Roaring Fork Watershed Biological Inventory 1997-1999

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prepared for
Pitkin County, the Aspen Wilderness Workshop,
and the Roaring Fork Valley Audubon Society

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Executive Summary

In 1996, the Colorado Natural Heritage Program (CNHP) was contracted by Pitkin County in partnership with the Aspen Wilderness Workshop and the Roaring Fork Valley Audubon Society to assess the natural heritage values of lands in the Roaring Fork River Watershed. This work, which spanned a three year period, was made possible by two grants that Pitkin County was awarded from Great Outdoors Colorado, as well as financial support from Roaring Fork Watershed county, city and town governments. This report includes a complete assessment of the natural heritage values documented in the Watershed.

The primary goal of the project was to identify the locations in the Roaring Fork Watershed with natural heritage significance. These locations were identified by 1) examining existing biological data, 2) accumulating additional information from other sources on rare or imperiled plant species, animal species, and significant plant communities (collectively called **elements**), and 3) conducting field surveys.

Over 78 rare or imperiled plant or animal species and significant plant communities (elements) have been documented in the Roaring Fork Watershed. Twenty-one of these natural heritage elements are globally significant. The other elements found in the Watershed have state-wide significance. Overall, the concentration of elements indicates that conservation in the Roaring Fork Watershed will have state-wide as well as global consequences.

Locations in the Watershed with natural heritage significance (places where elements have been documented) are presented in this report as **potential conservation areas (PCA)**. **The potential conservation area boundaries designated in this report do not confer any regulatory protection on the area.** These boundaries were based on the ecological processes needed to support the elements within that area. Fifty-five PCAs are described and prioritized. The PCAs are prioritized according to their **biodiversity significance rank**, or "B-rank," which ranges from B1 (outstanding biodiversity significance) to B5 (general or state-wide biodiversity significance). The highest ranking PCAs (B2 in the Roaring Fork Watershed) are the highest priorities for conservation action. The sum of all the PCAs in this report represents the area CNHP believes needs to be protected to ensure the Watershed's natural heritage is not lost. Recommendations for protection and management of each PCA are presented.

The new information gathered during this inventory was placed in the Natural Heritage Program's database, the Biological and Conservation Data System (BCD). The BCD is used throughout the entire Natural Heritage network (which consists of over eighty offices in North America and internationally) to maintain species and community information and to assess each element's degree of imperilment. By incorporating new information into the BCD we can refine our conservation priorities. The new information becomes part of a permanent record of Colorado's natural heritage. It is important to keep in mind that the BCD is a very active database, continually being updated as we gather new data.

The Natural Heritage Biological Inventory was conducted in several steps:

1. **Identify rare or imperiled species and significant plant communities with potential to occur in Roaring Fork Watershed.** Using known range and life history information, over 125 natural heritage elements potentially occurring in the Roaring Fork Watershed were identified.

2. **Collect existing information.** CNHP databases were updated with information about both species' biology and locations within the Roaring Fork Watershed. Sources included museum collections, scientific literature, and local naturalists and biologists such as expert sources at the Roaring Fork Valley Audubon Society, the Colorado Division of Wildlife, the Bureau of Land Management, and the U.S. Forest Service.

3. **Identify targeted inventory areas.** Using the information collected in step 2 and aerial photography, targeted inventory areas were identified based on several factors including the presence of potential habitat for rare or imperiled species and evidence of little human disturbance.

4. **Conduct field surveys**. Targeted inventory areas were surveyed on site (**with landowner permission only**). Data on the presence of elements were recorded, and an estimate of overall biological quality of the location was made.

5. **Delineate and prioritize potential conservation areas.** Preliminary conservation planning boundaries were identified based on the ecological processes that support the Natural Heritage elements at the site.

A task force of about 15 people representing private and public organizations in the Roaring Fork Watershed provided input at all stages of the inventory. The following groups participated in this role: Colorado Division of Wildlife; Bureau of Land Management; Aspen Wilderness Workshop; Roaring Fork Valley Audubon Society; Garfield and Pitkin counties; Glenwood Springs River Commission; City of Aspen; Fuller Consulting Services; Town of Snowmass Village; Colorado Bird Observatory; Mt. Sopris Group of the Sierra Club; Aspen Center for Environmental Studies; Roaring Fork Watershed Coalition; and the Town of Basalt.

Recommendations

1. **Develop and implement a plan for protecting the Potential Conservation Areas (PCAs) profiled in this report, with the most attention directed toward PCAs with biodiversity rank (B-rank) B2 and B3.** The PCAs in this report provide Pitkin County and the Aspen Wilderness Workshop with a basic framework for implementing a comprehensive conservation program. The B2 and B3 PCAs, because they have global significance, should receive the most attention. The sum of all the PCAs in this report represents the area CNHP believes needs to be protected to ensure the Watershed's natural heritage is not lost.

2. **Consider open space acquisition and/or conservation easements for potential conservation areas where appropriate and necessary to protect their ecological values.** A possible source of funds to protect these PCAs as open space is Great Outdoors Colorado, which supports open space grants to protect natural areas of state-wide significance. Priority should be placed on B2 and B3 PCAs, although protection opportunities on B4 and B5 PCAs should be pursued where they exist. Work with local land protection organizations such as Pitkin County Open Space and Trails Program and Aspen Valley Land Trust to develop a conservation strategy.

3. **Incorporate the information included in this report in the review of proposed activities in or near PCAs so that the activities do not adversely affect natural heritage elements.** All of the PCAs presented contain natural heritage elements of state or global significance. Development activities in or near a PCA may affect the element(s) present. Wetland and riparian PCAs are particularly susceptible to impacts from off-site activities if the activities affect water quality or hydrologic regimes. In addition, cumulative impacts from many small changes can have effects as profound and far-reaching as one large impact. As proposed activities within the Roaring Fork Watershed are considered, they should be compared to the PCA maps presented herein. If a proposed project would potentially impact a PCA, planning personnel should contact persons, organizations, or agencies with expertise to get detailed comments. The Colorado Natural Heritage Program, Colorado Natural Areas Program, and Colorado Division of Wildlife routinely conduct environmental reviews state-wide and should be considered available resources.

4. **In the effort to protect natural diversity, promote cooperation among landowners and pertinent government agencies and non-profit conservation organizations.** The long-term protection of natural diversity in the Roaring Fork Watershed will be facilitated with the cooperation of many government agencies, non-government organizations, and private landowners. Pitkin County and the Aspen Wilderness Workshop have played a leadership role in attempting to incorporate diverse opinions in the planning process. Efforts to this end should continue, providing stronger ties among federal, state, local, and private interests involved in the protection or management of natural lands.

5. **Promote proper management of the natural heritage resources that exist within the Roaring Fork Watershed, recognizing that designation of Potential Conservation Areas does not by itself confer protection on the plants, animals, and plant communities.** Development of a conservation plan is a necessary component of protecting a PCA. Because some of the most serious threats to the Roaring Fork Watershed's ecosystems are large-scale (altered hydrology, residential encroachment, non-native species invasion), considering each PCA in the context of its surroundings is critical. Building partnerships is essential to the long-term protection of a PCA. An important component of partnerships could be the research and development of techniques for maintaining or restoring sites to aid in the preservation of imperiled species or significant plant communities. CNHP would welcome the opportunity to partner with organizations in the Roaring Fork Watershed in the further development of strategic conservation plans for sites of natural heritage significance. In addition, several organizations and agencies are available for consultation in the development of conservation plans, including the Colorado Natural Areas Program, The Nature Conservancy, the Colorado Division of Wildlife, and various academic institutions.

6. **Increase public awareness of the benefits of protecting significant natural areas.** Natural lands are becoming ever more scarce, especially those near densely populated areas. Rare and imperiled species will continue to decline if not given appropriate protection. This will result not only in the loss of our natural heritage, but may also lead to additional conflicts between developers and natural resource managers. Increasing the public's knowledge of the remaining significant areas will build support for the programmatic initiatives necessary to protect them. To build awareness of the commitment to protect sites of biodiversity significance, conservation actions should be publicized. Slides will be provided to assist with this effort.

7. **Consider using incentives, including tax incentives, to promote conservation actions on private lands.** Conservation of important natural heritage resources can only take place with the cooperation of private landowners. Tax incentives could be used to help landowners defray the costs of protecting something of value to all of the residents of the Roaring Fork Watershed.

8. **Continue natural heritage resource inventories where necessary, including inventories for species that cannot be surveyed adequately in one field season and inventories on lands that CNHP could not access during 1997 or 1998.** Despite the best efforts during two field seasons, it is likely that some elements occur in locations not identified in this report.

9. **Prohibit the introduction and/or sale of non-native species that are known to negatively and profoundly affect natural areas, especially wetlands and riparian areas.** These include, but are not limited to, tansy *(Tanacetum vulgare)* , Russian olive, shasta daisy, Dame's rocket, wild chamomile, and non-native fish species. Natural area managers, public agencies, and private landowners should be encouraged to remove these species from their

properties. The above mentioned individuals or organizations should work with the local landscape companies and nurseries to build local supplies of native plants and seeds for restoration projects, re-seeding efforts, and other such activities. To find out more about exotic plant species management contact the Colorado Department of Agriculture, Noxious Weed Management.

Overview of the Study Area

The Roaring Fork River Watershed headwaters are east of Aspen, Colorado, and the river flows northwest to its confluence with the Colorado River in Glenwood Springs. The Roaring Fork River Watershed crosses three counties and four municipalities, and includes two other major river drainages, the Crystal and the Fryingpan rivers. There is a high percentage of private lands along these rivers and on the immediately adjacent slopes in the lower elevations of the watershed. Throughout the watershed, there is a high percentage of public lands which are managed by various government agencies, such as the U.S. Forest Service, Bureau of Land Management, and the Colorado Division of Wildlife. Elevations range from several peaks over 14,000 feet to 5800 feet where the Roaring Fork River meets the Colorado River. The Roaring Fork River Watershed is located in the western central portion of Colorado within the North-Central Highlands and Rocky Mountain ecoregional section (Bailey et al. 1994). The Elk and the Sawatch mountain ranges border the Roaring Fork watershed on the south and east, respectively.

The Roaring Fork River is at the base of as many as three terraces that show periods of stability over the course of the river's history. Geological activity has created a diversity of landforms in the Watershed. Lava beds, the Maroon Formation, Mancos Shale, and Mesa-Verde Sandstone occur in the lower valley. At higher elevations, granite, gneiss and schist rock formations are dominant (Chronic 1980).

The climate is generally characterized by long, cold, and moist winters, and short, cool, dry summers. Climatic data from the Town of Glenwood Springs indicate that this area receives approximately 16.49 inches of precipitation each year. Average minimum and maximum temperatures are, respectively, 31.2 and 62.8 degrees Fahrenheit. The average total snowfall is 63.1 inches (Western Regional Climate Center 1997).

The Roaring Fork River Watershed is dominated by nine diverse vegetation types which are distributed across multiple elevational gradients. The lower valley includes sagebrush shrublands, agricultural fields, *pinyon-juniper (Pinus edulis-Juniperus osteosperma)*, cottonwood riparian, and mixed shrublands (including Gambel's oak *(Quercus gambelii)*, serviceberry, and mountain mahogany *(Cercocarpus montanus)*). Higher in the valley the primary vegetation types are dominated by willows, *spruce-fir (Picea engelmannii-Abies lasiocarpa)*, lodgepole, aspen *(Populus tremuloides)* and alpine communities.

Currently, developments associated with the ski areas, golf courses and other recreational, residential, agricultural and commercial developments are widespread in the valley. Historical mining and timbering operations have dramatically affected lands in the upper stretches of the watershed. These various land uses introduce problems associated with habitat fragmentation, hydrological alterations, non-native species invasions, and alternation of natural fire regimes.

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. It stands to reason that biological diversity should be of concern to all people.

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

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

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

3. **Community Diversity** -- the variety of plant communities within an area that represent the range of species relationships and inter-dependence. These communities may be diagnostic or even 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 Data System. This locational information is incorporated into a GIS system (Arcview and Arcinfo). 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 that use the Biological and Conservation Data System developed by The Nature Conservancy. CNHP has effective relationships with several state and federal agencies, including the Colorado Natural Areas Program, Colorado Department of Natural Resources and the Colorado Division of Wildlife, the U.S. Environmental Protection Agency, and the U.S. Forest Service. Numerous local governments and private entities also work closely with CNHP. Use of the data by many different individuals and organizations, including Great Outdoors Colorado, encourages a proactive approach to development and conservation thereby reducing the potential for conflict. Information collected by the Natural Heritage Programs around the globe provides a means to protect species before the need for legal endangerment status arises.

Concentrating on site-specific data for each element of natural diversity enables 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.
S#B Refers to the breeding season imperilment of elements that are not permanent residents.
S#N Refers to the non-breeding season imperilment of elements that are not permanent residents.
Where no consistent location can be discerned for migrants or non-breeding populations, a rank of SZN is used.
SZ Migrant whose occurrences are too irregular, transitory, and/or dispersed to be reliable identified, mapped, and protected.
SA Accidental in the state.
SR Reported to occur in the state, but unverified.
S? Unranked. Some evidence that species may be imperiled, but awaiting formal rarity ranking.

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

Legal Designations

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.

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

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

Table 2. Federal and State Agency Special Designations.

Federal Status:

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

LE Endangered; 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

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.
> **Viability –** 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, pristine, defensible, and viable.
B	The occurrence is small but in good condition, or large but removed from its natural condition and/or not viable and defensible.
C	The occurrence is small, in poor condition, and possibly of questionable viability.
D	The occurrence does not merit conservation efforts because it is too degraded or not viable.
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.
F	The occurrence was not relocated; failed to find.

Potential conservation areas

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

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

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 action required immediately or element occurrences could be lost or irretrievably degraded within one year.
M2 New management action will be needed within 5 years to prevent the loss of element occurrences.
M3 New management action will be needed within 5 years to maintain current quality of element occurrences.
M4 Although not currently threatened, management may be needed in the future to maintain the current quality of element occurrences.
M5 No serious management needs known or anticipated at the PCA.

Inventory Methods

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

Collect Information

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

Identify Targeted Elements of Global and State-wide Concern

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

The following list of elements includes those elements currently monitored by CNHP that were thought to potentially occur in the Roaring Fork Watershed, and were therefore targeted in CNHP field inventories. Over 75 rare species and significant plant communities were targeted in these surveys.

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.

Table 3. Targeted Elements of Global or State-wide Concern
List of targeted elements, organized by taxonomic group, identified for the Roaring Fork Watershed Biological Inventory in 1997-1999. Please see Table 1 for rank explanations.

Element Name	Element Common Name	Global Rank	State Rank	Fed Status	State Status	Fed Sens
AMPHIBIANS						
Bufo boreas	boreal toad	G5T2Q	S1	C	E	FS
Rana pipiens	northern leopard frog	G5	S3		SC	FS
BIRDS						
Falco peregrinus anatum	american peregrine falcon	G5T4	S2B, SZN	LE	T	
Haliaeetus leucocephalus	bald eagle	G4	S1B, SZN	LT	T	
Cypseloides niger	black swift	G4	S3B			FS
Aegolius funereus	boreal owl	G5	S2			FS
Leucostica australis	brown-capped rosy finch	G4	S3S4B, S4N			
Accipiter cooperii	Cooper's hawk	G5	S3S4B, S4N			
Podiceps nigricollis	eared grebe	G5	S3B, SZN			
Sayornis phoebe	eastern phoebe	G5	S3B, SZN			
Vireo vicinior	gray vireo	G4	S2B, SZN			
Ardea herodias	great blue heron	G5	S3B, SZN			
Accipiter gentilis	northern goshawk	G5	S3B, SZN			FS
Circus cyaneus	northern harrier	G5	S3B, SZN			
Contopus borealis	olive-sided flycatcher	G5	S3S4B			FS
Pandion haliaetus	osprey	G5	S3B, SZN			FS
Progne subis	purple martin	G5	S3B, SZN			FS
Amphispiza belli	sage sparrow	G5	S3B, SZN			
Accipiter striatus	sharp-shinned hawk	G5	S3S4B, S4N			
Porzana carolina	sora	G5	S3S4B, SZN			
MAMMALS						
Felis lynx canadensis	lynx	G5	S1	C	E	FS
Gulo gulo	wolverine	G4	S1		E	FS
Myotis californicus	California myotis	G5	S3S4			
Myotis yumanensis	yuma myotis	G5	S3			
Notiosorex crawfordi	desert shrew	G5	S3			

Plecotus townsendii pallescens	pale lump-nosed bat	G4	S2		
Sorex hoyi montanus	pygmy shrew subsp.	G5T2T3	S2		FS
Sorex merriami	Merriam's shrew	G5	S2		
Sorex nanus	dwarf shrew	G4	S2S3		FS
Sorex preblei	Preble's shrew	G5	S1?		
FISH					
Catostomus latipinnis	flannelmouth sucker	G3G4	S3S4	SC	
Gila robusta	roundtail chub	G2G3	S2		
Oncorhynchus clarki pleuriticus	Colorado River cutthroat	G4T3T4	S3	SC	FS
Prosopium williamsoni	mountain whitefish	G5	S3		
REPTILES					
Coluber constrictor mormon	western yellowbelly racer	G5T5	S3		
Elaphe guttata	corn snake	G5	S3S4		
PLANTS					
Arnica angustifolia ssp. *tomentosa*	alpine arnica	G5T5	S1		
Asplenium trichomanes-ramosum	green spleenwort	G4	S1S2		
Astragalus molybdenus	Leadville milkvetch	G3	S2		
Braya glabella	arctic braya	G5	S1		
Crepis nana	dwarf hawksbeard	G5	S2		
Cryptantha cana	mountain cat's-eye	G5	S2		
Cryptogramma stelleri	slender rock-brake	G5	S2		
Cypripedium fasciculatum	purple lady's-slipper	G4	S3		FS
Cypripedium pubescens	yellow lady's slipper	G5	S2		
Cystopteris montauna	mountain bladder fern	G5	S1		
Draba crassa	thick-leaf whitlow-grass	G3	S3		
Draba globosa	rockcress draba	G3	S1		
Draba grayana	Gray's Peak whitlow-grass	G2	S2		
Draba lonchocarpa var. *lonchocarpa*	draba	G4T4	S3		
Draba oligosperma	woods draba	G5	S2		
Draba porsildii	Porsild draba	G3G4	S1		
Draba spectabilis var. *oxyloba*	draba	G3?T3Q	S3		
Draba streptobrachia	Colorado Divide whitlow-grass	G3	S3		
Draba ventosa	tundra draba	G3	S1		
Erigeron humilis	low fleabane	G4	S1		
Erigeron lanatus	woolly fleabane	G3G4	S1		
Eriogonum coloradense	Colorado wild buckwheat	G2	S2		
Eriophorum altaicum var. *neogaeum*	altai cottongrass				

Iliamna grandiflora	large-flower globe-mallow	G3?Q	S1	
Machaeranthera coloradoensis	Colorado tansy-aster	G2	S2	
Papaver lapponicum ssp. *occidentale*	alpine poppy	G4T4	S2	
Penstemon harringtonii	Harrington beardtongue	G3	S3	FS
Penstemon mensarum	Grand Mesa penstemon	G3	S3	
Platanthera sparsiflora var. *ensifolia*	canyon bog-orchid	G4G5T3	S2	
Ranunculus karelinii	tundra buttercup	G4G5	S2	
Saxifraga cespitosa ssp *monticola*	tundra saxifrage	G5T5	S1	
Sullivantia hapemanii var. *purpusii*	hanging garden sullivantia	G3T3	S3	
INVERTEBRATES				
Adelpha bredowii	sister	G4G5	S3	
Aeshna californica	California darner	G5	SU	
Callophrys affinis affinis	green-winged hairstreak	G4T?	S3S4	
Erebia theano demmia	demmia alpine	G4T2	S2	
Euphilotes rita emmeli	desert buckwheat blue	G4T2	S1	
Hesperopsis libya	mohave sooty-wing	G5	S2	
Lycaena editha		G5	S2S3	
Lymnaea stagnalis	swampy lymnaea	G5	S2	
Nymphalis californica	California tortoise shell	G5	S3S4	
Oarisma edwardsii	Edward's skipperling	G4	S3	
Ochlodes yuma	yuma skipper	G5	S2S3	
Oeneis alberta	Alberta arctic	G5	S3	
Oeneis jutta reducta	Rocky Mountain arctic jutta	G5TU	S1	
Oeneis polixenes	polixenes arctic	G5	S3	
Oenieis taygete	white-veined arctic	G5?	S3	
Papilio bairdii	Baird's swallowtail	G4	S3S4	
Papilio indra minori	short-tailed black swallowtail	G5TU	S1S2	
Pyrgus ruralis	two-banded skipper	G4	S3	
Satyrium fuliginosum	sooty gossamer wing	G4	S3	
Speyeria egleis	egleis fritillary	G5	S2	
PLANT COMMUNITIES				
Abies lasiocarpa -Picea engelmannii -Populus angustifolia/ Lonicera involucrata	montane riparian forest	G4	S3	
Abies lasiocarpa/ Rubus parviflorus	subalpine forest	G5	S2	
Abies lasiocarpa-Picea engelmanii/ Mertensia ciliata	montane riparian forest	G5	S5	

Abies lasiocarpa-Picea engelmannii/ Alnus incana	montane riparian forest	G5	S4S5
Artemisia tridentata vaseyana/ Carex geyeri	west slope sagebrush shrubland	G3	SU
Artemisia tridentata vaseyana/ Symphoricarpos oreophilus	west slope sagebrush shrubland	G3G4	S3S4
Carex aquatilis-Carex utriculata wetland	montane wet meadow	G4	S4
Carex rupestris-Trifolium dasyphyllum	alpine meadows	G3G$	S3S4
Festuca idahoensis-Festuca thurberi	montane grassland	G3G4	S3S4
Geum rossii/ Trifolium spp.	alpine meadow	G3G4	S3S4
Picea pungens/ Alnus incana	montane riparian forest	G3	S3
Picea pungens/ Cornus sericea	montane riparian forest	G1	S2
Pinus edulis- Juniperus osteosperma/ Stipa comata	xeric western slope pinyon-juniper woodlands	GU	SU
Populus angustifolia - Picea pungens/ Alnus incana	montane riparian forest	G3	S3
Populus angustifolia/ Alnus incana	montane riparian forest	G3?	S3
Populus angustifolia/ Betula occidentalis	montane riparian forest	G3?	S2
Populus angustifolia/ Cornus sericea	cottonwood riparian forest	G4	S3
Populus angustifolia/ Prunus virginiana	narrowleaf cottonwood/ common chokecherry	G2G3	S1
Populus angustifolia-Pseudotsuga menziesii	montane riparian forest	GU	S2
Pseudotsuga menziesii/ Carex geyeri	lower montane forest	G5Q	S3
Pseudotsuga menziesii/ Cornus sericea	lower montane riparian forest	G4	S2
Pseudotsuga menziesii/ Pachistima myrsinites	lower montane forest	G2G3	S2S3
Psuedotsuga menziesii/ Quercus gambelii	western slope douglas fir forests	G5	S4
Psuedotsuga menziesii/ Symphoricarpos oreophilus	western slope douglas fir forests	G5	S4
Quercus gambelii-Amelanchier utahensis	mixed mountain shrubland	G3G5	SU
Quercus gambelii/ symphoricarpos	mixed mountain shrubland	G5	S3S4

oreophilus			
Quercus gambelii-Cercocarpus montanus/ Carex geyeri	mixed mountain shrubland	G3	S3
Salix drummondiana/ Calamagrostis canadensis	lower montane willow carr	G3	S3
Salix drummondiana/ Carex utriculata	montane willow carr	GU	S3
Salix exigua/mesic graminoid	coyote willow/mesic graminoid	G5	S5
Salix geyeriana-Salix monticola/ Calamagrostis canadensis	montane willow carr	G3	S3
Salix monticola/ Calamagrostis canadensis	montane willow carr	G3	S3
Salix planifolia/ calamagrostis canadensis	subalpine riparian willow carr	G3	S3
Salix planifolia/ Caltha leptosepala	subalpine riparian willow carr	G4	S4
Salix planifolia/ Carex aquatilis	subalpine riparian willow carr	G5	S4
Salix planifolia/ Deschampsia cespitosa	subalpine riparian willow carr	G2G3	S3

Identify Targeted Inventory Areas

Survey sites were chosen based on their likelihood of harboring rare or imperiled species or significant plant communities. Previously documented locations were targeted, and additional potential areas were chosen using available information sources. Precisely known element locations were always included so that they could be verified and updated. Many locations were not precisely known due to ambiguities in the original data, i.e., "Independence Pass." In such cases, survey sites for that element were chosen in likely areas in the general vicinity. Areas with potentially high natural values were chosen using aerial photographs, geology maps, vegetation surveys, personal recommendations from knowledgeable local residents, and numerous roadside surveys by our field scientists. Aerial photography is perhaps the most useful tool in this step of the process. High altitude infrared photographs at 1:40,000 scale (National Aerial Photography Program 85) were used for this project and are well suited for assessing vegetation types and, to some extent, natural conditions on the ground.

Using the biological information stored in the CNHP databases, these information sources were analyzed for areas having the highest potential for supporting specific elements. General habitat types can be discerned from aerial photographs. Those chosen for survey sites appeared to be in the most natural condition. In general, this means those sites that are the largest, least fragmented, and relatively free of visible disturbances, such as roads, trails, fences, quarries, etc.

The above information was used to delineate over 100 survey areas that were believed to have relatively high probability of harboring natural heritage resources. These areas vary in size from less than 10 to several thousand acres and include all major habitat types in the study area.

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

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

Contact Landowners

Obtaining permission to conduct surveys on private property was essential to this project. Once survey sites were chosen, land ownership of these areas was determined using records at local assessor's offices. Landowners were then either contacted by phone or mail or in person. If landowners could not be contacted, or if permission to access the property was denied, this was recorded and the site was not visited. **Under no circumstances were properties surveyed without landowner permission.**

Conduct Field Surveys

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

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

Amphibians: visual or with aquatic nets
Reptiles: visual
Mammals: shrews, pitfall traps; bats, mist nets
Birds: visual or by song/call, evidence of breeding sought
Insects: aerial net
Plants: visual
Plant communities: visual, collect qualitative or quantitative composition data

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

When a rare species or significant plant community was discovered its precise location and known extent was recorded on 1:24,000 scale topographic maps. Other data recorded at each occurrence included numbers observed, breeding status, habitat description, disturbance features, observable threats, and potential protection and management needs. The overall significance of each occurrence, relative to others of the same element, was estimated by rating the quality (size, vigor, etc.) of the population or community, the condition or naturalness of the habitat, the long-term viability of the population or community, and the defensibility (ease or difficulty of protecting) of the occurrence. These factors are combined into an element occurrence rank,

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

Delineate Potential Conservation Areas

Finally, since the objective for this inventory is to prioritize specific areas for conservation efforts, Potential Conservation Area (PCA) boundaries were delineated. Such a boundary is an estimation of the minimum area needed to ensure persistence of the 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 such as aerial photography are also used. These boundaries are considered preliminary and additional information about the PCA or the element may call for alterations to the boundaries.

Results

A total of 28 of the targeted plant species, 19 of the targeted animal species, and 29 significant plant communities have been identified in the Roaring Fork Watershed (Please see table 4). These occurrences provide the foundation for a total of 55 Potential Conservation Areas that follow (please see table 6 for a summary of these PCAs). All of the data collected are housed and maintained in the Biological and Conservation Data System (BCD). The gray catbird (*Dumetella carolinensis*), slender-leaf ligusticum (*Ligusticum tenuifolia*), and Osterhout's beardtongue (*Penstemon osterhoutii*) were found to be common during the 1997 field season. These species have been taken off the Colorado Natural Heritage Program's list of rare and imperiled animals, plants, and plant communities (CNHP 1997a).

Table 4. Elements of Global or State-wide Concern Documented in the Roaring Fork Watershed Potential Conservation Areas

The following elements, organized by taxonomic group, have been documented in the Roaring Fork Watershed Potential Conservation Areas identified during the 1997-1999 Roaring Fork Watershed Biological Inventory. 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
AMPHIBIANS						
Bufo boreas	boreal toad	G4T1Q	S1	C	E	
Rana pipiens	northern leopard frog	G5	S3		SC	
BIRDS						
Haliaeetus leucocephalus	bald eagle	G4	S1B, S3N	LT	T	
Cypseloides niger	black swift	G4	S3B			FS
Aegolius funereus	boreal owl	G5	S2			
Leucostica australis	brown-capped rosy finch	G4	S3S4B, S4N			
Accipiter cooperii	Cooper's hawk	G5	S3S4B, S4N			
Podiceps nigricollis	eared grebe	G5	S3B, SZN			
Ardea herodias	great blue heron	G5	S3B, SZN			
Accipiter gentilis	northern goshawk	G5	S3B, SZN			FS
Contuopus borealis	olive-sided flycatcher	G5	S3S4B			FS
Pandion haliaetus	osprey	G5	S3B, SZN			FS
Falco peregrinus anatum	American peregrine falcon	G4T3	S2B, SZN	LE		
Progne subis	purple martin	G5	S3B, SZN			
Amphispiza belli	sage sparrow	G5	S3B, SZN			
Accipiter striatus	sharp-shinned hawk	G5	S3S4B,			

			S4N			
Porzana carolina	sora	G5	S3S4B, SZN			
MAMMALS						
Felis lynx canadensis	lynx	G5	S1	C	E	
Sorex c.f. *preblei*	Preble's shrew	G5	S1?			
Sorex merriami	Merriam's shrew	G5	S3			
FISH						
Oncorhynchus clarki pleuriticus	Colorado River cutthroat trout	G4T3	S3		SC	
Prosopium williamsoni	mountain whitefish	G5	S3			
REPTILES						
none documented						
PLANTS						
Arnica angustifolia ssp. *tomentosa*	alpine arnica	G5T5	S1			
Asplenium trichomanes-ramosum	green spleenwort	G4	S1S2			
Astragalus molybdenus	Leadville milkvetch	G3	S2			FS
Botrychium pallidum	pale moonwort	G2	S2			FS
Braya glabella	arctic braya	G5	S1			FS
Chinophila jamesii	snow lover	G3G4	S3S4			
Crepis nana	dwarf hawksbeard	G5	S2			
Cypripedium pubescens	yellow lady's slipper	G5	S2			
Cystopteris montana	mountain bladder fern	G5	S1			
Draba crassa	thick-leaf whitlow-grass	G3	S3			
Draba globosa	rockcress draba	G3	S1			
Draba grayana	Gray's Peak whitlow-grass	G2	S2			
Draba lonchocarpa var. *lonchocarpa*	lancepod whitlow-grass	G4T4	S3			
Draba oligosperma	woods draba	G5	S2			
Draba streptobrachia	Colorado Divide whitlow-grass	G3	S3			
Draba ventosa	tundra draba	G3	S1			
Erigeron humilis	low fleabane	G4	S1			
Erigeron lanatus	woolly fleabane	G3G4	S1			FS
Eriogonum coloradense	Colorado wild buckwheat	G2	S2			BLM
Eriophorum altaicum var. *neogaeum*	altai cottongrass	G4T?	S2			
Iliamna grandiflora	large-flowered globe-mallow	G3?Q	S1			
Machaeranthera coloradoensis	Colorado tansy-aster	G2	S2			
Papaver kluanense	alpine poppy	G4	S3			
Penstemon harringtonii	Harrington beardtongue	G3	S3			FS
Penstemon mensarum	Grand Mesa penstemon	G3	S3			
Platanthera sparsiflora var. *ensifolia*	canyon bog-orchid	G4G5 T3`	S2			

Ranunculus gelidus	tundra buttercup	G4G5	S2
Sullivantia hapemanii var. *purpusii*	hanging garden sullivantia	G3T3	S3
INVERTEBRATES			
none documented			
PLANT COMMUNITIES			
Abies lasiocarpa-Picea engelmannii-Populus angustifolia	montane riparian forest	G3	S3
Abies lasiocarpa-Picea engelmanii/ Alnus incana	montane riparian forest	G3	S3?
Abies lasiocarpa-Picea engelmanii /Mertensia ciliata	montane riparian forest	G5	S5
Abies lasiocarpa/ Rubus parviflorus	subalpine forest	G5	S2
Artemisia tridentata vaseyana/ Carex geyeri	west slope sagebrush shrubland	G3	SU
Artemisia tridentata vaseyana/ Symphoricarpos oreophilus/ Agropyron tracycaulum	west slope sagebrush shrubland	G3G4	S3S4
Carex aquatilis/Carex utriculata	montane wet meadow	G4	S4
Picea pungens/Alnus incana	montane riparian forest	G3	S3
Picea pungens/Cornus sericea	montane riparian forest	G3	S3
Pinus edulis-Juniperus osteosperma /Stipa comata	xeric western slope pinyon-juniper woodland	GU	SU
Populus angustifolia - Picea pungens/ Alnus incana	montane riparian forest	G3	S3
Populus angustifolia-Pseudotsuga menziesii	montane riparian forest	GU	S2
Populus angustifolia/ Alnus incana	montane riparian forest	G3	S3
Populus angustifolia /Betula occidentalis	montane riparian forest	G3	S2
Populus angustifolia/ Cornus sericea	cottonwood riparian forest	G4	S3
Populus angustifolia/ Prunus virginiana	narrowleaf cottonwood/common chokecherry	G2?	S1?
Populus angustifolia-Pseudotsuga menziesii	montane ripanian forest	GU	S2
Pseudotsuga menziesii/ Carex geyeri	lower montane forest	G5Q	S3
Pseudotsuga	lower montane riparian	G4	S2

menziesii/Cornus sericea	forest		
Pseudotsuga menziesii/Quercus gambelii	Douglas fir forest	G5	S3S4
Quercus gambellii-Amelanchier utahensis	mixed mountain shrubland	G3G5	S2
Quercus gambelii-Cercocarpus montanus/ Carex geyeri	mixed mountain shrubland	G3	S3
Quercus gambelii/ Symphoricarpos oreophilus	mixed mountain shrubland	G5	S3S4
Salix drummondiana/ Calamagrostis canadensis	lower montane willow carr	G3	S3
Salix drummondiana Carex utriculata	montane willow carr	GU	S3
Salix planifolia/ Calamagrostis canadensis	subalpine riparian willow carr	G4	S4
Salix planifolia/ Caltha leptosepala	subalpine riparian willow carr	G4	S4
Salix planifolia /Deschampsia cespitosa	subalpine riparian willow carr	G3	S3
Salix monticola/ Calamagrostis canadensis	montane willow carr	G3	S3

In addition, there have been numerous sightings of boreal toads (*Bufo boreas* pop. 1) throughout the Roaring Fork watershed in the past few years (Table 5). These reports are observations of adult toads. CNHP maintains information in the BCD and creates PCAs only for breeding sites of the boreal toad. These non-breeding observations are important for targeting inventory as well as evaluation of the distribution of this toad.

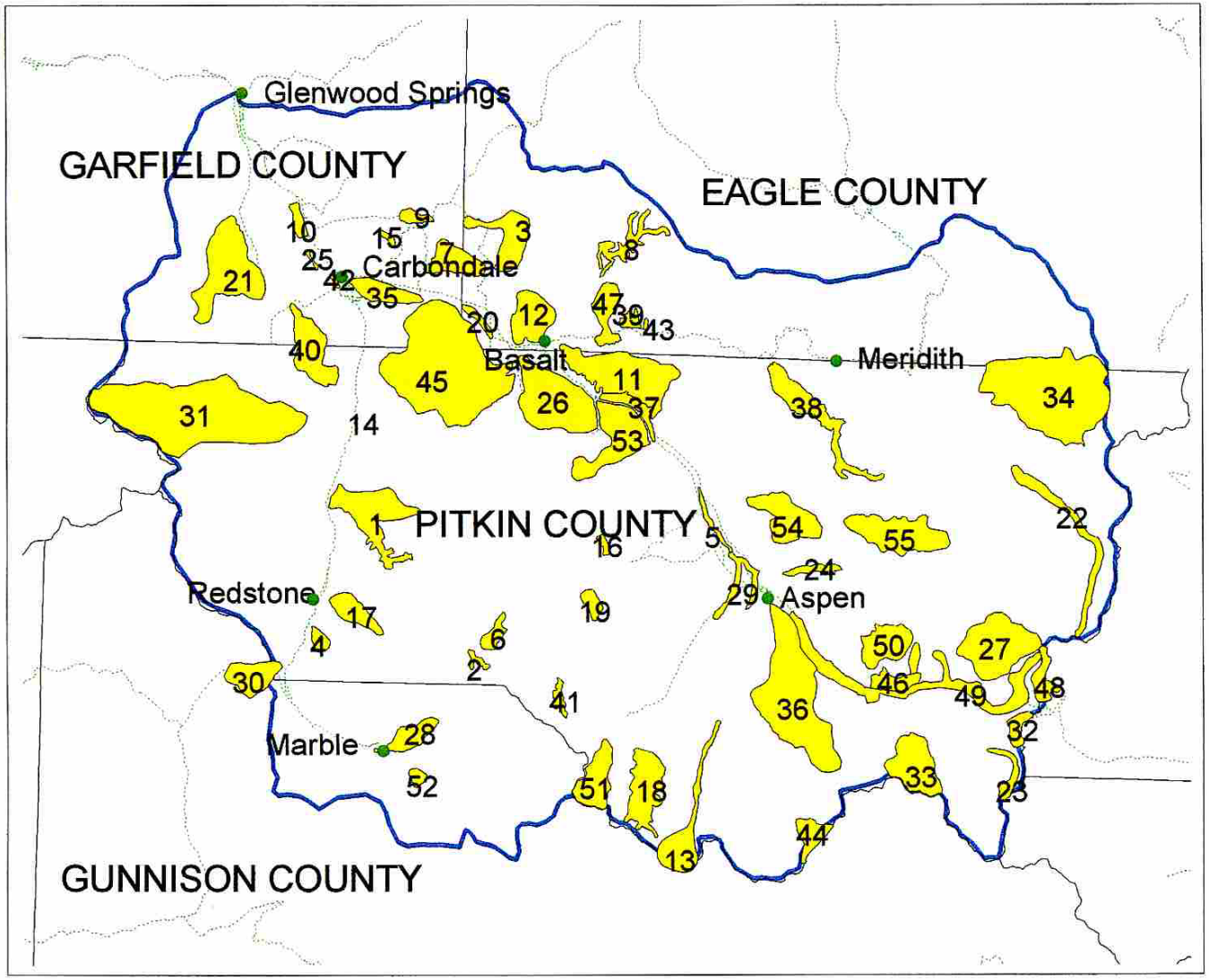
Table 5. Observations of adult boreal toads (*Bufo boreas* pop 1) in the Roaring Fork Watershed

date of observation	number of boreal toads	location
September 5, 1998	1 adult	Pitkin Co. Roaring Fork River, North Star Nature Preserve. 8,035 feet.
August 3, 1998	2	Pitkin Co. Snowmass Creek, approximately 1 – 2 miles below Snowmass Lake. 10,100 feet.
July 25, 1998	1	Pitkin Co. Snowmass Lake. 10,980 feet.
August 25, 1997	1 adult	Pitkin Co. Fryingpan River, Twin Meadows above Chapman. 9400 feet.
July 13, 1997	1	Pitkin Co. Approximately 5.5 miles up trail from Snowmass Falls Ranch trailhead. 10,000 feet.
June 16, 1997	1	Pitkin Co. Approximately 4 miles from East Maroon trailhead, 1 mile past wilderness boundary. 9,200 feet.
August 1995	2 adults	Pitkin Co. Lincoln Creek and Galena Creek. 11,000 feet
July 30, 1995	1 adult	Pitkin Co. Buckskin Pass. Forest Service trail 1975 on Snowmass Creek. 10,800 feet.

Table 6. Roaring Fork Watershed Potential Conservation Areas
The following PCAs were identified during the 1997-1999 Roaring Fork Watershed Biological Inventory. The Biodiversity Significance, Protection Urgency, and Management Urgency Ranks are included (see pages 10-17 for rank definitions). PCAs are listed in approximate order for conservation attention.

PCA Name	Biodiversity Rank	Protection Urgency Rank	Management Urgency Rank
Maroon-Castle Creek	B2	P2	M1
Upper Roaring Fork River	B2	P3	M2
Avalanche Creek	B2	P3	M3
Middle Thompson Creek	B2	P3	M3
Taylor Pass	B2	P3	M3
Twining Peak	B2	P4	M2
The Crown	B2	P4	M3
Warren Peak	B2	P4	M3
New York Creek	B2	P4	M4
Woody Creek Headwaters	B2	P4	M4
Roaring Fork River at Brush Creek	B3	P2	M1
Lost Trail Creek	B3	P2	M2
Roaring Fork at Old Snowmass	B3	P2	M3
Williams Hill	B3	P2	M3
North Fork Fryingpan	B3	P3	M2
Smith Gulch	B3	P3	M3
West Maroon Creek	B3	P3	M3
Cerise Gulch	B3	P3	M3
The Grottos	B3	P4	M1
Mountain Boy Park	B3	P4	M2
Conundrum Creek	B3	P4	M3
East Maroon Creek	B3	P4	M3
East Snowmass Creek	B3	P4	M3
Lost Man Creek	B3	P4	M3
McClure Pass	B3	P4	M3
Grizzly Creek	B3	P4	M3
Snowmass Creek at Snowmass Peak	B3	P4	M3
Light Hill	B3	P4	M3
Fryingpan River	B3	P4	M4
Rocky Fork Creek	B3	P4	M4
Whitehouse Mountain	B3	P4	M4
Capitol Peak	B3	P4	M4
Big Kline Creek	B3	P4	M4
Missouri Heights	B4	P1	M1
Crystal Springs Road	B4	P1	M2
Crystal River at Potato Bill Creek	B4	P1	M2
Cattle Creek at Coulter Creek	B4	P2	M1
Fourmile Creek at Sunlight	B4	P2	M2
Toner Creek	B4	P2	M2
Woody Creek at Horseshoe Draw	B4	P2	M2

Hunter Creek	B4	P2	M3
Ranch at the Roaring Fork	B4	P3	M2
El Jebel	B4	P3	M3
Basalt Mountain	B4	P3	M3
Christine State Wildlife Area	B4	P4	M3
East Creek	B4	P4	M3
Taylor Creek	B4	P4	M3
Roaring Fork River at Cattle Creek	B5	P1	M1
Kaiser Stevens Ditch	B5	P3	M3
Seven Castles	B5	P3	M4
Richmond Hill	B5	P4	M2
Sutank	B5	P4	M2
Avalanche Lake	B5	P4	M3
Cattle Creek	B5	P4	M4
Eagle Mountain	B5	P4	M4



PCA NAME
1. AVALANCHE CREEK
2. AVALANCHE LAKE
3. BASALT MOUNTAIN
4. BIG KLINE CREEK
5. ROARING FORK RIVER AT BRUSH CREEK
6. CAPITOL PEAK
7. MISSOURI HEIGHTS
8. CATTLE CREEK
9. CATTLE CREEK AT COULTER CREEK
10. ROARING FORK RIVER AT CATTLE CREEK
11. CERISE GULCH
12. CHRISTINE STATE WILDLIFE AREA
13. CONUNDRUM CREEK
14. CRYSTAL RIVER AT POTATO BILL
15. CRYSTAL SPRINGS ROAD
16. EAGLE MOUNTAIN
17. EAST CREEK
18. EAST MAROON CREEK
19. EAST SNOWMASS CREEK
20. EL JEBEL
21. FOURMILE CREEK AT SUNLIGHT
22. FRYINGPAN RIVER
23. GRIZZLY CREEK
24. HUNTER CREEK
25. KAISER STEVENS DITCH
26. LIGHT HILL
27. LOST MAN CREEK
28. LOST TRAIL CREEK
29. MAROON-CASTLE CREEK
30. MCCLURE PASS
31. MIDDLE THOMPSON CREEK
32. MOUNTAIN BOY PARK
33. NEW YORK CREEK
34. NORTH FORK FRYINGPAN
35. RANCH AT THE ROARING FORK
36. RICHMOND HILL
37. ROARING FORK AT OLD SNOWMASS
38. ROCKY FORK CREEK
39. SEVEN CASTLES
40. SMITH GULCH
41. SNOWMASS CREEK AT SNOWMASS PEAK
42. SUTANK
43. TAYLOR CREEK
44. TAYLOR PASS
45. THE CROWN
46. THE GROTTOS
47. TONER PEAK
48. TWINING PEAK
49. UPPER ROARING FORK RIVER
50. WARREN PEAK
51. WEST MAROON CREEK
52. WHITEHOUSE MOUNTAIN
53. WILLIAMS HILL
54. WOODY CREEK AT HORSESHOE DRAW
55. WOODY CREEK HEADWATERS

4 0 4 8 Miles

N W E S

Towns
Counties
Highways
Watershed

Figure 1: Potential Conservation Areas in the Roaring Fork Watershed

Figure 1: Roaring Fork Watershed Potential Conservation Areas

PCA Profile Explanation

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

Biodiversity Rank (B-rank): The overall significance of the PCA in terms of rarity of the Natural Heritage resources and the quality (condition, abundance, etc.) of the occurrences. Please see pages 10-17 for the definitions of the ranks.

Protection Urgency Rank (P-rank): An estimate of the time frame in which conservation protection should occur. This rank generally refers to the need for a major change of protective status (e.g., ownership or designation as a natural area). Please see pages 10- 17 for the definitions of the ranks.

Management Urgency Rank (M-rank): An estimate of the time frame in which conservation management should occur. Using best scientific estimates, this rank refers to the need for management in contrast to protection (legal, political, or administrative measures). See pages 10- 17 for the definitions of the ranks.

Location: General location and specific 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 Rank Justification: A summary of major land ownership issues that may affect the PCA and the element(s) in the PCA.

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

Roaring Fork Watershed Potential Conservation Areas

Maroon-Castle Creek

Biodiversity Rank: B2 Very high significance
Six plant community occurrences, including an excellent occurrence of a globally-vulnerable lower montane willow carr, are within this PCA.

Protection Urgency Rank: P2
This PCA is entirely on private land and the threat of residential and recreational development is expected.

Management Urgency Rank: M1
Management is essential to prevent loss or quality of elements at this PCA. Recommended management actions include restricted access to the river for recreational activities, exotic plant removal, and a road maintenance management plan. Water quality, quantity, and flooding should not be significantly altered. Management plans should include consideration of the hydrology of the entire upstream watershed that is not contained in the PCA.

Location: Pitkin County. Small portions of Castle Creek, Maroon Creeks, and the Roaring Fork River are included and lie immediately west of Aspen.
Legal Description: U.S.G.S. 7.5 minute Aspen quadrangle. T10S R85W S 1, 2, 11-15, 22. T9S R85W S35.

General Description: The headwaters of Castle and Maroon Creek begin at Castle Peak (14,265 feet) and the Maroon Peaks (14,014 feet and 14,156 feet) respectively. Both creeks flow northward toward Aspen and drain into the Roaring Fork River on the northeast edge of town. This PCA incorporates 1137 acres including narrow riparian zones on portions of Castle and Maroon Creeks and the Roaring Fork River. These riparian areas support four significant plant communities dominated by blue willow (*Salix drummondiana*), narrowleaf cottonwood (*Populus angustifolia*) or blue spruce (*Picea pungens*). The highest elevations of the PCA occur at approximately 8000 feet in two parallel narrow canyons with rocky cliffs and red sandstone derived soils. At the lower elevations the PCA opens into the Roaring Fork Watershed, at 7600 feet. This lower portion of the PCA is degraded and surrounded by residential development associated with the town of Aspen, a golf course, and the Aspen Highlands Ski Area. Roads associated with the above activities are plentiful and parallel the riparian areas within the PCA.

Biodiversity Rank Justification: This PCA includes six occurrences of two globally-vulnerable and two state-vulnerable plant communities with degraded conditions at lower elevations and higher quality conditions at higher elevations. The most significant occurrence within this PCA is a lower montane willow carr in excellent condition. This plant community is known from 19 locations in 8 counties in Colorado. This is the only occurrence of this particular willow association documented in the Roaring Fork Watershed. A small population of an orchid

subspecies that is thought to be vulnerable on a global scale and is rare in Colorado was also documented in this PCA.

Natural Heritage element occurrences at the Maroon-Castle Creek PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix drummondiana/ Calamagrostis canadensis	**lower montane willow carr**	**G3**	**S3**				**A**
Populus angustifolia-Picea pungens/ Alnus incana	Rocky Mountain riparian forest	G3	S3				B
Populus angustifolia-Picea pungens/ Alnus incana	Rocky Mountain riparian forest	G3	S3				C
Populus angustifolia-Picea pungens/ Alnus incana	Rocky Mountain riparian forest	G3	S3				B
Platanthera sparsiflora var. *ensifolia*	canyon bog-orchid	G4G5 T3?	S2				C
Populus angustifolia/ Cornus sericea	cottonwood riparian forest	G4	S3				C
Populus angustifolia-Pseudotsuga menziesii	montane riparian forest	GU	S2				B

*EO=Element Occurrence

Boundary Justification: The boundary encompasses the riparian communities and a very narrow buffer along the creeks to protect from direct disturbances. A much larger area, including the full watershed of both creeks needs to be considered when a plan is developed for the long-term viability of the communities of concern. Narrowleaf cottonwoods require periodic, above average, floods usually in June for seed germination and survival. Therefore, it is important to maintain a natural flooding regime.

Protection Rank Justification: This PCA is entirely on private land in an area that is seeing rapid changes resulting from residential and recreational developments.

Management Rank Justification: This PCA includes a small segment of the Roaring Fork River between Maroon and Castle Creeks and the lower portions of these creeks. The PCA is surrounded by the town of Aspen, a golf course, and the Aspen Highlands Ski Area. A bike path parallels the Roaring Fork through this segment and creates a very narrow riparian area. All of these developments are choked with exotic plant species that are moving into the riparian zone. These weeds should be controlled. Activities such as fishing and other recreation, should be limited or restricted. The roads and paths that parallel the creeks/river should not be expanded. Maintenance associated with these traffic ways can detrimentally affect (i.e., sedimentation,

fragmentation) the aquatic and plant communities. These factors should be considered in a management plan for this area. Water quality, quantity, and flooding should not be significantly altered. Management plans should include the hydrology of the entire upstream watershed that is not contained in the PCA.

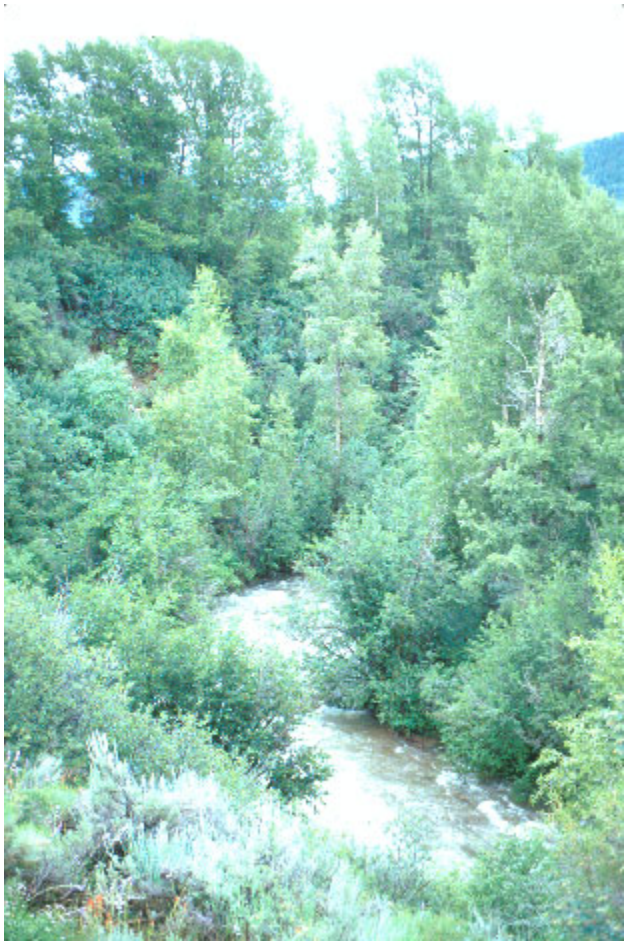
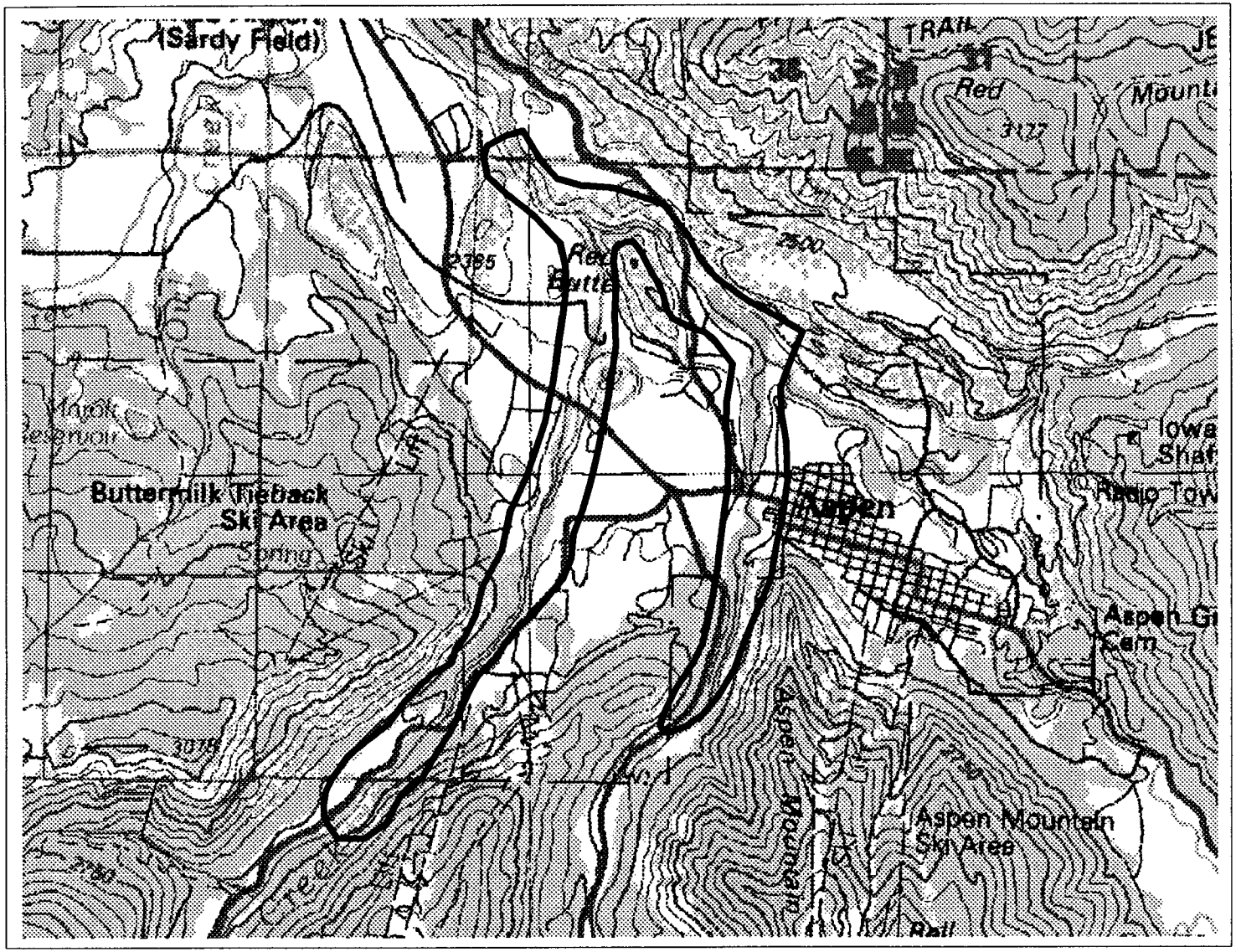
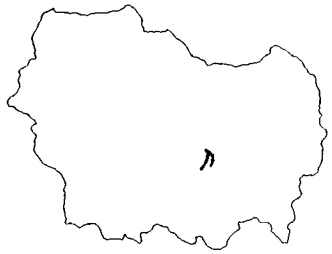


Photo 1: Photo taken at the Maroon-Castle Creek PCA showing one of the significant riparian areas dominated by narrowleaf cottonwood (*Populus angustifolia*).





Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

Natural Heritage Program
COLORADO

Maroon-Castle Creek Potential Conservation Area

Upper Roaring Fork River

Biodiversity Rank: B2 Very high significance
This stretch of the Roaring Fork River includes 29 element occurrences of seven plant communities, three mammals, one fish, one amphibian, and eight bird species. Most notably, there is an excellent occurrence of a montane riparian forest.

Protection Urgency Rank: P3
The lower elevation private lands of this PCA are threatened by residential development. The upper elevations are publicly owned, but recreational development pressures are high.

Management Urgency Rank: M2
Management is needed immediately within Difficult Creek Campground and Northstar Preserve. Management recommendations to consider include recreation restrictions and the implementation of exotic plant eradication programs.

Location: Pitkin County. East of Aspen on the Roaring Fork River to the headwaters.
Legal Description: U.S.G.S. 7.5 minute Aspen, Hayden Peak, Thimble Rock, New York Peak, Mount Champion, Independence Pass quadrangles. T10S R84W S 17, 19, 20, 21, 28, 29, 33, 34, 35. T10S R82W S 28, 29, 31-33. T11S R83W 1-6, 11, 12. T11S R84W S1-3, 12. T11S R82W S 5-8. T10S R83W S27-29, 32-35.

General Description: The Upper Roaring Fork River PCA contains a fifteen mile stretch from the headwaters of the Roaring Fork River to Aspen, that includes alpine, subalpine, and montane riparian systems. The stretch spans between 8000 and 12,490 feet and includes 6851 acres. The following descriptions include details of smaller portions within the PCA.

Northstar lies between Aspen, Smuggler Mountain, and Bell Mountain and consists of several diverse habitats, including haymeadows, sedge (*Carex* spp.) meadows, willow (*Salix* spp.) carrs, and narrowleaf cottonwood (*Populus angustifolia*) dominated riparian areas. This area is known to support a rich diversity of bird species.

The Difficult Creek area can be divided into two sections. The lower section includes a campground with a low gradient stream and is somewhat degraded due to several trails. This section is characterized by a montane willow carr (*Salix monticola-S. geyeriana/Calamagrostis canadensis*), as well as narrowleaf cottonwood-Douglas fir (*Populus angustifolia-Pseudotsuga menziesii*) and narrowleaf cottonwood-blue spruce (*Populus angustifolia-Picea pungens*) communities in the riparian area. Upstream from the campground the condition of the PCA is greatly improved. Douglas fir, subalpine fir (*Abies lasiocarpa*) and narrowleaf cottonwood with rocky mountain maple (*Acer glabrum*) and serviceberry (*Amelanchier* sp.) dominate the riparian area. Adjacent to this, the vegetation is dominated by aspen (*Populus tremuloides*) and buckbrush (*Ceanothus* sp.). The uplands in this area include oceanspray (*Holodiscus discolor*)

on the north-facing slopes and Engelmann spruce-subalpine fir (*Picea engelmannii-Abies lasiocarpa*) on the south-facing slopes.

Further upstream, the riparian area is dominated by willow carrs. Other than a few anthropogenic disturbances such as a ditch, a picnic area and a historical display, this portion of the PCA is in pristine condition. The uplands are dominated by *spruce-fir (Picea engelmannii-Abies lasiocarpa)* and are crossed by several dramatic avalanche paths.

Biodiversity Rank Justification: The Upper Roaring Fork River PCA supports not only a plethora of elements of biodiversity concern (29 element occurrences: 16 plant community occurrences of seven plant communities, three mammals, one fish, one amphibian, and nine bird species occurrences), but also is the longest stretch of relatively pristine riparian vegetation observed on the Roaring Fork River. The most significant element within this PCA is an excellent example of a narrowleaf cottonwood-blue spruce/alder (*Populus angustifolia-Picea pungens/Alnus incana*) community. This riparian forest is known from 71 locations in Colorado, however, only 15 of these are considered to be in excellent condition.

Shrew specimens were taken at two locations within this PCA during the 1997 field surveys. Long-tailed shrews are difficult to discern at the species level, and identification is generally only accurately accomplished with cranial (skeletal) analysis. The specimens have been sent to an expert in New Mexico to be verified. The preliminary external measurements and dental characteristics indicate Preble's shrew (*Sorex* c.f. *preblei*) and Merriam's shrew (*Sorex merriami*) are among the specimens captured. The Preble's shrew is typically a species of the upper Great Basin and Columbian Plateau, where habitats are generally described as semi-arid shrublands, including sagebrush, grasslands, alpine tundra, and sagebrush openings in subalpine forest (Hoffman and Fisher 1978; Fitzgerald et al. 1994). In Colorado, there are only three locations documented. Merriam's shrew is globally common occurring in shrublands from the southwestern U.S. to the Pacific Northwest. In Colorado, this species occurs in the northwest and southwest corners of the state and along the foothills region of the Front Range (Armstrong 1972; Fitzgerald et al. 1994). In general, there is little known about shrews in Colorado. It is expected that most of them are more common than the current information reflects.

Additionally, there is a historic report of a lynx (*Lynx canadensis*) in the "Independence Pass" area. Lynx, like other wide-ranging carnivores, need a very large, mostly undisturbed area for their home range. This large area is not incorporated into this potential conservation area, but the lynx should be considered as an important historical element in this area.

Natural Heritage element occurrences at the Upper Roaring Fork River PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Abies lasiocarpa-Picea engelmannii-Populus angustifolia	montane riparian forest	G3	S3				B
Populus angustifolia-Picea pungens/ Alnus incana	**montane riparian forest**	**G3**	**S3**				**A**
Abies lasiocarpa-Picea engelmannii/ Alnus incana	montane riparian forest	G3	S3?				B
Abies lasiocarpa-Picea engelmannii/ Alnus incana	montane riparian forest	G3	S3?				B
Salix planifolia/ Calamagrostis canadensis	subalpine riparian willow carr	G4	S4				A
Salix planifolia/ Caltha leptosepala	subalpine riparian willow carr	G4	S4				A
Salix planifolia/ Caltha leptosepala	subalpine riparian willow carr	G4	S4				A
Salix planifolia/ Caltha leptosepala	subalpine riparian willow carr	G4	S4				A
Salix planifolia/ Caltha leptosepala	subalpine riparian willow carr	G4	S4				A
Salix planifolia/ Caltha leptosepala	subalpine riparian willow carr	G4	S4				B
Salix planifolia/ Caltha leptosepala	subalpine riparian willow carr	G4	S4				B
Oncorhynchus clarki pleuriticus	Colorado River cutthroat trout	G4T3	S3		SC	FS	E
Lynx canadensis	lynx	G5	S1	C	E		H
Sorex c.f. *preblei*	Preble's shrew	G5	S1?				E
Abies lasiocarpa/ Rubus parviflorus	subalpine forest	G5	S2				A
Rana pipiens	northern leopard frog	G5	S3		SC	FS	H
Sorex merriami	Merriam's shrew	G5	S3				E
Contupus borealis	olive-sided flycatcher	G5	S3 S4				E
Porzana carolina	sora	G5	S3 S4B, SZN				E
Pandion haliaetus	osprey	G5	S3B, SZN				H
Ardea herodias	great blue heron	G5	S3B, SZN				D
Podiceps nigricollis	eared grebe	G5	S3B, SZN				E
Accipiter striatus	sharp-shinned hawk	G5	3S4E S4N				E

Accipiter cooperii	Cooper's hawk	G5	3S4E S4N				E
Accipiter cooperii	Cooper's hawk	G5	3S4E S4N				E
Abies lasiocarpa-Picea engelmannii /Mertensia ciliata	montane riparian forest	G5	S5				A
Abies lasiocarpa-Picea engelmannii/ Mertensia ciliata	montane riparian forest	G5	S5				A
Abies lasiocarpa-Picea engelmannii/ Mertensia ciliata	montane riparian forest	G5	S5				A

*EO=Element Occurrence

Boundary Justification: This PCA includes 15 miles of excellent quality riparian communities and includes seven plant communities of special concern. A buffer of approximately 1000 feet from the riparian vegetation was included to protect from direct disturbances such as road maintenance and development that change the overland water flow. Foraging and potential breeding habitat at the lower elevations are included to support nine of the species of state-rare birds. A much larger area should be considered to protect the specific hydrologic regime (water quality and natural flooding) of this PCA. Narrowleaf cottonwoods require periodic, above average, floods usually in June for seed germination and survival. Therefore, it is important to maintain a natural flooding regime.

Protection Rank Justification: This PCA is publicly owned and is managed by the White River National Forest with the exception of the Northstar Preserve. There are several small private inholdings at the lower elevations. The U.S. Forest Service is working to exchange these inholdings to incorporate the private properties into the public land or into the Northstar Preserve. Recreational development for ski areas, additional campgrounds, widening of Highway 82, the proposed Old Stage Road Trail from Aspen to the top of Independence Pass, and the continuation of the East of Aspen Trail may threaten habitat in the future.

The Northstar Preserve (175 acres) is owned by Pitkin County, and has been managed by the Aspen Center for Environmental Studies since 1984. This area was purchased by The Nature Conservancy in 1977 and was then bought by Pitkin County in 1978.

Management Rank Justification: In general, problems associated with Highway 82, the three campgrounds, and the numerous trails in this PCA are common problems to the entire PCA.

Highway 82, which parallels the Roaring Fork River for the entire length of this PCA, provides a conduit for the spread of exotic plant species. Also, sedimentation from road maintenance is detrimental to the riparian area. These factors degrade the quality of the communities and interfere with the natural hydrological setting. These problems should be considered during

proposals such as widening Highway 82 or extending the East of Aspen Trail. The highway is closed above Difficult Creek in the winter, so winter road maintenance is not an issue. However, snow removal in the spring may cause problems associated with increased erosion. In general, new trails and roads in this area should be discouraged and the current roads and trails should be managed for low impacts to the natural systems.

The Eared Grebe *(Podiceps nigricollis)* and Sora (*Porzana carolina)* in particular require high quality water habitats. A natural hydrologic regime throughout this PCA is important to maintain the native vegetation and the elements of concern. Ski areas above this PCA, along with water manipulations, such as the dam on Tagert's Lake, may be altering important hydrologic conditions. The water quality, quantity, and natural flooding should not be significantly altered. Hydrologic considerations should extend beyond the PCA boundaries to the entire watershed.

Within the Difficult Creek Campground a well-marked trail should be constructed along the Roaring Fork River for fishing and hiking access. The current web of trails should be reduced to one or two well-designed trails and the previously impacted areas should be restored, especially near the campground. Exotic plant species, including Kentucky blue grass *(Poa pratensis)*, orchard grass (*Dactylis glomerata)*, and houndstongue (*Cynoglossum officinale*), should be discouraged from spreading. One of the best defenses against the spread of exotics is to discourage future roads and trails.

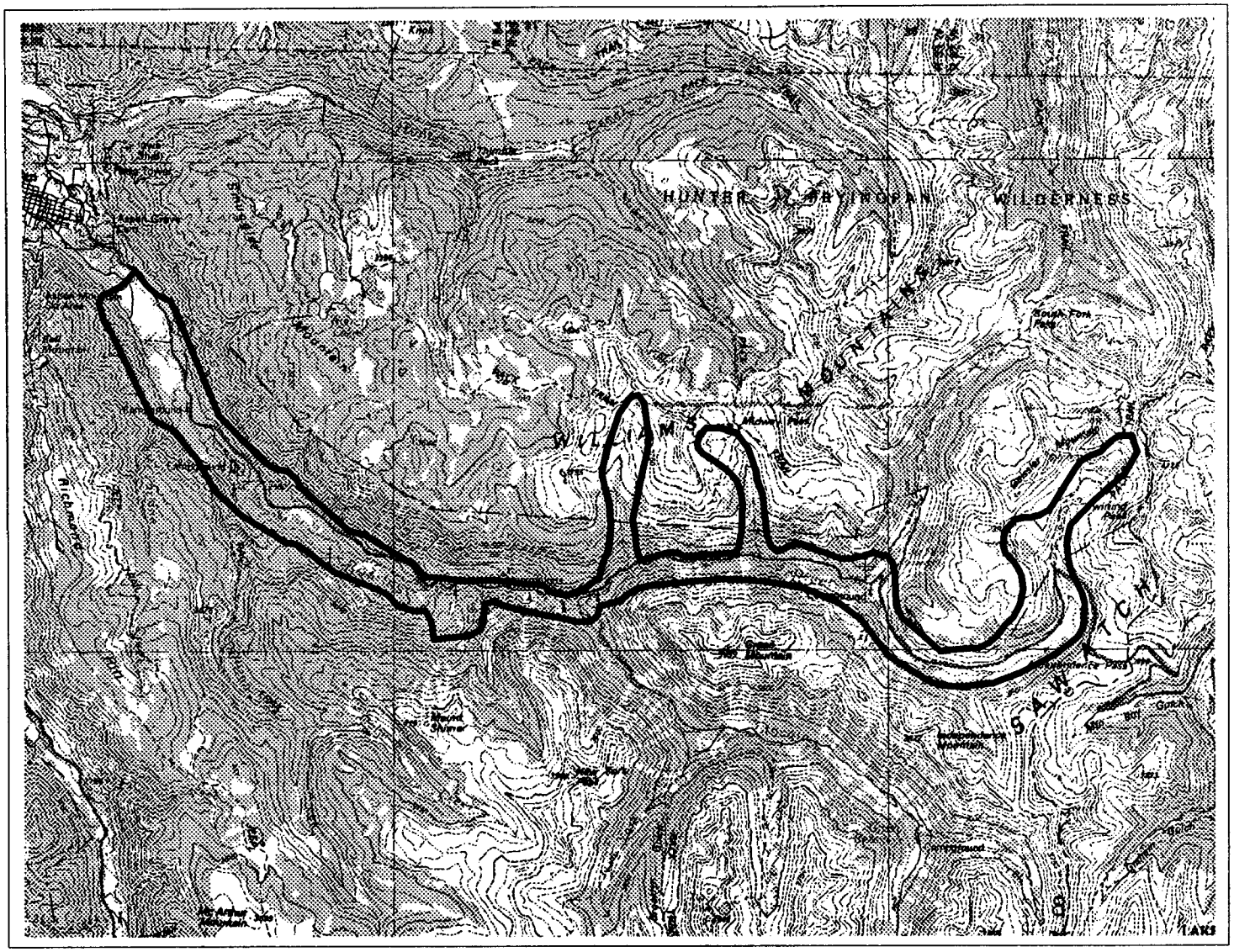
A management plan for the Northstar Preserve has been developed to sustain the ecosystem and provide enjoyment for the people (Design Workshop, Inc. 1989). This management plan addresses relevant issues and provides effective guidance for the long-term survival of the elements. Currently, this management plan has not been adopted. A management plan should be finalized and implemented as soon as possible. Special attention should be paid to the effects from paragliders and off trail recreation. Expansion of the bike path may destroy adjacent habitat, which should be considered before construction. The wetland habitat within the Northstar Preserve is important for the sora, which relies on this area for breeding, migration, and wintering habitats (Melvin and Gibbs 1996).

Additional management considerations for this PCA include: the Lost Man, Grottos, and Braille trails; Warren Lake and Lost Man campgrounds; and the Independence townsite. Recreation activities should be restricted to current trails. Expansion of the trails, parking areas, and campgrounds should be discouraged. Of specific concern is the Lost Man trail. It is adjacent to the Roaring Fork River headwaters and is commonly wet, causing hikers to widen the trail considerably with new routes. Trail maintenance would prevent this widening.

Great Blue Herons (*Ardea herodias*) are known to abandon nests and colonies with increased visits by humans and with road building and logging activity. The responses of birds to disturbance greatly depends on the time of breeding season. A minimum buffer of 300 meters is recommended where no human activity should take place during courtship and nesting seasons (Butler 1992). In this area, Great Blue Heron courtship and nesting occurs mid April through

July. Timbering and heavy grazing have been documented to decrease the reproductivity of the Cooper's Hawk (*Accipiter cooperii*) (Rosenfield and Bielefeldt 1993). These activities should be limited near the nests of this species.

Photo 2: Photo showing the higher elevations of the Upper Roaring Fork River PCA.



Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

Natural Heritage Program
COLORADO

Upper Roaring Fork River Potential Conservation Area

Avalanche Creek

Biodiversity Rank: B2 High biodiversity significance
This PCA contains an excellent occurrence of a plant community that is vulnerable on a global scale.

Protection Urgency Rank: P3
Most of the PCA is in Wilderness. However, the western end of the PCA is threatened by developments associated with recreational uses and mining for marble.

Management Urgency Rank: M3
Management actions are essential to prevent the loss of occurrences. Actions should include weed control and restoration efforts, and restricted recreation access.

Location: Pitkin County. Avalanche Creek and Bulldog Creek are included in the PCA. These drainages flow west into the Crystal River, just south of Mount Sopris, and north of the town of Redstone.

Legal Description: U.S.G.S. 7.5 minute Mount Sopris and Redstone quadrangles. T10S R87W S 6, 7. T10S R88W S1,2,3,11,12, T9S R88W S21-29,33-36, T9S R87W S19,30.

General Description: Affording spectacular views of Mount Sopris to the north, this PCA includes one of the most intact stretches of riparian vegetation along the lower elevations of the Crystal River drainage. The PCA includes approximately a five mile stretch of Avalanche Creek and an approximately three and a half mile stretch of Bulldog Creek. These creeks flow west from the Elk Mountains, and meet the Crystal River at about 6800 feet. The southern flanks of Mount Sopris, up to about 12,400, are also included in the PCA.

The riparian vegetation includes a mosaic dominated by narrowleaf cottonwood *(Populus angustifolia)*, blue spruce *(Picea pungens)*, and alder *(Alnus incana)*. Within this high quality riparian vegetation, the rare canyon bog orchid (*Limnorchis sparsiflora* var. *ensifolia*) was found in a few small patches, as well as one location of a globally-vulnerable globe-mallow (*Iliamna grandiflora*). It is possible that further research would discover additional orchid and globe-mallow occurrences in this PCA.

Adding to the significance of the riparian areas, Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus)* were documented in this drainage in 1993.

The adjacent upland areas support mixed shrublands on the south-facing slopes and Douglas fir *(Pseudotsuga menziesii)* forests on the north-facing slopes. The higher elevation areas in the PCA support spruce-fir *(Picea engelmannii-Abies lasiocarpa)* forests, and a small area of alpine vegetation on the south slope of Mount Sopris. An east-facing slope in the westernmost portion

of the PCA supports a globally significant shrubland dominated by oak *(Quercus gambelii)* and mountain mahogany *(Cercocarpus montanus)*.

An intermittent drainage that flows south into Bulldog Creek supports a multiple tiered waterfall that exceeds 50 feet in height. These waterfalls provide nesting habitat for the Black Swift (*Cypseloides niger*).

On the north bank of the river a two-track road and then a trail follows the river. Avalanche and Janeway Campgrounds are located in the western portion of the PCA. A total of 4672 acres are included within this PCA; the elevation range is approximately 6800 to 12,400 feet.

Biodiversity Rank Justification: This PCA supports an excellent example of a globally-vulnerable riparian plant community. This PCA is one of five locations in the Roaring Fork Watershed that supports a rare orchid subspecies and one of two known occurrences of the globe-mallow for the watershed. A breeding colony of Black Swifts was also discovered within this PCA. There are approximately 20 Black Swift colonies known in Colorado.

This PCA also includes a fair occurrence of a globally-vulnerable subspecies, the Colorado River cutthroat trout. This trout is a U.S. Forest Service Sensitive and State Special Concern species. The introduction of non-native trout species dating back to 1872 in Colorado is considered a primary cause for the decline in numbers and genetic purity of Colorado River cutthroat trout. The populations of Colorado River cutthroat trout that are still genetically intact are now priorities for conservation.

Natural Heritage element occurrences at the Avalanche Creek PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Populus angustifolia-Picea pungens/ Alnus incana	**montane riparian forest**	**G3**	**S3**				**A**
Quercus gambellii-Cercocarpus montanus/ Carex geyeri	mixed mountain shrubland	G3	S3				B
Iliamna grandiflora	large-flowered globe-mallow	G3?Q	S1				E
Platanthera sparsiflora var. *ensifolia*	canyon bog-orchid	G4G5 T3	S2				A
Oncorhynchus clarki pleuriticus	Colorado River cutthroat trout	G5T3	S3		SC	FS	C
Cypseloides niger	black swift	G4	S3B			FS	C
Pseudotsuga menziesii/Quercus gambelii	Douglas fir forest	G5	S3S 4				B

*EO=Element Occurrence

Boundary Justification: The boundary is drawn to include the seven occurrences and adjacent potential habitat up and down stream to allow the rare plants, birds and communities to move into suitable habitat over time. This area is intended to protect the occurrences from direct disturbances. The full drainage above the waterfall where the swift nest is located is included in the PCA. Hydrological processes originating outside the planning boundary, including water quality, quantity, and timing should be managed to maintain PCA viability. Narrowleaf cottonwoods require periodic, above average, floods usually in June for seed germination and survival. Therefore, it is important to maintain a natural flooding regime.

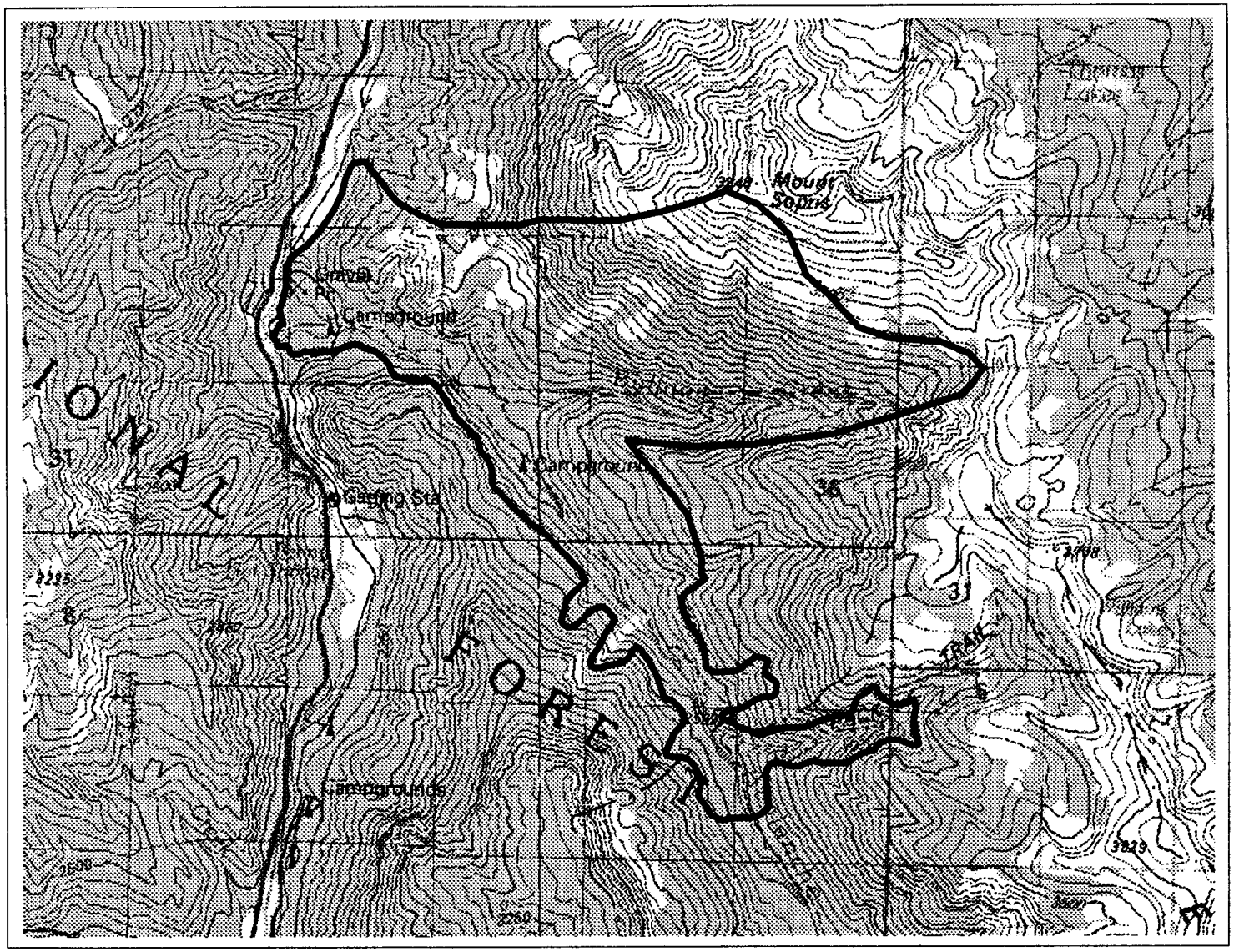
Protection Rank Justification: Most of the PCA is included in the Maroon Bells-Snowmass Wilderness managed by the White River National Forest.

Management Rank Justification: Horse grazing and packing may be the cause of the spread of exotic plant species, including hay grasses, houndstongue (*Cynoglossum officinale*), cheatgrass (*Bromus tectorum*), sweetclover (*Melilotus officinale*), oxeye-daisy (*Leucanthemum vulgare*), and plumeless and Canada thistle (*Carduus acanthoides* and *Cirsium arvense).* Negative effects resulting from domestic sheep grazing needs to be determined. Possible impacts to the native plant species compositon and the bighorn sheep populations should be considered. The elements should also be protected from road maintenance activities. Additional information is needed about the reproduction ecology of the canyon bog-orchid (*Platanthera sparsiflora* var. *ensifolia*) and the globe-mallow (*Iliamna grandiflora*) to enhance management objectives.

The Black Swift is a colonial nester and has a rather unique nesting biology. It has six nesting characteristics described by Knorr (1993) as: water, high relief (almost invariably), inaccessibility, darkness, unobstructed flyways, and niches in rock for nests. In the Roaring Fork watershed, waterfalls provide these conditions for nesting Black Swifts. The response of the Black Swifts to disturbance greatly depends on the time of breeding season. In Colorado, incubation usually begins in early July and fledging does not take place until mid-September (Knorr 1961).

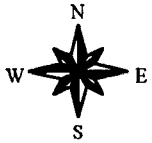
Additionally, a maternity roost of the western small-footed myotis (*Myotis ciliolabrum*) was discovered in a mine located on Bulldog Creek. This mine is currently open. If plans are made to close the mine, a bat-friendly gate should be used.

Photos 3 and 4: Photo taken at the Avalanche Creek PCA (bottom). The large flowered globe malow (*Iliamna grandiflora*, top) is one of the rare plant species that was documented in this PCA.



Location in the Roaring Fork Watershed

PCA boundary



Natural Heritage Program COLORADO

Avalanche Creek Potential Conservation Area

Middle Thompson Creek

Biodiversity Rank: B2 Very high biodiversity significance
An excellent occurrence of a globally-vulnerable riparian plant community is found within this PCA.

Protection Urgency Rank: P3
This PCA is publicly owned and managed by the U.S. Forest Service and the BLM. Recreational development is a definable threat to this PCA.

Management Urgency Rank: M3
Management actions are essential to prevent the loss of occurrences. Actions should include weed control and restricted recreation access.

Location: Pitkin County. South of Jerome Park.
Legal Description: U.S.G.S. 7.5 minute Stony Ridge and Quaker Mesa quadrangles. T8S R88W S31. T8S R90W S25-29, 32-36. T9S R88W S6, 7. T9S R90W S1-4, 11, 12. T8S R89W S20, 21, 25-36. T9S R89W S1-12.

General Description: The headwaters of Middle and North Thompson Creeks reach about 10,000 feet along the border of Pitkin and Mesa counties. The creeks flow east into Pitkin County from these headwaters for about 10 miles down to about 7000 feet at their confluence with Thompson Creek, about 3 miles upstream of where this full drainage meets the Crystal River. This area is characterized by rolling hills with open parks, ridges and summits, and mature riparian forests. The riparian vegetation includes a community of narrowleaf cottonwood with blue spruce and alder (*Populus angustifolia-Picea pungens/Alnus incana*) and supports a high diversity of other species including Douglas fir *(Pseudotsuga menziesii)*, mountain maple (*Acer glabrum*), thimbleberry (*Rubus parviflorum*), dogwood (*Cornus sericea*), mixed mesic forbs. The adjacent upland areas rise 200 feet above the floodplain and support Douglas fir on north-facing slopes, and pinyon-juniper (*Pinus edulis-Juniperus osteosperma*) woodlands and mixed shrublands containing bitterbrush (*Purshia tridentata*), snowberry (*Symphoricarpos rotundifolius*), oak *(Quercus gambelii)*, serviceberry (*Amelanchier* sp.), and mountain mahogany (*Cercocarpus montanus*) on the south-facing slopes. Additionally, this PCA supports a few scattered, very large ponderosa pines, and small patches of sagebrush (*Artemisia tridentata*) shrublands. The PCA contains rock outcrops of dark grey Mancos Shale and red sandstone of the Maroon Formation. A total of 17,413 acres are included within this PCA. The area immediately south of the eastern end of the PCA, including Assignation Creek and Assignation Ridge, has been evaluated as a potential Research Natural Area for the White River National Forest (Lyon 1995).

Biodiversity Rank Justification: This PCA includes one of the largest good condition riparian areas observed in the lower Crystal River/Roaring Fork Watershed. It supports an excellent

occurrence of a globally-vulnerable riparian plant community. This community has been documented in a total of 71 locations in Colorado, but only 15 of these are considered to be in excellent condition.

The Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) has been documented in this PCA. This subspecies is considered Sensitive by the U.S. Forest Service and is on the State Special Concern list. The greatest threat to the continued viability of Colorado River cutthroat trout is the introduction and migration of non-native fish species. Competition with brook trout and hybridization with rainbow trout are threats to this subspecies (Behnke 1992).

This PCA also includes a probable breeding location of a Boreal Owl (*Aegolius funereus*), a state-rare bird species. Boreal Owl nests are extremely difficult to find because they are located in tree cavities in dense forests. Furthermore, this resident species (living year-round in this area) is fairly local so it is very likely to be a breeding occurrence. There is also an occurrence of a Northern Goshawk (*Accipiter gentilis*) nest within this PCA.

A non-breeding observation of a boreal toad (*Bufo boreas* pop. 1) was made within this PCA. Breeding was not documented at this location, but is likely occurring in the area. Further inventory is needed to locate breeding sites.

Natural Heritage element occurrences at the Middle Thompson Creek PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Populus angustifolia- Picea pungens/ Alnus incana	**Montane riparian forest**	**G3**	**S3**				**A**
Oncorhynchus clarki pleuriticus	Colorado River cutthroat trout	G4T3	S3		SC	FS	B
Aegolius funereus	boreal owl	G5	S2			FS	E
Aegolius funereus	boreal owl	G5	S2			FS	E
Accipiter gentilis	northern goshawk	G5	S3B, SZN			FS	E

*EO=Element Occurrence

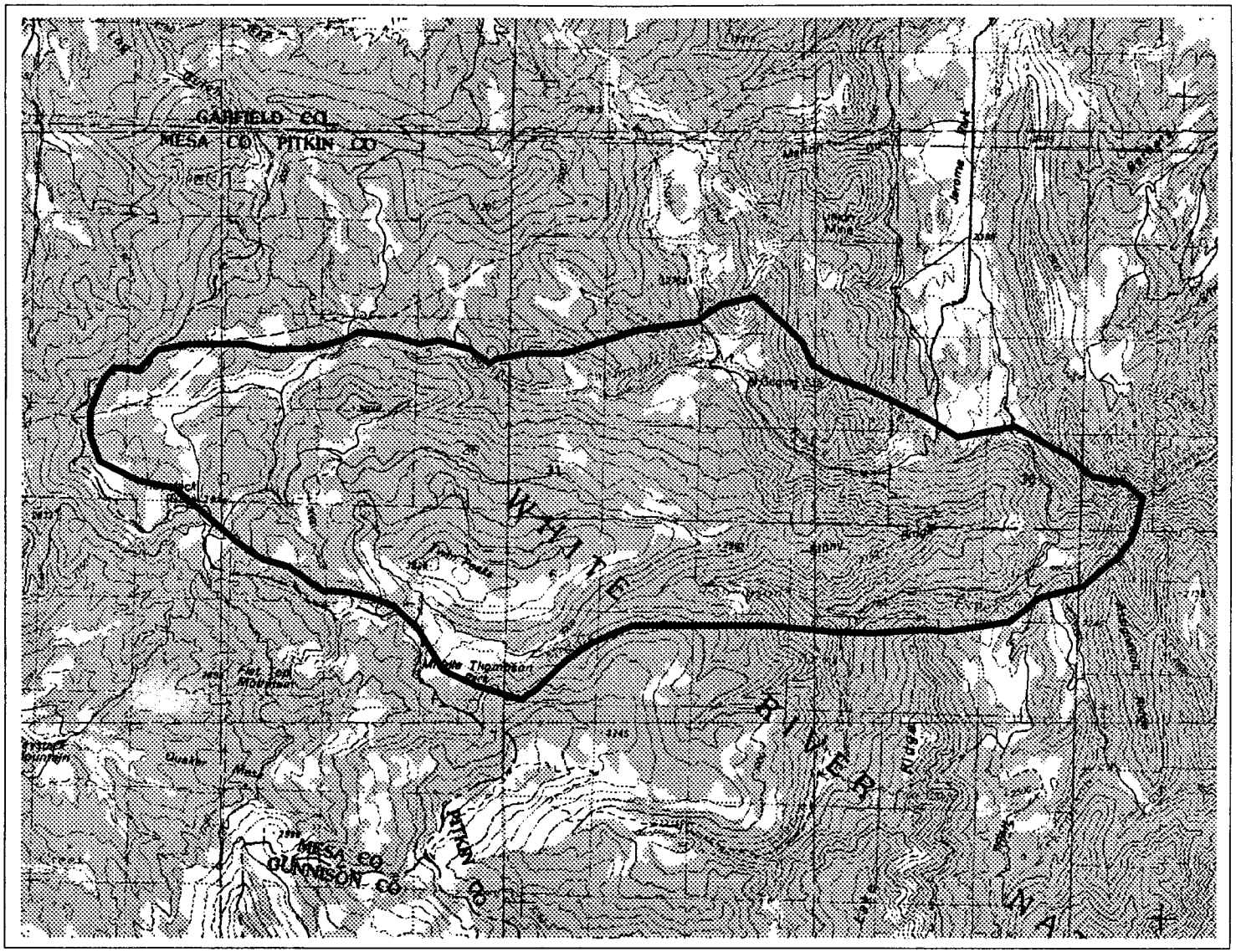
Boundary Justification: The boundary is drawn to include the occurrences and adjacent potential habitat up and down stream to allow the rare animals and communities to move into suitable habitat over time. This area is intended to act as a buffer for the occurrences and protect them from direct disturbances. Although the headwaters of Middle and North Thompson Creeks are included in the PCA, all of the side drainages are not included. Management goals should include consideration of the full watershed. Narrowleaf cottonwoods require periodic, above average, floods usually in June for seed germination and survival. Therefore, it is important to maintain a natural flooding regime.

Protection Rank Justification: This PCA includes lands that are managed by the BLM Glenwood Springs RA and the White River National Forest. There are mines on both creeks that could pose threats to the occurrences.

Management Rank Justification: There are several roads, trails, and a ditch that fragment the PCA and may contribute to the spread of exotic plant species such as dandilion (*Taraxicum officinale*), Kentucky blue grass (*Poa pratensis*), *Orchardgrass (Dactylis glomerata)*, and yellow sweet-clover (*Melilotis officinale*). During our visit in 1998 these non-natives were found only in fairly low cover, mostly along the roads in the lower elevations of the PCA. Some of the roads should be closed and revegetated or maintained as trails. The hydrology of the PCA should be maintained, including the human-made ditches and ponds that may be contributing to the persistence of some of the elements. A monitoring program should be established to detect changes in the overall quality or condition of the occurrences.

The Boreal Owl (*Aegolius funereus*) is a secondary cavity nester that frequently uses cavities originally created by woodpeckers. On National Forest lands, fire suppression is commonly practiced. This practice discourages development of habitat mosaics. These mosaics encourage potential Boreal Owl prey species (including white-footed mice, voles, and shrews) and provide woodpecker habitat. Boreal Owls will use nest boxes but suitable habitat is preferable.

Photo 5: A Northern Goshawk (*Accipiter gentilis*) nest was documented in the Middle Thompson Creek PCA.



Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

0.9 0 0.9 1.8 Miles

Middle Thompson Creek Potential Conservation Area

Taylor Pass

Biodiversity Rank: B2 Very high biodiversity significance
The biodiversity rank is based on a good occurrence of a globally imperiled plant.

Protection Urgency Rank: P3
This PCA is located on lands managed by the White River and Gunnison National Forests. Mining claims pose a potential threat to the occurrences. Recommended actions include following through with designation of RNA status.

Management Urgency Rank: M3
Recreational impacts need to be addressed to ensure the long-term protection of the occurrences.

Location: Pitkin and Gunnison counties. Taylor Pass to Taylor Peak in the Elk Mountains. Roughly 12 miles south of Aspen.
Legal Description: U.S.G.S. 7.5 minute Pearl Pass and Hayden Peak quadrangles. T12S R84W S8-10, 15-17, 20, 21.

General Description: The ridges south and west of Taylor Pass are characterized by alpine meadows, willow carrs, scree and talus slopes, and rock outcrops. Dominant species include krumholtz Engelmann spruce (*Picea engelmannii*), willows (*Salix brachycarpa and Salix nivalis*), alpine avens (*Geum rossii*), cinquefoil (*Potentilla* sp.), alpine buckwheat *(Bistort bistortoides*), grasses (*Poa alpina*), sedges (*Kobresia myosuroides*), fleabane (*Erigeron pinnatisectus*), and mountain dryad (*Dryas octopetala*). Ten rare plant species are found in this alpine setting. Most of the PCA is above timberline, though some subalpine areas at the top of the Express Creek drainage are included. Rock outcrops in the PCA show sedimentary layering and steep slopes are covered by talus. Stunning views are afforded of the Sawatch Range, Elk Range, and Taylor Park in the Gunnison Basin. A total of 1279 acres are included within this PCA, with an elevation range of about 11,000 to 13,500 feet.

Biodiversity Rank Justification: A good occurrence of a globally imperiled plant species, as well as nine other globally or state-rare species. This PCA includes the highest concentration of rare plant species found in the Roaring Fork Watershed and the only known location for alpine arnica (*Arnica angustifolia* ssp. *tomentosa*) in the state of Colorado.

Natural Heritage element occurrences at the Taylor Pass PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Machaeranthera coloradensis	**Colorado tansy-aster**	**G2**	**S2**				**B**
Astragalus molybdenus	Leadville milkvetch	G3	S2			FS	B
Draba crassa	thickleaf whitlow-grass	G3	S3				C
Draba globosa	rockcress draba	G3	S1				C
Erigeron lanatus	woolly fleabane	G3G4	S1			FS	E
Draba oligosperma	woods draba	G5	S2				B
Braya glabella	arctic braya	G5	S1			FS	E
Braya glabella	arctic braya	G5	S1			FS	E
Papaver kluanensis	alpine poppy	G5T3?	S3				E
Arnica angustifolia ssp. *tomentosa*	alpine arnica	G5T5	S1				E
Chinophila jamesii	snow lover	G3G4	S3S4				E

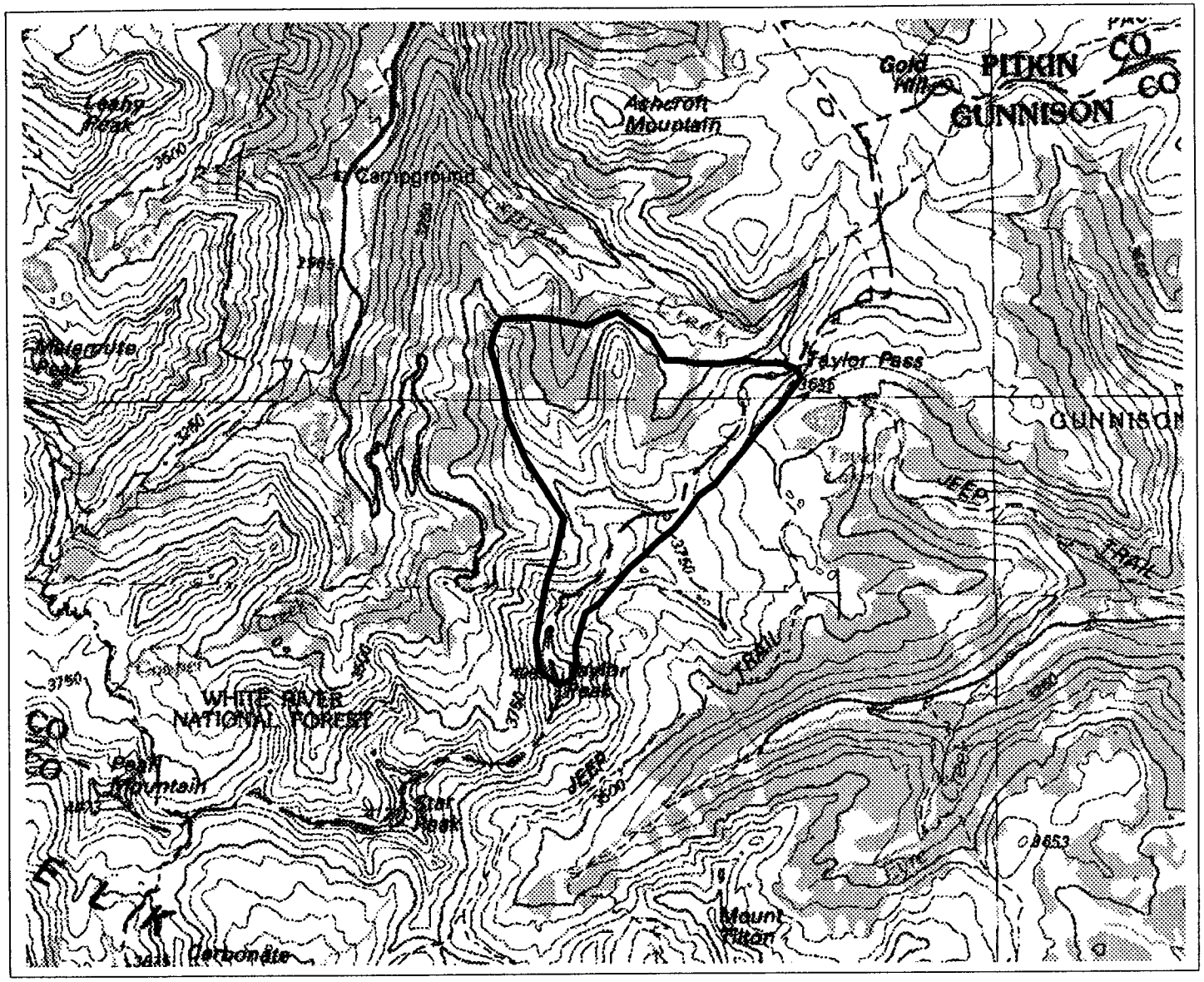
*EO=Element Occurrence

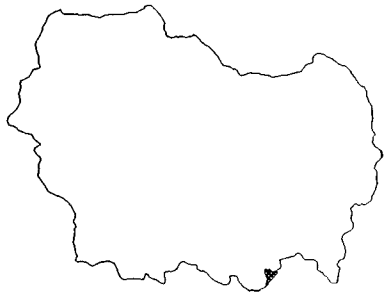
Boundary Justification: The boundary is drawn to include the occurrences and adjacent potential habitat along the alpine ridges to allow the rare plants to move into suitable habitat over time. This area is also likely to be sufficient in protecting the occurrences from direct disturbances and erosion.

Protection Rank Justification: This PCA is publicly owned and managed by the White River National Forest, contains small mining claims, and could be threatened by mining. There is a privately owned quarry in the southwestern part of the PCA, and other inactive mining claims in area. The status of the mining claims needs to be determined. An ecological evaluation was conducted in roughly this same area by CNHP for the White River and Gunnison National Forests to determine potential for RNA status (Lyon 1995).

Management Rank Justification: No exotic plants were observed in this PCA. Recreational uses including 4WD and ORV uses present a serious concern. Many jeep roads dissect the area. Some have been closed, but use of these routes has continued. Additional information is needed about the reproduction ecology of the rare plants to enhance management objectives. The rare species should be monitored every five years to detect changes in overall quality or condition. Snow willow (*Salix nivalis)* on north and east-facing slopes suggests that a survey for the Uncompagre fritillary butterfly (*Boloria acrocnema*) may be warranted.

Photos 6 and 7. Colorado tansy-aster (*Machaeranthera coloradensis*, top) found at the Taylor Pass PCA (bottom).





Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

0.6 0 0.6 1.2 Miles

Natural Heritage Program
COLORADO

Taylor Pass Potential Conservation Area

Twining Peak

Biodiversity Rank: B2 Very high significance
There are three globally-vulnerable and two state-rare plant species within this PCA.

Protection Urgency Rank: P4
This PCA is publicly owned and managed by the U.S. Forest Service, including a small part of the Hunter-Fryingpan and Mount Massive Wilderness Areas. There are no threats known for the foreseeable future.

Management Urgency Rank: M2
Management of recreation is needed to maintain the element occurrences.

Location: Pitkin and Lake counties. North of Independence Pass.
Legal Description: U.S.G.S. 7.5 minute Mt. Champion quadrangle. T11S R82W S3, 4, 9. T10S R82W S28, 33.

General Description: Twining Peak rises to 13,700 feet and is crossed by the Continental Divide. The headwaters of the Roaring Fork River run along the western edge of the PCA. Dramatic views are afforded of Capitol Peak, Mt. Sopris, and the Maroon Bells. Along the southern end of the PCA, there are a series of small ponds, willow patches, and marshy areas dominated by white marsh-marigold (*Caltha leptosepala*). Highway 82 and the Independence Pass summit area are adjacent to these lower elevation plant communities. The slopes at the lower elevations in the PCA are sparsely vegetated with dwarf clover (*Trifolium nanum*), yellow paintbrush (*Castilleja occidentalis*) and Ross' avens (*Geum rossii*). At the higher elevations, there are scree slopes, fellfields, rock gardens, and large boulder outcrops interspersed. The western slopes of Twining Peak support diamondleaf willow-barren ground willow (*Salix planifolia-Salix brachycarpa*) shrublands, with scattered Engelmann spruce (*Picea engelmannii*) that extend just above treeline, and open-wet and open-dry alpine meadows. The upper elevations are rocky, with talus and boulder fields and scattered alpine meadows. There are some large patches with cryptogrammic soil crusts. The PCA is 1202 acres and ranges in elevation from 12,200 feet to the summit of Twining Peak (13,700 feet).

Biodiversity Rank Justification: The high concentration of rare plants on this peak is matched only by a handful of other alpine locations in the state. This PCA includes occurrences of four rare plant species; three of these are considered to be globally-vulnerable. The alpine habitat is in excellent condition.

Natural Heritage element occurrences at the Twining Peak PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Draba grayana	Gray's Peak whitlow-grass	G2	S2				E
Draba crassa	**thick-leaf whitlow-grass**	**G3**	**S3**				**A**
Draba streptobrachia	Colorado Divide whitlow grass	G3	S3				B
Papaver lapponicum ssp. *occidentale*	alpine poppy	G4T4	S2				E
Papaver lapponicum ssp. *occidentale*	alpine poppy	G4T4	S2				B
Draba lonchocarpa var. *lonchocarpa*	lancepod whitlow-grass	G4T4	S3				C

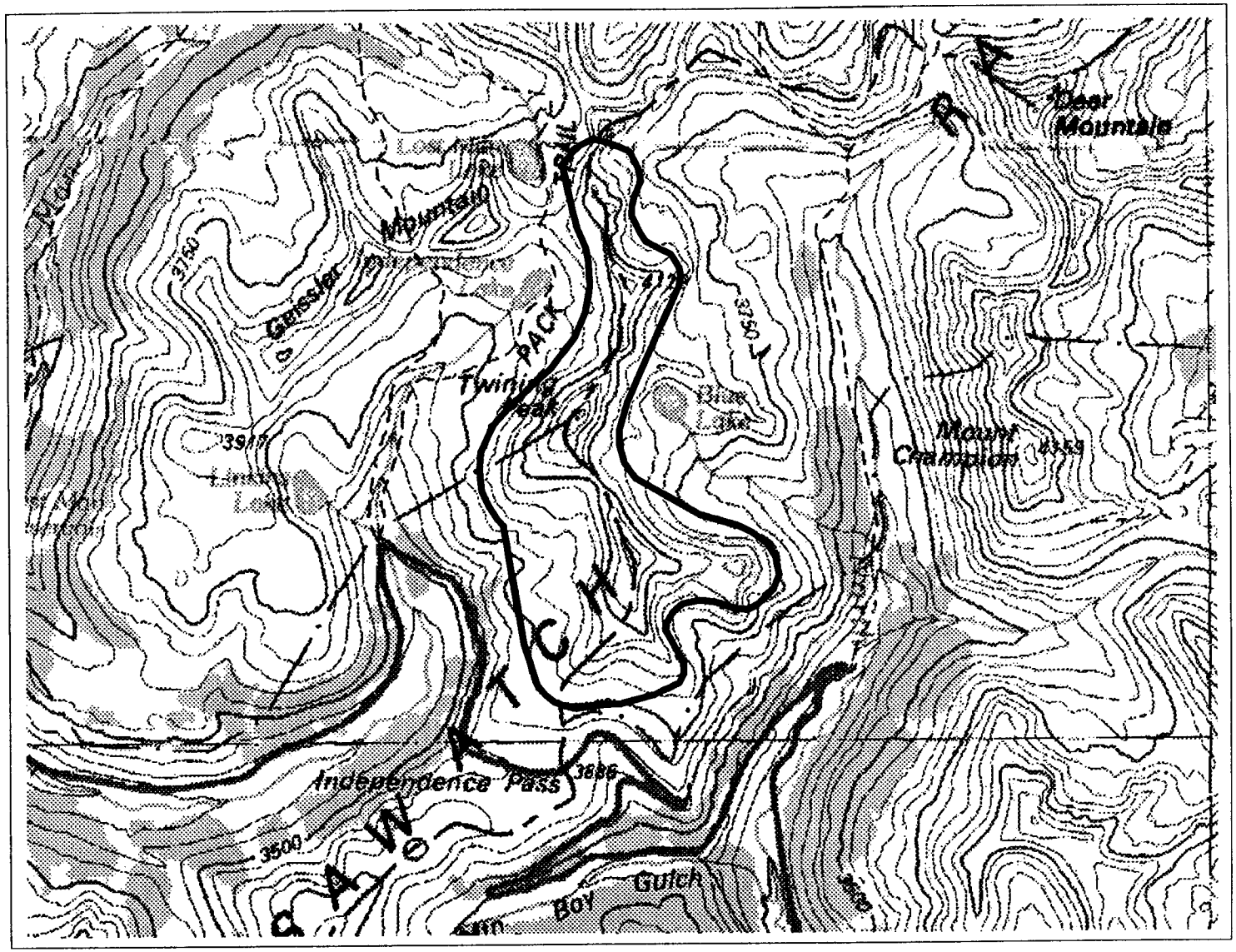
*EO=Element Occurrence

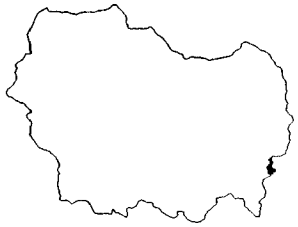
Boundary Justification: This boundary includes the occurrences and is drawn to: 1) protect the occurrences from direct impacts such as trampling or other surface disturbances; 2) provide suitable habitat where additional individuals can become established over time; and 3) include representation from each of the local alpine plant communities which may support a pollinator for one or more of the rare plant species.

Protection Rank Justification: The PCA is publicly owned and managed by the U.S. Forest Service and is partially contained within the Hunter-Fryingpan and Mount Massive Wilderness Areas.

Management Rank Justification: Currently this PCA has no official trails yet some recreation (mainly hiking) occurs within the boundaries. If recreational uses increase, the construction of a trail would be needed to reduce trampling and should be designed around the rare plants and their habitat. There are no exotic species at this time. Two commonly visited areas are adjacent to this PCA, the Lost Man Trail (and parking area) and the summit of Independence Pass (parking area and interpretive trail). These easy access points may increase the use within the Twining Peak PCA. Restricted access should be considered in the future for this area.

Photos 8 and 9: Alpine poppy (*Papaver kluanense,* top) is one of the rare plant species found at the Twining Peak PCA. Habitat for Lancepod whitlow-grass (*Draba lonchocarpa* var. *lonchocarpa*, Colorado Divide whitlow-grass (*Draba streptobrachia)*, and the alpine poppy in the Twining Peak PCA (bottom).





Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

Natural Heritage Program
COLORADO

0.4 0 0.4 0.8 Miles

Twining Peak Potential Conservation Area

The Crown

Biodiversity Rank: B2 Very high significance
An excellent occurrence of a globally-vulnerable plant species and an excellent occurrence of a plant community are found within this PCA.

Protection Urgency Rank: P4
This PCA is publicly owned and managed by the BLM and there are no threats known for the foreseeable future.

Management Urgency Rank: M3
Management is needed to maintain the quality of the PCA. Recommended management actions include restrictions regarding hiking, biking, motor vehicles, and grazing and the implementation of an exotic plant eradication program.

Location: Garfield, Eagle and Pitkin counties. Above Basalt to the south.
Legal Description: U.S.G.S. 7.5 minute Mount Sopris and Basalt quadrangles. T8S R87W S3-10, 13-34. T7S R87W S31, 32, 33. T8S R88W S1, 12-14, 23-25.

General Description: The Crown is bounded by Prince Creek to the west, West Sopris Creek to the east, and the Roaring Fork River to the north. The PCA ranges in elevation from about 6500 feet along the Roaring Fork River, to 8800 feet at the summit of The Crown. Shadowed by Mount Sopris at 12,953 feet, this PCA is spectacular. The PCA is characterized by pinyon-juniper (*Pinus edulis-Juniperus osteosperma*) woodlands, Gambel's oak (*Quercus gambelii*) shrublands, and sagebrush (*Artemisia tridentata*) shrublands. Within the large areas of Gambel's oak shrublands, there is an area that is dominated by Gambel's oak *(Quercus gambelii)* and snowberry (*Symphoricarpos oreophilus*), which is an uncommon plant association in Colorado. The sagebrush dominated areas are known to support the globally-vulnerable Harrington's beardtongue (*Penstemon harringtonii*), although few individuals have been documented from this location. The west-facing slopes from top of The Crown to Prince Creek are steep with intermittent creeks. In contrast, the slopes down to West Sopris Creek and are gentle rolling hills. Approximately 7000 acres are included in the PCA boundaries. This large area is in good condition overall, however there are scattered roads and trails used by recreationists. The activity along these thorough-ways are creating erosion and weed problems.

Biodiversity Rank Justification: Harrington's beardtongue (*Penstemon harringtonii*) is a globally-vulnerable plant which is restricted to Colorado and is found almost exclusively in sagebrush habitat. This species is only known from approximately 37 locations centered around the town of Edwards in Eagle County. In general, Harrington's beardtongue and its habitat are highly threatened due to residential and recreational development. These threats in addition to its restricted range create an urgency for protection of this species. The Crown includes two occurrences of Harrington's beardtongue. There is also an excellent example of a state-rare,

mixed-mountain shrubland within this larger high quality PCA. The importance of these occurrences is enhanced by the good condition of the surrounding communities, and the local significance of these large areas of undeveloped land to the Roaring Fork Valley. Williams Hill, Light Hill, and The Crown easily stand out as three of the best large areas of plant communities still intact in the low elevations of Roaring Fork Valley.

Natural Heritage element occurrences at The Crown PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Penstemon harringtonii	**Harrington's beardtongue**	**G3**	**S3**			**FS**	**A**
Penstemon harringtonii	Harrington's beardtongue	G3	S3			FS	B
Quercus gambellii-Amerlancier utahensis	Mixed mountain shrubland	G3G5	S2				B
Quercus gambellii-Cercocarpus montanus/Carex geyeri	Mixed mountain shrubland	G3	S3				C
Quercus gambelii/ Symphoricarpos oreophilus	mixed mountain shrubland	G5	S3S4				A

*EO=Element Occurrence

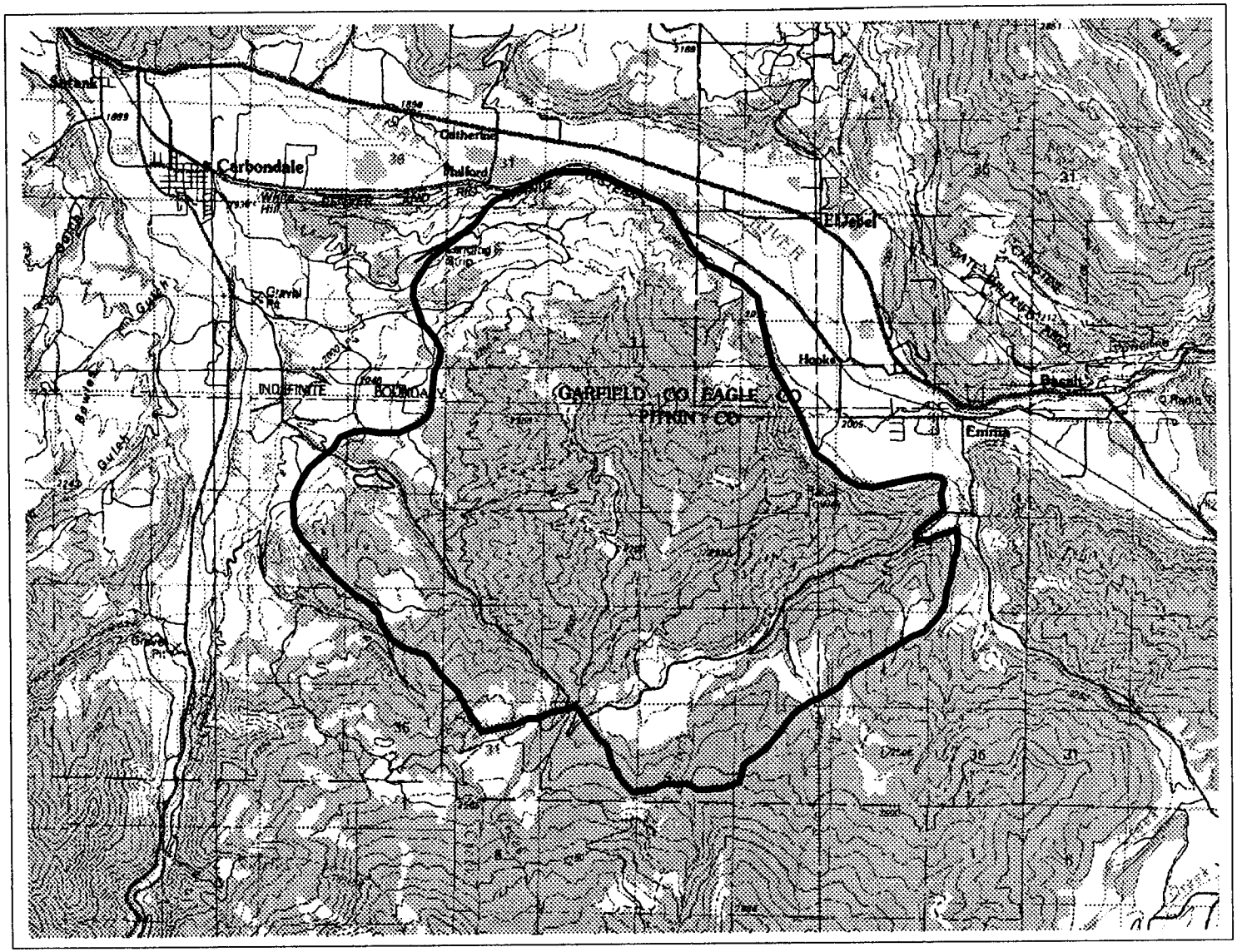
Boundary Justification: This PCA includes the mosaic of community types in which the four element occurrences are found. The surrounding high quality habitat is included to act as a buffer to direct disturbances, such as trampling, and indirect disturbances, such as unnatural erosion. The PCA also provides additional suitable habitat to allow for natural migration of the elements.

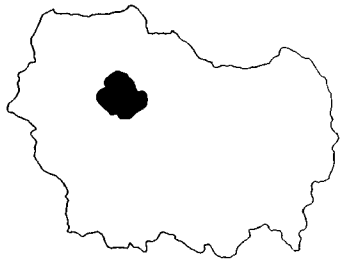
Protection Rank Explanation: This PCA is publicly owned and managed by the Bureau of Land Management. Residential and recreational development pressures are high in this area. Any developments may threaten this PCA.

Management Rank Explanations: The Bureau of Land Management is aware of Harrington's beardtongue (*Penstemon harringtonii*) at this location, but a management plan for this species in this resource area, and specifically at this location has not been developed. Grazing, ORV use, motorcycle use, and recreation are currently the main land uses. Grazing has been noted on Harrington's beardtongue but probably is not affecting the quality and condition of this occurrence. There are roads scattered throughout the PCA which are causing erosion problems and are acting as conduits for weeds, such as Kentucky bluegrass (*Poa pratensis*). One of the best defenses against the spread of these exotic species is to discourage future trails/roadways. Management actions could include road closures or restrictions regarding hiking, biking and motor vehicles, an exotic plant eradication program, and grazing restrictions.

The BLM plans to burn the slope above Prince Creek. The purpose of the burn is to restore the sagebrush park that is being invaded by juniper (*Juniperus osteosperma*) and to reduce the height and density of the Gambel's oak (*Quercus gambelii*) brush for wildlife. The effects of fire on Harrington's beardtongue is unknown. This burn may help to determine this question. However, it is important to recognize that the fire may improve habitat conditions but it may harm the viability of this population. A prescribed burn may provide information on the fire tolerance of Harrington's beardtongue.

Photo 10: Harrington's beardtongue (*Penstemon harringtonii*) was found at The Crown, Williams Hill, Cerise Gulch, Light Hill, Smith Gulch, Crystal Spring Road, and Christine State Wildlife Area PCAs.





Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

1 0 1 2 Miles

The Crown Potential Conservation Area

Warren Peak

Biodiversity Rank: B2 Very high significance
This PCA is in excellent condition and contains two occurrences of a state-rare plant species and a globally-vulnerable plant community.

Protection Urgency Rank: P4
This PCA is protected within a U.S. Forest Service Wilderness Area and there are no foreseen threats.

Management Urgency Rank: M3
Recreation management is needed to maintain the element occurrences at the current condition.

Location: Pitkin County. East of Aspen, above the Roaring Fork River. Take Smuggler Mountain Road from Aspen.
Legal Description: U.S.G.S. 7.5 minute Thimble Rock quadrangle. T10S R84W S 23-26, 35, 36. T10S R83W S 19, 20, 29, 30.

General Description: Smuggler Mountain, including Warren Peak, climbs 3000 feet above the Roaring Fork River in less than two miles. The headwaters of No Name Creek, and two unnamed creeks, confluence in this PCA. These creeks create the wetland areas containing three significant elements of biodiversity. This PCA includes a total of 2624 acres.

Biodiversity Rank Justification: This PCA contains high quality wetlands, two occurrences of a state-rare plant species, and a globally-vulnerable plant community. Subalpine riparian willow carrs are quite common in Colorado; however, this understory of tufted hairgrass (*Deschampsia cespitosa*) creates an unusual combination. The altai cottongrass (*Eriophorum altaicum* var. *neogaeum*) is known from 23 locations in Colorado.

Natural Heritage element occurrences at the Warren Peak PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix planifolia/ Deschampsia cespitosa	**subalpine riparian willow carr**	**G3**	**S3**				**A**
Eriophorum altaicum var. *neogaeum*	altai cottongrass	G4T?	S2				A
Eriophorum altaicum var. *neogaeum*	altai cottongrass	G4T?	S2				A

*EO=Element Occurrence

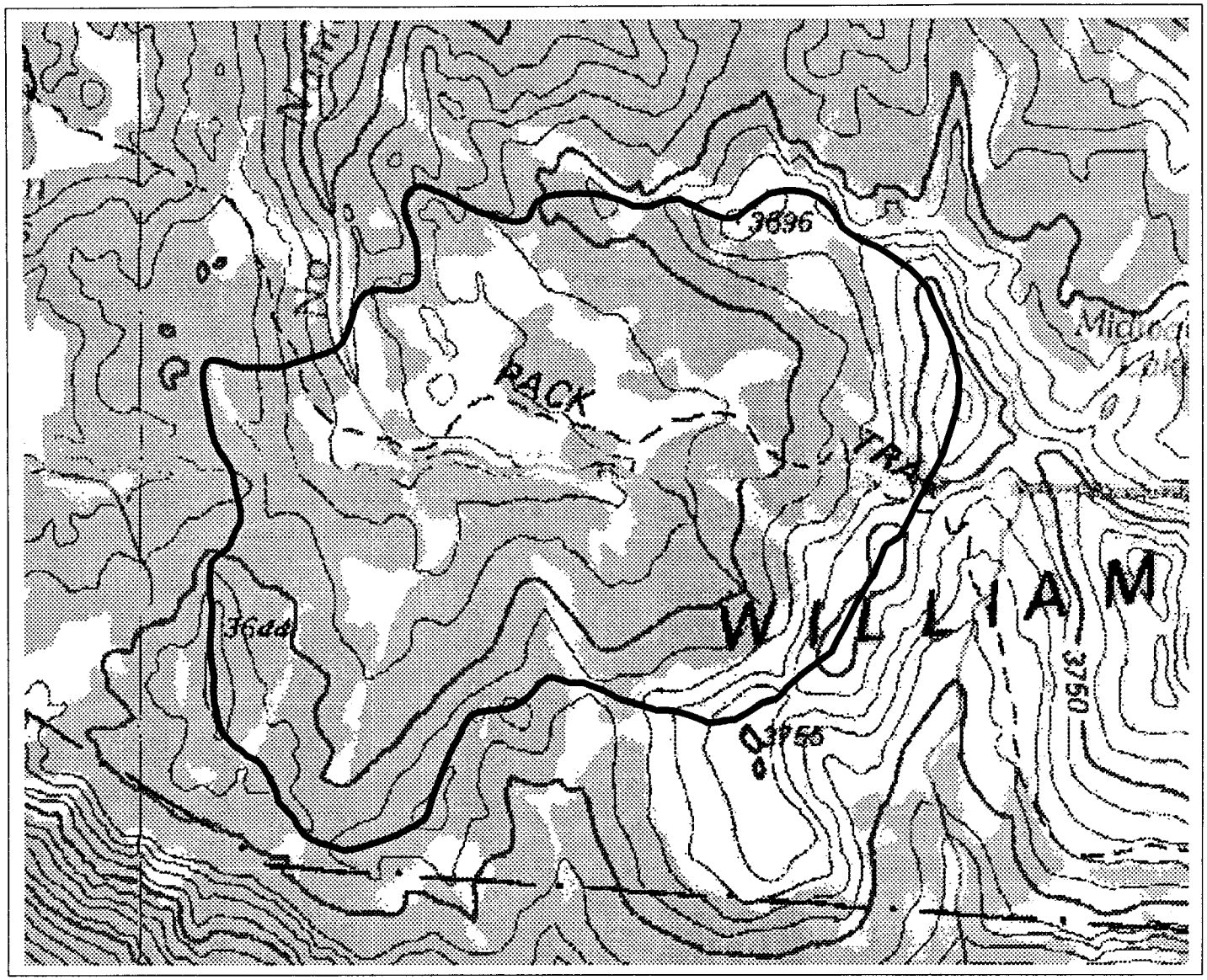
Boundary Justification: This PCA includes the three occurrences and a buffer of adjacent high quality habitat to protect from direct disturbances. Hydrological processes originating outside of

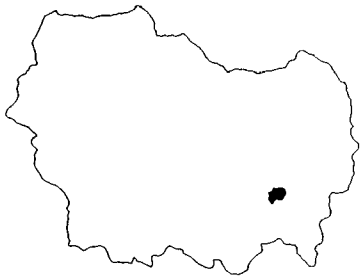
the boundary, including water quality, quantity, and flooding, should be managed to maintain the viability of the populations and community.

Protection Rank Justification: The Warren Peak PCA is publicly owned and managed by the U.S. Forest Service. The Hunter-Frying Pan Wilderness Area encompasses this PCA and will likely provide adequate protection. This PCA is within a proposed Research Natural Area.

Management Rank Justification: This PCA is currently in excellent condition. However, if recreation increases in the future these wetlands may be vulnerable. Recreationists should be encouraged to stay on designated trails and new trails should not be created. To restrict access to the area, Smuggler Mountain Road should not be improved. Water quality, quantity, and flooding should not be significantly altered. Hydrologic considerations should extend beyond the PCA boundaries to include the watershed.

Photo 11: The altai cottongrass (*Eriophorum altaicum* var. *neogaeum*) is a rare subspecies in the sedge family that was documented in the Warren Peak and North Fork Fryingpan PCAs.





Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

0.3 0 0.3 0.6 Miles

Warren Peak Potential Conservation Area

New York Creek

Biodiversity Rank: B2 Very High biodiversity significance
The biodiversity rank is driven by an excellent occurrence of a globally-vulnerable riparian plant community.

Protection Urgency Rank: P4
This PCA is contained within the U.S. Forest Service, Collegiate Peaks Wilderness area. Current threats are unknown. Threats to the occurrences that may be posed by mining and/or grazing activities should be avoided.

Management Urgency Rank: M3
Management is needed to maintain the quality of the PCA. Recommended management actions include trail maintenance and enforced camping restrictions.

Location: Pitkin County. Headwaters of New York Creek and Brooklyn Gulch.
Legal Description: U.S.G.S. 7.5 minute New York Peak quadrangle. T11S R83W S16-21, 28-30, 32-34.

General Description: New York Creek and Brooklyn Gulch flow south to meet Lincoln Creek in the headwaters of the Roaring Fork River drainage. These drainages support high quality examples of riparian communities dominated by a mosaic of mixed conifers and willows (*Salix* sp.). Adjacent uplands are dominated by dense spruce-fir (*Picea engelmannii-Abies lasiocarpa*) forests, rock outcrops, and avalanche paths; and above timberline, alpine tundra with rocky slopes. The PCA ranges in elevation from about 10,400 to 13,300 feet, and includes 3617 acres.

Biodiversity Rank Justification: This PCA includes an excellent occurrence of a globally-vulnerable riparian community dominated by Drummond's willow and Canada reedgrass (*Salix drummondiana/Calamagrostis canadensis*), which is known from only 24 locations in the state. Additionally, the PCA includes two excellent occurrences of a common riparian community.

Natural Heritage element occurrences at the New York Creek PCA.

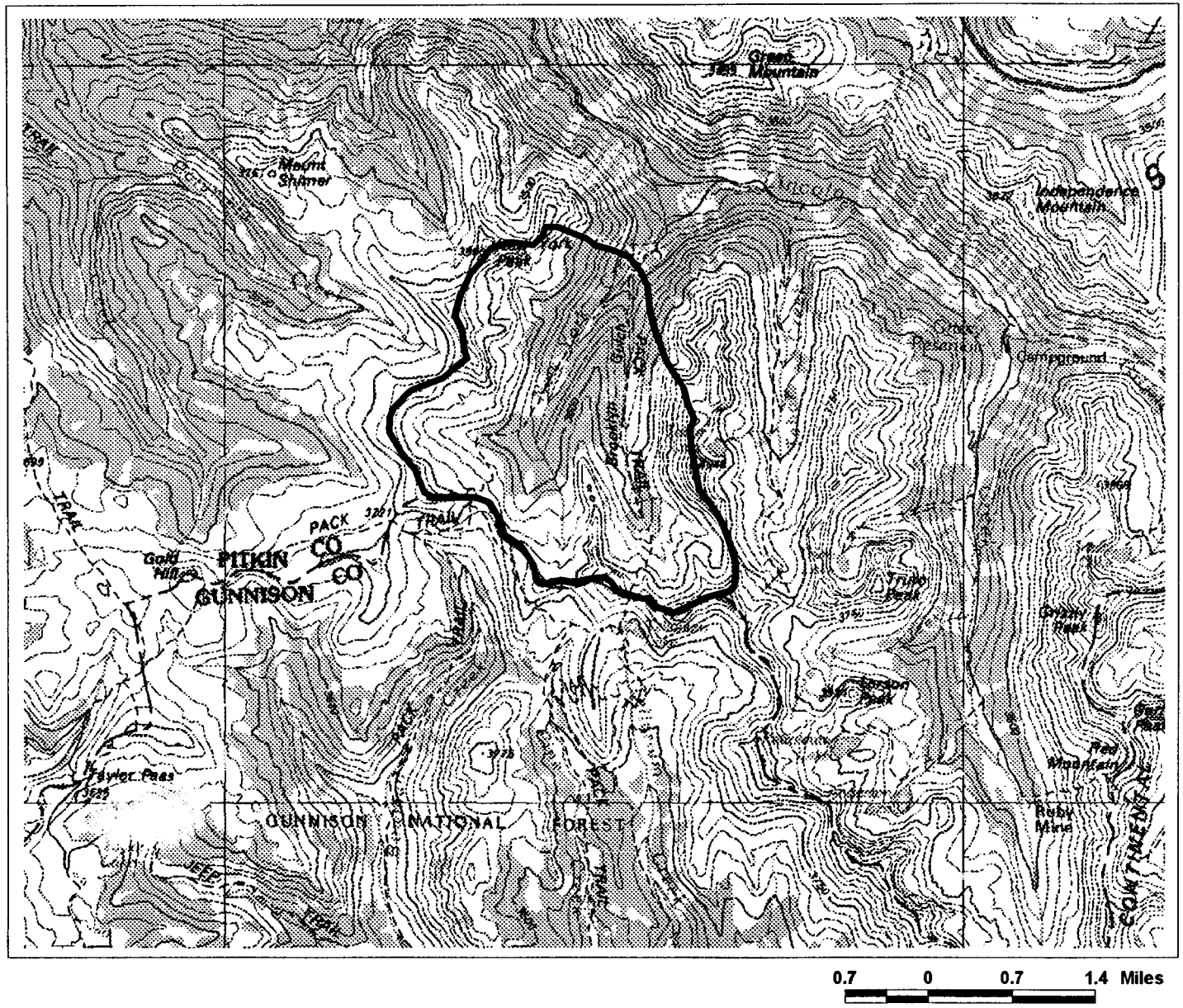
Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix drummondiana/ Calamagrostis canadensis	**lower montane willow carr**	**G3**	**S3**				**A**
Abies lasiocarpa-Picea engelmannii/ Mertensia ciliata	montane riparian forest	G5	S5				A
Abies lasiocarpa-Picea engelmannii/ Mertensia ciliata	montane riparian forest	G5	S5				A

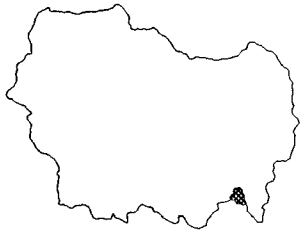
*EO=Element Occurrence

Boundary Justification: The PCA includes the full drainage above the occurrences, including the southeast slopes of New York Peak. This area should adequately serve to protect the occurrences from direct disturbances, such as trampling, and indirect disturbances, such as unnatural erosion. The PCA also provides additional suitable habitat to allow for natural migration of the communities over time.

Protection Rank Explanation: This PCA is publicly owned and managed by the White River National Forest, and is included in the Collegiate Peaks Wilderness Area. Recreational pressures are high in this area. Any developments may threaten this PCA. Although there do not currently appear to be mines in this PCA, any future mining activities should be managed to ensure protection of the element occurrences.

Management Rank Explanations: Recreational use including hikers, horse packers, fishing, hunting, and the associated litter that unfortunately results is impacting this PCA and the significant community occurrences that it contains. It is important in this area to route and maintain trails with minimum impacts to the riparian areas, and to prohibit and enforce no camping within 200 meters of streams. No exotic plants were noted in the PCA. The occurrences should be monitored every five years to detect changes in overall quality or condition.





Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

Natural Heritage Program
COLORADO

New York Creek Potential Conservation Area

Woody Creek Headwaters

Biodiversity Rank: B2 Very high significance
Several globally secure riparian plant communities are found within this PCA.

Protection Urgency Rank: P4
Most of the PCA is in Hunter Fryingpan Wilderness Area that is managed by the White River National Forest.

Management Urgency Rank: M4
Management actions may be necessary in the future to prevent degradation of the occurrences. Actions could include weed control and restoration efforts, and restricted recreation access.

Location: Pitkin County. Headwaters of Woody Creek.
Legal Description: U.S.G.S. 7.5 minute Thimble Rock quadrangle. T9S R83W S19-21, 27-34. T9S R84W S22-27, 35, 36.

General Description: This PCA includes a roughly six mile stretch of Woody Creek, between 8800 and 11,600 feet. The riparian vegetation includes a mosaic of spruce-fir with alder (*Picea engelmannii-Abies lasiocarpa*/*Alnus incana)*, spruce-fir with bluebells (*Picea engelmannii-Abies lasiocarpa*/*Mertensia ciliata*), willow carrs, and open meadows. A trail follows the river through the full extent of the PCA. The adjacent upland areas support spruce-fir (*Picea engelmannii-Abies lasiocarpa*) forests with patches of aspen *(Populus tremuloides)* and areas with lodgepole pine *(Pinus contorta)*. This area was observed to support elk. A total of 4512 acres are included within this PCA.

Biodiversity Rank Justification: This PCA contains six excellent occurrences of riparian plant communities, most notably the willow carrs dominated by plain leaf willow and marsh marigold (*Salix planifolia/Caltha leptosepala*). This high concentration of excellent quality communities supports the overall importance of this PCA.

Natural Heritage element occurrences at the Woody Creek Headwaters PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix planifolia/ Caltha leptosepala	**subalpine riparian willow carr**	**G4**	**S4**				**A**
Salix planifolia/ Caltha leptosepala	**subalpine riparian willow carr**	**G4**	**S4**				**A**
Abies lasiocarpa-Picea engelmanii/ Alnus incana	montane riparian forest	G5	S5				A
Abies lasiocarpa-Picea engelmanii/ Mertensia ciliata	montane riparian forest	G5	S5				A
Abies lasiocarpa-	montane riparian forest	G5	S5				A

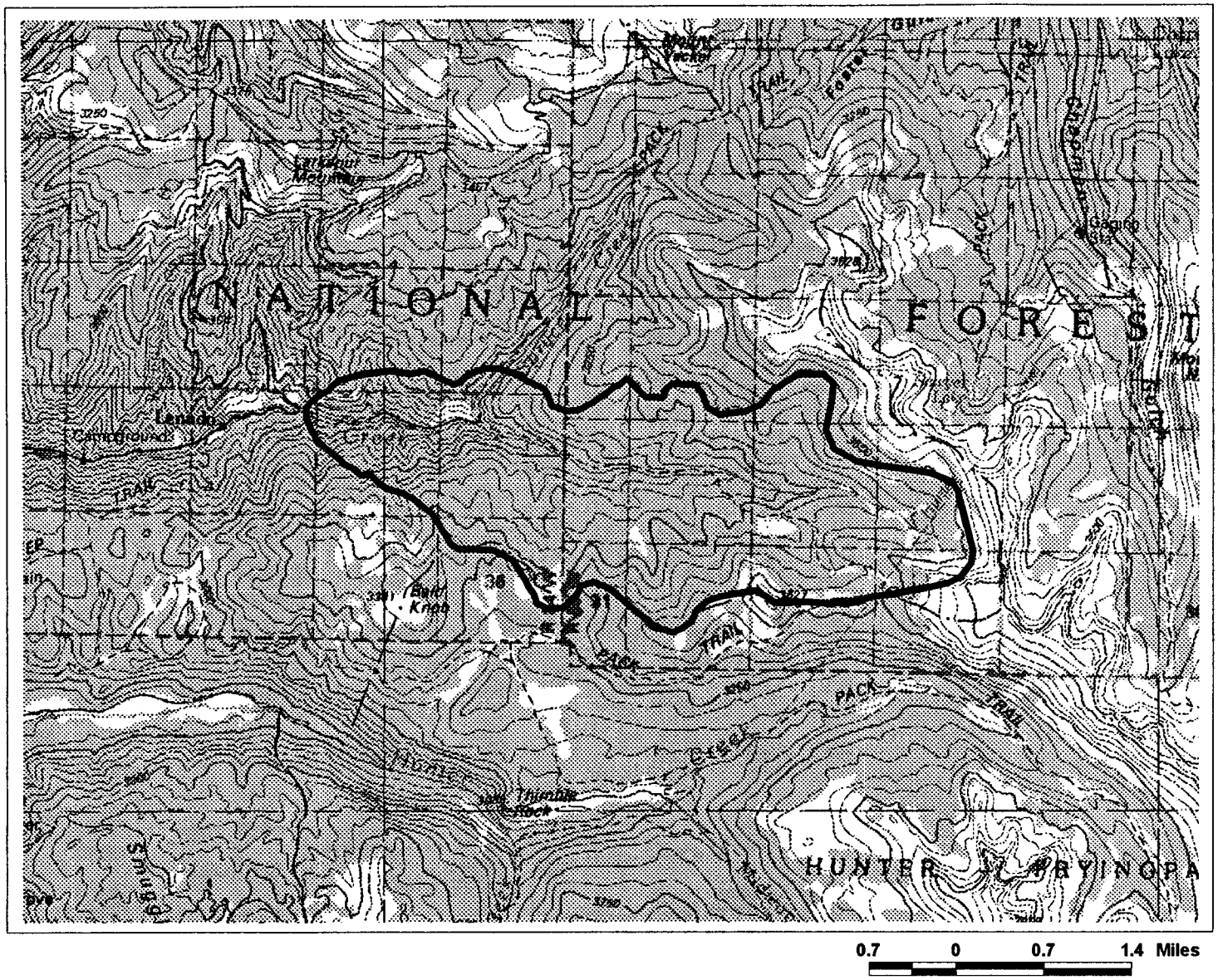
Picea engelmanii/ Mertensia ciliata							
Salix planifolia/ Carex aquatilis	subalpine riparian willow carr	G5	S4				A

*EO=Element Occurrence

Boundary Justification: The boundary is drawn to include the six occurrences and adjacent potential habitat up and down stream to allow the communities to move into suitable habitat over time. This area is intended to act as a buffer for the occurrences and protect them from direct disturbances. Hydrological processes originating outside the planning boundary, including water quality, quantity, and timing should be managed to maintain PCA viability.

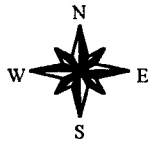
Protection Rank Justification: Most of the PCA is included in the Hunter-Fryingpan Wilderness Area managed by the White River National Forest. Spruce Creek Wilderness Study Area is also found at the headwaters of Woody Creek, though how the boundaries overlap with the PCA has not been determined. Potential threats posed by mining activities in this area need to be addressed.

Management Rank Justification: Horse packing, camping, and hiking may be the cause of the spread of exotic plant species, including fairly low cover of Kentucky bluegrass (*Poa pratensis*), timothy (*Phleum pratense*), red clover (*Trifolium pratense*), and dandilion (*Taraxacum officinale*) along the trail. Otherwise, this area was found to be in very good condition. The elements should be protected from trail maintenance activities. Additional information is needed about the processes that support the riparian communities to enhance management objectives.



Location in the Roaring Fork Watershed

PCA boundary



Natural Heritage Program
COLORADO

Woody Creek Headwaters Potential Conservation Area

Roaring Fork at Brush Creek

Biodiversity Rank: B3 High biodiversity significance
This PCA supports a good example of a globally-vulnerable riparian plant community.

Protection Urgency Rank: P2
Residential development is expected to threaten this privately owned PCA in the future.

Management Urgency Rank: M1
Management actions, including weed control and bank restoration, are essential to prevent loss of the occurrence. The current road construction on route 82 presents serious management concerns. Erosion from construction work will likely impact this occurrence.

Location: Pitkin County. Northeast of Aspen. Along the Roaring Fork River between Woody Creek and Owl Creek.
Legal Description: U.S.G.S. 7.5 minute Highland Peak, Woody Creek, and Aspen quadrangles. T9S R85W S 16, 21, 27, 28, 34, 35.

General Description: The Brush Creek PCA is located on the Roaring Fork River between Aspen and Basalt. This stretch of the river is within a deep canyon. The canyon walls rise to about 7600 feet from the River at approximately 7200 feet. The vegetation at this PCA is composed of a montane riparian forest dominated by narrowleaf cottonwood (*Populus angustifolia*). The co-occurrence of narrowleaf cottonwood with blue spruce (*Picea pungens*) and alder (*Alnus incana*) makes this PCA significant. This community type follows the river for about 3 miles and is very narrow, but is in good condition. Uplands are dominated by oak-serviceberry *(Quercus gambelii-Amelanchier utahensis*) shrubland, sagebrush (*Artemisia tridentata*) shrublands, scattered Rocky Mountain juniper (*Juniperus scopulorum*) and outcrops of river cobbles and dark Mancos Shale. The shale outcrops support the Colorado endemic, Osterhout's penstemon (*Penstemon osterhoutii*). An old road/foot path, a power line, and an abandoned railroad track run adjacent to the occurrence for about 1-2 miles. These corridors are spreading non-native plants such as orchard grass (*Dactylis glomerata*), timothy (*Phleum pratense*), brome (*Bromus* sp.), and thistles (*Cirsium* spp.). The Brush Creek PCA includes approximately 450 acres.

Biodiversity Rank Justification: The lower reaches of the Roaring Fork River Valley have been fragmented by residential, recreational, and agricultural developments. High quality riparian areas are few and far between because of this fragmentation. This PCA contains an example of a relatively large remnant of a once larger riparian forest. This specific community type is known from 71 locations in Colorado, however, only 15 of these are considered to be in excellent condition. Two of these are found in the Roaring Fork Watershed, along Avalanche Creek, and along Middle Thompson Creek.

Natural Heritage element occurrences at the Roaring Fork at Brush Creek PCA.

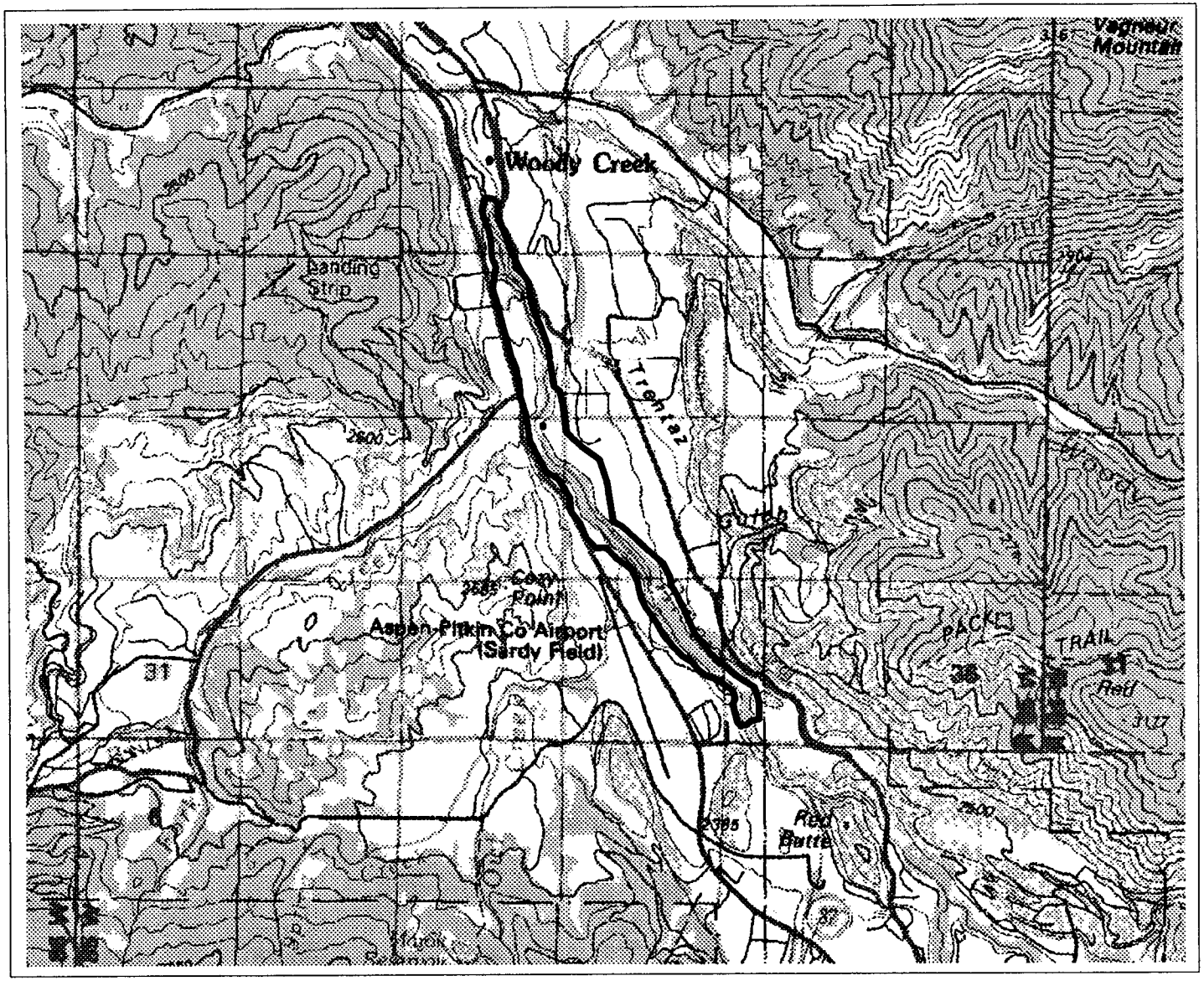
Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Populus angustifolia-Picea pungens/Alnus incana	**montane riparian forests**	**G3**	**S3**				**B**

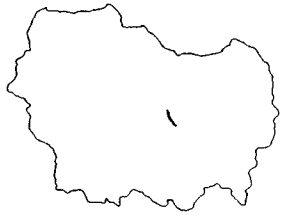
*EO=Element Occurrence

Boundary Justification: The boundary is drawn to protect the significant community from direct disturbances. A much larger area should be considered to protect the specific hydrologic regime (water quality and natural flooding) of this PCA. Narrowleaf cottonwoods require periodic, above average, floods usually in June for seed germination and survival. Therefore, it is important to maintain a natural flooding regime.

Protection Rank Justification: Specific plans for this PCA are unknown. However, this PCA occurs on private land surrounded by an area of high residential development pressures.

Management Rank Justification: Residential development pressures from Aspen and Snowmass are increasing in this area. Development, such as the widening of Highway 82, on top of the steep walls of the canyon, may cause unnatural erosion and increase exotic plant species. Activities, such as fishing and hiking, should be restricted within the canyon and near the top of the canyon walls to prevent these disturbances. Impacts from future trails and bike paths should be considered before development. A trail/rail corridor is proposed for the old railroad tracks that run through this PCA. A 100 foot wide easement is owned by the Roaring Fork Railroad Holding Authority. This 100 foot area may see a lot of disturbance if this project is funded. The riparian plant communities would be highly threatened. Water quality, quantity, and flooding should not be significantly altered. Hydrologic considerations should extend beyond the PCA boundaries to the entire watershed.





Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

0.6 0 0.6 1.2 Miles

Roaring Fork River at Brush Creek Potential Conservation Area

Lost Trail Creek

Biodiversity Rank: B3 High biodiversity significance
The biodiversity rank is based on good occurrences of two globally-vulnerable riparian plant communities found within this PCA.

Protection Urgency Rank: P2
This PCA contains a mix of U.S. Forest Service and private lands. There are portions of the PCA that are threatened by residential development pressures. U.S. Forest Service plans are unknown. A portion of the PCA is included in a Wilderness Area. There is a state fishing area at western end of PCA.

Management Urgency Rank: M2
Management is needed to maintain the quality of the PCA. Recommended management actions include inventory and monitoring of the rare plant species, controlling recreational impacts, and implementing an exotic plant eradication program. There is a need to better understand the ecological processes needed to support the community types and rare plants.

Location: Gunnison County. East of Marble.
Legal Description: U.S.G.S. 7.5 minute Marble quadrangle. T11S R87W S17-20, 30. T11S R88W S24-26.

General Description: Above Marble the riparian areas along the Crystal River and Lost Trail Creek are dominated by narrowleaf cottonwood (*Populus angustifolia*), alder *(Alnus incana)*, spruce-fir *(Picea engelmannii-Abies lasiocarpa)*, Douglas fir *(Pseudotsuga menziesii)*, and aspen *(Populus tremuloides)*. These species form small stands of specific plant associations with various shrubs including dogwood (*Cornus serecia*), rose (*Rosa woodsii*), chokecherry (*Prunus virginiana*), Rocky Mountain maple (*Acer glabrum*), mountain-ash (*Sorbus scopulina*), elderberry (*Sambucus microbotrys*), gooseberry (*Ribes* sp.), and willows (*Salix* spp.). Four-wheel drive roads follow the creeks. Adjacent uplands are gradually to steeply sloping with spruce-fir (*Picea engelmanii/Abies lasicarpa*) forests and aspen (*Populus tremuloides*) woodlands. The PCA ranges in elevation from about 8000 feet along Beaver Lake, to about 10,800 feet in the National Forest on the North Fork of Lost Trail Creek. The PCA is significant because of the globally-vulnerable willow carrs and the globally-vulnerable *Penstemon* species found here. Most of the PCA is fairly inaccessible with the only access being very rough four-wheel drive roads. The western portion of the PCA is immediately adjacent to the town of Marble and a state fishing area. There are several mining claims within the PCA. Specific impacts from these mines are currently unknown. Lost Trail creek flows west into the Crystal River just up stream of Beaver Lake. A total of 1589 acres are included in the PCA boundaries.

Biodiversity Rank Justification: There are good examples of two globally-vulnerable riparian communities and a fair occurrence of a globally-vulnerable plant within this PCA. The rare

plant species is endemic to Colorado and is documented in only 37 locations in the world. The community dominated by Drummond's willow and Canada reedgrass (*Salix drummondiana/Calamagrostis canadensis*) is known from 24 records in the state.

Natural Heritage element occurrences at the Lost Trail Creek PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix monticola/ Calamagrostis canadensis	**montane willow carr**	**G3**	**S3**				**B**
Salix drummondiana/ Calmagrostis canadensis	**lower montane willow carr**	**G3**	**S3**				**B**
Penstemon mensarum	Grand Mesa penstemon	G3	S3				C
Abies lasiocarpa-Picea engelmanii/ Alnus incana	montane riparian forest	G5	S5				B

*EO=Element Occurrence

Boundary Justification: This PCA includes the occurrences and enough of the surrounding adjacent habitat to protect the occurrences from direct disturbances, such as trampling, and indirect disturbances, such as unnatural erosion. The PCA also provides additional suitable habitat to allow for natural migration of the rare plants and communities. Hydrological processes originating outside of the planning boundary, including water quality, quantity, and timing, should be managed to maintain the viability of the element occurrences.

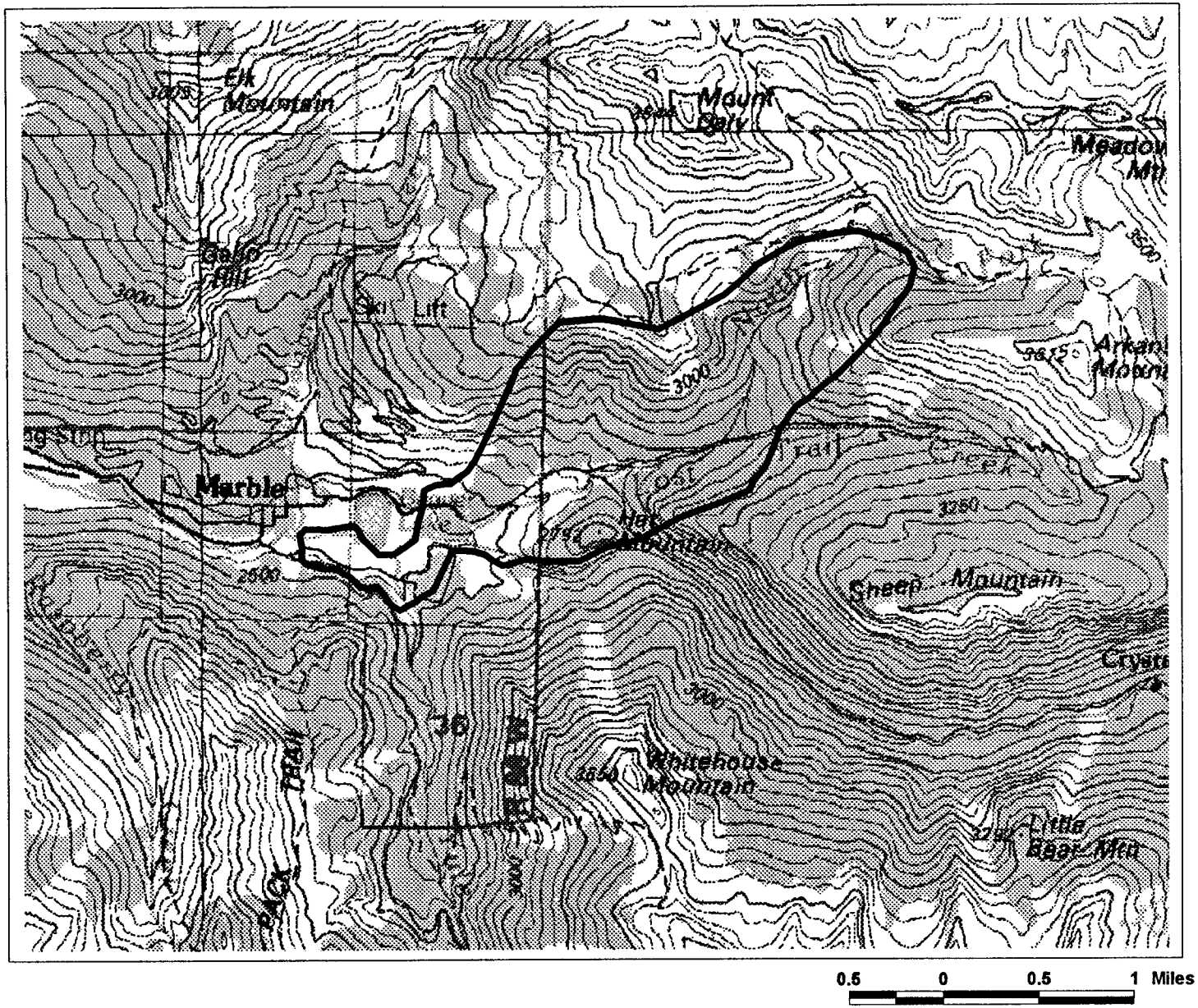
Protection Rank Explanation: This PCA includes a mix of private lands and lands that are publicly owned and managed by the White River National Forest. Residential and recreational development pressures are high in this area. Threats posed by mining activities should be investigated. It is probably best to not improve the 4wd road. The Colorado Outward Bound School campus is located within the PCA.

Management Rank Explanations: There are roads scattered throughout the PCA which may cause erosion problems and are acting as conduits for weeds, such as Kentucky bluegrass (*Poa pratensis*), yellow sweet-clover (*Melilotis officinale*), dandelion *(Taraxacum officinale)*, houndstongue *(Cynoglossum officinale)*, plumeless thistle (*Carduus acanthoides*), *Timothy* (*Phleum pratense*), crested wheatgrass (*Agropyron cristatum*), and cheatgrass (*Bromus tectorum*). One of the best defenses against the spread of these exotic species is to discourage future trails and roads. The rare plant occurs along the road and should be protected from roadside maintenance activities.

Recreational uses including hiking, horse packing, fishing, hunting, four-wheeling and associated litter are also impacting the PCA. Management actions could include road closures or restrictions regarding hiking, biking and motor vehicle use; wildlife permeable fencing placed

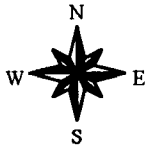
around some of the riparian areas; eradicating exotic plants; and enforcing a strict littering policy. Management agreement could be sought with willing private landowners. A management plan should be developed for this PCA including a complete inventory for the rare plant species and a monitoring program designed to detect changes in the overall quality and condition of the element occurrences.

Photo 12: Grand Mesa penstemon (*Penstemon mensarum*) is a globally rare plant species known only from west central Colorado. This species was found in the Lost Trail Creek and the McClure Pass PCAs.



Location in the Roaring Fork Watershed

PCA boundary



Natural Heritage Program COLORADO

Lost Trail Creek Potential Conservation Area

Roaring Fork at Old Snowmass

Biodiversity Rank: B3 High significance
The most significant element in this PCA is a fair occurrence of a globally-vulnerable plant community. Three other plant communities of concern, the mountain whitefish, and the Preble's shrew occur here; a bald eagle has been reported in the area.

Protection Urgency Rank: P2
This PCA is privately owned and has a high threat of residential development.

Management Urgency Rank: M3
Management actions regarding weed control are needed to maintain the quality of the PCA.

Location: Pitkin County. Southeast of Old Snowmass, along the Roaring Fork River and Highway 82 between Old Snowmass and Woody Creek.
Legal Description: U.S.G.S. 7.5 minute Woody Creek quadrangle. T8S R86W S23, 25-27, 36. T8S R85W S30, 31. T9S R85W S6.

General Description: This PCA occurs at the steep base of the north-facing slopes of Williams Hill and includes a narrow band of riparian vegetation between the highway and the Roaring Fork River at approximately 7000 feet. The stretch is dominated by narrowleaf cottonwood (*Populus angustifolia*) with a mosaic of diverse shrubs, which creates the four different riparian plant communities of special concern. Narrowleaf cottonwood with blue spruce (*Picea pungens*) and alder (*Alnus incana*) is the largest of these riparian plant communities and stretches for approximately two miles. Exotic plant species, such as houndstongue (*Cynoglossum officinale*), Kentucky blue grass (*Poa pratensis*) and the plumeless thistle (*Carduus acanthoides*) are currently invading the native communities. This PCA includes approximately 1028 acres.

Biodiversity Rank Justification: There are three globally-vulnerable and one state-rare plant communities within this PCA. The overall size of the plant community occurrences is small and contains exotic plant species in the understory. This stretch of the Roaring Fork River is sandwiched between two high quality upland PCAs, the Williams Hill and the Cerise Gulch PCAs. Although the riparian communities in this PCA are in fair to poor condition, the adjacent uplands are high quality examples of plant communities. The most significant element in this PCA is the narrowleaf cottonwood/chokecherry (*Populus angustifolia/Prunus virginiana*). This plant community is known from five occurrences in five counties in Colorado. Although the state and global distributions are not well known, this community is thought to be rare at both scales.

Shrew specimens were taken at two locations within this PCA during the 1997 field surveys. Long-tailed shrews (*Sorex* spp.) are difficult to discern at the species level, and identification is

only accurately accomplished with cranial (skeletal) analysis. The specimens have been sent to an expert in New Mexico to be verified. The preliminary external measurements and dental characteristics indicate Preble's shrew (*Sorex* c.f. *preblei*) among the specimens captured. The Preble's shrew is a species of the upper Great Basin and Columbian Plateau, where habitats are generally described as semi-arid shrublands, including sagebrush, grasslands, alpine tundra, and sagebrush openings in subalpine forest (Hoffman and Fisher 1978; Fitzgerald et al. 1994). In Colorado, there are only three locations documented.

Additionally, there is a report of a wintering bald eagle in the area. The mountain whitefish (*Prosopium williamsoni*) is known to occur in Roaring Fork River from Glenwood Springs to near Woody Creek but is unverified between Woody Creek and Aspen. There are few rivers in Colorado known to contain this fish species. It is mostly restricted to the northwestern portion of the state.

Natural Heritage element occurrences at the Roaring Fork at Old Snowmass PCA.

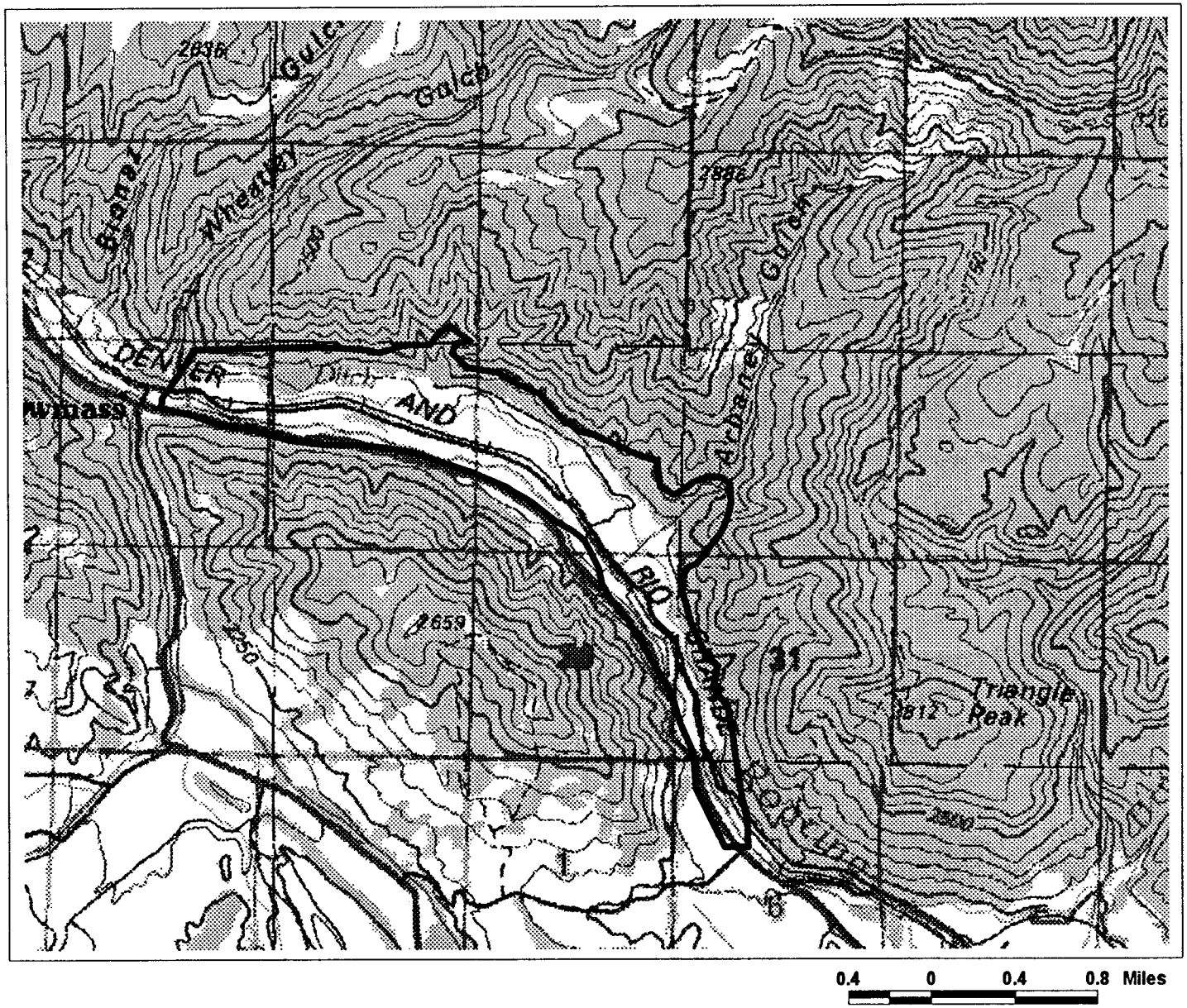
Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Populus angustifolia/ Prunus virginiana	**narrowleaf cottonwood/common chokecherry**	**G2?**	**S1?**				**C**
Populus angustifolia/ Betula occidentalis	montane riparian forest	G3	S2				D
Populus angustifolia-Picea pungens/ Alnus incana	Rocky Mountain riparian forest	G3	S3				C
Haliaeetus leucocephalus	bald eagle	G4	S1B, S3N	LT	T		E
Populus angustifolia/ Cornus sericea	cottonwood riparian forest	G4	S3				C
Sorex c.f. *preblei*	Preble's shrew	G5	S1?				E
Prosopium williamsoni	mountain whitefish	G5	S3				E

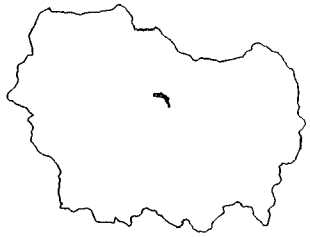
*EO=Element Occurrence

Boundary Justification: The boundary is drawn to encompass the riparian communities and a 1000 foot buffer along each side of the river to protect from direct disturbances such as trampling, habitat destruction, and unnatural erosion. A much larger area should be considered in any long-term management plan to protect the hydrologic regime (quality, quantity, and flooding) of the PCA. Narrowleaf cottonwoods require periodic, above average, floods usually in June for seed germination and survival. Therefore, it is important to maintain a natural flooding regime.

Protection Rank Justification: This PCA is on private land adjacent to land managed by the Bureau of Land Management. Residential development and the widening of the highway are possible threats in the near future.

Management Rank Justification: Highway 82 parallels the Roaring Fork River through this PCA. Re-seeding on the south side of the highway right-of-way has introduced exotic plant species such as houndstongue (*Cynoglossum officinale*), Kentucky blue grass (*Poa pratensis*), and the plumeless thistle (*Carduus acanthoides*). These plants should be controlled and should not be used for seeding projects in the future. Recreation activities, such as fishing, boating and hiking, should be monitored along the river. If ill effects are observed activities should be restricted either in the form of a designated path, restricted access, and/or restricting the landing of boaters. A trail/rail corridor is proposed for the old railroad tracks that run through this PCA. A 100 foot wide easement is owned by the Roaring Fork Railroad Holding Authority. This 100 foot area may see a lot of disturbance if this project is funded. The riparian plant communities would be highly threatened. The hydrologic regime (including water quality, quantity, and flooding) of the area should be maintained to protect the current native vegetation and to support the mountain whitefish occurrence. Hydrologic considerations should extend beyond the PCA boundaries to the entire watershed.





Location in the Roaring Fork Watershed

PCA boundary

Natural Heritage Program
COLORADO

Roaring Fork at Old Snowmass Potential Conservation Area

Williams Hill

Biodiversity Rank: B3 High significance
This PCA includes a good occurrence of a globally-vulnerable plant species and a globally-vulnerable plant community.

Protection Urgency Rank: P2
There is a possibility of a land sale within this PCA. Protection actions could include: placement of a conservation easement agreement with the new owner, land exchange with the BLM, or an open space acquisition.

Management Urgency Rank: M3
Management of recreation is needed to maintain the quality of the PCA.

Location: Pitkin County. Southeast of Old Snowmass. This PCA is above the Roaring Fork River between Old Snowmass and Woody Creek.
Legal Description: U.S.G.S. 7.5 minute Woody Creek quadrangle. T9S R85W S6. T9S R86W S1-3, 9-12, 15, 16. T8S R86W S25-27, 34-36.

General Description: Williams Hill gains 1800 feet in approximately 0.5 mile as it rises from the south bank of the Roaring Fork River. This north-facing slope is dominated by dense Gambel's oak (*Quercus gambelii*) and mountain mahogany (*Cercocarpus montanus*) with an elk sedge (*Carex geyeri*) understory. The south-facing slope is a gentle slope down to Snowmass Creek. The soils are sandstone derived and support pinyon-juniper (*Pinus edulis-Juniperus osteosperma*), Gambel's oak (*Quercus gambelii*), and mountain sagebrush (*Artemisia tridentata* ssp. *vaseyana*) communities. The sagebrush community provides important habitat for a globally vulnerable penstemon species. Native grasses such as needle-and-thread grass (*Stipa comata*), Indian ricegrass (*Oryzopsis hymenoides*) and elk sedge (*Carex geyeri*) are present in the herbaceous layer of these communities. However, exotic species such as Kentucky bluegrass (*Poa pratensis*) and cheatgrass (*Bromus tectorum*) are dominant in some areas. In addition, Williams Hill supports a large herd of wintering elk and provides critical winter habitat for this herd. A total of 4416 acres are included in the PCA boundaries, in an elevation range of about 6900 to 8800 feet.

Biodiversity Rank Justification: Harrington's beardtongue (*Penstemon harringtonii*) is a globally vulnerable plant species which is restricted to Colorado and is found almost exclusively in sagebrush habitat. This species is only known from approximately 37 locations, all of which are centered around Edwards in Eagle County. In general, Harrington's beardtongue and its habitat are highly threatened by residential, agricultural, and recreational development. These threats, in addition to its restricted range, create an urgency for protection. Harrington's beardtongue populations are known to fluctuate in population numbers from year to year. Therefore, this specific location may be a higher priority than the current information reflects. This PCA includes a small occurrence of Harrington's beardtongue.

The globally-vulnerable Gambel's oak (*Quercus gambelii/ Carex geyeri*) community is in good condition and increases the biodiversity value of this PCA. Williams Hill, Light Hill, and The Crown stand out as three of the best large areas of plant communities still intact in the lower elevation of Roaring Fork Watershed.

Natural Heritage element occurrences at the Williams Hill PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Quercus gambelii-Cercocarpus montanus/Carex geyeri	**mixed mountain shrublands**	**G3**	**S3**				**B**
Penstemon harringtonii	**Harrington's beardtongue**	**G3**	**S3**			**FS**	**B**

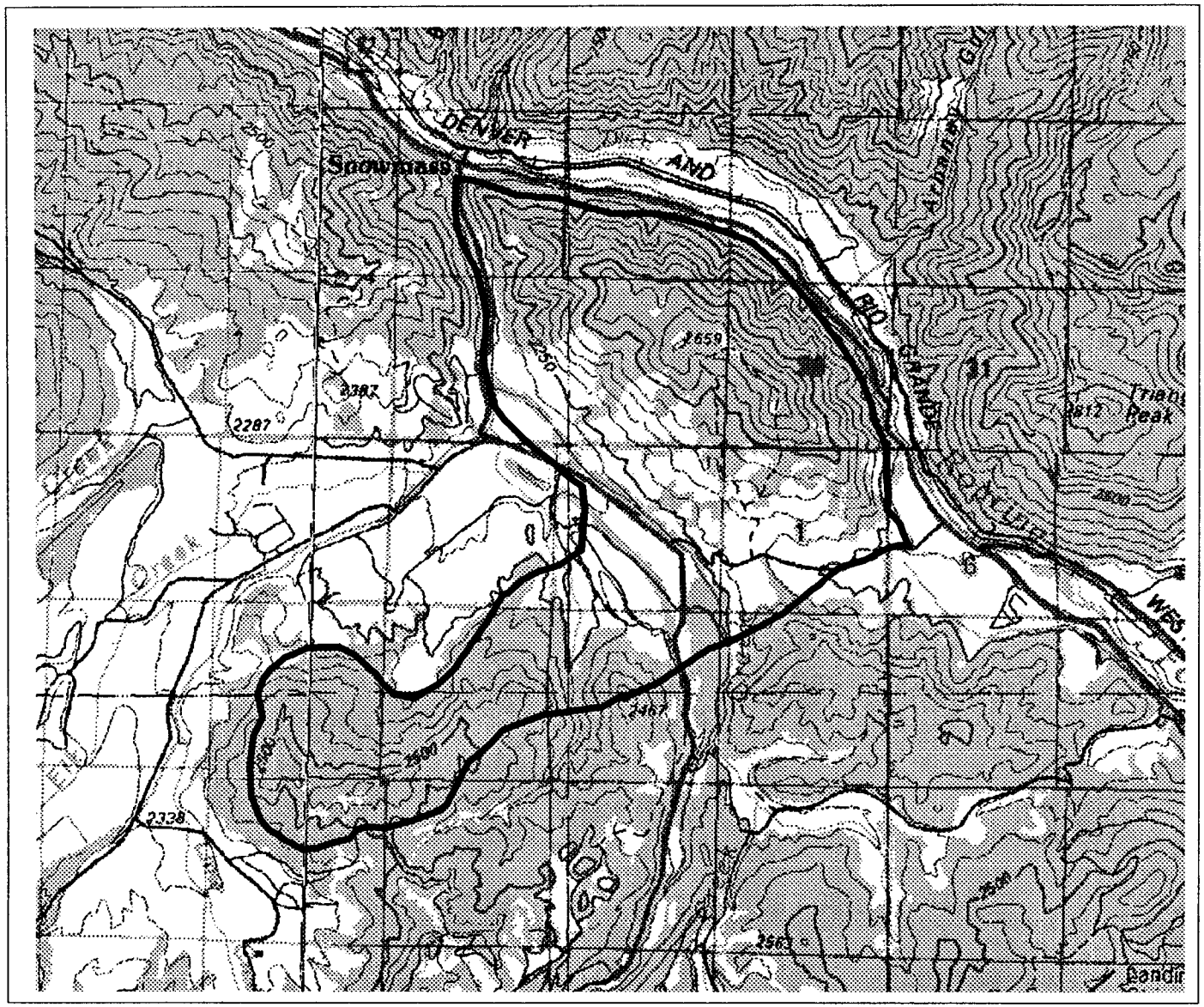
*EO=Element Occurrence

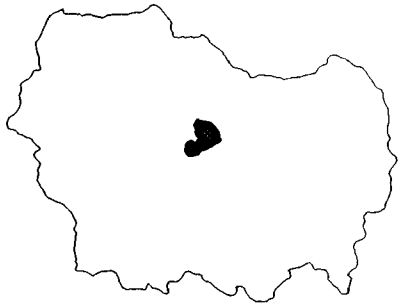
Boundary Justification: This PCA includes the two element occurrences and the surrounding high-quality habitat. The surrounding habitat is intended to protect the occurrences from direct disturbances, such as trampling. Indirect disturbances, such as unnatural erosion from upslope activities or the establishment of exotic species within a PCA should also be avoided within this boundary.

Protection Rank Justification: This PCA contains private lands and lands that are publicly owned and managed by the Bureau of Land Management and the Colorado Division of Wildlife (for the State Land Board). The State Land Board currently owns section 36 within this PCA, however, it is on their "disposal" list. There is a pending land exchange with the BLM for this parcel. Pitkin County is sponsoring this same parcel to be included in the Stewardship Land Trust Project. This action would provide relief from development pressures for an undetermined amount of time. There is a possibility of a private owner acquiring this parcel. The plans of the State Land Board should be determined and a management agreement implemented with the final owner. This PCA also includes lands owned by the Windstar Land Conservancy, which is using the property for education and research, and is attempting to improve the condition of the property.

Management Rank Justification: Work with the Bureau of Land Management to ensure protection of this PCA. The Harrington's beardtongue (*Penstemon harringtonii*) occurs within the Bureau of Land Management (BLM) property. The BLM is aware of the penstemon. A management plan for this species, and this PCA specifically, should be developed by the BLM.

Harrington's beardtongue (*Penstemon harringtonii*) should be monitored to detect changes in overall quality or condition of this occurrence. The land use is very limited, and is typically limited to maintenance of the radio tower on Williams Hill. The 4WD road which begins in a hay meadow is a probable source of exotic plant species such as cheatgrass (*Bromus tectorum*), Kentucky blue grass (*Poa pratensis*), and Canada thistle (*Cirsium arvense*). The spread of these non-natives may degrade the plant community occurrence, and they should be controlled from spreading. Current trails should be reviewed for impacts on the elements of concern. Re-routing may be needed. Additional trails/roads should be discouraged. Recreation, including hunting, ORV use, and hiking, should be restricted to designated trails.





Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

Natural Heritage Program
COLORADO

0.6 0 0.6 1.2 Miles

Williams Hill Potential Conservation Area

North Fork Fryingpan

Biodiversity Rank: B3 High biodiversity significance
This PCA includes a good occurrence of a riparian plant community that is vulnerable on a global scale and two excellent occurrences of globally common plant communities.

Protection Urgency Rank: P3
Private lands in this area are being developed. There is a need to determine how these activities will impact the PCA.

Management Urgency Rank: M2
Management issues concerning recreation, grazing, and hydrology should be addressed.

Location: Pitkin and Eagle counties. The headwaters of the North Fork of the Fryingpan River and the full Cunningham Creek drainage are included in this PCA.
Legal Description: U.S.G.S. 7.5 minute Nast quadrangle. T8S R82W S7-30, 32-36. T8S R83W S12-14, 23-25. T9S R82W S2, 3.

General Description: This PCA includes the full drainages of Cunningham Creek and the North Fork of the Fryingpan River down to and including the Elk Wallow willow carr. The headwaters of this basin support alpine systems. Further downstream (10,000 feet) the vegetation is dominated by spruce-fir *(Picea engelmannii-Abies lasiocarpa)* and lodgepole pine (*Pinus contorta*) forests with small willow carrs and wet meadows. One of these wet meadows supports a globally-vulnerable plant subspecies. Additionally, a county record for a state-rare fern was located in the PCA in an upland spruce-dominated (*Picea engelmannii*) forest. At these middle elevations the rivers exhibit a pool drop pattern, and contain many boulders and side channels. Scattered outcrops of gray gneiss are found through out the PCA. In general, the PCA supports fairly mature forests, indicated by mixed size classes and lots of dead and down trees, though some logging has occurred in this area in the past. Further downstream (about 9000 feet) Cunningham Creek flows into the North Fork of the Fryingpan River. The drainage then opens out of a lodgepole pine *(Pinus contorta)* forest into a wide valley with extensive willow carrs dominated by Drummond's willow and Canada reedgrass (*Salix drummondiana/Calamagrostis canadensis*) and wet meadows (*Carex aquatilis-Carex utriculata*). The Elk Wallow campground is situated here, just out of the floodplain above the willow carr. Downstream of the PCA, the willow carr is interrupted by reservoirs and homes. There is a very large powerline that crosses through the PCA; and there are roads adjacent to the rivers for most of the lower elevation areas. These corridors in addition to logging have fragmented and altered the riparian areas. Elevation range within the PCA is about 8800 to almost 12,500 feet. A total of 13,477 acres are included in the PCA boundaries.

Biodiversity Rank Justification: The PCA includes an extensive, good quality occurrence of a riparian community that is globally vulnerable. This community, dominated by Drummond's

willow and Canada reedgrass (*Salix drummondiana/Calamagrostis canadensis*), has been documented in only 24 locations in Colorado. Further, a three mile stretch of an excellent occurrence of a globally secure plant community, a pristine occurrence of a common wetland, a county record for a state-rare fern, and a good occurrence of a globally-vulnerable plant subspecies were documented in this PCA. Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) have been documented in two places in this PCA. One of these was last observed in 1981 and has been assigned an historical element occurrence rank by CNHP. The other was last observed in 1995. This subspecies is considered Sensitive by the U.S. Forest Service and is on the State Special Concern list. The greatest threat to the continued viability of Colorado River cutthroat trout is the introduction and migration of non-native fish species. Competition with brook trout and hybridization with rainbow trout are threats to this subspecies (Behnke 1992).

Natural Heritage element occurrences at the North Fork Fryingpan PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix drummondiana/ Calamagrostis canadensis	**lower montane willow carr**	**G3**	**S3**				**B**
Abies lasiocarpa-Picea engelmanii/ Alnus incana	**montane riparian forest**	**G5**	**S3S4**				**A**
Carex aquatilis/ Carex utriculata	**montane wet meadow**	**G4**	**S4**				**A**
Eriophorum altaicum var. *neogaeum*	Altai cottongrass	G4T3	S3				B
Oncorhynchus clarki pleuriticus	Colorado River cutthroat trout	G4T3	S3				C
Oncorhynchus clarki pleuriticus	Colorado River cutthroat trout	G4T3	S3				H
Cystopteris montana	mountain bladder fern	G5	S1				B

*EO=Element Occurrence

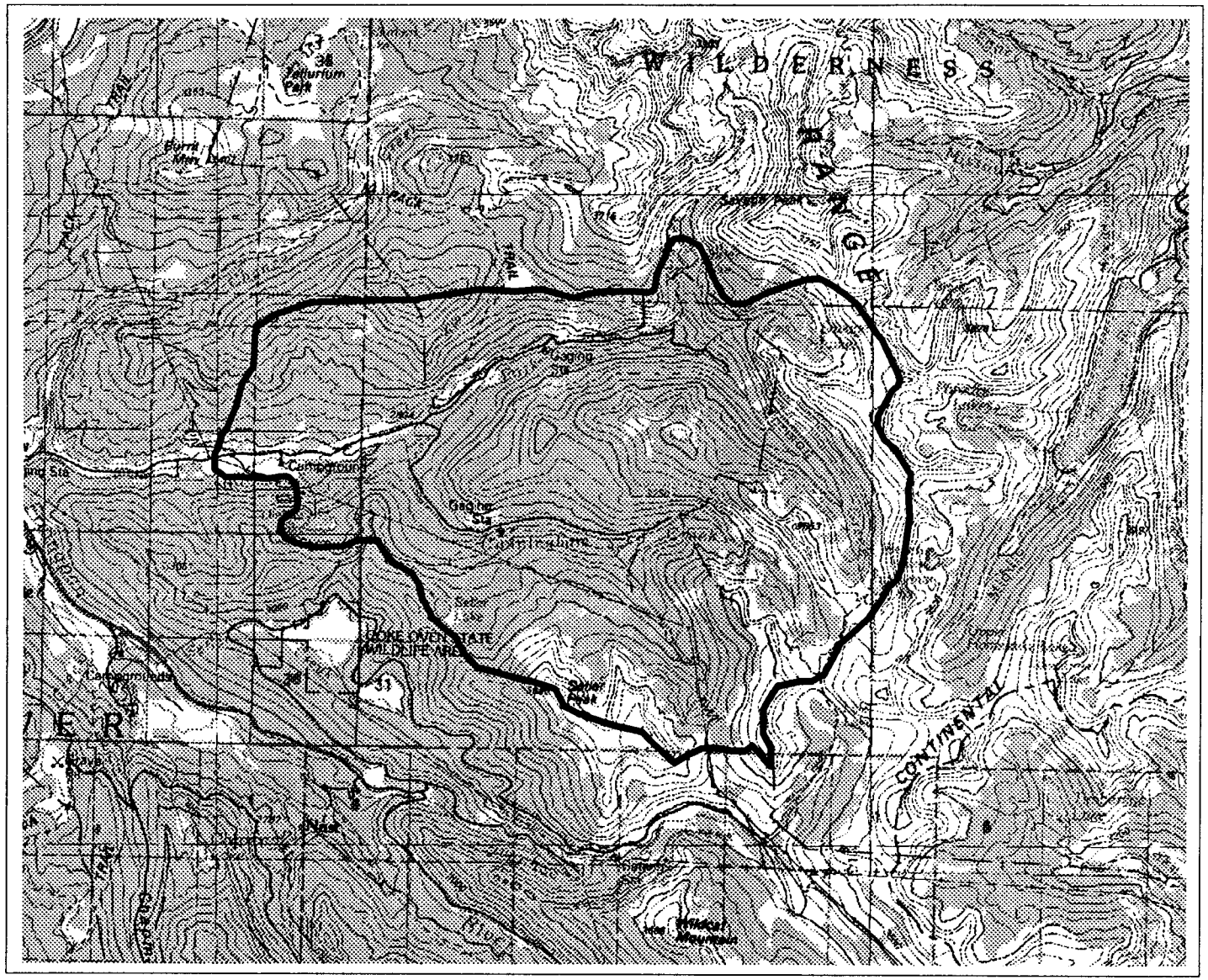
Boundary Justification: The headwaters of the North Fork of the Fryingpan River and the full Cunningham Creek drainage are included in this PCA. This area should be adequate to protect the occurrences from direct disturbances and to allow for migration of the elements over time. Hydrological processes originating outside the boundary should be considered in protection planning.

Protection Rank Explanation: This PCA includes public lands managed by the White River National Forest and private land. Private lands are being developed.

Management Rank Explanations: Recreational use is very high in this area including a campground, 4WD and ORV use, fishing, hiking, and camping. Recreational management should address the impacts of trails and campsites in the riparian areas and along the river

corridors in general. Some portions of the PCA are used for cattle grazing. It is important to keep the cattle out of the riparian areas, particularly those stretches that support communities of concern. Non-native species including dandelion *(Taraxacum officinale)*, timothy (*Phleum pratense*), Kentucky bluegrass (*Poa pratensis*), and Orchard grass (*Dactylis glomerata*) were found at lower elevations and along roads. Management goals should aim to prevent the spread of these and other exotic species. The reservoir downstream of the PCA could change the hydrology of the Elk Wallow willow carr. There is an altered hydrologic cycle in this drainage because of many diversions. Land managers could work with the Bureau of Reclamation to mimic natural flooding regime.

Photos 13 and 14: The lower montane willow carr (top) and the mountain bladder fern (*Cystopteris montana*, bottom) documented at the North Fork Fryingpan PCA.



Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

0.8 0 0.8 1.6 Miles

North Fork Fryingpan Potential Conservation Area

Smith Gulch

Biodiversity Rank: B3 High biodiversity significance
This PCA includes a good occurrence of a globally-vulnerable plant species.

Protection Urgency Rank: P3
This PCA contains a mix of privately owned lands, and lands that are owned and managed by the BLM. The privately owned portions could be threatened by residential development in the future. Actions could include conservation easements with willing private landowners and Area of Critical Environmental Concern (ACEC) or Special Interest Area (SIA) designation on the BLM lands.

Management Urgency Rank: M3
Management is needed to prevent degradation or loss of the occurrences. Actions may include developing a weed control and a road/trail maintenance management plan, and restoration of the sagebrush habitat.

Location: Garfield and Pitkin counties. Southwest of Carbondale between Edgerton Creek and Smith Gulch.
Legal Description: U.S.G.S. 7.5 minute Cattle Creek, Carbondale, Mount Sopris, and Stony Ridge quadrangles. T7S R89W S36. T8S R88W S5-8, 17-21, 28-29. T8S R89W S1, 12, 13, 24.

General Description: Edgerton Creek, Barbers Gulch and Smith Gulch are intermittent drainages that flow to the Crystal River just above its confluence with the Roaring Fork River. This area is characterized by a combination of pinyon-juniper (*Pinus edulis-Juniperus osteosperma*) woodlands, oak (*Quercus gambelii*) shrublands, and sagebrush (*Artemisia tridentata*) shrublands. The sagebrush shrublands are known to support a globally-vulnerable plant species, Harrington's beardtongue (*Penstemon harringtonii*). Osterhout's beardtongue (*Penstemon osterhoutii*) is also found in this PCA. This species is common, though only known from Colorado. This PCA includes about 3,200 acres over an elevation range of about 7000 to 8000 feet.

Biodiversity Rank Justification: Harrington's beardtongue (*Penstemon harringtonii*) is a globally-vulnerable plant species which is restricted to Colorado and is found almost exclusively in sagebrush habitat. This species is known globally from 38 locations, all of which are centered around Edwards, in Eagle County. In general, Harrington's beardtongue and its habitat are threatened by residential development. These threats in addition to its restricted range create an urgency for protection. Harrington's beardtongue populations are known to fluctuate in population numbers from year to year. Therefore, this specific location may be a higher priority than the current information reflects. The Smith Gulch PCA includes two scattered occurrences for this species which are in fair to good condition.

Natural Heritage element occurrences at the Smith Gulch PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Penstemon harringtonii	**Harrington's beardtongue**	**G3**	**S3**			**FS**	**B**
Penstemon harringtonii	Harrington's beardtongue	G3	S3			FS	C

*EO=Element Occurrence

Boundary Justification: The PCA boundary includes the occurrences of Harrington's beardtongue and additional potential habitat to allow for migration of the rare plants over time.

Protection Rank Justification: The PCA includes both private and Bureau of Land Management lands. Cattle grazing is currently the primary land use. This PCA may be impacted in the future by road or housing developments as there are high development pressures from Carbondale. One of the private landowners is interested in preserving the rangeland and the rare plant. Actions could include the development of conservation easements or management agreements with willing private landowners, and specific management plans for the BLM lands that would address the long-term viability of the rare plant at this location. BLM lands should be considered for Area of Critical Environmental Concern (ACEC) or Special Interest Area (SIA) designation.

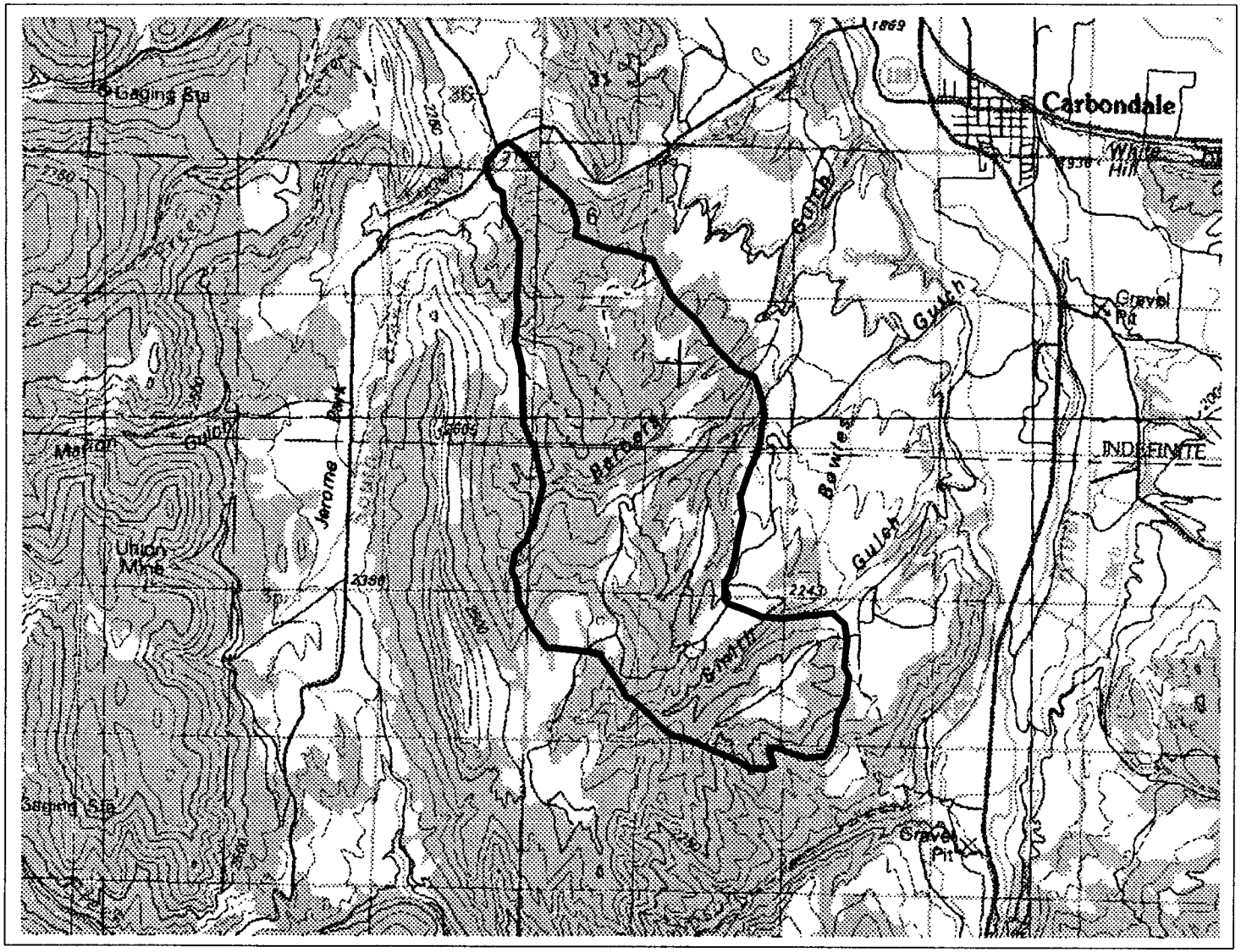
Management Rank Justification: The occurrence in the far northwestern portion of the PCA is directly adjacent to a road; road maintenance activities may effect the Harrington's beardtongue. There is also a pipeline in this area which may have associated maintenance and motorized recreational activity that should be considered in the management of this rare species. Hay grasses are frequent in the PCA and should be controlled, along with a few other exotic plant species such as yellow sweet clover (*Melilotis officinale*) and houndstongue (*Cynoglossum officinale*).

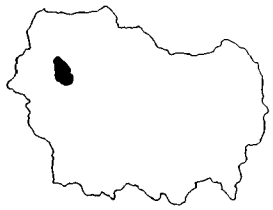
Much of the land within the PCA has been grazed since the 1930's, and smaller portions have been planted with hay grasses, which are likely spreading to other areas. Patches of sagebrush that are heavily grazed do not contain Harrington's beardtongue. Areas that are grazed less heavily contain populations of Harrington's beardtongue that are in good condition. Grazing activities should be managed to ensure that they are compatible with the survival of the rare plants.

There are numerous dirt roads and trails that fragment the PCA. Trail construction activities on the BLM lands could negatively impact this PCA. A management plan should be developed for the BLM lands before recreational uses increase. Only non-motorized recreation is recommended for this area.

Landowner permission is needed to search the remaining sagebrush habitat in this area. Other recommended actions include restoration of degraded sagebrush habitat, development of a weed control and road/trail maintenance management plan, and a monitoring plan designed to detect changes in overall quality and condition of the Harrington's beardtongue.

Photo 15: Habitat for Harrington's beardtongue (*Penstemon harringtonii*) at the Smith Gulch PCA.





Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

Natural Heritage Program
COLORADO

Smith Gulch Potential Conservation Area

West Maroon Creek

Biodiversity Rank: B3- High biodiversity significance
A good occurrence of a globally-vulnerable riparian plant community is found within this PCA.

Protection Urgency Rank: P3
This area is managed by the White River National Forest. The level of threat posed by mining needs to be determined.

Management Urgency Rank: M3
Management is needed to maintain the quality of the PCA. Recommended management actions include enforced camping restrictions, management of recreational uses, and monitoring.

Location: Pitkin County. Headwaters of West Maroon Creek in the Elk Mountains. Southern border of the PCA abuts Gunnison County.
Legal Description: U.S.G.S. 7.5 minute Maroon Bells quadrangle. T11S R86W S22, 23, 26, 27, 33-35. T12S R86W S2-4, 9-11.

General Description: The headwaters of West Maroon Creek lie in a dramatic cirque. The creek drops about 2000 feet and flows south over roughly four miles to a moderately wide subalpine valley, and enters Carter Lake at about 10,000 feet. The riparian vegetation in this drainage is in good condition and is dominated by a mix of willow carrs and spruce-fir *(Picea engelmannii-Abies lasiocarpa)* forests with bluebells (*Mertensia ciliatata*). These stands are patchy due to disturbances from avalanches. Uplands in the PCA are characterized by lodgepole pine (*Pinus contorta*) and spruce-fir (*Picea engelmannii-Abies lasiocarpa*) forests, and talus slopes. There is a pack trail through the PCA along the west side of Maroon Creek that continues over west Maroon Pass. A total of 2567 acres are included in the PCA and the elevation ranges from about 10,000 to 13,130 feet.

Biodiversity Rank Justification: This PCA includes a good occurrence of a globally-vulnerable riparian plant community that is only known from 24 locations in the state of Colorado.

Natural Heritage element occurrences at the West Maroon Creek PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix drummondiana/ Calmagrostis canadensis	**lower montane willow carr**	**G3**	**S3**				**B**

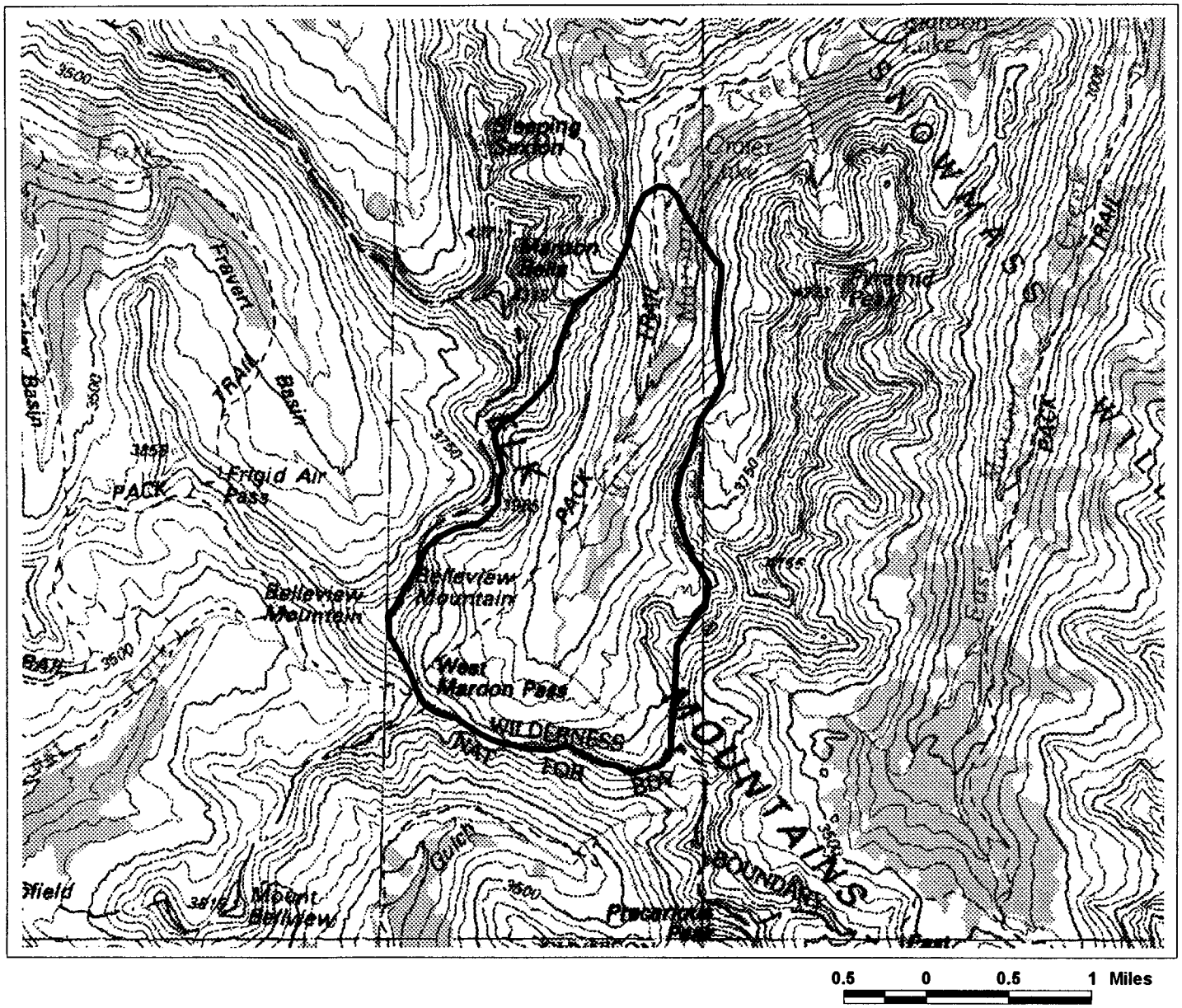
*EO=Element Occurrence

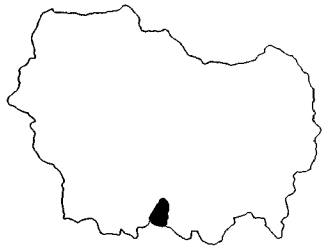
Boundary Justification: The full upper watershed of West Maroon Creek is included in the PCA to protect the hydrologic regime necessary for persistence of the natural community. The

upland areas included in the PCA should be adequate to protect the occurrences from direct disturbances, such as trampling, and indirect disturbances, such as unnatural erosion. The PCA also provides additional suitable habitat to allow for natural migration of the community.

Protection Rank Explanation: This PCA is publicly owned and managed by the White River National Forest. Recreational pressures are high in this area including heavy use by outfitters and campers. Threats posed by mining need to be determined.

Management Rank Explanations: Recreational uses including hiking, horse packing, fishing, and hunting are heavy in this area and are impacting this PCA. Trail maintenance activities could affect the significant riparian areas. The non-native plants, dandelion (*Taraxacum officinale*) and Kentucky bluegrass (*Poa pratensis*), were found in low cover. Recommended management actions include limiting user numbers, the enforcement of no camping within 200 meters of streams, and the development of management and monitoring plans. The Roaring Fork Outdoor Volunteers in partnership with Volunteers for Outdoor Colorado will be working on trail maintenance in this drainage in the summer of 1999.





Location in the Roaring Fork Watershed

PCA boundary

N
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S

0.5 0 0.5 1 Miles

West Maroon Creek Potential Consrvation Area

Cerise Gulch

Biodiversity Rank: B3 High significance
This PCA supports a good occurrence of a globally-vulnerable plant species. Also included in the PCA are five plant community occurrences in excellent to fair condition.

Protection Urgency Rank: P3
There are no known threats for the foreseeable future on the public land. The private land may be threatened by residential development.

Management Urgency Rank: M3
Management of recreation and invasive weeds is needed to maintain the quality of this PCA.

Location: Pitkin and Eagle counties. East of Basalt. Take the Arbaney/Kittle trail out of Wingo.
Legal Description: U.S.G.S. 7.5 minute Basalt quadrangle. T8S R86W S 8-11, 13-17, 21-27. T8S R85W S 17-20, 30, 31.

General Description: The Cerise Gulch PCA lies immediately east of the junction of the Roaring Fork River and the Fryingpan River. This PCA includes the south-facing slopes above the Roaring Fork River that are drained by Bionaz, Wheatley, Cerise, Arbaney, and Dobson Gulches. The major plant communities are dominated by pinyon pine (*Pinus edulis*), sagebrush (*Artemisia tridentata*), Douglas fir (*Pseudotsuga menziesii*), or Gambel's oak (*Quercus gambelii*). Wide, shallow drainages are dominated by sagebrush with needle-and-thread grass (*Stipa comata*) and Indian rice grass (*Oryzopsis hymenoides*) at the lower elevations, and Thurber's fescue (*Festuca thurberi*) at higher elevations. These sagebrush communities provide habitat for the globally-vulnerable Harrington's beardtongue (*Penstemon harringtonii*). Gambel's oak *(Quercus gambelii)* occupies hillsides above the sagebrush and a band just above the steeper drainage bottoms. Cool, steep north-facing slopes support Douglas fir *(Pseudotsuga menziesii)* with Gambel's oak *(Quercus gambelii)*, serviceberry (*Amelanchier* sp.) and elk sedge (*Carex geyeri*). South-facing slopes and lower elevation slopes support pinyon pine with Arizona fescue (*Festuca arizonica*), blue bunch wheatgrass (*Pseudoroegneria spicata*) or bare soil (erodable dark red soil of the Maroon Formation). This area contains one of the best examples of a Douglas fir forest in the Roaring Fork Watershed. Grouse were observed and elk (*Cervus elaphus*) are known to use this area. The PCA includes approximately 6517 acres between 6800-10,000 feet.

Biodiversity Rank Justification: Harrington's beardtongue (*Penstemon harringtonii*) is a globally-vulnerable plant species that is restricted to Colorado and is found almost exclusively in sagebrush habitat. This species is only known from approximately 37 locations, all of which are centered around Edwards, in Eagle County. In general, Harrington's beardtongue and its habitat are highly threatened due to residential, agricultural, and recreational development. These

threats, in addition to its restricted range, create an urgency for protection. Harrington's beardtongue populations are known to fluctuate in population numbers from year to year. Therefore, this specific location may be a higher priority than the current information reflects.

Harrington's beardtongue is the most significant occurrence within this PCA. However, there are four plant communities of global and state significance in fair condition which augment the importance of this PCA. Evidence of elk use also lends importance to the protection of the area.

Natural Heritage element occurrences at the Cerise Gulch PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Penstemon harringtonii	**Harrington's beardtongue**	**G3**	**S3**			**FS**	**B**
Artemisia tridentata ssp. *vaseyana/ Carex geyeri*	west slope sagebrush shrubland	G3	SU				C
Artemisia tridentata ssp. *vaseyana/ Symphoricarpos oreophilus/ Agropyron trachycaulum*	west slope sagebrush shrubland	G3G4	S3S4				C
Artemisia tridentata ssp. *vaseyana/ Symphoricarpos oreophilus/ Agropyron trachycaulum*	west slope sagebrush shrubland	G3G4	S3S4				C
Pseudotsuga menziesii/ Carex geyeri	**lower montane forest**	**G5Q**	**S3**				**A**
Populus angustifolia-Pseudotsuga menziesii	montane riparian forest	GU	S2				C

*EO=Element Occurrence

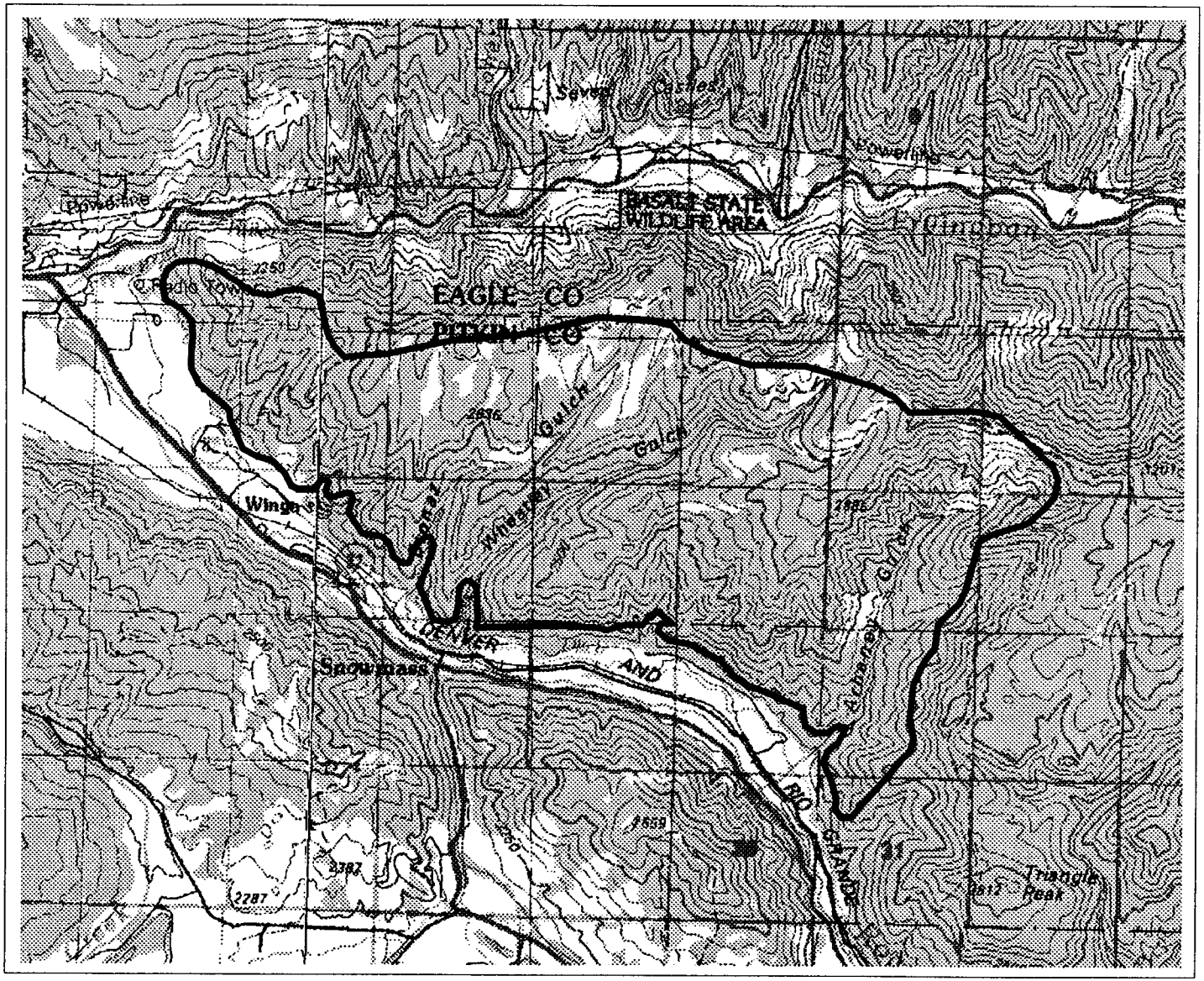
Boundary Justification: This PCA includes the above occurrences and the surrounding high quality habitat. This area is intended to act as a buffer to direct disturbances, such as trampling, and indirect disturbances, such as unnatural erosion.

Protection Rank Justification: The PCA is mostly publicly owned and managed by the Bureau of Land Management and the U.S. Forest Service. The lower elevations are privately owned and are threatened by development.

Management Rank Justification: The Harrington's beardtongue (*Penstemon harringtonii*) occurs within the Bureau of Land Management (BLM) property. The BLM is aware of the penstemon. A management plan for this species, and this PCA specifically, should be developed by the BLM. The Arbaney/Kittle trail runs through the PCA. This trail was formerly used by off-road vehicles. Currently the trail is closed to motorized vehicles, but open to horse and mountain bike traffic. However, closures are not enforced, and an extensive user-created trail system is developing. The exotic plant species found in the PCA are mostly pasture grasses such as smooth brome (*Bromus inermis)* and orchard grass (*Dactylis glomerata*). These non-native species were found mostly along the trail, and are probably dispersed by hikers, horses and

mountain bikes. Houndstongue (*Cynoglossum officinale*) and plumeless thistle (*Carduus acanthoides*) were also documented in the PCA. These species should be controlled before they spread further from the trails. Due to the proximity of the rare plants to the trial, it is necessary that recreationists stay on the trail. Re-routing or closure of this trail should be considered and future trails should be discouraged. Use of motor vehicles should be prohibited. Grazing occurred on the National Forest land in this PCA in the past. The effects of the cattle are still visible on the land in the form of cattle trails. Grazing, if established in the future, should not be allowed in the riparian zones.

Photos 16 and 17: The lower montane forest (*Pseudotsuga menziesii-Carex geyeri*) plant community (top) found in the Cerise Gulch PCA (bottom).



Location in the Roaring Fork Watershed

PCA boundary

N
W E
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Natural Heritage Program
COLORADO

Cerise Gulch Potential Conservation Area

The Grottos

Biodiversity Rank: B3 High significance
This PCA includes a good occurrence of a globally-vulnerable plant subspecies.

Protection Urgency Rank: P4
There are no known threats for the foreseeable future.

Management Urgency Rank: M1
Management for recreation is essential to prevent loss of individual plants at this PCA.

Location: Pitkin County. At the confluence of Lincoln Creek with the Roaring Fork River.
Legal Description: U.S.G.S 7.5 minute New York Peak quadrangle. T11S R83W S 5, 6. T10S R84W S36. T11S R84W S1. T10S R83W S 31-33.

General Description: The PCA includes a large rock outcrop which stretches for at least 2 miles in an east-west direction, paralleling Highway 82 and the Roaring Fork River. The outcrop includes large rock faces, overhangs, and large boulder fields and talus slopes at the base of the cliffs (9400-11,400 feet). There are small seeps which maintain a moist to dripping micro-climate on the rock. This habitat creates hanging gardens that include the rare plant species, hanging garden sullivantia (*Sullivantia hapemanii* var. *purpusii*). The surrounding vegetation is mainly composed of oceanspray *(Holodiscus bicolor*). Stands of spruce-fir (*Picea engelmannii-Abies lasiocarpa*), lodgepole (*Pinus contorta*), aspen (*Populus tremuloides*) and Douglas fir *(Pseudotsuga menziesii*) occur in the uplands surrounding the PCA. A total of 1166 acres are included in this PCA.

Biodiversity Rank Justification: The globally-vulnerable hanging garden sullivantia (*Sullivantia hapemanii* var. *purpusii*) occurs here in good-quality, but threatened, habitat. This subspecies is restricted to west central Colorado. This is the only known occurrence of this subspecies in the Roaring Fork River Watershed.

Natural Heritage element occurrences at The Grottos PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Sullivantia hapemanii* var. *purpusii	**hanging garden sullivantia**	**G3T3**	**S3**				**B**

*EO=Element Occurrence

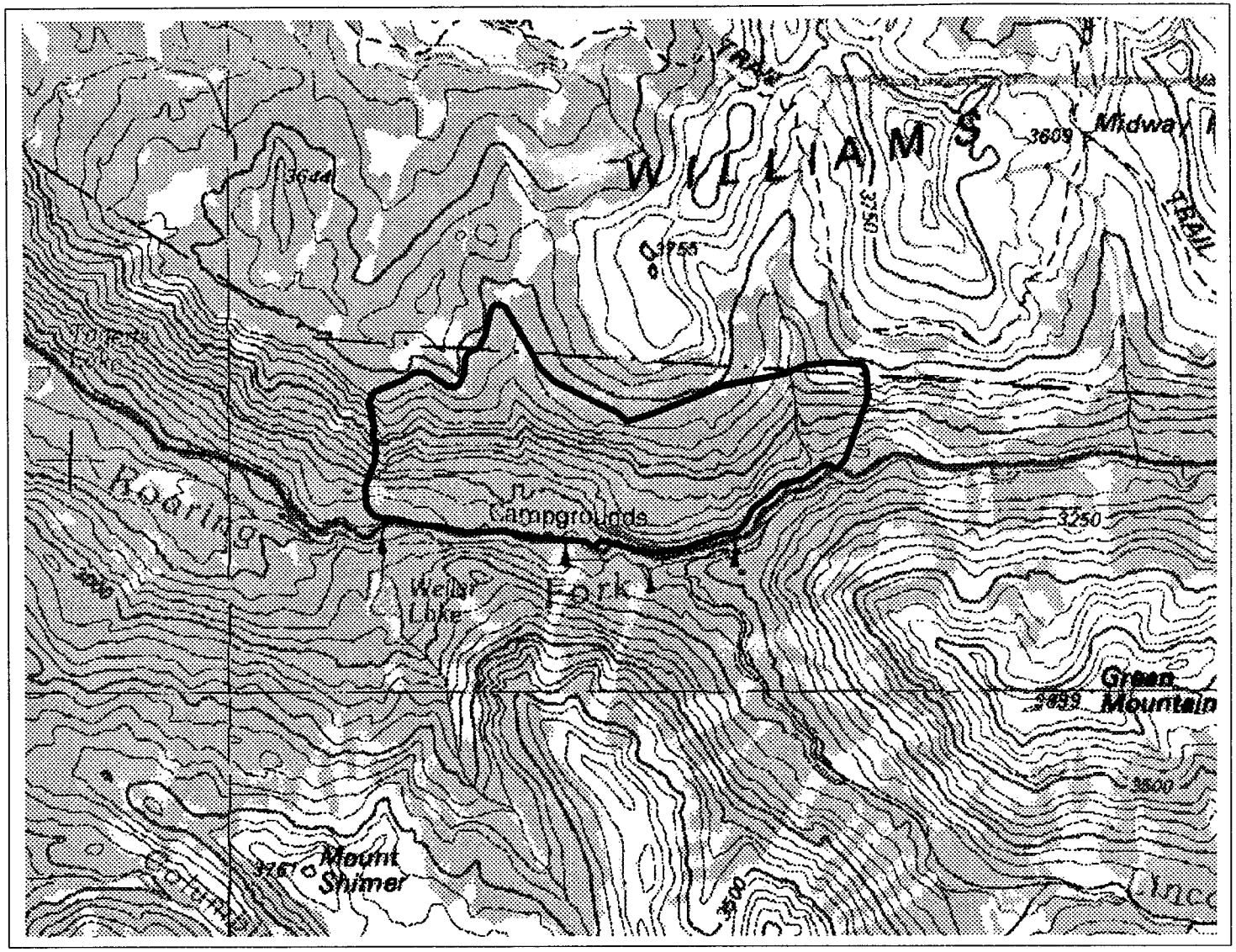
Boundary Justification: There appears to be abundant potential habitat for this species in this area that is not accessible for surveys. The boundary includes the element and this potential habitat, as well as a portion of each of the dominant plant communities immediately adjacent to

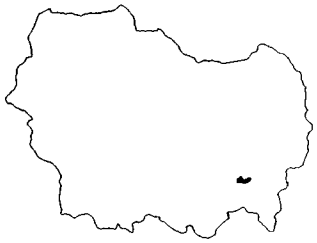
the occurrence. These adjacent communities act as an ecological buffer, and provide landscape context within which to manage and protect the elements.

Protection Rank Justification: The PCA is on public land managed by the U.S. Forest Service. As long as the management issues are addressed, there are no foreseeable protection actions needed.

Management Rank Justification: This PCA is threatened by recreational activities, especially rock climbers. Specifically, climbers are hiking through the hanging garden to access the technical climbing routes. It is the access routes, not the technical routes, that are threatening the rare plant occurrence. Education about hanging garden sullivantia *(Sullivantia hapemanii* var. *purpusii*) and its habitat should be provided to the climbers who frequent the area. If this approach is not successful in protecting the hanging gardens within two years, the access routes used by climbers should be re-established and the occurrence should be visited every other year to check for vigor and abundance. Another possible threat to this occurrence would be the widening of Highway 82. This has not been proposed but is always a concern. Additionally, any activities above this PCA may create management concerns. The management of the hanging garden sullivantia should be considered when forming future plans for this area.

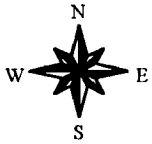
Photos 18 and 19: Hanging garden sullivantia (*Sullivantia hapemanii* var. *purpusii*) (top) found at The Grottos PCA (bottom).





Location in the Roaring Fork Watershed

PCA boundary



0.5 0 0.5 1 Miles

The Grottos Potential Conservation Area

Mountain Boy Park

Biodiversity Rank: B3 High significance
This PCA includes a globally-vulnerable and a state-rare plant species, and bird species which is uncommon in the state.

Protection Urgency Rank: P4
This PCA is located within a U.S. Forest Service Wilderness Area and there are no foreseeable threats.

Management Urgency Rank: M2
Management is essential to prevent loss of the occurrences from recreational impacts.

Location: Pitkin and Lake counties. South of Independence Pass.
Legal Description: U.S.G.S. 7.5 minute Independence Pass quadrangle. T11S R82W S7-9, 17-20.

General Description: The Mountain Boy Park PCA ranges in elevation between 11,600 and 13,000 feet along the Continental Divide. This PCA is a north-south running ridge, southwest of Independence Pass, which affords spectacular views of Mount Sopris and the Maroon Bells. To the east is a steep cliff that drops into Mountain Boy Gulch, and looks across to La Plata Peak. To the west, the slopes are more gradual and support a mosaic of alpine plant communities including rock gardens. The western slopes drop into Independence Creek and the Roaring Fork River. A heavily used trail follows the Continental Divide to a 13,198 foot peak. This PCA includes 772 acres.

Biodiversity Rank Justification: This PCA includes one globally-vulnerable and one state-rare plant species. Colorado Divide whitlow-grass (*Draba streptobrachia*) occurs in 11 counties widely scattered across Colorado. Although a globally common species, low fleabane (*Erigeron humilis*) is known in Colorado only from the Continental Divide area in Gunnison and Pitkin counties. The brown-capped rosy-finch *(Leucosticte tephrocotis,* var. *austalis*) was also found in this PCA. Individuals found in Colorado may be a subspecies which is restricted to the mountains of Wyoming, Colorado, and New Mexico. This is not a recognized subspecies currently, but if it is determined to be distinct the significance of this PCA would increase.

Natural Heritage element occurrences at the Mountain Boy Park PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Draba streptobrachia	**Colorado Divide whitlow-grass**	**G3**	**S3**				**B**
Erigeron humilis	low fleabane	G4	S1				E
Leucosticte tephrocotis, var. *austalis*	brown-capped rosy-finch	G4	S3S 4B, S4N				E

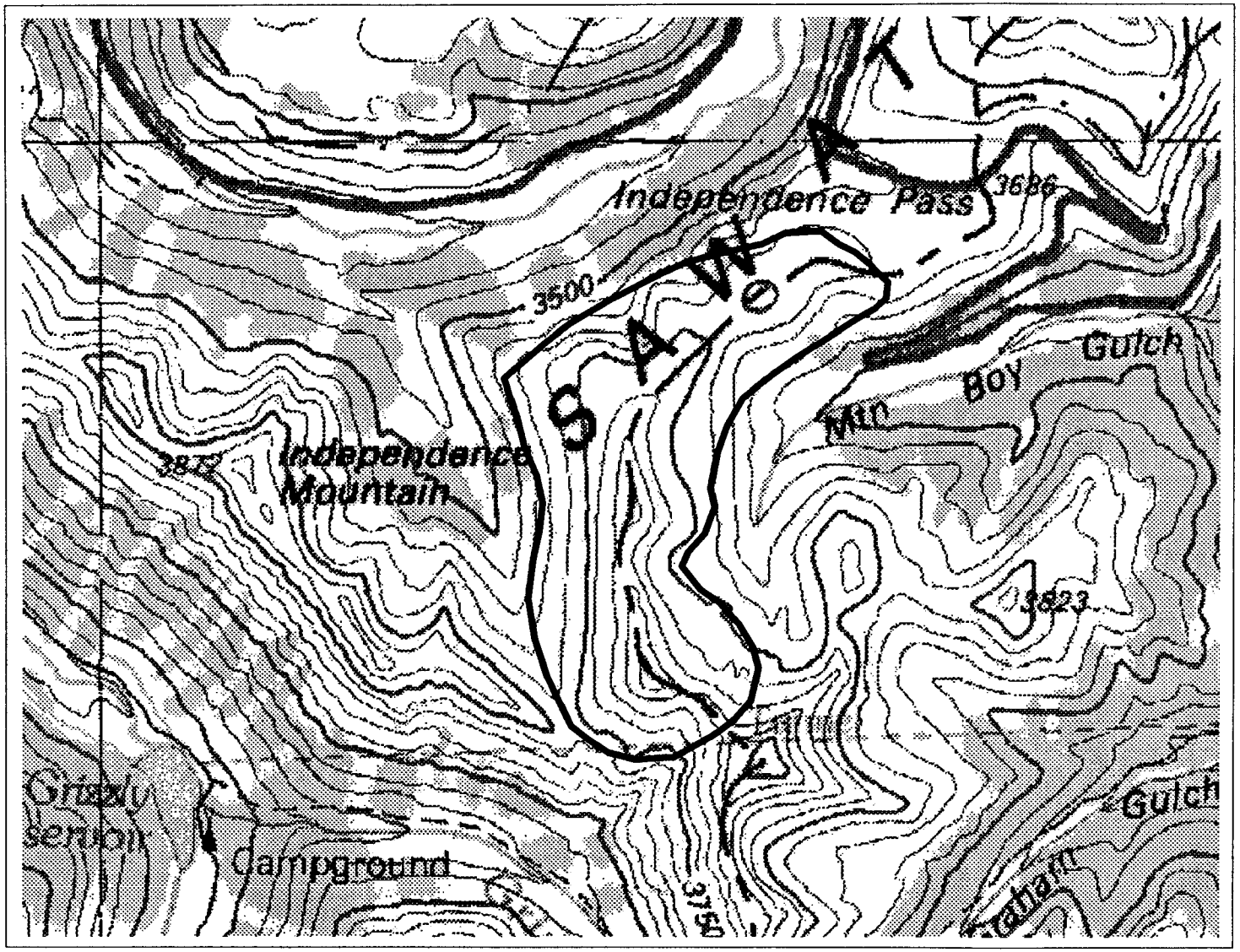
*EO=Element Occurrence

Boundary Justification: This boundary is drawn to: 1) protect the occurrences from direct impacts such as trampling or other surface disturbances; 2) provide suitable habitat where additional individuals can become established over time; and 3) include representation from each of the local alpine plant communities which may support a pollinator for one or more of the rare plant species.

Protection Rank Explanation: This PCA is publicly owned and managed by the U.S. Forest Service within the Collegiate Peaks Wilderness Area.

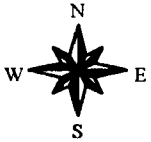
Management Rank Explanation: The habitat is pristine and management is adequate, except for the area adjacent to the trail. A trail runs directly adjacent to the rare plant occurrences and bisects the PCA down the middle. Trampling from hikers is an immediate threat to these plants. Educational signs along the trail expressing the importance of preserving the rare plant habitat may be useful. If this is not effective, the trail should be closed or re-routed. The occurrence of low fleabane is small; a thorough search should be conducted. These rare plant species should be monitored to detect changes in overall quality or condition of the occurrences. Disturbance to the brown-capped rosy finch, especially during the breeding season, should be minimized.

Photos 20 and 21: Colorado Divide whitlow-grass (*Draba streptobrachia*) (top) was found in the Twining Peak and Mountain Boy Park PCAs. Habitat for Colorado Divide whitlow-grass on Twining Peak (bottom).



Location in the Roaring Fork Watershed

PCA boundary



0.3 0 0.3 0.6 Miles

Mountain Boy Park Potential Conservation Area

Conundrum Creek

Biodiversity Rank: B3
This PCA contains the only known breeding location of the critically imperiled boreal toad (*Bufo boreas* pop. 1) in the Roaring Fork watershed.

Protection Urgency Rank: P4
Maroon Bells-Snowmass Wilderness. White River National Forest.

Management Urgency Rank: M3
Recreational use is high along trail to Conundrum Hot Springs. Management may be needed to maintain the quality of the PCA.

Location: Pitkin County. Conundrum Creek, approximately 10 miles south of Aspen.
Legal Description: U.S.G.S. 7.5 minute Maroon Bells, Hayden Peak, and Gothic quadrangles. T11S R85W S15, 21, 22, 27-28,33. T12S R85W S4, 9, 16-21, 28, 29.

General Description: Conundrum Creek's headwaters begin at approximately 11,500 feet below talus slopes and flow by Conundrum Hot Springs at about 11,200 feet. The creek flows through a series of beaver ponds and empties into Cattle Creek, which flows through west Aspen. A well-used trail follows the creek throughout the entire PCA. Approximately 3,000 acres are included in the PCA boundaries.

Biodiversity Rank Justification: The Conundrum Creek PCA includes the only breeding occurrence of the globally critically imperiled boreal toad (*Bufo boreas* - southern Rocky Mountains population) in the Roaring Fork watershed.

There are numerous historical occurrences of rare plants in this PCA. These include the globally imperiled Colorado wild buckwheat (*Eriogonum coloradense*), the globally-vulnerable tundra draba (*Draba ventosa*) and Leadville milkvetch (*Astragalus molybdenus*), as well as the state-rare wolly fleabane (*Erigeron lanatus*) and dwarf hawks beard (*Crepis nana*). There are also historical occurrences of two rare mustards, *Draba spectabilis* var. *oxyloba* and *Draba lonchocarpa* var. *lonchocarpa*, in the general area of Conundrum Pass, which falls within the upper portion of the PCA. These occurrences are likely still present due to the relatively undisturbed alpine habitat in which these plants are found. Further inventory of the alpine habitat in this PCA is needed to update these records.

Natural Heritage element occurrences at the Conundrum Creek PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Bufo boreas pop. 1	**boreal toad (southern Rocky Mounatin population)**	**G4T1Q**	**S1**	**C**	**SE**	**FS**	**D**
Eriogonum coloradense	Colorado wild buckwheat	G2	S2			BLM	H
Draba ventosa	tundra draba	G3	S1				H
Astragalus molybdenus	Leadville milkvetch	G3	S2			FS	H
Draba crassa	thick-leaf willow-grass	G3	S3				H
Erigeron lanatus	wolly fleabane	G3G4	S1			FS	H
Crepis nana	dwarfhawks beard	G5	S2				H
Crepis nana	dwarf hawksbeard	G5	S2				H
Crepis nana	dwarf hawksbeard	G5	S2				H

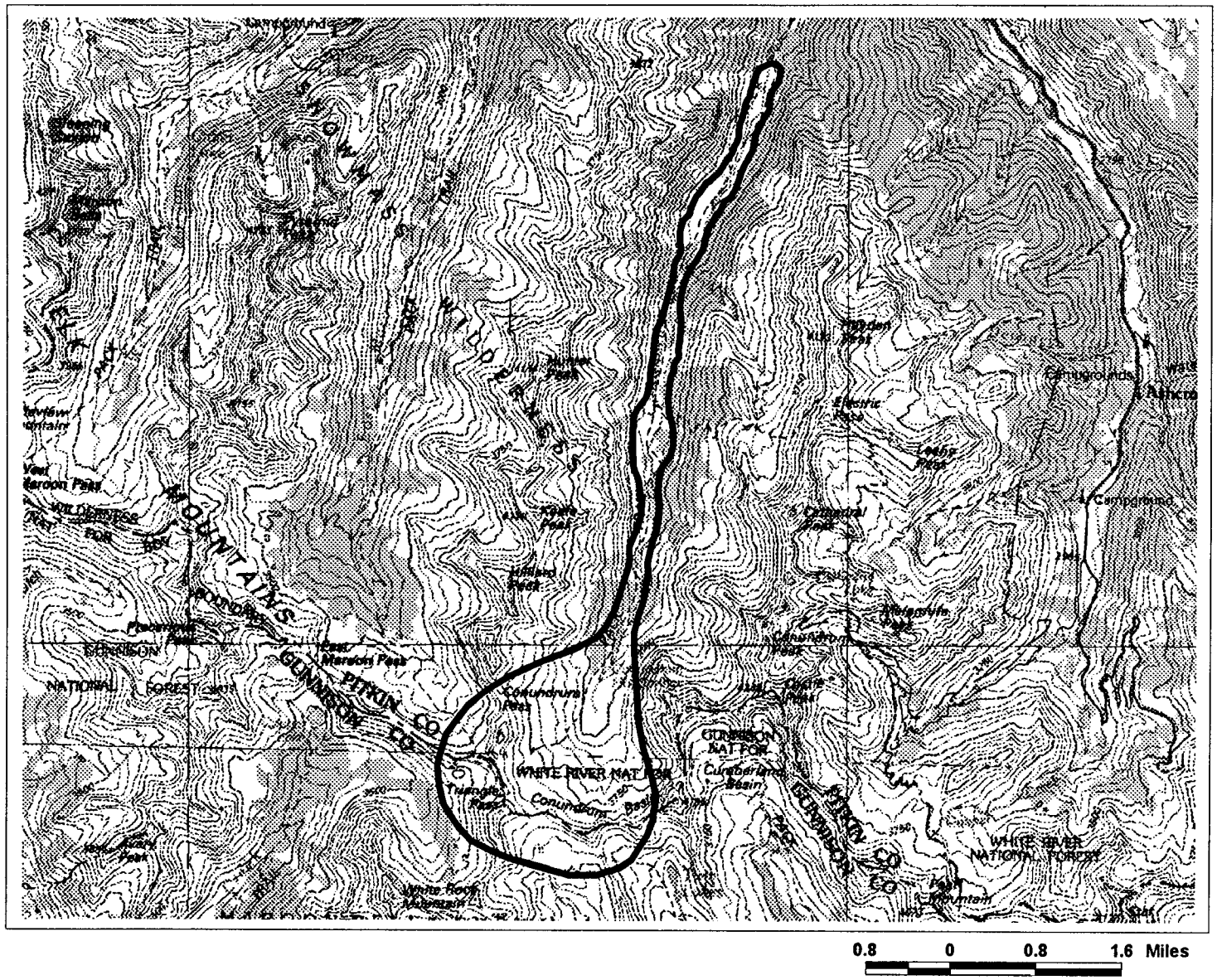
*EO=Element Occurrence

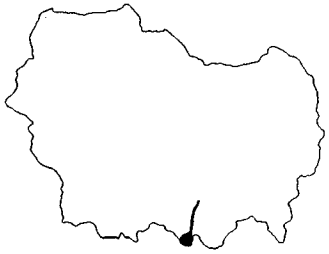
Boundary Justification: The planning boundary includes the headwaters of this creek as well as an upland buffer which should be sufficient to limit direct physical disturbance and local hydrological alteration. The boundary is extended over the watershed divide to contain the alpine habitat supporting some rare plants that were historically documented in the area. Hydrological processes originating outside of the planning boundary, including water quality, quantity, and timing, should be managed to maintain population viability.

Protection Rank Explanation: This PCA falls within the Maroon Bells-Snowmass Wilderness Area, in the White River National Forest.

Management Rank Explanations: The high recreational activity along Conundrum Creek is a likely disturbance to the population of boreal toads present in the PCA. It may be necessary to limit the amount of use this trail receives. The Boreal Toad Recovery Team is aware of this population and has been monitoring this location for several years. A management plan should be developed for this PCA to ensure long term protection of the occurrences. The rare plant occurrences need to be visited to document their current condition.

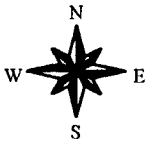
Photo 22. The Conundrum Creek PCA includes the only breeding occurrence of the boreal toad (*Bufo boreas*-sountern Rocky Mountain population) in the Roaring Fork Watershed.





Location in the Roaring Fork Watershed

PCA boundary



Natural Heritage Program COLORADO

Conundrum Creek Potential Conservation Area

East Maroon Creek

Biodiversity Rank: B3 - High biodiversity significance
A good occurrence of a globally-vulnerable riparian plant community is found within this PCA.

Protection Urgency Rank: P3
This PCA is publicly owned and managed by the White River National Forest. The level of threats posed by potential mining and other activities needs to be determined.

Management Urgency Rank: M3
Management is needed to maintain the quality of the PCA. Recommended management actions include management of recreational uses and monitoring.

Location: Pitkin County. East Maroon Creek.
Legal Description: U.S.G.S. 7.5 minute Maroon Bells quadrangle. T11S R85W S29-32. T11S R86W S24, 25, 36. T12S R85W S5-7, 18. T12S R86W S1, 12, 13.

General Description: East Maroon Creek flows south into West Maroon Creek. The riparian areas along East Creek are dominated by a mix of willow carrs and conifer forests. There is a pack trail that follows the east side of the creek. This PCA includes a total of 3477 acres with an elevation range of about 9600 to11,800 feet.

Biodiversity Rank Justification: This PCA includes a good occurrence of a globally-vulnerable riparian plant community that is only known from 24 locations in the state of Colorado.

Natural Heritage element occurrences at the East Maroon Creek PCA.

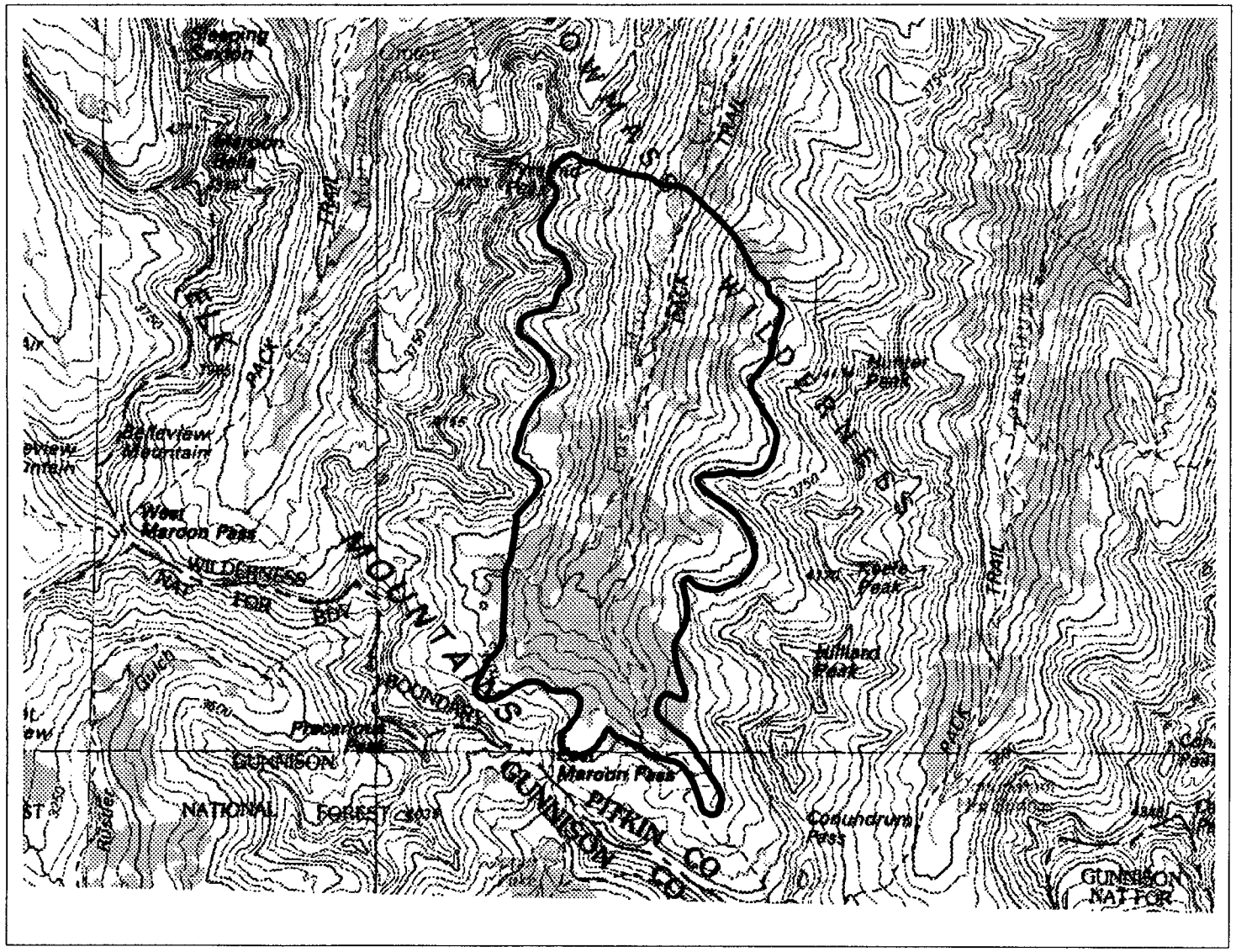
Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix drummondiana/ Calamagrostis canadensis	**Lower montane willow carr**	**G3**	**S3**				**B**

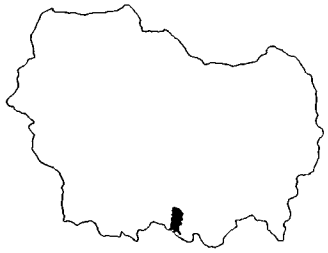
*EO=Element Occurrence

Boundary Justification: The full upper watershed of East Maroon Creek is included in the PCA to protect the hydrologic regime necessary for persistence of the natural community. The upland areas included in the PCA should be adequate to protect the occurrences from direct disturbances, such as trampling, and indirect disturbances, such as unnatural erosion. The PCA also provides additional suitable habitat to allow for natural migration of the community.

Protection Rank Explanation: This PCA is publicly owned and managed by the White River National Forest. Recreational pressures are high in this area. Any developments may threaten this PCA. Threats posed by mining need to be determined.

Management Rank Explanations: Recreational uses including hiking, horse packing, fishing, and hunting are common in the PCA. These activities as well as trail maintenance could effect the significant riparian areas. Actions could include the development of a long-range management plan including mitigation of various impacts, and a monitoring program designed to detect changes in the overall quality or condition of the community occurrence.





Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

0.6 0 0.6 1.2 Miles

Natural Heritage Program
COLORADO

East Maroon Creek Potential Conservation Area

East Snowmass Creek

Biodiversity Rank: B3 High biodiversity significance
A good occurrence of a globally-vulnerable riparian plant community has been documented within this PCA.

Protection Urgency Rank: P4
This PCA is within the Maroon Bells-Snowmass Wilderness Area, which is managed by the White River National Forest. The PCA is immediately adjacent to a large ski area, which could pose threats in the future.

Management Urgency Rank: M3
Management is needed to maintain the quality of the PCA. Recommended management actions includes the eradication of non-native plants along the trail that follows East Snowmass Creek.

Location: Pitkin County. East Snowmass Creek
Legal Description: U.S.G.S. 7.5 minute Highland Peak quadrangle. T10S R86W T9, 10, 15, 16, 22.

General Description: East Snowmass Creek flows south from its headwaters near Baldy Mountain, and enters Snowmass Creek just west of the Snowmass ski area. The PCA includes a roughly two mile stretch of East Snowmass Creek, and supports a mosaic of good quality riparian vegetation, including a globally-vulnerable community dominated by Drummond's willow (*Salix drummondiana*) and Canada reedgrass (*Calamagrostis canadensis*). This community occurrence is found in a moderately wide valley with steep canyon walls. The adjacent uplands support a mixed conifer forest and rock outcrops. The PCA includes 632 acres and ranges in elevation from about 9,200 to 11,200 feet.

Biodiversity Rank Justification: This PCA includes a good quality occurrence of a globally-vulnerable plant community dominated by Drummond's willow and Canada reedgrass (*Salix drummondiana/Calamagortis canadensis*). This community type is known from 24 records in the state. There is also an occurrence of a Northern Goshawk (*Accipiter gentilis*) nest within this PCA.

Natural Heritage element occurrences at the East Snowmass Creek PCA.

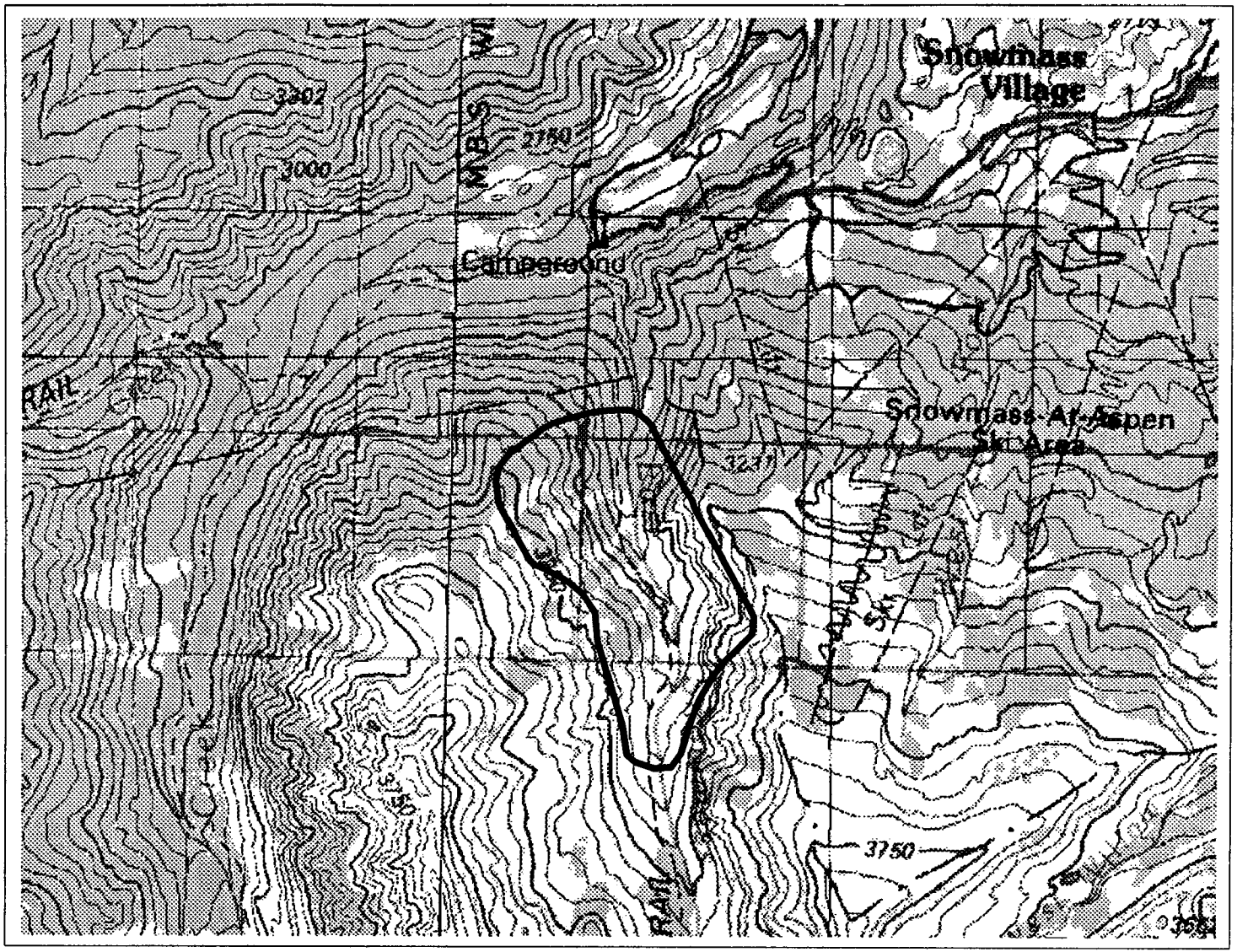
Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Accipiter gentilis	Northern Goshawk	G5	S3B, SZ				E
Salix drummondiana/ Calamagrostis canadensis	**Lower montane willow carr**	**G3**	**S3**				**B**

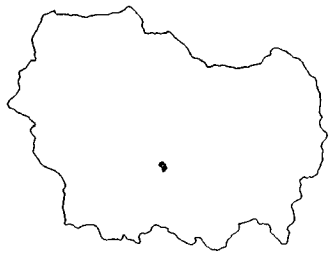
*EO=Element Occurrence

Boundary Justification: The surrounding high quality habitat is included to act as a buffer to direct disturbances, such as trampling, and indirect disturbances, such as unnatural erosion. The PCA also provides additional suitable habitat to allow for natural migration of the community. Hydrological processes originating outside of the planning boundary, including water quality, quantity, and timing, should be managed to maintain the population viability. This boundary provides for the nest of the Northeren Goshawk found within this PCA, its entire territory is not included in this boundary.

Protection Rank Explanation: Special area designation should not be necessary for protection if management issues are adequately addressed.

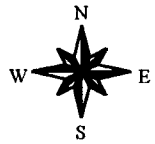
Management Rank Explanations: A trail follows the west side of East Snowmass Creek which may cause erosion problems and is acting as a conduits for weeds, such as dandilion *(Taraxacum officinale)*, orchard grass (*Dactylis glomerata*), and white clover (*Trifolium repens*). One of the best defenses against the spread of these exotic species is to discourage future trailways. Impacts resulting from recreational uses including hiking and camping should also be addressed in a management plan for this PCA.





Location in the Roaring Fork Watershed

PCA boundary



East Snowmass Creek Potential Conservation Area

Lost Man Creek

Biodiversity Rank: B3 High biodiversity significance
An excellent occurrence of a globally secure riparian community is found within this PCA.

Protection Urgency Rank: P4
Most of the PCA is included in the Hunter-Fryingpan Wilderness Area, managed by the White River National Forest. There is a need to determine the level of threat posed by potential mining activities.

Management Urgency Rank: M3
Management is needed to maintain the quality of the PCA. Recommended management actions include trail improvements. Recreational uses may threaten the occurrence.

Location: Pitkin County. Lost Man Creek flows south into the Roaring Fork River near its headwaters. Northwest of Independence Pass.
Legal Description: U.S.G.S. 7.5 minute Mount Champion and Thimble Rock quadrangles. T10S R82W S18-21, 28-32. T10S R83W S13, 23-26, 35, 36.

General Description: Lost Man Creek flows south from its headwaters at about 12,000 feet and drops gently over a 3-4 mile distance before flowing into Lost Man Reservoir at about 10,600 feet. This wide U-shaped, glacially carved valley supports high quality willow carrs with small breaks of spikerush (*Eleocharis* sp.) wetlands and subalpine meadows. The adjacent uplands are characterized by spruce-fir (*Picea engelmannii-Abies lasiocarpa*) communities, avalanche chutes and rock outcrops. The highest elevations in the site support alpine plant communities, several alpine lakes, and dramatic rock outcrops. A trail winds along the west side of Lost Man Creek. In most places the trail is high enough up the slope to leave the willow carr fairly well untouched, but trial maintenance activities are needed to ensure protection of the willow carr. Sparse cover of dandilion (*Taraxacum officinale*) was the only exotic species noted. Approximately 5575 acres are included in the PCA boundaries, including an elevation range of about 10,600 to 13,000 feet.

Biodiversity Rank Justification: This PCA includes an excellent example of a globally common riparian community. The Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) has also been documented in this PCA. This subspecies is considered Sensitive by the U.S. Forest Service and is on the State Special Concern list. The greatest threat to the continued viability of Colorado River cutthroat trout is the introduction and migration of non-native fish species. Competition with brook trout and hybridization with rainbow trout are threats to this subspecies (Behnke 1992).

Natural Heritage element occurrences at the Lost Man Creek PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix planifolia/ Caltha leptocephala	**subalpine riparian willow carr**	**G4**	**S4**				**A**
Onchorhynchus clarkii pleuriticus	Colorado River cutthroat trout	G4T3	S3		SC	FS	

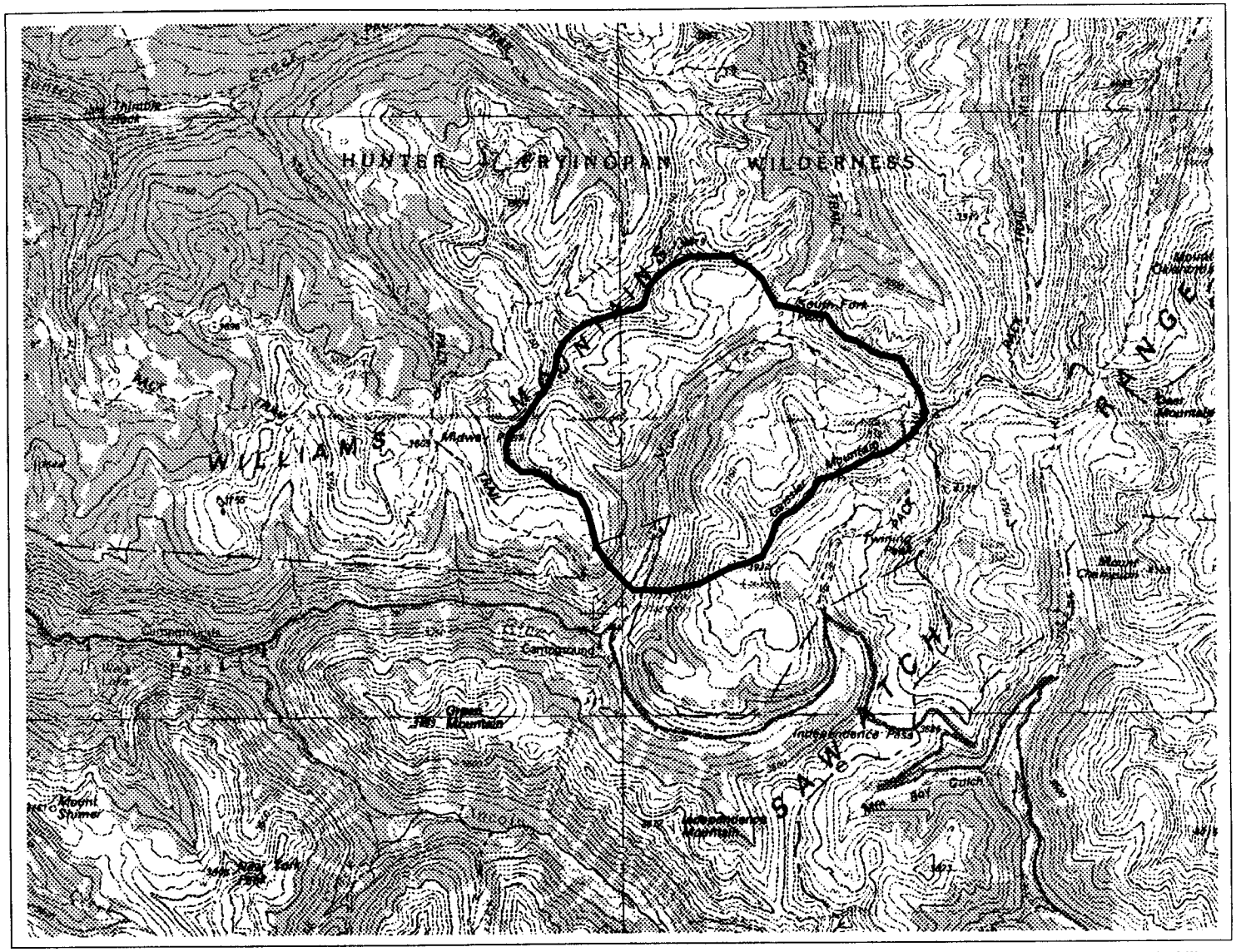
*EO=Element Occurrence

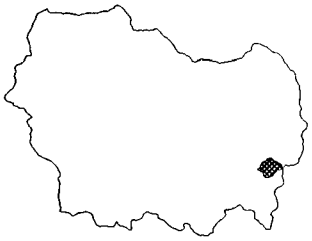
Boundary Justification: The PCA includes some of each of the mosaic of community types in which the element occurrences are found. The surrounding high quality habitat is included to act as a buffer to direct disturbances, such as trampling, and indirect disturbances, such as unnatural erosion.

Protection Rank Explanation: This PCA is publicly owned and managed by the White River National Forest. Recreational use is fairly high in this area. Level of threat posed by potential mining activities should be determined.

Management Rank Explanations: Recreational uses including hiking, horse packing, fishing, hunting, and camping have brought litter in to the PCA. Trail maintenance and re-routing may be needed to protect the willow carr. Only trace amounts of dandelion were noted along the trail. The community in this PCA should be monitored every five years to detect changes in overall quality or condition.

Photo 23: Subalpine willow carr (*Salix planifolia-Caltha leptocephala*) at the Lost Man Creek PCA.





Location in the Roaring Fork Watershed

PCA boundary

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Natural Heritage Program
COLORADO

Lost Man Creek Potential Conservation Area

McClure Pass

Biodiversity Rank: B3 High biodiversity significance
This PCA is based upon a good occurrence of a globally-vulnerable plant species.

This PCA is not immediately threatened. Work with the U.S. Forest Service and the Colorado Department of Transportation to ensure long-term protection. Timber harvesting could threaten the occurrences.

Management Urgency Rank: M3
Management actions are essential to prevent the loss of occurrences. Actions should include weed control and restoration efforts, and restricted recreation access.

Location: Pitkin and Gunnison counties. McClure Pass.
Legal Description: U.S.G.S. 7.5 minute Placita and Chair Mountain quadrangles. T11S R89W S1-3, 10, 11, 12, 14.

General Description: This PCA contains extensive aspen *(Populus tremuloides)* forests with bracken fern (*Pteridium aquilinum*) in the understory, spruce-fir (*Picea engelmannii-Abies lasiocarpa*) forests, and mixed shrublands dominated by Gambel's oak *(Quercus gambelii)*, serviceberry (*Amelanchier utahensis*), snowberry (*Symphoricarpos rotundifolius*), chokecherry (*Prunus virginiana*) or rose (*Rosa woodsii*). Small rock outcrops and the shrublands support a globally-vulnerable plant species. Dramatic views are afforded of the Crystal River drainage and the Ragged Mountains above Marble. This PCA includes a total of 2174 acres ranging in elevation from about 8200 to 9600 feet.

Biodiversity Rank Justification: This PCA supports the best of two occurrences known in the Roaring Fork Watershed for the Grand Mesa penstemon (*Penstemon mensarum)*, a globally-vulnerable species that is endemic to Colorado and known from only in only 37 locations world wide. This is the only known location in the watershed for the purple martin (*Progne subis*). The large-flowered globe-mallow (*Iliamna grandiflora*) was documented in two locations in the watershed, but has not been seen here since 1954. It is possible that this species still occurs in the PCA as suitable habitat appears to be present. This globally-vulnerable species has been collected in very few locations in Colorado, and the taxonomic status is somewhat uncertain for its range wide distribution. It is possible that the plants here in Colorado are a separate species. If this is determined to be true, the significance of the PCAs that contain the large flowered globe-mallow would increase.

Natural Heritage element occurrences at the McClure Pass PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal	EO* Rank
Penstemon mensarum	**Grand Mesa penstemon**	**G3**	**S3**				**B**
Iliamna grandiflora	large-flowered globe-mallow	G3?Q	S1				H
Progne subis	purple martin	G5	S3B, SZN			FS	
Progne subis	purple martin	G5	S3B, SZN			FS	

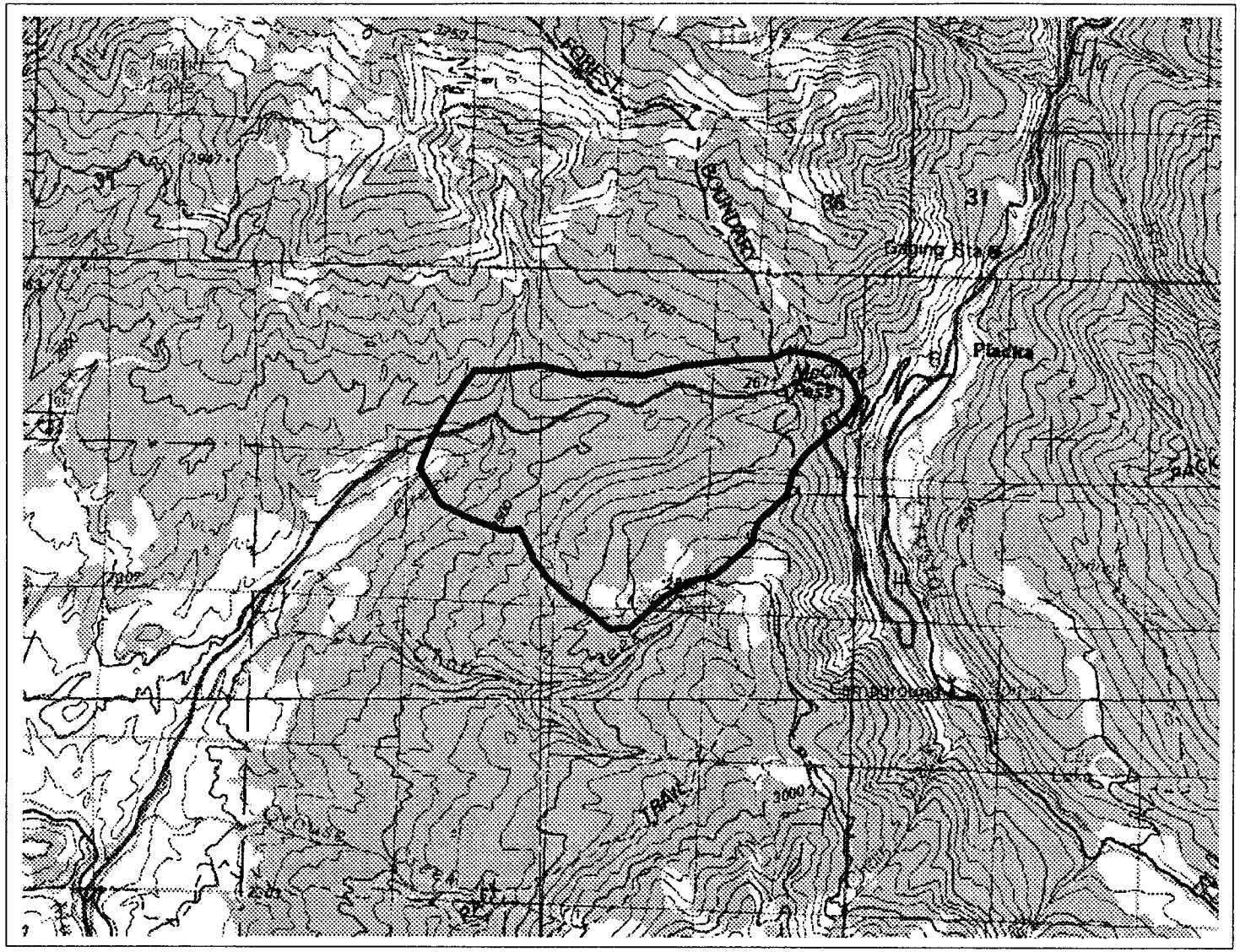
*EO=Element Occurrence

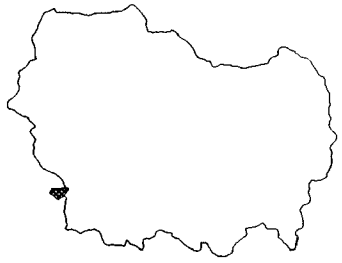
Boundary Justification: The boundary is drawn to include the occurrences and adjacent potential habitat to allow the rare plants and birds to move into suitable habitat over time. This area is intended to protect the occurrences from direct disturbances.

Protection Rank Justification: The McClure Pass PCA includes lands managed by the White River and the Gunnison National Forests. Land uses should be monitored to ensure long-term protection for the element occurrences.

Management Rank Justification: Route 133 passes through the northern part of the PCA and presents some management concerns because the globally-vulnerable species is abundant along the road. Route 133 may also encourage the spread of exotic plant species, including hay grasses, orchard grass (*Dactylis glomerata*), houndstongue (*Cynoglossum officinale*), smooth brome (*Bromus inermis*), sweetclover (*Melilotus officinale*), and thistles (*Carduus* and *Cirsium* sp.). These exotics may compete with the rare plant species. The elements should be protected from road, ditch, powerline and railroad maintenance activities as well as recreational activities. Additional information is needed about the reproduction ecology of the penstemon to enhance management objectives. It is likely that this species is pollinated by bees as are most of the species in this genus. The penstemon had been browsed by late summer. It is possible that this will interfere with the long-term viability of this population. A monitoring program could be established to increase understanding about the effects of the various impacts.

The response of purple martin to disturbance greatly depends on the time of breeding season. A buffer of 300 meters minimum where no human activity should take place during courtship and nesting seasons is recommended (Butler 1992).





Location in the Roaring Fork Watershed

PCA boundary

Natural Heritage Program
COLORADO

McClure Pass Potential Conservation Area

Grizzly Creek

Biodiversity Rank: B3 High biodiversity significance
Excellent examples of two globally secure riparian plant communities are found within this PCA.

Protection Urgency Rank: P4
This PCA is located in the Collegiate Peaks Wilderness Area that is managed by the White River National Forest. There is a need to determine level of threat posed by potential mining activities.

Management Urgency Rank: M3
Management is needed to maintain the quality of the PCA. Recommended management actions include trail improvements. Recreational uses may threaten the occurrences.

Location: Pitkin County. Southwest of Independence Pass. Grizzly Creek flows into Lincoln Creek.
Legal Description: U.S.G.S. 7.5 minute Independence Pass quadrangle. T11S R82W S19, 29-32. T11S R83W S24. T12S R82W S6.

General Description: Grizzly Creek flows from Grizzly Lake at about 12,500 feet down to Grizzly Reservoir, which is situated at about 10,500 feet in the Lincoln Creek drainage. Grizzly Creek is known to support high quality riparian communities dominated by either spruce-fir (*Picea engelmannii-Abies lasiocarpa*) or plain leaf willow (*Salix planifolia*). Uplands are dominated by spruce-fir (*Picea engelmannii-Abies lasiocarpa*) forests, and at higher elevations, alpine communities. A state-rare plant species, tundra buttercup (*Ranunculus gelidus*) has been documented in the alpine area of the PCA on Grizzly Peak, a 13,988 foot peak. A total of 813 acres are included in the PCA boundaries.

Biodiversity Rank Justification: This PCA includes excellent examples of two globally common riparian communities, and an unranked occurrence of a state-rare plant species. The brown-capped rosy-finch *(Leucosticte tephrocotis,* var. *austalis*) was also found in this PCA. Individuals found in Colorado may be a subspecies which is restricted to the mountains of Wyoming, Colorado, and New Mexico. This is not a recognized subspecies currently, but if it is determined to be distinct the significance of this PCA would increase.

Natural Heritage element occurrences at the Grizzly Creek PCA.

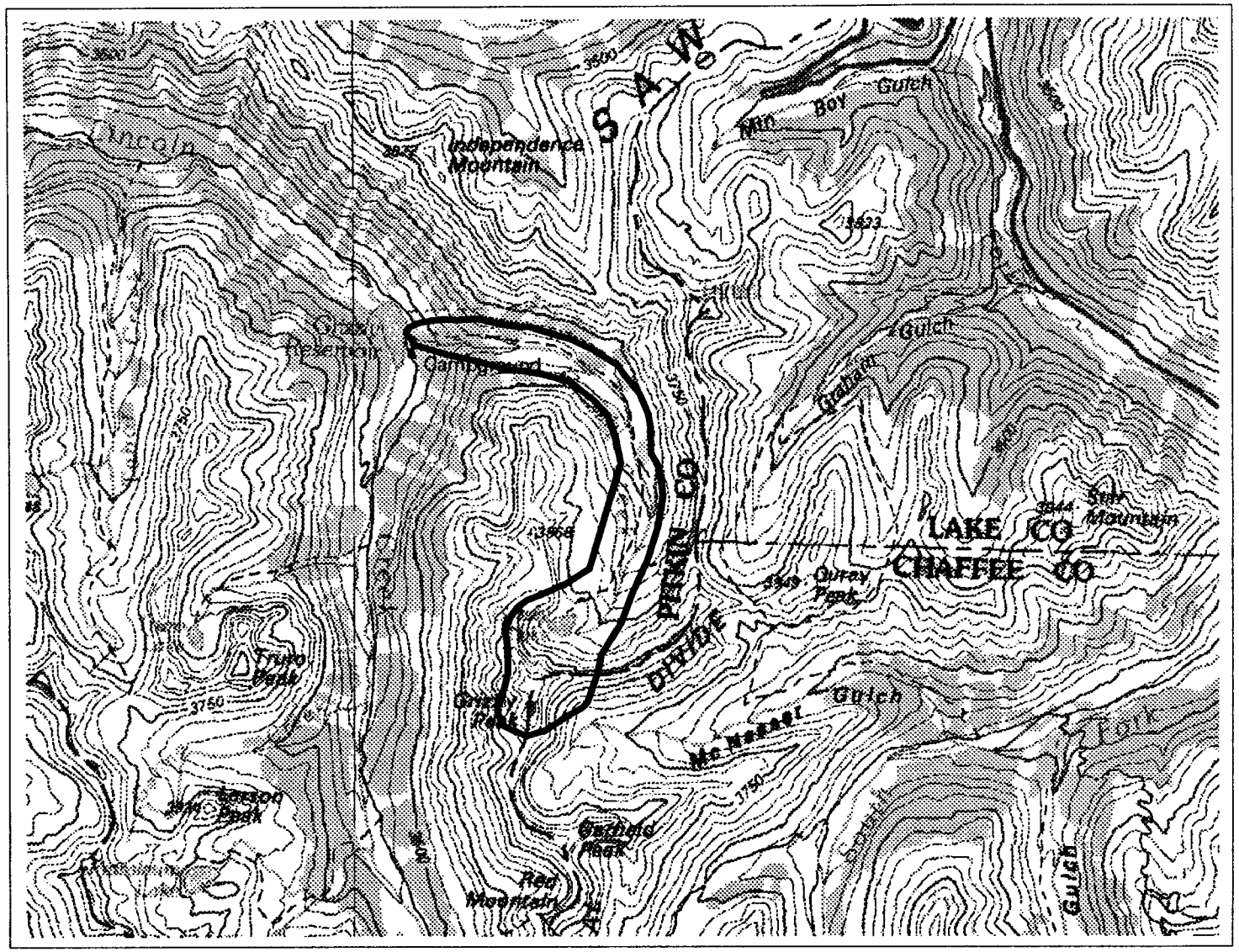
Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix planifolia/ Caltha leptocephala	**subalpine riparian willow carr**	**G4**	**S4**				**A**
Abies lasiocarpa-Picea engelmannii/ Mertensia ciliata	**montane riparian forest**	**G5**	**S5**				**A**
Ranunculus gelidus	tundra buttercup	G4G5	S2				E
Leucosticte tephrocotis, var. *austalis*	brown-capped rosy-finch	G4	S3S4 B, S4N				E

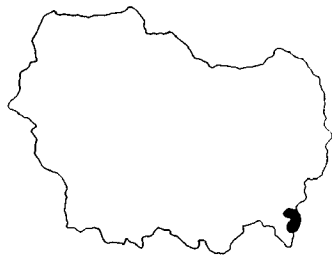
*EO=Element Occurrence

Boundary Justification: This PCA includes the four occurrences and some of the surrounding high quality habitat. This area should be adequate to protect the occurrences from direct disturbances, such as trampling, and indirect disturbances, such as unnatural erosion. The full watershed above Grizzly Creek has not been included in the PCA boundaries. Hydrological processes originating outside the PCA boundaries should be considered when management objectives are set.

Protection Rank Explanation: This PCA is publicly owned and managed by the White River National Forest. Threats that may be posed by mining have not been determined.

Management Rank Explanations: Recreational use is fairly high in this area. A popular hiking trail to Grizzly Lake is used for hiking, camping, and fishing. These activities have introduced litter into this area. Some exotic plant species have been noted along the trail. Disturbance to the brown-capped rosy finch, especially during the breeding season, should be minimized.





Location in the Roaring Fork Watershed

PCA boundary

N
W E
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Natural Heritage Program
COLORADO

Grizzly Creek Potential Conservation Area

Snowmass Creek at Snowmass Peak

Biodiversity Rank: B3 - High biodiversity significance
An excellent occurrence of an globally secure riparian plant community is found within this PCA.

Protection Urgency Rank: P4
This PCA is contained within the Maroon Bells-Snowmass Wilderness Area in the White River National Forest. There is a need to determine level of threat posed by potential mining activities, hydrological alterations, and recreational uses.

Management Urgency Rank: M3
Management actions are needed to maintain the quality of the PCA. Recommended management actions include the development of a management plan and a monitoring plan designed to detect changes in the overall quality and condition of the occurrence.

Location: Pitkin County. Snowmass Creek near Snowmass Lake.
Legal Description: U.S.G.S. 7.5 minute Snowmass Mountain quadrangle. T11S R86W S5, 8, 9, 16, 17.

General Description: Snowmass Creek flows south from its headwaters in the Maroon Bells, and meets the Roaring Fork River at Old Snowmass. The riparian areas include a combination of high quality willow carrs and spruce-fir (*Picea engelmannii-Abies lasiocarpa*) forests with alder (*Alnus incana*). Adjacent communities are dominated by spruce-fir forests. A pack trail crosses the creek in the PCA. The only non-native species that were noted are downstream of the PCA. A total of 481 acres are included in the PCA boundaries, and the elevation range is about 10,200 to 11,000 feet.

Biodiversity Rank Justification: An excellent example of a globally common riparian community was documented in this PCA. This community type has been documented in good to excellent condition in 39 locations in Colorado.

Natural Heritage element occurrences at the Snowmass Creek at Snowmass Peak.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix planifolia/ Caltha leptocephala	**subalpine riparian willow carr**	**G4**	**S4**				**A**
Bufo boreas	boreal toad						

*EO=Element Occurrence

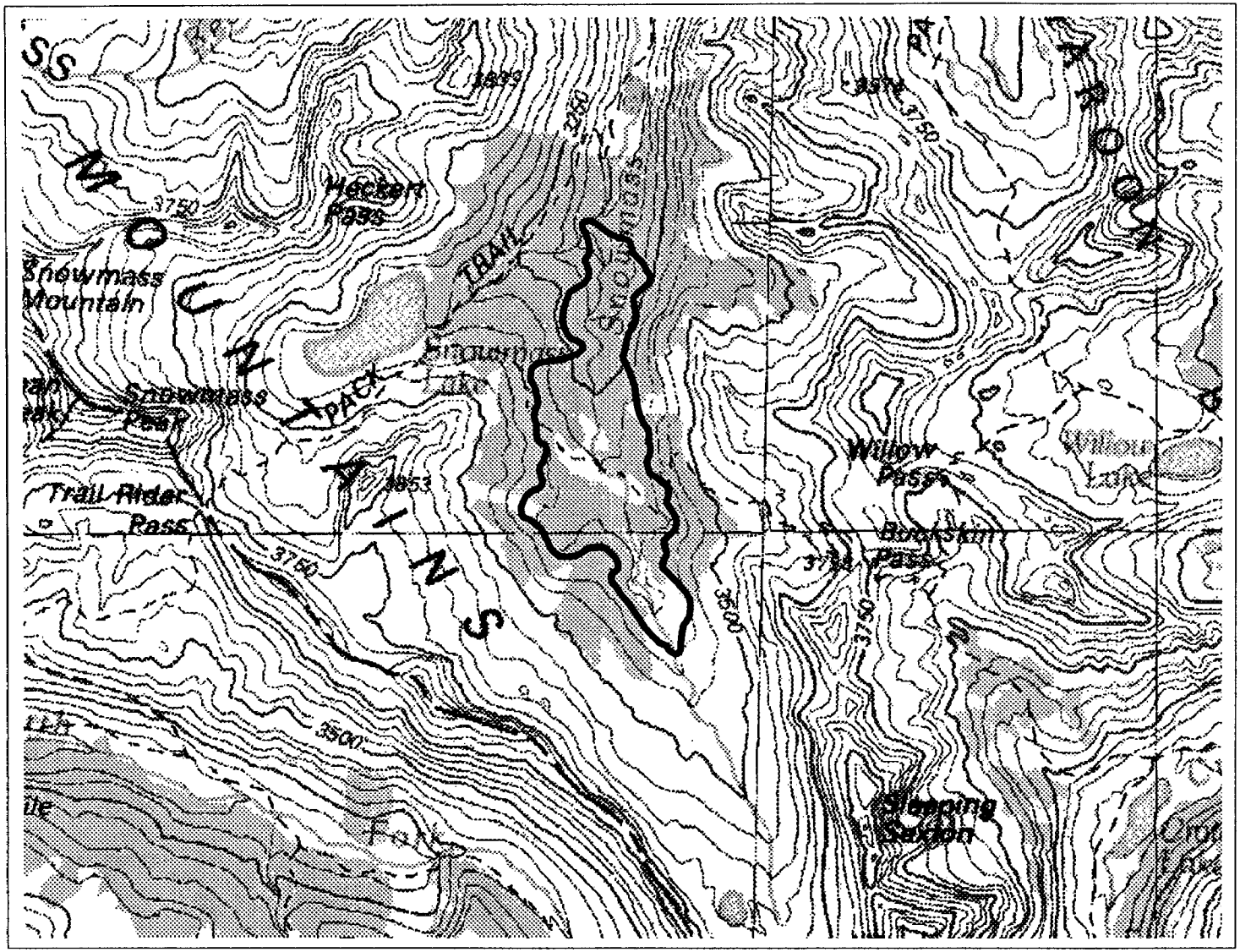
Boundary Justification: This PCA includes some of each of the mosaic of community types in which the element occurrence is found. The surrounding high quality habitat is included to act

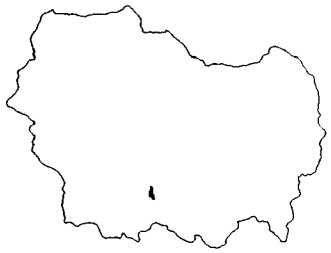
as a buffer to direct disturbances, such as trampling, and indirect disturbances, such as unnatural erosion.

Protection Rank Explanation: This PCA is publicly owned and managed by the White River National Forest, and is in the Maroon Bells-Snowmass Wilderness Area. Recreational use is fairly high in this area. There is a need to determine level of threats posed by potential mining and water development projects. A reservoir may be planned on Snowmass Creek for snowmaking for the ski area. The status of these plans and how they would impact the occurrences needs to be determined.

Management Rank Explanations: This area is heavily used by backpackers and hunters, as well as pack trips and associated grazing of pack horses. Impacts that result from these activities need to be monitored.

Further inventory for boreal toads is necessary to determine breeding status.





Location in the Roaring Fork Watershed

PCA boundary

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W E
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Natural Heritage Program
COLORADO

Snowmass Creek at Snowmass Peak Potential Conservation Area

Light Hill

Biodiversity Rank: B3 High biodiversity significance
This PCA includes an excellent occurrence of a globally-rare plant community, a good occurrence of a state-rare plant community, a fair occurrence of the globally-vulnerable Harrington's beardtongue, and a good occurrence of the state-rare sage sparrow.

Protection Urgency Rank: P4
This PCA is publicly owned and managed by the BLM and there are no known threats for the foreseeable future. Private lands adjacent to the PCA are being developed.

Management Urgency Rank: M3
Management is needed to maintain or improve the quality of the PCA. Actions should include weed control and restricted recreation access.

Location: Pitkin County. Between Sopris Creek and the Roaring Fork River southwest of Old Snowmass.
Legal Description: U.S.G.S 7.5 minute Basalt and Woody Creek quadrangles. T8S R86W S17-21, 27-34. T8S R87W S13, 24, 25, 36. T9S R86W S3-5.

General Description: Light Hill rises from 6800 to 8500 feet over approximately 0.5 miles from the Roaring Fork River near Old Snowmass. The ridgetop consists of rolling hills of clay soils covered with sagebrush (*Artemisia tridentata*), Gambel's oak (*Quercus gambelii*), and juniper (*Juniperus osteosperma*) shrublands and is bisected by a 2-track road. The globally-vulnerable Harrington's beardtongue (*Penstemon harringtonii*) occurs within the sagebrush and on the edge of the Gambel's oak and juniper shrublands. Exotic plant species such as cheatgrass (*Bromus tectorum*) and houndstongue (*Cynoglossum officinale*) undermine the overall quality of the PCA, although as of yet they are not pervasive. East Sopris Creek runs on the south side of Light Hill. Within this PCA, the creek is dominated by a narrowleaf cottonwood-blue spruce/alder (*Populus angustifolia-Picea pungens/Alnus incana*) riparian forest. In addition, Light Hill supports a large herd of wintering elk and provides critical winter habitat for this herd. This PCA is about 5000 total acres in size.

Biodiversity Rank Justification: Harrington's beardtongue (*Penstemon harringtonii*) is a globally-vulnerable plant species which is restricted to Colorado and is found almost exclusively in sagebrush habitat. This species is only known from approximately 37 locations, all of which are centered around Edwards in Eagle County. In general, Harrington's beardtongue and its habitat are threatened from residential and recreational development. These threats, in addition to its restricted range, create an urgency for protection. Harrington's beardtongue populations are known to fluctuate in population numbers from year to year. Therefore, this specific location may be a higher priority than the current information reflects.

The sage sparrow (*Amphispiza belli*) is a state-rare bird species that occurs along this ridgetop in sagebrush habitat. Williams Hill, Light Hill, and The Crown easily stand out as three of the best large unfragmented areas of plant communities still intact in the lower Roaring Fork Watershed.

Natural Heritage element occurrences at the Light Hill PCA.

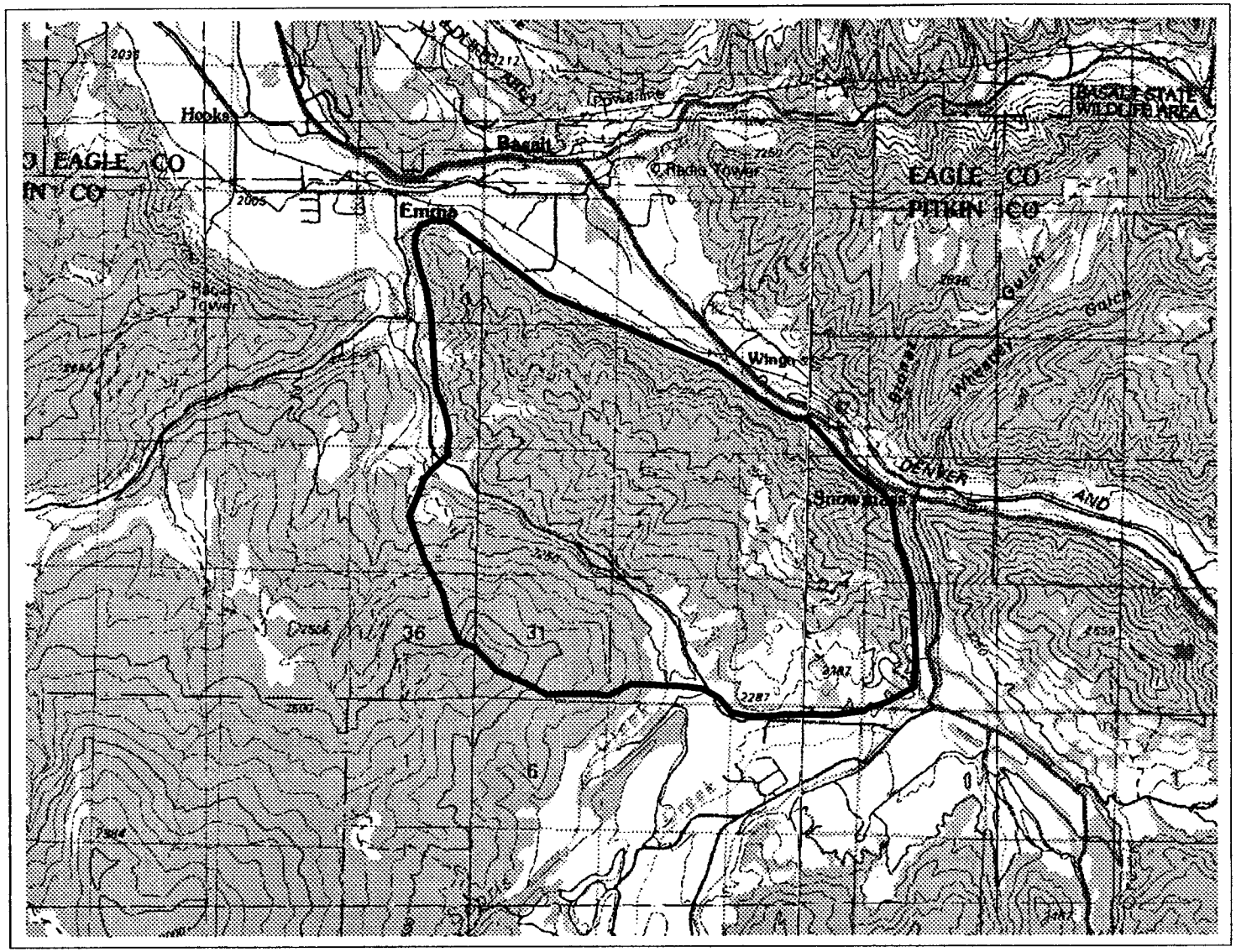
Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Quercus gambellii-Cercocarpus montanus/Carex geyeri	**Mixed mountain shrubland**	**G3**	**S3**				**A**
Quercus gambellii-Amelanchier utahensis	Mixed mountain shrubland	G3G5	S2				B
Penstemon harringtonii	Harrington's beardtongue	G3	S3			FS	C
Amphispiza belli	sage sparrow	G5	S3B, SZ				B

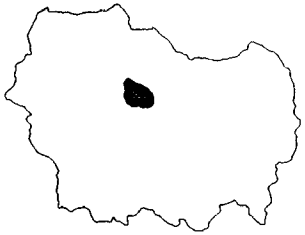
*EO=Element Occurrence

Boundary Justification: The PCA boundary includes the above occurrences and the surrounding high quality habitat. This surrounding habitat is intended to provide protection from direct disturbances, such as trampling and fragmentation. Indirect disturbances occurring outside the PCA boundary, such as unnatural erosion caused from upslope activities or the establishment of exotic species, should be limited.

Protection Rank Justification: There are housing developments on two sides of this PCA and development pressures are high. The PCA is currently on public land managed by the Bureau of Land Management. However, if this land was traded and developed the occurrences may be destroyed.

Management Rank Justification: The current management appears to be adequate. Off-road-vehicles and hunting are the only current uses. The primary concern for the area is erosion problems which may jeopardize the elements. Motor vehicle use should be restricted and non-motorized use should be limited to a small number of designated trails. Road closures in wet weather decrease, but do not eliminate, the erosion problem. The exotic plant species such as cheatgrass (*Bromus tectorum*) and houndstongue (*Cynoglossum officinale*) should be controlled in the PCA. Harrington's beardtongue (*Penstemon harringtonii*) should be monitored to detect changes in overall quality or condition of this occurrence.





Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

0.6 0 0.6 1.2 Miles

Natural Heritage Program
COLORADO

Light Hill Potential Conservation Area

Fryingpan River

Biodiversity Rank: B3 High significance
This PCA includes a good occurrence of a globally-vulnerable plant community.

Protection Urgency Rank: P4
This PCA is contained within the Hunter-Fryingpan Wilderness Area, White River National Forest. There is a need to determine level of threat posed by potential mining activities.

Management Urgency Rank: M4
Management may be needed in the future to maintain the quality of the PCA. Recreational uses may threaten the occurrences.

Location: Pitkin County. Fryingpan River.
Legal Description: U.S.G.S. 7.5 minute Mount Champion and Nast quadrangles. T9S R82W S7-9,15-17,22-23,25-26,36. T10S R82W S1-2,11-12,14,23.

General Description: The Fryingpan River flows north from its headwaters at about 12,000 feet and drops gently over a 2 mile distance before flowing into Fryingpan Lake at about 11,000 feet. This open U-shaped glacially carved valley supports good quality willow carrs with small breaks of subalpine meadows. Adjacent upland areas include spruce-fir (*Picea engelmannii-Abies lasiocarpa*) forests with scattered lodgepole pines *(Pinus contorta)*, avalanche chutes and rock outcrops. A trail winds along the river. This PCA ranges in elevation from about 9,000 feet to about 12,600 feet. Alpine habitat is present at higher elevations. Approximately 2,600 acres are included in the PCA boundaries.

Biodiversity Rank Justification: The biodiversity rank of this PCA is driven by the presence of a good occurrence of a globally-vulnerable plant community. The Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) has also been documented in this PCA. This subspecies is considered Sensitive by the U.S. Forest Service and is on the State Special Concern list. The greatest threat to the continued viability of Colorado River cutthroat trout is the introduction and migration of non-native fish species. Competition with brook trout and hybridization with rainbow trout are threats to this subspecies (Behnke 1992).

Natural Heritage element occurrences at the Fryingpan River PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Salix drummondiana/ Calmagrostis canadensis	**Lower montane willow carr**	**G3**	**S3**				**B**
Oncorhynchus clarki pleuriticus	Colorado River cutthroat trout	G4T3	S3		SC	FS	B

*EO=Element Occurrence

Boundary Justification: The planning boundary includes the headwaters and major tributaries of this creek as well as a 1000 foot upland buffer which should be sufficient to limit direct physical disturbance and local hydrological alteration. Hydrological processes originating outside of the planning boundary, including water quality, quantity, and timing, should be managed to maintain population and community viability.

Protection Rank Explanation: This PCA is publicly owned and managed by the White River National Forest. Recreational use is high in this area. Threats that may be posed by potential future mining activities or hydrological alterations are unknown.

Management Rank Explanations: A permanent downstream barrier is needed to prohibit non-native fish species from invading PCA. Hydrologic considerations should be extended beyond the PCA boundaries, especially wherever the watershed is not contained within the boundaries. Recreational uses include hiking, horse packing, fishing, camping, and possibly hunting. Little exotic flora is present, except along the trail.

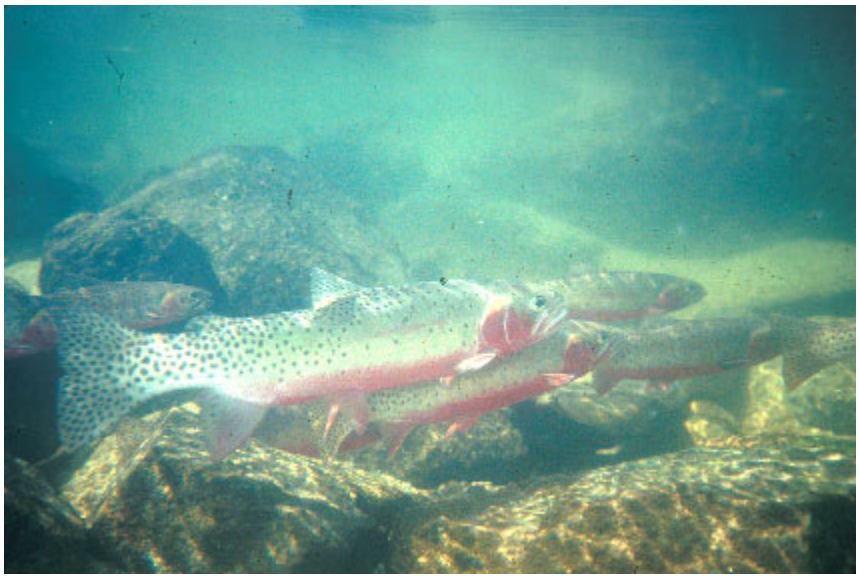
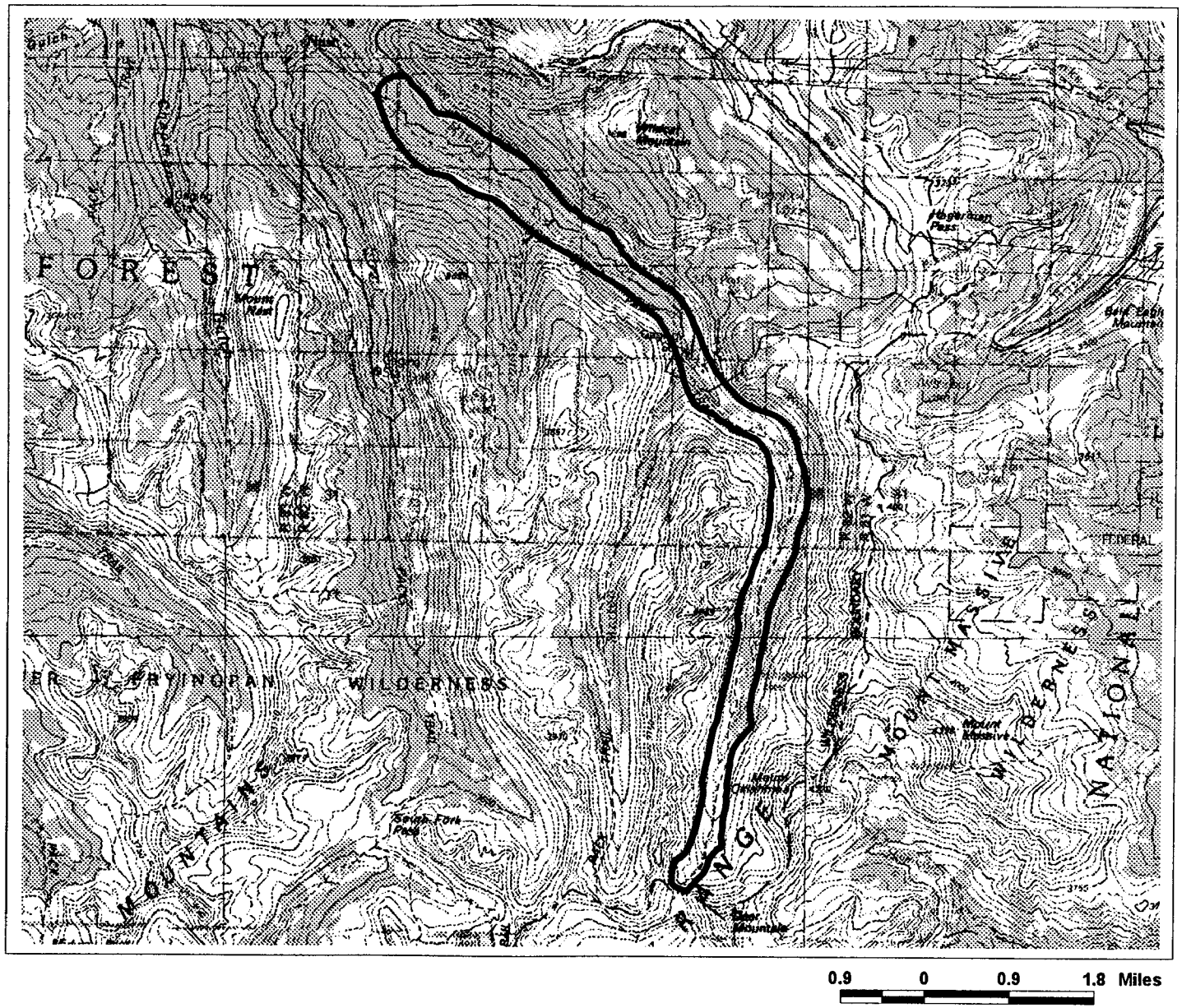
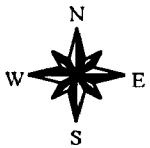


Photo 24: Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*).



Location in the Roaring Fork Watershed

PCA boundary



0.9 0 0.9 1.8 Miles

Fryingpan River Potential Conservation Area

Rocky Fork Creek

Biodiversity Rank: B3
An excellent occurrence of a globally-vulnerable subspecies of the Colorado River cutthroat trout is documented within this PCA.

Protection Urgency Rank: P4
This PCA is located in the White River National Forest. Level of threat posed by potential mining activities needs to be determined.

Management Urgency Rank: M4
Management may be needed in the future to maintain the quality of the PCA. Recreational uses may eventually threaten the occurrence.

Location: Pitkin County. South of Ruedi Reservoir.
Legal Description: Rudei Reservoir and Meredith U.S.G.S. 7.5 minute quadrangles. T8S R84W S18-21, 27-30, 33-34. T8S R85W S13. T9S R84W S3, 10-13.

General Description: This PCA follows Rocky Fork Creek from an elevation of 7,500 feet up to its headwaters at 11,500 feet. This creek runs through a narrow valley margined by steep red sandstone cliffs, and opens up to numerous beaver ponds and meadows throughout its course. The riparian community along the lower stretch of Rock Fork Creek consists of spruce-fir forests with alder in the understory (*Abies lasiocarpa-Picea engelmannii/Alnus incana*). The upland community consists of mixed densities of spruce-fir and Douglas fir *(Pseudotsuga menziesii)*. Approximately 3,800 acres are included in the PCA boundaries.

Biodiversity Rank Justification: The Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) has been documented in this PCA. This subspecies is considered Sensitive by the U.S. Forest Service and is on the State Special Concern list. The greatest threat to the continued viability of Colorado River cutthroat trout is the introduction and migration of non-native fish species. Competition with brook trout and hybridization with rainbow trout are threats to this subspecies (Behnke 1992). Young et al. (1996) considered the trout within this PCA to be a conservation population, meaning that it is believed to be indigenous, genetically pure, allopatric above a barrier; and not believed to be in a recently stocked watershed.

Natural Heritage element occurrences at the Rocky Fork Creek PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Oncorhynchus clarki pleuriticus	**Colorado River cutthroat trout**	**G4T3**	**S3**		**SC**	**FS**	**A**

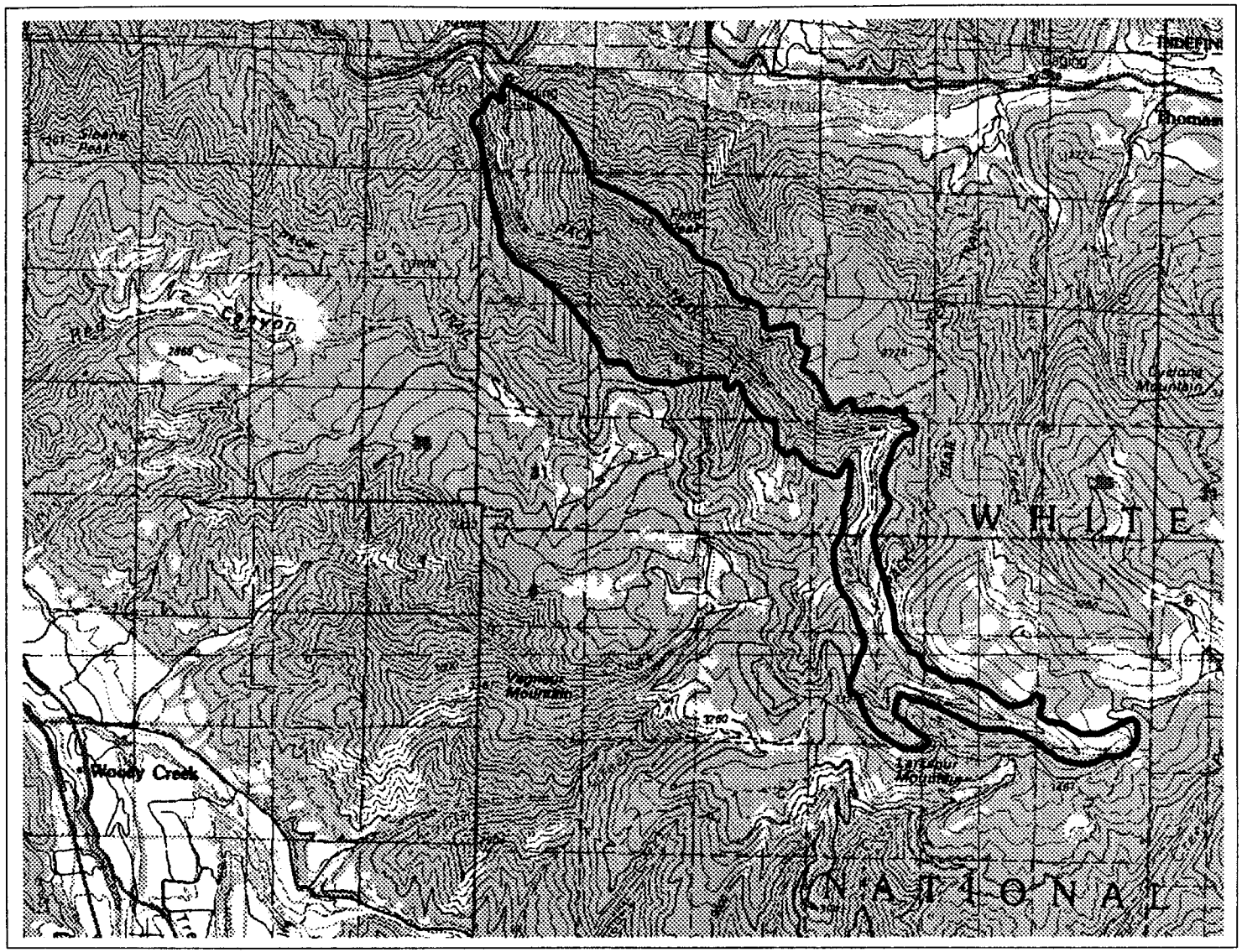
*EO=Element Occurrence

Boundary Justification: The boundary is drawn to include the entire reach of Rocky Fork Creek that contains Colorado River cutthroat trout as well as an upland buffer which should be sufficient to limit direct physical disturbance and local hydrological alteration. Hydrological processes originating outside of the planning boundary, including water quality, flow, and timing, should be managed to maintain population viability.

Protection Rank Justification: This PCA is publicly owned and managed by the U.S. Forest Service, White River National Forest. No threats are known for the foreseeable future.

Management Rank Justification: Recreational use and over fishing may be a concern in the future. Most fishing pressure on this creek occurs in the lower portion of the PCA or outside of the planning boundaries. Current impacts do not appear to be serious, although some exotic plant species have invaded as a result of recreational use and horses. Motorized recreation should be prohibited. Livestock should be kept out of the riparian areas.

Photo 25: A high quality occurrence of Colorado River cutthroat trout is found in the Rocky Fork Creek PCA.



0.8 0 0.8 1.6 Miles

Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

Natural Heritage Program
COLORADO

Rocky Fork Creek Potential Conservation Area

Whitehouse Mountain

Biodiversity Rank: B3 High biodiversity significance
A fair occurrence of a globally imperiled plant is found within this PCA.

Protection Urgency Rank: P4
This PCA includes lands managed by the White River National Forest and private lands owned by The Nature Conservancy. This area could be threatened by mining activities.

Management Urgency Rank: M4
Management may be needed in the future to maintain the quality of the PCA. Recommended management actions include further inventory, and monitoring of the rare plant species. There is a need to better understand the ecological processes that support rare plants.

Location: Gunnison County. 2.5 miles southeast of Marble.
Legal Description: U.S.G.S. 7.5 minute Marble quadrangle. T11S R87W S31, 32. T12S R87W S6.

General Description: This small PCA includes spruce-fir *(Picea engelmannii-Abies lasiocarpa)* forests, alpine communities, and limestone boulders and rock outcrops. This area supports occurrences of two rare plant species; one is a globally-vulnerable fern ally, and the other is a state-rare fern. The PCA is fairly inaccessible with the only access being a very rough four-wheel drive road. There is a mining claim just outside the PCA boundaries. Specific impacts that result from the mining activities are currently unknown. 380 acres are included in the PCA boundaries with an elevation range from about 9800 to 12,000 feet.

Biodiversity Rank Justification: A fair occurrence of a globally imperiled plant and another small occurrence of a state-rare plant species are found in this PCA. The globally-vulnerable species is only known from eight locations in the world. The state-rare species is globally secure but has been documented in only six locations in Colorado.

Natural Heritage element occurrences at the Whitehorse Mountain PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Botrychium pallidum	**pale moonwort**	**G2**	**S2**			**FS**	**C**
Asplenium trichomanes-ramosum	green spleenwort	G4	S1S2				E

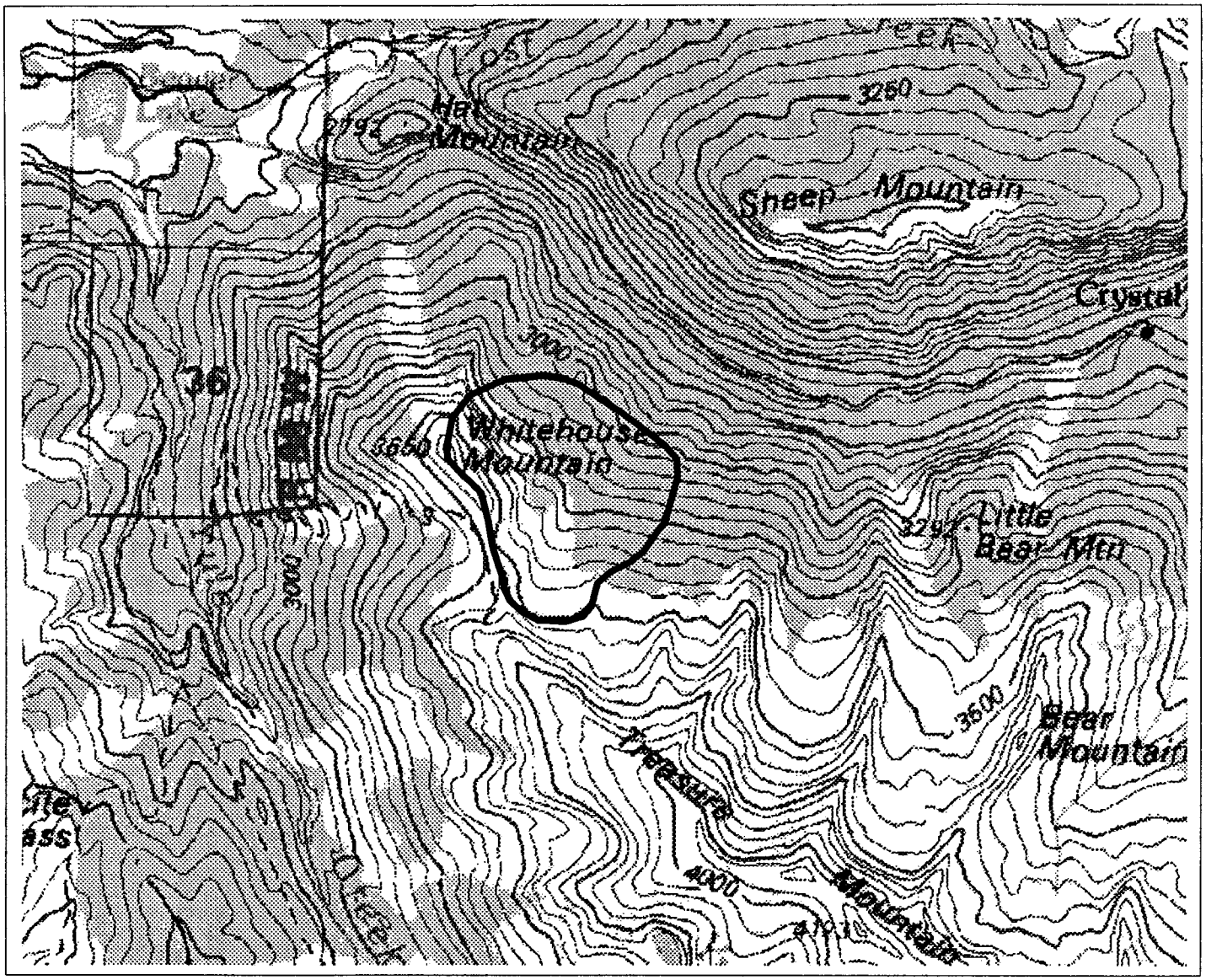
*EO=Element Occurrence

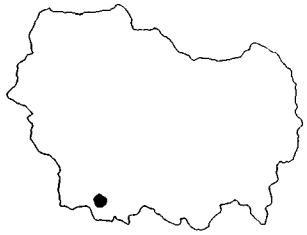
Boundary Justification: The surrounding high quality habitat is included to protect the occurrences from direct disturbances, such as trampling, and indirect disturbances, such as

unnatural erosion. The PCA also provides additional suitable habitat to allow for natural migration of the elements.

Protection Rank Explanation: This PCA includes a mix of private land and lands that are publicly owned and managed by the White River National Forest. Some of the private lands are owned by The Nature Conservancy. Developments such as mining and/or recreational uses may threaten this PCA. The four-wheel drive road affords some protection because it is rough enough to make the PCA difficult to access; this road should not be improved.

Management Rank Explanations: There is a need to know more about the processes that support these rare species and their full distribution. Further inventory and monitoring are recommended for this PCA.





Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

0.3 0 0.3 0.6 Miles

Natural Heritage Program COLORADO

Whitehouse Mountain Potential Conservation Area

Capitol Peak

Biodiversity Rank: B3 High biodiversity significance
This PCA contains two unranked occurrences of a globally imperiled plant species.

Protection Urgency Rank: P4
This PCA is in the Maroon Bells-Snowmass Wilderness Area, managed by the White River National Forest, and would make an excellent candidate for RNA status. Level of threat posed by mining claims needs to be determined.

Management Urgency Rank: M4
Current management appears to be adequate, though additional inventory work is needed to ensure protection of the full occurrences. Should recreational uses increase in the future, their impacts will need to be addressed.

Location: Pitkin County. Mount Daly and Capitol Peak at the headwaters of the Capitol Creek drainage. Reached via the trail from the north along Capitol Creek to Capitol Lake.
Legal Description: U.S.G.S. 7.5 minute Capitol Peak quadrangle. T10S R87W S23-27, 34, 35.

General Description: This PCA includes Capitol Peak, the southern portion of Mount Daly (including the summit), and the high elevation ridge between these two peaks. The PCA ranges in elevations from about 12,000 to 14,130 feet at the summit of Capitol Peak. All above timberline, this PCA includes a high mountain pass, several cirque headwalls, nearly vertical slopes, and knife edge ridges, all sculpted from granitic bedrock. *Draba spectabilis* var. *oxyloba* has been documented in this area as well as other rare alpine flora. These species are not considered specifically in this PCA because the informaton documenting the location was too general. Approximately 760 acres are included within this PCA.

Biodiversity Rank Justification: This PCA includes one of only 17 known occurrences of a globally imperiled plant species in the world. There is one other historically documented occurrence of this species in the Roaring Fork Watershed at the headwaters of Conundrum Creek.

Natural Heritage element occurrences at the Capitol Peak PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Eriogoum coloradense	**Colorado wild buckwheat**	**G2**	**S2**			**BLM**	**E**
Eriogoum coloradense	**Colorado wild buckwheat**	**G2**	**S2**			**BLM**	**E**

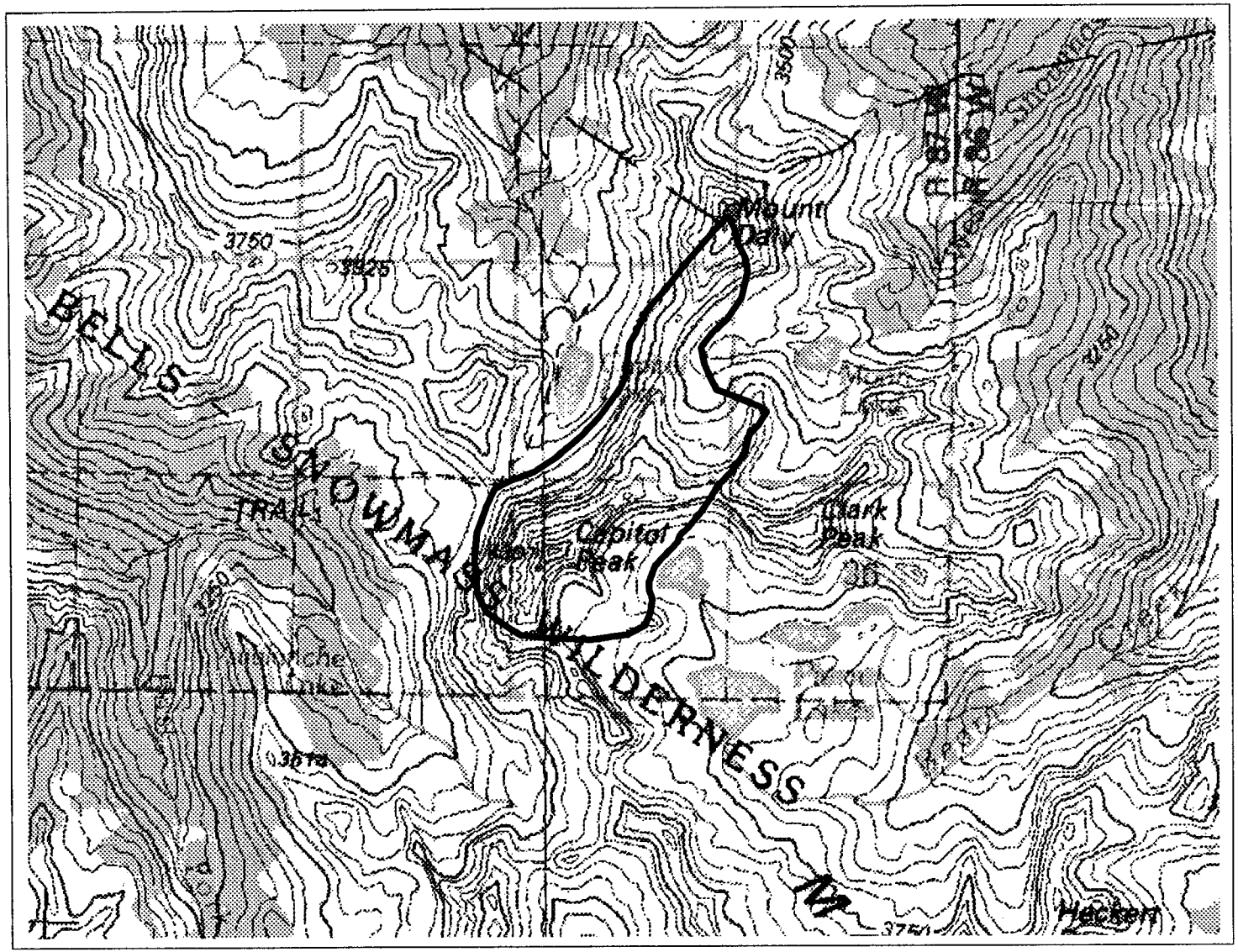
*EO=Element Occurrence

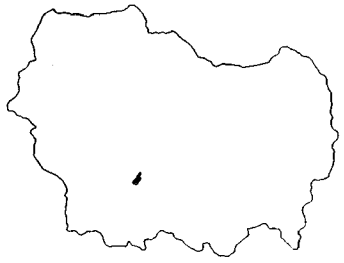
Boundary Justification: The boundary is drawn to include the occurrences and adjacent potential habitat in the alpine to allow the rare plants to move into suitable habitat over time. This area is intended to protect the occurrences from direct disturbances and erosion.

Protection Rank Justification: White River National Forests Aspen Ranger District could be approached to encourage the establishment of an RNA at this location. Status of any mining claims within this PCA needs to be determined, and mitigation actions taken if necessary.

Management Rank Justification: People climbing the fourteen thousand foot Capitol Peak frequent this area and may potentially degrade the PCA. If necessary, a trail should be clearly delineated and informational signs should point out the biodiversity significance of the rare plant. The Colorado Fourteeners Initiative has a comprehensive plan to address impacts to all of the fourteen thousand foot peaks in Colorado.

The full extent and quality of these occurrences needs to be determined. A monitoring program should then be established to detect changes in population size and/or condition. Additional information is needed about the reproduction ecology of the rare plant species to enhance management objectives.





Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

0.4 0 0.4 0.8 Miles

Capitol Peak Potential Conservation Area

Big Kline Creek

Biodiversity Rank: B3 High biodiversity significance
A good occurrence of a globally-vulnerable riparian plant community is found within this PCA.

Protection Urgency Rank: P4
Most of the PCA is in the White River National Forest, with some private inholdings in the far northwestern portion of the PCA. About half of the PCA is in the Maroon Bells-Snowmass Wilderness area.

Management Urgency Rank: M4
Management may be needed in the future to maintain the quality of the PCA. Access is restricted by private landowners so recreational uses are probably not currently heavy enough to threaten the occurrence.

Location: Pitkin County. Big Kline Creek flows northwest into the Crystal River about a mile upstream (south) of Redstone.
Legal Description: U.S.G.S. 7.5 minute Redstone quadrangle.

General Description: Big Kline Creek flows northwest to the Crystal River. Riparian vegetation along this creek supports a globally-vulnerable riparian plant community dominated by blue spruce (*Picea pungens*) and alder (*Alnus incana*). Other associates include narrowleaf cottonwood (*Populus angustifolia*) and mountain lover (*Paxistima myrinites*). A total of 508 acres are included in the PCA boundaries. The elevation ranges from 7400 to 9500 feet.

Biodiversity Rank Justification: This PCA contains a good example of a globally-vulnerable riparian community. This community type is known from 34 locations in Colorado.

Natural Heritage element occurrences at the Big Kline Creek PCA.

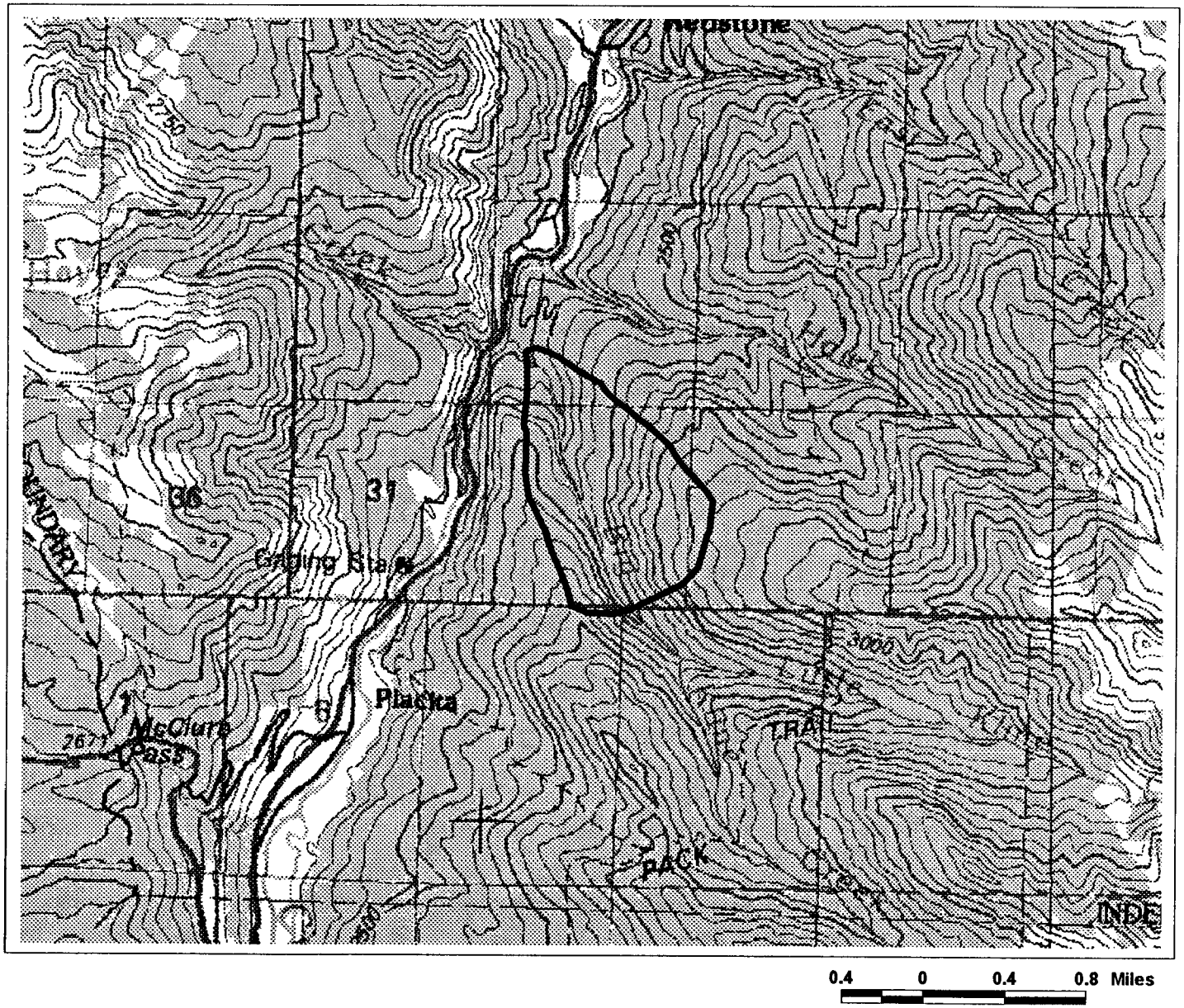
Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Picea pungens/Alnus incana	**Montane riparian forest**	**G3**	**S3**				**B**

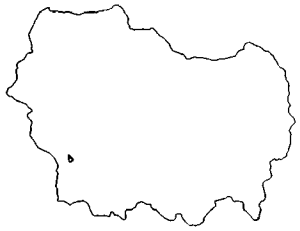
*EO=Element Occurrence

Boundary Justification: The high quality habitat surrounding the occurrence is included in the PCA to protect the occurrence from direct disturbances, such as trampling, and indirect disturbances, such as unnatural erosion. Hydrological processes originating outside of the planning boundary still need to be considered.

Protection Rank Explanation: Most of this PCA is publicly owned and managed by the White River National Forest. Recreational use is fairly high in this area, though the Kline Creek drainage has restricted access because of the private inholdings.

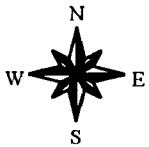
Management Rank Explanations: A management plan should be developed for this PCA. The plan should address long-term monitoring of the riparian community and long-term protection of the hydrological setting.





Location in the Roaring Fork Watershed

PCA boundary



Big Kline Creek Potential Conservation Area

Missouri Heights

Biodiversity Rank: B4 Moderate biodiversity significance
A fair occurrence of a globally-vulnerable plant is the basis for this PCA.

Protection Urgency Rank: P1
This PCA is found exclusively on private lands.

Management Urgency Rank: M1
Management needs for this PCA are urgent.

Location: Garfield and Eagle counties. Approximately 4 miles northwest of Carbondale, southwest of Spring Park Reservoir, northwest of El Jebel.
Legal Description: U.S.G.S. 7.5 minute Carbondale and Leon quadrangles. T7S R87W S16, 17, 19-22, 27-30.

General Description: The Missouri Heights PCA is characterized by rolling hills of sagebrush (*Artemisia tridentata*) shrublands with spectacular views of Mt Sopris and the Elk Range. The surrounding slopes are dominated by pinyon-juniper *(Pinus edulis-Juniperus osteosperma)* woodlands; bottomlands have been converted for agricultural uses. About 50% of the sagebrush shrublands have been cleared for agricultural or residential developments. The remaining sagebrush is highly fragmented by residential development and associated roads, and /or degraded as a result of cattle grazing. Exotic grasses such as Kentucky bluegrass (*Poa pratensis*) and smooth brome (*Bromus inermis*) are spreading into the shrublands. High quality shrublands are difficult to find in this area. Harrington's beardtonue (*Penstemon harringtonii*) is found in these relatively high quality areas as well as between residences where landscaping has spared the native vegetation. There are countless roads, and a power line that cross through the PCA. A total of 2079 acres are included within this PCA with an elevation range of 7000-7200 feet.

Biodiversity Rank Justification: Harrington's beardtongue (*Penstemon harringtonii*) is a globally-vulnerable plant species restricted to Colorado and is found almost exclusively in sagebrush habitat. This species is only known from approximately 37 locations centered around Edwards in Eagle County. In general, Harrington's beardtongue and its habitat are highly threatened due to residential and recreational development. These threats, in addition to its restricted range, create an urgency for protection. This is a degraded PCA containing a very degraded and fragmented (though extensive) occurrence of Harrington's beardtongue.

Natural Heritage element occurrences at the Missouri Heights PCA.

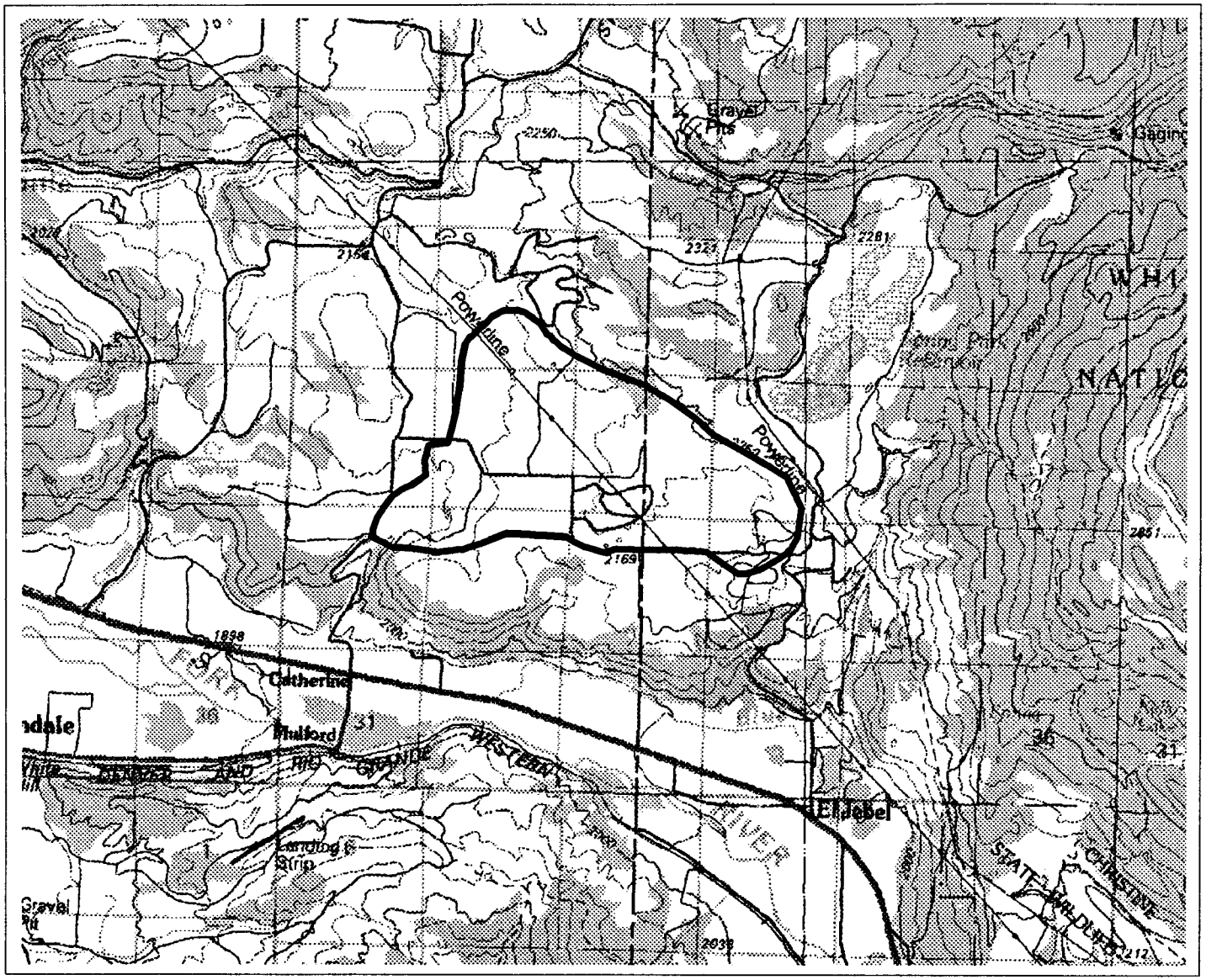
Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Penstemon harringtonii	**Harrington's beardtongue**	**G3**	**S3**			**FS**	**C**

*EO=Element Occurrence

Boundary Justification: The primary threats to Harrington's beardtongue (*Penstemon harringtonii*) at this PCA are residential development and heavy livestock grazing. The PCA boundary includes the occurrence of Harrington's beardtongue and a buffer that is intended to protect it from these direct disturbances. Indirect disturbances, such as unnatural erosion caused from up slope activities or the establishment of exotic species within the PCA, should be considered but are not included within the PCA boundary.

Protection Rank Justification: This PCA is on private land, is heavily platted in areas, and includes an estimated 100 different landowners. This area is being developed very rapidly.

Management Rank Justification: A power line, several roads, and extensive housing developments occur in this PCA. Additional construction activities including the maintenance of the power line or of the roads may destroy, or further degrade, this PCA. Homeowners associations and county planners should be encouraged to institute strict landscaping guidelines that will allow Harrington's beardtongue (*Penstemon harringtonii*) to survive in the remaining sagebrush. Roads and agricultural fields are introducing exotics such as yellow sweet clover (*Melalotis officinale*), smooth brome (*Bromus inermis*), and Kentucky bluegrass (*Poa pratensis*). Research is needed on the impacts of grazing (cattle, elk, and deer), and of habitat fragmentation on *Penstemon harringtonii*.



Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

Natural Heritage Program
COLORADO

Missouri Heights Potential Conservation Area

Crystal Springs Road

Biodiversity Rank: B4 Moderate significance
A fair occurrence of a globally-vulnerable plant species.

Protection Urgency Rank: P1
This PCA is privately owned and immediately threatened by residential development.

Management Urgency Rank: M2
Management actions are essential to prevent loss. We recommend the development of a weed control and a road maintenance management plan.

Location: Garfield County. Northeast of Carbondale between Cattle Creek and the Roaring Fork River.
Legal Description: U.S.G.S 7.5 minute Carbondale quadrangle. T7S R88W S13, 14.

General Description: This PCA includes south-facing rolling hills dominated by pinyon-juniper (*Pinus edulis-Juniperus osteosperma*) woodlands with sagebrush (*Artemisia tridentata*) shrublands. Harrington's beardtongue (*Penstemon harringtonii*), a globally-vulnerable plant species, is found along a road that defines the western boundary of the PCA. Although this species is usually found in sagebrush habitats, this occurrence is documented in a *pinyon-juniper (Pinus edulis-Juniperus osteosperma)* woodland. The slopes surrounding the PCA are dominated by *pinyon-juniper (Pinus edulis-Juniperus osteosperma)* and mixed shrublands interspersed with houses and hay meadows. Approximately 180 acres are included in this PCA. Elevation spans from 6800 to 7000 feet.

Biodiversity Rank Justification: Harrington's beardtongue (*Penstemon harringtonii*) is a globally-vulnerable plant species which is restricted to Colorado and is found almost exclusively in sagebrush habitat. This species is only known from approximately 37 locations, all of which are centered around Edwards in Eagle County. In general, Harrington's beardtongue and its habitat are threatened from residential development. These threats, in addition to its restricted range, create an urgency for protection. Harrington's beardtongue populations are known to fluctuate in population numbers from year to year. Therefore, this specific location may be a higher priority than the current information reflects.

The unusual circumstances of this occurrence (found in *pinyon-juniper (Pinus edulis-Juniperus osteosperma)* woodland) may be explained by its proximity to the road. Anthropogenic factors may contribute to the dispersal and the growing conditions present.

Natural Heritage element occurrences at the Crystal Springs Road PCA.

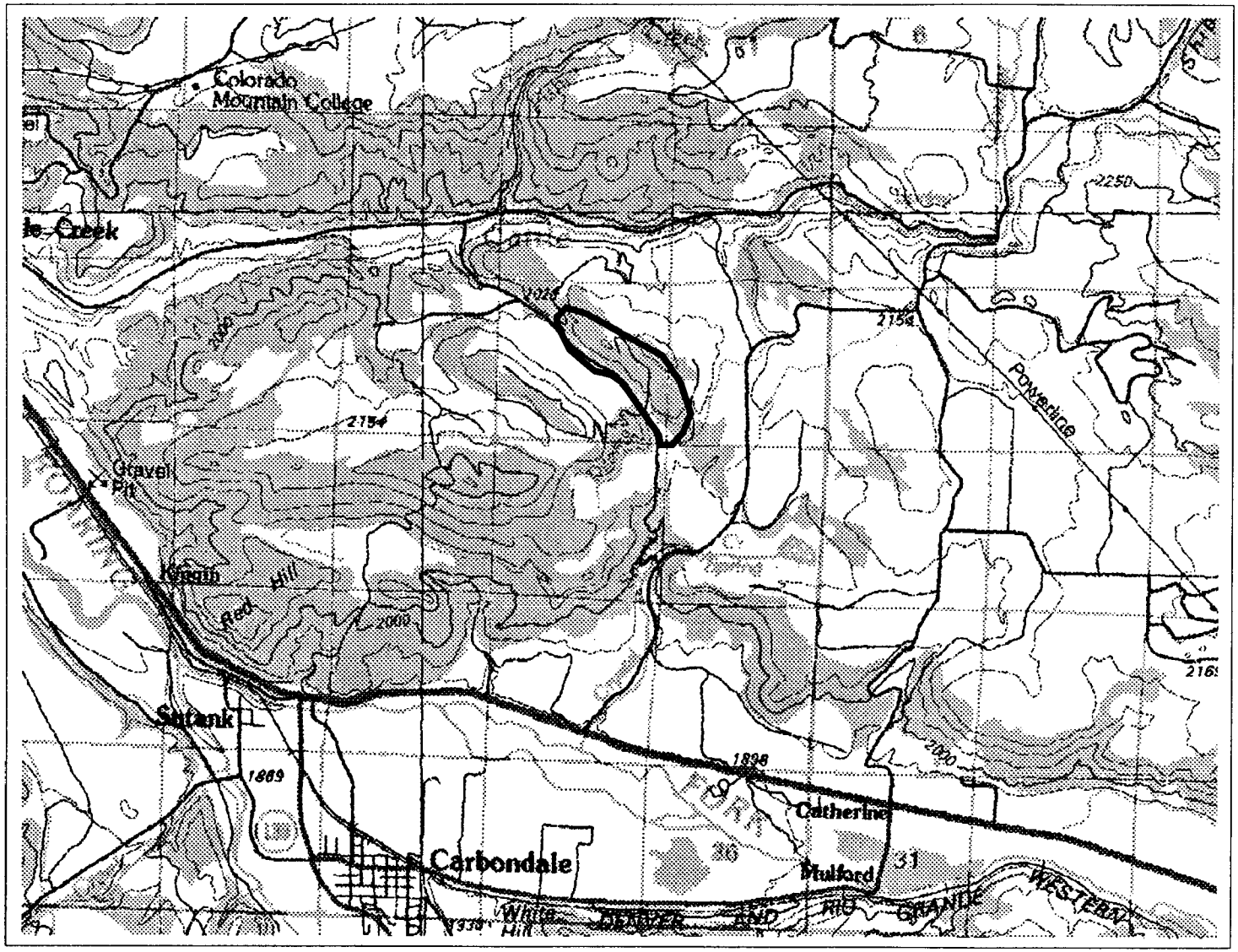
Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Penstemon harringtonii	**Harrington's beardtongue**	**G3**	**S3**				**C**

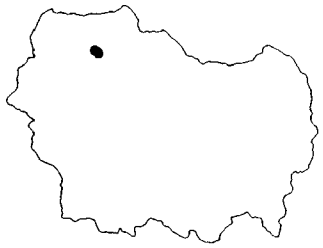
*EO=Element Occurrence

Boundary Justification: The primary threat to Harrington's beardtongue at this location is residential development along the road. The PCA boundary includes the occurrence of Harrington's beardtongue and a buffer of approximately 1000 feet intended to provide protection from direct disturbances. Indirect disturbances occurring outside the PCA boundaries, such as unnatural erosion caused from upslope activities or the establishment of exotic species within the PCA, should be limited.

Protection Rank Justification: This PCA is privately owned and located in a rapidly developing area. A management plan could be negotiated with willing private landowners. If the road is ever widened some individuals of Harrington's beardtongue would be destroyed.

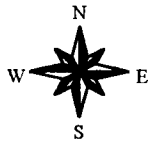
Management Rank Justification: The occurrence of Harrington's beardtongue (*Penstemon harringtonii*) is directly adjacent to Crystal Springs Road and should be protected from road maintenance activities. This PCA is between a hayfield and houses, and the exotic plant species should be controlled before this PCA is degraded.





Location in the Roaring Fork Watershed

PCA boundary



0.4 0 0.4 0.8 Miles

Crystal Springs Road Potential Conservation Area

Crystal River at Potato Bill Creek

Biodiversity Rank: B4 Moderate significance
This PCA contains a good occurrence of a plant subspecies that is vulnerable on a global scale.

Protection Urgency Rank: P1
Land ownership needs to be determined, and the PCA needs to be protected from activities along Highway 133.

Management Urgency Rank: M2
Management actions that address impacts of road construction and maintenance activities are needed to maintain the occurrence.

Location: Pitkin County. A very short stretch of the Crystal River, between Redstone and Carbondale, just upstream of the confluence of the Crystal River and Potato Bill Creek.

Legal Description: U.S.G.S. 7.5 minute Mount Sopris quadrangle. T8S R88W S34. T9S R88W S3.

General Description: The riparian vegetation in this small area is dominated by narrowleaf cottonwood *(Populus angustifolia)*, coyote willow (*Salix exigua*), yellow willow (*Salix monticola*), and *Carex aquatilis*. Within this small riparian area between the highway and the Crystal River, the rare canyon bog orchid (*Platantera sparsiflora* var. *ensifolia*) was found in good condition. This is the largest occurrence of this species documented in the Roaring Fork Watershed. A total of 21 acres are included within this PCA; the elevation is approximately 6400 feet.

Biodiversity Rank Justification: This PCA is one of six locations in the Roaring Fork Watershed that supports this rare orchid subspecies.

Natural Heritage element occurrences at the Crystal River at Potato Bill Creek PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Platanthera sparsiflora* var. *ensifolia	**canyon bog-orchid**	**G4G5 T3**	**S2**				**B**

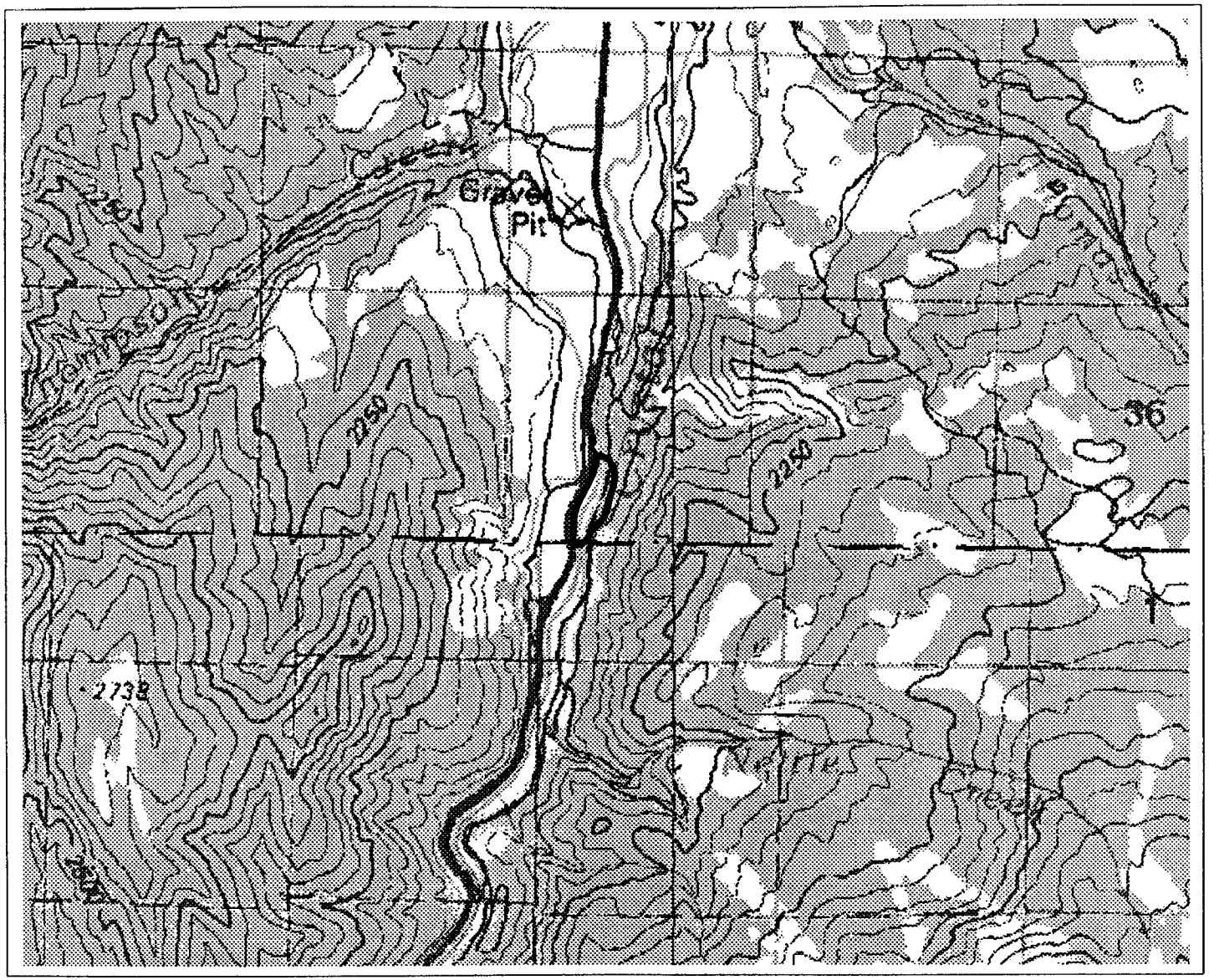
*EO=Element Occurrence

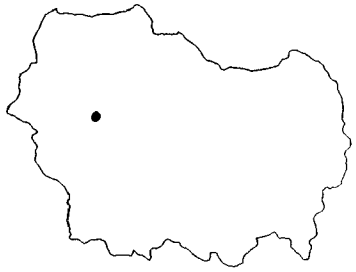
Boundary Justification: The boundary is drawn to include the occurrence and adjacent potential habitat up and down stream to allow the rare plants to move into suitable habitat over time. Hydrological processes originating outside the planning boundary, including water quality, quantity, and timing should be managed to maintain species viability.

Protection Rank Justification: The land ownership of this PCA is unknown. It includes a very narrow corridor between Highway 133 and the Crystal River. Protection actions are urgent because of the close proximity to the highway.

Management Rank Justification: The orchid should be protected from road maintenance activities. Additional information is needed about the reproduction ecology of the canyon bog-orchid (*Platanthera sparsiflora* var. *ensifolia*) to enhance management objectives.

Photo 26: The rare canyon bog orchid (*Platanthera sparsiflora* var. *ensifolia*) was found at the Crystal River at Potato Bill Creek PCA.





Location in the Roaring Fork Watershed

PCA boundary

0.4 0 0.4 0.8 Miles

Crystal River at Potato Bill Creek Potential Conservation Area

Cattle Creek at Coulter Creek

Biodiversity Rank: B4 Moderate biodiversity significance
A fair occurrence of a globally-vulnerable plant community is found within this PCA.

Protection Urgency Rank: P2
This PCA includes a mix of private lands and lands publicly owned and managed by the BLM. Actions could include management agreement and/or land exchanges with willing private landowners.

Management Urgency Rank: M1
Management is needed to maintain the quality of the PCA. Recommended management actions include the implementation of an exotic plant eradication program, and erosion control to prevent runoff from impacting the riparian occurrence.

Location: Garfield County. North and south-facing slopes of Cattle Creek between 6600 and 7200 feet. West of Spring Park Reservoir.
Legal Description: U.S.G.S. 7.5 minute Carbondale quadrangle. T7S R87W S7, 8. T7S R88W S12.

General Description: This PCA ranges in elevation from about 6600 to 7200 feet and is characterized by Gambel's oak (*Quercus gambelii*) shrublands on the north-facing slopes, pinyon-juniper (*Pinus edulis-Juniperus osteosperma*) and sagebrush (*Artemisia tridentata*) communities on south-facing slopes, and a blue spruce-alder *(Picea pungens-Alnus incana)* community in the riparian area. The oak shrubland (*Quercus gambellii-Cercocarpus montanus/Carex geyeri*) is considered to be a globally-vulnerable community type and also supports a diverse combination of other species such as pinyon pine (*Pinus edulis*), Douglas fir (*Pseudotsuga menzisesii*), serviceberry (*Amelanchier utahensis*), snowberry (*Symphoricarpos rotundifolius*), big sagebrush (*Artemisia tridentata*), and mountain lover (*Paxistima*) in low cover. The blue spruce/dogwood (*Picea pungens/Cornus sericea*) riparian community is considered to be rare in Colorado, and also supports a diversity of other shrubs and trees such a coyote willow (*Salix exigua*), yellow willow (*Salix monticola*), chokecherry (*Prunus virginiana*), Douglas fir (*Pseudotsuga menziesii*), and alder (*Alnus incana*). This small area is in good condition overall, however there is a road that follows Cattle Creek and a power line that passes through the western portion of the PCA. The activity along these thorough ways are creating erosion and weed problems. A total of 543 acres are included in the PCA boundaries.

Biodiversity Rank Justification: This PCA includes a fair occurrence of a globally-vulnerable mixed mountain shrubland (*Quercus gambelii-Cercocarpus montanus/Carex geyeri*). This community type is only known from 33 locations in Colorado. The PCA also includes a fair

example of a state-rare montane riparian forest (*Picea pungens/Cornus sericea*), which has only been documented in 21 locations in Colorado.

Natural Heritage element occurrences at the Cattle Creek at Coulter Creek PCA.

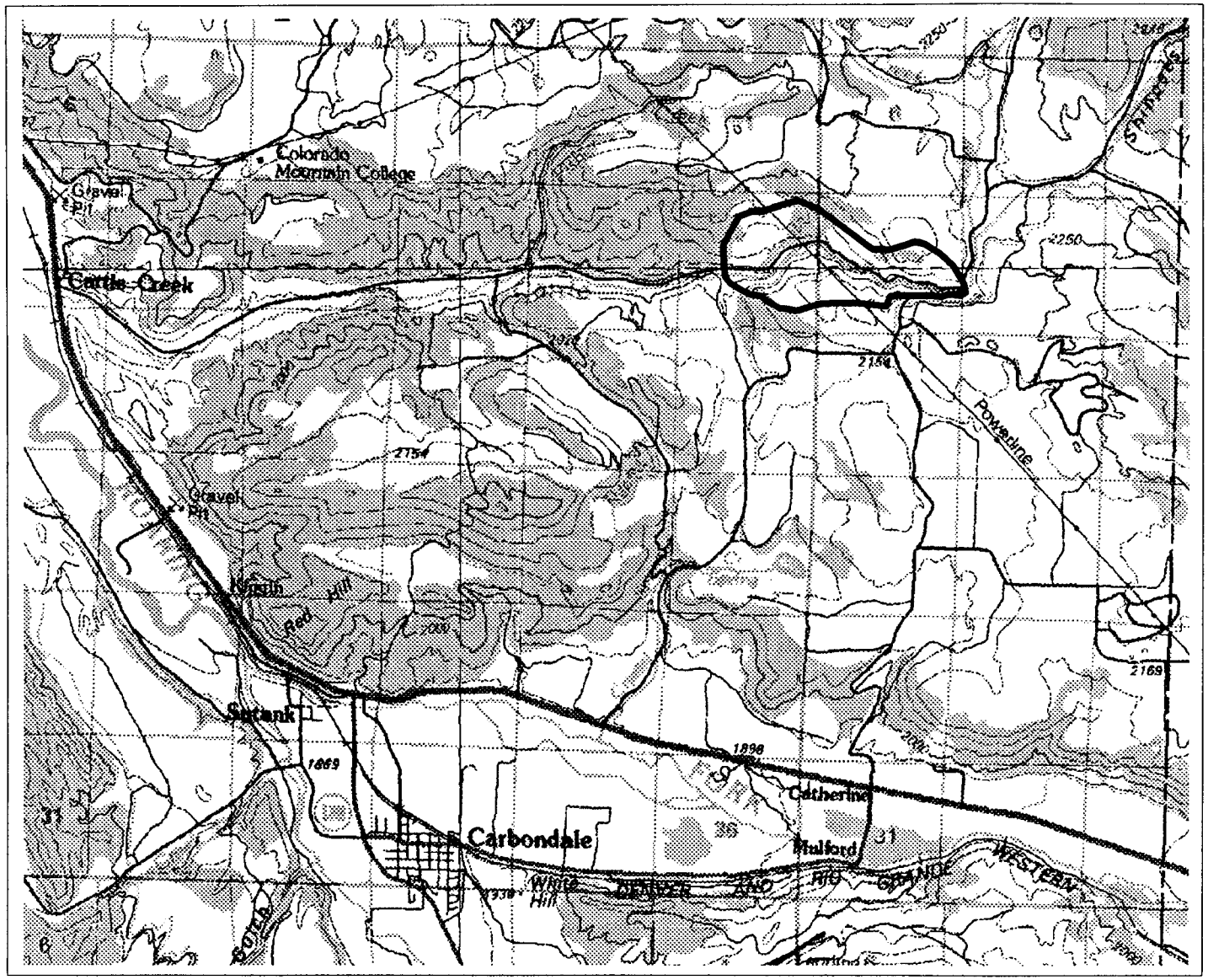
Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Quercus gambelii-Cercocarpus montanus/Carex geyeri	**mixed mountain shrubland**	**G3**	**S3**				**C**
Picea pungens/Cornus sericea	montane riparian forest	G4	S2				C

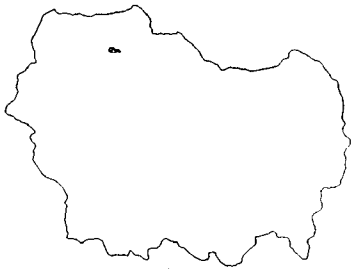
*EO=Element Occurrence

Boundary Justification: This PCA includes the mosaic of community types in which the element occurrences are found. The surrounding high quality habitat is included to protect the occurrences from direct disturbances, such as trampling, and indirect disturbances, such as unnatural erosion. The PCA also provides additional suitable habitat to allow for natural migration of the communities over time. A much larger area should be considered in order to protect the hydrological processes that support the riparian community.

Protection Rank Explanation: This PCA includes a combination of privately owned lands and lands that are publicly owned and managed by the Bureau of Land Management. Residential and recreational development pressures are high in this area. Any developments may threaten this PCA. Land exchanges between willing private landowners and the BLM should be considered.

Management Rank Explanations: There is one road that passes through the PCA along Cattle Creek which is causing erosion problems, and runoff sediments are being deposited in the riparian area. The road is also acting as a conduit for weeds, such as yellow sweet clover (*Melilotis officinale*), plumeless thistle (*Carduus acanthoides*), cheatgrass (*Bromus tectorum*), Russian thistle (*Salsola iberica*), mullein (*Verbascum thapsus*), curly dock (*Rumex crispus*), houndstongue *(Cynoglossum officinale)*, and tansy *(Tanacetum vulgare)*. One of the best defenses against the spread of these exotic species is to discourage future roads and/or trails in the PCA. Management actions could include the development of a management plan, an exotic plant eradication program, and monitoring the occurrences to detect any changes in their overall quality or condition. Management agreements should be sought with the BLM, private landowners, and the highway department.





Location in the Roaring Fork Watershed

PCA boundary

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Natural Heritage Program
COLORADO

Cattle Creek at Coulter Creek Potential Conservation Area

Fourmile Creek at Sunlight

Biodiversity Rank: B4 Moderate biodiversity significance
A good occurrence of an apparently globally-secure plant community is found within this PCA.

Protection Urgency Rank: P2
This PCA includes a mix of U.S. Forest Service and private lands, and is threatened by residential developments.

Management Urgency Rank: M2
Management is needed to maintain the quality of the PCA. Recommended management actions include the implementation of an exotic plant eradication program. There is also a need to better understand the ecological processes that support this community type.

Location: Garfield County. South and east facing slopes in the Fourmile Creek drainage. PCA also includes a small area to the east of Fourmile Creek, with northwest facing slopes.
Legal Description: U.S.G.S. 7.5 minute Cattle Creek quadrangle. T7S R89W S8-10, 15-17, 20-22, 26-29, 31-35. T8S R89W S 5, 6, 8.

General Description: The PCA ranges in elevation from about 6800 feet along Fourmile Creek, to 9400 feet in the adjacent National Forest. The PCA is significant because of the Gambel's oak (*Quercus gambelii*)- serviceberry (*Amelanchier utahensis*) shrublands. These shrublands are dense and also include low cover of mountain mahogany (*Cercoparpus montanus*), pinyon pine (*Pinus edulis*), Douglas fir (*Pseudotsuga menziesii*), and sagebrush (*Artemesia*). A few very large Ponderosa pines (*Pinus ponderosa*) are scattered through the PCA at lower elevations. The soils and rock outcrops in this area are fine textured sandstones or shales, light in color, tan. Several drainages cross the oak *(Quercus gambelii)* shrubland, most of these are dominated by aspen *(Populus tremuloides)*. This large area is in good condition overall, however there are a few scattered roads and trails that fragment the PCA. The activity along these pathwayss is creating erosion and weed problems. Sunlight Ski area is due south of the PCA. The riparian vegetation along Fourmile Creek is dominated by narrowleaf cottomwood (*Populus angustifolia*), blue spruce *(Picea pungens)*, and alder *(Alnus incana)*. Further upstream, more spruce-fir *(Picea engelmannii-Abies lasiocarpa)*/alder *(Alnus incana)*, willows (*Salix drummondiana, Salix monticola, and Salix bebbiana*), and alder *(Alnus incana)* shrublands are found in a moderately wide valley bottom. The road follows Fourmile Creek and appears to have less of an impact upstream of the ski area. Downstream of the ski area the riparian vegetation is in poor condition. Adjacent uplands are gradually to steeply sloping valley sides with mixed aspen *(Populus tremuloides)* conifer forests. A good occurrence of subalpine fir/thimbleberry (*Abies lasiocarpa/Rubus parviflorus*) community has been documented within this PCA. There is not enough known about this community type to suggest conservation action, though it is ranked a G5/S2 by CNHP. A total of 6,298 acres are included in the PCA boundaries.

Biodiversity Rank Justification: There is a good example of a globally-vulnerable, mixed-mountain shrubland within this PCA. This community type, oak-serviceberry *(Quercus gambelii –Amelanchier utahensis)*, is documented in only six locations in Colorado.

Natural Heritage element occurrences at the Fourmile Creek at Sunlight PCA.

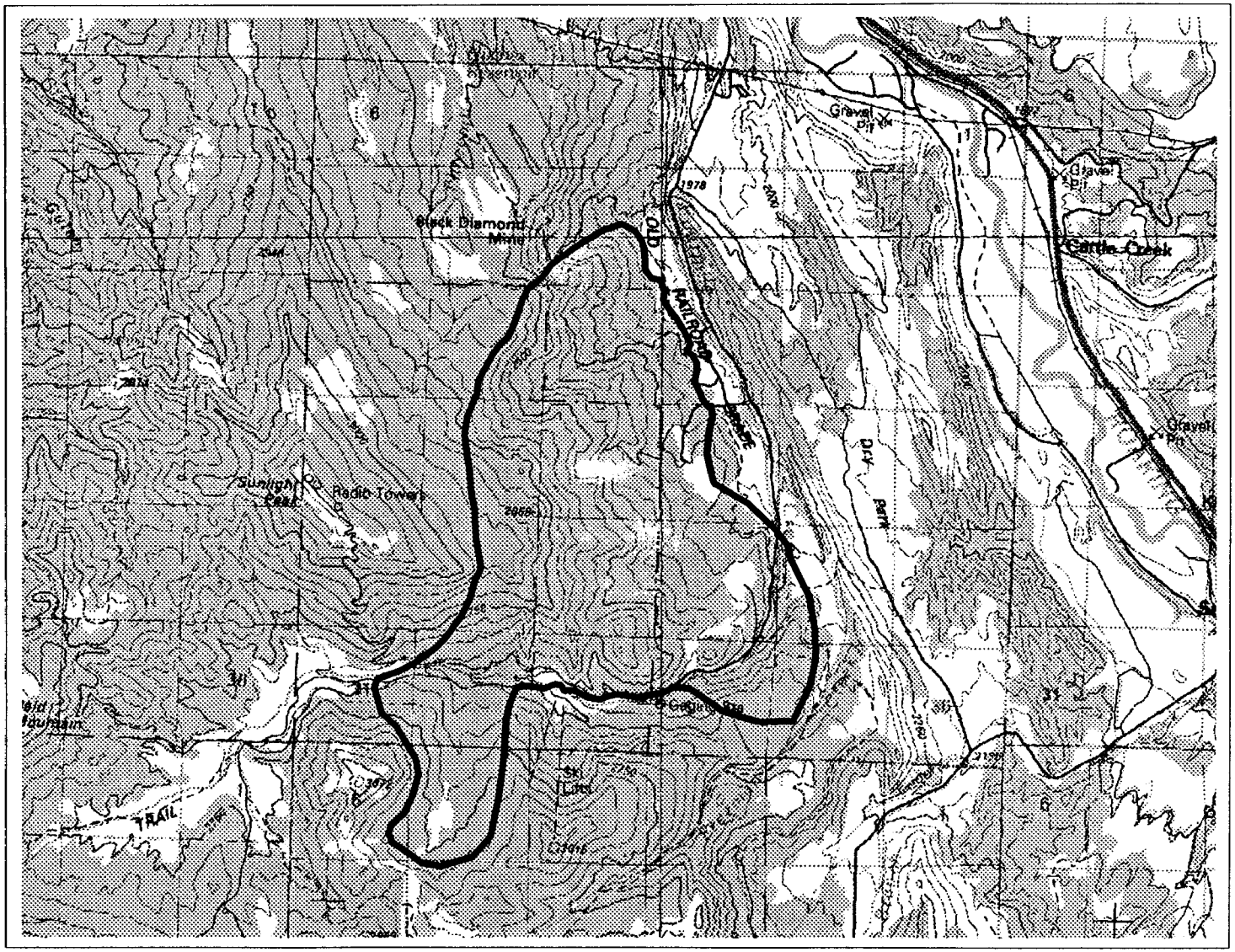
Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Quercus gambelii-Amelanchier utahensis	**mixed mountain shrubland**	**G3G5**	**S**				**B**

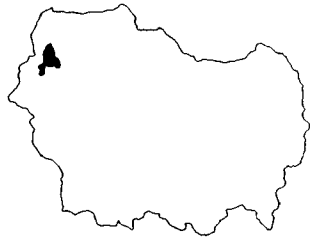
*EO=Element Occurrence

Boundary Justification: This PCA includes the mosaic of community types in which the element occurrence is found. The surrounding high quality habitat is included to act as a buffer to direct disturbances, such as trampling, and indirect disturbances, such as unnatural erosion. The PCA also provides additional suitable habitat to allow for natural migration of the element.

Protection Rank Explanation: This PCA is a mix of private land and lands that are publicly owned and managed by the White River National Forest. Residential and recreational development pressures are high in this area. If Sunlight Ski area is expanded residential development in this area is expected to follow. Any developments may threaten this PCA.

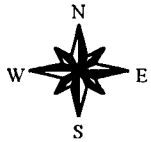
Management Rank Explanations: There is a need to know processes that support this community type, and its full distribution. There are roads scattered throughout the PCA, which may cause erosion problems and are acting as conduits for weeds, such as Kentucky bluegrass (*Poa pratensis*), yellow sweet clover (*Melilotis officinale*), bindweed (*Convolvulus arvensis*), dandelion *(Taraxacum officinale)*, tansy *(Tanacetum vulgare)*, curly dock (*Rumex crispus*), smooth brome (*Bromus inermis*), and mullein (*Verbascum thapsus*). One of the best defenses against the spread of these exotic species is to discourage future trails/roadways. Management actions could include road closures or restrictions regarding hiking, biking and motor vehicles, and an exotic plant eradication program. A management agreement with private landowners should be pursued.





Location in the Roaring Fork Watershed

PCA boundary



0.8 0 0.8 1.6 Miles

Fourmile Creek at Sunlight Potential Conservation Area

Toner Creek

Biodiversity Rank: B4 Moderate significance
A good occurrence of a globally-secure riparian plant community is found within this PCA. This is the best example of this community type in the Roaring Fork Watershed.

Protection Urgency Rank: P2
This PCA is publicly owned and managed by the U.S. Forest Service and Christine State Wildlife Area managed by the CDOW. There are private inholdings within the PCA. Roads parallel the riparian areas and need to be protected from road maintenance activities.

Management Urgency Rank: M2
Management is needed to maintain the quality of the PCA. Recommended management actions include restrictions regarding hiking, biking, motor vehicles, and grazing, and the implementation of an exotic plant eradication program.

Location: Eagle County. Along the Frying Pan and Toner Creek, about 3 miles upstream of Basalt. Between Basalt Mountain and Seven Castles.
Legal Description: U.S.G.S. 7.5 minute Toner Reservoir and Woody Creek quadrangles. T7S R86W S 26,27,34,35. T8S R86W S2, 3,10,11.

General Description: Toner Creek flows south into the Frying Pan River through a landscape dominated by pinyon-juniper (*Pinus edulis-Juniperus osteosperma*) woodlands and Gambel's oak (*Quercus gambelii*) shrublands. Douglas fir *(Pseudotsuga menziesii)* forests and dramatic red sandstone cliffs are found on the north-facing slopes. Small patches of sagebrush within the PCA appear to be suitable habitat for Harrington's beardtongue (*Penstemon harringtonii)*, but this species was not located during our survey. This is the only area in the watershed that balsam cottonwood was documented. This PCA also includes potential habitat for rare orchid species (as indicated by the presence of *Mianthemum* and *Equicetum*).

Two examples of a globally-vulnerable riparian community are found within the PCA. Diverse shrubs are found in the riparian understory including rose (*Rosa woodsii*), alder *(Alnus incana)*, coyote willow (*Salix exigua)*, river birch (*Betula glandulosa*), and mountain maple (*Acer glabrum*). The community along Toner Creek is narrow and is being encroached by exotic plants and housing developments. The occurrence on the main stem of the Fryingpan River is much wider (about 75m), though it is dissected by footpaths and the road on the north side of the river. This occurrence is naturally very narrow on the south side of the river because of the cliffs.

The PCA ranges in elevation from about 7000 feet along the Fryingpan River, to about 10,000 feet including most of the headwaters of Toner Creek. Toner Reservoir feeds one of the intermittent drainages that flows into the PCA. The reservoir is not includes in the PCA boundaries. A power line crosses over the PCA just north of the Fryingpan River. This area is in

fair to good condition overall, however there are scattered roads and trails used by recreationists and home owners, and substantial roads that parallel the prominent drainages. The activity along these thorough-ways are creating erosion and weed problems. There are five houses in the PCA and a state fish and game station. Upstream of the game station the riparian vegetation is very degraded. This area is included in the PCA to serve as a buffer to the riparian communities downstream, and they may be recoverable. Approximately 1760 acres are included in the PCA boundaries.

Biodiversity Rank Justification: This PCA includes a good and a fair example of a globally secure plant community. This community is only known from approximately 39 locations in Colorado. These occurrences stand out as representing one of the best large areas of riparian plant communities still intact in the low elevations of the Fryingpan River drainage.

Natural Heritage element occurrences at Toner Creek PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Populus angustifolia/Cornus serecia		**G4**	**S3**				**B**
Populus angustifolia/Cornus serecia		G4	S3				C

*EO=Element Occurrence

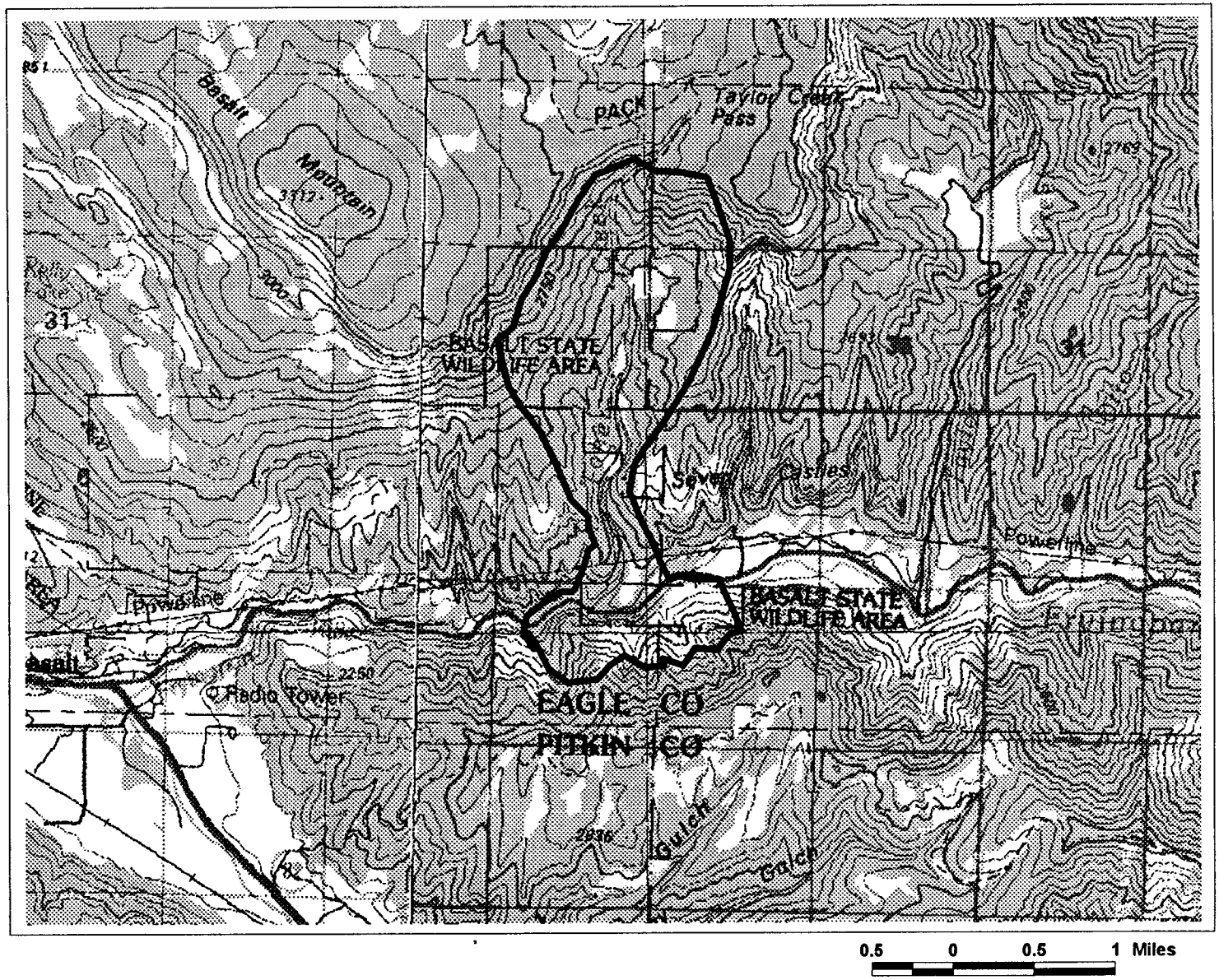
Boundary Justification: This PCA includes the mosaic of community types in which the two element occurrences are found. The surrounding high quality habitat is included to act as a buffer to direct disturbances, such as trampling, and indirect disturbances, such as unnatural erosion. The PCA also provides additional suitable habitat to allow for natural migration of the community.

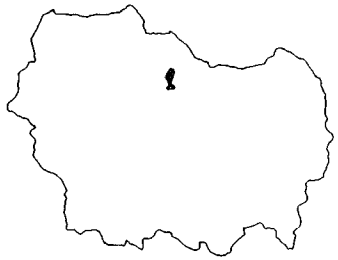
Protection Rank Explanation: This PCA includes mixed public and private ownership. The public lands are managed by the U.S. Forest Service and the CDOW. Residential and recreational development pressures are high in this area. Any developments, also including road maintenance activities may threaten this PCA.

Management Rank Explanations: Grazing, residential and recreation are currently the main land uses. Grazing has affected the quality and condition of the occurrence along Toner Creek. There are roads scattered throughout the PCA which are causing erosion problems and are acting as conduits for weeds such as ox-eye daisy (*Leucanthemum vulgare*), yellow sweet-clover (*Melilotus officinale*), hay grassses, plumeless thistle (*Carduus acanthoides*), mullein (*Verbascum thapsus*), and houndstongue *(Cynoglossum officinale)*. One of the best defenses against the spread of these exotic species is to discourage future trails and roadways. Management actions could include trail and road closures or restrictions regarding hiking, biking and motor vehicles, the development of an exotic plant eradication program, and grazing restrictions. Management agreements could be arranged with private landowners. The influence

that Toner Reservoir has on this PCA needs to be determined The road along Toner Creek could be closed to motor vehicles except for private landowners.

Photo 27: Cottonwood riparian forest (*Populus angustifolia/Cornus serecia*) found at the Toner Creek PCA.





Location in the Roaring Fork Watershed

PCA boundary

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Natural Heritage Program
COLORADO

Toner Creek Potential Conservation Area

Woody Creek at Horseshoe Draw

Biodiversity Rank: B4 Moderate biodiversity significance
A good occurrence of a globally-vulnerable riparian plant community is the basis for this biodiversity rank.

Protection Urgency Rank: P2
Most of the PCA is composed of U.S. Forest Service lands. However, there are private inholdings within the PCA, as well as up and downstream of the PCA. These areas are threatened with residential and agricultural developments that could destroy and/or degrade significant portions of the significant communities. There are mining claims around Lenado just upstream of the riparian occurrence.

Management Urgency Rank: M2
Management actions are essential to prevent the loss of occurrences. Actions should include weed control and restoration efforts, and restricted recreation access. There is a two lane road that follows Woody Creek and a jeep trail that passes through the southeast corner of the PCA.

Location: Pitkin County. About 2 air miles north of Aspen. Woody Creek and adjacent slopes for two miles downstream of Lenado. PCA is about 2 miles from a wilderness area boundary.
Legal Description: U.S.G.S. 7.5 minute Aspen and Ruedi Reservoir quadrangles. T9S R84W S17-21, 28-33. T9S R85W S13, 23, 24.

General Description: Woody Creek flows west into the Roaring Fork River roughly seven miles downstream of Aspen. The PCA includes approximately a 2 mile stretch of Woody Creek, between 8000 and 8400 feet. This stretch of Woody Creek is in a fairly narrow V shaped valley with deep reddish soils. The riparian vegetation includes a discontinuous riparian community dominated by narrowleaf cottonwoodand blue spruce with alder in the understory (*Populus angustifolia-Picea pungens/Alnus incana*). The understory in the riparian areas is diverse with honeysuckle (*Lonicera involucrata*), dogwood (*Cornus serecia*), mountain lover (*Paxistima myrsinites*), gooseberry (*Ribes inerme*), and mountain maple (*Acer glabrum*). The PCA also includes a globally secure community dominated by spruce-fir *(Picea engelmannii-Abies lasiocarpa)* and alder *(Alnus incana)*. On the north bank of the river a two lane road follows the river. On the south bank the riparian vegetation is confined to a narrow canyon with steep walls, although the valley bottom is moderately wide. The adjacent upland areas support spruce-fir *(Picea engelmannii-Abies lasiocarpa)* communities on the north facing slopes and globally-vulnerable shrublands dominated by oak *(Quercus gambelii)* and serviceberry (*Amelancier utahensis*) on the south facing slopes. These shrublands also supports snowberry (*Symphoricarpos rotundifolius*), and a mix of other shrubs in low cover. Several small drainages including Horseshoe Draw, Casaday Creek, and Sawmill Creek bisect the oak occurrence and are dominated by aspen *(Populus tremuloides)*, blue spruce *(Picea pungens)* and Douglas fir

(Pseudotsuga menziesii). Further downstream a Drummond's willow (*Salix drummondiana)* willow carr was documented. This area is flooded, probably by beaver. A total of 3462 acres are included within this PCA.

Biodiversity Rank Justification: This PCA supports a good example of a globally-vulnerable riparian plant community known from 71 locations in Colorado. The PCA also supports a good example of an oak-serviceberry *(Quercus gambelii-Amelanchier utahensis)* community, which has been documented in only 12 places Colorado.

Natural Heritage element occurrences at the Woody Creek at Horseshoe Draw PCA.

Element	Common Name	Global Rank	State	Federal	State Status	Federal Sens.	EO* Rank
angustifolia- Picea pungens/ Alnus incana	**montane riparian forest**	**G3**	**S3**				**B**
Amelanchier utahensis	mixed mountain shrubalnd		SU				
Abies lasiocarpa-Picea engelmanii/ Alnus incana	montane riparian forest	G5	S3S4				A

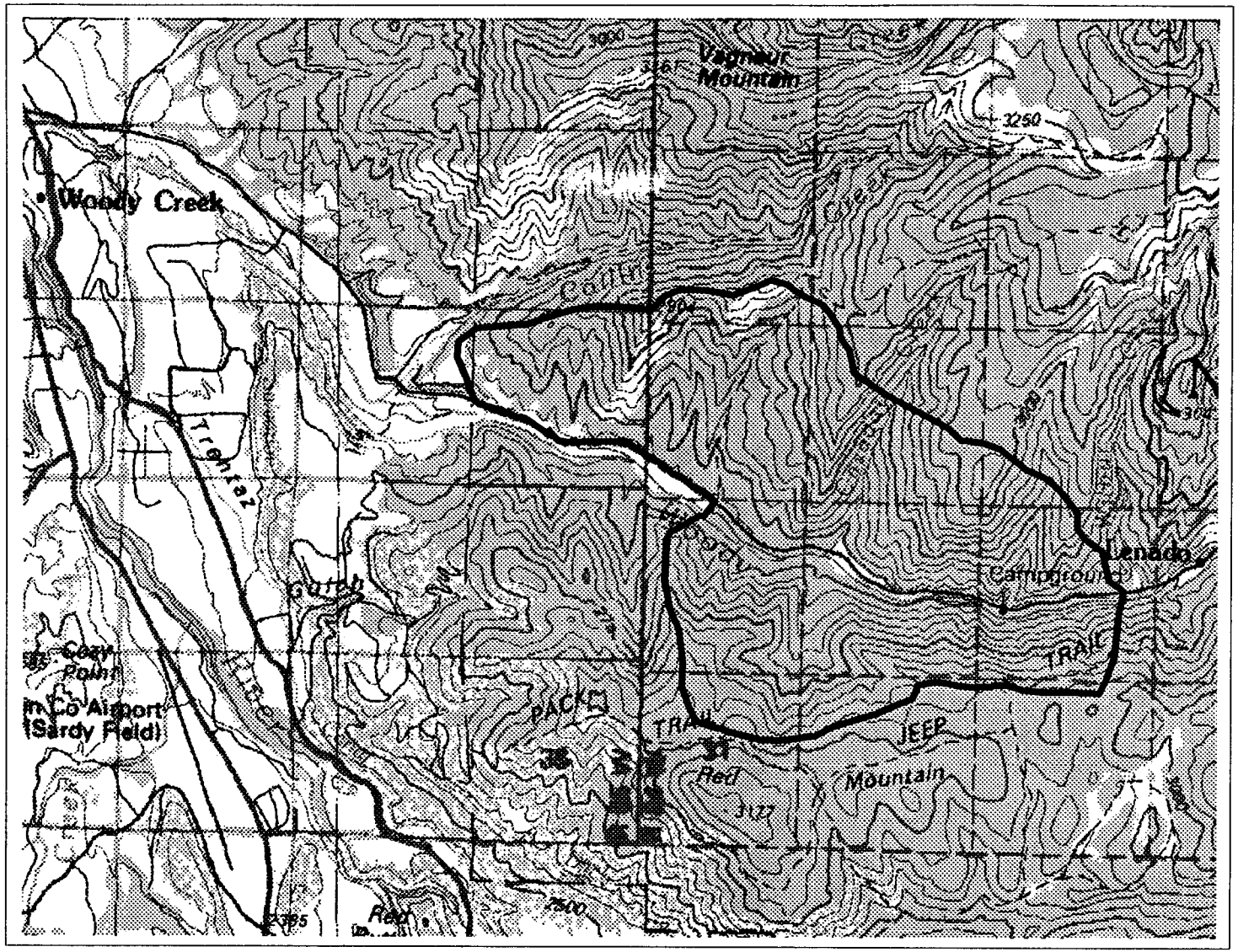
*EO=Element Occurrence

Boundary Justification: The boundary is drawn to include the three occurrences and adjacent potential habitat up and down stream to allow the communities to move into suitable habitat over time. The adjacent steep slopes that would most likely impact occurrences if altered are also included. This area is intended to act as a buffer for the occurrences and protect them from direct disturbances. The full drainage is not included in the PCA. Hydrological processes originating outside the planning boundary, including water quality, quantity, and timing should be managed to maintain PCA viability. Narrowleaf cottonwoods require periodic, above average, floods usually in June for seed germination and survival. Therefore, it is important to maintain a natural flooding regime.

Protection Rank Justification: Most of the PCA is managed by the White River National Forest. There are several private inholdings within the PCA including one 45 acre estate, which is altering the hydrological setting and effecting water quality by using pesticides for lawn care. Conservation easements or management agreements with private landowners should be pursued as soon as possible.

Management Rank Justification: Hay meadows and houses are adjacent to the significant riparian communities along the main stem of Woody Creek. Woody Creek Road follows the river and supports roadside weeds such as smooth brome (*Bromus inermis*), crested wheat grass (*Agropyron cristatum*), Timothy (*Phleum pratense*), mullein *(Verbascum thapsus)*, and red clover (*Trifolium pratense*). Other non-natives such as Orchard grass (*Dactylis glomerata*),

Kentucky bluegrass (*Poa pratensis*), and dandilion (*Taraxacum officinale*) were noted near private land in the floodplain. The most aggressive exotics in the PCA and should be controlled. There is an old campground in the PCA near the intersection of Sawmill Creek and Woody Creek. The elements should be protected from road maintenance activities.



Location in the Roaring Fork Watershed

PCA boundary

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Natural Heritage Program
COLORADO

Woody Creek at Horseshoe Draw Potential Conservation Area

Hunter Creek

Biodiversity Rank: B4 Moderate significance
This PCA includes a state-rare riparian plant community and historical reports of two state-rare amphibians.

Protection Urgency Rank: P1
This PCA is immediately threatened by development and recreation activities.

Management Urgency Rank: M3
Management actions are needed within five years to maintain or improve the quality of the PCA. Actions should include weed control and restricted recreation access.

Location: Pitkin County. Northeast of Aspen.
Legal Description: U.S.G.S. 7.5 minute Aspen quadrangle. T10S R84W S3-6.

General Description: Hunter Creek drains into the Roaring Fork River near the town of Aspen. There is a diverse representation of community types in the Hunter Creek drainage in a small elevation span between 8200-9000 feet. The communities range from upland slopes with red sandstone-derived soil dominated by serviceberry (*Amelanchier alnifolia*) and Gambel's oak (*Quercus gambelii*) at the lower elevations, to wet aspen *(Populus tremuloides)* forests interspersed with meadows at the higher elevations. Lodgepole pine (*Pinus contorta*) and Douglas fir (*Pseudotsuga menziesii*) occupy the north-facing uplands.

Within the PCA, the lower area of the riparian zone is dominated by Douglas fir (*Pseudotsuga menziesii)* and narrowleaf cottonwood *(Populus angustifolia)* with a diverse shrub layer of currant (*Ribes),* raspberry *(Rubus)*, maple *(Acer),* honeysuckle *(Lonicera),* cherry *(Prunus),* serviceberry *(Amelanchier)*, and dogwood (*Cornus),* and a sparsely vegetated herbaceous layer. Above Lenado Gulch, Hunter Creek meanders through willow carrs, dominated by Drummond's willow (*Salix drummondiana*) and mesic meadows. Abandoned oxbows and beaver dams form ponds next to the river. This PCA incorporates these diverse communities in approximately a 600 acre boundary.

Biodiversity Rank Justification: The Hunter Creek PCA includes a good occurrence of a state-rare plant community. The global range of this community is unknown, so it is considered to be globally significant until additional information is available. The boreal toad (*Bufo boreas boreas*) and the northern leopard frog (*Rana pipiens*) were documented in this PCA over 10 years ago. Although these species have not been reported since, it is possible that further research would document their persistence.

Natural Heritage element occurrences at the Hunter Creek PCA.

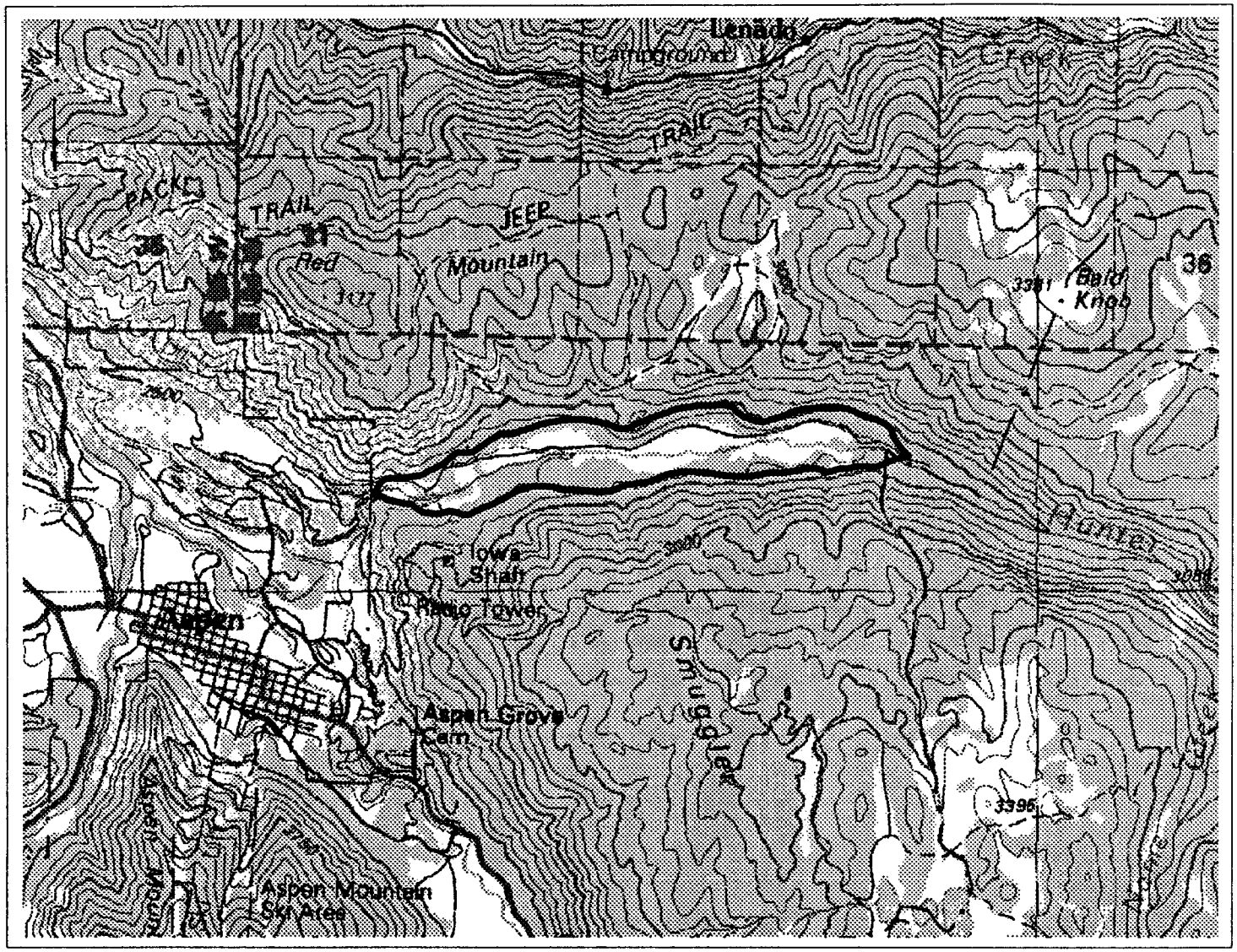
Element	Common Name	Global Rank	State Rank	Federal	State Status	Federal Sens.	EO* Rank
Bufo boreas boreas		G4 T1Q	S1	C	E	FS	
Rana pipiens	northern leopard frog	G5	S3		SC		H
Salix drummondiana/ Carex utriculata	**montane willow carr**	**GU**	**S3**				**B**

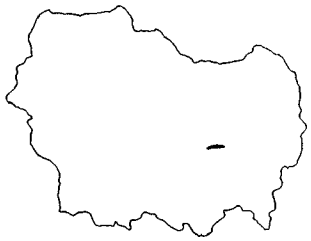
*EO=Element Occurrence

Boundary Justification: The boundary is drawn to protect the occurrences from direct disturbances. Additionally, the hydrologic regime of the area should be protected in order to maintain the quality of these riparian communities.

Protection Rank Justification: Most of this PCA is within the Benedict Park Land Trust Preserve which is owned by Pitkin County Open Space Department. There is also private land within the PCA boundaries, and the upper portion of the PCA is in the White River National Forest. A picnic area may be developed in the east portion of the PCA. The Red Mountain Housing Development, above Aspen, is directly adjacent to the Hunter Creek PCA and the development pressures are high in this area.

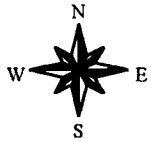
Management Rank Justification: The Land Trust Preserve has unrestricted access. The predominant land use is recreation. A heavily used trail and an old pasture on Hunter Creek are probably the source for many of the trailside weeds such as orchard grass (*Dactylis glomerata*), Kentucky bluegrass (*Poa pratensis*), smooth brome (*Bromus inermis*), dandelion (*Taraxacum officinale*), clover (*Trifolium pratense*), and timothy grass (*Phleum pratense*). These exotic species should be controlled from spreading into the communities adjacent to the trail. To protect the hydrologic regime for the riparian and aquatic habitat, the PCA should be managed to maintain the quality, quantity, and flooding of water. Hydrologic considerations should extend beyond the PCA boundaries, especially wherever the watershed is not contained in the PCA.





Location in the Roaring Fork Watershed

PCA boundary



Hunter Creek Potential Conservation Area

Ranch at the Roaring Fork

Biodiversity Rank: B4 Moderate significance
A globally-vulnerable riparian plant community, a globally-vulnerable orchid subspecies, a state-rare orchid species, the mountain whitefish, and a great blue heron rookery are found within this PCA.

Protection Urgency Rank: P3
Residential and recreational development is a definable threat to this PCA.

Management Urgency Rank: M2
Management actions are essential to prevent the loss of occurrences. Actions should include weed control and restoration efforts, and restricted recreation access.

Location: Garfield County. East of Carbondale and west of Mulford along the Roaring Fork River for a 3 mile stretch.
Legal Description: U.S.G.S. 7.5 minute Carbondale Quadrangle. T7S R87W S31. T7S R88W S25-28, 34-36.

General Description: Affording spectacular views of Mount Sopris to the south, and including the widest stretch of riparian vegetation, this is one of the most intact sites along the lower elevations of the Roaring Fork River. The PCA includes approximately a three mile stretch of the Roaring Fork River floodplain, between 6120 and 6280 feet. The riparian vegetation includes a continuous mosaic of narrowleaf cottonwood (*Populus angustifolia*) and coyote willow (*Salix exigua*) and supports a high diversity of species in the shrub layer. In a few small patches, a rare orchid, yellow lady's slipper (*Cypripedium pubescens*), is found associated with false solomon's seal (*Maianthemum stellatum*). In similar habitats, but distinct locations, another rare orchid was documented. It is possible that further research would discover additional orchid occurrences in this PCA. On the north bank of the river, the riparian vegetation is bisected by multiple two-track roads. A series of ponds in the north and center part of the PCA support a diverse mix of native bird species, cattail marshes, and patches of sedge and rush-dominated wetlands. On the south side of the river there are private homes scattered within the historic floodplain and natural riparian vegetation. Islands in the river are covered by dense stands of coyote willow (*Salix exigua*). The alluvial deposits found along the river banks range from pure sand to large cobbles. The adjacent upland areas rise 200 feet above the floodplain and support pinyon-juniper (*Pinus edulis-Juniperus osteosperma*) communities and mixed shrublands. Approximately 500 acres are included within this PCA.

Biodiversity Rank Justification: This is one of the largest good condition riparian areas observed in the lower Roaring Fork Watershed. It supports a fair example of a globally-vulnerable riparian plant community. This PCA is one of two locations in the Roaring Fork

Watershed that supports two rare orchid species. A poor example of a coyote willow *(Salix exigua)* plant community also occurs within this PCA. However, due to its poor condition it is not an element occurrence according to CNHP methodology. A small rookery of great blue herons (*Ardea herodias*), including approximately four nests, is found within this PCA. Great blue heron rookeries often include several hundred pairs of birds. There are approximately 100 great blue heron (*Ardea herodias*) rookeries in Colorado. This colonial bird species appears to be increasingly common in the state but is quickly being threatened by habitat alteration (Pague et al. 1997).

The mountain whitefish (*Prosopium williamsoni*) is also known to occur in Roaring Fork River from Glenwood Springs to near Woody Creek and unverified occurrences have been reported between Woody Creek and Aspen. There are few rivers in Colorado known to contain this fish species. It is mostly restricted to the northwestern portion of the state.

Natural Heritage element occurrences at the Ranch at the Roaring Fork PCA.

Element	Common Name	Rank	State Rank	Federal Status	State Status	Federal Sens.	EO*
Populus angustifolia/ Alnus incana	**forest**	**G3**	**S3**				**C**
Platanthera sparsiflora var. *ensifolia*	canyon bog-orchid	T3	S2				C
pubescens	yellow lady's-slipper		S2				B
williamsoni	mountain whitefish	G5	S3				E
	great blue heron	G5	S3B, SZN				E

*EO=Element Occurrence

Boundary Justification: The boundary is drawn to include the five occurrences and adjacent potential habitat up and down stream to allow the rare plants, birds and communities to move into suitable habitat over time. This area is intended to act as a buffer for the occurrences and protect them from direct disturbances. A much larger area should be considered to protect the specific hydrologic regime (water quality and natural flooding) of this PCA. Narrowleaf cottonwoods require periodic, above average, floods usually in June for seed germination and survival. Therefore, it is important to maintain a natural flooding regime.

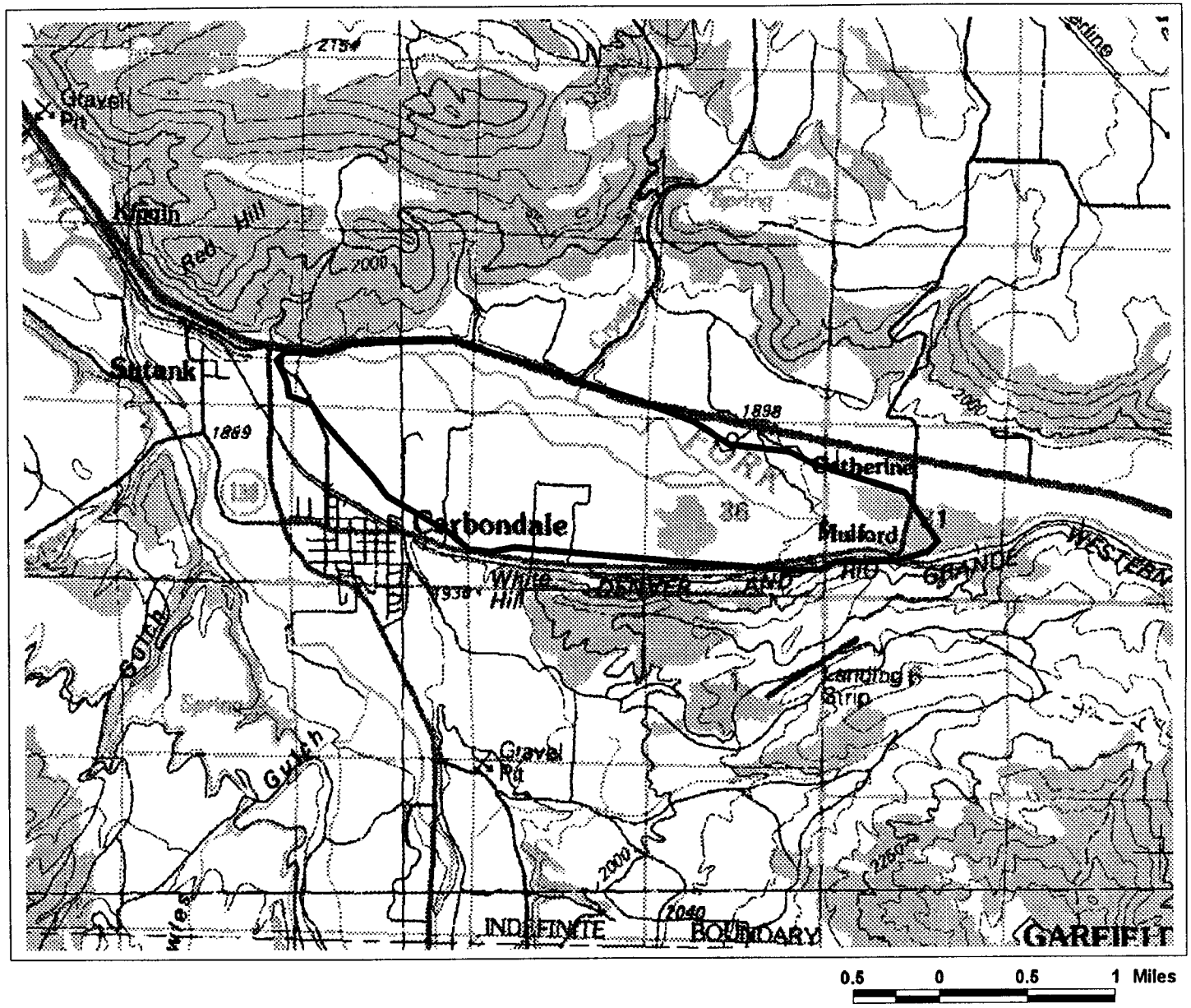
Protection Rank Justification: The Ranch at the Roaring Fork is a private housing community which has chosen to leave this large stretch of riparian floodplain intact, and to allow low impact recreational uses such as walking and birding. If development for this PCA is planned in the future, the land should be considered for Open Space acquisition.

Management Rank Justification: Horse ranching and coal mining occurred within this PCA historically. Horse grazing may be the cause of the spread of exotic plant species, including hay

grasses, houndstongue (*Cynoglossum officinale*), cheatgrass (*Bromus tectorum*), sweetclover (*Melilotus officinale*), oxeye-daisy (*Leucanthemum vulgare*), and plumeless and Canada thistle (*Carduus acanthoides* and *Cirsium arvense*). Tansy (*Tanacetum vulgare*) is the most aggressive exotic in the PCA and should be controlled. Russian olive (*Elaeagnus angustifolia*) extends in a narrow band for about 50 feet along the Roaring Fork River and its removal should be considered in a management plan. The hydrology of the PCA should be maintained, including the human-made ditches and ponds. The elements should be protected from road, ditch, powerline and railroad maintenance activities. The roads within the Ranch at the Roaring Fork riparian areas should be closed and maintained as trails. Additional information is needed about the reproduction ecology of the yellow lady's slipper (*Cypripedium pubescens*) and the canyon bog-orchid (*Platanthera sparsiflora* var. *ensifolia*) to enhance management objectives. Management agreements with the private landowners regarding the rare plants and plant community occurrences should be pursued.

Great blue herons (*Ardea herodias*) are known to abandon nests and colonies with increased visits by humans and with road building and logging activity. The responses of birds to disturbance greatly depends on the time of breeding season. A buffer of 300 meters minimum where no human activity should take place during courtship and nesting seasons is recommended (Butler 1992).

Photos 28 and 29: Photos of the yellow lady's slipper orchid (*Cypripedium pubescens*) and its habitat taken at the Ranch at the Roaring Fork PCA.



Location in the Roaring Fork Watershed

PCA boundary

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Natural Heritage Program
COLORADO

Ranch at the Roaring Fork Potential Conservation Area

El Jebel

Biodiversity Rank: B4 Moderate significance
This PCA includes a fair occurrence of a globally-vulnerable plant community and an occurrence of the mountain whitefish.

Protection Urgency Rank: P3
Residential development is a definable threat.

Management Urgency Rank: M3
Management actions are needed to maintain the quality of the PCA. Weed control and restricted recreation access is recommended.

Location: Eagle County. Between Basalt Mountain and The Crown along the Roaring Fork River.
Legal Description: U.S.G.S. 7.5 minute Leon quadrangle. T7S R87W S33,34. T8S R87W S2-4, 10, 11.

General Description: This PCA includes approximately a two mile stretch of the Roaring Fork River (approximately 6400 feet) between The Crown and Basalt Mountain, southwest of El Jebel. The El Jebel PCA includes small fragments of riparian communities within developed areas. The river is deeply entrenched for small reaches. Narrowleaf cottonwood (*Populus angustifolia*) with mixed understory dominates both banks of the river along this stretch. Approximately 500 acres are included in this boundary.

Biodiversity Rank Justification: This PCA includes a globally-vulnerable riparian plant community, narrowleaf cottonwood/alder (*Populus angustifolia/Alnus incana).* This plant community is known from 30 locations scattered throughout Colorado. There are poor quality remnant examples of narrowleaf cottonwood/skunkbrush *(Populus angustifolia/Rhus trilobata)* and narrowleaf cottonwood/coyote willow *(Populus angustifolia/Salix exigua)* communities within this PCA but they are not considered element occurrences according to CNHP methodology. Further surveys, with additional landowner permission, may reveal larger occurrences which would change the importance of this PCA.

The mountain whitefish (*Prosopium williamsoni*) is known to occur in Roaring Fork River from Glenwood Springs to near Woody Creek, and unverified occurrences have been reported between Woody Creek and Aspen. There are few rivers in Colorado known to contain this fish species. It is mostly restricted to the northwestern portion of the state.

Natural Heritage element occurrences at the El Jebel PCA.

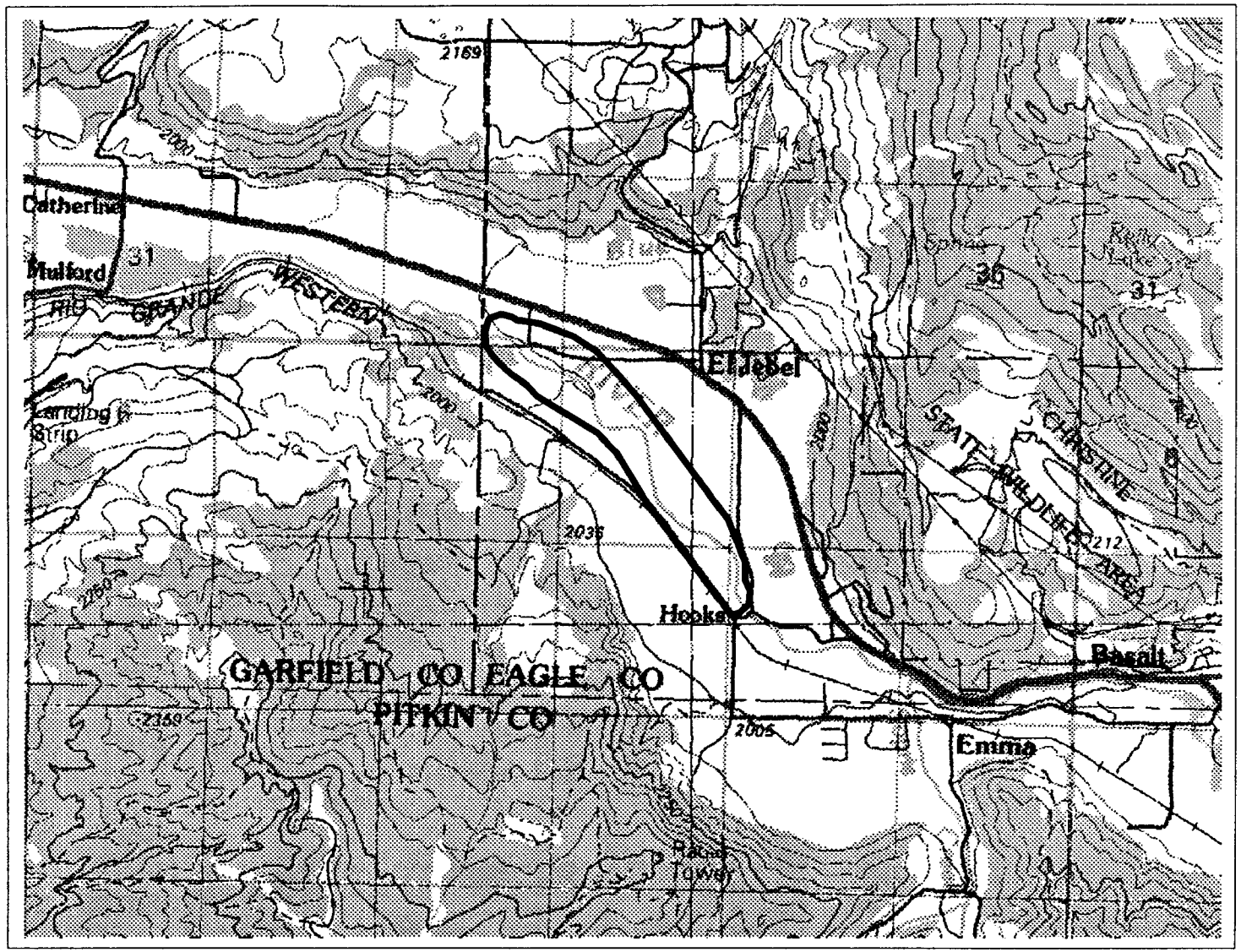
Element	Common Name	Global Rank	State Rank	Status	State Status	Federal Sens.	EO* Rank
Populus angustifolia/ Alnus incana	**montane riparian forest**	**G3**	**S3**				
Prosopium williamsoni	mountain whitefish	G5	S3				

*EO=Element Occurrence

Boundary Justification: The boundary is drawn to protect the occurrences from direct disturbances. Additionally, the hydrologic regime of the area should be protected in order to maintain the quality and long-term viability of the occurrences.

Protection Rank Justification: This PCA is privately owned. Development in the riparian zone is unlikely. However, similar riparian areas along the Roaring Fork have been developed. The land owners future plans are unknown.

Management Rank Justification: This PCA is adjacent to a housing subdivision, human-made ponds, irrigation ditches, and hayfields, which are contributing to an infestation of exotic plant species in the natural riparian vegetation. These weeds should be controlled. Disturbance of this PCA should be minimized, and may include fencing or restricting human activities. A trail/rail corridor is proposed for the old railroad tracks that run through this PCA. A 100 foot wide easement is owned by the Roaring Fork Railroad Holding Authority. This 100 foot area may see a lot of disturbance if this project is funded. The riparian plant communities would be highly threatened. All trails should be kept out of the riparian area. Water quality, quantity, and flooding should not be significantly altered. Hydrologic considerations should extend beyond the PCA boundaries, especially wherever the watershed is not contained in the PCA.



Location in the Roaring Fork Watershed

PCA boundary

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0.6 0 0.6 1.2 Miles

Natural Heritage Program
COLORADO

El Jebel Potential Conservation Area

Basalt Mountain

Biodiversity Rank: B4 - Moderate biodiversity significance
A good occurrence of a globally secure shrubland plant community is found within this PCA.

Protection Urgency Rank: P3
This PCA includes a combination of U.S. Forest Service and private lands. The private lands are threatened by residential development.

Management Urgency Rank: M3
Management is needed to maintain the quality of the PCA. Recommended management actions include restricting recreational use to existing roads and trails, and the implementation of an exotic plant eradication program. Need to better understand the ecological processes that are necessary to support this community type.

Location: Eagle County. North of El Jebel. Low elevation west-facing slopes of Basalt Mountain around the north and east sides of Spring Park Reservoir.
Legal Description: U.S.G.S. 7.5 minute Leon quadrangle. T7S R87W S1, 2, 9-14, 23, 24, 26.

General Description: This PCA ranges in elevation from about 7300 feet along Cattle Creek, to about 9000 feet in the National Forest on the mid slopes of Basalt Mountain. The PCA is significant because of the Gambel's oak-serviceberry (*Quercus gambelii-Amelanchier utahensis*) shrublands. These shrublands are dense and also include low cover of snowberry (*Symphoricarpos rotundifolia*) and sagebrush (*Artemesia tridentata*). Adjacent uplands are gradually to steeply sloping with sagebrush shrublands at the lower elevations and mixed aspen *(Populus tremuloides)* and conifer forests at higher elevations. There is a paved road along Cattle Creek and a dirt road on Basalt Mountain as well as trails that fragment the PCA. The activity along these thorough-ways are creating erosion and weed problems. A total of 2795 acres are included in the PCA boundary.

Biodiversity Rank Justification: There is a good example of a globally-secure, mixed-mountain shrubland within this PCA. This community type is documented in only thirteen locations in Colorado.

Natural Heritage element occurrences at the Basalt Mountain PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Quercus gambelii/ Amelanchier utahensis	**mixed mountain shrubland**	**G3G5**	**SU**				**B**

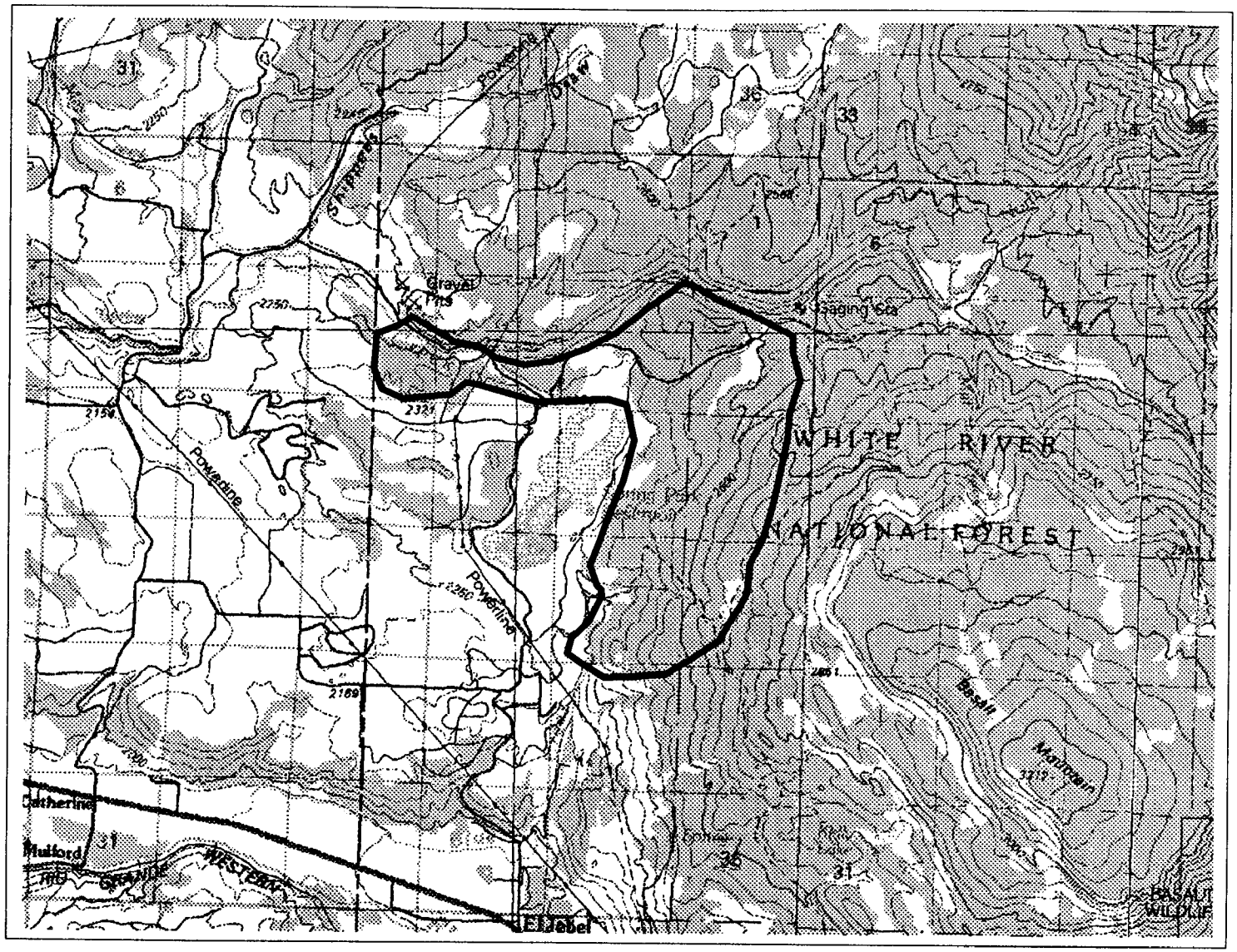
*EO=Element Occurrence

Boundary Justification: This PCA includes some of each of the mosaic of community types in which the element occurrence is found. Some of the surrounding high quality habitat is included to act as a buffer to direct disturbances, such as trampling, and indirect disturbances, such as unnatural erosion. The PCA also provides additional suitable habitat to allow for natural migration of the community.

Protection Rank Explanation: This PCA is a mix of private land and lands that are publicly owned and managed by the White River National Forest. Residential and recreational development pressures are high in this area. Any developments may threaten this PCA.

Management Rank Explanations: A management plan should be developed for this PCA including, if possible, management agreements with private landowners. Research is needed so that we can better understand the processes that support this community type and its full distribution. There are roads scattered throughout the PCA which may cause erosion problems and are acting as conduits for weeds, such as Kentucky bluegrass (*Poa pratensis*), yellow sweet-clover (*Melilotis officinale*), dandelion *(Taraxacum officinale)*, houndstongue *(Cynoglossum officinale)*, plumeless thistle (*Carduus acanthoides*), timothy (*Phleum pratense)*, crested wheatgrass (*Agropyron cristatum*), and cheatgrass (*Bromus tectorum*). One of the best defenses against the spread of these exotic species is to discourage future trails and roadways. Management actions could include road closures or restrictions regarding hiking, biking and motor vehicles, and an exotic plant eradication program.

Photo 30: Mixed shrubland (*Quercus gambellii-Amelanchier utahensis*) at the Basalt Mountain PCA.



Location in the Roaring Fork Watershed

PCA boundary

N
W E
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Natural Heritage Program
COLORADO

Basalt Mountain Potential Conservation Area

Christine State Wildlife Area

Biodiversity Rank: B4 Moderate significance
A fair occurrence of a globally-vulnerable plant species and a good occurrence of a poorly known upland plant community exist within this PCA.

Protection Urgency Rank: P4
This PCA is publicly owned and managed by the CDOW and there are no known threats for the foreseeable future.

Management Urgency Rank: M2
Management of recreational uses and exotic species invasions will be needed to prevent loss and degradation of element occurrences.

Location: Eagle County. Between Basalt Mountain and the Roaring Fork River.
Legal Description: U.S.G.S. 7.5 minute Leon quadrangle. T8S R87W S1, 12. T8S R86W S5-7. T7S R87W S36. T7S R86W S31, 32.

General Description: Christine State Wildlife Area occurs at the base of Basalt Mountain and upslope from the Roaring Fork River. This PCA is characterized by rolling hills (7200-8600 feet) of diverse native shrublands and excellent wildlife habitat. This PCA includes a mosaic of plant communities dominated by pinyon-juniper (*Pinus edulis-Juniperus osteosperma*), Gambel's oak (*Quercus gambelii*), or sagebrush (*Artemisia tridentata*). The sagebrush shrublands provide important habitat for a globally-vulnerable penstemon species. Approximately 1500 acres are included within the boundaries.

Biodiversity Rank Justification: Harrington's beardtongue (*Penstemon harringtonii*) is a globally-vulnerable plant species which is restricted to Colorado and is found almost exclusively in sagebrush habitat. This species is only known from approximately 37 locations, all of which are centered around Edwards in Eagle County. In general, Harrington's beardtongue and its habitat are highly threatened from residential development. These threats in addition to its restricted range create an urgency for protection. Harrington's beardtongue populations are known to fluctuate in population numbers from year to year. Therefore, this specific location may be a higher priority than the current information reflects. This PCA supports a small number of individuals scattered over 500 acres.

The pinyon-juniper (*Pinus edulis-Juniperus osteosperma*) plant community in this PCA is found with needle-and-thread grass (*Stipa comata*). The distribution of this specific combination of plant species is unknown, and is currently considered significant. This example of pinyon-juniper community is in good condition and adds to the importance of biodiversity of this PCA.

Natural Heritage element occurrences at the Christine State Wildlife Area PCA.

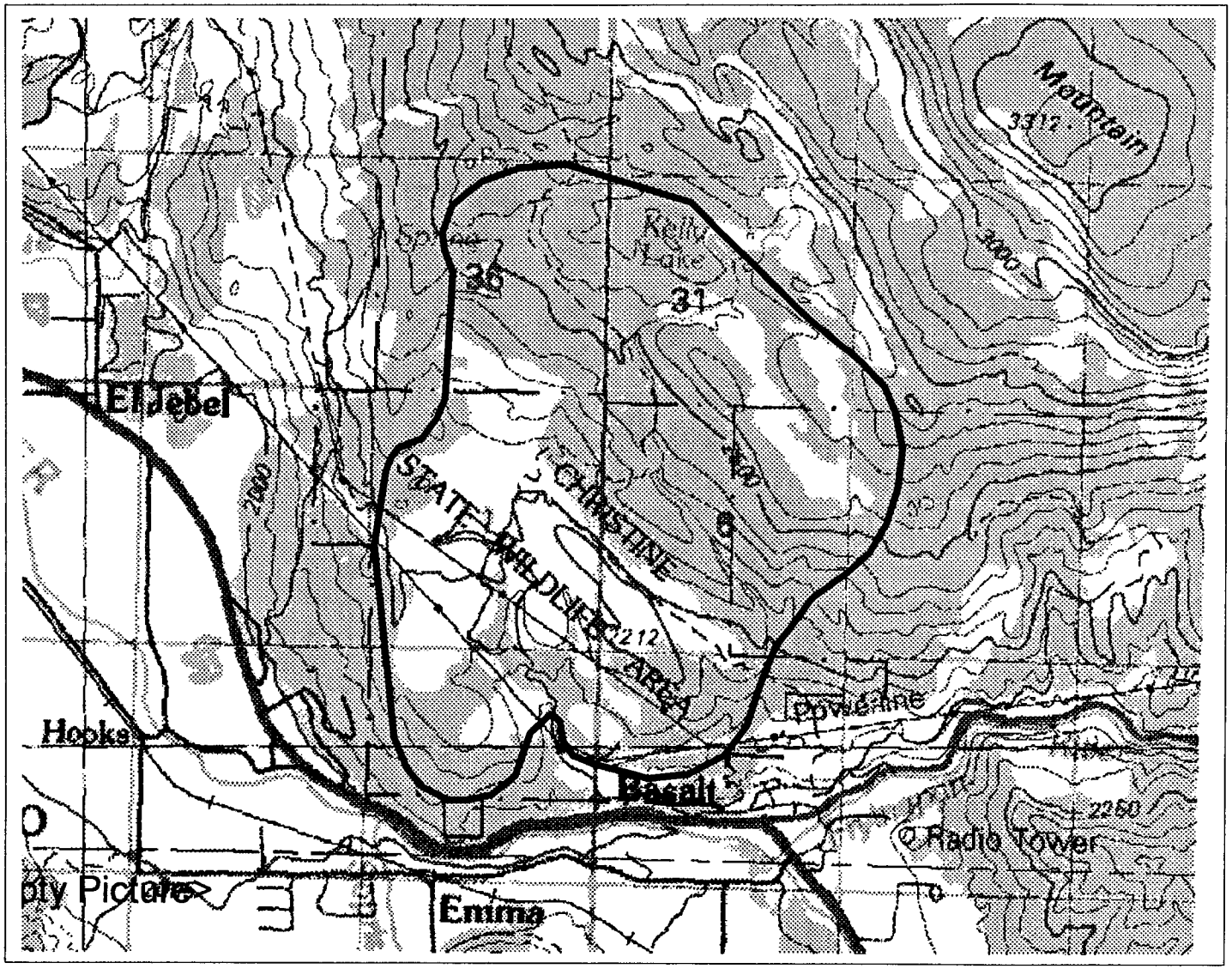
Element	Common Name	Global Rank	State	Federal	State Status	Federal Sens.	EO* Rank
Penstemon harringtonii	**Harrington's beardtongue**	**G3**	**S3**			**FS**	
Pinus edulis-Juniperus osteosperma/ Stipa comata	xeric western slope pinyon-juniper woodlands	GU	SU				

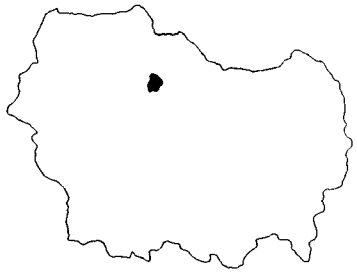
*EO=Element Occurrence

Boundary Justification: The PCA boundary includes the two occurrences and a buffer which is intended to protect the occurrences from direct disturbances, such as trampling. Indirect disturbances occurring outside the PCA boundaries, such as unnatural erosion caused from upslope activities or the establishment of exotic species, should be limited.

Protection Rank Justification: Christine State Wildlife Area PCA is public land managed by the Colorado Division of Wildlife and the White River National Forest.

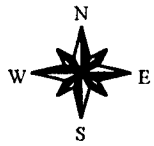
Management Rank Justification: The current management appears to be adequate. There is no grazing and vehicle access is restricted. Recreation access should be limited to existing trails and roads. Exotic plant species are present and should be controlled from spreading into the native communities. The surrounding development makes this area increasingly important as wildlife habitat.





Location in the Roaring Fork Watershed

PCA boundary



0.3 0 0.3 0.6 Miles

Christine State Wildlife Area Potential Conservation Area

East Creek

Biodiversity Rank: B4 - Moderate biodiversity significance
A good occurrence of a riparian plant community that is rare in Colorado is found within this PCA.

Protection Urgency Rank: P4
This PCA is publicly owned and managed by the U.S. Forest Service. Most of the PCA is within the Maroon Bells-Snowmass Wilderness Area.

Management Urgency Rank: M3
Management is needed to maintain the quality of the PCA. Recommended management actions include preservation of the hydrological processes, restrictions regarding recreational uses, and the implementation of an exotic plant eradication program.

Location: Pitkin County. The primary drainage to the east of Redstone.
Legal Description: U.S.G.S. 7.5 minute Redstone quadrangle. T10S R88W S15, 16, 21-23, 26-28, 35.

General Description: East Creek flows west from its headwaters at about 12,000 feet over an approximately four mile distance to its confluence with the Crystal River at about 7200 feet. The Creek flows through a landscape dominated by Gambel's oak (*Quercus gambelii*) shrublands, aspen *(Populus tremuloides)* and Douglas fir *(Pseudotsuga menziesii)* woodlands, and red sandstone outcrops. Dogwood (*Cornus sericea*) is abundant in pockets in steeply sloping rocky areas. A state-rare riparian community, dominated by Douglas fir *(Pseudotsuga menziesii)* and dogwood, is found in the lower elevations of the PCA. This riparian community supports several other shrub species including snowberry (*Symphoricarpos rotundifolius*), dogwood (*Cornus sericea*), Drummond's willow (*Salix drummondiana*), mountain ash (*Sorbus scopulina*), mountain maple (*Acer glabrum*), and alder *(Alnus incana)*. At higher elevations (above 8500 feet) there are several large rock outcrops, and the vegetation is dominated by spruce-fir (*Picea engelmanii-Abies lasiocarpa*) forests with patches of aspen *(Populus tremuloides)*. The riparian areas in the higher elevations of the PCA support a good example of a spruce-fir community with bluebells (*Mertensia ciliata)* in the understory. At about 10,000 feet large sloping meadows occur, possibly as a result of avalanches or deep snow cover. The headwaters of East Creek, in the southeastern portion of the PCA, are above treeline. The PCA is accessible only from a four-wheel drive road which provides some natural protection as it is somewhat less convenient to reach than areas that are immediately accessible by paved roads. This PCA is in good condition overall; however there are trails used for hiking, fishing, horseback riding, and hunting. The activities along these thorough-ways are creating erosion and weed problems. Kentucky bluegrass (*Poa pratensis*), Orchard grass (*Dactylis glomerata*), and dandelion (*Taraxacum officinale*) were noted along the trail in low cover. The PCA ranges in elevation from about 7800 to about 12,200 feet to include the headwaters of East Creek. A total of 1620 acres are included in the PCA boundaries.

Biodiversity Rank Justification: This PCA includes a good example of a riparian community that is considered to be rare in Colorado. This community has only been documented in eight locations in the state. This PCA includes the only representation of this community type in the Roaring Fork watershed.

Natural Heritage element occurrences at East Creek PCA.

Element	Common Name	Global Rank	Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Pseudotsuga menziesii/Cornus sericea	**lower montane riparian forest**		**S2**				**B**

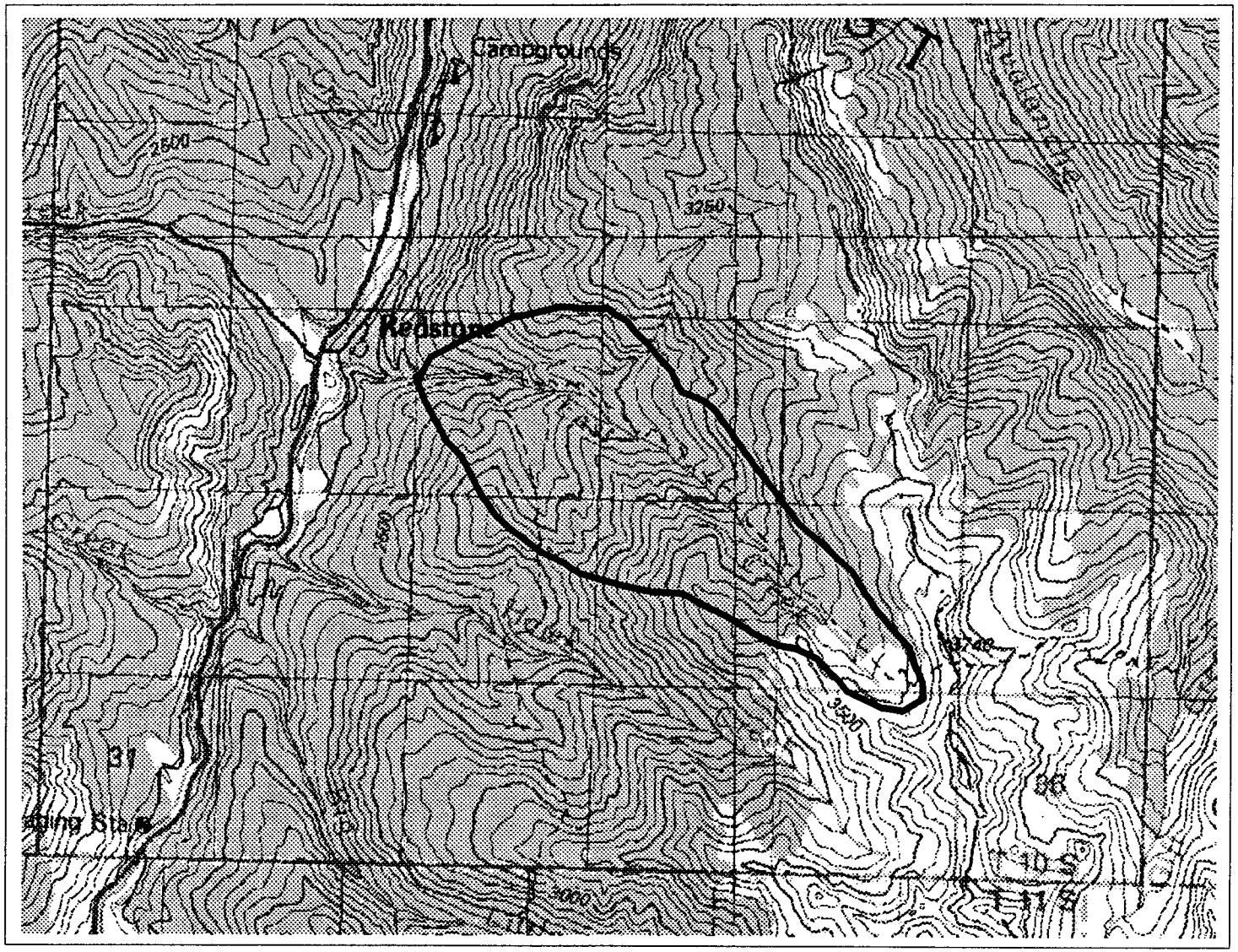
*EO=Element Occurrence

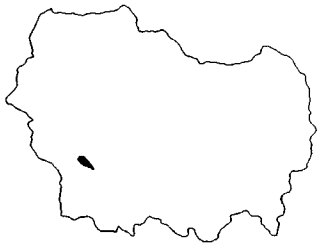
Boundary Justification: This PCA includes the headwaters of East Creek to protect the hydrological setting. The surrounding high quality habitat is included to protect the occurrence from direct disturbances, such as trampling, and indirect disturbances, such as unnatural erosion. The PCA provides additional suitable habitat to allow for natural migration of the riparian community.

Protection Rank Explanation: This PCA is owned and managed by the U.S. Forest Service. Most of the PCA is within the Maroon Bells-Snowmass Wilderness Area. As long as hydrological processes are preserved, and other management issues are addressed, further protection may not be necessary.

Management Rank Explanations: Recreation is currently the main land use. The road leading to the PCA is fairly rough which makes the area less easily accessible. If the road is not improved it may provide some level of natural protection to the PCA. A trail that follows the creek is causing erosion problems and is acting as a conduit for weeds, such as Kentucky bluegrass (*Poa pratensis*), Orchard grass (*Dactylis glomerata*), and dandelion (Taraxacum officinale). One of the best defenses against the spread of these exotic species is to discourage future trails. Management actions could include trail modifications to minimize erosion, and restricted recreational use. Water supply for Redstone is just downstream of the PCA.

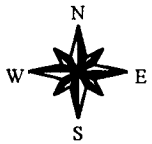
Photo 31: Lower montane riparian forest (*Pseudotsuga menziesii/Cornus serecia*) at the East Creek PCA.





Location in the Roaring Fork Watershed

PCA boundary



0.5 0 0.5 1 Miles

East Creek Potential Conservation Area

Taylor Creek

Biodiversity Rank: B4 High significance
This PCA is based on a fair occurrence of a globally-vulnerable plant species.

Protection Urgency Rank: P4
This PCA is publicly owned and managed by the U.S. Forest Service and there are no threats known for the foreseeable future.

Management Urgency Rank: M3
Management is needed to maintain the quality of the PCA. Recommended management actions include restrictions regarding recreational uses, the implementation of an exotic plant eradication program, and restoration of the sagebrush community.

Location: Eagle County. West facing slopes east of Taylor Creek about a half mile to one mile upstream from Taylor Creek's confluence with the Frying Pan River. Between Red Table Mountain and the Frying Pan River.
Legal Description: U.S.G.S. 7.5 minute Toner Reservoir quadrangle. T8S R86W S1.

General Description: The PCA ranges in elevation from about 7200 feet just upstream of the confluence of Taylor Creek and the Frying Pan River to 7800 feet, following the low ridge to the east of Taylor Creek. The PCA is characterized by pinyon-juniper (*Pinus edulis-Juniperus osteosperma*) woodlands, mixed shrublands (Gambel's oak *(Quercus gambelii)* and mountain mahogany (*Cercocarpus montanus*)), and sagebrush (*Artemisia tridentata*) shrublands. The sagebrush dominated areas are co-dominated by Kentucky bluegrass (*Poa pratensis*), junegrass (*Koeleria macrantha*), and needle and thread grass (*Stipa comata*), and are known to support the globally-vulnerable Harrington's beardtongue (*Penstemon harringtonii).* Soils in the area are derived from sandstone. This small PCA is in good condition overall, however there are two small two track roads in the PCA, one that follows Taylor Creek at the western edge of the PCA, and another that passes through the occurrence. A power line passes through the southern end of the PCA. The activity along these thorough-ways are creating erosion and weed problems. Osterhout's beardtongue (*Penstemon osterhoutii)*, a much more common species, which is endemic to Colorado and can be confused with *Penstemon harringtonii* was also noted at this PCA. A total of 67 acres are included in the PCA boundaries.

Biodiversity Rank Justification: Harrington's beardtongue (*Penstemon harringtonii*) is a globally-vulnerable plant which is restricted to Colorado and is found almost exclusively in sagebrush habitat. This species is only known from approximately 38 locations centered around the town of Edwards in Eagle County. In general, Harrington's beardtongue and its habitat are highly threatened due to residential and recreational development. These threats in addition to its restricted range create an urgency for protection. Harrington's beardtongue populations are known to fluctuate in population numbers from year to year. Although only about 100

individuals have been documented within this PCA, it may be a higher priority than the current information reflects.

Natural Heritage element occurrences at Taylor Creek PCA.

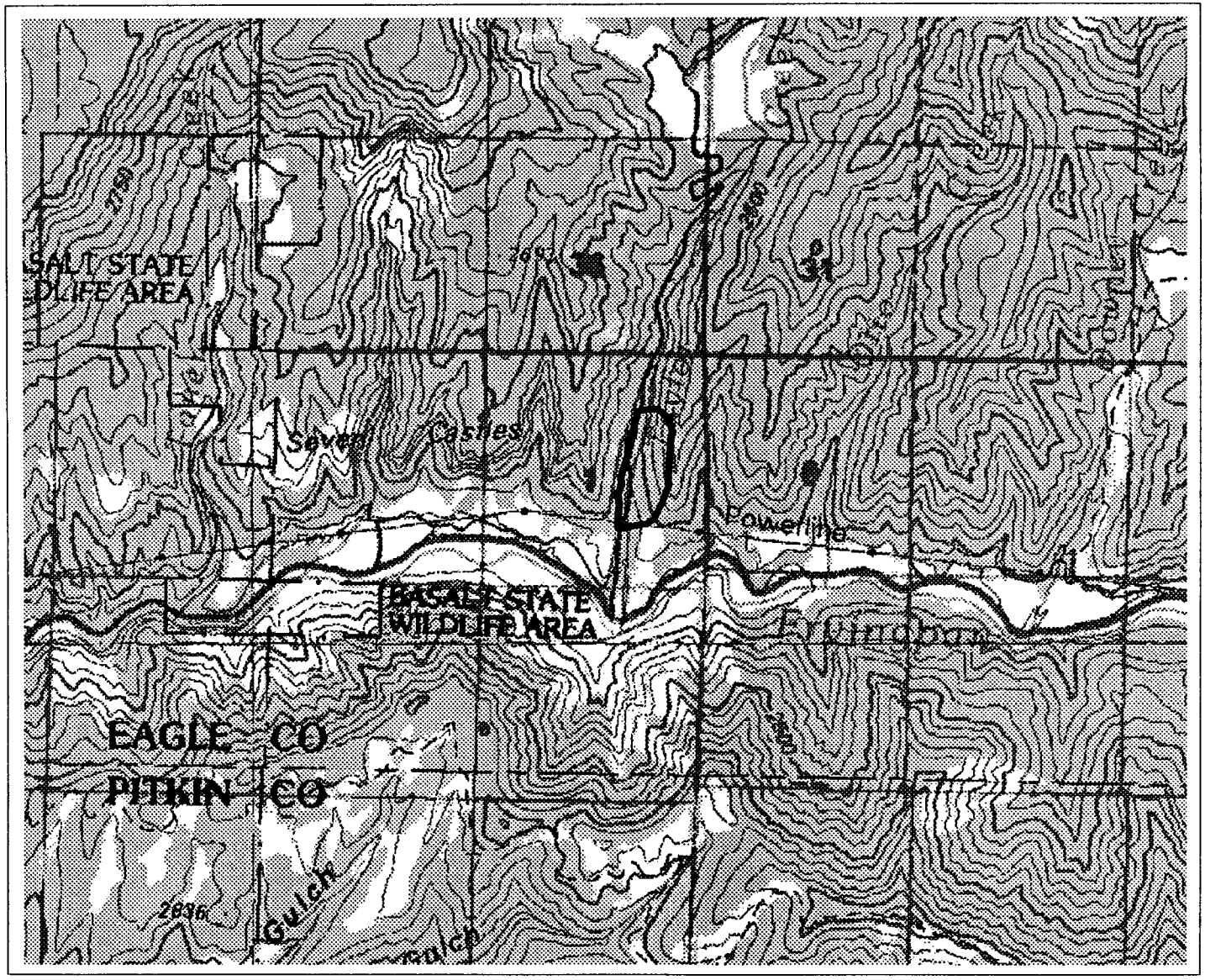
Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
harringtonii	**Harrington's beardtongue**	**G3**	**S3**			**FS**	

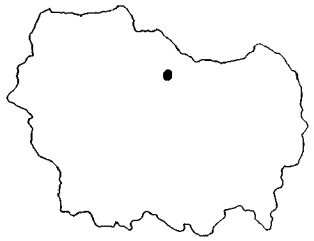
*EO=Element Occurrence

Boundary Justification: This PCA includes the mosaic of community types in which the element occurrences are found. The surrounding high quality habitat is included to act as a buffer to direct disturbances, such as trampling, and indirect disturbances, such as unnatural erosion. The PCA also provides additional suitable habitat to allow for natural migration of the rare plants.

Protection Rank Explanation: This PCA is publicly owned and managed by the U.S. Forest Service. Residential and recreational development pressures are high in this area. Any developments may threaten this PCA.

Management Rank Explanations: The U.S. Forest Service is aware of Harrington's beardtongue (*Penstemon harringtonii*) at this location, but a management plan for this species has not been developed. Recreation is currently the main land use. Elk were noted to use this area and may be browsing the rare penstemon. Grazing has been noted on Harrington's beardtongue but probably is not heavily affecting the quality and condition of this occurrence. There are roads in the PCA which are acting as conduits for weeds, such as Kentucky bluegrass (*Poa pratensis*), Bromus inermis, Yellow sweet-clover (*Melilotis officinale*), dandelion *(Taraxacum officinale)*, and cheatgrass (*Bromus tectorum*). *Poa pratensis* is dominant within the sagebrush. One of the best defenses against the spread of these exotic species is to discourage future trails/roadways. An old two track road switch backs through the occurrence. A powerline passes over the southern end of the PCA. Management actions could include road closures or restrictions regarding hiking, biking and motor vehicles, an exotic plant eradication program, and grazing restrictions.





Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

0.4 0 0.4 0.8 Miles

Taylor Creek Potential Conservation Area

Roaring Fork River at Cattle Creek

Biodiversity Rank: B5 General or state-wide biodiversity interest
A rookery of a state-rare great blue heron, the mountain whitefish, and a historical occurrence of the globally-vulnerable subspecies of the Colorado River cutthroat trout are documented within this PCA.

Protection Urgency Rank: P1
This PCA is immediately threatened by residential and recreational development.

Management Urgency Rank: M1
Restricted access to the rookery is essential to prevent loss of this element occurrence.

Location: Garfield County. Between Glenwood Springs and Carbondale along the Roaring Fork River. Drive south from Glenwood Springs on Highway 82 for approximately 8 miles to the confluence with Cattle Creek.
Legal Description: U.S.G.S 7.5 minute Cattle Creek quadrangle. T7S R89W S1, 12, 13. T7S R88W S 7, 18.

General Description: This PCA includes approximately a one mile stretch (approximately 200 acres) of the Roaring Fork River at about 6000 feet. There is a narrowleaf cottonwood/willow (*Populus angustifolia/Salix* sp.) riparian community along both sides of the river. A sagebrush (*Artemisia tridentata*) dominated shrubland is adjacent to the riparian zone on the east side of the river.

Biodiversity Rank Justification: A great blue heron (*Ardea herodias*) rookery, one of approximately 100 in Colorado, is located in this PCA. This colonial bird species appears to be increasingly common in the state but is quickly being threatened by habitat alteration (Pague et al. 1997). The Colorado River cutthrout trout (*Oncorhynchus clarki pleuriticus*), also documented in this PCA, is a U.S. Forest Service Sensitive and a State Special Concern species. The introduction of non-native trout species, dating to 1872 in Colorado, is considered a primary cause for the decline in numbers and genetic purity of Colorado River cutthroat trout. The populations of Colorado River cutthroat that are still genetically intact are now a priority for conservation. Since this location has not been sampled since 1992 and the genetic purity of this occurrence is unknown, the occurrence is considered historical until further research is completed.

The mountain whitefish (*Prosopium williamsoni*) is also known to occur in Roaring Fork River from Glenwood Springs to near Woody Creek, and unverified occurrences have been reported between Woody Creek and Aspen. There are few rivers in Colorado known to contain this fish species. It is mostly restricted to the northwestern portion of the state.

Natural Heritage element occurrences at the Roaring Fork River at Cattle Creek PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State	Federal Sens.	EO* Rank
Oncorhynchus clarki pleuriticus	Colorado River cutthroat trout	G4T3	S3				
Prosopium williamsoni	mountain whitefish	G5	S3				
Ardea herodias	**great blue heron**	**G5**	**S3B, SZN**				

*EO=Element Occurrence

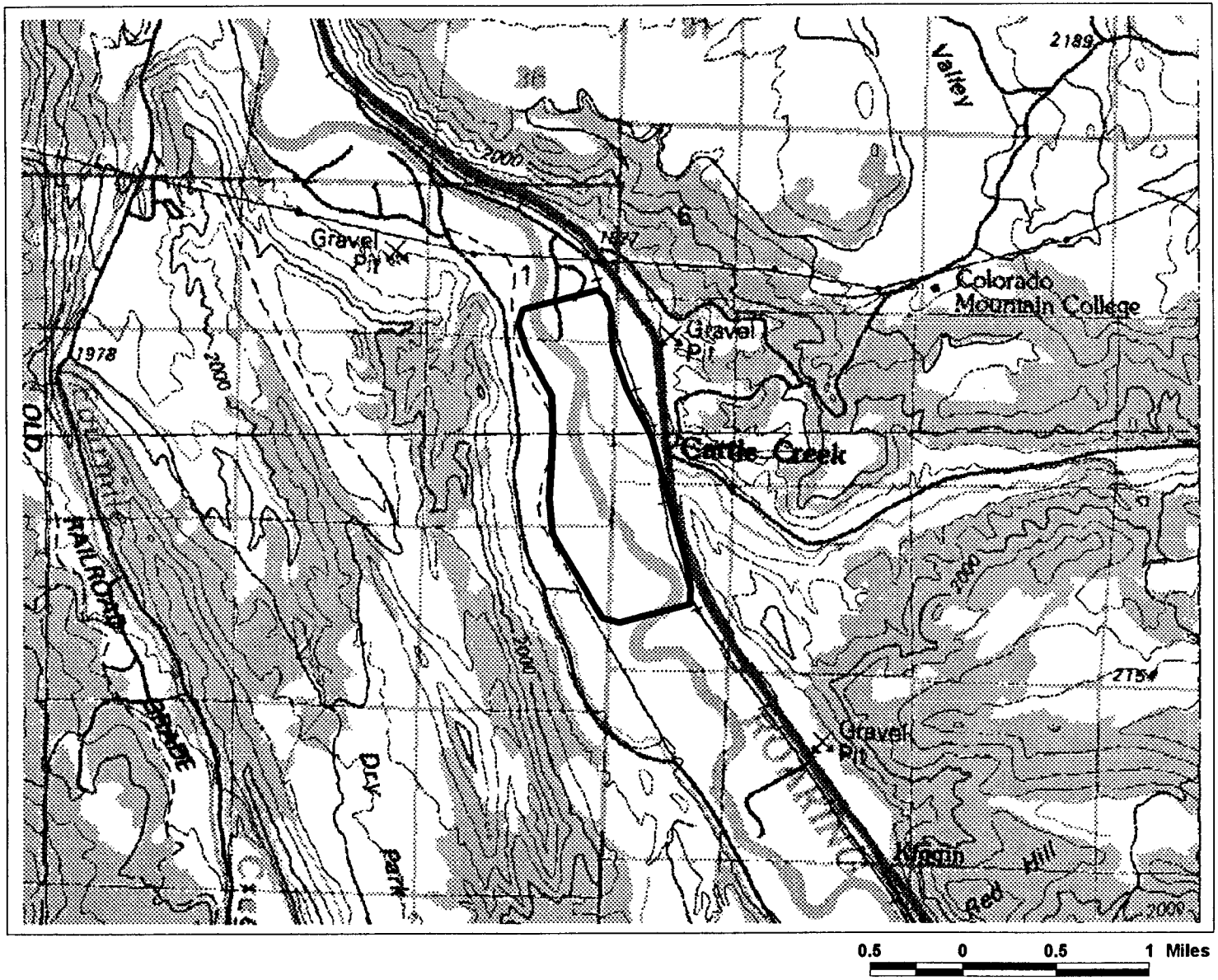
Boundary Justification: The PCA includes the rookery and a short buffer up and downstream on the river to protect from direct disturbances.

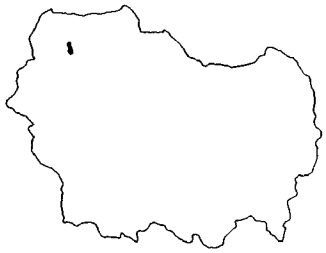
Protection Rank Justification: This PCA occurs on private land. Residential development is currently occurring on the east side of the river and the west side is scheduled for housing. This may partially or completely destroy the rookery.

Management Rank Justification: A management plan for the long-term survival of the great blue heron (*Ardea herodias*) rookery should be developed with the private land owner. During nesting season activities should be restricted (development, grazing, recreation, etc.) within the area on both sides of the River surrounding the rookery. The river quality, timing and flow should be kept intact, as it is important for the viability of great blue heron and mountain whitefish. Hydrologic considerations should extend beyond the PCA boundaries to the entire watershed.

Great blue herons (*Ardea herodias*) are known to abandon nests and colonies with increased visits by humans and with road building and logging activity. The responses of birds to disturbance greatly depends on the time of breeding season. A buffer of 300 meters minimum where no human activity should take place during courtship and nesting seasons is recommended (Butler 1992).

Photo 32: Great blue heron (*Ardea herodias*) rookery found in the Roaring Fork River at Cattle Creek PCA.





Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

Natural Heritage Program
COLORADO

Roaring Fork River at Cattle Creek Potential Conservation Area

Kaiser Stevens Ditch

Biodiversity Rank: B5 General or state-wide biodiversity interest
A globally-vulnerable orchid subspecies, and a raptor species occur within this PCA. Bald eagles nested here historically.

Protection Urgency Rank: P3
Recreational development is a definable threat.

Management Urgency Rank: M3
Management, especially weed control, is needed to maintain the quality of the occurrence.

Location: Garfield County. West of Carbondale approximately 2 miles along the Roaring Fork River. Take County Road 109 approximately 2 miles northwest from Carbondale.
Legal Description: U.S.G.S. 7.5 minute Cattle Creek Quadrangle. T7S R88W S19, 20, 29.

General Description: This PCA supports a small patch of riparian vegetation at an elevation of about 6100 feet. In the past, the riparian vegetation seen here stretched for miles along the Roaring Fork River. It is fragmented now by a county road on the west, and a housing/golf course development to the north. It is dominated by coyote willow (*Salix exigua)* stands interspersed with aquatic sedge (*Carex aquatilis)* and rush (*Juncus* spp.*)* meadows. This riparian area supports an occurrence of a globally-vulnerable orchid subspecies. 100 acres are included in the PCA.

Biodiversity Rank Justification: This PCA includes a globally-vulnerable orchid subspecies within a low quality riparian area. A bald eagle nest was located on this stretch of the Roaring Fork River historically.

Natural Heritage element occurrences at the Kaiser-Stevens Ditch PCA.

Element	Common Name	Rank	State Rank	Federal	State	Federal Sens.	EO* Rank
Haliaeetus leucocephalus	bald eagle	G4	S1B, SZN	LT	T		H
Platanthera sparsiflora* var. *ensifolia	**canyon bog-orchid**	**G4G5 T3**	**S2**				**B**

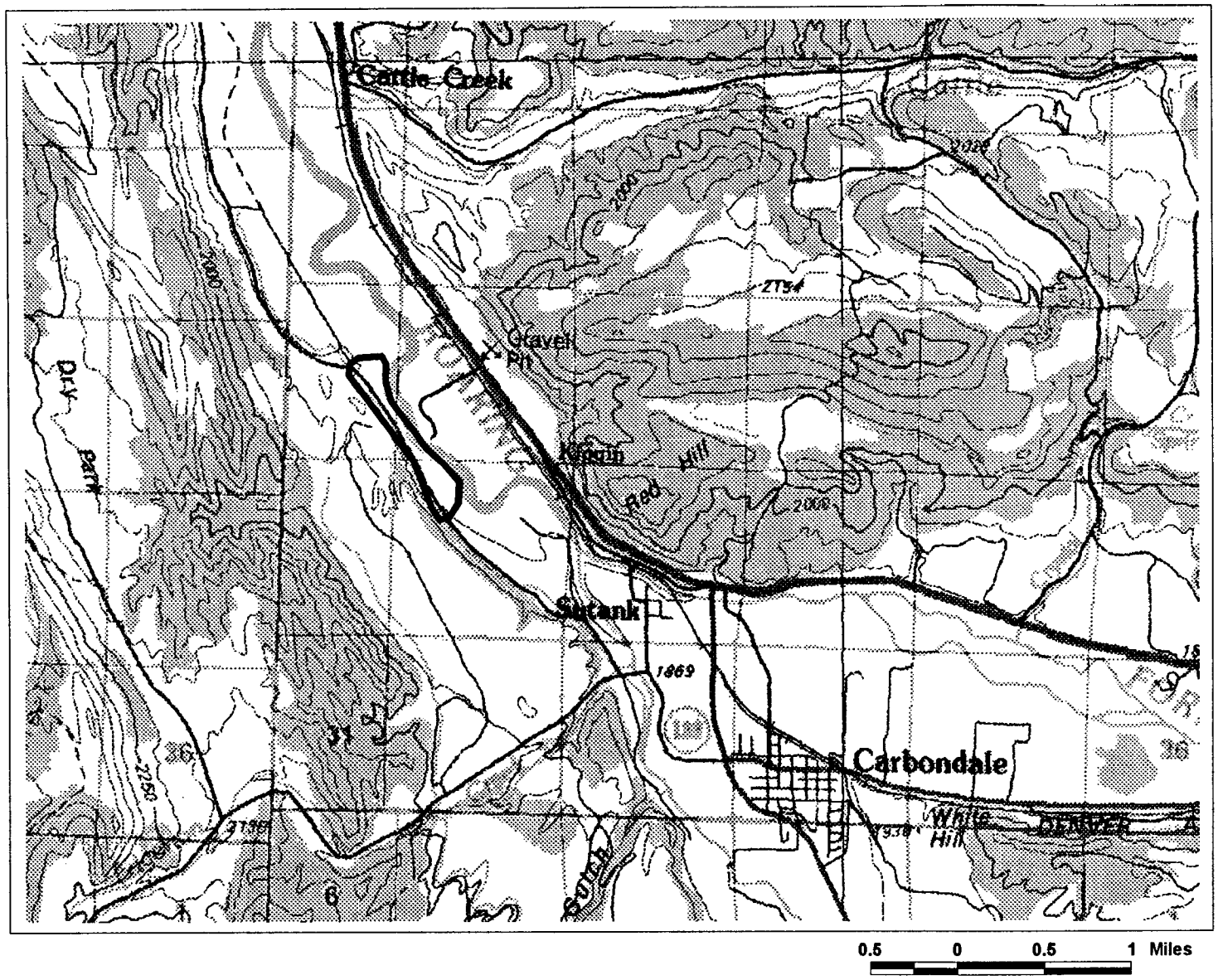
*EO=Element Occurrence

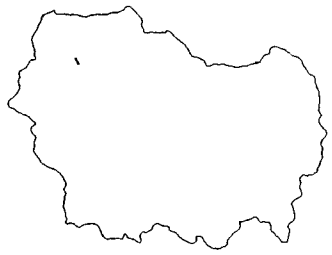
Boundary Justification: This PCA is a fragment of a larger riparian community along the Roaring Fork. It is bound by a county road and a housing/golf course development. The PCA follows these boundaries and only includes this small riparian patch and the rare plant occurrence. A larger area should be considered necessary to protect the hydrological setting at this PCA.

Protection Rank Justification: This PCA is privately owned. A golf course/housing subdivision is immediately adjacent to the PCA. This small area has been set aside as open space by the golf course designers. The small area is probably not currently threatened, but it may be planned for development in the future.

Management Rank Justification: A management agreement with the private landowner to provide protection for the rare plant species is recommended. This small area is not currently being used for human activities and management strategies should aim to continue this status. Due to the disturbances and complete habitat destruction surrounding this PCA, exotic plants such as hay grasses, thistles (*Cirsium* spp.), and sweetclover (*Melilotus officinale*) are common in this area and are moving into this PCA. At present, these species have not been found to occur with the canyon bog orchid (*Platanthera sparsiflora* var. *ensifolia*) and should be controlled to maintain this status. Road maintenance on County Road 109 may affect the PCA and should be considered in a management plan for this PCA. The orchids should be monitored every other year to detect changes in population size or condition.

Photo 33: Canyon bog-orchid (*Platanthera sparsiflora* var. *ensifolia).*





Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

Natural Heritage Program
COLORADO

Kaiser Stevens Ditch Potential Conservation Area

Seven Castles

Biodiversity Rank: B5 General or state-wide biodiversity interest
This rank is based on an occurrence of the federally endangered American peregrine falcon (*Falco peregrinus anatum*).

Protection Urgency Rank: P3
PCA is located on private and U.S. Forest Service lands.

Management Urgency Rank: M4
Management may be needed in the future to maintain the quality of the PCA.

Location: Eagle County. North of the Fryingpan River and east of Christine State Wildlife Area.
Legal Description: Toner Reservoir U.S.G.S. 7.5 minute quadrangle. T7S R86W S35, 36. T8S R86W S1, 2.

General Description: This PCA includes about 425 acres over an elevation range of 7,000 to 8,200 feet. Dramatic cliffs of red sandstone provide nesting habitat for peregrine falcons.

Biodiversity Rank Justification:
Natural Heritage element occurrences at the Seven Castles PCA.

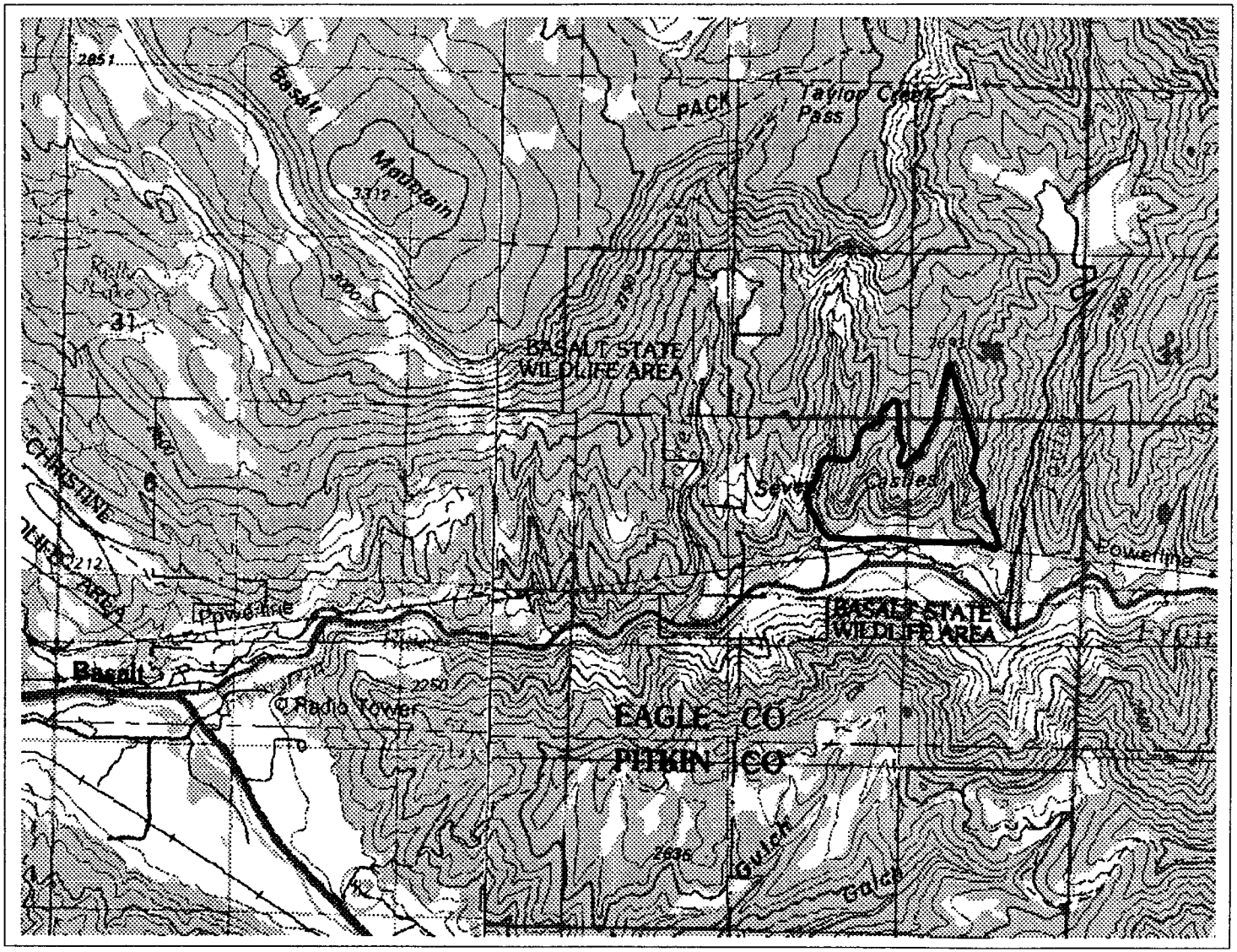
Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Sens.	EO* Rank
Falco peregrinus anatum	**American peregrine falcon**	**G4T3**	**S2B, SZN**	**LE**			**E**

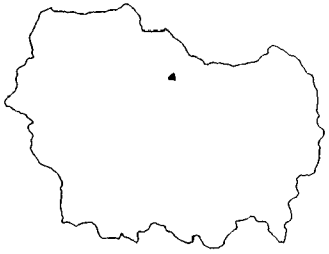
*EO=Element Occurrence

Boundary Justification: The PCA boundary includes the nesting area of an occurrence of the American Peregrine Falcon (*Falco peregrinus anatum*) and a buffer to limit direct physical disturbance to the eyrie.

Protection Rank Justification: The PCA includes private lands and public lands managed by the White River National Forest.

Management Rank Justification:
Recreational use may be a concern, although access is limited.





Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

0.5 0 0.5 1 Miles

Natural Heritage Program
COLORADO

Seven Castles Potential Conservation Area

Richmond Hill

Biodiversity Rank: B5 General or state-wide biodiversity interest
Boreal Owl, a state-rare bird, was documented in this PCA.

Protection Urgency Rank: P4
This PCA is publicly and privately owned. Residential and recreational development may threaten this PCA in the future.

Management Urgency Rank: M2
Recreation within this PCA should be managed for low impacts to the occurrences.

Location: Pitkin County. South of Aspen including Richmond Hill ridge between Castle Creek and Difficult Creek.
Legal Description: U.S.G.S. 7.5 minute Aspen and Hayden Peak quadrangles. T10S R84W S 18-20, 29-33. T11S R84W S 4-9, 15-18, 20-22, 27-29.

General Description: This PCA lies below the summit of McArthur Peak, above steep cliffs falling to Castle Creek on the west, and Difficult Creek on the east. This PCA occurs between 8000-12,139 feet. It is dominated by spruce-fir (*Picea engelmannii-Abies lasiocarpa*) which is replaced with meadows and willow carrs above treeline. Approximately 10,900 acres are included in the PCA boundaries.

Biodiversity Rank Justification: This PCA includes a probable breeding location of a Boreal Owl (*Aegolius funereus*), a state-rare bird species. Boreal Owl nests are extremely difficult to find because they are located in tree cavities in dense forests. Furthermore, this resident species (living year-round in this area) is fairly local so it is very likely to be a breeding occurrence. There is also an occurrence of a Northern Goshawk (*Accipiter gentilis*) nest within this PCA.

There is a historical record of the state-rare White-winged Crossbill (*Loxia leucoptera*) from the general area of this PCA. There are two 1953 accounts that mention the sighting of this species on "Richmond Hill, near Aspen." Continued surveys are needed to determine the status of this bird at this location.

Natural Heritage element occurrences at the Richmond Hill PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO*
Aegolius funereus	**boreal owl**	**G5**	**S2**				**E**
Accipiter gentilis	Northern Goshawk	G5	S3B, SZN				E

*EO=Element Occurrence

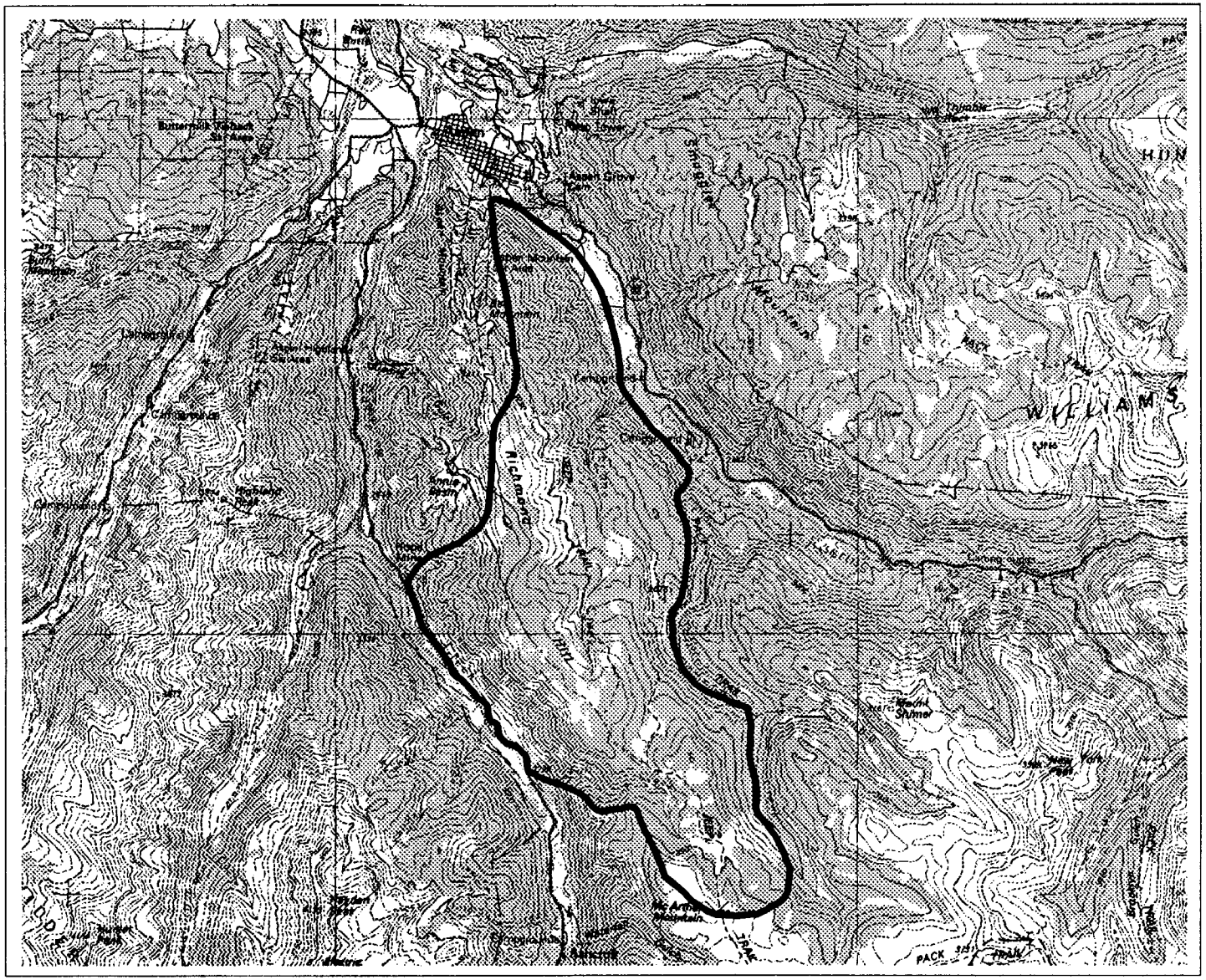
Boundary Justification: The boundary includes subalpine meadow/willow carr areas as potential hunting ground and spruce/fir communities as nesting habitat for the Boreal Owl.

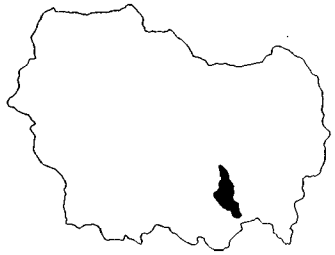
Protection Rank Justification: This PCA is mostly publicly owned and managed by the White River National Forest and partially contained within the Collegiate Peak Wilderness Area. Future developments by the U.S. Forest Service, such as campgrounds or ski areas, should be discouraged. Additionally, there are small private inholdings. Activities on this land may affect the viability of the element occurrence and should be considered.

Management Rank Justification: The Boreal Owl (*Aegolius funereus*) is a secondary cavity nester that frequently uses cavities originally created by woodpeckers. On National Forest lands, fire suppression is commonly practiced. This practice discourages development of habitat mosaics. These mosaics encourage potential Boreal Owl prey species (including white-footed mice, voles, and shrews) and provide woodpecker habitat. Boreal Owls will use nest boxes but suitable habitat is preferable.

Roads and trails are prevalent in the area and allow easy access for recreationists. The area is popular in the summer and winter. Restrictions to motor vehicles should be considered. Trails and roads should be discouraged within this PCA. A recreation and travel management strategy for the Richmond Ridge and Little Annie area is being developed by the U.S. Forest Service and Pitkin County. Additionally, activities occurring on the private lands may affect the viability of the element occurrences and should be considered.

Photo 34: Boreal owls (*Aegolius funereus*) were found in the Richmond Hill PCA.





Location in the Roaring Fork Watershed

PCA boundary

Natural Heritage Program COLORADO

Richmond Hill Potential Conservation Area

Sutank

Biodiversity Rank: B5 General or state-wide biodiversity significance
One state-rare orchid, one globally-vulnerable orchid subspecies, the mountain whitefish, and a globally-vulnerable plant community occur within this PCA.

Protection Urgency Rank: P4
There are no known threats for the foreseeable future.

Management Urgency Rank: M2
Management of exotic plant species is essential to prevent loss of the element occurrences.

Location: Garfield County. One mile north-west of Carbondale at the junction of the Crystal and the Roaring Fork Rivers.
Legal Description: U.S.G.S 7.5 minute Carbondale Quadrangle. T7S R88W S 28, 29, 33.

General Description: This PCA consists of a narrow riparian area located on the west bank of the floodplain of the Crystal River, just upstream from the junction with the Roaring Fork River. The riparian vegetation is limited to a small area because of houses on the west, and the natural narrowing of the floodplain to the south. This area is dominated by narrowleaf cottonwood (*Populus angustifolia*), dense stands of coyote willow (*Salix exigua*), Rocky Mountain willow (*S. monticola*), alder (*Alnus incana*), and honeysuckle (*Lonicera involucrata*) with an understory of field horsetail *(Equisetum arvense*), false solomon's seal (*Maianthemum stellatum*), and rush species (*Juncus* spp). Two rare orchid species are found within this diverse riparian zone. The PCA includes approximately 150 acres and ranges in elevation from 6120 to 6160 feet.

Biodiversity Rank Explanation: This population of yellow lady's-slipper orchid (*Cypripedium pubescens*) has been known for at least 25 years. There are local rumors that the owners of the property planted this orchid. However, the owners report that the orchids moved in naturally. This creates an interesting question about the significance of this PCA, since the only other occurrence of this species in the Roaring Fork Watershed watershed is approximately 2 miles upstream on the Roaring Fork River. The presence of a globally-vulnerable orchid subspecies increases the significance of this PCA. A poor example of a globally-vulnerable riparian community is also documented here. This occurrence is very small and degraded.

The mountain whitefish (*Prosopium williamsoni*) is also known to occur in Roaring Fork River from Glenwood Springs to near Woody Creek and unverified occurrences have been reported between Woody Creek and Aspen. There are few rivers in Colorado known to contain this fish species. It is mostly restricted to the northwestern portion of the state.

Natural Heritage element occurrences at the Sutank PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sens.	EO* Rank
Populus angustifolia-Picea pungens/Alnus incana	montane riparian forest		S3				D
Platanthera sparsiflora* var. *ensifolia		**G4G5 T3**	**S2**				**B**
Cypripedium pubescens		G5	S2				B
Prosopium williamsoni	mountain whitefish	G5	S3				E

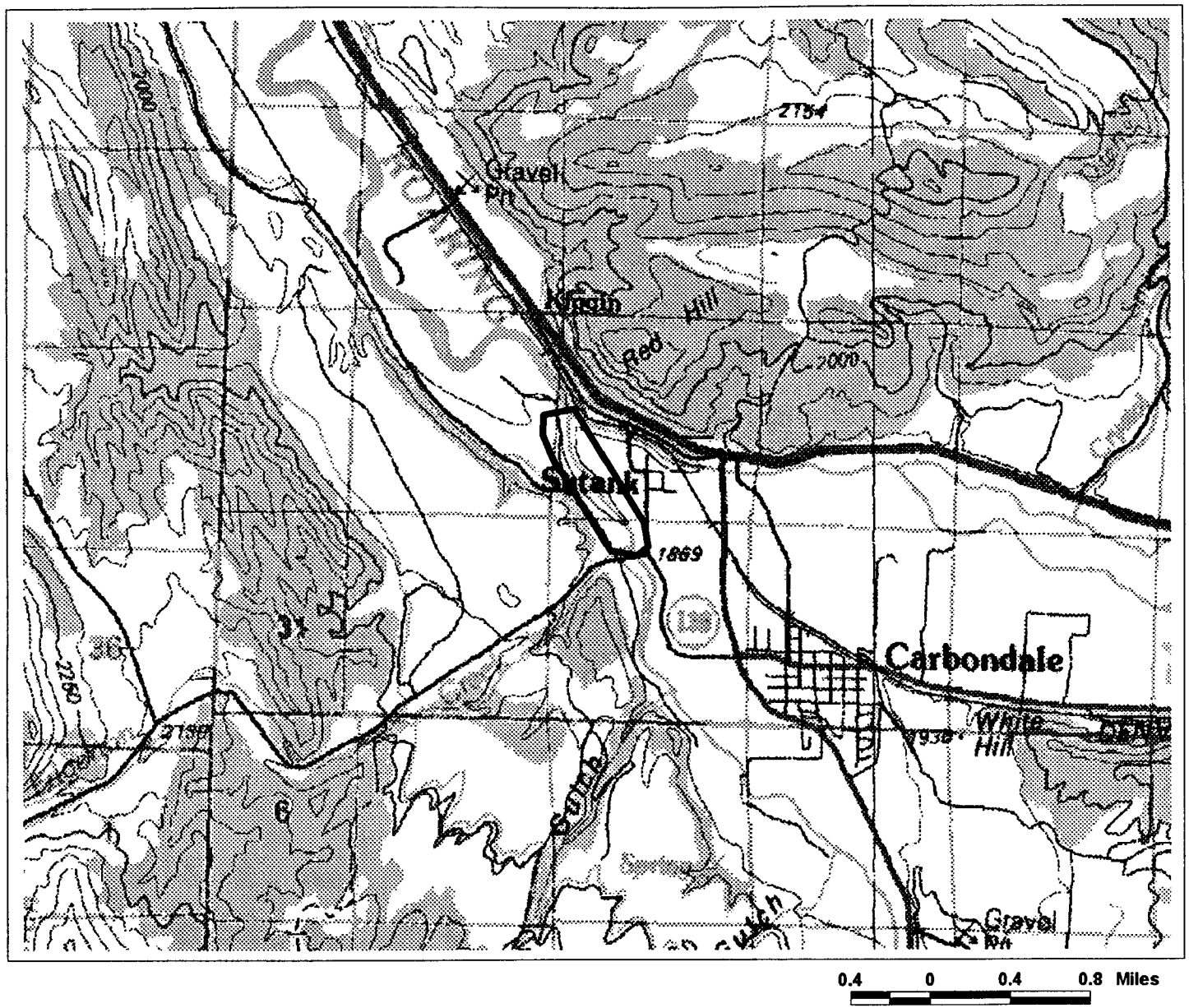
*EO=Element Occurrence

Boundary Justification: This boundary was drawn to protect the rare plant and plant community occurrences and to provide additional potential habitat for the species to colonize. Hydrological processes originating outside of the planning boundary including water quality, quantity, and flooding, should be managed to maintain the population and community viability.

Protection Rank Explanation: This property is privately owned and is not in danger of development. The current landowners are interested in conservation and excited about the elements found on their property.

Management Rank Explanation: This PCA is the backyard of a private home owner. A ditch runs parallel to the Crystal River modifying the River's hydrology. Current hydrology may be important to the rare orchid occurrences and changes should be considered before construction. Exotic plant species in the PCA include houndstongue (*Cynoglossum officinale*), orchard grass (*Dactylis glomerata*), Kentucky blue grass (*Poa pratensis*), tansy (*Tanacetum vulgare*), and Russian olive (*Elaeagnus angustifolia*). These should be controlled and removed if possible. Foot paths should be re-routed or closed to prevent further trampling of vegetation. The owners are aware of the orchid and will be interested in working with land managers.

Photos 35: Montane riparian forest *(Populus angustifolia-Picea pungens/Alnus incana)* at the Sutank PCA.



Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

Natural Heritage Program
COLORADO

Sutank Potential Conservation Area

Avalanche Lake

Biodiversity Rank: B5 - General or state-wide biodiversity significance
This rank is based on a good occurrence of a globally-vulnerable fish.

Protection Urgency Rank: P4
U.S. Forest Service Maroon Bells-Snowmass Wilderness Area, White River National Forest.

Management Urgency Rank: M3
Management actions, including development of a secure, permanent barrier downstream and control of non-native fish species, are needed to maintain the native trout population.

Location: Pitkin County. Headwaters of Avalanche Creek.
Legal Description: U.S.G.S. 7.5 minute Capitol Peak quadrangle. T10S R87W S34. T11S R87W S2, 3.

General Description: This PCA includes Avalanche Lake at about 10,700 feet and the headwaters of Avalanche Creek above the lake to about 12,200 feet. Approximately 300 acres are included in the PCA boundaries.

Biodiversity Rank Justification: The Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) has been documented in this PCA. This subspecies is considered Sensitive by the U.S. Forest Service and is on the State Special Concern list. The greatest threat to the continued viability of Colorado River cutthroat trout is the introduction and migration of non-native fish species. Competition with brook trout and hybridization with rainbow trout are threats to this subspecies (Behnke 1992).

Natural Heritage element occurrences at the Avalanche Lake PCA.

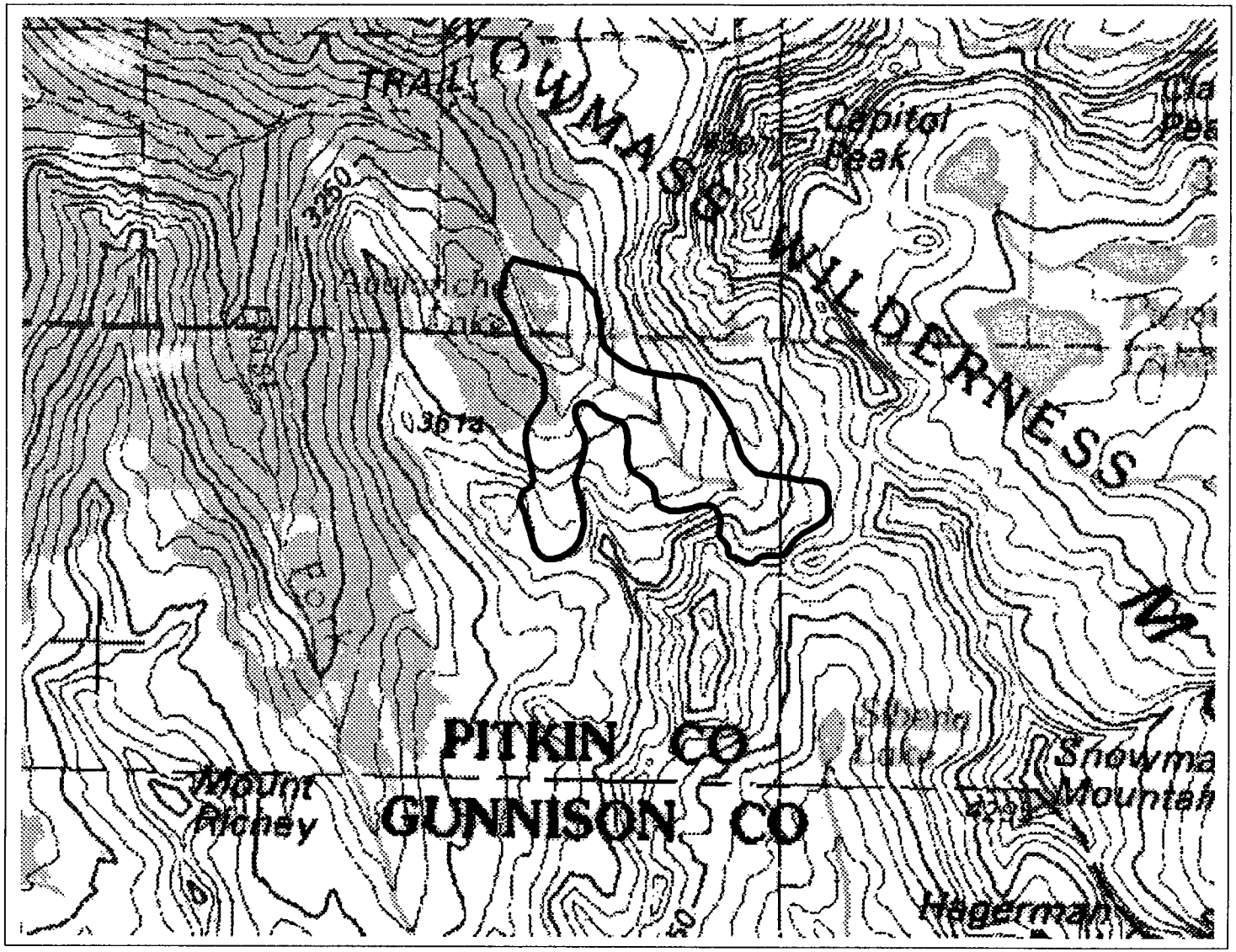
Element	Common Name	Global Rank	State Rank	Federal Status	State	Federal Sens.	EO* Rank
Oncorhynchus clarki pleuriticus	**Colorado River cutthroat trout**	**G4T3**			**SC**		**B**

*EO=Element Occurrence

Boundary Justification: The planning boundary includes the headwaters and major tributaries of Avalanche Creek above Avalanche Lake as well as an upland buffer which should be sufficient to limit direct physical disturbance and local hydrological alteration. Hydrological processes originating outside of the planning boundary, including water quality, quantity, and timing, should be managed to maintain population viability.

Protection Rank Explanation: This PCA is publicly owned and managed by the U.S. Forest Service, White River National Forest. It is fully contained within the Maroon Bells-Snowmass wilderness area.

Management Rank Explanation: A permanent downstream barrier is needed to prohibit non-native fish species from invading PCA. There is a series of bedrock waterfalls downstream from the PCA that are acting as a barrier, although a more secure barrier is needed. Stocking non-native fish in Avalanche Lake should not continue. Hydrologic considerations should be extended beyond the PCA boundaries, especially wherever the watershed is not contained within the boundaries.



Location in the Roaring Fork Watershed

PCA boundary

0.3 0 0.3 0.6 Miles

Avalanche Lake Potential Conservation Area

Cattle Creek

Biodiversity Rank: B5 General or state-wide biodiversity interest
An occurrence of a globally-vulnerable subspecies of the Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) is documented within this PCA.

Protection Urgency Rank: P4
This PCA is publicly owned and managed by the White River National Forest.

Management Urgency Rank: M4
Non-native fish species should be excluded from the creek where the trout are found.

Location: Eagle County. Headwaters of Cattle Creek.
Legal Description: U.S.G.S. 7.5 minute Toner Reservoir Quadrangle. T7S R85W S6-7,18; T7S R86W S11-15,22-23,27.

General Description: This PCA follows Cattle Creek from an elevation of 8,400 feet up to its headwaters at 11,200 feet. Approximately 2,000 acres are included in the PCA boundaries.

Biodiversity Rank Justification: The Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) has been documented in this PCA. This subspecies is considered Sensitive by the U.S. Forest Service and is on the State Special Concern list. The greatest threat to the continued viability of Colorado River cutthroat trout is the introduction and migration of non-native fish species. Competition with brook trout and hybridization with rainbow trout are threats to this subspecies (Behnke 1992).

Natural Heritage element occurrences at the Cattle Creek PCA.

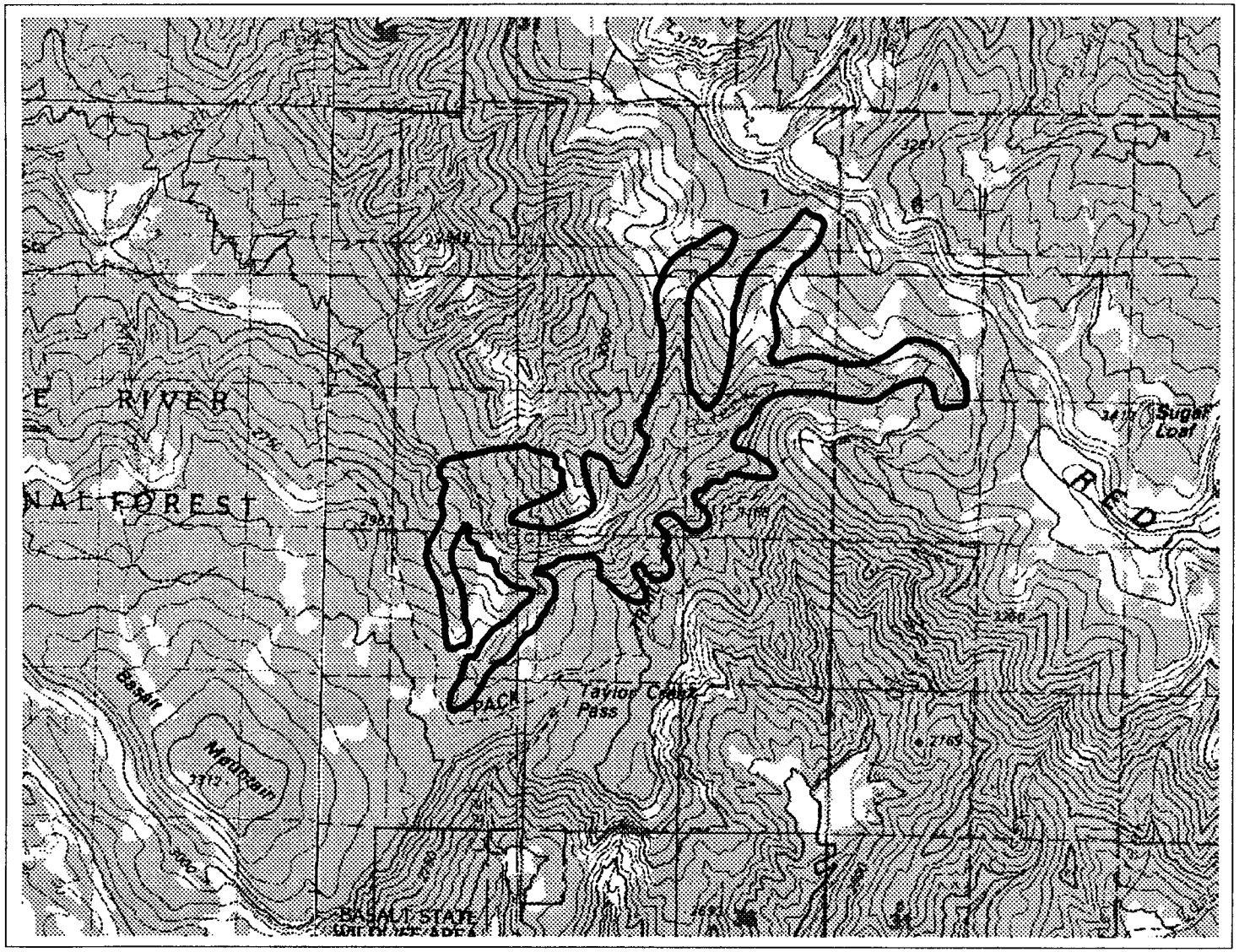
Element	Common Name	Global Rank	Rank	Federal	State Status	Federal Sens.	EO*
Oncorhynchus clarki pleuriticus	**Colorado River cutthroat trout**	**G4T3**	**S3**		**SC**	**FS**	**E**

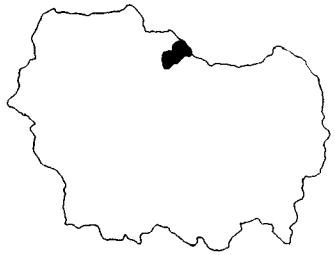
*EO=Element Occurrence

Boundary Justification: The PCA boundary is drawn to include the entire reach of Cattle Creek that contains Colorado River cutthroat trout as well as an upland buffer which should be sufficient to limit direct physical disturbance and local hydrological alteration. Hydrological processes originating outside of the planning boundary, including water quality, flow, and timing, should be managed to maintain population viability.

Protection Rank Justification: This PCA is publicly owned and managed by the White River National Forest.

Management Rank Justification: A secure barrier should be installed to prevent non-native fish species from moving upstream.





Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

0.6 0 0.6 1.2 Miles

Natural Heritage Program
COLORADO

Cattle Creek Potential Conservation Area

Eagle Mountain

Biodiversity Rank: B5 General or state-wide biodiversity significance
A small rookery of great blue herons, a state-rare bird, is included in this PCA.

Protection Urgency Rank: P4
There are no threats known for the foreseeable future.

Management Urgency Rank: M4
Management is not needed now but may be needed in the future.

Location: Pitkin County. At the east side of the base of Eagle Mountain. Eight miles south of Old Snowmass on Snowmass Creek Road.
Legal Description: U.S.G.S. 7.5 minute Highland Peak quadrangle. T10S R86W S2, 3, 34, 35.

General Description: Eagle Mountain, at 9937 feet, looms over Snowmass Creek which lies at approximately 8200 feet. This PCA supports a narrowleaf cottonwood (*Populus angustifolia*) dominated riparian zone and is adjacent to spruce-fir (*Picea engelmannii-Abies lasiocarpa)* forests to the east and west. Approximately 300 acres are included in this PCA.

Biodiversity Rank Justification: This PCA supports a great blue heron (*Ardea herodias*) rookery which has been documented for at least four years. The rookery has supported between two and four successful nests each year. This rookery contains a small number of nests for this species. There are approximately 100 great blue heron (*Ardea herodias*) rookeries in Colorado. This colonial bird species appears to be increasingly common in the state but is quickly being threatened by habitat alteration (Pague et al. 1997).

Natural Heritage element occurrences at the Eagle Mountain PCA.

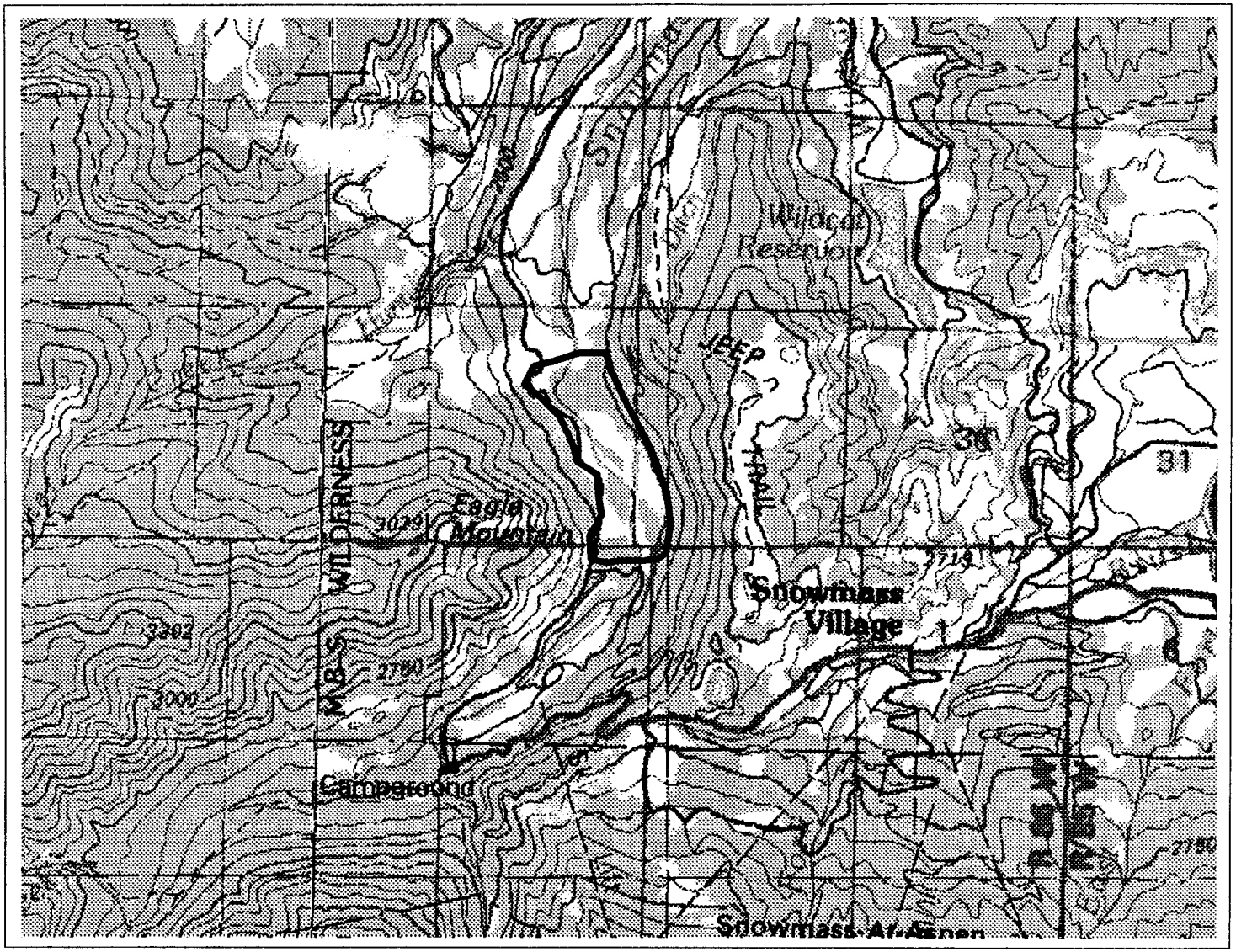
Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal	EO* Rank
Ardea herodias	**great blue heron**	**G5**	**SZN**				**D**

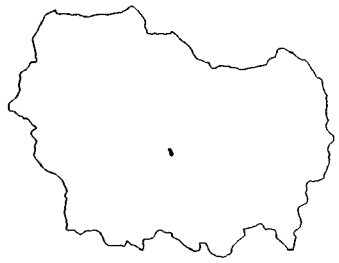
*EO=Element Occurrence

Boundary Justification: The boundary drawn for this PCA includes all known nests of this great blue heron rookery. Wildcat Reservoir, to the east, but not included within the boundary of this PCA, may be used by the herons for feeding and should be considered important to this PCA.

Protection Rank Justification: This PCA is privately owned. The owner is interested in protecting this rookery.

Management Rank Justification: Snowmass Creek road is currently being paved. This activity as well as other disturbances along this creek may have detrimental effects on this rookery. Great blue herons (*Ardea herodias*) are known to abandon nests and colonies with increased visits by humans and with road building and logging activity. The responses of birds to disturbance greatly depends on the time of breeding season. A buffer of 300 meters minimum where no human activity should take place during courtship and nesting seasons is recommended (Butler 1992).





Location in the Roaring Fork Watershed

PCA boundary

N
W E
S

Natural Heritage Program
COLORADO

Eagle Mountain Potential Conservation Area

References

Armstrong, D.M. 1972. Distribution of mammals in Colorado. Monograph of the Museum of Natural History. University of Kansas Printing Service, Lawrence.

Bailey, R.G., P.E. Avers, T. King, and W.H. McNab. 1994. Ecoregions and subregions of the United States (map). Scale 1:7,5000,000; colored. U.S. Geological Survey, Washington, DC.

Baker, W.L. 1984. A preliminary classification of the natural vegetation of Colorado. *Great Basin Naturalist* 44(4):647-676.

Baker, W.L. 1989. Classification of the riparian vegetation of the montane and subalpine zones in western Colorado. *Great Basin Naturalist* 49(2):214-228.

Behnke, R.J. 1992. Native trout of western North America. American Fisheries Society Monograph 6.

Behnke, R.J. and D.E. Benson. 1980. Endangered and threatened fishes of the upper Colorado River basin. Bulletin 503A. Cooperative Extension Service, Colorado State University, Fort Collins, CO.

Bourgeron, P.S. and L.D. Engelking, editors. 1994. A preliminary vegetation classification of the Western United States. Report prepared by the Western Heritage Task Force for The Nature Conservancy, Boulder, CO.

Butler, R.W. 1992. Great Blue Heron. The Birds of North America, No. 25 (A. Poole, P. Stettenheim, and F. Gill, Eds.) Philadelphia: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.

Chronic, H. 1980. Roadside Geology of Colorado. Mountain Press, Missoula, MT.

Colorado Natural Heritage Program (CNHP). 1997. Biological and Conservation Data (BCD) System. Data from field surveys. Colorado Natural Heritage Program, Fort Collins, CO

Colorado Natural Heritage Program (CNHP). 1997a. Rare and imperiled animals, plants, and plant communities. Volume 3(1). Fort Collins, CO.

Design Workshop, Inc. 1989. North Star Nature Preserve Resource Management Plan.

Driscoll, R.S., D.L. Merkel, D.L. Radloff, D.E. Snyder, and J.S. Hagihara. 1984. An Ecological Land Classification Framework for the United States. U.S.D.A. Forest Service Miscellaneous Publication Number 1439. U.S. Government Printing Office, Washington, DC.

Fitzgerald, J.P., C.A. Meaney, and D.M. Armstrong. 1994. Mammals of Colorado. Denver Museum of Natural History and University Press of Colorado, Denver, CO.

Flora of North America Editorial Committee. 1993. Flora of North America. Vol. 2: Pteridophytes and Gymnosperms. Oxford University Press, New York, NY.

Goettl, J.P. (editor). and the Boreal Toad Recovery Team. 1997. Boreal toad (*Bufo boreas boreas*) (southern Rocky Mountain population), Recovery Plan. Colorado Division of Wildlife, Denver, CO.

Hammerson, G.A. 1982. Amphibians and reptiles in Colorado. Colorado Division of Wildlife. Denver, CO.

Harrington, H.D. 1954. Manual of the Plants of Colorado. Sage Books, Denver, CO.

Hess, K. and C.H. Wasser. 1982. Grassland, shrubland, and forestland habitat types of the White River-Arapaho National Forest. Region. R2-Ecol-87-2. Report prepared for U.S.D.A. Forest Service, Rocky Mountain Forest and Experiment Station, Fort Collins, CO.

Hoffman, R.S., and R.D. Fisher. 1978. Additional distribution records of Preble's shrew (*Sorex preblei*). *Journal of Mammology* 59:883-884. 59:883-884.

Horstman, G.P. 1996. Boreal toad breeding sites (1995-1996) northwest Colorado. Report prepared for the Colorado Division of Wildlife, Denver, CO.

Horstman, G.P. 1997. Letter to Chuck Loeffler (Colorado Division of Wildlife) re: mid-season boreal toad synopsis in northwest Colorado.

Johnston, B. 1987. Plant Associations of Region Two. Edition 4. R2-ECOL-87-2. U.S.D.A. Forest Service, Rocky Mountain Forest and Experiment Station, Fort Collins, CO.

Kartesz, J.T. 1994. A Synonymized Checklist of the Vascular Flora of the United States, Canada, and Greenland. Second edition. Volume 1. Timber Press, Inc., Portland, OR.

Kittel, G. M., R. J. Rondeau, N. Lederer, and D. Randolph. 1994. A classification of the riparian vegetation of the White and Colorado River basins, Colorado. Report prepared for the Colorado Department of Natural Resources and the U.S. Environmental Protection Agency, Region VIII. Colorado Natural Heritage Program, Fort Collins, CO.

Knorr, O.A. 1961. The geographical and ecological distribution of the Black Swift in Colorado. *Wilson Bulletin* 73:155-170.

Knorr, O.A. 1993. Black Swift (*Cypseloides niger*) nesting site characteristics: some new insights. *Avocetta* 17:139-140.

Melvin, S.M., and J. P. Gibbs. 1996. Sora (*Porzana carolina*). The Birds of North America, No. 250 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

Osborn, R.G., G.M. Kittel, M.S. Reid. 1998. Riparian Plant Associations of Colorado and Vegetation Classification Western United States. First edition. CDROM. U.S. Geiological Survey, Midcontinental Ecology Research Center. Fort Collins, CO.

Pague, C.P., L. Grunau, A.M. Loar, M.W. Sherman, K.E. Pague, M.B. Wunder, D.J. Shinneman, T.P. Schuerman, and S.M. Zwicker. 1997. Conservation status of the rare and imperiled vertebrates of Colorado. Colorado Natural Heritage Program, Fort Collins, CO.

Proebstel, D.S. 1994. Taxonomic identification of Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) in Colorado--draft report. Colorado Division of Wildlife, Fort Collins, CO.

Reynolds, R.T. 1983. Management of western coniferous forest habitat for nesting Accipiter hawks. General Technical Report. U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Rosenfield, R.N. and J. Bielefeldt. 1993. Cooper's Hawk (Accipiter cooperii). The Birds of North America, No. 75 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists's Union.

Sanderson, J. and S. Kettler. 1996. A preliminary wetland vegetation classification for a portion of Colorado's west slope. Report prepared for the Colorado Department of Natural Resources and the Environmental Protection Agency, Region VIII. Colorado Natural Heritage Program, Fort Collins, CO.

Spackman , S., B. Jennings, J. Coles, C. Dawson, M. Minton, A. Kratz, and C. Spurrier. 1997. Colorado Rare Plant Field Guide. Prepared for the Bureau of Land Management, the U.S. Forest Service and the U.S. Fish and Wildlife Service by the Colorado Natural Heritage Program.

The Nature Conservancy. 1992. Upper Colorado River Basin Bioreserve Strategic Plan. Report. Colorado Field Office, The Nature Conservancy, Boulder, CO.

Tweto, O. 1979. Geological Map of Colorado. Scale 1:500,000, colored. U.S.G.S., Denver, CO.

UNESCO. 1973. International classification and mapping of vegetation. United Nations Educational, Scientific and Cultural Organization, Geneva, Switzerland.

Weber, W.A. 1961. Alpine floristic components of the southern Rocky Mountains. *Bulletin of the Ecological Society of America*. 42(4):164.

Weber, W.A. and R.C. Wittmann. 1996. Colorado Flora: Western Slope. Revised edition. University Press of Colorado, Niwot, CO.

Weber, W. A. and R. C. Wittmann. 1992. Catalog of the Colorado Flora: A Biodiversity Baseline. University Press of Colorado, Niwot, CO.

Welsh, S.L. 1974. Andeson's Flora of Alaska and Adjacent Canada. Brigham Young University, Provo, UT.

Welsh, S.L., N.D. Atwood, L.C. Higgins, and S. Goodrich, editors. 1987. A Utah Flora. Great Basin Naturalist Memoir No. 9. Brigham Young University, Provo, UT.

Western Regional Climate Center. 1997. http:\\www.wrcc.sage.dri.edu/summary/climsmco.html. Reno, NV.

White, D. J., E. Haber and C. Keddy. 1993. Invasive Plants of Natural Habitats in Canada. Canadian Wildlife Service, Ottawa, Ontario, Canada.

Whitson, T. D., L. C. Burrell, S. A. Dewey, D. W. Cudney, B. E. Nelson, R. D. Lee, R. Parker. 1992. Weeds of the West. The Western Society of Weed Science, Newark, CA.

Wilcove, D. S., C. H. McLellan, and A .P. Dobson. 1986. Habitat fragmentation in the temperate zone:273-256. *In:* M.E. Soule, ed. Conservation Biology. The Science of Scarcity and Diversity. Sinauer Associates, Sunderland, MA.

Wilson, E.O., editor. 1988. Biodiversity. National Academy Press, Washington, DC.

Woodling, J. 1985. Colorado's Little Fish, A Guide to the Minnows and Other Lesser Known Fishes in the State of Colorado. Colorado Division of Wildlife. Denver, CO.

Young, M.K., R.N. Schmal, T.W. Kohley, and V.G. Leonard. 1996. Conservation status of Colorado River cutthroat trout. General Technical Report RM-GTR-282. U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.