuma counties.
(ArcView shape file of locations included on accompanying CD)

1. BLM land 1 mile northwest of Mesa Verde National Park entrance

U.S.G.S. Quadrangle: Point Lookout

T36N R14W Sections 19 and 30

Elev. Approx. 6,600 ft.

Owner: BLM

1a. Shrubs/grassland

Shrubs

Artemisia tridentata ssp. *tridentata*

Sarcobatus vermiculatus

Graminoids

Elymus elymoides

Sporobolus cryptandrus

Forbs

Calochortus nuttallii
Sphaeralcea coccinea

1b. Juniperus osteosperma/Pinus edulis/ Cercocarpus montanus community**Trees**

Juniperus osteosperma
Pinus edulis

Shrubs

Amelanchier utahensis
Cercocarpus montanus
Opuntia phaeacantha
Opuntia polyacantha
Rhus trilobata

Graminoids

Bromus tectorum
Oryzopsis hymenoides

Forbs

Alyssum desertorum
Chaetopappa ericoides
Cirsium neomexicanum
Cymopterus purpureus
Draba cuneifolia
Eriogonum alatum
Heterotheca villosa
Ipomopsis aggregata
Lactuca serriola
Lappula redowskii
Lesquerella rectipes
Oreocarya flavoculata
Pedicularis centranthera
Penstemon breviculus
Penstemon commarhenus
Penstemon lentus
Penstemon linarioides
Phlox longifolia
Physaria acutifolia
Senecio multilobatus
Tetraneuris ivesiana
Townsendia incana

1c. Weedy areas where more moist, and perhaps seeded**Shrubs**

Artemisia tridentata
Atriplex confertifolia
Chrysothamnus nauseosus
Sarcobatus vermiculatus

Graminoids

Bromus tectorum

Thinopyrum intermedium

Forbs

Acroptilon repens

Astragalus wingatanus

Cardaria sp.

Carduus nutans

Castilleja chromosa

Chaetopappa ericoides

Cirsium arvense

Descurainia sophia

Eriogonum alatum

Gutierrezia sarothrae

Marrubium vulgare

Pascopyrum smithii

Psilochenia sp.

Tetraneuris ivesiana

2. Mud Canyon, south of McElmo Canyon

U.S.G.S. Quadrangle: Mud Creek

T35N R17W Section 12

Elev. 5900 *ft.*

Owner: BLM

2a. Juniperus osteosperma/Pinus edulis with Artemisia tridentata ssp. tridentata openings

Trees

Juniperus osteosperma

Pinus edulis

Shrubs

Artemisia tridentata ssp. *tridentata*

Chrysothamnus viscidiflorus

Opuntia pheaeacantha

Graminoids

Bouteloua gracilis

Bromus tectorum

Elymus elymoides

Hilaria jamesii

Oryzopsis hymenoides

Pascopyrum smithii

Hesperostipa comata

Vulpia octoflora

Forbs

Acrolasia sp.

Astragalus sp.

Calyophus lavandulifolia

Chaetopappa ericoides

Chamaesyce fendleri

Cirsium neomexicanum

Delphinium scaposum

Descurainia pinnata

Descurainia sophia

Erodium cicutarium

Halogeton glomerata

Lappula marginata

Lappula redowskii

Leptodactylon pungens

Lesquerella rectipes

Oenothera albicaulis

Penstemon breviculus

Phacelia crenulata

Sisymbrium altissimum

Sphaeralcea coccinea

Stanleya pinnata

Stephanomeria sp.

Tragopogon dubius

2b. Sagebrush shrubland

Shrubs

Artemisia tridentata ssp. tridentata
Chrysothamnus viscidiflorus
Opuntia phaeacantha

Graminoids

Bromus tectorum
Elymus elymoides
Hilaria jamesii
Oryzopsis hymenoides
Stipa comata
Vulpia octoflora

Forbs

Calochortus nuttallii
Delphinium scaposum
Descurainia pinnata
Eriastrum diffusum
Erigeron concinnus
Gutierrezia sarothrae
Halogeton glomerata
Ipomopsis aggregata
Lappula redowskii
Lathyrus eucosmus
Lupinus brevicaulis
Marrubium vulgare
Penstemon breviculus
Phlox longifolia
Sisymbrium altissimum
Sphaeralcea coccinea
Tetrandeum ivesiana

2c. Juniperus osteosperma/Pinus edulis community along canyon rim

Trees

Juniperus osteosperma
Pinus edulis

Shrubs

Amelanchier utahensis
Artemisia tridentata ssp. tridentata
Cylindropuntia whipplei
Ephedra viridis
Opuntia phaeacantha
Opuntia polyacantha
Pediocactus simpsonii
Purshia tridentata
Rhus trilobata

Graminoids

Bouteloua gracilis
Bromus tectorum
Elymus elymoides

Oryzopsis hymenoides
Poa fendleriana
Sporobolus cryptandrus
Stipa comata
Thinopyrum ponticum
Vulpia octoflora

Forbs

Astragalus sp.
Chaetopappa ericoides
Delphinium scaposum
Descurainia pinnata
Eriogonum alatum
Eriogonum ovalifolium
Gutierrezia sarothrae
Heterotheca villosa
Lactuca serriola
Lappula redowskii
Leptodactylon pungens
Lesquerella rectipes
Lupinus sp.
Mirabilis multiflora
Oreocarya flavoculata
Penstemon barbatus
Penstemon breviculus
Penstemon comarrhenus
Petradoria pumila
Senecio multilobatus
Sphaeralcea coccinea
Tetraneuris ivesiana
Townsendia incana

2d. Canyon bottom and around stock pond

Trees

Juniperus osteosperma
Pinus edulis
Populus deltoides ssp. wislizenii
Tamarisk ramosissima

Shrubs

Artemisia tridentata ssp. tridentata
Chrysothamnus depressus
Echinocereus triglochidiatus

Graminoids

Bromus inermis
Koeleria macrantha
Poa fendleriana
Poa secunda

Forbs

Centaureum repens
Cymopterus purpureus
Psilochenia sp.

Tetraneuris ivesiana
Melilotus officinalis
Typha latifolia
Asclepias asperula
Chaenactis douglasii
Hedeoma drummondii
Hedysarum boreale
Oxybaphus linarioides
Silene antirrhina
Stenotus armerioides
Streptanthus cordatus

2e. Pinyon-juniper/Artemisia nova community on steep north slope and rim

Trees

Pinus edulis
Juniperus osteosperma

Shrubs

Amelanchier utahensis
Artemisia nova
Chrysothamnus depressus
Cylindropuntia whipplei
Opuntia phaeacantha
Opuntia polyacantha
Purshia tridentata

Graminoids

Bromus tectorum
Elymus elymoides
Hilaria jamesii
Koeleria macrantha
Oryzopsis hymenoides
Poa fendleriana
Vulpia octoflora

Forbs

Astragalus sp.
Chaetopappa ericoides
Erigeron concinnus
Hymenopappus filifolius
Leptodactylon pungens
Machaeranthera grindelioides

Penstemon lentus

Petradoria pumila
Stenotus armerioides
Tetraneuris ivesiana
Townsendia incana

2f. Hillside above bench

Shrubs

Artemisia tridentata ssp. tridentata
Echinocereus triglochidiatus

Sclerocactus whipplei

Graminoids

Hilaria jamesii

Forbs

Erigeron concinnus

Eriogonum ovalifolium

Gutierrezia sarothrae

Lactuca serriola

Leptodactylon pungens

Mirabilis multiflora

Penstemon breviculus

Plantago patagonica

Senecio multilobatus

Tragopogon dubius

3. Cash Canyon

U.S.G.S. Quadrangle: Dolores East

T36N R15W Section 15

Elev. 6,500 ft.

Owner: BLM

3a. Pinus edulis-Juniperus osteosperma/ Cercocarpus montanus community

Trees

Juniperus osteosperma

Pinus edulis

Shrubs

Artemisia tridentata ssp. tridentata

Atriplex canescens

Cercocarpus montanus

Chrysothamnus nauseosus

Ephedra viridis

Opuntia phaeacantha

Opuntia polyacantha

Purshia tridentata

Quercus gambelii

Yucca baccata

Graminoids

Agropyrum cristatum

Elymus elymoides

Hilaria jamesii

Oryzopsis hymenoides

Forbs

Acroclasia sp

Alyssum desertorum

Asclepias asperula

Astragalus sp.

Carduus nutans

Chaetopappa ericoides

Chenopodium sp.
Cirsium neomexicanum
Convolvulus arvensis
Cymopterus purpureus
Descurainia pinnata
Descurainia sophia
Draba cuneifolia
Erigeron sp.
Eriogonum alatum
Erodium cicutarium
Gilia pinnatifida
Grindelia squarrosa
Helianthus annuus
Hymenopappus filifolius
Ipomopsis aggregata
Lactuca serriola
Leptodactylon pungens
Lesquerella rectipes
Oerocarya flava
Pedicularis centranthera
Penstemon breviculus
Penstemon comarrhenus
Penstemon linarioides
Petradoria pumila
Phlox longifolia
Senecio multilobatus
Sisymbrium altissimum
Sphaeralcea coccinea
Stenotus armerioides
Tetraneuris ivesiana
Townsendia incana

3b. North facing slope with Juniperus osteosperma/Pinus edulis /Cercocarpus montanus community.

Trees

Juniperus osteosperma
Pinus edulis

Shrubs

Amelanchier utahensis
Cercocarpus montanus
Ephedra viridis
Rhus trilobata

Graminoids

Bromus tectorum
Elymus elymoides

Forbs

Alyssum parviflorum
Calochortus nuttallii
Descurainia pinnata
Gutierrezia sarothrae
Ipomopsis aggregata
Lactuca serriola

Lappula redowskii
Pedicularis centranthera
Penstemon breviculus
Physaria acutifolia
Senecio multilobatus
Sisymbrium altissimum
Sphaeralcea coccinea
Townsendia incana

3c. Canyon bottom with 2 ft. wide stream

Trees

Populus deltoides ssp. wislizenii

Shrubs

Amelanchier utahensis
Artemisia tridentata ssp. tridentata
Chrysothamnus nauseosus
Quercus gambelii
Rhus trilobata
Rosa woodsii
Salix exigua
Symphoricarpos oreophilus

Graminoids

Bromus tectorum
Eleocharis palustris
Juncus balticus
Poa pratensis

Forbs

Achillea lanulosa
Asclepias speciosa
Carduus nutans
Centaurea repens
Cirsium arvense
Erigeron divergens
Erigeron flagellaris
Hymenopappus filifolius
Melilotus officinalis
Penstemon barbatus
Penstemon comarrhenus
Penstemon linarioides
Phlox longifolia
Solidago canadensis

3d. South facing steep slope and rim with Dakota Sandstone outcrops--Juniperus osteosperma/Cercocarpus montanus/Hilaria jamesii community

Trees

Juniperus osteosperma

Shrubs

Cercocarpus montanus
Cylindropuntia whipplei
Echinocereus triglochidiatus
Ephedra viridis
Opuntia polyacantha
Rhus trilobata

Graminoids

Aristida purpurea
Hilaria jamesii

Forbs

Brickellia grandiflora
Chaetopappa ericoides
Eriogonum alatum

4. Canyons of the Ancients, south of Risley Canyon

U.S.G.S. Quadrangle: Bowdish Canyon
T36 R19 Section 22
Elev. 5,652 ft.
Owner: BLM

4a. Juniperus osteosperma-Pinus edulis/Cercocarpus montanus-Amelanchier utahensis community

Trees

Juniperus osteosperma
Pinus edulis

Shrubs

Amelanchier utahensis
Atriplex canescens
Cercocarpus montanus
Chrysothamnus viscidiflorus
Ephedra viridis
Purshia stansburiana
Rhus simplicifolia
Rhus trilobata
Sclerocactus whipplei
Yucca harrimaniae

Graminoids

Aristida purpurea
Bromus tectorum
Koeleria macrantha
Oryzopsis hymenoides
Stipa comata
Stipa neomexicana

Forbs

Astragalus molissimus
Brickellia microphylla
Brickellia oblongifolia
Chaetopappa ericoides
Cryptantha flava
Delphinium scaposum

Gutierrezia sarothrae
Halogeton glomerata
Hymenopappus filifolius
Ipomopsis aggregata
Leptodactylon pungens
Lesquerella rectipes
Linum lewisii
Machaeranthera grindelioides
Mirabilis multiflora
Platyschuhria integrifolia
Senecio multilobatus
Stanleya pinnata
Tetraneuris ivesiana
Townsendia incana

4b. North facing slope with some grassy areas

Trees

Juniperus osteosperma
Pinus edulis

Graminoids

Hilaria jamesii

Forbs

Astragalus sp.
Chaetopappa ericoides
Cymopterus purpureus
Eriastrum diffusum
Erodium cicutarium
Gutierrezia sarothrae
Lappula marginata
Plantago patagonica
Platyschuhria integrifolia
Sphaeralcea coccinea
Townsendia sp.

5. Echo Basin Road

U.S.G.S. Quadrangle: Rampart Hills
T36N R12W Section 6
Elev. 8,000
Owner: USFS

5a. Pinus ponderosa/Quercus gambelii woodland

Trees

Juniperus scopulorum
Pinus ponderosa
Populus tremuloides

Shrubs

Amelanchier utahensis
Prunus virginiana var. melanocarpa
Quercus gambelii

Rosa woodsii
Symphoricarpos oreophilus

Graminoids

Bromus tectorum
Carex geeyeri
Festuca arizonica
Pascopyrum smithii
Poa fendleriana
Poa pratensis

Forbs

Achillea lanulosa
Allium geeyeri
Antennaria rosea
Artemisia ludoviciana
Astragalus bisulcatus
Comandra umbellata
Delphinium nuttallianum
Erigeron flagellaris
Eriogonum racemosum
Galium septentrionale
Hedysarum boreale
Iris missouriensis
Lathyrus pauciflorus
Linum lewisii
Lomatium grayi
Lupinus sp.
Mahonia repens
Medicago lupulina
Penstemon cespitosus
Penstemon linarioides
Potentilla pulcherrima
Pseudocymopterus montanus
Senecio oodes
Taraxacum officinale
Vicia americana

5b. Riparian. Populus angustifolia/Alnus incana community

Trees

Alnus incana
Populus angustifolia
Salix sp.

Shrubs

Crataegus rivularis
Quercus gambelii
Ribes inerme
Ribes montigenum
Ribes wolfii
Salix monticola

Graminoids

Carex sp. coll.

Eleocharis sp.
Poa pratensis

Forbs

Allium geyeri
Androsace septentrionalis
Antennaria rosea
Capsella bursa-pastoris
Cardaria sp.
Cerastium sp.
Chamerion danielsii
Cirsium arvense
Coriflora hirsutissima
Fragaria virginiana
Galium triflorum
Geranium richardsonii
Heracleum lanatum
Hydrophyllum fendleri
Mahonia repens
Mentha arvensis
Mertensia ciliata
Osmorhiza depauperata
Pedicularis sp.
Trifolium repens
Veronica serpyllifolia var. humifusa
Viola adunca
Viola canadensis

6. Ismay Trading Post

U.S.G.S. Quadrangle: Wickiup Canyon
T36N R20W Section 34 and 35
Elev. 4,900 ft.
Owner: BLM

Disturbed Grassland

Shrubs

Atriplex confertifolia
Opuntia polyacantha
Sarcobatus vermiculatus

Graminoids

Bromus tectorum
Hilaria jamesii

Forbs

Astragalus nuttallianus
Calochortus flexuosus
Cordylanthus wrightii
Erodium cicutarium
Gutierrezia sarothrae
Halogeton glomerata
Lappula marginata
Phacelia crenulata
Plantago patagonica

Sphaeralcea coccinea
Townsendia strigosa

7. School Section Reservoir area
U.S.G.S. Quadrangle: Boggy Draw
T37N R15W Section 36
Elev. 7,653 ft.
Owner: USFS

7a. Pinus ponderosa/Quercus gambelii community

Trees

Pinus ponderosa

Shrubs

Purshia tridentata
Quercus gambelii
Rosa woodsii

Graminoids

Bromus tectorum
Carex rossii
Poa fendleriana
Poa pratensis

Forbs

Achillea lanulosa
Allium acuminatum
Antennaria rosea
Artemisia ludoviciana
Astragalus sp.
Cirsium arvense
Collinsia parviflora
Delphinium andersonii var. scaposum
Erigeron divergens
Erigeron flagellaris
Eriogonum jamesii
Eriogonum racemosum
Heterotheca villosa
Lithospermum multiflora
Mahonia repens
Penstemon barbatus
Senecio oodes
Taraxacum officinale

7b. Exposed bedrock, sparse vegetation

Shrubs

Echinocereus triglochidiatus
Opuntia fragilis
Purshia tridentata

Graminoids

Bromus tectorum
Poa bulbosa

Poa fendleriana

Forbs

Allium acuminatum
Antennaria rosea
Artemisia ludoviciana
Comandra umbellata
Erigeron divergens
Erigeron flagellaris
Eriogonum alatum
Erodium cicutarium
Heterotheca villosa
Purshia tridentata
Sedum lanceolatum
Sellaginella sp.
Tetraneuris ivesiana
Tragopogon dubius

8. Slick Rock Hill

U.S.G.S. Quadrangle: Horse Range Mesa
T43N R19W Section 1
Owner: BLM

Juniperus osteosperma/Pinus edulis community

Trees

Juniperus osteosperma
Pinus edulis

Shrubs

Amelanchier utahensis
Artemisia nova
Cercocarpus montanus
Ephedra viridis
Fendlera rupicola
Opuntia polyacantha

Graminoids

Bouteloua gracilis
Bromus tectorum
Carex rossii
Elymus elymoides
Oryzopsis hymenoides
Poa fendleriana
Stipa comata

Forbs

Eriogonum microthecum
Gutierrezia sarothrae
Hymenopappus filifolius
Tetraneuris ivesiana

9. Boggy Draw Reservoir

U.S.G.S. Quadrangle: Boggy Draw

T39N R14W Section 34

Elev. 8,400 ft.

Owner: USFS

***Pinus ponderosa*/*Quercus gambelii* community**

Trees

Pinus ponderosa

Populus tremuloides

Shrubs

Amelanchier alnifolia

Quercus gambelii

Rosa woodsii

Symphoricarpos oreophilus

Graminoids

Bromus inermis

Carex geyeri

Pascopyrum smithii

Poa pratensis

Forbs

Achillea lanulosa

Allium geyeri

Antennaria rosea

Boechera drummondii

Cerastium strictum

Chamerion danielsii

Delphinium scaposum

Eremogone congesta

Erigeron flagellaris

Erythronium grandiflorum

Fragaria virginiana

Galium septentrionale

Heterotheca villosa

Iris missouriensis

Lathyrus leucanthus

Mahonia repens

Medicago lupulina

Noccaea montana

Pseudocymopterus montanus

Pseudostellaria jansiana

Senecio oodes

Taraxacum officianale

Thalictrum fendleri

Thermopsis montana

10. McPhee Park

U.S.G.S. Quadrangle: Stoner

T38N R14W Section 2

Elev. 8,065 ft.

Owner: USFS

Pinus ponderosa/Populus tremuloides/Quercus gambelii community

10 a. Second growth forest

Trees

Pinus ponderosa
Populus tremuloides

Shrubs

Amelanchier alnifolia
Prunus virginiana
Purshia tridentata
Quercus gambelii
Rosa woodsii
Symphoricarpos oreophilus

Graminoids

Carex geyeri
Carex rossii
Dactylis glomerata
Poa pratensis

Forbs

Achillaea lanulosa
Antennaria parviflora
Arabis perennans
Artemisia ludoviciana
Collinsia parvifolia
Delphinium scaposum
Eriogonum racemosum
Erigeron flagellaris
Fragaria virginiana
Galium septentrionalis
Mahonia ripens
Maianthemum stellatum
Microsteris gracilis
Osmorhiza depauperata
Senecio oodes
Taraxacum officinale
Thalictrum fendleri
Trifolium sp.
Vicia americana

10 b. Virgin Pinus ponderosa forest, set aside in 1930. Large trees, more savanna like, less oak, but understory standard.

Trees

Pinus ponderosa

Shrubs

Prunus virginiana var. melanocarpa
Quercus gambelii
Symphoricarpos oreophilus

Graminoids

Carex geyeri

Dactylis glomerata

Forbs

Arabis perennans
Artemisia ludoviciana
Collinsia parviflora
Galium septentrionale
Thalictrum fendleri
Vicia americana

11. Cottonwood Creek

U.S.G.S. Quadrangle: Nipple Mountain
T39N R13W Section 6 and 36
Elev. 7,925 ft.
Owner: USFS

Populus angustifolia/Populus tremuloides community

Trees

Populus angustifolia
Populus tremuloides

Shrubs

Chrysothamnus nauseosus
Crataegus rivularis
Potentilla fruiticosa
Salix bebbiana
Salix monticola
Symphoricarpos oreophilus

Graminoids

Festuca arizonica
Poa fendleriana
Poa pratensis

Forbs

Achillea lanulosa
Agoseris aurantiaca
Allium geayeri
Antennaria rosea
Arabis drummondii
Artemisia ludoviciana
Cerastium strictus
Chamerion danielsii
Delphinium nuttallianum
Dugaldia hoopsii
Erigeron flagellaris
Eriogonum jamesii
Fragaria virginiana
Frasera speciosa
Galium septentrionale
Geranium richardsonii
Heterotheca villosa
Ipomopsis aggregata
Lathyrus leucanthus

Lupinus sp.
Mahonia repens
Noccaea montana
Oenothera caespitosa
Polygonum sp.
Potentilla hippiana
Potentilla pulcherrima
Pseudocymopterus montanus
Pseudostellaria jamesiana
Senecio oodes
Taraxacum officinale
Thermopsis montana
Trifolium longipes
Veratrum tenuipetalum

12. USFS Pinyon-juniper above McPhee

U.S.G.S. Quadrangle: Trimble Point
T38N R16W
Elev. 6,700 *ft.*
Owner: USFS

12a. Pinus edulis- Juniperus osteosperma/ Cercocarpus montanus community

Trees

Juniperus osteosperma
Pinus edulis

Shrubs

Amelanchier utahensis
Artemisia tridentata ssp. tridentata
Cercocarpus montanus
Fendlera rupicola
Peraphyllum ramosissimum
Purshia tridentata
Quercus gambelii
Rhus trilobata
Symphoricarpos oreophilus
Yucca baccata

Graminoids

Bromus tectorum
Elymus elymoides
Koeleria macrantha
Oryzopsis hymenoides
Poa fendleriana

Forbs

Achillea lanulosa
Allium acuminatum
Alyssum parviflorum
Artemisia ludoviciana
Astragalus sp.
Balsamorhiza sagittata
Cymopterus purpureus
Descurainia pinnata

Eriogonum alatum
Eriogonum racemosum
Eriogonum umbellatum
Gutierrezia sarothrae
Ipomopsis congesta var. congesta
Lactuca serriola
Lathyrus leucanthus
Lathyrus pauciflorus
Linum lewisii
Lupinus sp.
Mahonia repens
Pedicularis centranthera
Penstemon cespitosus
Penstemon linarioides
Petradoria pumila
Physaria acutifolia
Psilochenia intermedia
Taraxacum officinale
Tragopogon dubius
Vicia americana
Toxicoscordion venenosum

12b. Shaly ridge top

Shrubs

Opuntia fragilis

Forbs

Cirsium neomexicanum
Descurainia pinnata
Sisymbrium altissimum
Sphaeralcea coccinea

12c. Additional spp. along road

Graminoids

Dactylis glomerata

Forbs

Convolvulus arvensis
Melilotus officinalis
Wyethia X magna

13. Mavreeso Canyon

U.S.G.S. Quadrangle: Nipple Mountain
T40N R13W Section 36
Elev. 8,300 ft.
Owner: USFS

13a. Riparian

Trees

Pinus ponderosa
Populus angustifolia
Populus tremuloides
Pseudotsuga menziesii

Shrubs

Cornus sericea
Symphoricarpos oreophilus
Distegia involucrata
Alnus incana
Prunus virginiana var. melanocarpa

Forbs

Ligusticum porteri
Osmorhiza occidentalis
Rudbeckia hirta
Taraxacum officinale
Thermopsis montana

13b. Upland meadow

Forbs

Delphinium nuttallianum
Iris missouriensis
Linum lewisii
Lupinus caudatus
Medicago lupulina
Senecio oodes
Trifolium hybridum
Wyethia X magna

13c. Shady north facing slope above creek

Shrubs

Actaea rubra
Paxistima myrsinites

Forbs

Aquilegia elegantula
Delphinium barbeyi
Dugaldia hoopsii
Heracleum lanatum
Maianthemum amplexicaule
Maianthemum stellatum
Streptopus fassettii
Viola adunca
Viola canadensis

14. West Dolores Road

U.S.G.S. Quadrangle: Nipple Mountain
T40N R12W Section 15
Elev. 8,400 *ft.*
Owner: USFS

Mixed conifer riparian

Trees

Abies concolor
Picea pungens
Pinus ponderosa
Populus angustifolia
Populus tremuloides
Pseudotsuga menziesii

Shrubs

Chrysothamnus nauseosus
Cornus sericea
Potentilla hippiana
Ribes sp
Rosa woodsii
Salix exigua
Salix monticola
Symphoricarpos occidentalis

Graminoids

Dactylis glomerata
Poa pratensis

Forbs

Achillea lanulosa
Antennaria rosea
Artemisia ludoviciana
Cardamine cordifolia
Cirsium arvense
Cirsium tracyi
Distegia involucrata
Equisetum arvense
Erigeron flagellaris
Fragaria virginiana
Galium septentrionale
Galium triflorum
Geranium richardsonii
Hippochaete hyemalis
Hydrophyllum fendleri
Iris missouriensis
Lathyrus leucanthus
Mahonia repens
Maianthemum stellatum
Medicago lupulina
Mertensia ciliata
Osmorhiza depauperata
Pseudocymopterus montanus
Rudbeckia laciniata
Rumex crispus
Taraxacum officinale
Thalictrum fendleri
Trifolium pratense
Vicia americana
Viola adunca
Viola canadensis

15. South Rim Dolores Canyon/ Haycamp Spring

U.S.G.S. Quadrangle: Stoner

T38N R13W Section 12

Elev. 8,506 ft.

Owner: USFS

Meadow on the south rim of Mesa

Shrubs

Chrysothamnus nauseosus

Rosa woodsii

Graminoids

Carex sp.

Poa pratensis

Stipa comata

Forbs

Achillea lanulosa

Artemisia ludoviciana

Boechera drummondii

Delphinium andersonii ssp. *Scaposum*

Erigeron flagellaris

Eriogonum racemosum

Iris missouriensis

Lupinus sp.

Melilotus officinalis

Navarretia breweri

Noccaea montana

Oenothera flava

Potentilla pulcherrima

Rumex crispus

Senecio neomexicana

Sisymbrium altissimum

Taraxacum officinale

Tragopogon dubius

Wyethia X *magna*

16. Dolores River Canyon across from Stoner

U.S.G.S. Quadrangle: Stoner

T38N R13W Section 5 and 6

Elev. 7,520 ft.

Owner: USFS

16a. Northeast facing slope with *Quercus gambelii*-*Symphoricarpos oreophilus* community.

Trees

Pseudotsuga menziesii

Shrubs

Prunus virginiana

Quercus gambelii

Rosa woodsii

Symphoricarpos oreophilus

Graminoids

Carex geeyeri
Elymus glaucus
Poa pratensis

Forbs

Achillea lanulosa
Boechera drummondii
Castilleja miniata
Delphinium andersonii ssp. scaposum
Eremogone congesta
Erigeron flagellaris
Erigeron speciosus
Eriogonum racemosum
Galium septentrionalis
Helianthella quinquenervis
Heuchera parvifolia
Lathyrus leucanthus
Ligusticum porteri
Linum lewisii
Osmorhiza occidentalis
Penstemon strictus
Potentilla pulcherrima
Pseudostellaria jamesiana
Thalictrum fendleri
Tragopogon dubius
Vicia americana
Wyethia X magna

16b. Populus tremuloides/Symphoricarpos oreophilus community with dense, luxuriant understory.**Trees**

Populus tremuloides

Shrubs

Amelanchier utahensis
Symphoricarpos oreophilus

Graminoids

Carex microptera
Elymus glaucus
Juncus balticus

Forbs

Achillea lanulosa
Allium geeyeri
Castilleja miniata
Erigeron speciosus
Fragaria virginiana
Galium septentrionalis
Geranium richardsonii
Helianthella quinquenervis
Iris missouriensis
Lathyrus leucanthus
Lupinus caudatus

Polemonium foliosissimum
Potentilla pulcherrima
Pseudocymopterus montanus
Pseudostellaria jamesiana
Senecio neomexicana
Taraxacum officinale
Thermopsis montana
Valeriana occidentalis
Vicia americana

17. Dry Lake

U.S.G.S. Quadrangle: Stoner
T38N R13W Section 8
Elev. 8,768 *ft.*
Owner: USFS

Pinus ponderosa/Quercus gambelii community

Trees

Pinus ponderosa

Shrubs

Amelanchier utahensis
Quercus gambelii
Rosa woodsii
Symphoricarpos oreophilus

Graminoids

Carex geeyeri
Carex occidentalis
Poa pratensis

Forbs

Achillea lanulosa
Allium geeyeri
Antennaria parvifolia
Delphinium andersonii ssp. Scaposum
Eremogone congesta
Erigeron flagellaris
Erythronium grandiflorum
Fragaria virginiana
Galium septentrionalis
Lathyrus leucanthus
Linum lewisii
Navarretia breweri
Potentilla pulcherrima
Pseudocymopterus montanus
Wyethia X magna

18. Wesley Reservoir

U.S.G.S. Quadrangle: Stoner
T38N R13W Section 20
Elev. 8,532 *ft.*
Owner: USFS

Small dry stream bed with *Pinus ponderosa* / *Potentilla fruiticosa*

Trees

Pinus ponderosa

Shrubs

Amelanchier alnifolia

Potentilla fruiticosa

Symphoricarpos oreophilus

Graminoids

Poa pratensis

Forbs

Achillea lanulosa

Allium geyeri

Aquilegia elegantula

Galium septentrionalis

Iris missouriensis

Mertensia ciliata

Ranunculus alismifolius

Thalictrum fendleri

Thermopsis montana

Toxicoscordion venenosum

Trifolium longipes

Veratrum tenuipetalum

19. Morgan Gulch, on Haycamp Mesa

U.S.G.S. Quadrangle: Wallace Ranch

T38N R12W Section 24

Elev. 9,140 ft.

Owner: USFS

Shady ravine in mixed conifer montane forest

Trees

Abies concolor

Picea engelmannii

Picea pungens

Populus tremuloides

Pseudotsuga menziesii

Shrubs

Actaea rubra

Distegia involucrata

Salix drummondiana

Salix lasiandra

Salix monticola

Symphoricarpos oreophilus

Vaccinium myrtillus

Graminoids

Carex aquatilis

Carex geyeri

Forbs

Achillea lanulosa
Aquilegia elegantula
Arnica cordifolia
Cardamine cordifolia
Castilleja miniata
Chamerion danielsii
Corallorhiza maculata
Cystopteris fragilis
Delphinium barbeyi
Dodecatheon pulchellum
Equisetum arvense
Fragaria virginiana
Galium septentrionalis
Geranium richardsonii
Heracleum lanatum
Ligusticum porteri
Maianthemum amplexicaule
Mertensia ciliata
Orthilia secunda
Osmorhiza depauperata
Oxypolis fendleri
Pedicularis racemosa
Pseudocymopterus montanus
Ranunculus alismifolius
Streptopus fassettii
Taraxacum officinale
Thalictrum fendleri
Viola canadensis
Viola sororia

20. Lost Canyon

U.S.G.S. Quadrangle: Wallace Ranch
T38N R12W Section 29
Elev. 8,700 ft.
Owner: USFS

Picea pungens/Alnus incana community**Trees**

Abies lasiocarpa
Acer glabrum
Alnus incana
Juniperus communis
Picea engelmannii
Picea pungens

Shrubs

Alnus incana
Amelanchier alnifolia
Distegia involucrata
Paxistima myrsinites
Ribes montigenum
Rosa woodsii
Rubus idaeus

Salix drummondiana
Salix monticola
Sambucus racemosa
Sorbus scopulina
Symphoricarpos oreophilus

Forbs

Allium geeyeri
Aquilegia elegantula
Arnica cordifolia
Campanula rotundifolia
Cardamine cordifolia
Chamerion danielsii
Corallorhiza maculata
Delphinium barbeyi
Draba spectabilis var. spectabilis
Dugaldia hoopsii
Equisetum arvense
Fragaria virginiana
Galium triflorum
Geranium richardsonii
Helianthella quinquenervis
Heracleum lanatum
Hydrophyllum fendleri
Iris missouriensis
Ligusticum porteri
Maianthemum amplexicaule
Maianthemum stellatum
Mertensia ciliata
Mitella stauropetala
Moehringia lateriflora
Noccaea montana
Osmorhiza depauperata
Oxypholis fendleri
Phacelia heterophylla
Pseudocymopterus montanus
Pseudostellaria jamesiana
Senecio triangularis
Streptopus fassettii
Thalictrum fendleri
Viola canadensis

21. Fish Creek /Turkey Creek

U.S.G.S. Quadrangle: Wallace Ranch
T38N R12W Section 32
Elev. 9,380 *ft.*
Owner: USFS

Picea pungens/Alnus incana community

Trees

Alnus incana
Picea engelmannii
Picea pungens

Shrubs

Actaea rubra
Distegia involucrata
Ribes montigenum
Symphoricarpos oreophilus
Vaccinium myrtillus

Graminoids

Carex aquatilis
Carex geyeri

Forbs

Androsace septentrionalis
Aquilegia coerulea
Aquilegia elegantula
Arnica cordifolia
Cardamine cordifolia
Equisetum arvense
Erythronium grandiflorum
Fragaria virginiana
Geranium richardsonii
Geum macrophyllum
Heracleum lanatum
Ligusticum porteri
Maianthemum amplexicaule
Maianthemum stellatum
Mertensia ciliata
Micranthes odontoloma
Mimulus guttatus
Mitella pentandra
Mitella stauropetalum
Noccaea montana
Primula parryi
Pseudocymopterus montanus
Ranunculus alismifolius
Ranunculus uncinatus
Senecio triangularis
Streptopus fassettii
Taraxacum officinale
Thalictrum fendleri
Viola adunca
Viola canadensis
Viola sororia

22. Spruce Mill Park

U.S.G.S. Quadrangle: Rampart Hills
T37N R12W Section 12
Elev. 10,518 ft.
Owner: USFS

22a. Picea engelmannii/-Abies lasiocarpa/ Vaccinium myrtillus community**Trees**

Abies lasiocarpa
Picea engelmannii

Shrubs

Distegia involucrata
Vaccinium myrtillus

Graminoids

Carex geyeri

Forbs

Androsace septentrionalis
Draba spectabilis var. spectabilis
Fragaria virginiana
Geranium richardsonii
Lathyrus leucanthus
Ligusticum porteri
Luzula parviflora
Maianthemum amplexicaule
Mertensia ciliata
Noccaea montana
Osmorhiza depauperata
Pedicularis racemosa
Polemonium pulcherrimum
Pseudocymopterus montanus
Ribes montigenum
Sambucus racemosa
Vicia americana

22b. Boggy area**Shrubs**

Ribes wolfii

Forbs

Aquilegia elegantula
Arnica cordifolia
Caltha leptosepala
Cardamine cordifolia
Castilleja miniata
Galium triflorum
Micranthes odontoloma
Senecio triangularis
Streptopus fassettii
Taraxacum officinale
Trollius albiflorus
Veratrum tenuipetalum

22c. Along road**Forbs**

Ranunculus inamoenus
Senecio atratus
Spergulastrum lanuginosum
Valeriana capitata

23. Burrow Mountain

U.S.G.S. Quadrangle: La Plata

T37N R11W Section 8

Elev. 10,872 *ft.*

Owner: USFS

Talus slope

Shrubs

Actaea rubra

Sambucus racemosa

Ribes montigenum

Rubus idaeus

Ribes sp.

Graminoids

Festuca thurberi

Phleum commutatum

Forbs

Allium geyeri

Androsace septentrionalis

Aquilegia coerulea

Besseyia ritteriana

Cryptogramma acrostichoides

Draba spectabilis

Fragaria virginiana

Hydrophyllum fendleri

Ligusticum porteri

Mertensia ciliata

Taraxacum officinale

Thalictrum fendleri

Urtica dioecia

Veratrum tenuipetalum

Viola labradorica

24. Bear Creek Trail

U.S.G.S. Quadrangle: Wallace Ranch

T38N R12W Section 9

Elev. 8,009 *ft.*

Owner: USFS

24a. Riparian-- *Picea pungens*-*Populus angustifolia*/*Alnus incana* with *Salix drummondiana* and *Salix monticola*

Trees

Abies lasiocarpa

Alnus incana

Picea pungens

Populus angustifolia

Shrubs

Actaea rubra

Alnus incana

Amelanchier alnifolia

Cornus sericea
Distegia involucrata
Potentilla fruticosa
Ribes montigenum
Rosa woodsii
Salix drummondiana
Salix exigua
Salix monticola
Shepherdia canadensis
Symphoricarpos oreophilus

Graminoids

Carex aquatilis
Carex aurea
Carex geyeri
Carex microptera
Poa pratensis

Forbs

Achillea lanulosa
Antennaria rosea
Apocynum androsaemifolium
Arnica mollis
Cardamine cordifolia
Castilleja miniata
Cirsium arvense
Equisetum arvense
Erigeron flagellaris
Erigeron glabellus
Erigeron speciosus
Fragaria virginiana
Galium septentrionale
Galium triflorum
Geranium caespitosum
Geranium richardsonii
Geum macrophyllum
Goodyera oblongifolia
Heracleum lanatum
Hippochaete hyemalis
Mahonia repens
Maianthemum stellatum
Mertensia ciliata
Moehringia lateriflora
Osmorhiza depauperata
Oxypolis fendleri
Potentilla hippiana
Potentilla pulcherrima
Pseudocymopterus montanus
Pseudotsuga menziesii
Rudbeckia laciniata
Senecio neomexicana
Stellaria calycantha
Streptopus fassettii
Taraxacum officinale
Thalictrum fendleri
Thermopsis montana

Trifolium pratense
Trifolium repens
Veronica americana
Vicia americana
Viola adunca
Viola canadensis

24b. Meadow

Shrubs

Sambucus racemosa

Graminoids

Dactylis glomerata
Juncus balticus
Poa pratensis
Stipa comata

Forbs

Astragalus alpinus
Capsella bursa-pastoris
Carduus nutans
Cerastium strictus
Cirsium centaureum
Equisetum arvense
Erodium cicutarium
Hippochaete hyemalis
Potentilla hippiana
Prunella vulgaris
Vicia americana

24c. Drier hillsides

Trees

Pinus ponderosa
Pinus strobiformis
Pseudotsuga menziesii

Shrubs

Ceanothus fendleri
Prunus virginiana var. melanocarpa
Quercus gambelii
Ribes inerme
Rubus idaeus
Vaccinium cespitosum

Graminoids

Phleum pratense
Poa fendleriana

Forbs

Antennaria rosea
Apocynum androsaemifolium
Artemisia ludoviciana

Boechera drummondii
Dugaldia hoopsii
Erigeron flagellaris
Erigeron speciosus
Eriogonum umbellatum
Helimeris multiflora
Heterotheca villosa
Ipomopsis aggregata
Lathyrus pauciflorus
Medicago sativa
Oenothera caespitosa
Oenothera elata
Oligosporus dracunculus
Penstemon strictus
Polemonium foliosissimum
Solidago sp.
Toxicodendron rydbergii

24d. North facing hillside, mixed montane forest, with, Populus tremuloides, Pseudotsuga menziesii, Picea pungens, Abies concolor: Very moist, lush understory. Dense, tall Carex geyeri, but also Poa pratensis and Taraxacum officinale.

Trees

Acer glabrum
Populus tremuloides
Pseudotsuga menziesii

Shrubs

Actaea rubra
Amelanchier alnifolia
Cornus sericea
Quercus gambelii
Rosa woodsii
Symphoricarpos oreophilus

Graminoids

Carex geyeri
Poa pratensis

Forbs

Achillea lanulosa
Arnica cordifolia
Castilleja miniata
Cirsium centaureum
Corallorhiza maculata
Erigeron flagellaris
Fragaria virginiana
Galium septentrionale
Geranium richardsonii
Lathyrus leucanthus
Ligusticum porteri
Mahonia repens
Maianthemum amplexicaule
Maianthemum stellatum
Osmorhiza depauperata

Pedicularis procera
Pseudocymopterus montanus
Rudbeckia laciniata
Senecio neomexicana
Solidago sp.
Streptopus fassettii
Taraxacum officinale
Thalictrum fendleri
Thermopsis montana
Vicia americana
Viola adunca
Viola canadensis

25. Cushman Gulch

U.S.G.S. Quadrangle: Wallace Ranch
T38N R12W Section 2
Elev. 9,036 *ft.*
Owner: USFS

**Southwest facing slope in *Populus tremuloides*/*Pteridium aquilinum* var. *pubescens* community
100% cover of each; next most abundant species is *Thalictrum fendleri*.**

Trees

Populus tremuloides

Shrubs

Rosa woodsii
Symphoricarpos oreophilus

Graminoids

Elymus glaucus
Juncus tracyi

Forbs

Castilleja miniata
Geranium richardsonii
Lathyrus leucanthus
Mahonia repens
Maianthemum amplexicaule
Maianthemum stellatum
Mertensia ciliata
Osmorhiza depauperata
Pteridium aquilinum var. *pubescens*
Taraxacum officinale
Thalictrum fendleri
Thermopsis montana
Vicia americana
Viola canadensis

26. Weber Canyon, Menefee Mountain

U.S.G.S. Quadrangle: Trail Canyon
T34N R13W Section 5
Elev. 6,686 *ft.*
Owner: BLM

26a. West side of mountain with *Pinus edulis*-*Juniperus osteosperma*/*Quercus gambelii*

Trees

Juniperus osteosperma
Pinus edulis

Shrubs

Amelanchier utahensis
Cercocarpus montanus
Fendlera rupicola
Opuntia fragilis
Opuntia phaeacantha
Opuntia polyacantha
Paxistima myrsinites
Quercus gambelii
Symphoricarpos oreophilus

Graminoids

Bromus tectorum
Elymus elymoides
Oryzopsis hymenoides
Poa fendleriana
Stipa comata

Forbs

Alyssum parviflorum
Androsace septentrionalis
Artemisia ludoviciana
Astragalus sp.
Astragalus lonchocarpus
Balsamorhiza sagittata
Boechera sp.
Carduus nutans
Chaetopappa ericoides
Comandra umbellata
Cymopterus purpureus
Descurainia pinnata
Erigeron divergens
Erigeron flagellaris
Erigeron speciosus
Eriogonum jamesii
Eriogonum racemosum
Gutierrezia sarothrae
Heterotheca villosa
Ipomopsis aggregata
Lactuca serriola
Lappula redowskii
Lathyrus leucanthus
Lepidium latifolium
Lesquerella rectipes
Lupinus ammophilus
Pedicularis centranthera
Penstemon barbatus
Penstemon lentus
Penstemon linarioides
Petradoria pumila

Phlox longifolia
Physaria acutifolia
Picradenia richardsonii
Senecio multilobatus
Stanleya pinnata
Streptanthus cordatus

26 b. Along the road in Weber Canyon to Ute boundary

Shrubs

Artemisia tridentata ssp. tridentata
Chrysothamnus nauseosus
Rhus trilobata
Yucca harrimaniae

Graminoids

Bromus inermis

Forbs

Acroptilon repens
Cirsium neomexicanum
Eriogonum corymbosum
Marrubium vulgare
Melilotus officinalis
Penstemon comarrhenus
Penstemon strictus
Salsola australis
Sisymbrium altissimum

27. East Canyon

U.S.G.S. Quadrangle: Trail Canyon
T35N R13W Section 33
Elev. 6,504 ft.
Owner: BLM

27a. Very steep eroded gray clay slopes with Pinus edulis/ Juniperus osteosperma on top. Eriogonum corymbosum is dominant on eroded slopes. Penstemon lentus in more protected areas in gullies and along rim.

Trees

Juniperus osteosperma
Pinus edulis

Shrubs

Atriplex canescens
Peraphyllum ramosissimum
Quercus gambelii
Rhus trilobata

Graminoids

Carex geyeri
Hilaria jamesii

Forbs

Acrolasia albicaulis
Asclepias cryptoceras
Gilia haydenii
Hedysarum boreale
Oenothera caespitosa
Penstemon lentus
Sphaeralcea coccinea

27b. Top of mountain, pinyon-juniper**Trees**

Juniperus osteosperma
Pinus edulis

Shrubs

Cercocarpus montanus
Ephedra viridis

Forbs

Cryptantha bakeri
Lepidium montanum

28. Forest Road 504

U.S.G.S. Quadrangle: Doe Canyon
T40 N R16W Sections 7 and 18
Elev. 7,400 ft.
Owner: USFS

Pinus ponderosa/Quercus gambelii community**Trees**

Pinus ponderosa
Populus tremuloides

Shrubs

Amelanchier alnifolia
Ceanothus fendleri
Potentilla fruticosa
Prunus virginiana var. melanocarpa
Quercus gambelii
Rosa woodsii
Symphoricarpos oreophilus

Graminoids

Bromus inermis
Carex geyeri
Danthonia californica (Weber: "few collections known, RT")
Elymus elymoides
Thinopyrum intermedium
Koeleria macrantha
Pascopyrum smithii
Poa bulbosa (just one clump along road)
Poa fendleriana

Poa pratensis
Stipa comata

Forbs

Achillea lanulosa
Allium acuminatum
Antennaria rosea
Artemisia ludoviciana
Boechera drummondii
Castilleja linariifolia
Castilleja miniata
Cirsium centaureum
Collinsia parviflora
Comandra umbellata
Convolvulus arvensis
Coriflora hirsutissima
Eremogone congesta
Erigeron flagellaris
Erigeron speciosus
Eriogonum umbellatum
Erodium cicutarium
Erythronium grandiflorum
Frasera speciosa
Galium septentrionale
Geranium richardsonii
Helianthella quinquenervis
Heliomeris multiflora
Heterotheca villosa
Ipomopsis aggregata
Iris missouriensis
Lathyrus leucanthus
Ligusticum porteri
Linum lewisii
Lotus wrightii
Lupinus caudatus
Mahonia repens
Medicago lupulina
Melilotus officinalis
Oligosporus dracunculus
Penstemon strictus
Phacelia heterophylla
Potentilla pulcherrima
Pseudostellaria jamesiana
Senecio oodes
Solidago sp.
Taraxacum officinale
Thalictrum fendleri
Thermopsis montana
Tragopogon dubius
Trifolium longipes
Verbascum thapsus
Vicia americana
Wyethia X *Magna*

29. Road 514, on rim above Narraguinnep Canyon

U.S.G.S. Quadrangle: Doe Canyon

T39N R17W Section 11

Elev. 7,464 *ft.*

Owner: USFS

***Pinus edulis*-*Juniperus osteosperma*/ *Artemisia tridentata* ssp. *tridentata* on mesa top. Major grass throughout area is *Bromus inermis*. Mountain shrub on north facing slope of the canyon.**

Trees

Juniperus osteosperma

Pinus edulis

Shrubs

Amelanchier utahensis

Artemisia nova

Cercocarpus montanus

Chrysothamnus greenii

Fendlera rupicola

Opuntia fragilis

Peraphyllum ramosissimum

Quercus gambelii

Symphoricarpos oreophilus

Graminoids

Bromus inermis

Elymus elymoides

Koeleria macrantha

Oryzopsis hymenoides

Stipa comata

Forbs

Achillea lanulosa

Allium acuminatum

Balsamorhiza sagittata

Cirsium neomexicanum

Cordylanthus wrightii

Erigeron divergens

Eriogonum alatum

Eriogonum racemosum

Eriogonum umbellatum

Gutierrezia sarothrae

Heterotheca villosa

Ipomopsis aggregata

Lappula redowskii

Penstemon comarrhenus

Penstemon linarioides coloradoensis

Petradoria pumila

Phlox longifolia

Psilochenia acuminata

Sphaeralcea coccinea

Tetrameuris ivesiana

Tragopogon dubius

Wyethia X magna

30. Garbureno Spring

U.S.G.S. Quadrangle: The Glade

T41N R17W Section 31

Elev. 8,199 *ft.*

Owner: USFS

Large open park in *Pinus ponderosa*/ *Artemisia cana* community with shallow drainage.

Shrubs

Amelanchier alnifolia

Artemisia cana

Potentilla fruticosa

Symphoricarpos oreophilus

Graminoids

Bromus tectorum

Festuca idahoensis

Carex geyeri

Koeleria macrantha

Phleum pratense

Poa fendleriana

Forbs

Achillea lanulosa

Allium acuminatum

Artemisia ludoviciana

Astragalus bisulcatus

Calyophus lavandulifolia

Cirsium centaureum

Delphinium scaposum

Eremogone fendleri

Erigeron flagellaris

Eriogonum racemosum

Eriogonum umbellatum

Galium septentrionale

Geranium richardsonii

Ipomopsis aggregata

Melilotus officinalis

Noccaea montana

Oenothera coronopifolia

Penstemon strictus

Potentilla pulcherrima

Solidago nana

Thalictrum fendleri

Tragopogon dubius

Trifolium longipes

Wyethia X *Magna*

31. Near rim of Dolores Canyon

U.S.G.S. Quadrangle: Secret Canyon

T41N R18W Section 7

Elev. 7,900 *ft.*

Owner: USFS

31a. *Pinus ponderosa*/Quercus gambelii community

Trees

Pinus ponderosa

Shrubs

Amelanchier utahensis

Ceanothus fendleri

Purshia tridentata

Quercus gambelii

Symphoricarpos oreophilus

Graminoids

Bromus tectorum

Elymus elymoides

Koeleria macrantha

Poa fendleriana

Forbs

Achillea lanulosa

Allium acuminatum

Antennaria dimorpha

Artemisia ludoviciana

Aster glaucodes

Balsamorhiza sagittata

Boechera divaricarpa

Calochortus gunnisonii

Comandra umbellata

Coriflora hirsutissima

Eremogone congesta

Erigeron divergens

Erigeron speciosus

Eriogonum racemosum

Eriogonum umbellatum

Geum macrophyllum

Heterotheca villosa

Ipomopsis aggregata

Lathyrus leucanthus

Linum lewisii

Lithospermum incisum

Mahonia repens

Penstemon linarioides

Penstemon strictus

Petradoria pumila

Phacelia heterophylla

Psilochenia acuminata

Sedum lanceolatum

Solidago nana

Tragopogon dubius

Vicia americana

Wyethia X magna

31b. Moist side canyon with *Populus tremuloides*/*Symphoricarpos oreophilus*

Trees

Populus tremuloides

Shrubs

Acer glabrum

Paxistima myrsinites

Prunus virginiana var. *melanocarpa*

Rosa woodsii

Graminoids

Carex geyeri

Forbs

Allium geyeri

Apocynum androsaemifolium

Frasera speciosa

Galium septentrionale

Helianthella

Ligusticum porteri

Lupinus caudatus

Maianthemum amplexicaule

Maianthemum stellatum

Streptopus fassettii

Thalictrum fendleri

Trifolium longipes

Vicia americana

32. Black Snag Road toward Disappointment Creek

U.S.G.S. Quadrangle: The Glade

T41N R17W Section 9

Elev. 7,664 *ft.*

Owner: USFS

***Pinus edulis*/*Stipa comata* with *Quercus gambelii* and *Artemisia nova*. *Stipa comata* has close to 100% cover.**

Trees

Pinus edulis

Shrubs

Amelanchier utahensis

Artemisia nova

Chrysothamnus Greenei

Pediocactus simpsonii

Quercus gambelii

Graminoids

Bromus tectorum

Elymus elymoides

Koeleria macrantha

Poa fendleriana

Poa pratensis

Stipa comata

Forbs

Achillea lanulosa
Artemisia ludoviciana
Astragalus sp
Balsamorhiza sagittata
Comandra umbellata
Cordylanthus ramosus
Erigeron divergens
Erigeron flagellaris
Eriogonum umbellatum
Gutierrezia sarothrae
Lupinus sp.
Medicago sativa
Orthocarpus purpureoalbus
Penstemon commarhenus
Petradoria pumila
Wyethia X magna

33. Benchmark Lookout.

U.S.G.S. Quadrangle: Glade Mountain
T41N R15W Section 31
Elev. 9,161 ft.
Owner: USFS

33a. Quercus gambelii community**Shrubs**

Amelanchier utahensis
Artemisia cana
Chrysothamnus nauseosus
Chrysothamnus viscidiflorus
Pediocactus simpsonii
Quercus gambelii
Symphoricarpos oreophilus
Tetradymia canescens

Graminoids

Bouteloua gracilis
Bromus tectorum
Carex geyeri
Elymus elymoides
Koeleria macrantha
Pascopyrum smithii
Poa fendleriana
Poa pratensis
Stipa comata

Forbs

Achillea lanulosa
Artemisia ludoviciana
Calochortus gunnisonii
Castilleja linariifolia
Cirsium centaureum
Comandra umbellata
Eremogone congesta

Erigeron flagellaris
Erigeron glaberrimus
Erigeron speciosus
Eriogonum alatum
Eriogonum racemosum
Eriogonum umbellatum
Erysimum capitatum
Heliomeris multiflora
Heterotheca villosa
Ipomopsis aggregata
Linum lewisii
Lithospermum incisum
Lithospermum ruderales
Lupinus caudatus
Mahonia repens
Oligosporus dracunculus
Oxytropus lambertii
Penstemon strictus
Potentilla hippiana
Psilochenia acuminata
Tetraneuris ivesiana
Wyethia X magna

**33b. Additional species on Lookout species list, compiled by Lookout crews,
from different seasons (may not be accurately identified)**

Shrubs

Echinocereus viridis

Forbs

Anthemis sp.
Erigeron subtrinervis
Fritillaria atropurpurea
Hackelia floribunda
Halerpestes cymbalaria
Lithophragma parviflora
Lithospermum ruderales
Oenothera flava
Orogenia linearifolia
Ratibida sp.
Scrophularia sp.
Viola biternata

33c. Populus tremuloides/Ligusticum porteri community

Trees

Populus tremuloides

Shrubs

Amelanchier alnifolia
Quercus gambelii
Symphoricarpos oreophilus

Graminoids

Carex geyeri
Elymus glaucus

Forbs

Castilleja miniata
Galium septentrionale
Geranium richardsonii
Lathyrus leucanthus
Ligusticum porteri
Lupinus caudatus
Mahonia repens
Maianthemum amplexicaule
Pedicularis procera
Pseudocymopterus montanus
Thalictrum fendleri
Vicia americana
Viola canadensis

34. Narraguinnep Mountain

U.S.G.S. Quadrangle: Narraguinnep Mountain
T40N R16W Sections 23 and 24
Elev. 8,281 *ft.*
Owner: USFS

Large Artemisia cana/Stipa comata community**Shrubs**

Artemisia cana
Artemisia nova
Symphoricarpos oreophilus

Graminoids

Bromus inermis
Elymus elymoides
Pascopyrum smithii
Poa fendleriana
Poa pratensis
Stipa comata

Forbs

Achillea lanulosa
Artemisia ludoviciana
Astragalus bisulcatus
Eremogone congesta
Eremogone fendleri
Erigeron flagellaris
Eriogonum racemosum
Eriogonum umbellatum
Geranium viscosissimum
Iris missouriensis
Lupinus caudatus
Orthocarpus luteus
Penstemon caespitosus
Potentilla hippiana

Senecio sp.
Taraxacum officinale
Trifolium longipes
Wyethia X magna

35. Narraguinnep Canyon

U.S.G.S. Quadrangle: Doe Canyon
T39N R17W Sections 9 and 10
Elev. 8,281ft.
Owner: USFS

Populus angustifolia/Alnus incana

Trees

Populus angustifolia

Shrubs

Alnus incana
Cornus sericea
Symphoricarpos oreophilus
Amelanchier alnifolia
Rosa woodsii
Potentilla fruticosa
Cercocarpus montanus.

Forbs

Galium septentrionale,
Melilotus officinalis
Monarda fistulosa
Toxicodendron rydbergii
Maianthemum stellatum
Thermopsis montana

36. Dolores River at SWA campground downstream from Bradfield Bridge

U.S.G.S. Quadrangle: Doe Canyon
T39N R17W Section 9
Elev. 6,467 ft.
Owner: USFS

Low elevation riparian

Trees

Acer negundo
Populus angustifolia
Populus deltoides ssp. wislizenii

Shrubs

Purshia stansburiana
Salix exigua
Salix monticola

Graminoids

Carex aquatilis
Juncus sp.

Poa fendleriana

Forbs

Apocynum cannabinum
Castilleja sulphurea
Heterotheca villosa
Hippochaete hyemalis
Leucanthemum vulgare
Medicago lupulina
Plantago lanceolata
Trifolium pratense
Trifolium repens
Vicia americana

37. Fish Creek drainage to Dolores Peak

U.S.G.S. Quadrangle: Dolores Peak and Groundhog Mountain
T41N R11W Sections 5, 7, and 8
Elev. 10,000-12,000
Owner: USFS

37a. Fish Creek riparian with a mix of *Cardamine cordifolia*-*Senecio triangularis*-*Mertensia ciliata* community and *Salix drummondiana*-*Salix monticola*/Mesic forbs

Trees

Picea engelmannii

Shrubs

Distegia involucrata
Ribes montigenum
Ribes wolfii
Rubus idaeus
Salix drummondiana
Salix monticola
Sambucus racemosa

Graminoids

Bromus inermis
Carex geyeri
Carex nova
Dactylis glomerata
Luzula parvifolia
Poa alpina
Poa pratensis
Trisetum spicatum

Forbs

Achillea lanulosa
Agoseris aurantiaca
Angelica pinnata
Aquilegia coerulea
Aquilegia elegantula
Arnica cordifolia
Boechera drummondii
Cardamine cordifolia
Castilleja miniata

Castilleja rhexifolia
Chamerion danielsii
Cirsium centaureum
Cirsium parryi
Dugaldia hoopsii
Erigeron coulteri
Erigeron elatior
Erigeron flagellaris
Erigeron speciosus
Fragaria virginiana
Gastrolychnis drummondii
Geranium richardsonii
Heliomeris multiflora
Heracleum lanatum
Lathyrus leucanthus
Ligularia bigelovii
Ligusticum porteri
Mertensia ciliata
Micranthes odontoloma
Mimulus guttatus
Noccaea montana
Oxypolis fendleri
Penstemon whippleanus
Phacelia heterophylla
Plantago lanceolata
Polemonium foliosissimum
Potentilla pulcherrima
Pseudocymopterus montanus
Senecio triangularis
Spergulastrum lanuginosum
Taraxacum officinale
Thalictrum fendleri
Valeriana capitata
Veratrum tenuipetalum
Vicia americana

37b. Large meadow with *Veratrum tenuipetalum* and *Besseyia ritteriana* and along rivulets in adjacent *Abies lasiocarpa*/*Picea engelmannii* forest

Trees

Abies arizonica
Abies lasiocarpa
Picea engelmannii
Picea pungens

Shrubs

Vaccinium myrtillus

Graminoids

Bromelica spectabilis
Bromus sp.
Carex aquatilis
Carex microptera
Carex sp.
Festuca thurberi

Juncus drummondii
Juncus sp.
Phleum commutatum

Forbs

Aconitum columbianum
Androsace septentrionalis
Antennaria rosea
Anticlea elegans
Arnica cordifolia
Arnica mollis
Besseyia ritteriana
Caltha leptosepala
Chenopodium sp.
Cirsium arvense
Collomia linearis
Delphinium barbeyi
Descurainia incisa
Draba spectabilis
Epilobium hornemannii
Equisetum arvense
Erigeron flagellaris
Geum macrophyllum
Heliomeris multiflora
Hydrophyllum fendleri
Ligularia bigelovii
Limnorchis hyperborea
Pedicularis bracteosa
Pedicularis racemosa
Pneumonanthe parryi
Polemonium pulcherrimum
Polygonum douglasii
Ranunculus uncinatus
Rumex triangulivalvis
Senecio atratus
Sibbaldia procumbens
Solidago simplex var. nana
Valeriana edulis
Veratrum tenuipetalum
Veronica nutans
Veronica serpyllifolia var. humifusa

37c. Abies lasiocarpa/Picea engelmannii forest

Trees

Abies lasiocarpa
Picea engelmannii

Shrubs

Symphoricarpos oreophilus

Graminoids

Poa reflexa

Forbs

Cystopteris fragilis
Erigeron coulteri
Fraseria speciosa
Helianthella quinquenervis
Oreochrysum parryi
Viola canadensis

37d. Upper slopes below scree at 10,000 ft.**Shrubs**

Juniperus communis

Forbs**Alsinoanthe macrantha**

Descurainia incisa
Rhodiola integrifolia
Senecio crassulus
Stellaria crassifolia

37e. In talus and along edge in tundra**Shrubs**

Rubus idaeus

Graminoids

Carex chaliceolepis
Carex sp.
Elymus trachycaulus
Festuca brachyphylla
Festuca thurberi
Juncus drummondii
Poa arctica

Forbs

Achillea lanulosa
Agoseris glauca
Allium geeyeri
Alsinoanthe macrantha
Angelica grayi
Antennaria rosea
Antennaria umbrinella
Aquilegia coerulea
Arnica mollis
Artemisia scopulorum
Bistorta bistortoides
Boechera drummondii
Castilleja haydenii
Castilleja miniata
Cerastium beeringianum
Cilaria austromontana
Claytonia megarhiza
Cryptogramma acrostichoides
Cystopteris fragilis

Distegia involucrata
Draba aurea
Dugaldia hoopsii
Erigeron compositus
Erigeron flagellaris
Erigeron melanocephalus
Erigeron simplex
Erysimum capitatum
Geum rossii
Lidia obtusiloba
Ligularia amplexens var. *holmii*
Mertensia ciliata
Mertensia lanceolata
Micranthes rhomboidea
Noccaea montana
Oreochrysum parryi
Oreoxys bakeri
Oxyria digyna
Pedicularis scopulorum
Penstemon harbourii
Phacelia sericea
Phlox condensata
Polemonium confertum
Rydbergia grandiflora
Selaginella sp.
Senecio atratus
Senecio fremontii
Sibbaldia procumbens
Silene acaulis
Smelowskia calycina
Tonestus pygmaeus
Trifolium attenuatum
Trifolium nanum
Urtica gracilis
Valeriana edulis
Viola adunca

38. Colorado Trail Hermosa Peak

U.S.G.S. Quadrangle: Hermosa Peak

T40N R10W Section 26

Elev. 11,000 *ft.*

Owner: USFS

38a. Wet meadow

Shrubs

Salix planifolia

Graminoids

Carex geyeri

Carex microptera

Deschampsia cespitosa

Juncus drummondii

Phleum commutatum

Poa alpina

Forbs

Agoseris aurantiaca

Allium geyeri

Alsinanthe macrantha

Anticlea elegans

Arnica mollis

Bistorta bistortoides

Caltha leptosepala

Cardamine cordifolia

Castilleja rhexifolia

Dugaldia hoopsii

Erigeron coulteri

Erigeron peregrinus

Geum rossii

Helianthella quinquenervis

Noccaea montana

Oreochrysum parryi

Pedicularis groenlandica

Pedicularis racemosa

Potentilla sp.

Senecio crassulus

Sibbaldia procumbens

Trifolium salictorum

Veratrum tenuipetalum

Veronica nutans

Veronica serpyllifolia var. *humifusa*

38b. *Abies lasiocarpa*/*Picea engelmannii* forest

Trees

Abies lasiocarpa

Picea engelmannii

Shrubs

Ribes montigenum

Vaccinium myrtillos

Graminoids

Carex nova

Luzula parvifolia

Poa alpina

Poa reflexa

Forbs

Allium geyeri

Arnica cordifolia

Draba spectabilis

Erigeron coulteri

Erigeron peregrinus

Geranium richardsonii

Mertensia ciliata

Osmorhiza depauperata

Pedicularis racemosa

Penstemon whippleanus
Polemonium pulcherrimum
Pseudocymopterus montanus
Ranunculus alismifolius
Rhodiola integrifolia
Senecio crassulus
Sibbaldia procumbens
Taraxacum officinale
Trifolium salictorum
Veronica nutans

38c. Talus and tundra

Shrubs

Salix reticulata

Graminoids

Carex chalicelepis

Forbs

Angelica grayi
Aquilegia coerulea
Artemisia scopulorum
Bistorta bistortoides
Castilleja sulphurea
Cerastium beeringianum
Chlorocrepis sp.
Claytonia megarhiza
Erigeron melanocephalus
Micranthes rhomboidea
Mitella pentandra
Oxyria digyna
Phacelia sericea
Ranunculus uncinatus
Saxifraga hyperborea ssp. debilis
Senecio holmii
Stellaria irrigua
Stellaria longipes
Stellaria umbellata

38d. Rock outcrop at base of talus

Shrubs

Salix reticulata

Forbs

Aquilegia coerulea
Cilinia austromontana
Erigeron simplex
Oreobrama pygmaea
Polemonium viscosum
Senecio fremontii
Silene acaulis

38e. Tundra

Graminoids

Calamagrostis canadensis

Forbs

Besseyia ritteriana

Bistorta vivipara

Castilleja miniata

Cystopteris fragilis

Draba crassifolia

Pedicularis bracteosa

Phlox condensata

Podistera eastwoodiae

Trifolium attenuatum

Viola labradorica

38f. *Abies lasiocarpa*/*Picea engelmannii* forest

Trees

Abies lasiocarpa

Picea engelmannii

Graminoids

Carex aquatilis

Eleocharis sp.

Juncus mertensianus

Luzula spicata

Trisetum spicatum

Forbs

Agoseris glauca

Anaphalis margaritacea

Androsace septentrionalis

Botrychium lunaria

Delphinium barbeyi

Erigeron compositus

Erigeron elatior

Ligularia bigelovii

Pneumonanthe parryi

Senecio amplexans

Senecio atratus

Senecio wernerifolia

Thalictrum fendleri

39. East Fork Trail, Sheep Mt. from south of Lizard Head Pass

U.S.G.S. Quadrangle: Mount Wilson

T41N R10W Section 29

Elev. 12,000 ft.

Owner: USFS

39a. Meadow and *Abies lasiocarpa*/*Picea engelmannii* forest

Trees

Abies lasiocarpa
Picea engelmannii

Shrubs

Distegia involocrata
Potentilla fruticosa
Ribes montigenum
Salix planifolia
Vaccinium cespitosum

Graminoids

Carex aquatilis
Carex bella
Carex canescens
Carex geyeri
Carex microptera
Carex sp.
Danthonia parryi
Elymus trachycaulus
Festuca thurberi
Juncus mertensianus
Phleum commutatum
Poa alpina
Poa pratensis
Salix scouleriana
Trisetum spicatum

Forbs

Achillea lanulosa
Aconitum columbianum
Agoseris aurantiaca
Allium geyeri
Androsace septentrionalis
Anticlea elegans
Aquilegia coerulea
Arnica cordifolia
Aster foliaceus
Astragalus alpinus
Besseyia ritteriana
Caltha leptosepala
Campanula rotundifolia
Cardamine cordifolia
Castilleja miniata
Castilleja sulphurea
Cirsium eatonii
Cirsium parryi
Collomia linearis
Deschampsia cespitosa
Descurainia incisa
Draba spectabilis
Dugaldia hoopsii
Epilobium hornemannii
Equisetum arvense
Erigeron coulteri
Erigeron formosissimus
Erigeron peregrinus

Fragaria virginiana
 Frasera speciosa
 Galium septentrionale
 Gastrolychnis drummondii
 Geranium richardsonii
 Goodyera oblongifolia
 Helianthella quinquenervis
 Heliomeris multiflora
 Heracleum lanatum
 Heuchera parvifolia
 Lathyrus leucanthus
 Ligusticum porteri
 Maianthemum stellatum
 Mertensia ciliata
 Mimulus guttatus
 Noccaea montana
 Oreochrysum parryi
 Orthilia secunda
 Osmorhiza depauperata
 Oxypolis fendleri
 Penstemon whippleanus
 Plantago lanceolata
 Polemonium pulcherrimum
 Polygonum douglasii
 Potentilla pulcherrima
 Prunella vulgaris
 Pseudocymopterus montanus
 Ranunculus uncinatus
 Senecio triangularis
 Solidago simplex
 Spargulastrum lanuginosum
 Stellaria longipes
Taraxacum officinale
 Thalictrum fendleri
Trifolium repens
 Valeriana edulis
 Veratrum tenuipetalum
 Veronica nutans
 Veronica serpyllifolia var. humifusa
 Vicia americana
 Viola adunca

39b. Wetland with Carex aquatilis and Caltha leptosepala.

Trees

Picea engelmannii

Shrubs

Salix planifolia (dwarf, beneath sedges and forbs, maybe grazed by elk?)

Graminoids

Carex aquatilis
 Luzula parviflora
 Phleum commutatum
 Trisetum spicatum

Forbs

Aconitum columbianum
Anticlea elegans
Bistorta bistortoides
Bistorta vivipara
Caltha leptosepala
Cardamine cordifolia
Castilleja rhexifolia
Epilobium hornemannii
Equisetum arvense
Erigeron peregrinus
Habenaria hyperborea
Micranthes odontoloma
Oxypolis fendleri
Pedicularis groenlandica
Pyrola chlorantha
Rhodiola integrifolia
Senecio triangularis
Swertia perennis
Trollius albiflorus

39c. Drier areas around the base of trees**Shrubs**

Distegia involucrata

Graminoids

Deschampsia cespitosa
Juncus longistylus

Forbs

Arnica mollis
Clementsia rhodantha
Epilobium lactiflorum
Fragaria virginiana
Juniperus communis
Potentilla pulcherrima
Ranunculus alismifolius
Veratrum tenuipetalum

40. Priest Gulch, upper end

U.S.G.S. Quadrangle: Clyde Lake
T39N R12W Sections 11 and 12
Elev. 9,800 *ft.*
Owner: USFS

40a. Clear cut and grazed area**Shrubs**

Ribes montigenum
Symphoricarpos oreophilus

Graminoids

Bromopsis porteri
Bromus inermis
Carex microptera
Elymus canadensis
Elymus glaucus
Koeleria macrantha
Poa pratensis
Trisetum spicatum

Forbs

Achillea lanulosa
Cirsium arvense
Cirsium centaureae
Draba spectabilis
Erigeron coulteri
Erigeron peregrinus
Fragaria virginiana
Fraseria speciosa
Gentianella heterosepala
Pedicularis groenlandica
Polygonum douglasii
Ranunculus sp.
Taraxacum officinale
Thalictrum fendleri
Veronica serpyllifolia

40b. Spruce-fir forest. Picea engelmannii/Erigeron eximius**Trees**

Picea engelmannii

Shrubs

Distegia involucrata
Vaccinium myrtillus

Graminoids

Carex chaldeolepis
Carex geeyeri
Elymus Canadensis
Elymus glaucus
Luzula parvifolia
Poa pratensis

Forbs

Arnica cordifolia
Arnica mollis
Erigeron coulteri
Erigeron eximius
Erigeron speciosus
Fragaria virginiana
Gentianella heterosepala
Geranium richardsonii
Goodyera oblongifolia
Ligusticum porteri

Mertensia ciliata
Oreochrysum parryi
Orthilia secunda
Osmorhiza depauperata
Pedicularis racemosa
Polemonium pulcherrimum
Pseudocymopterus montanus
Streptopus fassettii
Trollius albiflorus

40c. Wetlands along stream and ponds in spruce-fir forest

Trees

Abies lasiocarpa
Picea engelmannii

Shrubs

Distegia involucrata

Graminoids

Carex bella
Scirpus sp.

Forbs

Arnica cordifolia
Caltha leptosepala
Cardamine cordifolia
Castilleja miniata
Chamerion danielsii
Delphinium barbeyi
Epilobium hornemannii
Epilobium sp.
Equisetum arvense
Erigeron coulteri
Habenaria hyperborea
Micranthes odontoloma
Mitella sp.
Oxypolis fendleri
Streptopus fassettii
Thalictrum fendleri
Veratrum tenuipetalum
Viola adunca

40d. Wet meadow opening in spruce-fir forest

Shrubs

Ribes wolfii
Salix drummondiana
Sambucus racemosa

Graminoids

Danthonia parryi
Festuca thurberi

Forbs

Achillea lanulosa
Aster spathulatus
Campanula rotundifolia
Cirsium parryi
Dugaldia hoopsii
Erigeron elatior
Erigeron eximius
Erigeron speciosus
Frasera speciosa
Gallium septentrionale
Helianthella quinquenervis
Heliomeris multiflora
Lathyrus leucanthus
Ligularia bigelovii
Ligusticum porteri
Pneumonanthe parryi
Pneumonanthe parryi
Potentilla pulcherrima
Senecio serra

41. Highline Trail, along ridge south of Storm Peak

U.S.G.S. Quadrangle: Rico
T40N R11W Section 32
Elev. 9,800 ft.
Owner: USFS

Alpine tundra near timberline**Shrubs**

Distegia involucrata
Ribes montigenum

Graminoids

Deschampsia cespitosa
Carex chalciolepis
Carex microptera
Elymus trachycaulus
Festuca thurberi
Juncus drummondii
Phleum commutatum
Poa alpina
Poa arctica
Trisetum spicatum

Forbs

Achillea lanulosa
Agoseris glauca
Agoseris macrocephala
Allium geoyi

Alsinanthe macrantha

Androsace septentrionalis
Angelica grayi
Antennaria sp.
Aquilegia coerulea
Besseyia ritteriana

Bistorta bistortoides
 Boechera drummondii
 Campanula rotundifolia
 Castilleja occidentalis
 Castilleja miniata
 Cerastium strictum
 Cystopteris fragilis
 Dugaldia hoopsii
 Erigeron coulteri
 Erigeron elatior
 Erigeron formosissimus
 Erigeron perigrinus
 Erigeron speciosus
 Fragaria virginiana
 Gentianella heterosepala
 Gentianodes algida
 Geum rossii
 Heterotheca villosa
 Lidia obtusiloba
 Ligularia bigelovii
 Ligusticum porteri
Machaeranthera coloradoensis
 Mertensia ciliata
 Noccaea montana
 Oreochrysum parryi
 Oreoxys alpina
 Oxyria digyna
 Pedicularis groenlandica
 Phlox condensata
 Pneumonanthe parryi
 Podistera eastwoodiae
 Polemonium confertum
 Potentilla pulcherrima
 Pseudocymopterus montanus
 Rhodiola integrifolia
 Rydbergia grandiflora
 Sedum rhodanthum
 Senecio atratus
 Senecio crassula
 Senecio holmii
 Senecio soldanella
 Senecio tridenticulata
 Sibbaldia procumbens
 Silene acaulis
Taraxacum officinale
 Trifolium attenuatum
 Trifolium nanum
 Veronica nutans
 Zygadenus elegans