Weed and Rare Plant Assessments on Selected BLM ACECs

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prepared for
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Natural Heritage Program
COLORADO

Colorado State University
Knowledge to Go Places

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Executive Summary

Between 1984 and 1996 the Bureau of Land Management (BLM) in Colorado designated 66 Areas of Critical Environmental Concern (ACEC), covering a total of 621,427 acres. These areas were designated because of the scenic, geological, wildlife, cultural, and botanical values that they support, and represent areas that merit special attention by BLM land managers. The Colorado Natural Heritage Program (CNHP) databases show that 24 of the 66 ACECs provide significant habitat for Threatened, Endangered, and BLM Sensitive plants. However, most of these areas do not have management plans in place, nor are monitoring programs established that would detect changes in the overall quality and condition of these areas or the significant species they support. Additionally, land managers are reporting an increase in invasions of non-native plant species at several ACECs. The non-native plants pose potentially irreversible threats to these significant areas because they degrade the overall quality of rare plant habitat, and compromise the long-term viability of the rare plant populations.

CNHP was contracted in January of 2000 by the Bureau of Land Management to assess the interactions between rare plants and invasive non-native species in ACECs throughout the state. Baseline data on the rare plants and weeds were gathered and photo monitoring plots were established to track changes in weed distribution in relation to rare plant occurrences and habitats as needed. Bureau of Land Management ACECs visited for this project include the Anasazi (now the Canyons of the Ancients National Monument) managed by the San Juan Field Office; Droney Gulch and Garden Park managed by the Royal Gorge Field Office; Deer Gulch, Yanks-Upper Greasewood, and South Cathedral Bluffs managed by the White River Field Office; Badger Wash, Pyramid Rock, and Rough Canyon managed by the Grand Junction Field Office; and Deep Creek and Bull Gulch managed by the Glenwood Springs Field Office. The Unaweep Seep Research Natural Area managed by the Grand Junction Field Office was also surveyed. These areas represent some of Colorado's highest priority sites for biodiversity conservation, supporting populations of some of our rarest plants.

The goals of this project were to:

- Prioritize weeds and rare plant research needs on Colorado ACECs
- Establish monitoring programs for weeds and rare plants on selected ACECs
- Assess threats to the rare plant populations on selected ACECs, especially those threats posed by non-native plant invasions.
- Build the CNHP and BLM databases with current information about the quality and condition of the selected ACECs, and produce a report reflecting the results of 2000 research.
- Work with local BLM land managers on follow-up actions, including future monitoring and analysis.
- Protect the investment BLM has made in setting ACECs aside by preserving the values for which the ACECs were designated.

The Natural Heritage Network and Biodiversity

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

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

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

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

What is Biological Diversity?

Protecting biological diversity has become an important management issue for many natural resource professionals. Biological diversity at its most basic level includes the full range of species on Earth, from species such as bacteria, and protists, through multicellular kingdoms of 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 between 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.

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 restricted to an area. It is within communities that all life dwells.

4. **Landscape Diversity** -- the type, condition, pattern, and connectedness of natural communities. A landscape consisting of a mosaic of natural communities may contain one multifaceted ecosystem, such as a wetland ecosystem. A landscape also may contain several distinct ecosystems, such as a riparian corridor meandering through shortgrass prairie. Fragmentation of landscapes, loss of connections and migratory corridors, and loss of natural communities all result in a loss of biological diversity for a region. Humans and the results of their activities are integral parts of most landscapes.

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

Colorado's Natural Heritage Program

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

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

The multi-disciplinary team of scientists and information managers 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. Information management staff carefully plot the data on 1:24,000 scale U.S.G.S. maps and enter it into the Biological and Conservation Database. This locational information is incorporated into Biotics, an ArcView-based program designed specifically for natural heritage programs. The Element Occurrence database can be accessed from a variety of angles, including taxonomic group, global and state rarity rank, federal and state legal status, source, observation date, county, quadrangle map, watershed, management area, township, range, and section, precision, and conservation unit.

CNHP is part of an international network of conservation data centers. The parent organization for this network is the Association for Biodiversity Information (ABI), based in Arlington, VA. CNHP has effective relationships with several state and federal agencies, including the Colorado Natural Areas Program, Colorado Department of Natural Resources and the Colorado Division of Wildlife, the U.S. Environmental Protection Agency, the Bureau of Land Management, and the U.S. Forest Service. Numerous local governments and private entities also work closely with CNHP. Use of the data by many different individuals and organizations, including Great Outdoors Colorado, encourages a proactive approach to development and conservation thereby reducing the potential for conflict. Information collected by the Natural Heritage Programs around the globe provides a means to protect species before the need for legal endangerment status arises.

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

The Natural Heritage Ranking System

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

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

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

Table 1. Definition of Colorado Natural Heritage Imperilment Ranks.

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

G/S1 Critically imperiled globally/state because of rarity (5 or fewer occurrences in the world/state; or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction.
G/S2 Imperiled globally/state because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extinction throughout its range.
G/S3 Vulnerable through its range or found locally in a restricted range (21 to 100 occurrences).
G/S4 Apparently secure globally/state, though it might be quite rare in parts of its range, especially at the periphery.
G/S5 Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
GX Presumed extinct.
G#? Indicates uncertainty about an assigned global rank.
G/SU Unable to assign rank due to lack of available information.
GQ Indicates uncertainty about taxonomic status.
G/SH Historically known, but not verified for an extended period, usually.
G#T# Trinomial rank (T) is used for subspecies or varieties. These taxa are ranked on the same criteria as G1-G5.
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

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

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

LT Threatened; taxa formally listed as threatened.

P Proposed E or T; taxa formally proposed for listing as endangered or threatened.

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

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

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

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

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

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

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

State Status:

1. Colorado Division of Wildlife

E Endangered

T Threatened

SC Special Concern

Weed Ranking

Table 3. The Colorado Noxious Weed Act, Title 35, Article 5.5, C.R.S. (2000) lists species designated as State Noxious Weeds. All weeds listed in the act are ranked as follows:

A	State Noxious Weeds. These species have been identified by individual counties as problem weeds in the county's area or have been recommended for management through public testimony.
B	Top Ten Prioritized Weed Species. These weed species are recognized as the top ten prioritized weed species for Colorado. These species are the most widespread and cause the greatest economic impact in Colorado.
C	Not Yet Widespread. These weed species may not yet be present or are not yet widespread or causing great economic impact within Colorado. However, counties and local advisory boards are encouraged to contain and eradicate these species before they proliferate and significantly impact the economic and environmental values of the lands of the state.

Element Occurrence Ranking

Actual locations of elements, whether they be single organisms, populations, or plant communities, are referred to as **element occurrences**. The element occurrence is considered the most fundamental unit of conservation interest and is at the heart of the Natural Heritage Methodology. In order to prioritize element occurrences for a given species, an element occurrence rank (EO-Rank) is assigned according to their ecological quality whenever sufficient information is available. This ranking system is designed to indicate which occurrences are the healthiest and ecologically the most viable, thus focusing conservation efforts where they will be most successful. The EO-Rank is based on 3 factors:

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

Each of these factors is rated on a scale of A through D, with A representing an excellent grade and D representing a poor grade. These grades are then averaged to determine an appropriate EO-Rank for the occurrence. If there is insufficient information available to rank an element occurrence, an EO-Rank of E is assigned. Possible EO-Ranks and their appropriate definitions are as follows:

A The occurrence is relatively large, and pristine, with natural ecological processes and the surrounding landscape intact.

B The occurrence is not large but in good condition, or large but removed from its natural condition. The surrounding area may be somewhat degraded.

C The occurrence is small, in poor condition, but apparently still viable and worthy of conservation efforts. Restoration of this occurrence may be possible.

D The occurrence does not merit conservation efforts because it is too small, degraded, or not viable. The surrounding area may be severely degraded.

H Historically known, but not verified for an extended period of time.

X Extirpated.

E The occurrence does not contain enough information to rank using the above ranks.

Potential Conservation Areas

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

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

Potential Conservation Planning Boundaries

Once the presence of rare or imperiled species or significant plant communities has been confirmed, the first step towards their protection is the delineation of a **preliminary** conservation planning boundary. In general, the potential conservation area boundary is our best estimate of the primary area supporting the long-term survival of targeted species and plant communities. In developing such boundaries, CNHP staff considered a number of factors that include, but are not limited to:

- the extent of current and potential habitat for the elements present, considering the ecological processes necessary to maintain or improve existing conditions;
- species movement and migration corridors;
- maintenance of surface water quality within the 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.

As the label "conservation planning" indicates, the boundaries presented here are for planning purposes. They delineate ecologically sensitive areas where land-use practices should be carefully planned and managed to ensure that they are compatible with protection goals for natural heritage resources and sensitive species. **Please note that these boundaries are based primarily on our understanding of the ecological systems. A thorough analysis of the human context and potential stresses was not conducted. All land within the conservation planning boundary should be considered an integral part of a complex economic, social, and ecological landscape that requires wise land-use planning at all levels.**

Off-Site Considerations

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

Ranking of Potential Conservation Areas

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

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

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

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

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

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

If an element occurrence is unranked due to a lack of information the element occurrence rank is considered a C rank. Similarly, if an element is a GU or G? it is treated as a G4.

Protection Urgency Ranks

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

P1 Protection actions needed immediately. It is estimated that stresses may reduce the viability of the elements within the PCA within 1 year.

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.

P3 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.

P4 No protection actions 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 legal 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. Threats that may require a protection action are as follows:

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

Management Urgency Ranks

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

A management action may include biological management (prescribed burning, removal of exotics, mowing, etc.) or people and site management (building barriers, rerouting trails, patrolling for collectors, hunters, or trespassers, etc.). Management action does not include legal, political, or administrative measures taken to protect a potential conservation area. The following codes are used to indicate the action needed to be taken at the area:

M1 Management 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 within 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.

Methods

The primary goal of this project was to identify areas where weeds are interacting with rare plants within the selected ACECs. Thus, only very specific areas within the ACECs were targeted, and all weeds within each ACEC were not mapped. However, all non-native weed species near or within selected rare plant occurrences were documented, and non-native weed populations within or near an ACEC that could potentially invade the ACEC or threaten rare plants in the future were noted.

The methods for assessing and prioritizing conservation needs over a large area are necessarily diverse. The Colorado Natural Heritage Program follows a general method which is continuously being developed specifically for this purpose. The Natural Heritage Inventory was conducted in several steps summarized below.

Collect Information

CNHP databases were updated with information regarding the known locations of rare plants and high quality natural community occurrences within the selected ACECs. A variety of information sources were searched for this information. The Colorado State University herbarium was searched, as were plant collections at the University of Colorado and Rocky Mountain Herbarium. Local experts from the BLM were consulted at each ACEC to identify areas of concern within the study areas.

Identify Targeted Elements of Global and State-wide Concern

The information collected in the previous step was used to generate a list of plant species that are tracked by the Colorado Natural Heritage Program and occur within the selected ACECs. Additional occurrences of targeted rare plant species were also sought during the weed and rare plant surveys.

The following list of elements includes plants and natural communities currently monitored by CNHP that had been documented previously within the selected ACECs, as well as those discovered within the ACECs during this project. The amount of effort given to the inventory for each of these elements is prioritized according to the element's rank. Globally-rare (G1 - G3) elements are given highest priority; state-rare elements are second. 28 rare plant species and 25 natural community types were targeted in these surveys.

Table 4. Targeted Plants and Natural Communities of Global or State-wide Concern
List of targeted elements, organized by ACEC, for this project. Please see Tables 1 and 2 for rank explanations.

Element Name	Element Common Name	Global Rank	State Rank	Fed/State Status	Agency Sensitive
CANYONS OF THE ANCIENTS NATIONAL MONUMENT					
Rare Plants					
Astragalus naturitensis	Naturita Milkvetch	G2G3	S2S3		BLM
Calochortus flexuosus	Weak Stemmed Mariposa	G4	S1		
Penstemon breviculus	Little Penstemon	G3Q	S2		
Penstemon utahensis	Utah Penstemon	G4	S2		
Natural Communities					
Celtis reticulata	Hackberry Forest	G3?	S1S2Q		
Juniperus osteosperma/ Cercocarpus montanus	Utah Juniper/ Mountain Mahogany	G2Q	S2?		
Atriplex confertifolia/ Hillaria jamesii	Saltbush/ Galleta Grass	G3	S2		
Populus fremontii/ Salix gooddingii	Fremont's Cottonwood/ Goodding's Black Willow	G2	S1		
DRONEY GULCH					
Rare Plants					
Eriogonum brandegeei	Brandegee's Wild Buckwheat	G1G2	S1S2		FS/BLM
Natural Communities					
Populus angustifolia/ Juniperus scopulorum	Montane Riparian Woodland	G2G3	S2		
GARDEN PARK					
Rare Plants					
Eriogonum brandegeei	Brandegee's Wild Buckwheat	G1G2	S1S2		FS/BLM
Nuttalia chrysantha	Golden Blazing Star	G1G2	S1S2		BLM
Asclepias uncialis	Dwarf Milkweed	G3?	S1S2		FS/BLM
Natural Communities					
Populus angustifolia/ Juniperus scopulorum	Montane Riparian Woodland	G2G3	S2		
UNAWEEP SEEP RESEARCH NATURAL AREA					
Rare Plants					
Epipactis gigantea	Helleborine orchid	G4	S2		FS
Natural Communities					
Acer negundo-Populus angustifolia/Celtis reticulatus	Narrowleaf cottonwood riparian forests	G1Q	S1Q		
Scirpus acutus	Great Plains marshes	G3	S2S3		
Alnus incana/Mesic forb	Thinleaf alder/Mesic forb	G3G4Q	S3		
Eleocharis palustris	Emergent wetlands	G5	S4		
Salix exigua/ Mesic graminoid	Coyote willow/Mesic graminoid	G5	S5		
BADGER WASH					
Rare Plants					
Eriogonum contortum	Grand Buckwheat	G3	S2		BLM
Oreocarya elata	Tall Cryptanth	G3	S2		

Astragalus musiniensis	Ferron Milkvetch	G2	S1		BLM
Allium nevadense	Nevada Onion	G4	S2		
Natural Communities					
Atriplex gardneri/Leymus salinus	Cold Desert Shrublands	G4G5	S3		
Sarcobatus vermiculatus/ Suaeda torreyana	Saline Bottomland Shrubland	G2G3	S2S3		
PYRAMID ROCK					
Rare Plants					
Astragalus debequaeus	DeBeque Milkvetch	G2	S2		BLM
Phacelia submutica	DeBeque Phacelia	G2	S2	C	FS
Sclerocactus glaucus	Uinta Basin Hookless Cactus	G3	S3	LT	
Cirsium perplexans	Rocky Mountain thistle	G2	S2		BLM
Natural Communities					
Juniperus osteosperma/ Leymus salinus	Western Slope Pinyon-Juniper Woodlands	GU	SU		
ROUGH CANYON					
Rare Plants					
Astragalus linifolius	Grand Junction Milkvetch	G3Q	S3		BLM
Oreocarya longiflora	Long Flower Cat's Eye	G3	S2		
Natural Communities					
Pinus edulis/Coleogyne ramosissima	Western Slope Pinyon Woodland	G3	SU		
DEEP CREEK					
Rare Plants					
Penstemon harringtonii	Harrington's Beardtongue	G3	S3		FS/BLM
Natural Communities					
Populus angustifolia/Cornus sericea (Betula occidentalis phase*)*	Cottonwood Riparian Forests	G4	S3		
BULL GULCH					
Rare Plants					
Penstemon harringtonii	Harrington's Beardtongue	G3	S3		FS/BLM
Natural Communities					
Populus angustifolia/Juniperus scopulorum	Montane Riparian Forest	G2G3	S2		
Juniperus scopulorum/ Cornus sericea	Riparian Woodland	G4	S2		
*Salix exigua/*bare ground	Coyote Willow/Bare Ground	G5	S5		
DEER GULCH					
Rare Plants					
Cirsium barnebyi	Barneby's Thistle	G2	S1		
Argillochloa dasyclada	Utah Fescue	G3	S3		
Penstemon scariosus var. albifluvis	White River Penstemon	G4T1	S1	C	
Natural Communities					
Pseudotsuga menziesii/ Symphoricarpos	Western Slope Douglas Fir Forest	G5	S4		

oreophilus					
Quercus gambellii-Cercocarpus montanus/ Carex geyeri	Mixed Mountain Shrublands	G3	S3		
Pseudoroegneria spicata	Western Slope Grasslands	G3	SU		
YANKS- UPPER GREASEWOOD					
Rare Plants					
Physaria obcordata	Piceance Twinpod	G2	S2	LT	
Ceanothus martinii	Utah Mountain Lilac	G4	S1		
Natural Communities					
Artemisia tridentata ssp. *tridentata/ Leymus cinereus (*phase *Symphoricarpos oreophilus)*	Sagebrush Bottomland Shrublands	G2G3	S1		
Pinus edulis/ Cercocarpus montanus (= Baker's *pied/cemo-amut-arpa/capi)*	Western Slope Pinyon-Juniper Woodlands	G5	S4		
Pinus edulis/ Cercocarpus montanus	Western Slope Pinyon-Juniper Woodlands	G5	S4		
SOUTH CATHEDRAL BLUFFS					
Rare Plants					
Lesquerella parviflora	Piceance Bladderpod	G2G3	S2S3		BLM
Thalictrum heliophilum	Sun-Loving Meadowrue	G3	S3		
Gentianella tortuosa	Utah Gentian	G3	S1		BLM
Nuttallia multicaulis	Many Stem Stickleaf	G3	S3		
Natural Communities					
Pseudoroegneria spicata	Western Slope Grasslands	G2?	S2?		

Identify Targeted Inventory Areas

Within ACECs, areas suitable for evaluation of threats from non-native plant species were determined based on the density, accessibility, and quality of rare plant occurrences or habitat. Such an area is referred to herein as a Targeted Inventory Area (TIA). High quality, easily accessible element occurrences were prioritized within a given ACEC for evaluation of non-native plant species threats. Precisely known element locations were always included so that they could be verified and updated. In most cases, CNHP's Biological and Conservation Datasystem (BCD) contained extensive information about the ACEC that assisted during the field surveys conducted for this project.

Conduct Field Surveys For Rare Plants and Natural Communities

Targeted Inventory Areas (TIAs) were visited at the appropriate time as dictated by phenology of the individual elements. Areas of appropriate habitat within each TIA were visually searched in a systematic fashion that would attempt to cover the area as thoroughly as possible in the given time.

When a rare plant or natural community was discovered, its precise location and known extent was recorded on 1:24,000 scale topographic maps. Also, the UTM coordinates were determined using a Garmin 12 CX GPS unit. Other data recorded at each occurrence included numbers observed, phenological status, habitat description, disturbance features, observable threats, and potential protection and management needs. Interactions between the targeted elements and non-native weed species were also documented (see next section). The overall significance of each occurrence, relative to others of the same element, was estimated by rating the size of the population or community, the condition or naturalness of the habitat, and the estimated long-term viability of the population or community. These factors are combined into an element occurrence rank, useful in refining conservation priorities. See the section on Natural Heritage Methodology for more about element occurrence ranking.

Voucher specimens of rare plants were collected and are to be deposited in the Herbaria at the University of Colorado and Colorado State University. Specimens were not collected from very small rare plant populations.

Documenting Weed and Rare Plant Interactions

Where non-native weed species were found in or near occurrences of rare plants or natural communities, these interactions were documented thoroughly during this study. Precise GPS locations of weed occurrences were determined using a Garmin 12 CX GPS unit. Sizeable weed occurrences are shown as points or polygons on the maps accompanying each ACEC in this report.

Photo monitoring plots were established at the Garden Park ACEC. Specific methodology used in sampling these plots is described in the Garden Park section of this report in the section on monitoring.

Delineate Potential Conservation Areas

Potential Conservation Area (PCA) boundaries were delineated in the Canyons of the Ancients National Monument. Such a boundary is an estimation of the minimum area needed to ensure persistence of the element. In order to ensure the preservation of an element, the ecological processes that support that occurrence must be preserved. The preliminary conservation planning boundary is meant to include features on the surrounding landscape that provide these functions. Data collected in the field are essential to delineating such a boundary, but other sources of information are also used. These boundaries are considered preliminary and additional information about the PCA or the element may call for alterations to the boundaries.

Results and Disscussion

The nature of the interaction between weeds and rare plants was different at each ACEC; therefore, it was determined that no standard methodology would be universally suitable for documenting and monitoring weeds in this study. In most ACECs, weeds were not present within the occurrences of rare plants and natural communities, obviating the immediate utility of establishing photo monitoring plots in these areas. However, in all cases some weeds were found either in the ACEC or in the surrounding area that could potentially threaten the rare plants or natural communities. These weed species were documented and their locations identified in this report to assist with their management and eradication.

A significant conflict between rare plants and weeds was observed at the Garden Park ACEC. In this area photo monitoring was determined to be a suitable method for analyzing the interaction between weeds and rare plants and to determine if weed density is increasing within the rare plant occurrences.

The goal of this project, as previously stated, was to determine areas within ACECs where non-native weed species are interacting with rare plant species, and make these occurrences known to managers. It is hoped that managers will work with the NRCS, State Department of Agriculture, County weed managers, weed cooperatives, extension agents, and other entities to determine the best methods for eradication and management of weeds that threaten the rare plant and natural community occurrences within the ACECs. Integrated Pest Management strategies that are designed for each ACEC will need to take into account their potential impacts on the rare plants and natural communities present. Where weeds are close to or among rare plants, eradication of the weeds is recommended, but the methods used must be very conservative to avoid impacts to the rare plants. The use of herbicides may not be appropriate where there is any chance that the chemicals will come in contact with rare plants. Spraying is not advised within a rare plant occurrence, or upwind of a rare plant occurrence. Specific recommendations regarding weed eradication and management are beyond the scope of this project.

Potential Conservation Areas (PCAs) were delineated where rare plant and natural community occurrences were identified in this study. For all ACECs except the Canyons of the Ancients National Monument, PCAs had been delineated previously due to their very high biodiversity significance. Four new PCAs were delineated in the Canyons of the Ancients National Monument.

BLM ACECs and Colorado Natural Heritage Program (CNHP) PCAs

For each BLM ACECs we provide background information and a map showing the ACEC boundary and locations of plants and plant communities of concern. Some of the ACECs in this report are written in the standard format used by the Colorado Natural Heritage Program (CNHP) to describe Potential Conservation Areas (PCAs). The sections of this report following this format are the Canyons of the Ancients National Monument, Droney Gulch ACEC, and Garden Park ACEC. Both the Droney Gulch and Garden Park ACECs are included within PCAs

delineated by CNHP that are larger and include areas not within the ACEC boundary. Thus, these sections focus on the rare plants, natural community and non-native weeds within the ACEC boundaries, but also include supplemental information about the PCA. Because the Canyons of the Ancients National Monument is very large, the four PCAs delineated within it are a small portion of the entire Monument. The sections used in this format and their contents are outlined and explained below. Most of the remaining ACECs in this report are also included within a larger PCA delineated by CNHP. However, those sections were not written with respect to the surrounding PCA, and only include information about the ACEC. Regardless of the format, each ACEC taken with the introductory sections of this report, should stand well on its own.

Table 5. List of BLM areas that were researched as part of this study, and their relationship to Colorado Natural Heritage Program (CNHP) Potential Conservation Areas (PCAs). Please note that the specific boundaries of the BLM areas are not necessarily the same as the PCA boundaries. Please see specific area profiles and maps for more detailed information. Please see page 11 for Biodiversity rank explanation.

BLM Designation	BLM Field Office	PCA name and Biodiveristy Rank	Relationship of BLM lands to CNHP PCAs
Canyons of the Ancients National Monument	San Juan Field Office	Cannonball Mesa-B2 Sand Canyon-B2 Mud Canyon-B3 Hovenweep-B2	All four PCAs are found within the Monument.
Unaweep Seep RNA	Grand Junction	Unaweep Seep-B2	RNA is located within the PCA
Badger Wash ACEC	Grand Junction	Badger Wash-B2	ACEC and PCA overlap
Pyramid Rock RNA	Grand Junction	Pyramid Rock-B2	RNA is located within the PCA
Rough Canyon ACEC	Grand Junction	Rough Canyon-B3	ACEC and PCA overlap
Deep Creek ACEC	Glenwood Springs	Deep Creek-B2	ACEC is located within the PCA
Bull Gulch ACEC	Grand Junction	Colorado River Radium to Red Dirt Creek-B2	ACEC and PCA overlap
Deer Gulch ACEC	White River	none	
Yanks-Upper Greasewood ACEC	White River	none	
South Cathedral Bluffs ACEC	White River	South Cathedral Bluffs-B2	ACEC and PCA overlap
Droney Gulch ACEC	Royal Gorge	Droney Gulch-B1	ACEC is located within the PCA.
Garden Park ACEC	Royal Gorge	Garden Park-B1	ACEC is located within the PCA.

PCA Profile Explanation

Biodiversity Rank (B-rank): The overall significance of the PCA in terms of rarity or imperilment of the natural heritage resources and the quality (condition, abundance, etc.) of the occurrences.

Protection Urgency Rank (P-rank): An estimate of the time frame in which conservation protection should occur, and the degree to which it is needed. This rank generally refers to the need for a major change of protective status (e.g., ownership or designation as a natural area).

Management Urgency Rank (M-rank): An estimate of the time frame in which conservation management should occur, and the degree to which it is needed. Using the best available estimates, this rank refers to the need for management in contrast to protection (legal, political, or administrative measures).

Location: General location and general road/trail directions.
Legal Description: U.S.G.S. 7.5 minute Quadrangle name and Township, Range, and Section(s).

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

Biodiversity Rank Justification: A synopsis of the rare species and significant plant communities that occur in the PCA. A table within the PCA profile lists the element occurrences found within the PCA, their ranks, the occurrence ranks, and federal and state agency designations. The species or community that is the primary element of concern is bolded within the table. See Table 1 for explanations of ranks and Table 2 for legal designations.

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

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

Management Comments: A summary of PCA management issues that may affect the long-term viability of the PCA.

Canyons of the Ancients National Monument (formerly Anasazi ACEC)

San Juan Public Lands Field Office

On June 9, 2000, President Clinton signed a proclamation creating the Canyons of the Ancients National Monument. This 164,000 acre Monument in Montezuma and Dolores Counties of southwest Colorado will be managed by the Bureau of Land Management. This area was formerly managed by the BLM as the Anasazi ACEC. The Monument contains the highest known density of archaeological sites anywhere in the United States. Over 5,000 sites have been recorded in the area and there may be 20,000 to 30,000 sites total. Occupation began over 10,000 years ago and continued until the Ancestral Pueblo people migrated from the area and moved to Hopi, Zuni, and the Rio Grande corridor in New Mexico. The archaeological record etched into this landscape is much more than isolated islands of architecture and the Monument is intended to protect a vast landscape of human occupation. The sites reflect all the physical components of past human life including villages, field houses, check dams, reservoirs, great kivas, cliff dwellings, shrines, sacred springs, agricultural fields, petroglyphs and pictographs, and sweat lodges.

Canyons of the Ancients National Monument is located in Montezuma and Dolores counties in extreme southwestern Colorado. It is delimited to the south by McElmo Creek and the Ute Mountain Ute Reservation, the state border to the west, and includes the upper reaches of many canyons at its north and east boundaries. The Monument encompasses a diverse landscape of deep canyons, alluvial plains, bottomlands, plateaus, and rugged uplands. The major drainages of the Monument run from the northeast to the southwest, and form dramatic, steep walled canyons. Many streams in the Monument are perennial due to runoff from irrigated beanfields and haymeadows to the northeast. There are also numerous springs in the canyons which were certainly a valuable asset to the Ancestral Puebloans as they are to cattlemen today. All of the drainages funnel into McElmo Creek to the south, either directly (Sand Creek) or via Yellowjacket Creek. Cross Canyon is another prominent drainage that roughly delimits the northwestern boundary of the Monument.

The mesa tops and other high elevation areas within the Monument are composed mainly of cretaceous deposits, many of which are Dakota sandstone and conglomerates. Quaternary eolian deposits of sand and silt overlay this strata on the uplands of the northeastern part of the Monument. Drainages cutting through the strata of the Monument reveal jurassic deposits of Entrada sandstone, which is often manifested as dramatic cliffs on canyon walls. These cliffs are most pronounced in Yellow Jacket, Sand, and Cross Canyons but are to be seen to some extent in all drainages in the Monument.

The heterogeneous landscape within the Monument has allowed for a considerable diversity of habitats. Pinyon-juniper woodlands dominate much of the Monument. These two species are nearly ubiquitous but the density of the woodlands they form varies greatly from place to place. North facing slopes and many of the flat uplands between the canyons with deep soil are forested with a nearly closed canopy of pinyon pine and Utah juniper. On xeric slopes and rocky areas with shallow soil the canopy cover is much reduced, with a diverse understory of shrubs, forbs, and grasses. In a few of the bottomlands and poorly drained areas of the Monument greasewood

shrublands are found. Many of the broad alluvial outwash plains, such as those to the south of Cannonball Mesa, are vegetated by blue grama-dominated grasslands. The sandstone canyon rims at the top of the Entrada are habitat for the Naturita milkvetch (*Astragalus naturitensis*), a rare, diminuitive cushion plant.

Cryptobiotic crusts are well developed in many areas of the Monument. Cryptobiotic crusts are currently the subject of much research, as they are becoming increasingly recognized as a key component of many ecosystems worldwide. They are particularly common in cold deserts, where they serve to stabilize soil and fix nitrogen. Both of these functions are essential in the ecosystem of the Canyons of the Ancients National Monument where plant cover is sparse, soils are sandy and highly erodable, and soil nutrient levels are low. The stabilizing effects of crusts are particularly obvious on the rims of canyons and mesas in the Monument.

Elements of Global or State-wide Concern Documented in the Canyons of the Ancients Potential Conservation Areas

The following rare plants, plant communities, and weeds have been documented in the Canyons of the Ancients Potential Conservation Areas identified during the 2000 Weed and Rare Plant Assessment. Please see Tables 1 and 2 for rank and status definitions.

Scientific Name	Common Name	Global Rank	State Rank	Fed Status	State Status	Fed Sens
RARE PLANTS						
Astragalus naturitensis	Naturita Milkvetch	G2G3	S2S3			BLM
Calochortus flexuosus	Weak Stemmed Mariposa					
Penstemon breviculus	Little Penstemon	G3Q	S2			
Penstemon utahensis	Utah Penstemon	G4	S2			
PLANT COMMUNITIES						
Populus fremontii/ Salix gooddingii	Fremont's Cottonwood/ Goodding's Black Willow	G2	S1			
Celtis reticulata	Hackberry Forest	G3?	S1S2Q			
Juniperus osteosperma/ Cercocarpus montanus	Utah Juniper/ Mountain Mahogany	G2Q	S2?			
Atriplex confertifolia/ Hillaria jamesii	Saltbush/ Galleta Grass	G3	S2			

Problematic Weeds Species in the Canyons of the Ancients National Monument. Please see page 8 for state status definitions.

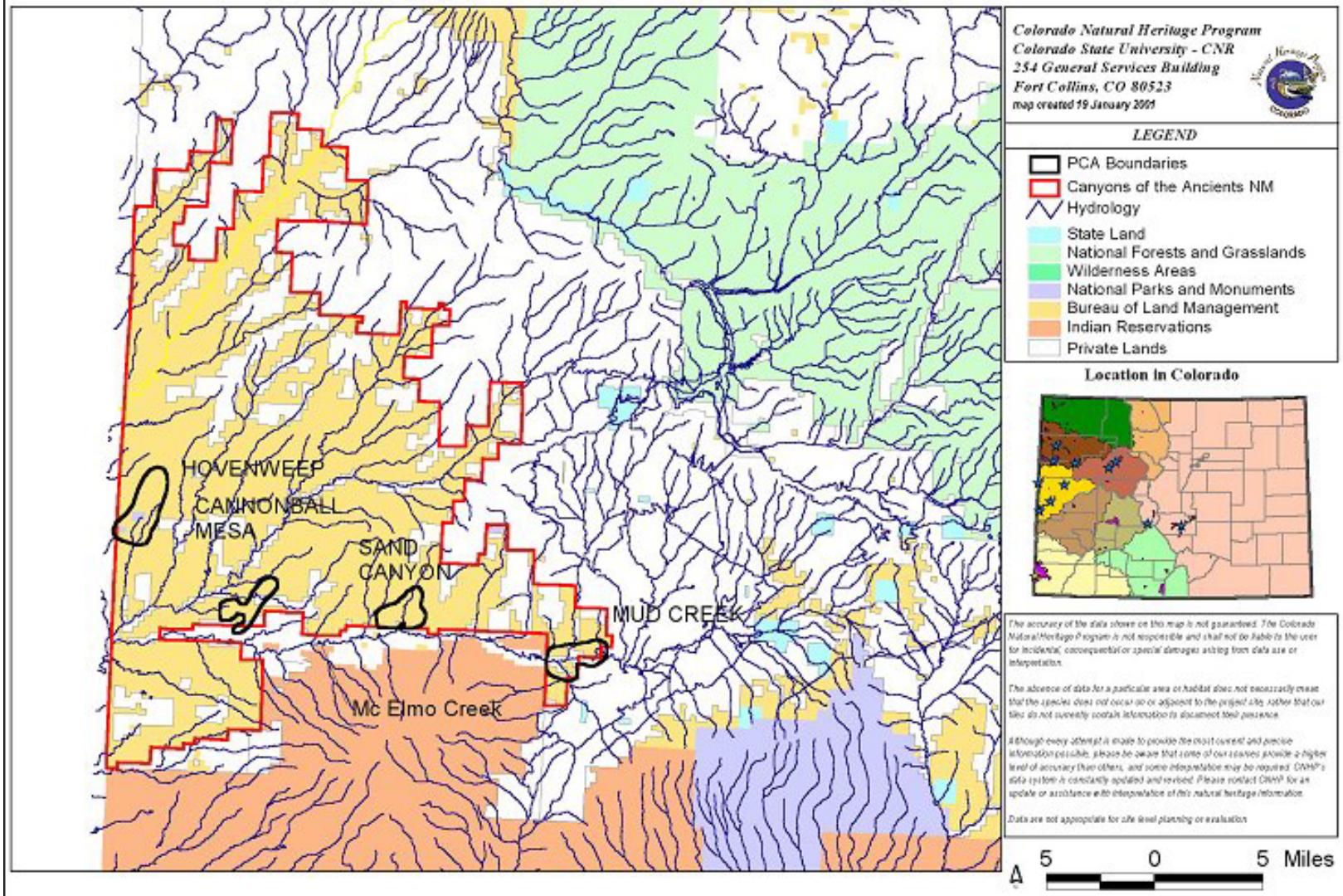
Scientific Name	Common Name	State Status
Acroptilon repens	Russian Knapweed	B
Cardaria draba	White Top	B
Linaria genistifolia ssp. dalmatica	Dalmatian Toadflax	B
Cirsium arvense	Canada Thistle	B
Carduus nutans	Musk Thistle	B

Lepidium latifolium	Perennial Pepperweed	A
Eleagnus angustifolia	Russian Olive	A
Salsola australis	RussianThistle	A
Tamarix ramossisima	Tamarisk	A
Anisantha tectorum	Cheat Grass	A
Erodium cicutarium	Redstem Filaree	A
Ceratocephala orthoceras	Bur Buttercup	none

Potential Conservation Areas identified within the Canyons of the Ancients National Monument

The Biodiversity Significance, Protection Urgency, and Management Urgency Ranks are included (see pages 11-18 for rank definitions). PCAs are listed in approximate order of priority for conservation attention.

PCA Name	Biodiversity Rank	Protection Urgency Rank	Management Urgency Rank
Cannonball Mesa	B2	P3	M2
Sand Canyon	B2	P3	M2
Hovenweep	B2	P4	M2
Mud Creek	B3	P3	M4



Potential Conservation Areas in the Canyons of the Ancients National Monument

Potential Conservation Areas in the Canyons of the Ancients National Monument

Cannonball Mesa

Biodiversity Rank: B3 High Significance
This PCA contains good (B-ranked) occurrences of elements that are vulnerable on a global scale (G3), and excellent (A-ranked) occurrences of elements that are globally secure (G5) but imperiled or critically imperiled in the state of Colorado (S1S2).

Protection Urgency Rank: P4 Low Urgency
As part of a National Monument the area has a high degree of protection but increased enforcement may be necessary to manage vehicle traffic.

Management Urgency Rank: M2 High Urgency
Most of the PCA contains few weeds at present. Noxious weeds are invading the occurrence of Utah penstemon in this PCA and should be managed or eradicated. Off-road vehicle traffic is impacting rare plant habitat in many areas of the PCA.

Location: Montezuma County. This PCA includes the eastern portion of Cannonball Mesa, the upper portion of Risley Canyon, and a portion of Mocassin Canyon.
Legal Description: USGS 7.5 minute Bowdish quadrangle. T36N R19W S 14, 22, 23, 27, 28, 33, 34.

General Description:

This PCA incorporates parts of many drainages and mesas within a highly heterogeneous landscape. Most of the PCA is dominated by open pinyon-juniper woodlands, with a diverse and interesting herbaceous understory. Some of the many species noted in this PCA are *Frasera albomarginata, Cymoterus bulbosus, Physaria acutifolia, Streptanthus cordatus, Astragalus amphioxys, Stenotus armerioides, Oenothera caespitosa,* and *Schlerocactus whipplei.*

The dominant landscape feature in the PCA is Cannonball Mesa, the eastern portion of which is included due to an unusual shrubland occupying approximately 200 acres of its top. The mesa top is very slightly concave and poorly drained, creating unusually mesic conditions that have allowed the development of a shrubland dominated by saltbush (*Atriplex confertifolia*), greasewood (*Sarcobatus vermiculatus*), and galleta grass (*Hilaria jamesii*), classified as a cold desert shrubland (*Atriplex confertifolia/ Hilaria jamesii*). The eastern flanks of Cannonball Mesa also support an unusual woodland dominated by forsellesia (*Forsellesia meionandra*), Utah juniper (*Juniperus osteosperma*), and mountain mahogany (*Cercocarpus montanus*). This community is classified as a Utah juniper/ mountain mahogany woodland (*Juniperus osteosperma/ Cercocarpus montanus*).

The main access road for the much of the Monument passes through this 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 through the PCA. It was seen

along the road within the occurrences of *Penstemon utahensis* and *Calochortus flexuosus*. It was also observed spreading into the occurrences, particularly within the *Penstemon utahensis* occurrence where it is moving downslope from a roadcut (see map).

Tamarisk (*Tamarix ramosisima*) 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 (see map), and it appears to be spreading along the wash in areas disturbed by periodic flowing water.

Cheat grass (*Anisantha tectorum*) was most abundant near roadsides, particularly in the southern portion of the PCA. Many areas of the PCA have little or no cheat grass and remain in excellent condition. Evidence of illegal off-road activity that could spread cheat grass was observed in the PCA.

Biodiversity Rank Justification: This PCA contains two good occurrences of elements that are vulnerable on a global scale (G3), and two excellent occurrences of elements that are globally secure (G4) but imperiled (S2) or critically imperiled (S1) in the state of Colorado.

Natural Heritage Element Occurrences in the Cannonball Mesa PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Calochortus flexuosus	Weak-Stemmed Mariposa Lily	G4	S1				A
Calochortus flexuosus	Weak-Stemmed Mariposa Lily	G4	S1				B
Penstemon breviculus	Little Penstemon	G3Q	S2				B
Penstemon utahensis	Utah Penstemon	G4	S2				A
Juniperus osteosperma/ Cercocarpus montanus	Utah Juniper/ Mountain Mahogany	G2Q	S2?				E
Atriplex confertifolia/Hilaria jamesii	Cold Desert Shrublands	G3	S2				B

*EO=Element Occurrence

Problematic weed species documented within the Cannonball Mesa PCA.

Element	Common Name	State Status
Acroptilon repens	Russian Knapweed	B
Anisantha tectorum	Cheat Grass	A
Cardaria draba	Hoary Cress	B
Tamarix ramossisima	Tamarisk	A

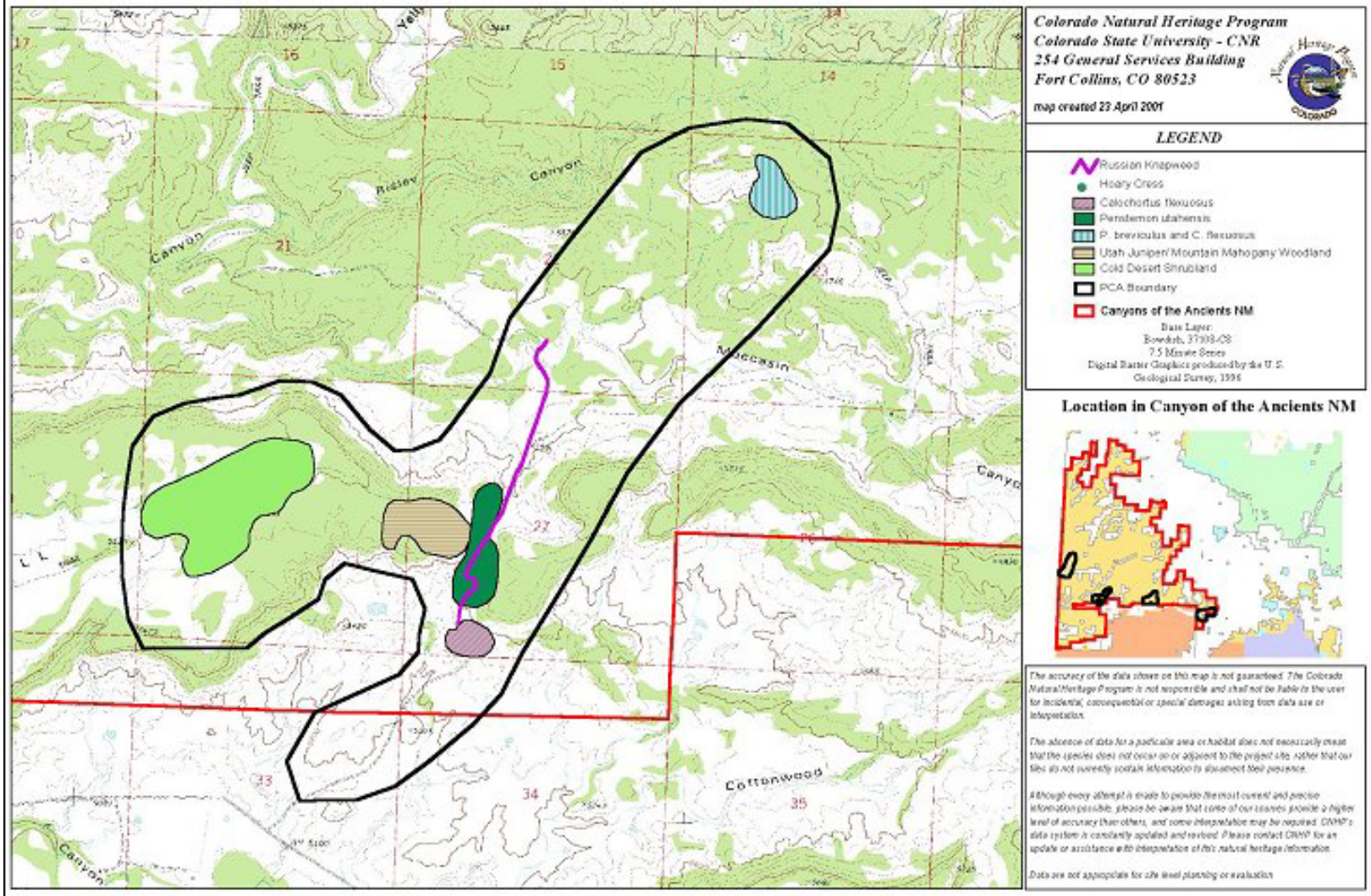
Boundary Justification: The boundary is drawn to include all of the element occurrences in the vicinity of Cannonball Mesa, including occurrences near Risley and Mocassin Canyons. Further refinement of this planning boundary may be warranted if survey work is done in the vicinity in the future, since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

Protection Comments: Most of the PCA is included within Canyons of the Ancients National Monument, but it also includes some adjacent private lands, primarily to the south.

Management Comments: Noxious weeds and ORV use appear to be the most significant management issues for maintaining the viability of the element occurrences in this PCA. The occurrence of Utah penstemon in the PCA has become infested with Russian knapweed, suggesting a need for eradication or management to ensure that the occurrence remains viable. ORV activity poses a tangible threat to the rare plant occurrences and acts as a vector for weed dispersal into uninfested areas. As visitation to this area increases due to its new status as a National Monument, risks to rare plants and their habitat and immigration of weeds will also increase. Annual monitoring of rare plants populations and communities would help insure that the biological resources protected in the monument remain viable.

Utah penstemon (Penstemon utahensis) in the Cannon Ball Mesa Potential Conservation Area.

Weak-stemmed mariposa lily (*Calochortus flexuosus*) in the southern part of the Cannon Ball Mesa Potential Conservation Area.



Cannonball Mesa Potential Conservation Area

Sand Canyon

Biodiversity Rank: B2 Very High Significance
This PCA contains an excellent (A ranked) occurrence of a globally imperiled (G2G3) species, a good (B ranked) occurrence of a species that is vulnerable on a global scale (G3) and imperiled (S2) in Colorado.

Protection Urgency Rank: P3 Moderate Urgency
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.

Management Urgency Rank: M2 High Urgency
Most of the PCA contains few weeds at present, although three invasive species were observed at the trailhead to Sand Canyon. Cryptobiotic crusts have incurred significant degradation in the PCA due to off-trail activities.

Location: Montezuma County. This PCA includes the lower reaches of Sand Canyon and parts of the surrounding uplands, including the Sand Canyon trailhead on McElmo Road.
Legal Description: USGS 7.5 minute Battle Rock quadrangle. T36N R18W S 22, 23, 25, 26, 27, 34, 35.

General Description: 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 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 PCA is dominated by open pinyon-juniper 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 (B-ranked) occurrence of little penstemon (*Penstemon breviculus*) was found in this PCA, with hundreds of individuals scattered along the trail from near the trailhead at McElmo Road for approximately one mile into Sand Canyon (see map). This population is estimated to contain at least 1000 plants. A fair (C-ranked) occurrence of the weak-stemmed mariposa (*Calochortus flexuosus*) was found on the west canyon rim in which only four individuals were counted. The Abajo penstemon (*Penstemon lentus*), was also found in the PCA. This species is

considered sufficiently common that it is no longer tracked by CNHP. The Longnose leopard lizard (*Gambelia wislizenii*), a critically imperiled lizard in Colorado, was observed in this PCA in 1993. Although this PCA was not drawn to address its needs, the area contains much suitable habitat for this species.

Biodiversity Rank Justification: This PCA contains an excellent (A ranked) occurrence of a globally imperiled (G2G3) plant species, and a good (B ranked) occurrence of a species that is vulnerable on a global scale (G3) and imperiled (S2) in Colorado. It also contains a fair (C ranked) occurrence of a globally secure (G4) plant species that is critically imperiled (S1) in Colorado.

Natural Heritage Element Occurrences in the Sand Canyon PCA.

Element	Common Name	Global Rank	State Rank	Federa Status	State Status	Federal Sens.	EO* Rank
Calochortus flexuosus	Weak-Stemmed Mariposa Lily	G4	S1				C
Astragalus naturitensis	Naturita Milkvetch	G2G3	S2S3			BLM	A
Penstemon breviculus	Little Penstemon	G3Q	S2				B

*EO=Element Occurrence

Problematic weed species documented within the Sand Canyon PCA.

Element	Common Name	State Status
Ceratocephala orthoceras	Bur Buttercup	not listed
Anisantha tectorum	Cheat Grass	A
Erodium cicutarium	Redstem Filaree	A

Boundary Justification: The boundary of this PCA includes the known extent of the occurrences of the Naturita milkvetch, the little penstemon, and the weak-stemmed mariposa. An historic occurrence of the longnose leopard lizard is also included within the PCA, but the boundary was not drawn in consideration of this species.

Protection Comments: This PCA is primarily located within the Canyons of the Ancients National Monument boundary. The lower portion of Sand Creek is on private land. Several gas wells and an access road are located in the eastern portion of the PCA.

Management Comments: This PCA was given high management urgency 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.

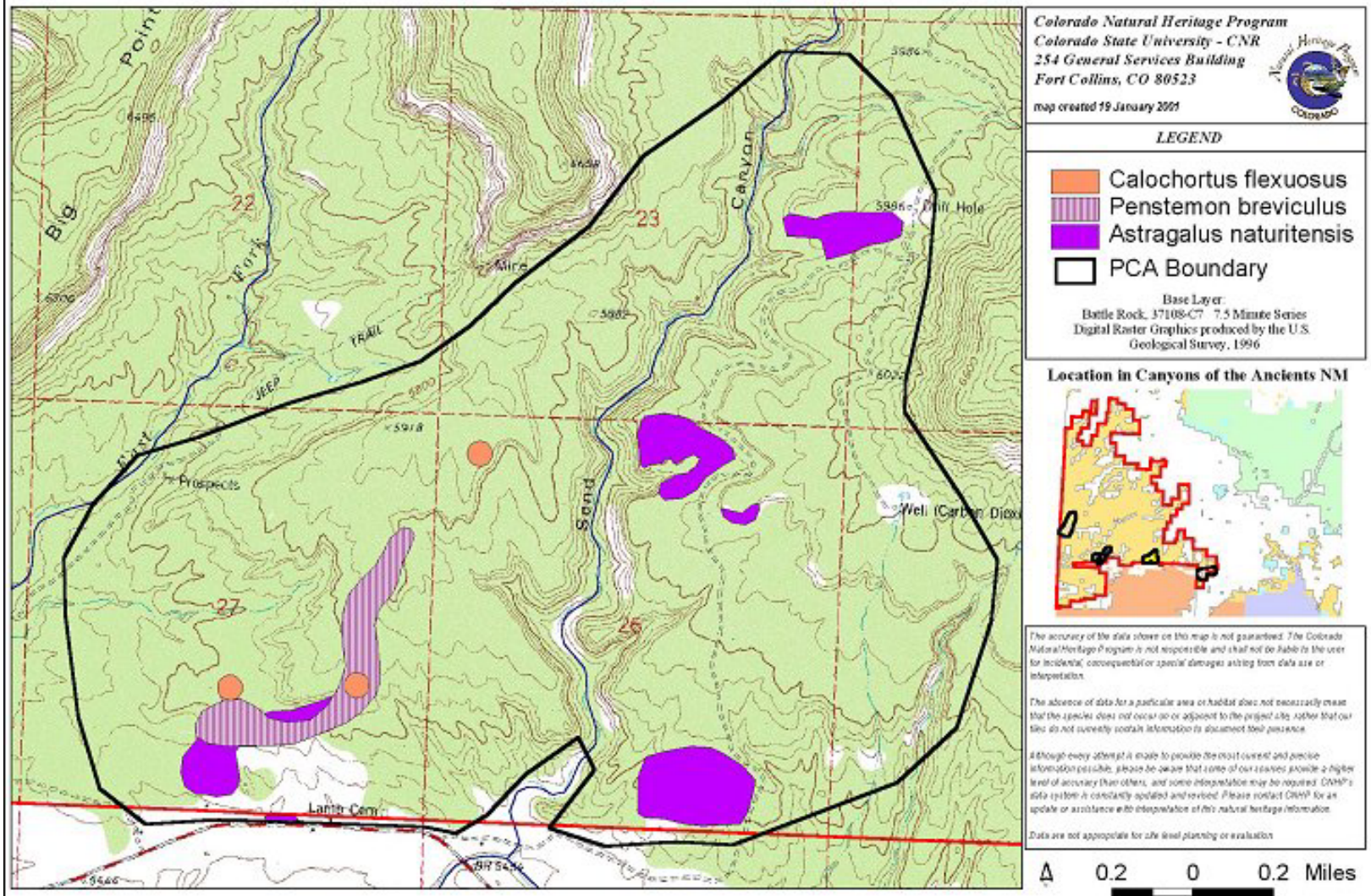
Heavy impacts to cryptobiotic crusts were observed throughout the canyon resulting from off-trail mountain bike use, horses, and hiking. In some areas social trails are quite dense and have

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 (*Astragalus naturitensis*) 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. This is remarkable, and deserves special management attention to keep it this way. Near the trailhead at McElmo Road, three weed species were observed that pose a significant threat to the PCA if they are allowed to spread. Cheat grass (*Anisantha tectorum*) poses the greatest threat, followed by bur buttercup (*Ceratocephala orthoceras*) and redstem filaree (*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 PCA. 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 PCA. The Naturita milkvetch is also known from the east side of Sand Canyon.

The tiny Naturita milkvetch (*Astragalus naturitensis*) growing in a thin veneer of soil atop the sandstone cliffs of Sand Canyon. Soils in which the Naturita milkvetch were found were covered with a dense cryptobiotic crust.

Sandstone cliffs and pinnacles north of the trail into Sand Canyon. The clifftops of this canyon contain extensive habitat for the Naturita Milkvetch (*Astragalus naturitensis*).



Sand Canyon Potential Conservation Area

Mud Canyon

Biodiversity Rank: B3 High Significance
This PCA contains a fair (C ranked) occurrence of a globally imperiled (G2G3) plant species.

Protection Urgency Rank: P3 Moderate Urgency
As part of a National Monument, parts of the PCA have a high degree of protection. The current land ownership pattern in the PCA is a patchwork of public and private land.

Management Urgency Rank: M4 Low Urgency
Few weeds were observed in the portion of the PCA visited in 2000 and none in direct competition with the rare plants in the area. Current management appears to be compatible with the rare plant occurrence in the PCA.

Location: Montezuma County. This PCA includes Mud canyon near its confluence with McElmo Creek, and a roadless reach of McElmo Canyon from the confluence with Mud Creek upstream approximately three miles.
Legal Description: USGS 7.5 minute Mud Creek quadrangle. T35N R16W S 5, 6, 7; T35N R17W S 1, 12; T36N R16W S31, 32; T36N R17W S 36.

General Description: The physiography of this PCA is dominated by the canyons of Mud Creek and McElmo Creek, which are flanked by steep sandstone canyon walls. Open pinyon - juniper forests dominate the uplands above the canyon rims, with a thick cryptobiotic crust on the soil in many places. A population of Naturita milkvetch is found here in soil pockets and cracks near the rim of Mud Canyon. Extensive unsurveyed habitat is present for this species in the PCA. An occurrence of little penstemon (*Penstemon breviculus*) has also been documented in the PCA but very little is known about this occurrence. Historic occurrences of cliff palace milkvetch (*Astragalus deterior*) and Naturita milkvetch are also reported from this area (in Section 1 of this PCA).

Very few weeds were found in this area. Cheat grass (*Anisantha tectorum*), bur buttercup (*Ceratocephala orthoceras*), and the red stem filaree (*Erodium cicutarium*) were found in this PCA but not in direct competition with the Naturita milkvetch. No cheat grass was seen on the tops of the bluffs where the Naturita milkvetch is located. Weed densities were highest in the canyon bottom. The McElmo Creek portion of the PCA was not visited.

Biodiversity Rank Justification: This PCA contains a fair (C ranked) occurrence of a globally imperiled (G2G3) plant species, and an unrankable (E-ranked) occurrence of a species that is vulnerable on a global scale (G3) and imperiled (S2) in Colorado.

Natural Heritage Element Occurrences in the Mud Canyon PCA.

Element	Common Name	Global Rank	State Rank	Federa Status	State Status	Federal Sens.	EO* Rank
Astragalus naturitensis	Naturita Milkvetch	G2G3	S2S3			BLM	C
Penstemon breviculus	Little Penstemon	G3Q	S2				E

*EO=Element Occurrence

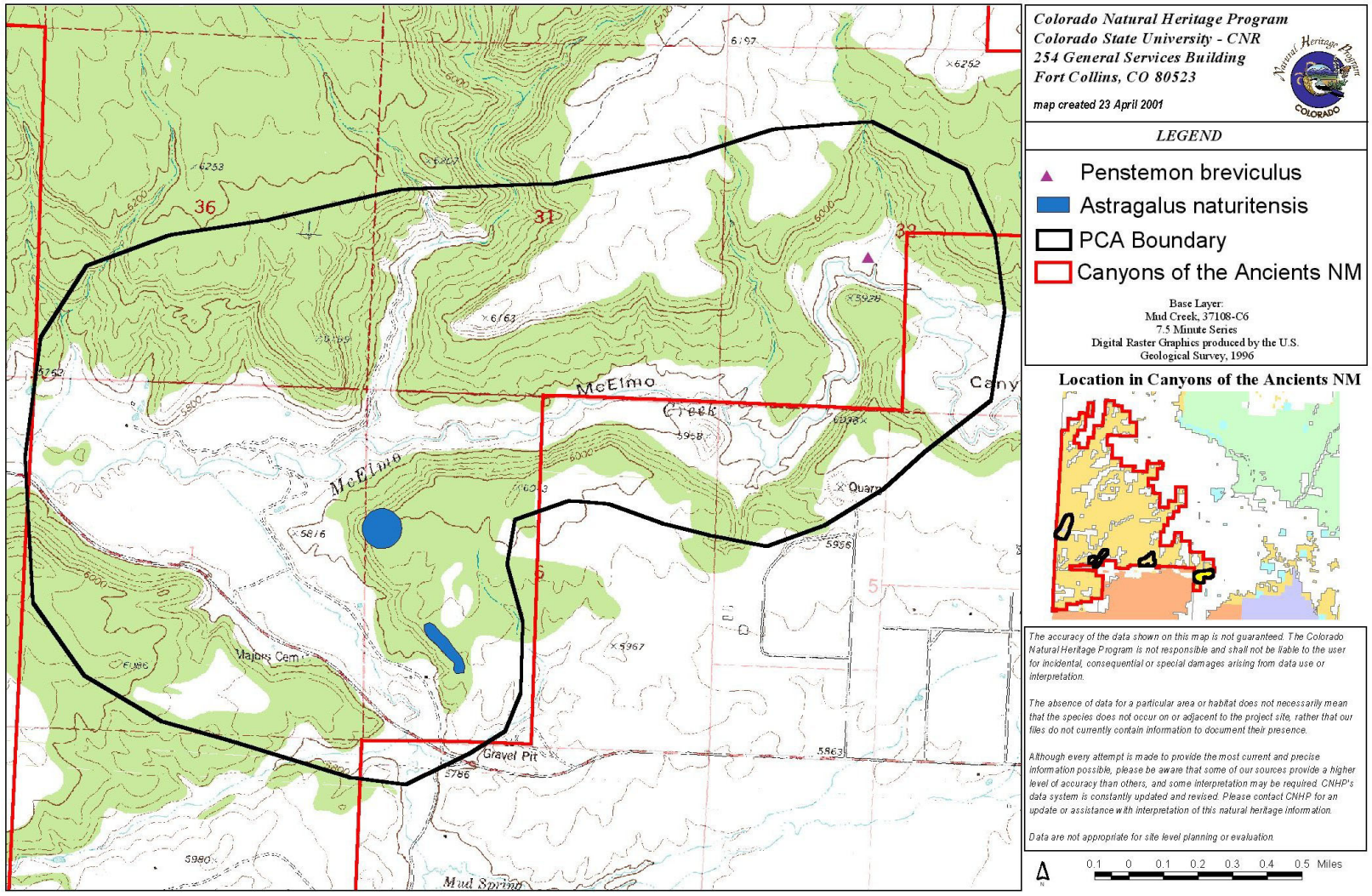
Problematic weed species documented within the Mud Canyon PCA.

Element	Common Name	State Status
Ceratocephala orthoceras	Bur Buttercup	not listed
Anisantha tectorum	Cheat Grass	A
Erodium cicutarium	Redstem Filaree	A

Boundary Justification: The boundary of this PCA includes the known extent of the occurrences of the Naturita milkvetch and the little penstemon in the area. It also includes a reach of McElmo Creek that was bypassed by McElmo Road. Large areas of high quality potential habitat for the Naturita milkvetch are present within the PCA, and remain to be surveyed.

Protection Comments: Portions of this PCA are located within the Canyons of the Ancients National Monument. The PCA is a patchwork, with an isolated area of public land in which the Naturita milkvetch resides, surrounded by private land inholdings.

Management Comments: This PCA was given low management urgency since the occurrence of Naturita milkvetch does not appear threatened by weeds or other unnatural disturbances at this time.



Mud Canyon Potential Conservation Area

Hovenweep

Biodiversity Rank: B2 Very High Significance
This PCA contains a good (B ranked) occurrence of a critically globally imperiled (G1G2) community, a good (B ranked) occurrence of a globally imperiled (G2) community, and a fair (C ranked) occurrence of a plant species that is vulnerable on a global scale (G3) and imperiled (S2) in Colorado.

Protection Urgency Rank: P4 Low Urgency
As part of a National Monument the area has a high degree of protection but increased enforcement may be necessary to manage human impacts and fire.

Management Urgency Rank: M2 High Urgency
Weeds are problematic in this PCA and have degraded two element occurrences. Human impacts and fire also threaten the occurrences in this PCA. The likelihood of destructive fires is increased due to the presence of weeds.

Location: Montezuma County, Colorado and San Juan County, Utah. The PCA includes Hackberry Canyon, Bridge Canyon, and contiguous sparsely forested uplands to the north. The access road to the two Hovenweep units in the PCA is also included.
Legal Description: USGS 7.5 minute Ruin Point quadrangle. T36N R20W S 1, 2, 3, 10, 11; T37N R20W S 23, 24, 25, 26, 34, 35, 36; T39S R26E S 10, 15.

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. The rugged sandstone canyons of Hackberry, Keely, and Bridge Creeks dominate this area, running roughly northeast to southwest. These drainages and their tributaries support the three known occurrences of rare natural communities documented in this PCA. Springs at the headwaters of Keely Creek and Hackberry Creek support a community dominated by hackberry (*Celtis reticulata*). This community is rare and globally imperiled (G1G2), with only three occurrences documented in Colorado. A tributary to Hackberry Creek supports an occurrence of the Fremont's poplar/ Goodding's black willow (*Populus fremontii/ Salix gooddingii*) community, also considered globally imperiled (G2). All three of these occurrences of rare plant communities are in good condition, diminished only by their small size and the presence of cheat grass (*Anisantha tectorum*) in their understories. Musk thistle (*Carduus nutans*) is also present in the western hackberry occurrence.

Little penstemon (*Penstemon breviculus*) and Utah penstemon (*Penstemon utahensis*) are also documented from this PCA. The little penstemon occurrence was found in 2000, and is not threatened by weeds at present. The Utah penstemon was documented in 1998 and was not revisited in 2000. It is near a road and thus potentially threatened by weeds, but no eminent threats were documented when it was reported.

The Abajo penstemon (*Penstemon lentus*), was also found in the PCA in the southwestern unit of Hovenweep National Monument at the trailhead to the Hackberry Group of ruins. This species is considered sufficiently common that it is no longer tracked by CNHP. The grey vireo (*Vireo vicinior*) and the sage sparrow (*Amphispiza belli*) have also been documented within the PCA, although the PCA boundary was not drawn in consideration of these species. The PCA contains significant areas of suitable habitat for these species.

Biodiversity Rank Justification: This PCA contains a good (B ranked) occurrence of a critically globally imperiled (G1G2) community, a good (B ranked) occurrence of a globally imperiled (G2) community, and a fair (C ranked) occurrence of a plant species that is vulnerable on a global scale (G3) and imperiled (S2) in Colorado.

Natural Heritage Element Occurrences in the Hovenweep PCA.

Element	Common Name	Global Rank	State Rank	Federa Status	State Status	Federal Sens.	EO* Rank
Celtis reticulata	Hackberry	G1G2Q	S1S2Q				A
Celtis reticulata	Hackberry	G1G2Q	S1S2Q				B
Populus fremontii/ Salix gooddingii	Fremont's Cottonwood/ Goodding's Black Willow	G2	S1				B
Penstemon breviculus	Little Penstemon	G3Q	S2				C
Penstemon utahensis	Utah Penstemon	G4	S2				E

*EO=Element Occurrence

Problematic weed species documented within the Hovenweep PCA.

Element	Common Name	State Status
Carduus nutans	Musk Thistle	B
Tamarix ramosissima	Tamarisk	A
Anisantha tectorum	Cheat Grass	A

Boundary Justification: This PCA 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 the occurrences of little penstemon and Utah penstemon in the vicinity, and significant areas of potential habitat for these species. Occurrences of two uncommon birds, the gray vireo and the sage sparrow, have also been documented within the PCA, but the boundary has not been drawn in consideration of these species. Nonetheless, appropriate habitat for these species is present in the PCA.

Protection Comments: This PCA is almost entirely protected within the boundary of the Canyons of the Ancients National Monument. Because this area now has a high level of protection, it was assigned a low protection urgency rank. Increased human visitation by tourists and the associated increased risk of fire may imperil the occurrences in the PCA, particularly the two community occurrences.

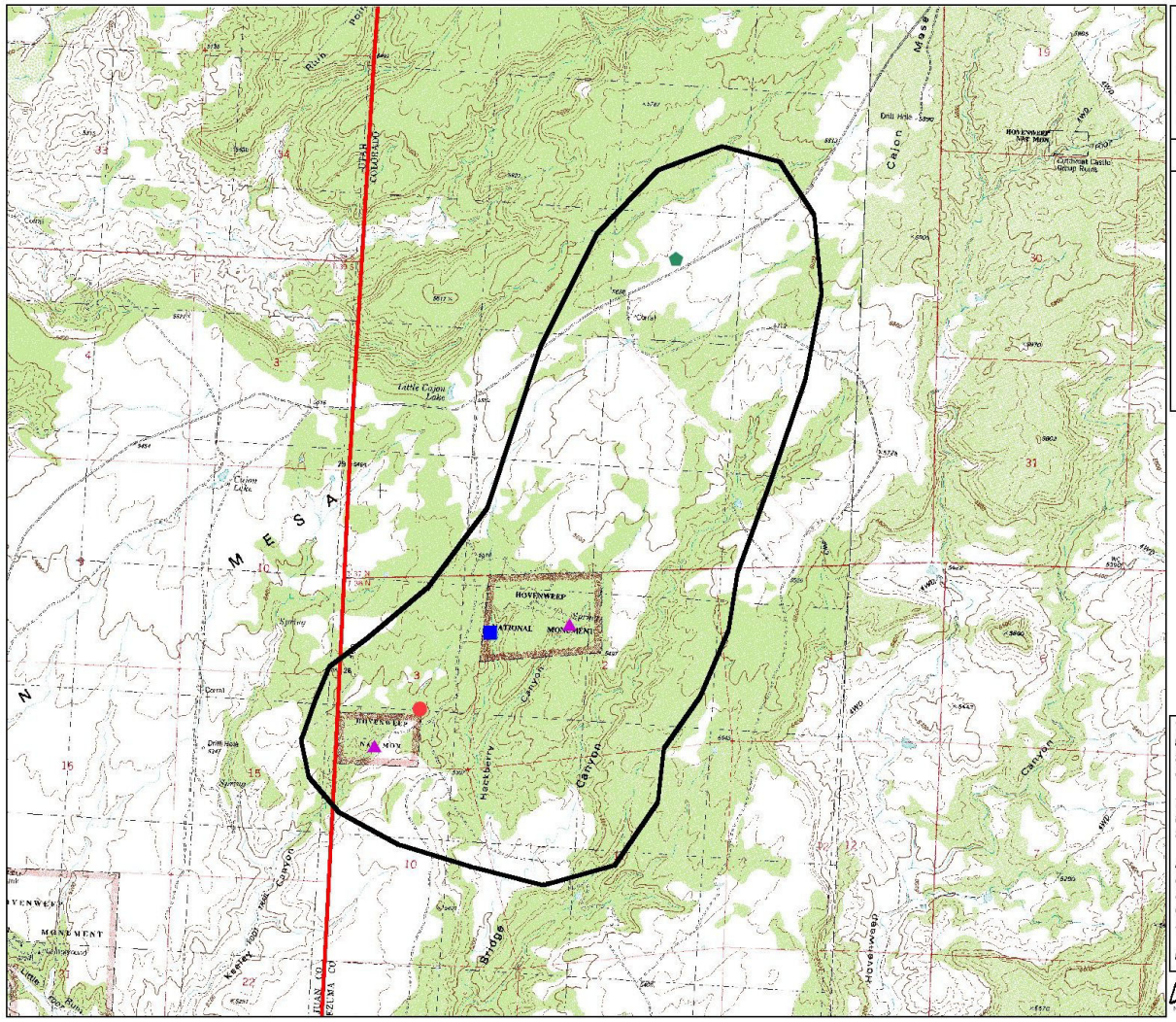
Management Comments: This PCA was given high management urgency due to the need for weed management and the likelihood that human visitation will soon increase sharply. The

greatest threat to the element occurrences in this PCA are weeds, particularly the cheat grass (*Anisantha tectorum*) infestations in and around the hackberry and the Fremont's cottonwood/ Goodding's black willow occurrences. Both of these are otherwise very high quality occurrences. Because cheat grass often forms dense stands and dries early in the summer, it creates a highly fire susceptible understory. Typically fire would be a very infrequent event in the riparian communities that it currently infests in the PCA, and the components of these communities are not resistant to fire. The unnatural understory of cheat grass acts like kindling, and an errant ash from a cigarette or a timely lightning strike would hastily erase these occurrences from the roster of natural heritage elements in this PCA. Managing or eradicating the cheat grass infestations in both of these community occurrences would greatly improve the long term viability of these occurrences. Tamarisk is also present in the Fremont's cottonwood/ Goodding's black willow occurrence and represents a significant threat. Aggressively managing tamarisk throughout the drainage will go a long ways towards insuring the long term viability of the community occurrence. Musk thistle is present in the western occurrence of hackberry forest at the headwaters of Keely Creek. As one of Colorado's top ten noxious weeds, this species represents a significant threat to the viability of this occurrence.

Human visitation to the area is a distant second behind the issue of weeds in this PCA, although the two issues are related in that the influx of noxious weeds will probably increase with the human traffic load. Managers may wish to observe closely for the appearance of weeds on Colorado's "C" list in this area, particularly medusahead which is on its way here from the Great Basin. Neither occurrence is frequently visited by humans although the eastern occurrence of the hackberry community is near a popular scenic area. Some unauthorized entry to this occurrence is evident from social trails descending the canyon walls.

The hackberry forest community occurrence (*Celtis reticulata*) at the headwaters of Keely Creek. Note the large, mature tree right of center and the Ancestral Puebloan site atop the cliff to the left. Cheat grass (*Anisantha tectorum*) can be seen below and to the right of the tree. This species becomes dry and flammable in the summer months, creating a fire hazard that threatens this community occurrence.

Little penstemon (*Penstemon breviculus*) in the Hovenweep Potential Conservation Area.



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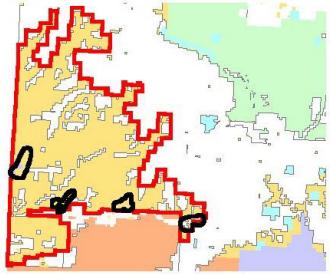
map created 25 April 2001

LEGEND

- Penstemon breviculus
- Penstemon utahensis
- Populus fremontii-Salix gooddingii
- Celtis reticulata
- PCA Boundary
- Canyons of the Ancients NM

Base Layer:
Ruin Point, 37109-D1
Negro Canyon, 37108-D8
7.5 Minute Series
Digital Raster Graphics produced by the U.S. Geological Survey, 1996

Location in Canyons of the Ancients NM



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The absence of data for a particular area or habitat does not necessarily mean that the species does not occur on or adjacent to the project site, rather that our files do not currently contain information to document their presence.

Although every attempt is made to provide the most current and precise information possible, please be aware that some of our sources provide a higher level of accuracy than others, and some interpretation may be required. CNHP's data system is constantly updated and revised. Please contact CNHP for an update or assistance with interpretation of this natural heritage information.

Data are not appropriate for site level planning or evaluation.

N

0.5 0 0.5 Miles

Hovenweep Potential Conservation Area

Unaweep Seep Research Natural Area

Grand Junction Field Office BLM

The Unaweep Seep Research Natural Area (RNA) is an unusual hillside spring ecosystem of wet sedge marshes and seeps located on south facing slopes on the side of Unaweep Canyon. The RNA represents a small area of 31.8 ha. located within the larger Unaweep Seep Potential Conservation Area (PCA) recognized and ranked B2 by CNHP. The primary motivation behind the RNA designation was to study and monitor the habitat of the Nokomis fritillary butterfly (*Speyeria nokomis nokomis*). The site also contains a rare assemblage of extralimital plant species, including a large population of the giant helleborine orchid (*Epipactis gigantea*). The orchids occur on the lower slopes of the seep, amid a dense growth of spikerushes. The site is grazed in early spring and fall, and seems to recover well during the summer. There are patches of coyote willow (*Salix exigua*) scattered throughout the seep area. At the base of the seep, West Creek supports a lush growth of narrowleaf cottonwood (*Populus angustifolia*), box elder (*Acer negundo*), skunkbrush (*Rhus trilobata*), dogbane (*Apocynum* sp.), alder (*Alnus incana* ssp. *tenuifolia*), birch (*Betula fontinalis*), hackberry (*Celtis reticulata*), coyote willow (*Salix exigua*), wild rose (*Rosa* sp.), poison ivy (*Toxicodendron rydbergii*), virgin's bower (*Clematis ligusticifolia*), hawthorn (*Crataegus* sp.), and a great diversity of other species. Several plants that are unusual in western Colorado occur here: Joe Pyeweed (*Eupatorium maculatum*); Himalayan blackberry (*Rubus* discolor), a domestic species that probably escaped from old homesteads in the area, and now grows wild; and tapered rosette grass (*Dicanthelium acuminatum* var. *fasciculatum*), that also is found in the seep with the spike rush. Above the seep, and in the surrounding uplands, the soils are dry and gravelly, and support a pinyon-juniper and Gambel oak plant community with mountain mahogany, yucca, Mormon tea, blue grama and prickly pear cactus.

Unaweep Seep was surveyed by CNHP on June 19, 2000, with the intent of noting any weeds present, and their present or potential threat to the helleborine orchid. The orchids were found in abundance, with thousands of individuals growing in a dense stand of spike rush (*Eleocharis palustris*) on the hillside. They were most abundant in the wettest parts of the seep, where runoff water is slowed or captured in terraces and depressions created by cattle's hooves sinking deeply into the saturated soils. Plants also were growing under the willows, and tended to be taller there. In mid-June, most of the orchids were in bud, but not yet flowering.

Weeds noted in adjacent dry areas were dandelion (*Taraxacum officinale*), black medic (*Medicago lupulina*), and sweet clover (*Melilotus officinale*). These species were not found in the wet area of the seep, and at present do not pose a threat to the helleborine orchid. In the riparian area at the base of the seep, there was some bindweed (*Convolvulus arvensis*), again, not presently threatening the orchids. These weeds are common along roadsides, and are transported by vehicles, wind, animals and people. There is little danger that humans will directly transport them into the seep, as the muck, horseflies and poison ivy discourage recreational use.

Although a native species and not a weed, coyote willow may pose a potential threat to the orchid population. Experiments in the past with fencing out cattle resulted in an increase in

willows. Apparently the present grazing regime is effective in controlling the woody species and maintaining the spike rush community which supports the orchid.

Tree of heaven (*Ailanthus altissima*) is a homestead escapee found along West Creek. It should be monitored for spreading, if not immediately controlled. Although this species is uncommon on the west slope, it has become a pest on the east slope, and could well spread from a nucleus such as this. Probably the greatest potential threat to the site is the non-native Himalayan blackberry, which has formed large impenetrable thickets along the edges of the seep, in slightly drier areas. This is the only occurrence known in western Colorado, and it is a potentially noxious weed (Weber 1996). We recommend, as a minimum, marking the present perimeter of the blackberry patch, and annual monitoring to determine whether it is expanding, and if so at what rate. Control of this species may be necessary in the future.

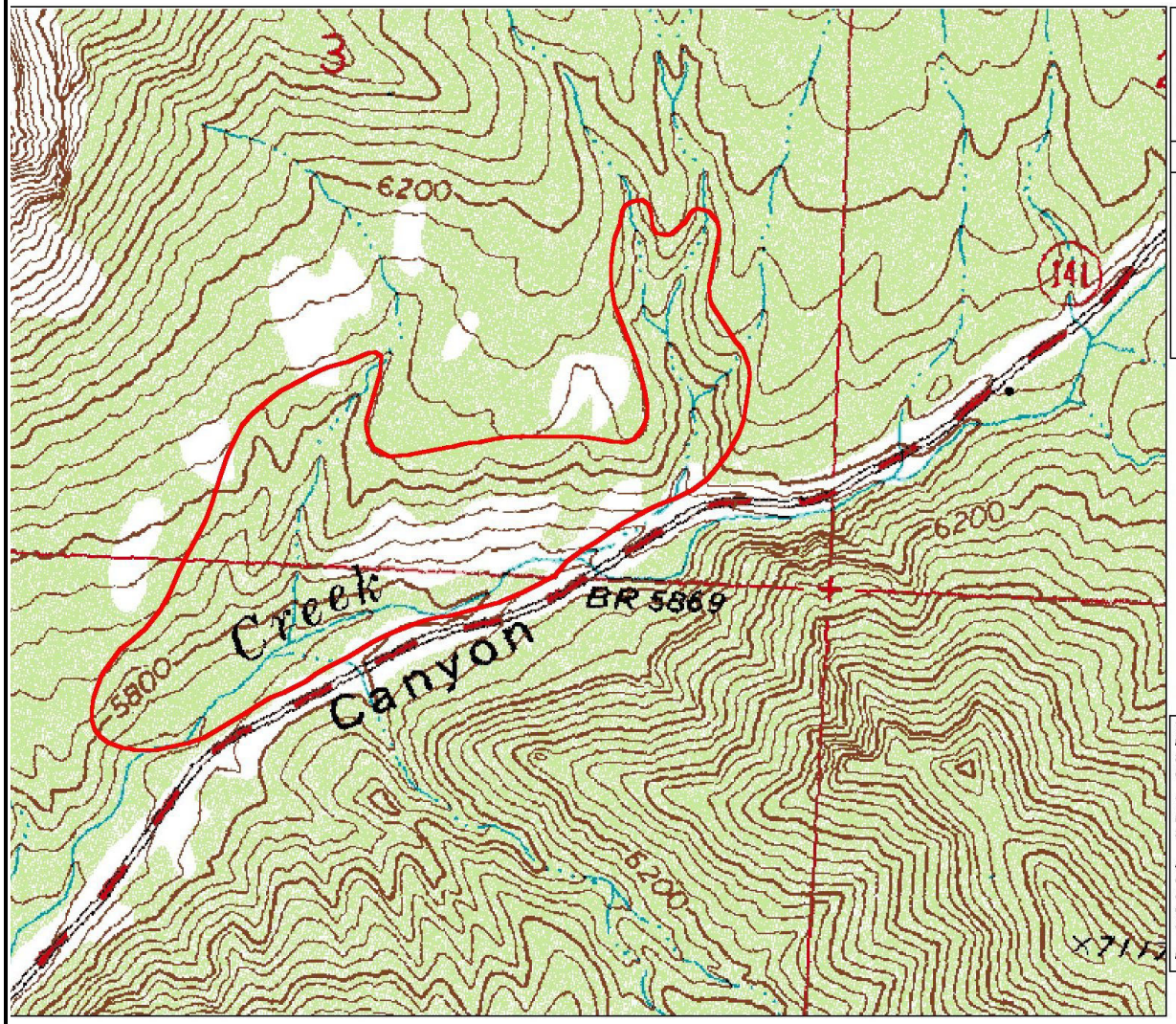
Elements of Global or State-wide Concern Documented in the Unaweep Seep Research Natural Area.

Scientific Name	Common Name	Global Rank	State Rank	Fed/state Status	Fed Sens	EO*rank
RARE PLANTS						
Epipactis gigantea	Helleborine orchid	G4	S2		FS	A
PLANT COMMUNITIES						
Acer negundo-Populus angustifolia/Celtis reticulatus	Narrowleaf cottonwood riparian forests	G1Q	S1Q			A
Scirpus acutus	Great Plains marshes	G3	S2S3			B
Alnus incana/Mesic forb	Thinleaf alder/ mesic forb	G3G4Q	S3			A
Eleocharis palustris	Emergent wetlands	G5	S4			A
Salix exigua/ Mesic graminoid	Coyote willow/ mesic graminoid	G5	S5			A

Problematic weed species documented within the Unaweep Seep Research Natural Area.

Element	Common Name	State Status
Convolvulus arvense	Bindweed	B
Melilotus officinale	Yellow sweetclover	A
Taraxacum officinale	Dandelion	none
Medicago lupulina	Black medic	none
Rubus discolor	Himalayan blackberry	none
Ailanthus altisssima	Tree of heaven	none

The Helleborine Orchid (*Epipactis gigantea*) in the Unaweep Seep RNA.



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map created 19 January 2001

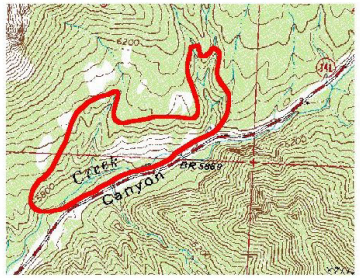
LEGEND

ACEC Boundary

Base Layer:

Two V Basin, 38108-G8
7.5 Minute Series
Digital Raster Graphics produced by the U.S. Geological Survey, 1996

Location in Project Area



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Unaweep Seep ACEC

Badger Wash ACEC

Grand Junction Field Office BLM

The Badger Wash ACEC consists of low hills and ridges of light gray clay soils derived from Mancos shale. Several drainages that are dry most of the year run generally south to West Salt Creek. Vegetation in the site is salt desert shrubland dominated by shadscale (*Atriplex confertifolia*), Gardner saltbush (*A. gardneri*), and galleta grass (*Hilaria jamesii*), with a substantial amount of bare soil. Other common plants are pretty buckwheat (*Eriogonum bicolor*), snakeweed (*Gutierrezia sarothrae*), and prince's plume (*Stanleya pinnata*).

The Badger Wash ACEC was surveyed by CNHP on June 7 and 8, 2000, to determine whether weeds were threatening rare plant populations. Two populations each of the globally vulnerable (G3) Grand buckwheat (*Eriogonum contortum*) and tall cryptanth (*Oreocarya elata*) were visited, and CNHP records updated. The buckwheat occupies sides and swales of the Mancos shale hills. Associated species are salina wildrye (*Elymus salina*), Gardner saltbush (*Atriplex gardneri*), spiny horsebrush (*Tetradymia spinosa*), sticky rabbitbrush (*Chrysothamnus viscidiflorus*), snakeweed (*Gutierrezia sarothrae*), and budsage (*Artemisia spinescens*). Tall cryptanth was observed on the edge of a gully, in the northern part of the ACEC. Associated species included shadscale (*Atriplex confertifolia*), snakeweed (*Gutierrezia sarothrae*), scarlet globemallow (*Sphaeralcea coccinea*), Indian rice grass (*Oryzopsis hymenoides*), and poison aster (*Xylorhiza venusta*). The tall cryptanth plants were already past flowering and dried out.

Major weed species observed in the ACEC were halogeton, or wienerleaf (*Halogeton glomerata*), annual wheatgrass (*Eremopyrum triticeum*), cheat grass (*Anisantha tectorum*), and white top (*Cardaria* sp.). However, they were not found in the sites with the rare plants. Halogeton was found mainly on flat bottomlands with greasewood (*Sarcobatus vermiculatus*) and along roads. Annual wheatgrass was along the road in the vicinity of the tall cryptanth, but not within the occurrence. White top was found in dried stockponds well away from any rare plants. Cheat grass was not abundant within the ACEC, although it dominates large areas in western Mesa County. Here, it was mainly in flat areas and along roads. Jim Hill mustard (*Sisymbrium altissimum*) and crested wheatgrass (*Agropyron cristatum*) were also observed around roads and gas well pads in the ACEC, but were not directly threatening rare plants.

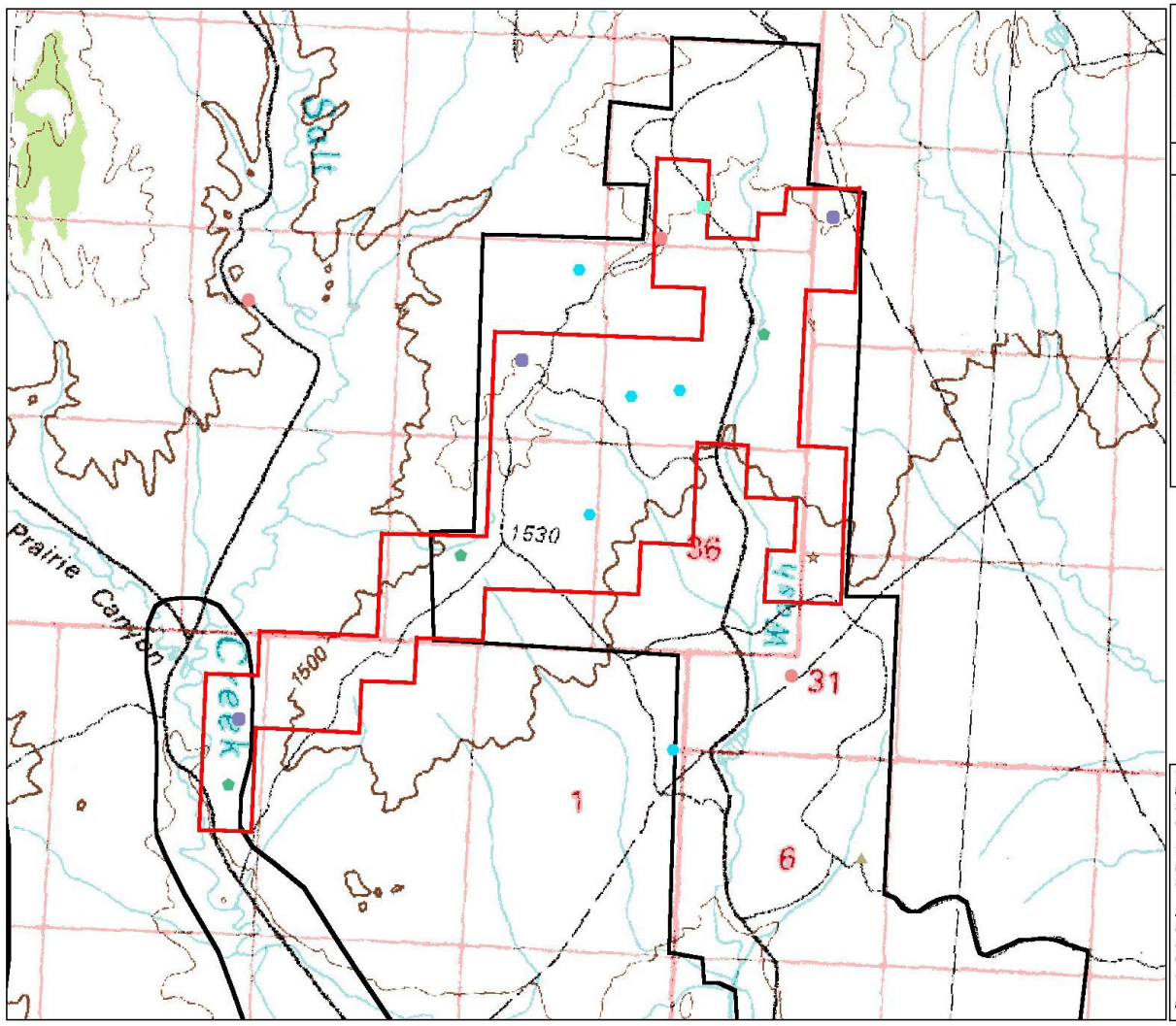
In conjunction with the Biological Survey of Garfield County, also conducted by CNHP in 2000, a large additional population of Grand buckwheat was found on BLM land just to the north of the ACEC. Cheat grass and burr buttercup (*Ceratocephala orthoceras*) were observed in this area growing along a pipeline, and there was tamarisk (*Tamarix ramosissima*) in the bottom of a dry reservoir. None of these were directly threatening the buckwheat.

Natural Heritage Plant and Community Element Occurrences in the Badger Wash ACEC.

Scientific Name	Common Name	Global Rank	State Rank	Fed/state Status	Fed Sens	EO*rank
RARE PLANTS						
Eriogonum contortum	Grand buckwheat	G3	S2		BLM	A
Eriogonum contortum	Grand buckwheat	G3	S2		BLM	B
Eriogonum contortum	Grand buckwheat	G3	S2		BLM	H
Oreocarya elata	Tall cryptanth	G3	S2			B
Oreocarya elata	Tall cryptanth	G3	S2			C
Oreocarya elata	Tall cryptanth	G3	S2			E
Astragalus musiniensis	Ferron milkvetch	G2	S1		BLM	E
Allium nevadense	Nevada onion	G4	S2			H
PLANT COMMUNITIES						
Atriplex gardneri/Leymus salinus	Cold desert shrublands	G4G5	S3			B
Atriplex gardneri/Leymus salinus	Cold desert shrublands	G4G5	S3			B
Atriplex gardneri/Leymus salinus	Cold desert shrublands	G4G5	S3			B
Sarcobatus vermiculatus/ Suaeda torreyana	Saline bottomland shrubland	G2G3	S2S3			H

Problematic weed species documented within the Badger Wash ACEC.

Element	Common Name	State Status
Halogeton glomeratus	Wienerleaf	A
Eremopyrum triticeum	Annual wheatgrass	none
Anisantha tectorum	Cheat grass	A
Cardaria sp.	White top	B
Ceratocephala orthoceras	Bur buttercup	none
Sisymbrium altissimum	Jim Hill mustard	A
Tamarix ramosissima	Tamarisk	A



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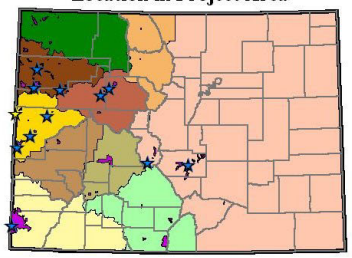
map created 26 April 2001

LEGEND

- ALLIUM NEVADENSE
- ASTRAGALUS MUSINIENSIS
- ERIOGONUM CONTORTUM
- OREOCARYA ELATA
- ATRIPLEX CORRUGATA SHALE BARREN
- ATRIPLEX GARDNERI/LEYMUS SALINUS
- SARCOBATUS VERMICULATUS/SUAEDA TORREYANA
- ACEC Boundary
- PCA Boundary (Badger Wash and West Salt Creek)

Base Layer:
Grand Junction, 39108-A1
30 x 60 Minute Series
Digital Raster Graphics produced by the U.S. Geological Survey, 1996

Location in Project Area



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Data are not appropriate for site level planning or evaluation.

Badger Wash ACEC

0.5 0 0.5 Miles

Pyramid Rock Research Natural Area

Grand Junction Field Office BLM

The Pyramid Rock Research Natural Area (RNA) comprises a single eroded sandstone pinnacle west of DeBeque in the Little Bookcliffs area. The site is also a designated Colorado Natural Area, for the protection of "sensitive plants that are dependent on this habitat type for their survival". Three rare plant species were known from the site, and a fourth was located during this survey. The 223 ha. RNA is located within the larger Pyramid Rock Potential Conservation Area (B2) identified by CNHP, which comprises a total of 36 element occurences. The site contains pinyon-juniper, shrubland and grassland communities, and sandstone outcrops of the Wasatch Formation. Common species include Utah juniper (*Juniperus osteosperma*), Mormon tea (*Ephedra viridis*), galleta grass (*Hilaria jamesii*), rabbitbrush (*Chrysothamnus nauseosus*), snakeweed (*Gutierrezia sarothrae*), Indian paintbrush (*Castilleja scabrida*), Indian rice grass (*Oryzopsis hymenoides*), and Prickly pear cactus (*Opuntia polyacantha* and *O. phaeocantha*).

The RNA was surveyed by CNHP on July 5 and 9, 2000, to ascertain whether weeds were co-occurring with rare plants. The Debeque milkvetch (*Astragalus debequaeus*) site at the northwest corner of the RNA was visited and records updated. Seventy-two plants were counted, an increase from the 50 plants previously recorded. Most were growing in shallow dry washes on a northwest facing slope. Although there is cheat grass (*Anisantha tectorum*) in the area, at the base of the hill, there were no weeds in the microhabitat occupied by the milkvetch.

The mapped locations of the DeBeque phacelia (*Phacelia submutica*) and for the Uinta Basin hookless cactus (*Sclerocactus glaucus*) were searched, but the plants were not found in 2000. This may be due to the extremely dry conditions during the spring.

Weeds were concentrated on the flat outwash areas below Pyramid Rock, with sagebrush (*Artemisia tridentata*) and greasewood (*Sarcobatus vermiculatus*). These areas appear to be heavily grazed. There was abundant pepperweed (*Lepidium perfoliatum*), cheat grass (*Anisantha tectorum*), and bur buttercup (*Ceratocephala orthoceras*) in openings in the shrub community. Wooly plantain (*Plantago patagonica*) was also abundant, and though it is a native species, it is an increaser on barren soils and overgrazed range (Weber 1996). Sweet clover (*Melilotus officinale*) was found in more moist sites in the gullies. Although they do not presently threaten the rare plant populations, control of these weeds now may prevent their increasing and posing a threat in the future.

An unexpected find was a new, large population of Rocky Mountain thistle (*Cirsium perplexans*), a plant that is endemic to only four counties in western Colorado, and considered imperiled (G2S2) by the Colorado Natural Heritage Program. It was found on benches below the summit of Pyramid Rock, on the east side of the mountain. Soils were dark brown, soft, loosened by shrink-swell action and rodents. Total plant cover was about 25%. Associated species included shadscale (*Atriplex brandegii*), desert bahia (*Platyschkuhria integrifolia*), galleta grass *(Hilaria jamesii*) and gumweed (*Grindelia squarrosa*). The occurrence was given a rank of A (excellent), based on its large size, excellent condition, and landscape context. It is

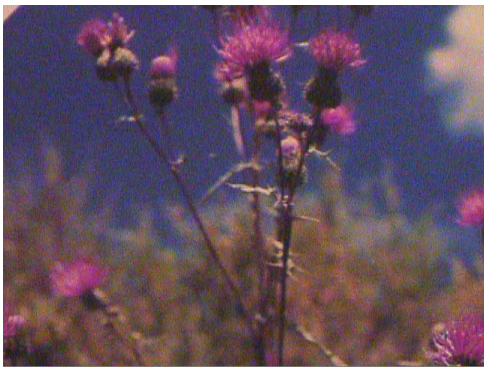
one of the largest known occurrences of the species, and is unusual in that it is in a natural area, away from roads. There were no weeds, except for a very small amount of *Anisantha tectorum* on the lower bench, and the soil disturbance in the area, which is beneficial for the establishment of the *Cirsium*, appeared to be from natural causes.

Natural Heritage Plant and Community Element Occurrences in the Pyramid Rock RNA.

Scientific Name	Common Name	Global Rank	State Rank	Fed/state Status	Fed Sens	EO*rank
RARE PLANTS						
Astragalus debequaeus	DeBeque milkvetch	G2	S2		BLM	A
Phacelia submutica	DeBeque phacelia	G2	S2	C	FS	B
Sclerocactus glaucus	Uinta Basin hookless cactus	G3	S3	LT		C
Cirsium perplexans	Rocky Mountain thistle	G2	S2		BLM	A
PLANT COMMUNITIES						
Juniperus osteosperma/ Leymus salinus	Western slope pinyon-juniper woodlands	GU	SU			BC

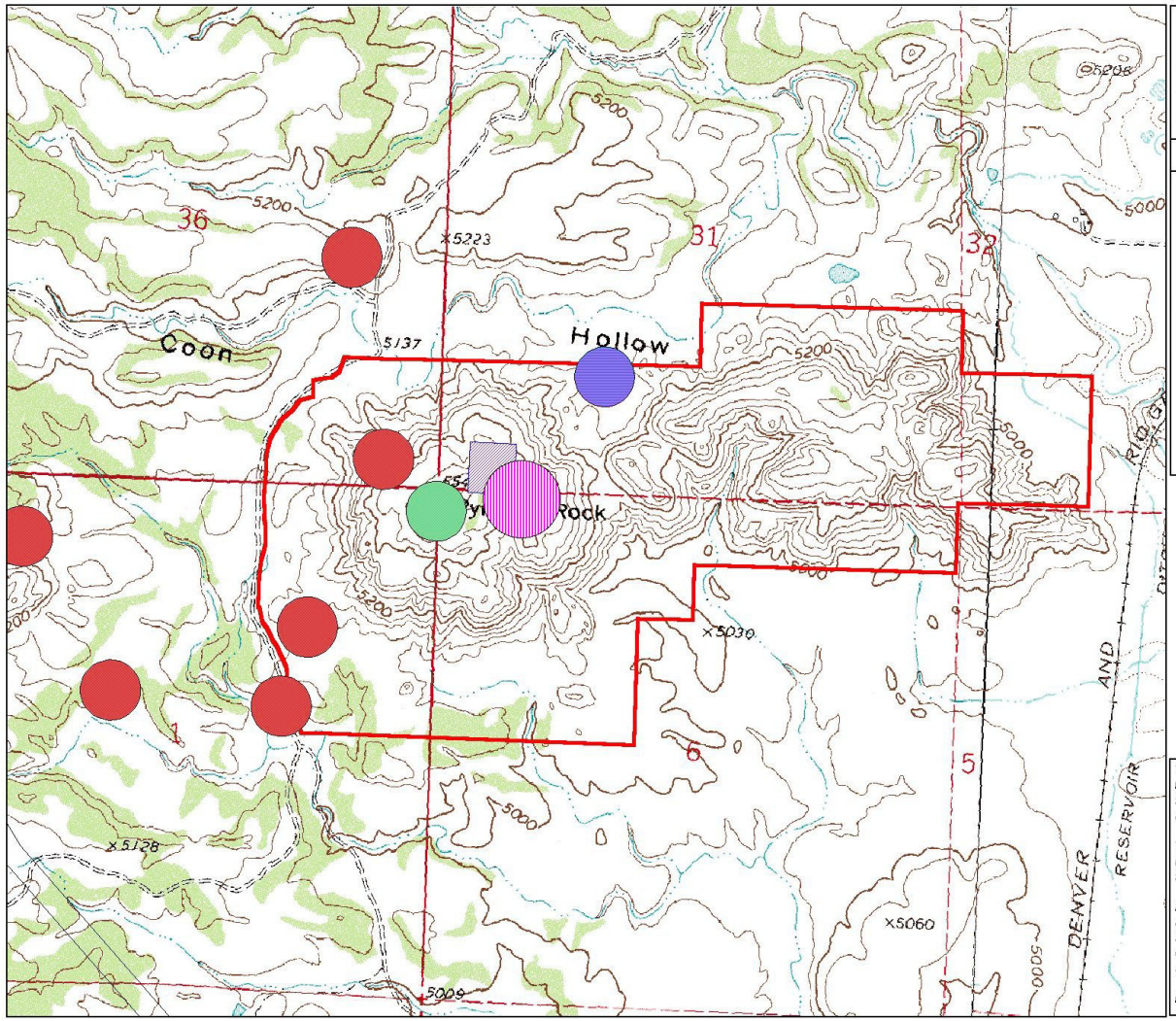
Problematic weed species documented within the Pyramid Rock RNA.

Scientific Name	Common Name	State Status
Anisantha tectorum	Cheat grass	A
Lepidium perfoliatum	Clasping pepperweed	none
Ranunculus orthoceras	Bur buttercup	none
Melilotus officinale	Yellow sweet clover	A



Rocky Mountain thistle (*Cirsium perplexans*) at the Pyramid Rock ACEC.

The Debeque milkvetch (*Astragalus debequaeus*), a rare plant species protected within the Pyramid Rock ACEC.



Colorado Natural Heritage Program
Colorado State University - CNR
254 General Services Building
Fort Collins, CO 80523

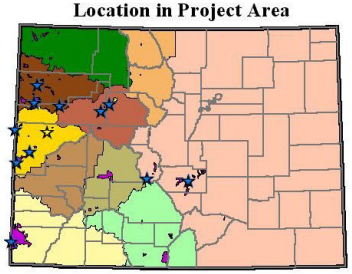
map created 27 April 2001

LEGEND

- ASTRAGALUS DEBEQUAEUS
- CIRSIUM PERPLEXANS
- PHACELIA SUBMUTICA
- SCLEROCACTUS GLAUCUS
- JUNIPERUS OSTEOSPERMA/ LEYMUS SALINUS
- ACEC Boundary

Base Layer:
Wagon Track Ridge, 39108-C3
De Beque, 39108-C2
7.5 Minute Series
Digital Raster Graphics produced by the U.S. Geological Survey, 1996

Location in Project Area



The accuracy of the data shown on this map is not guaranteed. The Colorado Natural Heritage Program is not responsible and shall not be liable to the user for incidental, consequential or special damages arising from data use or interpretation.

The absence of data for a particular area or habitat does not necessarily mean that the species does not occur on or adjacent to the project site, rather that our files do not currently contain information to document their presence.

Although every attempt is made to provide the most current and precise information possible, please be aware that some of our sources provide a higher level of accuracy than others, and some interpretation may be required. CNHP's data system is constantly updated and revised. Please contact CNHP for an update or assistance with interpretation of this natural heritage information.

Data are not appropriate for site level planning or evaluation.

Pyramid Rock ACEC

0.1 0 0.1 0.2 0.3 0.4 0.5 Miles

Rough Canyon ACEC

Grand Junction Field Office BLM

Rough Canyon is designated both an ACEC and a Research Natural Area, as well as a State Natural Area. The 1108 ha. ACEC partially overlaps the 1617 ha. CNHP Rough Canyon Potential Conservation Area (B3), which includes additional subpopulations of the globally vulnerable Grand Junction milkvetch (*Astragalus linifolius*). The ACEC includes a slickrock canyon of Triassic sandstones, and uplands in the Morrison Formation. Some precambrian rock is exposed in the bottom of the upper canyon. Vegetation is primarily a sparse pinyon-juniper (*Pinus edulis-Juniperus osteosperma*) woodland with black sagebrush (*Artemisia nova*), blackbrush (*Coleogyne ramosissima*), and much exposed rock and bare soil. Other common plants in the site are Mormon tea (*Ephedra viridis*), mountain mahogany (*Cercocarpus montanus*), rabbitbrush (*Chrysothamnus nauseosus*), single leaf ash (*Fraxinus anomala*), big sagebrush (*Artemisia tridentata*), golden aster (*Heterotheca villosa*), yucca (*Yucca harrimaniae*), shadscale (*Atriplex confertifolia*), rock goldenrod (*Petradoria pumila*), snakeweed (*Gutierrezia sarothrae*), cliff fendlerbush (*Fendlera rupicola*), and Eastwood's desert parsley (*Lomatium eastwoodiae*).

The mapped occurrence of Grand Junction milkvetch (*Astragalus linifolius*) was visited on June 11, 2000 by CNHP to determine whether weeds were threatening the population. An additional sub-population was also located in the next drainage to the east from the mapped location. Over 500 plants were counted, and an estimated 1000 total for the two drainages. A few plants had experienced some herbivory. Plants were most abundant on west facing slopes on the sides of the main drainages and their tributaries, east of the Cross Canyon trail, south of Rough Canyon. They occurred on light gray soils derived from the Morrison Formation.

The slickrock pinyon-juniper community is in good condition. However, there is a potential for off road vehicle use to damage cryptobiotic crusts and introduce weeds to the pockets of soil that support the vegetation. The area along the ORV trail should be monitored for any establishment of weeds.

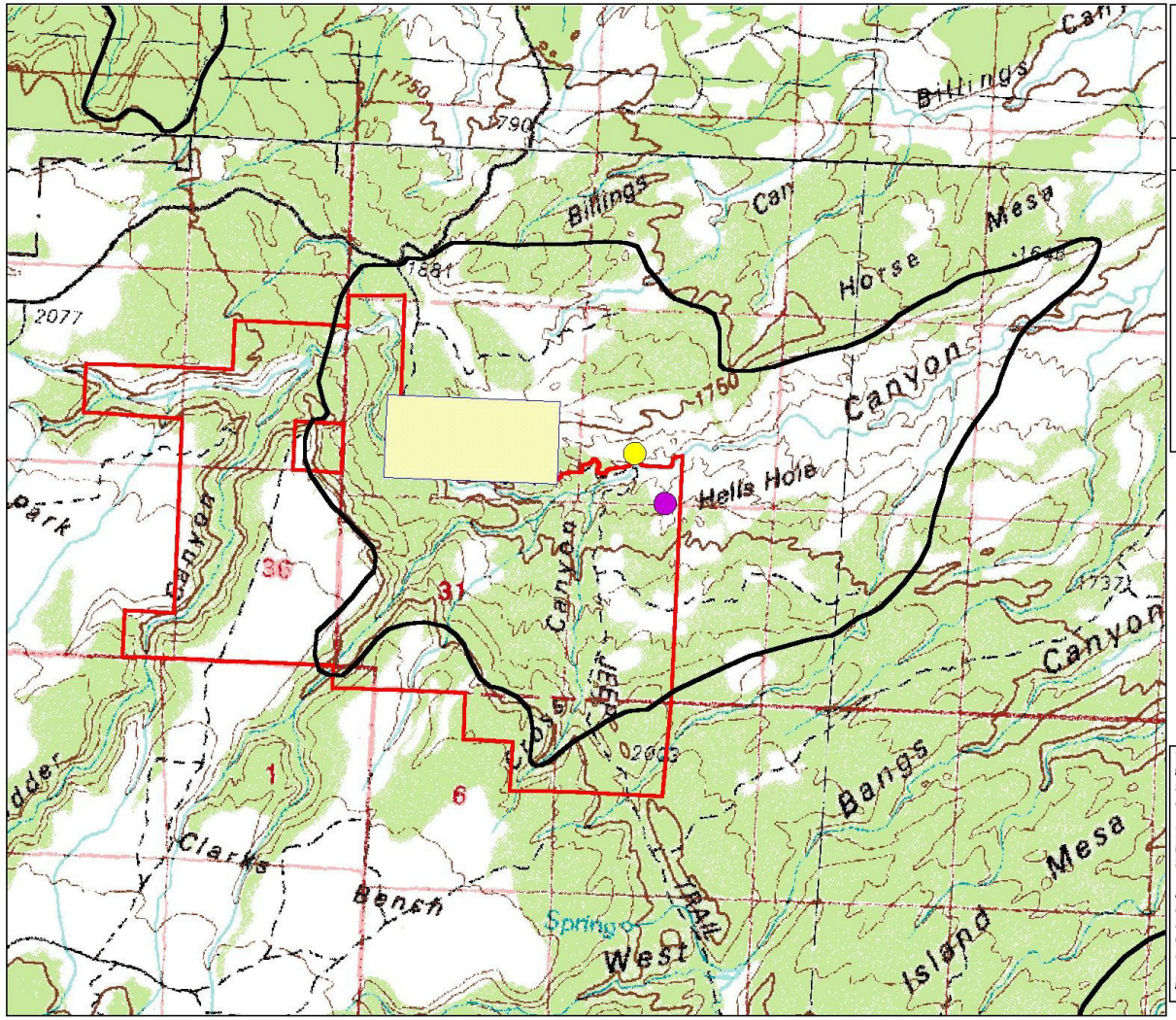
Weeds noted were mainly confined to the bottoms of the main drainages. They included sweet clover (*Melilotus officinale* and *M. albus*), cheat grass (*Anisantha tectorum*), and crested wheatgrass (*Agropyron cristatum*). There were only very small amounts of cheat grass in the milkvetch habitat. At this time, the rare plants do not appear to be threatened by weeds.

Natural Heritage Plant and Community Element Occurrences in the Rough Canyon ACEC and RNA.

Scientific Name	Common Name	Global Rank	State Rank	Fed/state Status	Fed Sens	EO*rank
RARE PLANTS						
Astragalus linifolius	Grand Junction milkvetch	G3Q	S3		BLM	AB
Oreocarya longiflora	Long flower cat's eye	G3	S2			E
PLANT COMMUNITIES						
Pinus edulis/Coleogyne ramosissima	Western Slope pinyon woodland	G3	SU			E

Problematic weed species documented within the Rough Canyon ACEC and RNA.

Scientific Name	Common Name	State Status
Anisantha tectorum	Cheat grass	A
Agropyron cristatum	Crested wheatgrass	none
Melilotus officinale	Yellow sweetclover	A
Melilotus albus	White sweetclover	A



Colorado Natural Heritage Program
Colorado State University - CNR
254 General Services Building
Fort Collins, CO 80523

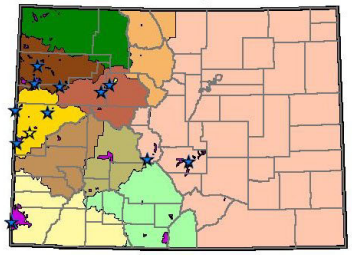
map created 27 April 2001

LEGEND

- ASTRAGALUS LINIFOLIUS
- OREOCARYA LONGIFLORA
- PINUS EDULIS/ COLEOGYNE RAMOSISSIMA (least squares)
- PCA Boundary
- ACEC Boundary

Base Layer:
Delta, 38108-E1
Grand Junction, 39108-A1
30 x 60 Minute Series
Digital Raster Graphics produced by the U.S. Geological Survey, 1996

Location in Project Area



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Data are not appropriate for site level planning or evaluation.

0.5 0 0.5 Miles

Rough Canyon ACEC and Potential Conservation Area

Deep Creek ACEC

Glenwood Springs Field Office BLM

Deep Creek begins at Deep Lake on the White River Plateau, and joins the Colorado River near Dotsero, Colorado. The headwaters of Deep Creek are subalpine forests of aspen, spruce and fir, interspersed with meadows and many small lakes. The BLM's Area of Critical Environmental Concern comprises the lower reaches of the creek, beginning at the National Forest/BLM boundary, at approximately 7440 ft., and continuing to the BLM/private land boundary at about 6200 ft., 1.6 miles from the confluence. The 2,425 acre ACEC is contained within the larger (37,279 acre) Deep Creek PCA (B2) identified by CNHP, which includes the USFS Research Natural Area and adjacent lands. Deep Creek stands out from neighboring canyons in its ruggedness, remoteness, and pristine condition. There is very little human disturbance within the canyon.

The landscape within the ACEC is characterized by cottonwood (*Populus angustifolia*) forests in the canyon bottom and pinyon-juniper (*Pinus edulis* and *Juniperus osteosperma*) woodlands with Gambel oak (*Quercus gambelii*), and mountain sagebrush (*Artemisia tridentata* ssp. *vaseyana*) on the slopes.

Significant elements of concern in the ACEC are the cottonwood riparian forest in the canyon bottom, and Harrington's penstemon (*Penstemon harringtonii*) in upland sites above the creek. The riparian community is dominated by narrowleaf cottonwood (*Populus angustifolia*), with blue spruce (*Picea pungens*) and red osier *dogwood (Cornus sericea*). It was classified as *Populus angustifolia/Cornus sericea* (*Betula occidentalis* phase) during CNHP's riparian survey in 1994. This community is ranked G4S3 by CNHP, and the occurrence in Deep Creek was ranked B, or good. Common native species in the riparian forest include Rocky Mountain juniper (*Juniperus scopulorum*), serviceberry (*Amelanchier alnifolia*), Gambel oak (*Quercus gambelii*), skunkbrush (*Rhus trilobata*), Rocky Mountain maple (*Acer glabrum*), river birch (*Betula occidentalis*), virgin's bower (*Clematis ligusticifolia*), coyote willow (*Salix exigua*), Woods rose (*Rosa woodsii*) and starry false solomonseal (*Maianthemum stellatum*).

Harrington's penstemon has been observed in upland sites near the ACEC boundaries. The species is considered globally vulnerable (G3S3). Occurrences on the northeastern part of the ACEC near Onion Creek were ranked from fair to excellent.

Animal species of concern in the ACEC include the bald eagle (*Haliaeetus leucocephalus*), which has a known roosting site along the Colorado River just downstream of the Deep Creek confluence, and probably uses the Deep Creek riparian area for foraging. Two species of bats, the spotted bat (*Euderma maculata*) and Townsend's big eared bat (*Plecotus townsendii*) as well as Peregrine Falcons (*Falco peregrinus anatum*), are also expected to use the creek for foraging.

The Deep Creek ACEC was surveyed by CNHP on July 8 and 9, 2000, to determine the presence of weeds and their effect on significant elements of biodiversity. In general, the interior of the ACEC is remarkably free of exotic species. Even the several campsites along the creek were

found to be weed free. Weeds observed include yellow and white sweet clover (*Melilotus officinale* and *M. albus*), which occur primarily along Coffee Pot Road and in the parking area, but have also begun to spread along the trail near the road. A few scattered populations of sweet clover found within the ACEC were hand pulled by the surveyor, but the populations close to the road were too extensive for hand pulling at this time. In disturbed areas, especially the parking area, there is also common mullein (*Verbascum thapsus*), cheat grass (*Anisantha tectorum*), and Jim Hill mustard (*Sisymbrium altissimum*). Control of these roadside weeds is recommended to prevent their spreading into the ACEC interior.

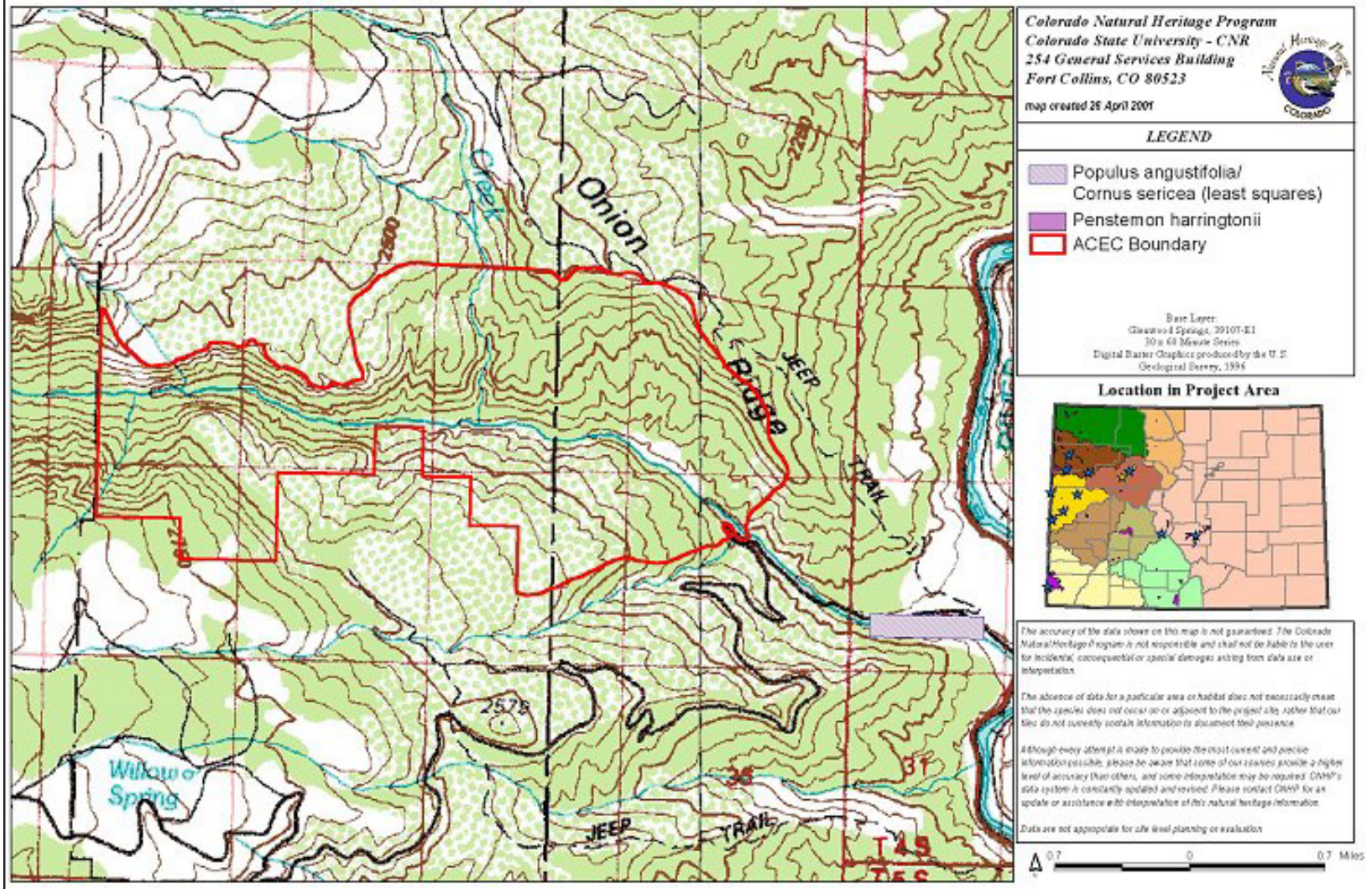
Tamarisk (*Tamarix ramosissima*) was noted along Deep Creek on private land downstream of the ACEC, and could pose a threat in the future.

Natural Heritage Plant and Community Element Occurrences in or near the Deep Creek ACEC.

Scientific Name	Common Name	Global Rank	State Rank	Fed/state Status	Fed Sens	EO*rank
RARE PLANTS						
Penstemon harringtonii	Harrington's beardtongue	G3	S3		FS/BLM	A
Penstemon harringtonii	Harrington's beardtongue	G3	S3		FS/BLM	B
Penstemon harringtonii	Harrington's beardtongue	G3	S3		FS/BLM	C
PLANT COMMUNITIES						
Populus angustifolia/Cornus sericea (Betula occidentalis phase*)*	Cottonwood riparian forests	G4	S3			B

Problematic weed species documented within the Deep Creek ACEC.

Scientific Name	Common Name	State Status
Anisantha tectorum	Cheat grass	A
Sisymbrium altissimum	Jim Hill mustard	A
Melilotus officinale	Yellow sweetclover	A
Melilotus albus	White sweetclover	A
Verbascum thapsus	Common mullein	A



Deep Creek ACEC

Bull Gulch ACEC

Grand Junction Field Office BLM

The Bull Gulch ACEC is located east of the Colorado River between Dotsero and Derby Junction in Eagle County. It comprises nearly 10,000 acres of mostly upland habitat, and about 2.6 miles of the riparian zone of the Colorado River. The Colorado River section of the ACEC is contained within the Colorado River, Radium to Red Dirt Creek PCA identified and ranked B2 by CNHP. Part of the eastern upland portion of the ACEC is included in CNHP's Black Mountain PCA. Upland communities are dominated by pinyon-juniper (*Pinus edulis* and *Juniperus osteosperma*) woodlands and sagebrush (*Artemisia tridentata*), with considerable exposed soil and rock. Narrow tributary drainages often have Douglas fir.

Riparian plant communities documented in the ACEC include narrowleaf cottonwood/Rocky Mountain juniper (*Populus angustifolia/Juniperus scopulorum*) montane riparian forest (G2G3 S2), Rocky Mountain juniper (*Juniperus scopulorum*) riparian woodland (G4S2), and coyote willow (*Salix exigua*)/bare ground (G5S5). The most common riparian tree species were Rocky Mountain juniper and river birch (*Betula occidentalis*). Ponderosa pines (*Pinus ponderosa*) occur occasionally along the river. The most common shrubs were coyote willow, red osier dogwood (*Cornus sericea*) and skunkbrush (*Rhus trilobata*). The globally vulnerable (G3) plant species, Harrington's beardtongue (*Penstemon harringtonii*) is known from the upland part of the ACEC.

The Bull Gulch ACEC was surveyed on July 28 and 29, 2000, by CNHP, to determine the presence and impact of weeds on elements of concern. Due to the large size of the ACEC and difficult access, this survey was limited primarily to the area along the river. Where the highway runs on the west side of the river, the east side was accessed via two railroad bridges and canoe.

Weeds found in the ACEC were concentrated along roads and the railroad. They included Canada thistle (*Cirsium arvense*), common mullein (*Verbascum thapsus*), yellow and white sweet clover (*Melilotus officinale* and *M. albus*), bull thistle (*Cirsium vulgare*), dandelion (*Taraxacum officinale*), prickly lettuce (*Lactuca serriola*), orchard grass (*Dactylis glomerata*), Kentucky bluegrass (*Poa pratensis*), and greenmolly (*Kochia americana*). There was some Russian olive (*Eleagnus angustifolia*) along the river. However, the native silver buffaloberry (*Shepherdia argentea*), which could be mistaken for Russian olive, was also present.

At a BLM foot trail leading into the Wilderness Study Area included in the ACEC (T3S, R85W, section 19) we noted a narrow but luxuriant riparian flora with both narrowleaf cottonwood and the narrowleaf-plains cottonwood hybrid (*Populus acuminata*). Associated species included gray aster (*Aster glaucodes*), Wyoming Indian paintbrush (*Castilleja linariifolia*), Woods rose (*Rosa woodsii*), red top (*Agrostis stolonifera*), big sagebrush (*Artemisia tridentata* ssp. *tridentata*), greasewood (*Sarcobatus vermiculatus*), rabbitbrush (*Chrysothamnus nauseosus*), Canada goldenrod (*Solidago canadensis*), American speedwell (*Veronica americana*), coyote willow, and skunkbrush. Weeds in this area included yellow and white sweet clover, bull thistle and dandelion.

Farther upstream, opposite a BLM camping area, cottonwoods and willows showed good regeneration. Associated riparian species included silver buffaloberry, giant reed (*Phragmites australis*), Rocky Mountain juniper, red osier dogwood, and occasional ponderosa pine. This area had considerable stands of sweet clover. Adjacent uplands were dominated by pinyon, juniper, sagebrush and Gambel oak. Associated species were rabbitbrush, gray aster, elk sedge (*Carex geyeri*), many-lobed groundsel (*Senecio multilobatus*), prickly pear cactus (*Opuntia polyacantha*), and basin wild rye (*Leymus cinereus*). There was a small amount of the non-native common mullein along the railroad track.

In the vicinity of the railroad bridge below the campground, non-native prickly lettuce and common mullein were growing in disturbed areas. A small tributary drainage was explored, and found to have a good condition community of Douglas fir, Rocky Mountain juniper, skunkbrush, and rabbitbrush. Adjacent slopes had bluebunch wheatgrass (*Pseudoroegneria spicata*) and basin wildrye was abundant along a ridgetop. Moist areas in ditches along the railroad harbored the most weedy species, including Canada thistle and bull thistle. However, these weeds showed no inclination to move into the drier areas upslope.

In summary, weeds in this ACEC tend to occur along the railroad and roads, and do not appear to pose a serious threat to rare plants or communities of concern at this time. Notably absent were two weed species that might be expected: tamarisk (*Tamarix ramosissima*) and cheat grass (*Anisantha tectorum*). Monitoring and control of Canada thistle and bull thistle in moist areas is recommended to prevent their spreading.

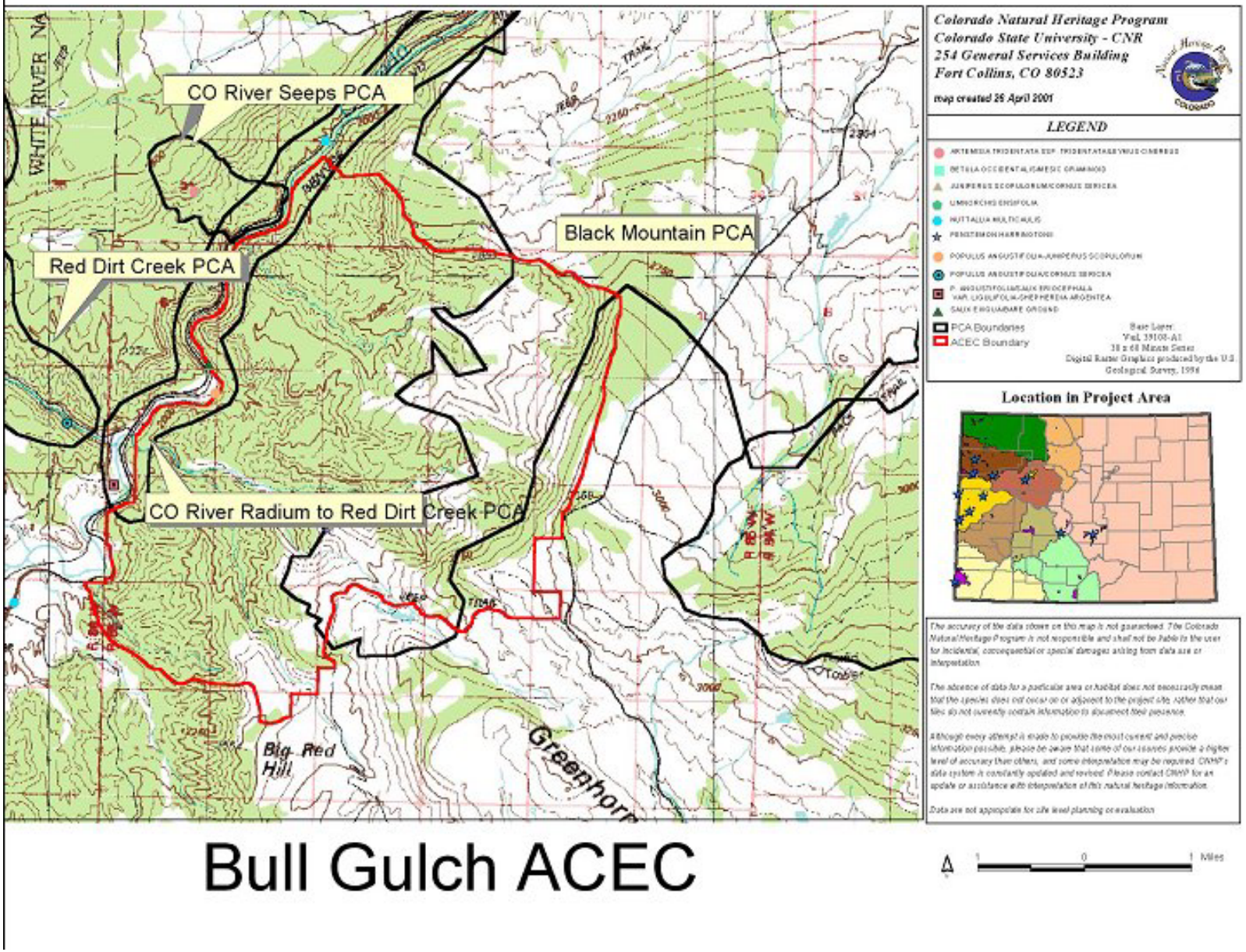
Natural Heritage Plant and Community Element Occurrences in the Bull Gulch ACEC.

Scientific Name	Common Name	Global Rank	State Rank	Fed/state Status	Fed Sens	EO*rank
RARE PLANTS						
Penstemon harringtonii	Harrington's beardtongue	G3	S3		FS/BLM	B
PLANT COMMUNITIES						
Populus angustifolia/Juniperus scopulorum	Montane riparian forest	G2G3	S2			C
Juniperus scopulorum/ Cornus sericea	Riparian woodland	G4	S2			C
*Salix exigua/*bare ground	Coyote willow/bare ground	G5	S5			B

Problematic weed species documented within the Bull Gulch ACEC.

Scientific Name	Common Name	State Status
Cirsium arvense	Canada thistle	B
Cirsium vulgare	Bull thistle	A
Melilotus officinale	Yellow sweetclover	A
Melilotus albus	White sweetclover	A
Taraxacum officinale	Dandelion	none
Eleagnus angustifolia	Russian olive	A
Verbascum thapsus	Common mullein	A
Lactuca serriola	Prickly lettuce	none
Dactylis glomerata	Orchard grass	none
Poa pratensis	Kentucky bluegrass	none
Kochia americana	Greenmolly	none

Harrington's beardtongue (*Penstemon harringtonii*), a rare plant found within the Bull Gulch ACEC.



Bull Gulch ACEC

Deer Gulch ACEC

White River Field Office BLM

The Deer Gulch ACEC is located north and east of Piceance Creek in Rio Blanco County. It includes steep shale slopes above Piceance Creek, and several tributary drainages, including Deer Gulch and Davis Gulch. The area is characterized by shale barrens of the Green River Formation (Parachute member) on the lower slopes, and pinyon (*Pinus edulis*), Rocky Mountain juniper (*Juniperus scopulorum*) and Douglas fir (*Pseudotsuga menziesii*) on upper slopes of the Uinta Formation. The mesa top has sagebrush parks and mountain shrublands with Gambel oak (*Quercus gambelii*) and mountain mahogany (*Cercocarpus montanus*). Other common species on the upper slopes were squaw apple (*Peraphyllum ramosissimum*), rock spirea (*Holodiscus dumosus*), snowberry (*Symphoricarpos oreophilus*), elk sedge (*Carex geyeri*), and Oregon grape (*Mahonia repens*). Plant communities that are tracked by CNHP in the ACEC include Western Slope Douglas fir forests, Mixed mountain shrublands and Western Slope grasslands.

Two rare plants, Barneby's thistle (*Cirsium barnebyi*) and Utah fescue (*Argillochloa dasyclada*) are locally abundant on the Green River shale slopes. There is also one record of the White River penstemon (*Penstemon scariosus* var. *albifluvis*) based on an herbarium specimen from the general area, but it is unknown whether this was collected within the ACEC or nearby. Other common species on the lower shale slopes are fringed sage (*Artemisia frigida*), bluebunch wheatgrass (*Pseudoroegneria spicata*), Indian rice grass (*Oryzopsis hymenoides*), and rayless aster (*Machaeranthera grindelioides*).

The ACEC was surveyed by CNHP on September 22, 2000 to determine the presence and impacts of weeds. The surveyed area included drainages above Piceance Creek in the southern part of the ACEC, and the mesa top between Piceance Creek and Bull Gulch. Access through private lands to reach the northern part of the ACEC was denied.

Weeds found in the ACEC were concentrated in the moist drainages on the south and west facing slopes above Piceance Creek. Several large bundles of weeds were hand-pulled during the survey, but many more remain. Areas outside the ACEC next to the creek are heavily infested with Canada thistle (*Cirsium arvense*), and the weeds have made their way up the drainages, where they decrease with elevation and distance from the source. A particularly heavy infestation of Canada thistle was found under sagebrush just above the highway, inside the ACEC. Bull thistle (*Cirsium vulgare*), burdock (*Arctium minus*), common mullein (*Verbascum thapsus*), and Russian thistle (*Salsola australis*) were also found in the drainages. Dry hillsides that harbor the Utah fescue and Barneby's thistle do not appear to be impacted by weeds. However, Barneby's thistle also occurs in the drainages, where it was found growing next to Canada thistle. Although no longer considered a sensitive species by CNHP or BLM, oil shale columbine (*Aquilegia barnebyi*) is an attractive plant that grows on the sides of the drainages, and may be threatened by weeds.

Natural Heritage Plant and Community Element Occurrences in the Deer Gulch ACEC.

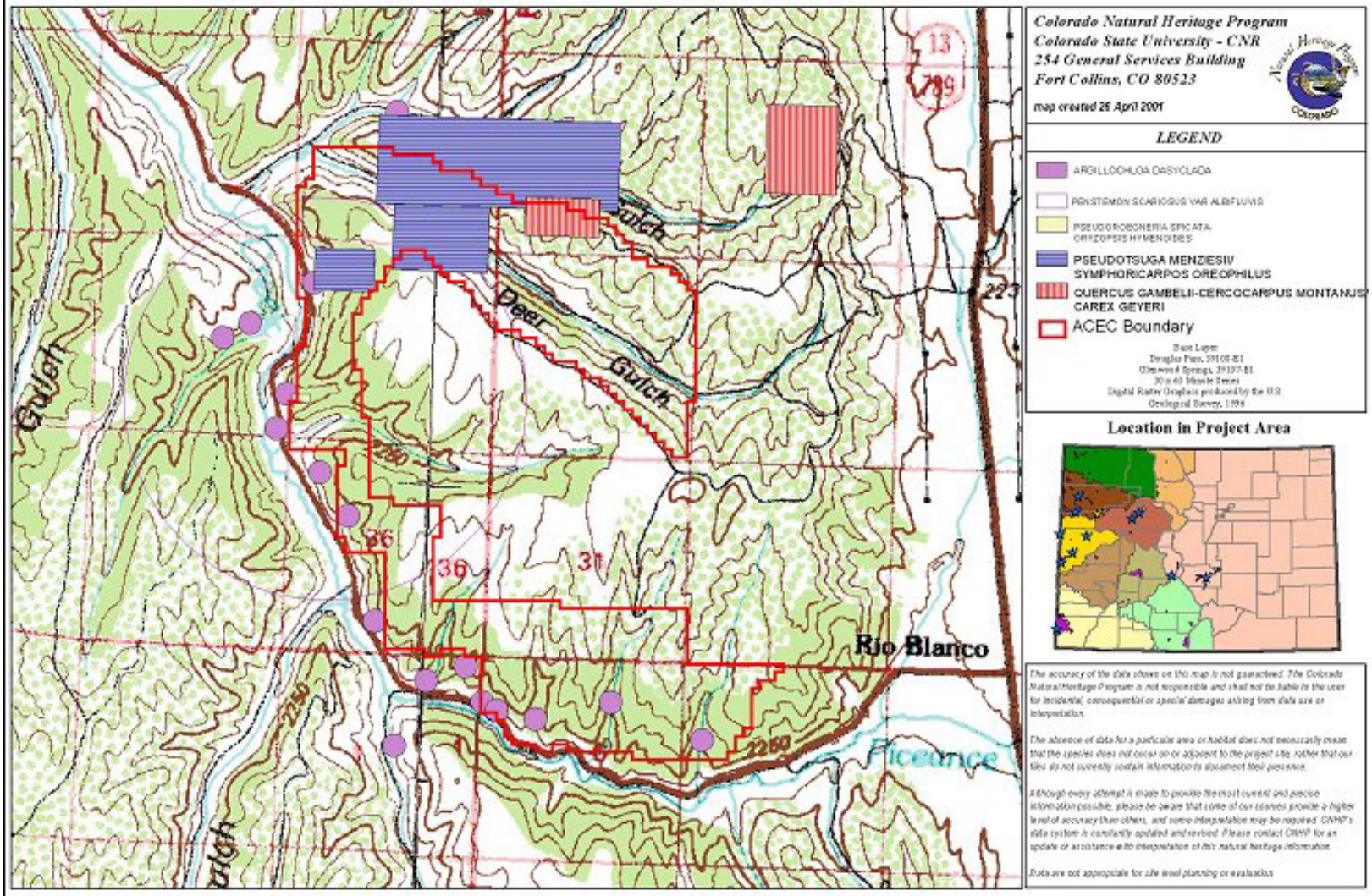
Scientific Name	Common Name	Global Rank	State Rank	Fed/state Status	Fed Sens	EO*rank
RARE PLANTS						
Cirsium barnebyi	Barneby's thistle	G2	S1			B
Argillochloa dasyclada	Utah fescue	G3	S3			E
Penstemon scariosus var. *albifluvis*	White River penstemon	G4T1	S1		C	E
PLANT COMMUNITIES						
Pseudotsuga menziesii/ Symphoricarpos oreophilus	Western Slope Douglas fir forest	G5	S4			B
Pseudotsuga menziesii/ Symphoricarpos oreophilus	Western Slope Douglas fir forest	G5	S4			AB
Quercus gambellii-Cercocarpus montanus/ Carex geyeri	Mixed mountain shrublands	G3	S3			A
Pseudoroegneria spicata	Western Slope grasslands	G3	SU			C

*EO=Element occurrence

Problematic weed species documented within the Deer Gulch ACEC.

Scientific Name	Common Name	State Status
Cirsium arvense	Canada thistle	B
Cirsium vulgare	Bull thistle	A
Salsola australis	Russian thistle	A
Verbascum thapsus	Common mullein	A
Arctium minus	Burdock	A

Canada thistle (*Cirsium arvense*) and mullein (*Verbascum thapsus*) at Deer Gulch ACEC.



Deer Gulch ACEC

Yanks-Upper Greasewood ACEC

White River Field Office BLM

The Yanks Gulch-Upper Greasewood ACEC is comprised of three separate parts, labeled A, B, and C on the attached map. The westernmost section (B) comprising the Yanks Gulch ACEC, is located on the west side of Calamity Ridge. The northern section (A) is one of two parts of the Upper Greasewood ACEC, and is located on Little Spring Creek, between the North Fork of Greasewood Gulch and Hay Canyon. The third, southeastern area (C) is the second part of the Upper Greasewood ACEC, and is located between the Middle Fork and East Fork of Greasewood Creek. All three sections were visited by CNHP in 2000, to determine whether exotic species were impacting rare plants.

The area was designated an ACEC to protect three plant species: Piceance twinpod (*Physaria obcordata*), oil shale columbine (*Aquilegia barnebyi*) and dragon milkvetch (*Astragalus lutosus*). *Physaria obcordata* is considered imperiled (G2S2) by CNHP, and federally listed as threatened under the Endangered Species Act. It is a Green River shale endemic, known only from Rio Blanco County, that inhabits scree slopes with sparse vegetation. *Astragalus lutosus* occupies similar habitats, but is much more common and widespread, and is no longer tracked by CNHP. *Aquilegia barnebyi* is found in hanging garden and seep communities, and is also considered to be common enough that it is no longer tracked by CNHP. In addition to the rare plants, the ACEC protects examples of remnant plant communities believed to be representative of pre-settlement vegetation in the Piceance Basin. These include northern mesic pinyon-juniper woodland (*Pinus edulis/ Amelanchier utahensis-Arctostaphylos patula-Cercocarpus montanus/ Carex pityophila*); pinyon-juniper woodland (*Juniperus osteosperma-Pinus edulis/ Amelanchier utahensis-Cercocarpus montanus*); Great Basin sagebrush (*Artemisia tridentata* ssp. *wyomingensis*/ *Symphoricarpos oreophilus/Leymus cinereus*) and Great Basin grassland (*Leymus cinereus*).

The dominant vegetation of the upland area is pinyon-juniper (*Pinus edulis-Juniperus osteosperma*) woodlands with sagebrush (*Artemisia tridentata* ssp. *vaseyana*), and mountain shrublands with mountain mahogany (*Cercocarpus montanus*), serviceberry (*Amelanchier utahensis*) and Gambel oak (*Quercus gambelii*). Other common species are bitterbrush (*Purshia tridentata*), arrowleaf balsamroot (*Balsamorhiza sagittata*), many-lobed groundsel (*Senecio multilobatus*), bluebunch wheatgrass (*Pseudoroegneria spicata*), sulphur buckwheat (*Eriogonum umbellatum*), muttongrass (*Poa fendleriana*), needle and thread (*Stipa comata*), Indian rice grass *(Achnatherum hymenoides),* elk sedge *(Carex geyeri)*, desert phlox *(Phlox austromontana*), rabbitbrush (*Chrysothamnus nauseosus* and *Chrysothamnus viscidiflorus*), Oregon grape (*Mahonia repens*), and mat penstemon (*Penstemon cespitosus*). The Upper Greasewood ACEC (sections A and C) has a unique variation on the pinyon-juniper woodland along the ridge tops, with significant barren shale and manzanita (*Arctostaphylos patula*) in the community. One state rare plant, Utah mountain lilac (*Ceanothus martinii,* G4/S1) that is a part of this community, was documented for the first time in 2000. A rare plant species, the Piceance twinpod (*Physaria obcordata*), has been found within the Yanks Gulch ACEC (B), but was not relocated during this survey. However, the area around Greasewood where the bladderpod was mapped previously

was not heavily impacted by weeds. Valley bottoms include the two communities with big sagebrush (*Artemisia tridentata* ssp. *tridentata*) and Basin wildrye (*Leymus cinereus*).

We observed (and hand-pulled) spotted knapweed (*Acosta maculosa*) along the Calamity Ridge Road near the intersection of County Roads 24X and 103. However, none was found within the ACECs. There was a minor amount of cheat grass (*Anisantha tectorum*) in the pinyon-juniper community in the Yanks Gulch (B) section. Kentucky bluegrass (*Poa pratensis*) is occasional, but does not appear to pose a threat to either the rare plants or plant communities. The Upper Greasewood ACEC is home to wild horses, which could act as a vector for weeds into the area, although impacts were not noted in 2000. In general, the ACEC is in excellent condition and remarkably free of weeds.

Natural Heritage Plant and Community Element Occurrences in the Yanks- Upper Greasewood ACEC.

Scientific Name	Common Name	Global Rank	State Rank	Fed/state Status	Fed Sens	EO*rank
RARE PLANTS						
Physaria obcordata	Piceance twinpod	G2	S2	LT		B
Ceanothus martinii	Utah mountain lilac	G4	S1			B
PLANT COMMUNITIES						
Artemisia tridentata ssp. *tridentata/ Leymus cinereus (*phase *Symphoricarpos oreophilus)*	Sagebrush bottomland shrublands	G2G3	S1			B
Pinus edulis/Cercocarpus montanus	Western Slope pinyon-juniper woodlands	G5	S4			A
Pinus edulis/Cercocarpus montanus)	Western Slope pinyon-juniper woodlands	G5	S4			AB

EO=Element occurrence

Problematic weed species documented within the Yanks-Upper Greasewood ACEC.

Scientific Name	Common Name	State Status
Anisantha tectorum	Cheat grass	A
Poa pratensis	Kentucky bluegrass	none

Yanks Gulch ACEC.

Cathedral Bluffs ACEC.

Hounds tongue (*Cynoglossum officinale*) in an aspen grove at Cathedral Bluffs ACEC.

South Cathedral Bluffs ACEC

White River Field Office BLM

The South Cathedral Bluffs ACEC was surveyed on September 11, 2000 to investigate the interactions of weeds with rare plant occurrences within the ACEC. This ACEC comprises a spectacular ridge and slopes of Green River shale. The ACEC was designated to protect occurrences of four rare plants and one high quality grassland community. The site is the type locality for two of these plants, the sun loving meadowrue (*Thalictrum heliophilum*) and the Piceance bladderpod (*Lesquerella parviflora*). Both species are endemic to the Green River shale. *Thalictrum heliophilum* is considered a globally vulnerable species (G3/S3) by CNHP. It is found on barren shale southwest facing slopes, particularly around seeps. *Lesquerella parviflora* is considered globally imperiled (G2G3/S2S3), and occupies similar sites. *Gentianella tortuosa* (G3/S1) was found on the more level ground along the top of the ridge, sometimes in disturbed areas, with moderate vegetation (more than on the barren shale slopes, but less than in the grassland areas). Dragon milkvetch (*Astragalus lutosus*) is no longer tracked by CNHP, as it has been found to be more widespread and common than previously thought. The ridgetop has good occurrences of bluebunch wheatgrass (*Pseudoroegneria spicata*), especially at the north end of the ACEC. These are interspersed with groves of aspen and patches of mountain shrubs.

Three new occurrences were added to the CNHP database in 2000: another excellent (A ranked) occurrence of Great Basin grassland (*Pseudoroegneria spicata*) at the northern end of the ridge; a small population of many stem stickleaf (*Nuttallia multicaulis*), a species considered globally vulnerable (G3/S3), found along small drainages on the shale slopes; and another location of *Thalictrum heliophilum* on the barren shale slopes.

Associated species observed on the shale slopes included aletes (*Aletes anisatus*), rayless aster (*Machaeranthera grindelioides*), milkvetch (*Astragalus spatulatus*), oceanspray (*Holodiscus dumosus*), Utah serviceberry (*Amelanchier utahensis*), buckwheat (*Eriogonum lonchophyllum*), dwarf penstemon (*Penstemon caespitosus*), bluebunch wheatgrass (*Pseudoroegneria spicata*), Osterhout's penstemon (*Penstemon osterhoutii*), blue flax (*Linum lewisii*), paintbrush (*Castilleja linariifolia*), mountain sagebrush (*Artemisia tridentata ssp. vaseyana*), rabbitbrush (*Chrysothamnus nauseosus*), snowberry (*Symphoricarpos oreophilus*) and wooly white (*Hymenopappus filifolius*). An unidentified native thistle (*Cirsium* sp.) was observed to be quite abundant, especially along the road. The plants are similar to *Cirsium barnebyi*, which is locally common farther north in the Piceance Basin, but is much less tomentose than plants seen there. It was collected, and its identification is being pursued.

Weeds were not present on the dry shale slopes. However, in seep areas with oil shale columbine (*Aquilegia barnebyi*), we found Canada thistle (*Cirsium arvense*), and houndstongue (*Cynoglossum officinale*). Although the sites would appear to be inaccessible to cattle, there was evidence that cattle had been present, apparently coming down drainages. There was also a *Chenopodium* present that is suspected of being exotic, although positive identification was not

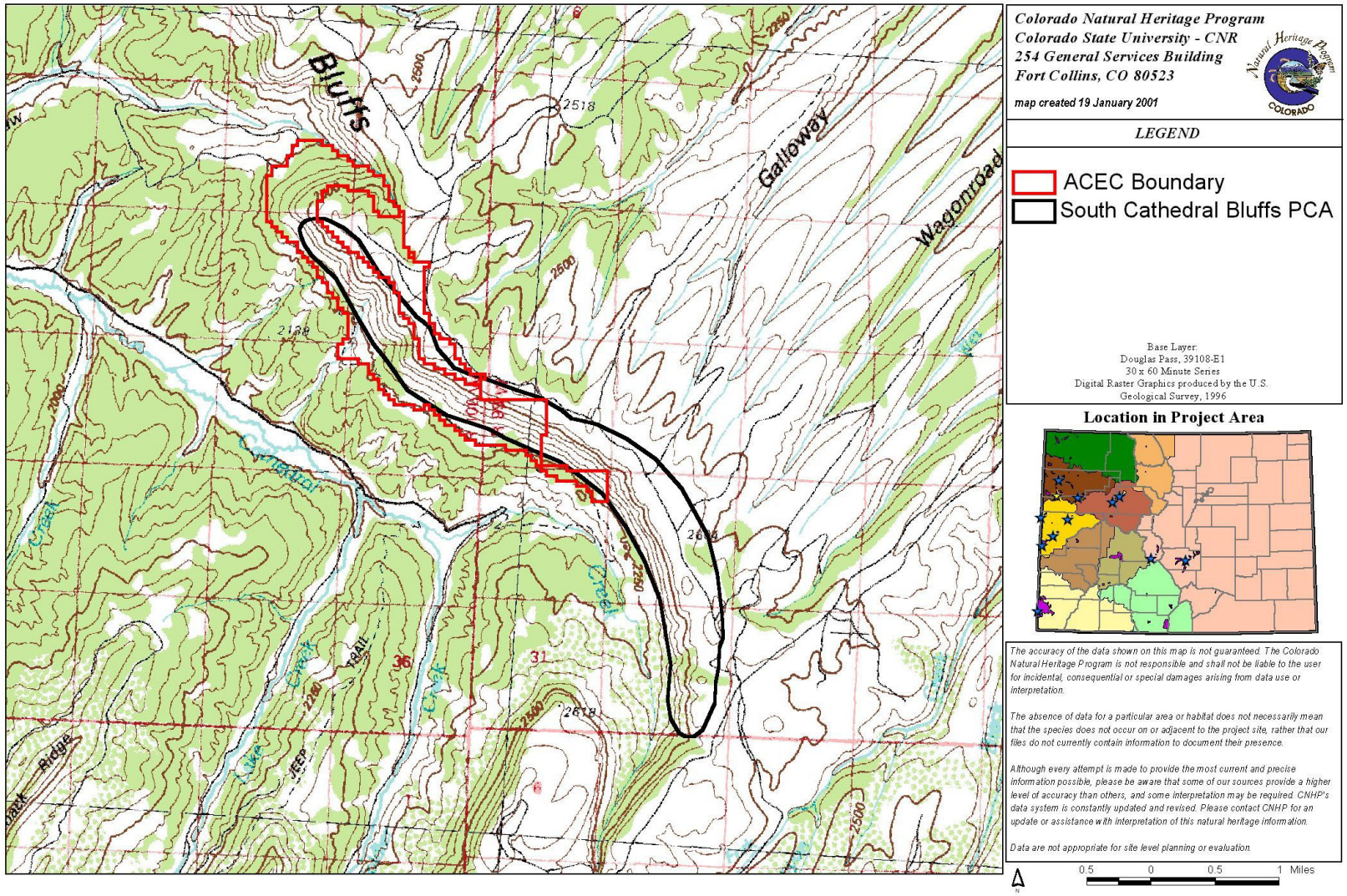
made. Houndstongue was also common in all aspen groves checked, and under shrubs in open areas. According to Rusty Roberts of the White River BLM Resource Area, houndstongue is being treated in the ACEC.

Natural Heritage Plant and Community Element Occurrences in the South Cathedral Bluffs ACEC.

Scientific Name	Common Name	Global Rank	State Rank	Fed/state Status	Fed Sens	EO*rank
RARE PLANTS						
Lesquerella parviflora	Piceance bladderpod	G2G3	S2S3		BLM	A
Lesquerella parviflora	Piceance bladderpod	G2G3	S2S3		BLM	A
Lesquerella parviflora	Piceance bladderpod	G2G3	S2S3		BLM	E
Thalictrum heliophilum	Sun-loving meadowrue	G3	S3		BLM	A
Gentianella tortuosa	Utah gentian	G3	S1		BLM	A
Gentianella tortuosa	Utah gentian	G3	S1		BLM	E
Nuttallia multicaulis	Many stem stickleaf	G3	S3			C
PLANT COMMUNITIES						
Pseudoroegneria spicata	Western slope grasslands	G2?	S2?			A
Pseudoroegneria spicata	Western slope grasslands	G2?	S2?			B

Problematic weed species documented within the South Cathedral Bluffs ACEC.

Scientific Name	Common Name	State Status
Cynoglossum officinale	Houndstongue	A
Poa pratensis	Kentucky bluegrass	none
Cirsium arvense	Canada thistle	B



South Cathedral Bluffs ACEC and PCA

Droney Gulch ACEC and Droney Gulch PCA

Royal Gorge Field Office BLM

Biodiversity Rank: B1 Outstanding Significance
This PCA contains an excellent (A ranked) occurrence of a critically globally imperiled (G1G2) plant species. It also includes one fair (C ranked) and two good (B ranked) occurrences of a globally imperiled (G2G3) community.

Protection Urgency Rank: P3 Moderate Urgency
ACEC designation has helped to ensure the long term viability of the Brandegee wild buckwheat occurrence within it. Adding a fence to the south side of the ACEC would provide additional protection for the ACEC from misuse by ORV traffic.

Management Urgency Rank: M2 High Urgency
Weeds do not currently directly threaten the Brandegee wild buckwheat on the barren slopes on which it resides. However, several highly invasive species are found in the area which represent tangible threats to the buckwheat. Unauthorized off road vehicle use also represents a significant threat to the fragile ecology of the ACEC.

Location: Chaffee County. West of Sand Park and north of Missouri Park on the west bank of the Arkansas River. Includes the brown hills of the Droney Gulch ACEC and Squaw Creek to the northwest.
Legal Description: USGS 7.5 Salida West and Maysville quadrangles. T50N R7E S 11-14; T50N R8E S 4, 5, 7-9, 16-18, 20-22. Droney Gulch ACEC is in T50N R8E S 20-22 only.

General Description: The Droney Gulch PCA circumscribes an area much larger than the Droney Gulch ACEC (see accompanying map). Although the ACEC includes some of the element occurrences in the area, the PCA boundary is drawn to include all of the occurrences of the Brandegee wild buckwheat, areas of appropriate habitat for the species, and three rare riparian communities. As such, the PCA extends northwest and southeast of the Droney Gulch ACEC. The rare plant and weed surveys that were conducted on August 24 and 25 focused primarily on the ACEC but surrounding areas were also visited to investigate threats from weeds encroaching on the ACEC and on occurrences of the Brandegee wild buckwheat located outside the ACEC.

The Droney Gulch PCA consists of sparsely vegetated light-brown hills of lacustrine alluvium of the Dry Union Formation (Tweto 1976). These Pliocene and Miocene deposits form soils ranging from silt-loams to sands. The stark, barren slopes of this area support one of the most outstanding occurrences of the globally critically imperiled (G1G2) Brandegee buckwheat (*Eriogonum brandegeei*). Droney Gulch represents one of the largest and least disturbed known occurrences in the world of this species. This site is one of the healthiest known occurrences with large, dense, rounded clumps scattered across the brown hills. At least 3000 individuals occur at this site. The plants range in age from small seedlings to large senescent clumps that are

deteriorating in their centers. The site has not been affected by livestock grazing, as the slopes are steep and the forage is sparse.

At the base of the slopes supporting the Brandegee wild buckwheat are sparse stands of the pinyon pine/mountain mahogany/Indian ricegrass (*Pinus edulis/ Cercocarpus montanus/ Achnatherum hymenoides*) plant association. Associated species are Utah juniper (*Juniperus osteosperma*), James buckwheat (*Eriogonum jamesii*), narrow-leaved yucca (*Yucca angustissima*), gray horsebrush (*Tetradymia canescens*), and rubber rabbitbrush (*Chrysothamnus nauseosus*). Surrounding uplands are dominated by denser stands of pinyon pine and Utah juniper. Toe slopes below the site are dominated by blue grama (*Chondrosum gracile*), pinyon pine, winterfat (*Kraschenninikovia lanata*), and four-wing saltbush (*Atriplex canescens*).

Outside the Droney Gulch ACEC to the northwest, the PCA boundary also includes three occurrences of a globally imperiled (G2G3) montane riparian forest along Squaw Creek. The dominant components of this community are narrow leaf cottonwood (*Populus angustifolia*) and Rocky Mountain juniper (*Juniperus scopulorum*). The current study did not focus on this portion of the PCA.

Weed and rare plant surveys were conducted in the Droney Gulch ACEC and in the surrounding PCA on August 24 and 25, 2000. The occurrences of the Brandegee wild buckwheat were revisited to assess their status and observe impacts of weeds. Numerous weed species were observed within the ACEC during the survey but no weed species were observed in direct competition with the Brandegee wild buckwheat. At the time of the survey, weed species appeared limited to the toeslopes and grasslands below and above the slopes of the Dry Union Formation on which the Brandegee wild buckwheat grows. Highly invasive weed species were found that potentially threaten the buckwheat if they begin to invade its habitat, and these represent the greatest weed management priority for the ACEC. Species with the greatest potential to impact the buckwheat are leafy spurge (*Euphorbia esula*), Russian thistle (*Salsola iberica*), and cheat grass (*Anisantha tectorum*). Jim Hill mustard (*Sisymbrium altissimum*) and lambsquarters (*Chenopodium album*) also represent lesser but tangible threats to the buckwheat in the ACEC. Eradicating these weed species within the ACEC would greatly reduce the probability of weed invasion in the habitat for the buckwheat. The principle areas of concentrated weed infestations are shown on the accompanying map to assist with management and eradication efforts.

Biodiversity Rank Justification: This PCA contains an excellent (A ranked) occurrence of a critically globally imperiled (G1G2) plant species, the Brandegee wild buckwheat. The Droney Gulch site is one of nine known occurrences for this species in the world. Its known global distribution does not extend beyond Fremont and Chaffee Counties in Colorado, and its occupied habitat is approximately 1.3 square miles. The PCA also includes one fair (C ranked) and two good (B ranked) occurrences of a globally imperiled community.

Natural Heritage Plant and Community Element Occurrences in the Droney Gulch ACEC and the Droney Gulch PCA.

Element	Common Name	Global Rank	State Rank	Federa Status	State Status	Federal Sens.	EO* Rank
Eriogonum brandegeei	Brandegee's Wild Buckwheat	G1G2	S1S2			FS/BLM	A
Populus angustifolia/ Juniperus scopulorum	Montane Riparian Woodland	G2G3	S2				B
Populus angustifolia/ Juniperus scopulorum	Montane Riparian Woodland	G2G3	S2				B
Populus angustifolia/ Juniperus scopulorum	Montane Riparian Woodland	G2G3	S2				C

*EO=Element Occurrence

Problematic weed species documented within the Droney Gulch ACEC and in the surrounding PCA.

Element	Common Name	State Status
Euphorbia esula	Leafy Spurge	B
Sisymbrium altissimum	Jim Hill Mustard	A
Salsola iberica	Russian Thistle	A
Chenopodium album	Lambsquarters	A
Melilotus officinale	Yellow Sweetclover	A
Anisantha tectorum	Cheat Grass	A

Boundary Justification: The boundary for the Droney Gulch PCA includes all of the known occurrences and potential habitat of the Brandegee wild buckwheat in the area. It also includes three occurrences of the montane riparian woodland (*Populus angustifolia/ Juniperus scopulorum*) to the northwest of the Droney Gulch ACEC.

Protection Comments: Adding area to the northwest and the southeast to the Droney Gulch ACEC would incorporate other occurrences of the Brandegee wild buckwheat, further potential habitat for the species, and three occurrences of rare riparian communities (see General Description).

The barren slopes in the Droney Gulch PCA are highly erodable and do not withstand recreational impacts well. Thus, potential impacts from off-road vehicle use and horseback riding on the Brandegee wild buckwheat are potentially severe. Fencing the ACEC along its southern boundary would add a significant amount of protection to the area from unauthorized off road vehicle traffic. Increased residential development and the potential for mineral exploration and extraction must also be considered for the protection of this outstanding occurrence of the Brandegee wild buckwheat.

Management Comments:

Five principal areas of weed infestation were identified in and around the ACEC, along the two access roads to the ACEC. These are delineated on the accompanying map. See below (Weed polygon descriptions) for detailed information on these areas.

Weeds are encouraged in areas along roads that have been disturbed for road maintenance. Russian thistle becomes increasingly common on both roads in the ACEC closer to Highway 285. Leafy spurge and cheat grass occur in the ACEC but are currently sparse. Due to their highly invasive nature and ability to alter ecosystem processes, these species represent the highest weed management priorities for the ACEC. The central part of the ACEC is the primary area of weed concern (see accompanying map), including the southern access road to the ACEC.

Due to the erodable soils and barren nature of the area, this area is vulnerable to impacts from off-road vehicle use, hiking, horseback riding, and grazing. Grazing by domestic livestock is not a threat unless allotment stocking rates become so high as to force animals onto this less productive range. Keeping stocking rates at a level that will avoid overgrazing of the adjacent slopes where the Brandegee wild buckwheat is found will prevent the degradation of this occurrence. Placing salt and water tanks for livestock away from the Brandegee wild buckwheat will also help ensure its long term viability.

Weed Polygon Descriptions

Each number below correlates with a polygon on the accompanying map.

<u>Access Road to the Northern Portion of the ACEC:</u>

1. Weed species observed include Jim Hill mustard, Russian thistle, lambsquarters, cheat grass, and unknown species of peppergrass (*Lepidium*) and tansy mustard (*Descurainia*). This polygon begins at the boundary of BLM and State Land Board land at the north end of Droney Gulch, and continues up the drainage.

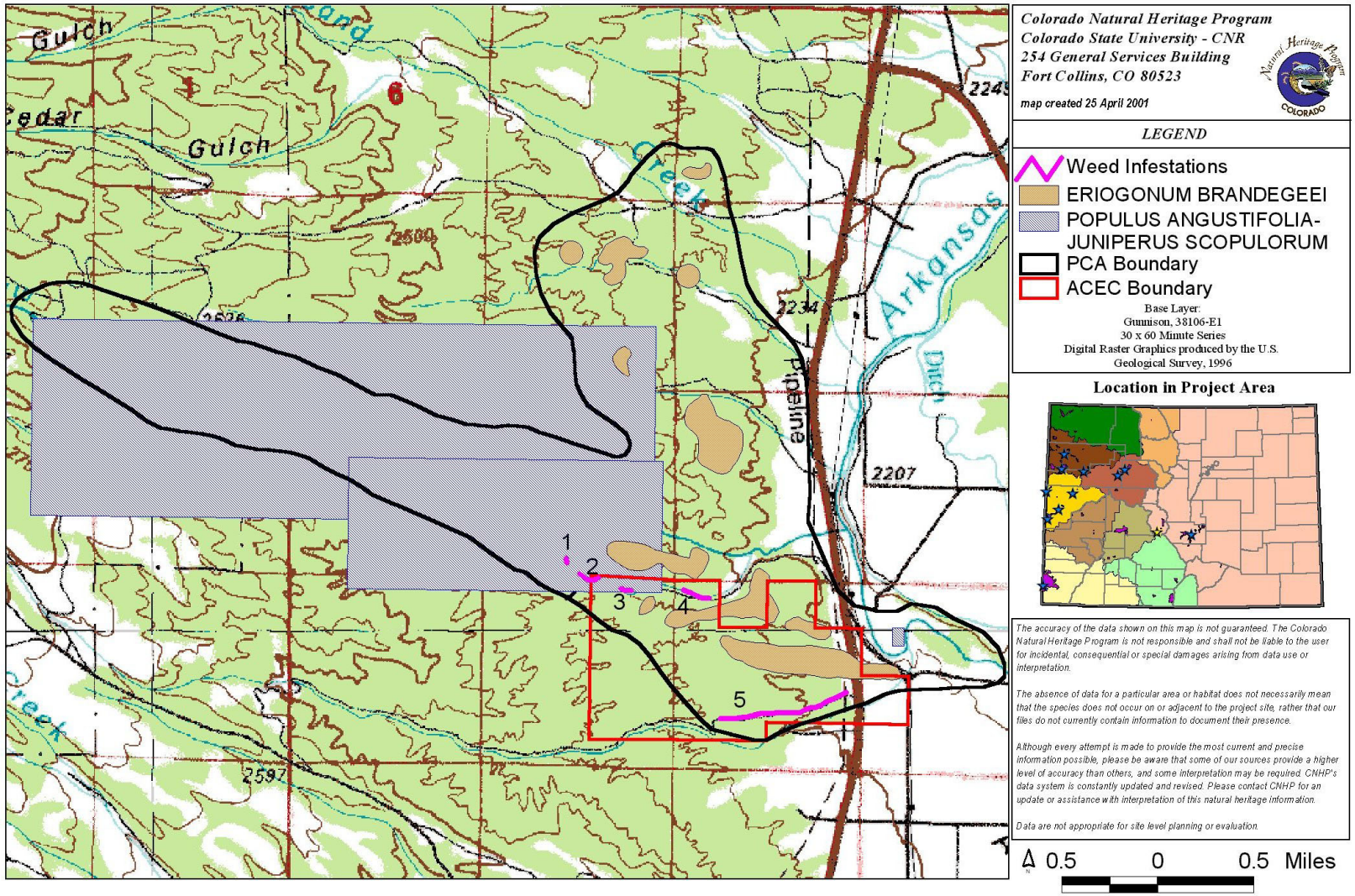
2. Weeds observed in this area were lambsquarters, Russian thistle, peppergrass (*Lepidium* sp.), and a clover (*Trifolium* sp.).

3. Weeds observed in this polygon were Russian thistle, lambsquarters, and tansy mustard (*Descurainia* sp.).

4. Weeds observed in this area were Russian thistle, cheat grass, Jim Hill mustard, leafy spurge, and tansy mustard (*Descurainia sophia*).

<u>Access Road to Southern Portion of Droney Gulch ACEC:</u>

5. This polygon extends west from the cattle guard on BLM property. Weeds observed in this area were Russian thistle (*Salsola iberica*), tansy mustard (*Descurainia sophia*), and leafy spurge (*Euphorbia esula*), and Jim Hill mustard (*Sisymbrium altissimum*).



Droney Gulch ACEC and Potential Conservation Area

Garden Park PCA and Garden Park ACEC

Royal Gorge Field Office BLM

Biodiversity Rank: B1 Outstanding Significance
This PCA contains five excellent (A ranked) or good (B ranked) occurrences of critically globally imperiled (G1G2) plant species. It also includes one good (B ranked) and one poor (D ranked) occurrence of a globally vulnerable (G3?) plant species, and two excellent (A ranked) occurrences of a globally imperiled (G2G3) community.

Protection Urgency Rank: P3 Moderate Urgency
ACEC designation has helped to ensure the long term viability of the element occurrence within it. Additional protection to the site may become necessary as human use of the area increases. Adding areas occupied by the Brandegee wild buckwheat and the golden blazing star in section 26 to the ACEC would help ensure their protection.

Management Urgency Rank: M2 High Urgency
Weeds have invaded the element occurrences in the ACEC, and are dense in some areas. As such they represent a significant potential threat. Mountain bike trails are taking shape on the clay barrens habitat of the rare plants in the ACEC and have the potential to severely degrade habitat. The gate on the access road to the ACEC does not adequately prevent access to the road by ORVs. Bentonite mining and paleontological research are other potential threats to the rare plants in the area.

Location: Fremont County. South end of Garden Park in Fourmile Creek Drainage.
Legal Description: USGS 7.5 minute Cooper Mountain quadrangle. T17S R70W S 4,9,10, 15-17, 21-29, 33, 34. Garden Park ACEC is in T17S R70W S20-23, 26-29, 33-35; T18S R70W S 3, 4.

General Description: The Garden Park Fossil PCA circumscribes an area larger than the Garden Park ACEC (see accompanying map). Although the ACEC includes most of the element occurrences in the area, the PCA boundary is drawn to include all of the occurrences of the Brandegee wild buckwheat, the golden blazing star, and the dwarf milkweed. Areas of appropriate habitat for these species to the north are also included, along with two rare riparian natural communities that are not included within the Garden Park ACEC along Felch Creek to the northeast. Additionally, an occurrence of Brandegee wild buckwheat and an occurrence of golden blazing star that are adjacent to but not included in the ACEC are also included in the PCA. As such, the PCA extends north and northeast of the Garden Park ACEC. The rare plant and weed surveys that were conducted on August 24 and 25 focused primarily on the ACEC but surrounding areas were also visited to investigate threats from weeds encroaching on the ACEC.

The Garden Park ACEC includes a section of Fourmile Creek and surrounding barren and forested uplands. It is roughly bounded to the north by Felch Creek. Felch Creek flows west into Fourmile Creek which then flows south into the Arkansas River. The area is characterized by a mosaic of high quality pinon-juniper woodlands, grasslands, and clay barrens. The

Brandegee wild buckwheat (*Eriogonum brandegeei*) and golden blazing star (*Nuttalia chrysantha*) occur in pockets along steep slopes cut by the creeks and within basins of eroded bentonite clay soil. These clay barrens are sparsely vegetated and also support Indian rice grass (*Achnatherum hymenoides*), frankenia (*Frankenia jamesii*), and saltbush (*Atriplex confertifolia*). Dwarf milkweed (*Asclepias uncialis*) is found in grasslands dominated by blue grama (*Chondrosum gracile*), three awn (*Aristida purpurea*), and hairy tridens (*Erioneuron pilosum*). Two high quality (A ranked) occurrences of the globally imperiled (G2G3) montane riparian woodland community (*Populus angustifolia/ Juniperus scopulorum*) are found along Felch Creek northeast of the ACEC. The canyon section of Felch Creek is full of large granite boulders that produce a pool-drop creek. There are many small wading pools, waterfalls, and dense cottonwood trees that make this section very scenic. This site also affords excellent views of the Sangre de Cristo Mountain Range.

Biodiversity Rank Justification: Four significant elements of natural diversity are found within the Garden Park Fossil PCA: the critically globally imperiled (G1G2) Brandegee wild buckwheat (*Eriogonum brandegeei*), the critically globally imperiled (G1G2) golden blazing star (*Nuttalia chrysantha*), the globally vulnerable (G3?) dwarf milkweed (*Asclepias uncialis*), and a globally imperiled (G1G2) montane riparian woodland community (*Populus angustifolia/ Juniperus scopulorum*). This site supports three good (B ranked) occurrences of the Brandegee wild buckwheat, with thousands of individuals and various size classes represented in approximately 280 acres of habitat in excellent condition. The Brandegee wild buckwheat has a global range that spans only 50 miles, with a total of nine known occurrences. The entire known occupied area of this species is approximately 800 acres, or 1.3 square miles. Two occurrences of the golden blazing star are also located within the PCA. One occurrence is good (B ranked), and is located inside the Garden Park ACEC, the other is excellent (A ranked), and is located just outside the ACEC boundary above Felch Creek. Hundreds of plants on approximately 160 acres of habitat were recorded. Golden blazing star has a global range of about 30 square miles. These are two of sixteen recently verified occurrences of this species. One B and one D ranked occurrence of dwarf milkweed, a regional endemic, are also documented within the PCA. All of the known extant occurrences in Colorado of the dwarf milkweed are restricted to 7 sites, one of which is Garden Park. The total number of documented individuals at all the extant sites is estimated to be less than 500. Two A ranked occurrences of the montane riparian woodland community (*Populus angustifolia/ Juniperus scopulorum*) community are documented in the PCA, to the northeast of the Garden Park ACEC. This is one of the highest quality occurrences of any riparian plant community recorded in the low elevation of the middle Arkansas Valley. It is a pristine riparian community with an intact mosaic and hydrologic regime.

Natural Heritage Plant and Community Element Occurrences in the Garden Park ACEC and in the Garden Park PCA.

Element	Common Name	Global Rank	State Rank	Federa Status	State Status	Federal Sens.	EO* Rank
Eriogonum brandegeei	Brandegee's Wild Buckwheat	G1G2	S1S2			FS/BLM	B
Eriogonum brandegeei	Brandegee's Wild Buckwheat	G1G2	S1S2			FS/BLM	B
Eriogonum brandegeei	Brandegee's Wild Buckwheat	G1G2	S1S2			FS/BLM	B
Nuttalia chrysantha	Golden Blazing Star	G1G2	S1S2			BLM	A
Nuttalia chrysantha	Golden Blazing Star	G1G2	S1S2			BLM	B
Asclepias uncialis	Dwarf Milkweed	G3?	S1S2			FS/BLM	B
Asclepias uncialis	Dwarf Milkweed	G3?	S1S2			FS/BLM	D
Populus angustifolia/ Juniperus scopulorum	Montane Riparian Woodland	G2G3	S2				A
Populus angustifolia/ Juniperus scopulorum	Montane Riparian Woodland	G2G3	S2				AB

*EO=Element Occurrence

Problematic weed species documented within the Garden Park ACEC and in the surrounding PCA.

Element	Common Name	State Status
Convolvulus arvensis	Field Bindweed	B
Anisantha tectorum	Cheat grass	B
Melilotus officinale	Yellow Sweetclover	A
Sisimbrium altissimum	Jim Hill Mustard	A
Salsola iberica	Russian Thistle	A
Phleum pratense	Timothy Grass	none

Boundary Justification: The PCA boundary includes all of the element occurrences for the critically imperiled (G1G2) elements in the area, the Brandegee wild buckwheat and the golden blazing star. It also includes all of the occurrences of the dwarf milkweed and two occurrences of the montane riparian woodland. A significant area of apparently suitable habitat for the Brandegee wild buckwheat and golden blazing star is also included in the northern portion of the PCA. This part is not currently included in the Garden Park ACEC.

Protection Comments: Excavation for dinosaur bones and bentonite mining are potential threats. Recreational use is likely on the rise. The barren slopes in the Garden Park PCA are highly erodable and do not withstand recreational impacts well. Thus, potential impacts from off-road vehicle use, mountain biking, and horseback riding on the Brandegee wild buckwheat and the golden blazing star are potentially severe. Adding areas to the north and northeast to the Garden Park ACEC would incorporate other occurrences of the Brandegee wild buckwheat, golden blazing star, further potential habitat for these species, and two occurrences of rare riparian communities (see General Description).

Management Comments:
Drainages and roadsides are weedy in places in the ACEC, and weeds were found in conjunction with rare plants in several locations. Six photo monitoring points were established in the most exemplary and accessible sites where impacts on rare plants by weeds appeared to be ongoing. The most pervasive weeds in the area are Russian thistle (*Salsola iberica*) and yellow sweet clover (*Melilotus officinale*). These species were targeted for photo monitoring since they were often found in conjuction with rare plants in the ACEC. Cheat grass (*Anisantha tectorum*), timothy grass (*Phleum pratense*), Jim Hill mustard (*Sisymbrium altissimum*), and field bindweed (*Convolvulus arvensis*) were also observed in and around the ACEC but did not co-occur with rare plants at the time of this survey (August 2000). They all, however, represent significant tangible threats to the biodiversity value of this site. The burned areas in the southern part of the ACEC are particularly weedy.

Weeds represent a significant threat to the biological resources of the Garden Park ACEC. Intensive weed management in the ACEC could effectively restore the area and alleviate the threat of extirpation of rare plant occurrences, helping to ensure the long term suitability of the habitat for the rare plants and the viability of the rare plant occurrences. Degradation of rare plant habitat by weed encroachment appears to be progressing in the ACEC. Six principal areas of weed infestation were identified during the survey in 2000 and photo monitoring plots were established and sampled (see accompanying map).

Use of the ACEC by mountain bikers appears to be on the rise and has resulted in numerous impromptu trails on the clay barrens habitat of the Brandegee wild buckwheat and golden blazing star. This has already resulted in some habitat degradation and represents a very real threat to the viability of these rare plant occurrences. As human densities and recreational uses of the area increase the potential impact from mountain bikes is likely to become severe without intervention . ORV activities in the area would also contribute to severe negative impacts on the rare plant species in the area, due to disturbance, erosion effects, and introduction of invasive species that would result from this sort of usage. Restricting road access to occurrences is needed to minimize unauthorized ORV impacts in the ACEC. The gate on the access road to the ACEC is inadequate to exclude unauthorized ORV activity. Currently there is room for a full-sized truck to drive around this gate. Similar sites in the area are currently experiencing heavy ORV use. The area to the northeast of the ACEC, which includes high quality occurrences of Brandegee wild buckwheat and golden blazing star, has a high potential to be impacted by future ORV use, and additional protection is recommended for this area.

Areas within the Garden Park ACEC have been important for paleontological research. Excavation quarries for dinosaur bones located within the ACEC have produced 5 type specimens of dinosaur species. If future excavations take place, giving consideration to rare plant locations and habitat will help ensure the security of the ACEC's biodiversity significance. Bentonite mining, should it be allowed within the ACEC, would result in catastrophic habitat loss and degradation for the rare plant species located here.

Grazing is currently taking place on the ACEC. Stocking levels appear to be low enough to prevent cattle from venturing into the less productive clay barrens for forage, where they would impact the occurrences of Brandegee wild buckwheat and golden blazing star.

Monitoring

Six photo monitoring plots were established in areas where rare plants co-occur with weeds in the ACEC. The photo monitoring plots were sampled on August 25, 2000. The plot locations are shown on the accompanying map. Locations were selected that provided a clear view of rare plant habitat and weeds, with permanent foreground and background landscape features to assist in relocating the sites and resampling. UTM coordinates were determined using a Garmin 12 CX GPS unit. With selective availability turned off this unit has been shown to be accurate to within 6 meters under ideal conditions (pers. com. Larry Morse 2001).

Photo Point Descriptions

Photo 1

UTM Coordinates	Compass Bearing	Lens	Film ASA	Speed	Aperature
13S 483173 4265914	82 degrees	35mm	100	125/sec	F8

Description: Yellow sweet clover (*Melilotus officinale*) has invaded occurrences of golden blazing star (*Nuttalia chrysantha*) and Brandegee wild buckwheat (*Eriogonum brandegeei*) in this location. These three species are visible in the photo. Saltbush (*Atriplex confertifolia*) is visible in the foreground; and rocky mountain juniper (*Juniperus scopulorum*) is visible in the background.

Photo 1:

Photo 2

UTM Coordinates	Compass Bearing	Lens	Film ASA	Speed	Aperature
13S 483173 4265914	312 degrees	35mm	100	125/sec	F11

Description: Russian thistle (*Salsola iberica*) has invaded an occurrence of golden blazing star (*Nuttalia chrysantha*) at this location. Appropriate habitat for the Brandegee wild buckwheat is present but this species was not found in the photoplot at the time of this survey. In the foreground, saltbush (*Atriplex confertifolia*) and rocky mountain juniper (*Juniperus scopulorum*) are growing on a small knob.

Photo 2:

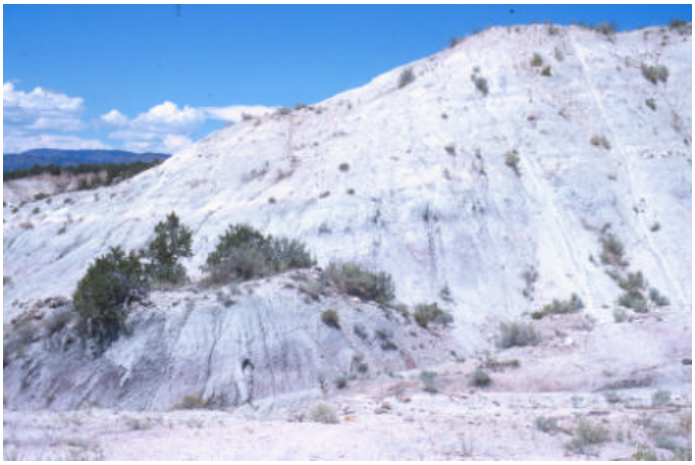


Photo 3

UTM Coordinates	Compass Bearing	Lens	Film ASA	Speed	Aperature
13S 483151 4265880	29 degrees	35mm	100	125/sec	F11

Description: Russian thistle (*Salsola iberica*) has invaded an occurrence of golden blazing star (*Nuttalia chrysantha*) at this location. Gumweed (*Grindelia squarrosa*) and saltbush (*Atriplex confertifolia*) are also visible in the photo.

Photo 3:

Photo 4

UTM Coordinates	Compass Bearing	Lens	Film ASA	Speed	Aperature
13S 483192 4265861	30 degrees	35mm	100	125/sec	F11

Description: This photo was taken standing on the bike path. Russian thistle (*Salsola iberica*) and yellow sweetclover (*Melilotus officinale*) have invaded an occurrence of golden blazing star (*Nuttalia chrysantha*) at this location. Gumweed (*Grindelia squarrosa*), wild buckwheat (*Eriogonum effusum*), and saltbush (*Atriplex confertifolia*) are also visible in the photo.

Photo 4:

Photo 5

UTM Coordinates	Compass Bearing	Lens	Film ASA	Speed	Aperature
13S 483079 4265923	57 degrees	35mm	100	125/sec	F11

Description: Russian thistle (*Salsola iberica*) and yellow sweetclover (*Melilotus officinale*) have invaded occurrences of golden blazing star (*Nuttalia chrysantha*) and Brandegee wild buckwheat (*Eriogonum brandegeei*) at this location. Other species visible in the photo are rocky mountain juniper *(Juniperus scopulorum*), gumweed (*Grindelia squarrosa*), wild buckwheat (*Eriogonum effusum*), frankenia (*Frankenia jamesii*), Indian rice grass (*Achnatherum hymenoides*), and saltbush (*Atriplex confertifolia*).

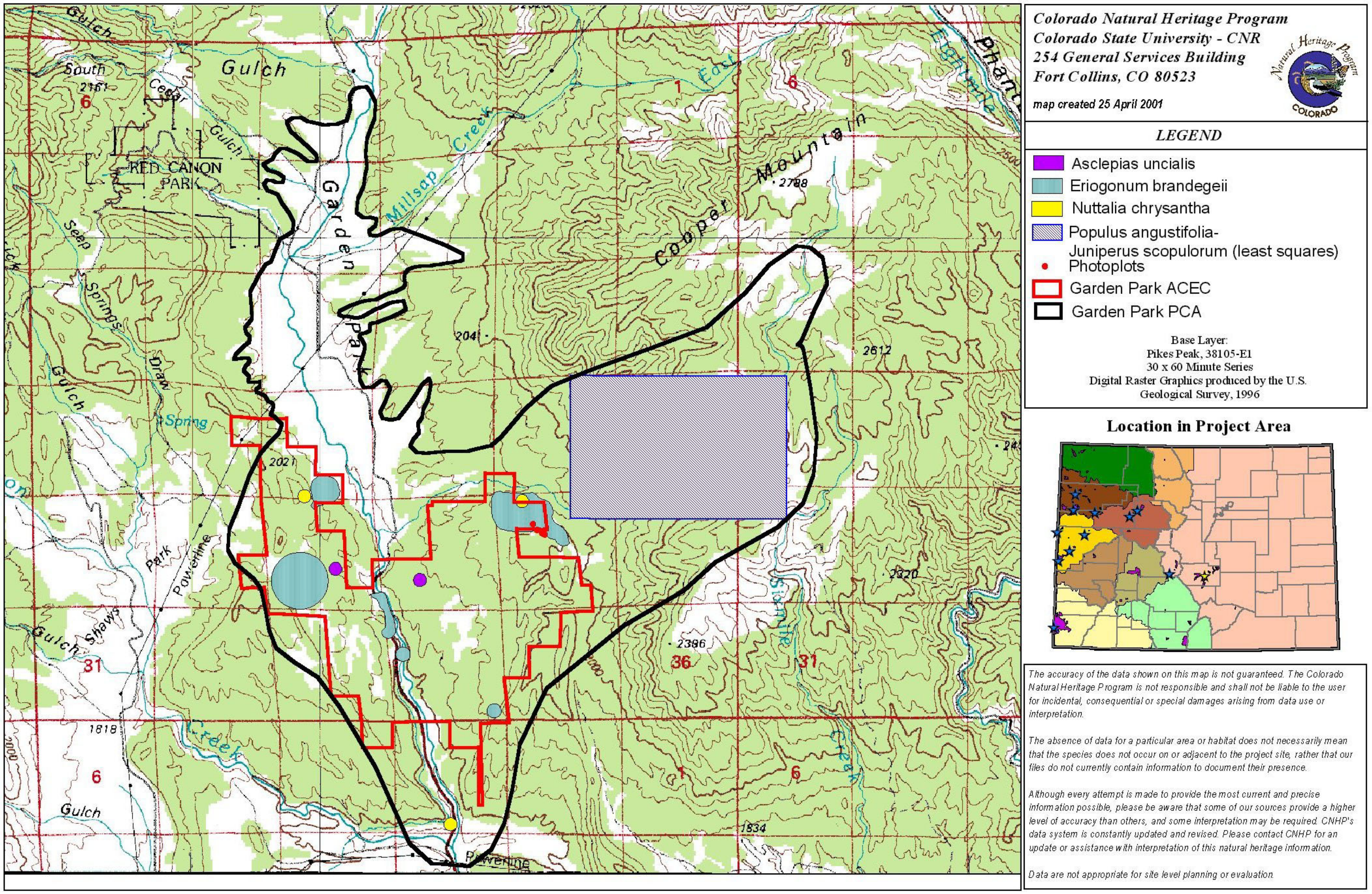
Photo 5:

Photo 6

UTM Coordinates	Compass Bearing	Lens	Film ASA	Speed	Aperature
13S 483018 4266010	61 degrees	35mm	100	125/sec	F8

Description: Russian thistle (*Salsola iberica*) has invaded an occurrence of golden blazing star (*Nuttalia chrysantha*) at this location. Apparently suitable habitat is also present for the Brandegee wild buckwheat (*Eriogonum brandegeei*) but this species was not observed in the photoplot. Other species present are rocky mountain juniper *(Juniperus scopulorum*), saltbush (*Atriplex confertifolia*), mountain mahogany (*Cercocarpus montanus*), and rabbitbrush (*Chrysothamnus* sp.).

Photo 6:



Garden Park ACEC and Potential Conservation Area

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1 0 1 Miles

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