

# Upper San Juan Basin Biological Assessment



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**Colorado  
State**  
University  
*Knowledge to Go Places*

Prepared for  
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## **Executive Summary**

Citizens of the Upper San Juan Basin are concerned about rapid growth, resulting in loss of open space, wildlife habitat, and unique natural surroundings. The population of Archuleta County, the heart of the Upper San Juan Basin, is expanding rapidly, yet the county finds itself ill prepared for this growth with zoning regulations that are lacking or inadequate. This has created the potential for sporadic residential development that threatens natural resources, wildlife habitat, open space and the agricultural qualities of the region. Large developments within the project area have consumed wildlife habitat, fragmented the landscape and encroach upon productive ranchland. Archuleta's citizens recognize the need to preserve the areas natural resources, the plants and animals and the ranching and agricultural traditions of the area through conservation. They also recognize that with limited resources it is important to prioritize their efforts. The need for information on the locations of the most significant biological resources of the area is urgent. With this information conservation planning efforts and conservation easements can be most effectively utilized to both preserve the county's natural resources and its agricultural traditions.

In 2000, the Southwest Land Alliance (SLA) and the Colorado Natural Heritage Program (CNHP) proposed to the Archuleta County Board of Commissioners, that a biological assessment be conducted for Archuleta County. The goal of the project would be to systematically identify the localities of rare, threatened, or endangered species and the locations of significant natural plant communities, and to identify and prioritize Potential Conservation Areas of critical habitat for these species and communities. In addition, CNHP offered to present the results of the study to the county commissioners, county planning departments and interested local groups, and assist in protection efforts.

Funding for the biological assessment was provided by a Great Outdoors Colorado planning grant to the Southwest Land Alliance. The SLA then contracted with Colorado Natural Heritage Program to perform the biological assessment.

The Colorado Natural Heritage Program began its research by updating its Biological and Conservation Data System with existing information. Data were obtained from various individuals and organizations, including the Colorado Division of Wildlife (CDOW), regional and local herbaria, local experts, federal agencies, and others. Based on this updated data set, we identified about 90 targeted inventory areas (TIAs) for field research. Additional areas of interest were added to this list during the field surveys.

Field surveys began in April 2001 and continued through September 2002. Results of the survey confirm that the Upper San Juan Basin contains areas with high biological significance. There are several extremely rare plants and animals that depend on this area for the survival of their species, including one plant, the Pagosa gilia, known only from three locations in the world, all in the Archuleta County. Altogether, 31 rare or imperiled plant species, 14 animal species, and 42 plant communities of concern have been documented for the Basin. Of these, 10 plant species and two animal species were recorded for the first time in the CNHP database for the Basin. This is truly a unique area

with an amazing richness of rare fauna and flora well worth preserving for future generations.

We have identified 62 Potential Conservation Areas (PCAs), containing from one to 11 occurrences of rare or imperiled plants, animals, and natural communities. Each PCA is ranked according to its biodiversity significance. Results of the survey are presented here, with descriptions and discussion of each Potential Conservation Area. The results will also be provided to the SLA and Archuleta County in GIS format, and will be available to the public on the CNHP website: (<http://www.cnhp.colostate.edu>).

The delineation of Potential Conservation Area boundaries in this report does not confer any regulatory protection of recommended areas. They are intended to support informed planning and decision making for the conservation of these significant areas. Additional information may be requested from Colorado Natural Heritage Program, Colorado State University, 8002 Campus Delivery, Fort Collins, CO 80523-8002 ([www.cnhp.colostate.edu](http://www.cnhp.colostate.edu) or (970) 491-1309).

**Table 1. Potential Conservation Areas of the Upper San Juan Basin.**

Potential Conservation Area	Biodiversity Rank	Page Number
<b>Outstanding Biosignificance</b>		
Mill Creek at Pagosa Springs	B1	36
<b>Very High Biosignificance</b>		
Archuleta Creek	B2	40
Chromo	B2	43
Devil Creek at Middle Mountain	B2	46
East Fork at San Juan River	B2	50
Pine Piedra Stock Trail	B2	53
Rio Blanco	B2	56
Stollsteimer Creek North	B2	60
Taylor Canyon at San Juan River	B2	64
The Ant Hill	B2	68
Turkey Mountain	B2	72
<b>High Biodiversity Significance</b>		
Buckles Lake	B3	75
Death Valley Creek	B3	79
Hunter Campground	B3	82
Indian Creek at Piedra River	B3	85
Newt Jack Spring Reservoir	B3	89
Piedra	B3	93
Sand Creek	B3	96
Turkey Creek at Stollsteimer	B3	101
Upper Ignacio Creek	B3	104
Weminuche Creek	B3	108
West Fork at Devil Creek	B3	112
White Creek at Opal Lake	B3	116

**Table 1. Potential Conservation Areas of the Upper San Juan Basin (cont.).**

Moderate Biodiversity Significance		
Beaver Creek at TNY Spring	B4	120
Blackhead Peak	B4	124
Blue Creek	B4	127
Burns Canyon	B4	131
Chimney Rock AA Site	B4	134
Cimarrona Creek	B4	137
Coldwater Creek at Skunk Creek	B4	140
Davis Creek	B4	143
East Fork Park	B4	146
East Fork Quartz Creek	B4	150
Hatcher Reservoir	B4	153
Headwaters of Summit Creek	B4	156
Hondo Creek	B4	159
Indian Creek at Williams Creek Reservoir	B4	163
Montezuma Creek	B4	166
Nabor Creek	B4	169
Navajo Peak Trail	B4	172
Navajo River	B4	175
Opal Lake	B4	179
Rio Blanco at Deadman Canyon	B4	182
Turkey Creek Road	B4	186
Upper Mosca Creek	B4	189
General Biodiversity Significance		
Adams Fork of the Conejos River	B5	192
Boone Creek Ponds	B5	195
Coyote Park	B5	198
Dunagan Canyon	B5	201
Elephant Head Rock	B5	204
Jackson Mountain	B5	207
Kenney Flats	B5	210
Mule Mountain	B5	213
Navajo Peak	B5	216
Piedra Forks Site	B5	219
Piedra River Trail	B5	222
Quartz Creek Trail	B5	225
Squaw Canyon	B5	228
Stollsteimer Site	B5	232
Stollsteimer Creek at Capote Lake	B5	235
Valle Seco	B5	239
Williams Creek Trail	B5	242

## **Acknowledgements**

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

We thank the Southwest Land Alliance for sponsoring the project, and Great Outdoors Colorado for providing the funding. The National Forest 2001 Rural Community Assistance (RCA) Grants, USFS San Juan National Forest, the Conservation Fund and the San Juan Water Conservancy contributed funding to this project.

John Broderick of CDOW shared his extensive knowledge of the county. Jeff Redders of the San Juan National Forest and Gary Thrash of the BLM were instrumental in securing supplemental funding for the project. The Archuleta County Assessor's Office gave us invaluable assistance in locating landowners.

Members of the Colorado Native Plant Society and other friends and volunteers helped in the field and in the office. Dickson Pratt and Joan Schmid accompanied us on our explorations, while Chris Lantz helped with preliminary planning. Volunteers in Archuleta County were extremely helpful. Thanks to Barry Thomas, Suzanne Coe, Charlie King, Dick Mosely, Sheila Salazar, Ryan Peskuski, and Joanne Guckert.

We are grateful to the landowners who gave us permission to survey their property. We enjoyed meeting them, and in some cases hiking with them on their property.

Our staff in Fort Collins, including Susan Spackman, Jill Handwerk, Denise Culver, Jodie Bell, Renee Rondeau, Alison Loar, Lee Grunau, Amy Lavender and Jeremy Siemers all worked with us patiently. Amy Lavender and John Sovell prepared the maps.

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## **Chapter 1. The Natural Heritage Network and Biodiversity**

Just as ancient artifacts and historic buildings represent our cultural heritage, a diversity of plant and animal species and their habitats represent our “natural heritage.” Colorado’s natural heritage encompasses a wide variety of ecosystems from tallgrass prairie and shortgrass high plains to alpine cirques and rugged peaks, from canyon lands and sagebrush deserts to dense subalpine spruce-fir forests and wide-open tundra.

These widely diversified habitats are determined by water availability, temperature extremes, altitude, geologic history, and land use history. The species that inhabit each of these ecosystems have adapted to the specific set of conditions found there. Because human influence today touches every part of the Colorado environment, we are responsible for understanding our impacts and carefully planning our actions to ensure our natural heritage persists for future generations.

Some generalist species, like house finches, have flourished over the last century, having adapted to habitats altered by humans. However, many other species are specialized to survive in vulnerable Colorado habitats; among them are Bell’s twinpod (a wildflower), the Arkansas darter (a fish), and the Uncompahgre fritillary (a butterfly). These species have special requirements for survival that may be threatened by incompatible land management practices and competition from non-native species. Many of these species have become imperiled not only in Colorado, but also throughout their range of distribution. Some species exist in less than five populations in the entire world. The decline of these specialized species often indicates disruptions that could permanently alter entire ecosystems. Thus, recognition and protection of rare and imperiled species is crucial to preserving Colorado’s diverse natural heritage.

Colorado is inhabited by some 800 vertebrate species and subspecies, and tens of thousands of invertebrate species. In addition, the state has approximately 4,300 species of plants and more than 450 recognized plant communities that represent terrestrial and wetland ecosystems. It is this rich natural heritage that has provided the basis for Colorado’s diverse economy. Some components of this heritage have always been rare, while others have become imperiled with human-induced changes in the landscape. This decline in biological diversity 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 biological diversity has been recognized for decades in the scientific community. However, many conservation efforts made in this country were not based upon preserving biological diversity; 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 biological diversity Dr. Robert Jenkins of The Nature Conservancy pioneered the Natural Heritage Methodology in the early 1970s.

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 rarity or imperilment of a species, the quality of its populations, and the importance of associated conservation sites, the methodology can facilitate the prioritization of conservation efforts so the most rare and imperiled species may be preserved first. As the scientific community realized that plant communities are equally important as individual species, this methodology has 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. The 85 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. Information collected by the Natural Heritage Programs can provide a means to protect species before the need for legal endangerment status arises. It can also enable 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 single-celled organisms such as bacteria and protists through the multicellular kingdoms of plants and animals. 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 many are important for the well being of humans.

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

**Genetic Diversity** — the genetic variation within a population and among populations of a plant or animal species. The genetic makeup of a species varies 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. Once lost, this unique genetic information cannot be reclaimed.

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

**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.

**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 should 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 closely linked to all levels of this hierarchy. We at the Colorado Natural Heritage Program believe that a healthy natural environment and a healthy human environment go hand in hand, and that recognition of the most imperiled species is an important step in comprehensive conservation planning.

### **The Colorado Natural Heritage Program**

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

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

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

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

and plant communities are referred to as “elements of natural diversity” or simply “elements.”

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

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

- What species and ecological communities exist in the area of interest?
- Which are at greatest risk of extinction or are otherwise significant from a conservation perspective?
- What are their biological and ecological characteristics, and where are these priority species or communities found?
- What is the species’ condition at these locations, and what processes or activities are sustaining or threatening them?
- Where are the most important sites to protect?
- Who owns or manages those places deemed most important to protect, and what is threatening those places?
- What actions are needed for the protection of those sites and the significant elements of biological diversity they contain?
- How can we measure our progress toward conservation goals?

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

### **The Natural Heritage Ranking System**

Key to the functioning of Natural Heritage Programs is the concept of setting priorities for gathering information and conducting inventories. The number of possible facts and observations that can be gathered about the natural world is essentially limitless. The

financial and human resources available to gather such information are not. Because biological inventories tend to be under-funded, there is a premium on devising systems that are both effective in providing information that meets users' needs and efficient in gathering that information. The cornerstone of Natural Heritage inventories is the use of a ranking system to achieve these twin objectives of effectiveness and efficiency.

Ranking species and ecological communities according to their imperilment status provides guidance for where Natural Heritage Programs should focus their information-gathering activities. For species deemed secure, only general information needs to be maintained by Natural Heritage Programs. Fortunately, the more common and secure species constitute the majority of most groups of organisms. On the other hand, for those species that are by their nature rare, more detailed information is needed. Because of these species' rarity, gathering comprehensive and detailed population data can be less daunting than gathering similarly comprehensive information on more abundant species.

To determine the status of species within Colorado, CNHP gathers information on plants, animals, and plant communities. Each of these elements of natural diversity is assigned a rank that indicates its relative degree of imperilment on a five-point scale (for example, 1 = extremely rare/imperiled, 5 = abundant/secure). The primary criterion for ranking elements is the number of occurrences (in other words, the number of known distinct localities or populations). This factor is weighted more heavily than other factors 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, the trends in both population and distribution, identifiable threats, and the number of protected occurrences.

Element imperilment ranks are assigned both in terms of the element's degree of imperilment within Colorado (its State-rank or S-rank) and the element's imperilment over its entire range (its Global-rank or G-rank). Taken together, these two ranks indicate 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 five current locations in Colorado, is ranked G5 S1 (globally-secure, but critically imperiled in this state). The Rocky Mountain Columbine, which is known only in Colorado from about 30 locations, is ranked a G3 S3 (vulnerable both in the state and globally, since it only occurs in Colorado and then in small numbers). Further, a tiger beetle that is only known from one location in the world at the Great Sand Dunes National Monument is ranked G1 S1 (critically imperiled both in the state and globally, because it exists in a single location). CNHP actively collects, maps, and electronically processes specific occurrence information for animal and plant species considered extremely imperiled to vulnerable in the state (S1 - S3). Several factors, such as rarity, evolutionary distinctiveness, and endemism (specificity of habitat requirements), contribute to the conservation priority of each species. Certain species 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 2.

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 2, ranks followed by a "B," for example S1B, indicate that the rank applies only to the status of breeding occurrences. Similarly, ranks followed by an "N," for example 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.

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 with an "S" or a "G" respectively, followed by a number or letter. These ranks should not be interpreted as legal designations.

**Table 2. Definition of Natural Heritage Imperilment Ranks.**

<b>G/S1</b>	Critically imperiled globally/state because of rarity (5 or fewer occurrences in the world/state; or 1,000 or fewer individuals), or because some factor of its biology makes it especially vulnerable to extinction.
<b>G/S2</b>	Imperiled globally/state because of rarity (6 to 20 occurrences, or 1,000 to 3,000 individuals), or because other factors demonstrably make it very vulnerable to extinction throughout its range.
<b>G/S3</b>	Vulnerable through its range or found locally in a restricted range (21 to 100 occurrences, or 3,000 to 10,000 individuals).
<b>G/S4</b>	Apparently secure globally/state, though it may be quite rare in parts of its range, especially at the periphery. Usually more than 100 occurrences and 10,000 individuals.
<b>G/S5</b>	Demonstrably secure globally/state, though it may be quite rare in parts of its range, especially at the periphery.
<b>G/SX</b>	Presumed extinct globally, or extirpated within the state.
<b>G#?</b>	Indicates uncertainty about an assigned global rank.
<b>G/SU</b>	Unable to assign rank due to lack of available information.
<b>GQ</b>	Indicates uncertainty about taxonomic status.
<b>G/SH</b>	Historically known, but usually not verified for an extended period of time.
<b>G#T#</b>	Trinomial rank (T) is used for subspecies or varieties. These taxa are ranked on the same criteria as G1-G5.
<b>S#B</b>	Refers to the breeding season imperilment of elements that are not residents.
<b>S#N</b>	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.
<b>SZ</b>	Migrant whose occurrences are too irregular, transitory, and/or dispersed to be reliably identified, mapped, and protected.
<b>SA</b>	Accidental in the state.
<b>SR</b>	Reported to occur in the state but unverified.
<b>S?</b>	Unranked. Some evidence that species may be imperiled, but awaiting formal rarity ranking.

Note: Where two numbers appear in a state or global rank (for example, S2S3), the actual rank of the element is uncertain, but falls within the stated range.

## Legal Designations for Rare Species

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 3 defines the special status assigned by these agencies and provides a key to abbreviations used by CNHP.

Candidate species for listing as endangered or threatened under the Endangered Species Act are indicated with a “C”. While obsolete legal status codes (Category 2 and 3) are no longer used, CNHP continues to maintain them in its Biological and Conservation Data system for reference.

**Table 3. Federal and State Agency Special Designations for Rare Species.**

<b>Federal Status:</b>	
<b>1. U.S. Fish and Wildlife Service (58 Federal Register 51147, 1993) and (61 Federal Register 7598, 1996)</b>	
LE	Listed Endangered: defined as a species, subspecies, or variety in danger of extinction throughout all or a significant portion of its range.
E(S/A)	Endangered: treated as endangered due to similarity of appearance with listed species.
LT	Listed Threatened: defined as a species, subspecies, or variety likely to become endangered in the foreseeable future throughout all or a significant portion of its range.
P	Proposed: taxa formally proposed for listing as Endangered or Threatened (a proposal has been published in the Federal Register, but not a final rule).
C	Candidate: taxa for which substantial biological information exists on file to support proposals to list them as endangered or threatened, but no proposal has been published yet in the Federal Register.
<b>2. U.S. Forest Service (Forest Service Manual 2670.5) (noted by the Forest Service as “S”)</b>	
FS	Sensitive: those plant and animal species identified by the Regional Forester for which population viability is a concern as evidenced by: Significant current or predicted downward trends in population numbers or density. Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.
<b>3. Bureau of Land Management (BLM Manual 6840.06D) (noted by BLM as “S”)</b>	
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.
<b>4. State Status:</b>	
The Colorado Division of Wildlife has developed categories of imperilment for non-game species (refer to the Colorado Division of Wildlife's Chapter 10 – Nongame Wildlife of the Wildlife Commission's regulations). The categories being used and the associated CNHP codes are provided below.	
E	Endangered: those species or subspecies of native wildlife whose prospects for survival or recruitment within this state are in jeopardy, as determined by the Commission.
T	Threatened: those species or subspecies of native wildlife which, as determined by the Commission, are not in immediate jeopardy of extinction but are vulnerable because they exist in such small numbers, are so extremely restricted in their range, or are experiencing such low recruitment or survival that they may become extinct.
SC	Special Concern: those species or subspecies of native wildlife that have been removed from the state threatened or endangered list within the last five years; are proposed for federal listing (or are a federal listing “candidate species”) and are not already state listed; have experienced, based on the best available data, a downward trend in numbers or distribution lasting at least five years that may lead to an endangered or threatened status; or are otherwise determined to be vulnerable in Colorado.

### **Element Occurrences and their Ranking**

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

**Size** – a measure of the area or abundance of the element’s occurrence, relative to other known, and/or presumed viable, examples. Takes into account factors such as area of occupancy, population abundance, population density, population fluctuation, and minimum dynamic area (which is the area needed to ensure survival or re-establishment of an element after natural disturbance).

**Condition/Quality** – an integrated measure of the composition, structure, and biotic interactions that characterize the occurrence. This includes factors such as reproduction, age structure, biological composition (such as the presence of exotic versus native species), structure (for example, canopy, understory, and ground cover in a forest community), and biotic interactions (such as levels of competition, predation, and disease).

**Landscape Context** – an integrated measure of two factors: the dominant environmental regimes and processes that establish and maintain the element, and connectivity. Dominant environmental regimes and processes include herbivory, hydrologic and water chemistry regimes (surface and groundwater), geomorphic processes, climatic regimes (temperature and precipitation), fire regimes, and many kinds of natural disturbances. Connectivity includes such factors as a species having access to habitats and resources needed for life cycle completion, fragmentation of ecological communities and systems, and the ability of the species to respond to environmental change through dispersal, migration, or re-colonization.

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 not enough information is available to rank an element occurrence, an EO-Rank of E is assigned. EO-Ranks and their definitions are summarized in Table 4.

**Table 4. Element Occurrence Ranks and their Definitions.**

<b>A</b>	Excellent viability.
<b>B</b>	Good viability
<b>C</b>	Fair viability.
<b>D</b>	Poor viability.
<b>H</b>	Historic: known from historical record, but not verified for an extended period of time.
<b>X</b>	Extirpated (extinct within the state).
<b>E</b>	Extant: the occurrence does exist but not enough information is available to rank.
<b>F</b>	Failed to find: the occurrence could not be relocated.

### **Potential Conservation Areas and Their Ranking**

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

The goal of the PCA process is to identify a land area that can provide the habitat and ecological processes upon which a particular element occurrence, or suite of element occurrences, depends for its continued existence. The best available knowledge about each species' life history is used in conjunction with information about topographic, geomorphic, and hydrologic features; vegetative cover; and current and potential land uses. In developing the boundaries of a Potential Conservation Area, CNHP scientists consider a number of factors that include, but are not limited to:

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

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

## Off-Site Considerations

Frequently, all necessary ecological processes cannot be contained within a PCA of reasonable size. For example, taken to the extreme, the threat of ozone depletion could expand every PCA to include the entire planet. The boundaries described in this report indicate the immediate, and therefore most important, area to be considered for protection. Continued landscape level conservation efforts are necessary as well, which will involve regional efforts in addition to coordination and cooperation with private landowners, neighboring land planners, and state and federal agencies.

## Ranking of Potential Conservation Areas

CNHP uses element and element occurrence ranks to assess the overall biological diversity significance of a PCA, which may include one or many element occurrences. Based on these ranks, each PCA is assigned a biological diversity rank (or B-rank). See Table 5 for a summary of these B-ranks.

**Table 5. Natural Heritage Program Biological Diversity Ranks and their Definitions.**

<b>B1</b>	Outstanding Significance (irreplaceable): only known occurrence of an element A-ranked occurrence of a G1 element (or at least C-ranked if best available occurrence) concentration of A- or B-ranked occurrences of G1 or G2 elements (four or more)
<b>B2</b>	Very High Significance (nearly irreplaceable): B- or C-ranked occurrence of a G1 element A- or B-ranked occurrence of a G2 element One of the most outstanding (for example, among the five best) occurrences rangewide (at least A- or B-ranked) of a G3 element. Concentration of A- or B-ranked G3 elements (four or more) Concentration of C-ranked G2 elements (four or more)
<b>B3</b>	High Significance: C-ranked occurrence of a G2 element A- or B-ranked occurrence of a G3 element D-ranked occurrence of a G1 element (if best available occurrence) Up to five of the best occurrences of a G4 or G5 community (at least A- or B-ranked) in an ecoregion (requires consultation with other experts)
<b>B4</b>	Moderate Significance: Other A- or B-ranked occurrences of a G4 or G5 community C-ranked occurrence of a G3 element A- or B-ranked occurrence of a G4 or G5 S1 species (or at least C-ranked if it is the only state, provincial, national, or ecoregional occurrence) Concentration of A- or B-ranked occurrences of G4 or G5 N1-N2, S1-S2 elements (four or more) D-ranked occurrence of a G2 element At least C-ranked occurrence of a disjunct G4 or G5 element Concentration of excellent or good occurrences (A- or B-ranked) of G4 S1 or G5 S1 elements (four or more)
<b>B5</b>	General or State-wide Biological Diversity Significance: good or marginal occurrence of common community types and globally secure S1 or S2 species.

### Protection Urgency Ranks

Protection urgency ranks (P-ranks) refer to the timeframe in which it is recommended that conservation protection occur. In most cases, this rank refers to the need for a major change of protective status (for example agency special area designations or ownership). The urgency for protection rating reflects the need to take legal, political, or other administrative measures to protect the area. Table 6 summarizes the P-ranks and their definitions.

**Table 6. Natural Heritage Program Protection Urgency Ranks and their Definitions.**

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

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

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

### Management Urgency Ranks

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

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

include legal, political, or administrative measures taken to protect a potential conservation area. Table 7 summarizes M-ranks and their definitions.

**Table 7. Natural Heritage Program Management Urgency Ranks and their Definitions.**

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

## Chapter 2. Potential Conservation Strategies

### Conservation Strategies

Conservation Strategies can be classified as three major types:

1. Public education about the significant ecological values of the county to engender support for land use decisions that protect these values;
2. Land protection accomplished through conservation easements, land exchanges, long-term leases, purchase of mineral or grazing rights, acquisition, or government regulation;
3. Management of the land influenced so that significant resources are protected.

The first step to facilitate any of the conservation strategies suggested above is to identify the significant elements of biodiversity and their locations in the county. This report and the accompanying GIS data provide information necessary for this first step. The next step is to use this information to conserve these elements and the areas that support them. The PCA descriptions within this report provide protection and management suggestions for each area identified during the inventory. However, some general recommendations for conservation of biological diversity in the Upper San Juan Basin are given here.

**1. Encourage public education functions and publications.** A significant early step in the process of conserving biodiversity is educating local citizens and other stakeholders on the value that such areas offer the public. As described in this report, the Upper San Juan Basin is rich in plant and animal diversity, and houses some of the most unique environments in Colorado. Explaining the value and function of these habitats, and the uniqueness of the species that inhabit them, to the public can generate greater interest in conserving significant habitats. Public education is especially important in counties that lack land use planning tools such as zoning, transfer/purchase of development rights programs, and open space programs. Education programs should also target private industries that may have large-scale impacts on the local environment, such as utility companies.

Conducting forums or presentations that highlight the biodiversity of the Upper San Juan Basin could be used to increase awareness of the uniqueness of the habitats in the area. Information on significant biological resources could be included in existing educational programs such as the Archuleta County weed awareness program. Similarly, providing educational pamphlets or newsletters that explain why these areas are so valuable can increase public interest and support for biodiversity conservation. Publishing a 'Rare Plants of Archuleta County' brochure would be very useful in helping citizens identify these imperiled species. General recognition of the rare plants in Archuleta County, and the ability to distinguish the rare native plants from weeds, is particularly important given on-going emphasis on weed control. CNHP has an existing template that could be used

to develop a very inexpensive rare plant brochure if local parties are interested in pursuing this option. Featuring the biodiversity of Archuleta County on the County's website, and providing links to websites hosted by CNHP, CDOW, etc., would be a very cost-effective and efficient means of distributing information on significant biological resources to the public. Work with local media to raise awareness of local biological resources and conservation efforts, to provide a balanced viewpoint, and to dispel myths.

**2. Develop and implement a plan for protecting the PCAs profiled in this report, with most attention directed toward areas with biodiversity rank (B-rank) B1, B2 and B3.** The PCAs provide a basic framework for implementing a comprehensive conservation program. The B1, B2 and B3 sites, because they have global biological significance, are in need of priority attention. Those interested in conserving these areas could consider purchasing lands or development rights from willing landowners. Also, one can support local organizations such as land trusts that hold conservation easements for protection of biological diversity or open space. On-going cooperation among local entities to preserve the county's biodiversity is always recommended. Encourage county leadership to take a lead role in promoting and coordinating conservation efforts, and institutionalize consideration of significant biological resources in land use planning.

**3. Devote particular attention to conservation efforts geared toward protection of the Pagosa gilia.** In the Upper San Juan Basin, the most significant PCA is Mill Creek at Pagosa Springs. This PCA hosts the highest quality (and possibly last remaining) occurrence of the Pagosa gilia (*Ipomopsis polyantha*). This species is limited to a 13-mile range of shale outcrops in Archuleta County. Based on current knowledge, it appears that if this species is not protected in Archuleta County, it will become extinct. The entire known range of this species is currently planned for residential development according to the Archuleta County Community Plan. All known locations occur on private land and highway right-of-ways, and there are no protected occurrences. In some cases, landowners are aware of the existence of this critically imperiled species on their property, and are supportive of its protection. This plant has an affinity for some disturbance in its habitat, and does not require special management. However, it is intolerant of grazing by livestock, and obviously could not withstand complete destruction of its habitat.

Due to the extremely restricted range of this species, conservation opportunities are limited. If this plant is to be protected, it will be very important to ensure that highway maintenance and construction activities are planned and executed with protection of this species in mind. Where possible, the establishment of conservation easement(s) would be beneficial. Public education efforts targeting the homeowners' associations in existing residential developments could make a significant contribution to the conservation of this species if these groups were willing to protect plants in their neighborhoods. Future planned developments should be designed to incorporate habitat protection for this species. Given the emphasis currently being placed on weed control, efforts to educate the general public about the Pagosa gilia (as well as the other rare plants outlined in this report) are crucial. Finally, a program to collect seeds from the existing population for

transplant into nearby protected habitat could make a significant contribution to the persistence of the species. The Echo Lake area or Pagosa City Parks could be ideal locations for a potential transplanting project.

**4. Use this report in the review of proposed activities in or near PCAs to determine how activities affect elements of biodiversity.** All of the PCAs presented contain elements of biodiversity that are of state or global significance. Weighing the biological resources represented by the PCAs will help guide planners and biologists in considering natural resource conservation when making land use decisions.

Certain land use activities in or near a site may affect the element(s) present there. Range-restricted species may be especially vulnerable to habitat destruction, while wetland and riparian areas are particularly susceptible to impacts from off-site activities that affect water quality or hydrologic regimes. In addition, cumulative impacts from seemingly minor changes can have profound and far-reaching impacts. As proposed land use changes are considered, they should be compared to the maps presented herein (also available in GIS format). However, when evaluating potential projects relative to the PCAs presented in this report, it is important to note that these boundaries are theoretical in nature, and should be interpreted with care. Each PCA is based on different species or suites of species. A particular activity may have different impacts (or no impact at all) on a particular PCA, depending on the species present. These boundaries are presented as guidelines to be used in planning, but should not necessarily be construed as across-the-board restrictions for specific activities.

If a proposed project has the potential to impact a site, planners and decision-makers can work with persons, organizations, or agencies that have the appropriate biological expertise to assist in the planning process. CNHP routinely conducts site-specific environmental reviews and should be considered a valuable resource. Also, CNHP is continually updating biodiversity data throughout the state and can provide up-to-date information in the area of concern. To contact CNHP's Environmental Review Coordinator call (970) 491-7331. Other key partners, such as the Colorado Division of Wildlife, can be valuable resources as well, particularly in evaluating potential impacts to biological resources not tracked by CNHP (e.g., game species).

**5. Recognize the importance of larger, contiguous natural communities.** While the PCAs identified in this report contain significant elements of natural diversity, protection of large areas in each vegetation type may ensure that we do not lose species that have not yet been located. Since all rare species cannot be easily identified, consider conservation or management of large, contiguous communities that may house a host of these species. Protecting large, unfragmented blocks of land in each of the major vegetation types may increase the available habitat for lesser-known and more common forms of wildlife. Large migrating animals like deer and elk are a part of our natural diversity, and their needs for winter range and access to food and water should be taken into consideration. Similarly, landscape fragmentation affects smaller animals and plants by altering continuous vegetation that may function as habitat corridors or by disrupting a continuous landscape and creating habitat for edge-adapted species (Forman and Godron

1986). Clustering developments and designating large common areas for preservation of natural communities may be more beneficial to rare species than scattering residences widely over the landscape. Providing education programs that explain the value of open space and relay the importance of these larger communities may increase interest in planning for biodiversity in future development. Trails and roads commonly fragment otherwise contiguous landscapes (Forman and Alexander 1998). See the booklet published by the State Trails Program (Colorado Department of Natural Resources 1998) for suggestions regarding planning trails with minimum impacts to wildlife.

**6. Increase efforts to protect biodiversity by promoting cooperation and incentives among landowners, pertinent government agencies, and non-profit conservation organizations.** One of the most effective means of developing cooperation for biodiversity conservation is to involve all stakeholders in land use planning. The long-term protection of natural diversity will be facilitated by the cooperation of private landowners, businesses, government agencies, and non-government organizations. Efforts to provide stronger ties among federal, state, local, and private interests involved in the protection or management of natural lands will increase the chance of success. By developing incentives that encourage biodiversity considerations in land-use planning, the likelihood of conserving biodiversity should increase. Such incentives will make planning for conservation a higher priority for private and public entities.

**7. Promote wise management of the biodiversity resources that exist within PCAs.** Since the delineation of PCAs does not by itself provide protection for the plants, animals, and plant communities, management that supports these elements should be encouraged. The development of a site-specific conservation plan for PCAs is a useful component of the long-term protection of the species and natural communities within the PCAs. Coordinate with managers of public parks or other public lands that support sensitive biological resources. Engage local citizens, groups, and organizations (e.g., schools, 4-H clubs, Native Plant Society) in assisting with management and monitoring projects on public lands. Make a concerted effort to involve individual landowners in conservation dialogue, as applicable.

Because some of the most serious impacts to the Upper San Juan Basin ecosystems are manifested at a large scale (i.e., altered hydrology, residential encroachment, and non-native species invasion), considering each area in the context of its surroundings is critical. Several organizations and agencies are available for consultation in the development of conservation plans, including CNHP, the Colorado Division of Wildlife, the U.S. Fish and Wildlife Service, the Natural Resources Conservation Service, The Nature Conservancy, and various academic institutions. With the rate of population growth in Colorado, rare and imperiled species will likely decline if not given appropriate protection or management.

**8. Stay informed and involved in public land management decisions.** Approximately 50 percent of the study area is publicly owned and another 13 percent is Southern Ute Tribal Land. The U.S. Forest Service and the Bureau of Land Management own approximately 55 percent and the State owns approximately 1 percent of the study

area. Many of the PCAs identified here are on public land and may be protected from development, but these same areas may not be protected from other impacts. Even the land ownership is not always secure, since federal and state agencies are becoming more and more involved in land exchanges. The San Juan National Forest is in the process of developing or revising management plans, such as Forest Management Plans and Grazing Management Plans. These plans require public input. Seek these and other opportunities to work with the U.S. Forest Service, Bureau of Land Management, Colorado State Land Board, Colorado Division of Wildlife, Southern Ute Nation and other government agencies in managing federal and state lands for the protection of local natural heritage. By encouraging the protection of the biologically significant PCAs on public lands and Southern Ute Tribal Lands, Archuleta and Hinsdale counties can retain a greater diversity of habitats and species.

**9. Continue inventories for species that cannot be surveyed adequately in one field season and continue inventories on lands that could not be accessed in 2001 and 2002.** Not all targeted inventory areas can be surveyed in one field season due to several factors, including lack of access to lands, the phenology of the species being surveyed, or time constraints. Because some species are ephemeral or migratory, completing an inventory in one field season is often difficult. Despite the best efforts during one field season, it is likely that some elements were not documented during the survey. Thus, it is recommended that this report and the data included within it serve as a guide for subsequent surveys of the Upper San Juan Basin.

**10. Continue to take a proactive approach to weed and exotic species control.** Weeds affect both agriculture and native plant communities. The introduction and/or sale of non-native species that impact natural areas can greatly hinder efforts to conserve rare plant and animal species. Exotic, invasive species such as tamarisk (*Tamarix ramosissima*), Russian olive (*Eleagnus angustifolia*), yellow toadflax (*Linaria vulgaris*), and non-native fish species can severely alter habitats by out-competing native species. Natural area managers, public agencies, and private landowners should be encouraged to remove these species from their properties. (Note the importance for land managers and landowners to be able to distinguish Archuleta County's rare plants from weeds!) The use of native species for revegetation and landscaping efforts should limit the effects of invasive weeds. Ideally, native seeds should be harvested and cultivated locally. The Native Plant Revegetation Guide for Colorado by the Colorado Natural Areas Program describes some appropriate species to be used for revegetation. This resource is available on the World Wide Web at <http://parks.state.co.us/cnap/publications.html>.

**11. Develop and implement a comprehensive program to address loss of wetlands.** In conjunction with the information contained in this report, information regarding the degree and trend of loss for all wetland types (i.e., salt meadows, emergent marshes, riparian forests, seeps/springs, etc.) should be sought and utilized to design and implement a comprehensive approach to the management and protection of Upper San Juan Basin wetlands. Such an effort could provide a blueprint for wetland conservation in the study area. Encourage and support statewide wetland protection efforts such as CDOW's Wetlands Partnership, Southwest Colorado Riparian Partnership and the

Southwest Focus Area Committee. County governments are encouraged to support research efforts on wetlands to aid in their conservation. Area wide education on the importance of wetlands could be implemented through the county extension service or other local agencies. Encourage communication and cooperation with landowners regarding protection of wetlands in the Upper San Juan Basin. Utilize the expertise and breadth of experience within the State and Federal agencies.

## **Likely Impacts to Biological Diversity in the Upper San Juan Basin**

### ***Hydrological Modifications***

River impoundment in the form of lakes and reservoirs and irrigation ditches or canals can affect aquatic-dependent plants and animals (Chien 1985). Annual flooding is a natural ecological process that can be severely altered by the construction of dams, reservoirs, and other water diversions. These water diversions and impoundments have altered the normal high peak flows that were once a part of the natural hydrological regimes of many tributaries of the San Juan and Piedra Rivers. These periodic floods are necessary for continued viability of most riparian vegetation. For example, many plants can only reproduce with flooding events, e.g., cottonwood trees (Rood and Mahoney 1993). As plant composition changes in response to alterations in the flooding regime, the composition of the aquatic and terrestrial fauna may also change.

In addition to river impoundment, rivers have also been altered by stream bank stabilization projects (i.e., channelization) (Rosgen 1996). Most streams and rivers are dynamic and inherently move across the land. Stabilizing or channelizing stream banks forces the river to stay in one place and often leads to changes in riparian ecology and more serious destruction downstream. It is also well known that different plant communities require different geomorphologic settings. For example, point bars are required for some species of willows to regenerate, terraces are required for mature cottonwood/shrubland forests, and old oxbow reaches may eventually provide habitat for many wetland communities. By stabilizing a river, the creation of these geomorphic settings is often eliminated. Thus, the plant communities that require such fluvial processes are no longer able to regenerate or survive. In general, the cumulative effects from dams, reservoirs, and channelization on plant communities have caused a gradual shift from diverse multi-aged riparian woodlands to mature single-aged forest canopies.

Many wetlands not associated with fluvial processes have been altered by irrigation practices, water diversions, and well pumping. Many historical wetlands, such as seeps and springs, have been lost or altered due to water “development” projects, such as water diversions or impoundments. The biodiversity significance of a human-made pond with minimal edge habitat is generally less than the biodiversity significance of extensive intact seep and spring wetlands or naturally occurring ponds.

### ***Development***

Residential development is increasing in the upper San Juan Basin, especially along the U. S. Highway 160 corridor, and along Highway 84 south of Pagosa Springs. Development creates a number of stresses, including habitat loss and fragmentation,

introduction of non-native species, fire suppression, and predation and disturbance from domestic animals (dogs and cats) (Oxley *et al.* 1974, Coleman and Temple 1994). Habitat loss to development is considered irreversible.

### ***Livestock Grazing***

Domestic livestock grazing has been a traditional livelihood in the Upper San Juan Basin since the late 1800s and has left a broad and sometimes subtle impact on the landscape. Many riparian areas in Basin are used for rangeland. Because there is little surface water available in the county, riparian areas often serve as the only available water. Additionally, riparian areas are often areas of the highest production of grasses and forbs. Long-term, incompatible livestock use of wetland and riparian areas can potentially erode stream banks, cause streams to downcut, lower the water table, alter channel morphology, impair plant regeneration, establish non-native species, shift community structure and composition, degrade water quality, and diminish general riparian and wetland functions (Windell *et al.* 1986). Depending on grazing practices and local environmental conditions, impacts can be minimal and largely reversible to severe and irreversible, such as extensive gullying and introduction of non-native or noxious species.

### ***Logging***

Most logging operations require a network of roads. The impacts from roads can result in threats to biodiversity (see “Roads” below for more detailed discussion). Other logging impacts include loss of wildlife habitat, habitat fragmentation, soil erosion, and lower water quality for aquatic species. The U.S. Forest Service monitors logging closely; nonetheless, problems can still occur (Husong and Alves 1998). The effects of logging on biodiversity have not been determined in Archuleta County.

### ***Recreation***

Recreation, once very local and perhaps even unnoticeable, is increasing and becoming a threat to natural ecosystems in the Upper San Juan Basin. Different types of recreation, primarily motorized vehicle use, typically have different effects on ecosystem processes. All-terrain vehicles can disrupt migration and breeding patterns, and fragment habitat for native resident species. This activity can also threaten rare plants found in non-forested areas. ATVs have also been identified as a vector for the invasion of non-native plant species.

Non-motorized recreation, mostly hiking but also some mountain biking and rock climbing, presents a different set of issues (Cole and Knight 1990, Knight and Cole 1991). Wildlife behavior can be significantly altered by repeat visits of hikers or bicyclists. Alpine areas, mountain lakes, and riparian zones are routes and destinations for many established trails. Thus, impacts to native vegetation (mainly trampling) in these areas can be high.

### ***Roads***

There is a complex, dense network of roads in many parts of Archuleta County. Expansion of the existing road network in some areas will detrimentally affect the biodiversity of the region. Roads are associated with a wide variety of impacts to natural

communities, including invasion by non-native plant species, increased depredation and parasitism of bird nests, increased impacts of pets, fragmentation of habitats, erosion, pollution, and road mortality (Noss *et al.* 1997).

Roads can function as conduits, barriers, habitats, sources, and sinks for some species and populations of species (Forman 1995). Road networks crossing landscapes can increase erosion and alter local hydrological regimes. Runoff from roads may impact local vegetation *via* contribution of heavy metals and sediments. Road networks interrupt horizontal ecological flows, alter landscape spatial patterns, and therefore inhibit important interior species (Forman and Alexander 1998).

Effects on wildlife can be attributed to road avoidance and mortality due to vehicular collisions (roadkill). Traffic noise appears to be the most important variable in road avoidance, although visual disturbance, pollutants, and predators moving along a road are alternative hypotheses as to the cause of avoidance (Forman and Alexander 1998). Songbirds appear to be sensitive to remarkably low noise levels, even to noise levels similar to that of a library reading room (Reijnen *et al.* 1995).

### ***Non-native Species***

Although non-native species are mentioned repeatedly as stresses in the above discussions, because they may be introduced through so many activities, they are included here as a general threat as well. Non-native plants or animals can have wide-ranging impacts. Non-native plants can increase dramatically under the right conditions and dominate a previously natural area (i.e., scraped roadsides). This can generate secondary effects on animals (particularly invertebrates) that depend on native plant species for forage, cover, or propagation. Effects of non-native fishes include competition that can lead to local extinctions of native fishes and hybridization that corrupts the genetic stock of the native fishes.

### ***Fragmentation and Edge Effects***

Edges are simply the outer boundary of an ecosystem that abruptly grades into another type of habitat (Forman and Godron 1986). Edges are often created by naturally occurring processes such as floods, fires, and wind. Edges can also be created by human activities such as roads, timber harvesting, agricultural practices, and rangeland management. Human-created edges are often dominated by plant and animal species that are adapted to disturbance. As the landscape is increasingly fragmented by large-scale, rapid anthropogenic conversion, these edges become increasingly abundant. The overall reduction of large landscapes jeopardizes the existence of specialist species, may increase non-native species, and may limit the mobility of species that require large landscapes or a diversity of landscapes for their survival.

## **Chapter 3. The Upper San Juan Basin Inventory**

### **Introduction**

The Upper San Juan Basin is home to a vast array of plants, animals and plant communities; however the numbers and diversity of these organisms is not fully understood. Federal, state, and local landowners of the Upper San Juan Basin have a good understanding of the ecology of their specific lands, but no attempt to document the diversity and abundance of rare species or plant communities has been conducted for the entire basin. In order to assist all landowners in managing their lands, CNHP conducted a basin-wide survey of the rare species and communities.

### **Purpose of the Study**

Citizens of the Upper San Juan Basin are concerned about rapid growth, resulting in loss of open space, wildlife habitat, and unique natural surroundings. The population of Archuleta County, the heart of the Upper San Juan Basin, is expanding rapidly, yet the county finds itself ill prepared for this growth with zoning regulations that are lacking or inadequate. This has created the potential for sporadic residential development that threatens natural resources, wildlife habitat, open space and the agricultural qualities of the region. Large developments have consumed wildlife habitat, fragmented the landscape and encroach upon productive ranchland. Archuleta's citizens recognize the need to preserve the areas natural resources, the plants and animals and the ranching and agricultural traditions of the area through conservation. They also recognize that with limited resources it is important to prioritize their efforts. The need for information on the locations of the most significant biological resources of the area is urgent.

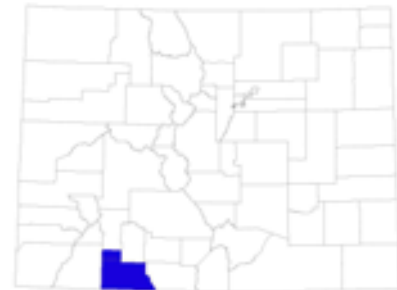
Rare plants, animals, and plant communities are usually the least understood organisms in a landscape. Some of these organisms are only understood after their rarity is recognized, as in the case of federal threatened and endangered species. However, conservation of these organisms can often be accomplished more quickly and less expensively if there is a clear understanding of their distribution and abundance. Furthermore, the likelihood for human conflicts is minimized if there is the opportunity to proactively plan for managing human activity or managing the species or habitat of interest. The purpose of this inventory is to provide a data resource for all citizens of the Upper San Juan Basin interested in conducting such proactive planning. This document should be considered a tool for managing lands that support rare species and communities within the basin, which includes Archuleta County and the southern most parts of Hinsdale County. With this information conservation planning efforts and conservation easements can be most effectively utilized to both preserve the county's natural resources and its agricultural traditions.

Although this report is intended to be a "tool" for the counties and its citizens, there are limitations to the information within it. In particular, a majority of the survey work was conducted over two springs and summers. The distribution and abundance of all organisms change with time, and the authors of this report anticipate that the conservation areas described in the report will change with time. Also, all areas of the basin were not surveyed, and priority was given to private lands. Due to limitations of time and land

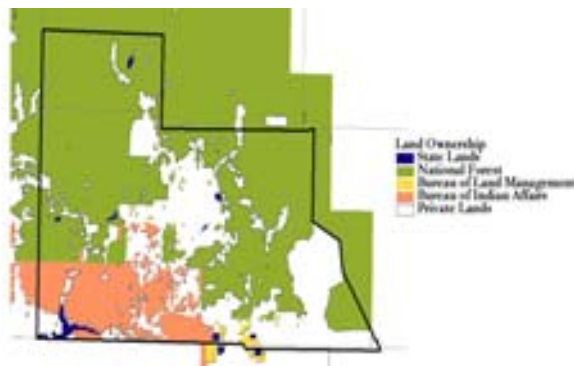
access, this report only includes information from readily observed species or from areas that biologists received permission to visit. Finally, this report does not include all species or communities found within the basin. This project specifically targeted the organisms that are tracked by the CNHP. As described in Chapter 1, CNHP has a methodology specific to Natural Heritage Programs and this study was intended to survey for those species believed to be the most rare or the least known.

## Description of Study Area

The study area, known as the Upper San Juan Basin, includes all of Archuleta County and a small portion of the southern tip of adjoining Hinsdale County. Archuleta County is located in southwestern Colorado, adjacent to the state line separating Colorado from New Mexico (Fig. 1). It is approximately 30 miles west of Wolf Creek Pass, near the headwaters of the San Juan River. Colorado counties bordering Archuleta County include La Plata, Hinsdale, Mineral, Rio Grande, and Conejos.



*Fig 1. Location of study area in Archuleta and Hinsdale Counties.*



*Fig. 2. Land ownership in the Upper San Juan Basin.*

Forest) and the Bureau of Land Management, while 32 percent is private land and the remaining 13 percent belongs to the Southern Ute Nation (Fig. 2).

The terrain of Archuleta County is primarily mountainous and hilly, interspersed with flat valley bottoms and mesas cut by gullies and arroyos. The San Juan Mountains, formed by volcanic activity, glaciation, and erosion, make up the northern and eastern part of the project area. Hot water vents at Pagosa Springs well up from sediments on the south flank of the San Juan's (Foutz 1994). The principal drainage in the project area is the San Juan River including its three major tributaries (the Piedra River, the Navajo River and the Rio Blanco), which flow through

The Upper San Juan Basin encompasses 1,548 square miles. About 55 percent of this area is either owned or managed by the US Forest Service (as the San Juan National



*Fig. 3. Major River Drainages and Creeks of the Upper San Juan Basin.*

the county toward the southwest (Fig. 3). Elevation ranges from 6,000 ft to 13,300 ft at Summit Peak, and the Continental Divide bisects the project area.

Average annual precipitation is 20 inches, with annual snowfall ranging from approximately 100 inches in Pagosa Springs to over 400 inches at Wolf Creek Pass. Precipitation and climate vary greatly with elevation; the southwest corner of the County receives only 12 to 16 inches annually, while the highest mountainous areas receive 50 to 60 inches (Fig. 4). Although temperature varies widely across the county depending on elevation, July highs are typically in the high 70s, while lows are in the 40s and 50s. January highs are typically in the 30s and 40s and lows average 5 to 10 degrees.

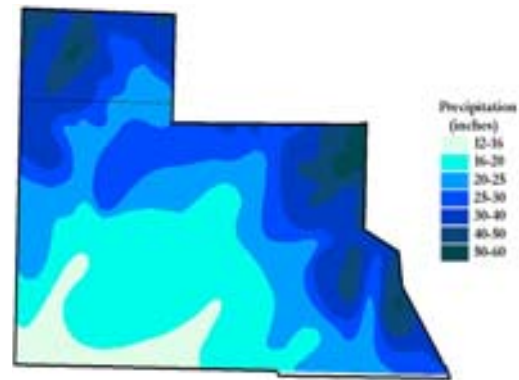


Fig. 4. Average Annual Precipitation in the Upper San Juan Basin (inches).

Archuleta and Hinsdale Counties are located within the *South-Central Highlands* section of the Southern Rocky Mountains ecoregion (Stein *et al.* 2000). The South-Central Highlands section is dominated by the San Juan Range and the Jemez Mountains, but also includes the Needle, La Garita, and La Plata Mountains, and the Uncompahgre Plateau. The Southern Rocky Mountain Ecoregion extends over nearly forty million acres and includes portions of southern Wyoming, central and southern Colorado and northern New Mexico. It includes two major mountain systems and the intervening valleys and parks. The primary ecological zones are alpine, subalpine, upper montane and lower montane-foothill (Neely *et al.* 2001). The Southern Rockies are home to many plant species and alpine ecosystems not found anywhere else in the United States, with

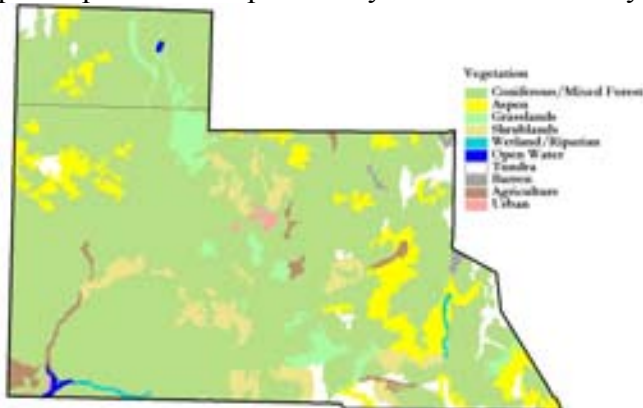


Fig. 5. Major Vegetation Associations of the Upper San Juan Basin.

double the number of alpine plant species found on the West Coast and triple the number found on the East Coast (Zwinger 1972). Major disturbance patterns in the ecoregion include fire, hydrologic regime, herbivory, insect outbreaks, snow avalanches and wind (Ricketts *et al.* 1999, Veblen 2000). Climatic variability may have a large role in altering disturbance regimes and vegetation patterns (Veblen 2000).

The above map, Fig. 5, shows the various vegetation associations within the study area:

- The Southern Rocky Mountains Alpine zone (equivalent to the “Tundra” areas in the above map) lies typically above 11,500 ft (3,500 m) and includes the highest mountain peaks with snow and ice fields, fellfields, dry alpine tundra, moist to wet alpine meadows, alpine streams and small cirque lakes. These are cold and wind-swept environments much of the year and receive intense ultraviolet radiation (TNC 2001).
- The Subalpine zone occurs roughly between about 9,189 ft (2,800 m) to 10,500 ft (3,200 m) elevation. In the above map showing vegetation types in the study area, the Subalpine Zone equates to the higher-elevation portions of the Coniferous/Mixed Forest and Shrublands. Common ecological systems in this zone are spruce-fir forests, wet meadows, subalpine-montane riparian shrublands and high gradient streams (TNC 2001).
- The Upper Montane zone lies generally between 7,500 ft (2,300 m) to 9,200 ft (2,800 m), and is characterized by aspen forest, mixed-conifer forests, montane grasslands, mountain sagebrush shrublands, montane riparian woodlands and shrublands, and high montane lakes and streams of high to moderate gradient. The lower-elevation Coniferous/Mixed Forest, Shrublands, Aspen, and the higher-elevation Grasslands and Wetland/Riparian areas indicate the Upper Montane Zone in the above map (TNC 2001).
- The Lower Montane-Foothill zone generally lies below 7,500 ft (2,300 m) elevation and encompasses the transition from montane ecosystems to lower-elevation systems in neighboring ecoregions. Ecological systems include Douglas-fir-ponderosa pine forests, ponderosa pine woodlands and savannas, pinyon-juniper woodlands, Gambel oak shrublands, intermontane-foothill grasslands, wetlands, and foothill riparian woodland and shrublands, as well as rivers of varying size and gradient. The Lower Montane-Foothill zone corresponds to the lowest Coniferous/Mixed Forest, Shrubland, Wetland/Riparian and Grassland areas (TNC 2001).

Archuleta County lies within two distinct geological regions: the San Juan Mountains and the San Juan Basin (Weimer and Haun 1960). The San Juan Mountains along with the White River Plateau and West Elk Mountains are the only three areas in the state that are capped by volcanic rock.

Over 25 million years ago the volcanic activity in the San Juans was intense, creating the largest recognized caldera in the world, the La Garita Caldera which is a twenty by fifty mile oval. Calderas are large basin-shaped volcanic depressions formed by explosion or collapse of a volcano. Archuleta County and the project area lie outside this caldera along the southern edge of the uplift. Along this edge the uplift consists of Paleozoic and Mesozoic sedimentary rocks that are tilted upward to a vaulted core of Precambrian rock (Chronic 1980) (See Table 1 for review of the geologic time scale). Glacial erosion over the last ice age from 20,000 to 30 million years ago was the finishing touch creating the magnificent jagged pikes and deep horseshoe canyons of the region (Foutz 1994).

A pediment or gently inclined erosion surface carved in the bedrock at the base of the San Juan Mountains extends southwestward from Archuleta County. This is the San Juan Basin, an area of young plateaus, which lies mainly in New Mexico. The basin consists mainly of Cretaceous sedimentary rocks of shale, sandstone and limestone. If you think of a table slightly tilted to one side and extending from southwestern Archuleta County to Mesa Verde National Park you will have an idea of what the San Juan Basin originally looked like in Colorado. Rivers and weathering have long since removed much of the pediment, isolating Mesa Verde and creating canyons across the rest of the basins extent in Colorado.

ERA	PERIOD	YEARS AGO	EPOCH
CENOZOIC	Quaternary	2 million	Pleistocene
	Tertiary	65 million	Pliocene Miocene Oligocene Eocene Paleocene
MESOZOIC	Cretaceous Jurassic Triassic	248 million	
PALEOZOIC	Permian Pennsylvanian Mississippian Devonian Silurian Ordovician Cambrian	590 million	
PRECAMBRIAN		4.5 billion	

**Table 8. The geologic timescale (after Foutz 1994).**

The San Juan Mountains area (in which Archuleta and Hinsdale Counties are located) consists of Tertiary volcanic ash flows, lavas, and conglomerates with local porphyritic intrusives. Pagosa Springs lies near the western edge of a valley that is floored with shale and surrounded by hills of tilted Dakota and Mesaverde sandstones laid down in the Cretaceous Period (Chronic 1980).

Figure 6 below, shows the different geologic types in the Upper San Juan Project Area:

- Quaternary units were shaped by the last ice age, in which glaciers gouged the rugged alpine terrain.
- Tertiary units were formed by volcanic action and uplifting.
- The Cretaceous period covered the area with shallow seas and left behind deposits of sedimentary rock.
- During the Jurassic, fossil-rich sandstone and limestone were laid down, while the Triassic left behind bright red sedimentary rocks.
- Red, sandy sediments created by the uplifting of islands formed the Permian and Pennsylvanian units. Finally, Precambrian units are sedimentary layers that eventually became gneisses, schists, quartzites and granites (Foutz 1994).

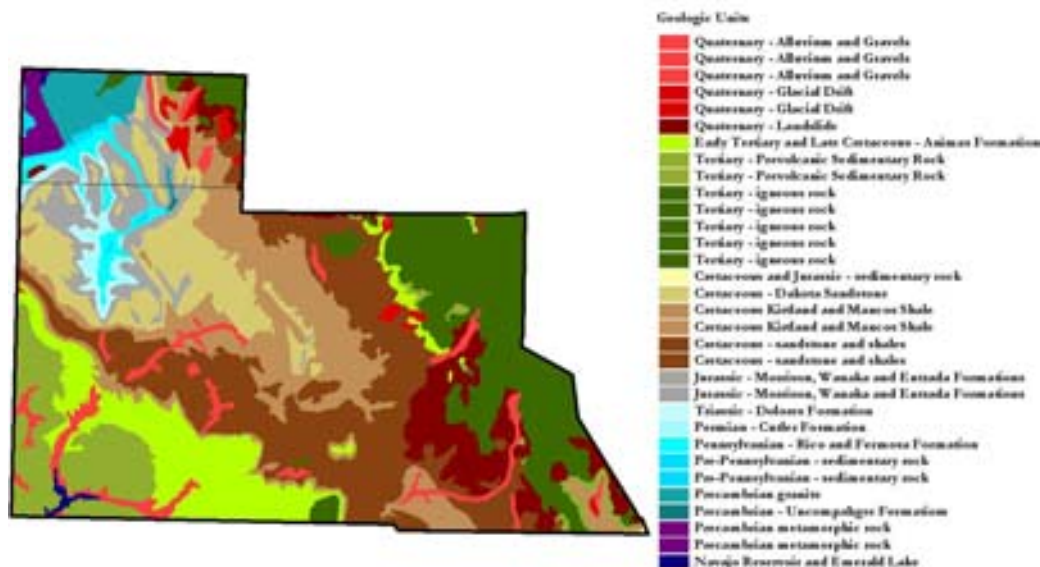


Fig. 6. Geology of the Upper San Juan Basin.

While the geology of Archuleta County may give a sense of changelessness, the County is experiencing rapid human population growth. The current population is approximately 10,700 (2001 estimate, US Census Bureau). Population increased 85% from 1990 to 2000—6.5 times the U.S average of 13% for the same time period, making Archuleta the 14<sup>th</sup> fastest-growing county in the United States. Population centers include Pagosa Springs, Chimney Rock, Chromo, and Arboles (Fig. 7). During this period the town of Pagosa Springs experienced a 32% growth in population, while the unincorporated area of the county grew by 101% from 4,138 to 8,307 people. The project area is



Fig. 7. Cities and Towns of the Upper San Juan Basin.

turning from an agrarian region to a second home and tourist mecca. Land converted to subdivisions since 1990 in the project area has been drastic with over 13,000 acres of ranchland being converted during this period (Sharpins Associates 2000). The population growth rate is the source of a wide range of threats to biodiversity, such as development (both residential and commercial) and increased water storage and transfers (Travis, personal communication). This growth is concentrated in the Pagosa Springs area at Aspen Springs, Pagosa Lakes, and the San Juan River Resort District, the South Pagosa Boulevard development and at subdivisions along U. S. Highway 84 south of Pagosa Springs. But development has spread into the rest of the project area including the Navajo River Watershed in southeast Archuleta County where several developments including Alpine Lakes, Navajo River, and Crowley and Spring Valley Ranches encroach on productive ranchland. There is also intense development in the vicinity of the Navajo

Reservoir at Arboles in southwest Archuleta County. Residential densities in these subdivisions range in size from 2 to 35+ acre lots. The rapidly expanding human population places increasing demands on the region's natural resources, open space and ranchlands.

### **Inventory Methods**

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

### **Collecting Information**

CNHP databases were updated with information regarding the known locations of species and significant plant communities within the Upper San Juan Basin. 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, Colorado College, Rocky Mountain Herbarium, and local private collections. The Colorado Division of Wildlife provided extensive data on a range of species. Both general and specific literature sources were incorporated into CNHP databases, either in the form of locational information or as biological data pertaining to a species in general. Other information was gathered to help locate additional occurrences of natural heritage elements. Such information covers basic species and community biology including range, habitat, phenology (reproductive timing), food sources, and substrates. This information was also entered into CNHP databases.

### **Identifying Rare or Imperiled Species and Significant Plant Communities Potentially Occurring in the Project Area**

The information collected in the previous step was used to refine a list of potential species and natural plant communities and to refine our search areas. In general, species and plant communities that have been recorded from the Upper San Juan Basin or from adjacent areas, are included in this list. Species or plant communities preferring habitats that are not included in this study area were removed from the list. Over 100 rare species and significant plant communities were targeted in these surveys (Appendix). Given a limited amount of time and funding for this research, a specific subset of species and communities were the priority of our inventory efforts. These elements were considered to be a priority because of their high level of biological significance (G1-G3) and/or because they are known to occur in areas that are subject to various development pressures such as hydrological alterations and residential development.

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 (S1-S3) elements are of a lower priority.

### **Identifying Targeted Inventory Areas**

Sites to survey in the field were chosen based on their likelihood of harboring rare or imperiled species or significant plant communities. Previously documented locations

were targeted, and additional potential areas were chosen using available information sources. Element occurrences with precisely known locations were always included so that they could be verified and updated. Many locations were not known due to ambiguities in the original data. In such cases, sites to survey for that element were chosen in likely areas in the general vicinity. Areas with potentially high natural values were selected using aerial photographs, geology maps, vegetation surveys, personal recommendations from knowledgeable local residents, and numerous roadside surveys by our field scientists.

Using the biological information stored in the CNHP database, areas having the highest potential for supporting specific elements were identified. 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, and quarries were identified.

The above information was used to delineate over 90 TIAs that were believed to have relatively high probability of harboring significant natural resources (Fig. 8). These areas vary in size from <5 acres to >40,000 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 aspects as weed infestation or composition of vegetation.

Because there were limited resources to address an overwhelming number of potential sites, surveys for all elements were prioritized by the degree of imperilment. For example, the species with Natural Heritage ranks of G1-G3 were the primary target of our inventory efforts. Inventory efforts resulted in visitation of 71 target inventory areas. Although species with lower Natural Heritage ranks were not the

# CNHP Targeted Inventory Areas for the Upper San Juan Basin

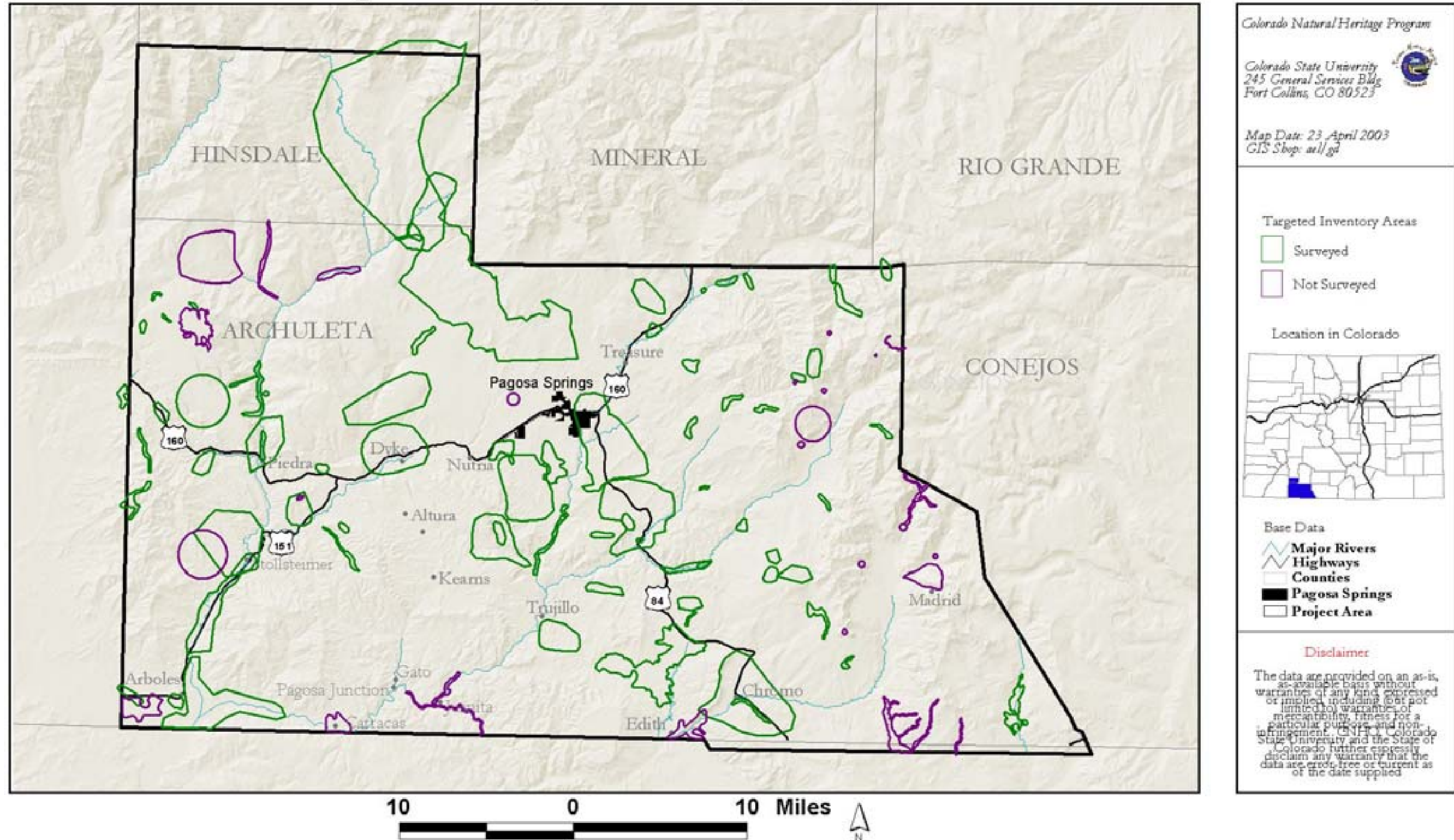


Fig. 8. Targeted Inventory Areas in the Upper San Juan Basin.

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.

### **Contacting 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 assessors' offices. Landowners were then either contacted by phone 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. However, some species were readily visible, such as prairie dog colonies, without having to be on the land.

### **Conducting 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 that are only present during certain times of the year.

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

- Amphibians: visual observation and capture using aquatic dip nets
- Reptiles: visual observation
- Mammals: live traps, pitfall traps and mist nets
- Birds: visual observation or identification by song or call
- Insects: aerial net and visual observation
- Plants: visual observation
- Plant communities: visual observation

Where 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 include 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 size of the population or community, the condition or naturalness of the habitat, and the landscape context (ease or difficulty of protecting) of the occurrence. These factors are combined into an element occurrence rank, useful in refining conservation priorities. See the previous section on Natural Heritage Methodology for more about element occurrence ranking.

### **Results of Biological Inventory**

Results of the survey identify many areas in the Upper San Juan Basin with high biological significance. There are several plants and animals that depend on these areas for survival. Some of these plants and animals are extremely rare, such as the Pagosa gilia (*Ipomopsis polyantha*) that occurs no else in the world but Archuleta County. All together, 23 rare or imperiled plant species, 18 rare or imperiled animal species, and 44 plant communities of concern have been documented in Upper San Juan Basin (Appendix). A total of 277 records of rare elements exist in the CNHP database for the project area; 79 (~30%) of these records are new observations including 37 plant, 2 natural community and 40 animal records that resulted from this inventory. There are a total of 98 plant, 47 natural community and 105 animal records within the project area in CNHPs database.

### **Delineating Potential Conservation Areas**

As the objective for this inventory is to prioritize specific areas for conservation efforts, Potential Conservation Area (PCA) boundaries were delineated. Such a boundary is an estimation of the minimum area needed to ensure persistence of the element (species or plant community). In order to ensure the preservation of an element, the ecological processes that support that element must be preserved. The preliminary conservation planning boundary is meant to include features on the surrounding landscape that provide these functions. Data collected in the field are essential to delineating such a boundary, but other sources of information such as aerial photography are also used. These boundaries are considered preliminary and additional information about the PCA or the element may call for alterations to the boundaries.

The Colorado Natural Heritage Program identified 62 Potential Conservation Areas (PCAs) in the Upper San Juan Basin. Each PCA was ranked according to its biodiversity significance. Of the 62 PCAs identified, one is of outstanding significance (B1), 10 are of very high significance (B2), 12 are of high significance (B3), 22 are of moderate significance (B4), and 17 are of general significance (B5). Of particular interest are rare plants that are unique to Archuleta County near Pagosa Springs in areas undergoing rapid development; a number of Gunnison's prairie dog complexes along Trujillo Road, U.S. Highway 84, and the Pine Piedra Road at O'Neal Park also in areas with development potential; native populations of Colorado River and Rio Grande cutthroat trout in the Navajo River and Nabor Creek drainages, respectively; numerous Peregrine Falcon aerie distributed throughout the project area; Bald Eagle concentration areas along the Piedra and San Juan Rivers where eagles concentrate during the winter season a number of unique rare riparian forest communities in the San Juan and Piedra River watersheds; and an extremely rare alpine wetland in the Headwaters of Summit Creek PCA. Finally, many of the B5 PCAs contain Peregrine Falcon aeries that are important to the conservation of this species. Taken together this wealth of natural resources indicates that the Upper San Juan Basin is truly unique with an amazing richness of rare fauna and flora well worth preserving for future generations. Overall, the concentration and quality of imperiled elements and habitats attest to the fact that conservation efforts in the Upper San Juan Basin will have both statewide and global significance.

## Chapter 4. Potential Conservation Areas

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

The goal of the PCA is to identify a land area that can provide the habitat and ecological processes upon which a particular element occurrence, or suite of element occurrences, depends for its continued existence. The best available knowledge about each species' life history is used in conjunction with information about topographic, geomorphic, and hydrologic features; vegetative cover; and current and potential land uses. In developing the boundaries of a PCA, CNHP scientists consider a number of factors that include, but are not limited to:

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

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

Table 9 indicates those PCAs that have been identified for The Upper San Juan Basin. These can be used to prioritize and evaluate conservation needs within the basin (see discussion in Chapter 1).

**Table 9. Potential Conservation Areas of the Upper San Juan Basin Displayed by Biological Diversity Rank (see Fig. 9).**

Potential Conservation Area	Biodiversity Rank	Page Number
Mill Creek at Pagosa Springs	B1	36

<b>Very High Biosignificance</b>		
Archuleta Creek	B2	40
Chromo	B2	43
Devil Creek at Middle Mountain	B2	46
East Fork at San Juan River	B2	50
Pine Piedra Stock Trail	B2	53
Rio Blanco	B2	56
Stollsteimer Creek North	B2	60
Taylor Canyon at San Juan River	B2	64
The Ant Hill	B2	68
Turkey Mountain	B2	72
<b>High Biodiversity Significance</b>		
Buckles Lake	B3	75
Death Valley Creek	B3	79
Hunter Campground	B3	82
Indian Creek at Piedra River	B3	85
Newt Jack Spring Reservoir	B3	89
Piedra	B3	93
Sand Creek	B3	96
Turkey Creek at Stollsteimer	B3	101
Upper Ignacio Creek	B3	104
Weminuche Creek	B3	108
West Fork at Devil Creek	B3	112
White Creek at Opal Lake	B3	116
<b>Moderate Biodiversity Significance</b>		
Beaver Creek at TNY Spring	B4	120
Blackhead Peak	B4	124
Blue Creek	B4	127
Burns Canyon	B4	131
Chimney Rock AA Site	B4	134
Cimarrona Creek	B4	137
Coldwater Creek at Skunk Creek	B4	140
Davis Creek	B4	143
East Fork Park	B4	146
East Fork Quartz Creek	B4	150
Hatcher Reservoir	B4	153
Headwaters of Summit Creek	B4	156
Hondo Creek	B4	159
Indian Creek at Williams Creek Reservoir	B4	163
Montezuma Creek	B4	166
Nabor Creek	B4	169
Navajo Peak Trail	B4	172
Navajo River	B4	175
Opal Lake	B4	179
Rio Blanco at Deadman Canyon	B4	182
Turkey Creek Road	B4	186
Upper Mosca Creek	B4	189
<b>General Biodiversity Significance</b>		
Adams Fork of the Conejos River	B5	192
Boone Creek Ponds	B5	195
Coyote Park	B5	198
Dunagan Canyon	B5	201
Elephant Head Rock	B5	204

Jackson Mountain	B5	207
Kenney Flats	B5	210
Mule Mountain	B5	213
Navajo Peak	B5	216
Piedra Forks Site	B5	219
Piedra River Trail	B5	222
Quartz Creek Trail	B5	225
Squaw Canyon	B5	228
Stollsteimer Site	B5	232
Stollsteimer Creek at Capote Lake	B5	235
Valle Seco	B5	239
Williams Creek Trail	B5	242

### PCA Profile Explanation

PCA Profiles are the summaries of the CNHP rankings, area location, area description, and ranking justifications. The following 58 PCA profiles, ranging in size from 12 acres to 4,638 acres, are sorted alphabetically by biodiversity rank. The PCA Profile includes the following fields:

- Biodiversity Rank
- Protection Urgency Rank
- Management Urgency Rank;
- Location
- Legal Description
- Size
- Elevation
- General Description
- Biodiversity Rank Justification
- Boundary Justification
- Protection Rank Comments
- Management Rank Comments

The Biodiversity Rank, the Protection Urgency Rank, and the Management Urgency Rank fields are described in detail in Chapter 1. The Location field includes information about the PCAs general location. The Legal Description field includes all of the relevant legal location data, including associated 7.5-minute U.S.G.S. quadrangle maps, Township (T), Range (R), and Section. The Size field reports the size of the PCA in acres and hectares. The Elevation field reports the elevation range for that particular PCA. The General Description field reports the features and biology of the PCA. This description may include such items as the history of the area, the management of the land and surrounding areas, and the flora and fauna found there. The Biodiversity Rank Justification field explains the rationale for the rankings given to a particular PCA. Similarly, the Protection Rank Comments and the Management Rank Comments fields explain in greater detail the reasons for the associated protection and management ranks.

## CNHP Potential Conservation Areas in the Upper San Juan Basin

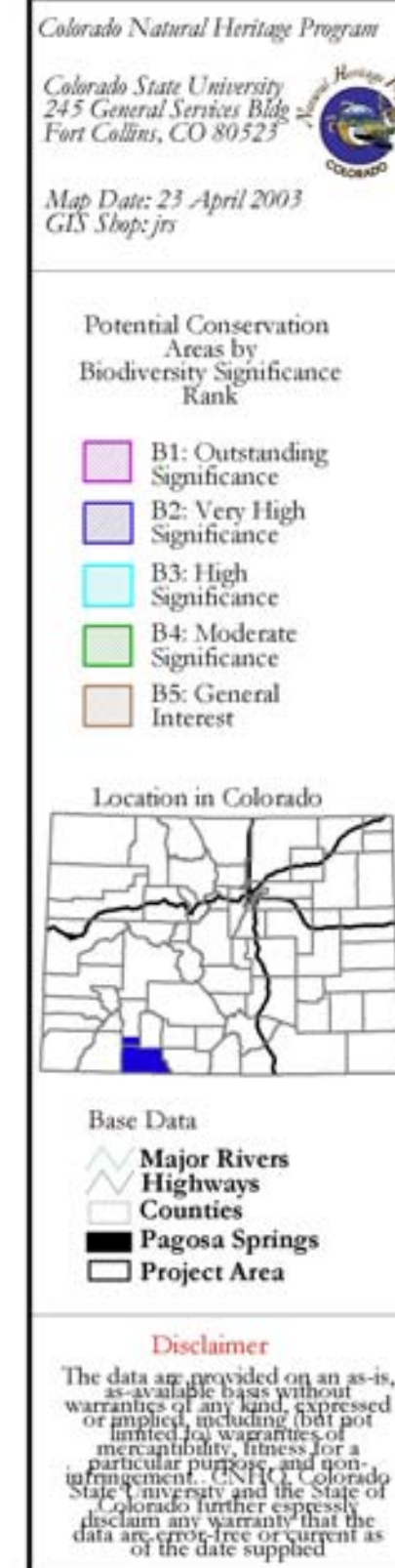
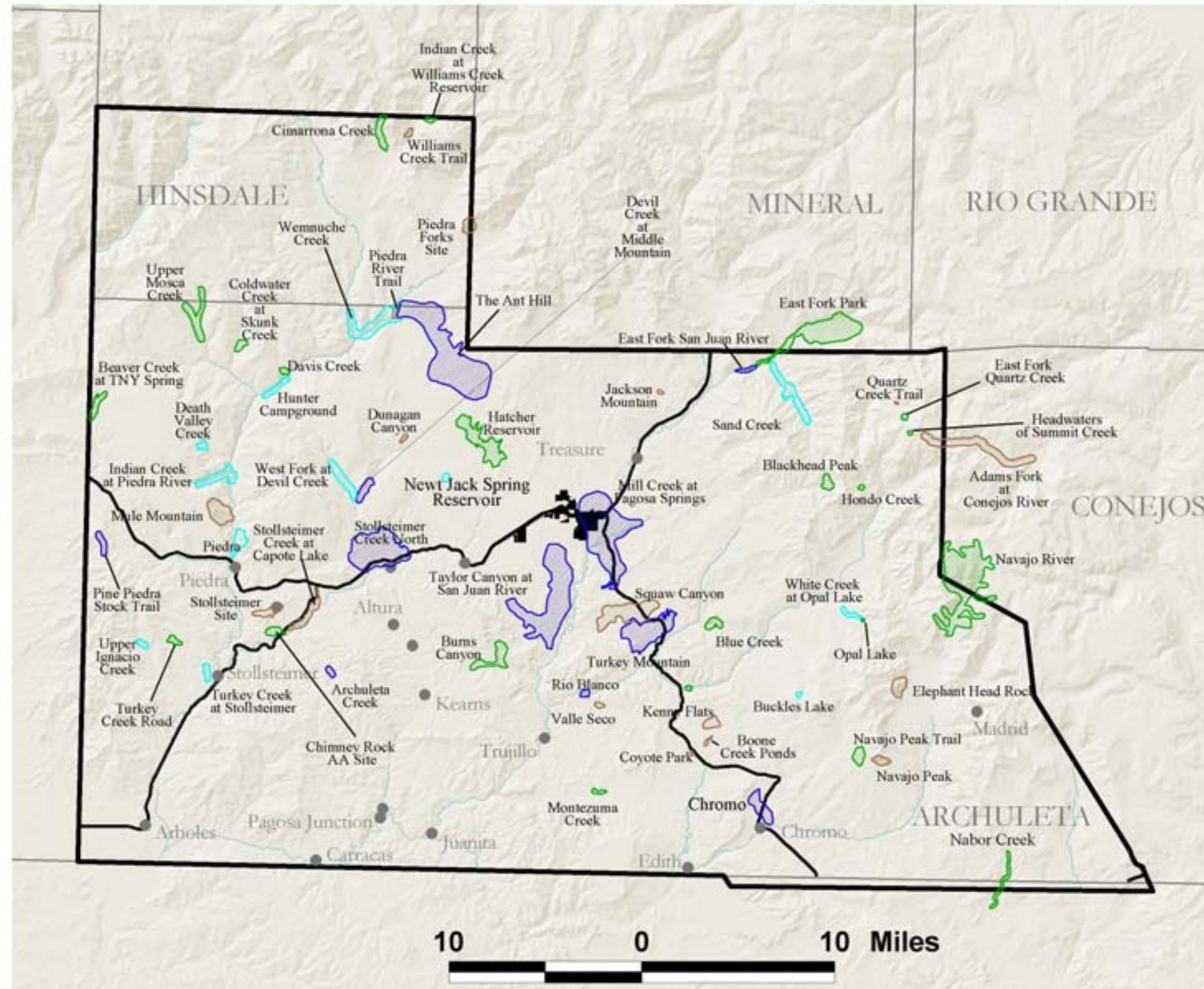


Fig. 9. Map of the Upper San Juan Basin Potential Conservation Areas (PCAs).

## Potential Conservation Area Profiles: B1 PCAs

### Mill Creek at Pagosa Springs

**Biodiversity Rank: B1 (Outstanding significance)**

The Mill Creek at Pagosa Springs PCA supports two of the only three populations known of the critically imperiled (G1 S1) Pagosa gilia (*Ipomopsis polyantha*). This is the highest quality occurrence of the Pagosa gilia in the world.

**Protection Urgency Rank: P1 (Very High urgency)**

Protection actions needed immediately. It is estimated that stresses may reduce the viability of the elements in the PCA within 1 year. Occurrences are fragmented, on private land and along highway right of way.

**Management Urgency Rank: M1 (Very high urgency)**

Management actions may be required within one year or the element occurrences could be lost or irretrievably degraded. Drastic actions may need to be taken to prevent the extinction of this species.

**Location:** Archuleta County on both sides of State Highway 84, south of Pagosa Springs, extending east along Mill Creek and west into subdivisions.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Pagosa Springs, Serviceberry Mountain, Jackson Mountain, Oakbrush Hill.

T34N R1W Sections 5, 6

T35N R1W Sections 7, 16-20, 29-32

T35N R2W Sections 12, 13, 24, 25

**Size:** 4,638 ac (1877 ha)

**Elevation:** 7,100 to 7,700 ft. (2,164 to 2,347 m)

**General Description:** The Mill Creek PCA encompasses Mancos shale slopes north and south of Pagosa Springs, on both sides of a major highway, Colorado State Highway 84. The area is primarily residential, with some small businesses and the county fairgrounds located within it. The eastern end of the PCA is more rural, but rapidly developing.

Patches of several rare native plants, including the Pagosa gilia, survive in residential areas, pastures, roadsides and vacant lots, but populations are extremely fragmented and vulnerable to extinction. The plants are restricted to soils derived from the Mancos shale formation that extends in a wide swath from northwest to southeast through the central part of Archuleta County. Natural vegetation of the site is predominantly ponderosa pine (*Pinus ponderosa*) forest, with Gambel oak (*Quercus gambelii*) in the understory. However, much of the natural vegetation has been removed with development of the area.

**Biodiversity Rank Justification:** The site is drawn for two good (B rank) occurrences of Pagosa gilia (*Ipomopsis polyantha*), a plant that is critically imperiled (G1) on a global scale. The Pagosa gilia is known from only three locations in the world. Two of these are included in this PCA and all are in Archuleta County. The PCA also includes four fair (C rank) occurrences of Pagosa bladderpod (*Lesquerella pruinos*a), imperiled (G2) globally, a good (B rank) and fair (C rank) occurrence of Pagosa phlox (*Phlox caryophylla*), vulnerable (S3) in Colorado, and two unranked (E) occurrences of Townsend's Easter daisy (*Townsendia glabella*), thought to be imperiled globally (G2?).

There is also a good (B rank) occurrence of the Gunnison's prairie dog (*Cynomys gunnisoni*), a species that is globally secure (G5S5). Gunnison's prairie dogs are endemic to the southwestern United States and have a broad distribution within Arizona, Colorado, New Mexico and Utah. Gunnison's prairie dogs are declining throughout their range, although the extent of the decline is unknown. Indiscriminate poisoning, habitat conversion, and plague have drastically reduced numbers and range (Miller and Cully 2001, Cully and Williams 2001). Plague is probably the greatest threat at this time. Gunnison's prairie dog is a keystone species upon which many other prairie species depend (Miller and Cully 2001). The Burrowing Owl (*Athene cunicularia*, G4), hawks, fox and coyote are among those animals that are found in greatest numbers on prairie dog towns.

**Table 10. Natural Heritage element occurrences at the Mill Creek at Pagosa Springs PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
<b>Plants</b>								
<i>Ipomopsis polyantha</i>	Pagosa gilia	G1	S1			BLM/FS	B	2002-05-29
<i>Ipomopsis polyantha</i>	Pagosa gilia	G1	S1			BLM/FS	B	2003-05-12
<i>Lesquerella pruinos</i> a	Pagosa bladderpod	G2	S2			BLM/FS	C	1996-05-19
<i>Lesquerella pruinos</i> a	Pagosa bladderpod	G2	S2			BLM/FS	C	1994-06-11
<i>Lesquerella pruinos</i> a	Pagosa bladderpod	G2	S2			BLM/FS	C	1994-06-07
<i>Lesquerella pruinos</i> a	Pagosa bladderpod	G2	S2			BLM/FS	C	1985-06-04
<i>Townsendia glabella</i>	Townsend's Easter daisy	G2?	S2?			BLM/FS	E	2002-05-22
<i>Townsendia glabella</i>	Townsend's Easter daisy	G2?	S2?				E	1985-01-24
<i>Phlox caryophylla</i>	Pagosa phlox	G4	S3				C	2002-05-04
<i>Phlox caryophylla</i>	Pagosa phlox	G4	S3				C	1985
<b>Mammals</b>								
<i>Cynomys gunnisoni</i>	Gunnison's prairie dog	G5	S5				B	2002-09-04

\*EO rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary is drawn to encompass all known occurrences of Pagosa gilia south of Pagosa Springs. It includes much unoccupied habitat between small remnant populations of the plant. Adjacent areas within the city and to the north that support other rare plant species and contain suitable habitat for the Pagosa gilia are included in the PCA. The boundary is also intended to represent the area needed to protect the prairie dog population and allow for suitable areas into which the population can expand. Although much of this area is undergoing residential development the boundary also includes some grasslands still being grazed by cattle, which mimics the historic disturbance processes of fire, and herbivory by bison, natural disturbances that influenced evolution of prairie dogs.

**Protection Comments:** All of the land on which the Pagosa gilia occurs is privately owned or along the state highway. The private land of the PCA containing the rare plant populations have been designated for low and high density residential development in the Archuleta County Community Plan. Such development could result in the complete loss (extinction) of this plant species. Several private landowners have expressed interest in the plant, and could be approached for conservation easements or management agreements. Some incentive would probably be required. Most of the plants are on very small parcels, containing only a fragment of the total population. Areas of this size are usually considered too small for easements. However, the risk of losing an entire species may dictate that small easements are worthwhile in this case.

**Management Comments:** Management strategies for the Pagosa gilia are complicated by the fact that the species often colonizes disturbed areas. However, extreme disturbances such as horse grazing have been shown to extirpate the species. Much of the population in this site is along the right of way of Highway 84. Widening of the highway would probably exterminate these plants. On the other hand, it has been noted that the population has been extended southward along the highway, perhaps due to movement of soils from shoulder maintenance. Spraying of roadside weeds would probably be extremely detrimental. Due to the extreme rarity of the Pagosa gilia, drastic steps may be necessary to preserve the species. One such measure would be to collect seed and introduce the plants in suitable habitat that is protected. The area around Echo Canyon Reservoir, owned by the Colorado Division of Wildlife is within a mile of the southern extent of the plant population in this site, and appears to have the required soils. Another possible reintroduction area is the park land owned by the city of Pagosa Springs. This species would also be a reasonable candidate for seed banking and cultivation for reintroduction.

Conversion of habitat supporting the prairie dog complex to residential development has the potential to eliminate the population. Some areas of the PCA are grazed and continued grazing of livestock, which traditionally occur in association with prairie dogs (Kotliar et al. 1999) is preferable to residential development. Research identifying whether this population of prairie dogs has been exposed to plague would assist in understanding its conservation value.

# **Mill Creek at Pagosa Springs** Potential Conservation Area

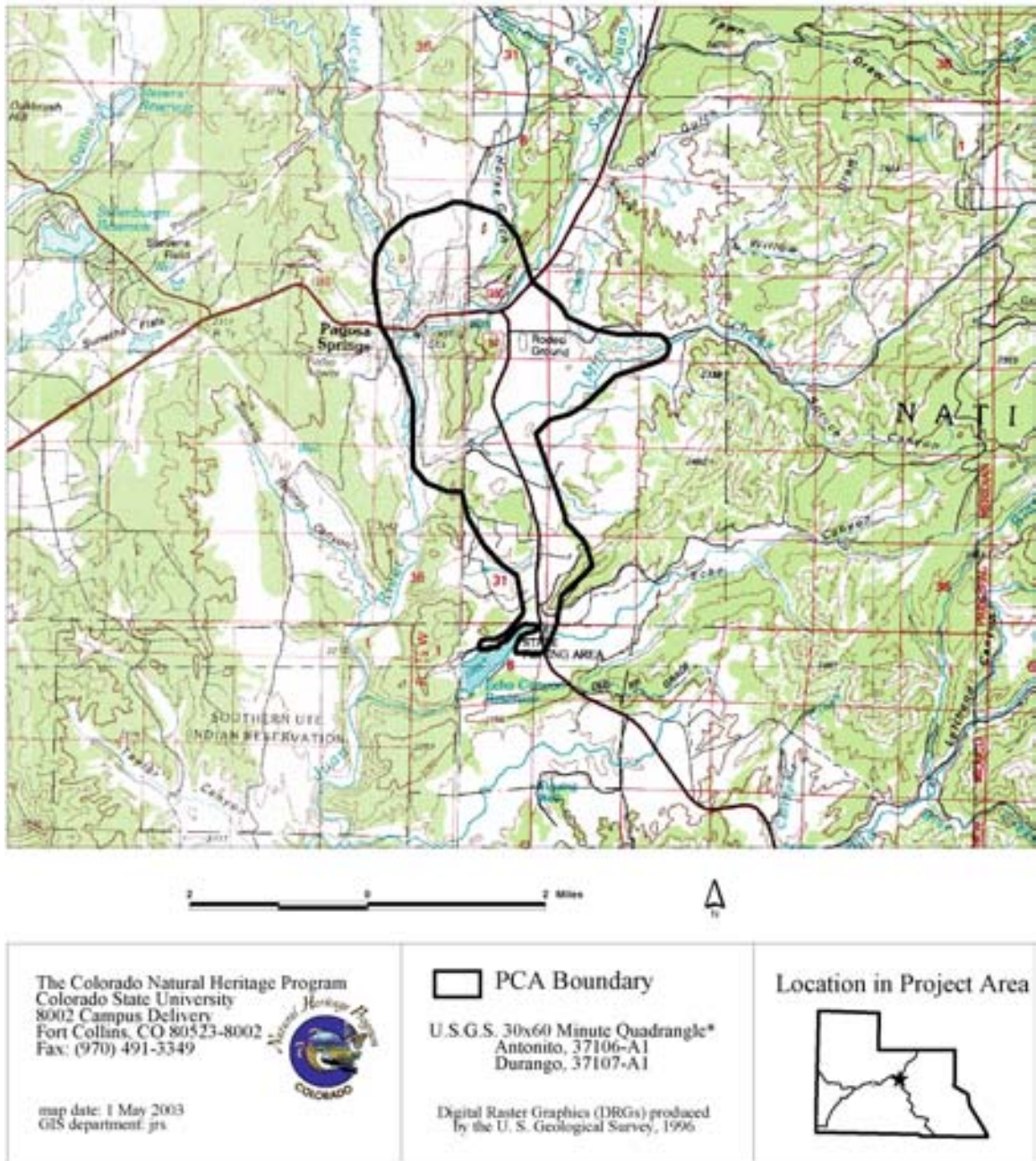


Fig. 10. Mill Creek at Pagosa Springs Potential Conservation Area.

## Potential Conservation Area Profiles: B2 PCAs

### Archuleta Creek

**Biodiversity Rank: B2 (Very high significance)**

This PCA contains one good (B rank) occurrence of the globally imperiled (G2) Narrowleaf Cottonwood Riparian Forest (*Acer negundo*-*Populus angustifolia*/*Cornus sericea*) community.

**Protection Urgency Rank: P5 (No urgency)**

Land protection is complete and no protection actions are needed. This location is on public land (San Juan National Forest) managed by the U. S. Forest Service and no further protection actions are deemed necessary.

**Management Urgency Rank: M3 (Moderate urgency)**

New management actions may be needed within 5 years to maintain the current quality of the rare plant communities within the PCA.

**Location:** Archuleta County, on Archuleta Creek, 3 miles upstream of its confluence with Stollsteimer Creek.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Chimney Rock, Lonetree Canyon  
T34N R4W S35, 36

**Size:** 112 ac (45 ha)

**Elevation:** 7,200 to 7,400 ft (2,195 to 2,256 m)

**General Description:** The Archuleta Creek PCA is located at the midpoint between the creek's headwaters and its confluence with Stollsteimer Creek at approximately 7,300 feet elevation on the southwestern slopes of the San Juan Mountains. The narrow mountain valley at the site of the PCA is characterized by slopes of an intermediate grade that are forested with a mix of ponderosa pine (*Pinus ponderosa*), Douglas fir (*Pseudotsuga menziesii*) and Gambel oak (*Quercus gambelii*). A road runs along the riparian area of Archuleta Creek where narrow-leaf cottonwood (*Populus angustifolia*), juniper (*Juniperus scopulorum*), and Douglas fir (*Pseudotsuga menziesii*) dominate the overstory, while alder (*Alnus incana*), dogwood (*Cornus sericea*) and willow (*Salix* spp.) dominate the shrub layer.

**Biodiversity Rank Comment:** This PCA contains one good (B rank) occurrence of the globally imperiled (G2) Narrow leaf Cottonwood Riparian Forest community (*Acer negundo*-*Populus angustifolia*/*Cornus sericea*). This community type is restricted to approximately 15 locations in Colorado and is not known from outside the state. Most areas that may have supported past occurrences of this community type have been altered by agriculture and development.

**Table 11. Natural Heritage element occurrences at the Archuleta Creek PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
<b>Plant Communities</b>								
<i>Acer negundo- Populus angustifolia/ Cornus sericea</i>	<b>Box elder- Narrowleaf Cottonwood/ Red-oiser Dogwood Riparian Forest</b>	<b>G2</b>	<b>S2</b>				<b>B</b>	<b>1994-06-16</b>
<i>Populus angustifolia/ Alnus incana</i>	Narrowleaf Cottonwood/ Thinleaf Alder Montane Riparian Forest	G3	S3				B	1994-06-16

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses the rare riparian forests and includes a buffer of approximately 1,000-feet. This boundary should protect the occurrence from direct disturbance, and is thought to protect the avian, macroinvertebrate and periphyton communities (Noel et al. 1986, Spackman and Hughes 1995) associated with the riparian forest. Maintenance of this 1,000-foot buffer should also protect against impacts from sedimentation (Karr and Schlosser 1978) resulting from increased erosion, which occurs in areas where streamside vegetation is removed or degraded.

Documentation of each community's exact extent is needed, which could change the current boundaries of the PCA. Seasonal flooding and sediment deposition are needed to maintain a viable population of the riparian forest along Archuleta Creek and it should be noted that the hydrological processes necessary to the riparian forest are not fully contained by the planning boundary. Upstream activities such as water diversions, impoundments, improper livestock grazing, and development are detrimental to the hydrology of the riparian area. This boundary indicates the minimum area that should be considered for any conservation management plan.

**Protection Comments:** This location is on public land (San Juan National Forest) managed by the U. S. Forest Service and no further protection actions are deemed necessary. Future changes in ownership or in land use practices may require reevaluation of the current protection rank.

**Management Comments:** New management actions may be needed within 5 years to control the spread of non-native plants and to manage recreational, livestock and water diversion activities that have the potential to adversely affect these riparian forests. Hydrological processes originating outside of the planning boundary, including water quality, quantity, timing and flow must be managed to maintain site viability.

# Archuleta Creek Potential Conservation Area

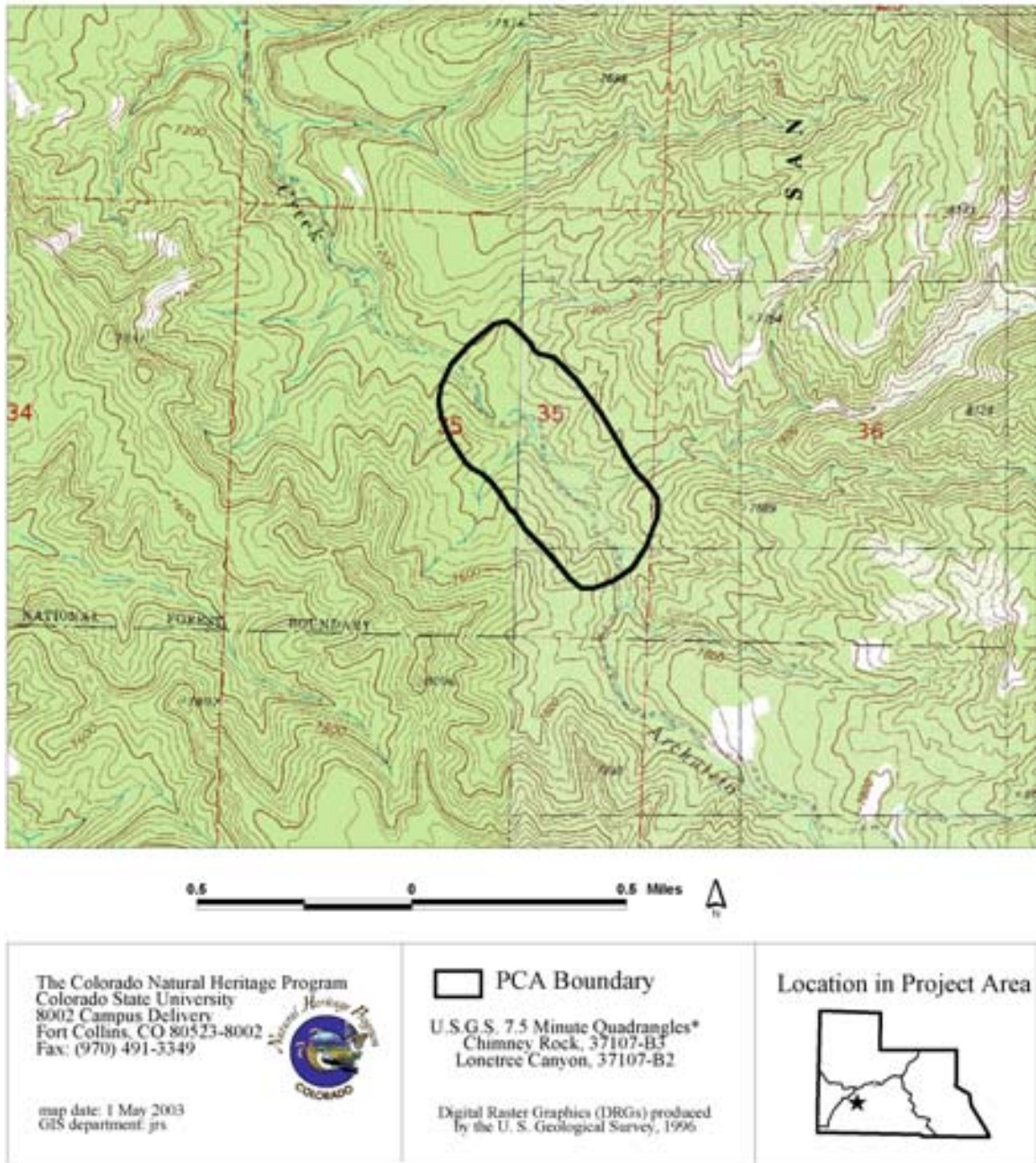


Fig. 11. Archuleta Creek Potential Conservation Area Map.

## Chromo

**Biodiversity Rank: B2 (Very high significance)**

The site has two good (B rank) occurrences of Pagosa bladderpod, a globally imperiled (G2) plant.

**Protection Urgency Rank: P3 (Moderate urgency)**

Protection actions may be needed, but probably not within the next 5 years. It is estimated that stresses may reduce the viability of the elements in the PCA if protection action is not taken. The site is entirely privately owned and development is possible in the future.

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. Monitoring of the population would aid in tracking the weed invasion and change in the quality of the rare plant populations requiring weed management. Continuing the traditional ranching activities of the area and avoiding residential development would be beneficial to the population of rare plants.

**Location:** Archuleta County, at Chromo, about 18 miles southeast of Pagosa Springs, along Highway 82.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Chromo

T32B R1E Sections 3, 4

T33N R1E Sections 28, 33, 34

**Size:** 635 ac (257 ha)

**Elevation:** 7,360 to 7,800 ft (2,243 to 2,377 m)

**General Description:** This PCA is located at the junction of the Navajo River and Little Navajo River, at Chromo. It encompasses the alluvial bottomland associated with both rivers, and is edged by foothills and low hills of Mancos shale. The hilly areas have scattered ponderosa pine (*Pinus ponderosa*) and Gambel oak (*Quercus gambelii*), interspersed with large areas of grass and shrubland. Pagosa bladderpod was found in the southern part of the site in 2002, growing in barren areas along the sides of a dry gully in Mancos shale that leads down to irrigated pastures along the Navajo River. Other species found in the area included western wheatgrass (*Pascopyrum smithii*), blue grama (*Bouteloua gracilis*), muttongrass (*Poa fendleriana*), fringed sage (*Artemisia frigida*), low rabbitbrush (*Chrysothamnus viscidiflorus*), and broom snakeweed (*Gutierrezia sarothrae*). The northern population, documented in 1989 was noted to be heavily grazed, and the pines to have been logged in the past.

**Biodiversity Rank Justification:** The PCA contains two good (B rank) occurrences of Pagosa bladderpod (*Lesquerella pruinos*), a species that is imperiled (G2) on a global scale. The Pagosa bladderpod is restricted to soils derived from Mancos shale and is currently known from only 16 locations, 16 of them within a small area in Archuleta County, Colorado. Recently, the species was also found just south of Chromo in New Mexico. Habitat destruction is the biggest threat to *L. pruinos*, especially considering its limited range. Residential growth and development around the city of Pagosa Springs could threaten nearby populations. The plants themselves are unaffected by grazing (they contain chemicals which render them unpalatable to cattle), but where cattle trails cross the shale barrens, severe erosion may occur. Horse pastures, associated with second homes and typically severely overgrazed, could present a new threat to the species. The Nature Conservancy and the U.S. Forest Service are exploring various ways of protecting *L. pruinos* habitat, particularly through the use of a Special Interest Area designation.

**Table 12. Natural Heritage element occurrences at the Chromo PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plants								
<i>Lesquerella pruinos</i>	<b>Pagosa bladderpod</b>	G2	S2			BLM/FS	B	2002-05-29
<i>Lesquerella pruinos</i>	<b>Pagosa bladderpod</b>	G2	S2			BLM/FS	B	1989-06-04

\*EO rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses two occurrences of Pagosa bladderpod and some additional potential habitat between them to allow for expansion of the populations over time.

**Protection Comments:** The PCA is entirely privately owned. The Archuleta Community Plan designates the entire area of the PCA for agricultural use (ranching), although the PCA is just outside the Navajo River subdivision. The area is currently used for cattle grazing and although unlikely, development is possible in the future. There are several oil wells mapped in the area, although their status is not known.

**Management Comments:** Several exotic plant species were noted in the site, including cheatgrass (*Bromus tectorum*), cranesbill (*Erodium cicutarium*), horehound (*Marrubium vulgare*), and musk thistle (*Carduus nutans*). Cattle graze the area, but they probably do not use the steep hillsides of Mancos shale where the bladderpod was found. However, the population may have extended into the grazed areas in the past. Monitoring of the population would aid in tracking the weed invasion and any change in the quality of the rare plant populations requiring weed management. Continuing the traditional ranching activities of the area and avoiding residential development would be beneficial to the population of rare plants.

# Chromo

## Potential Conservation Area

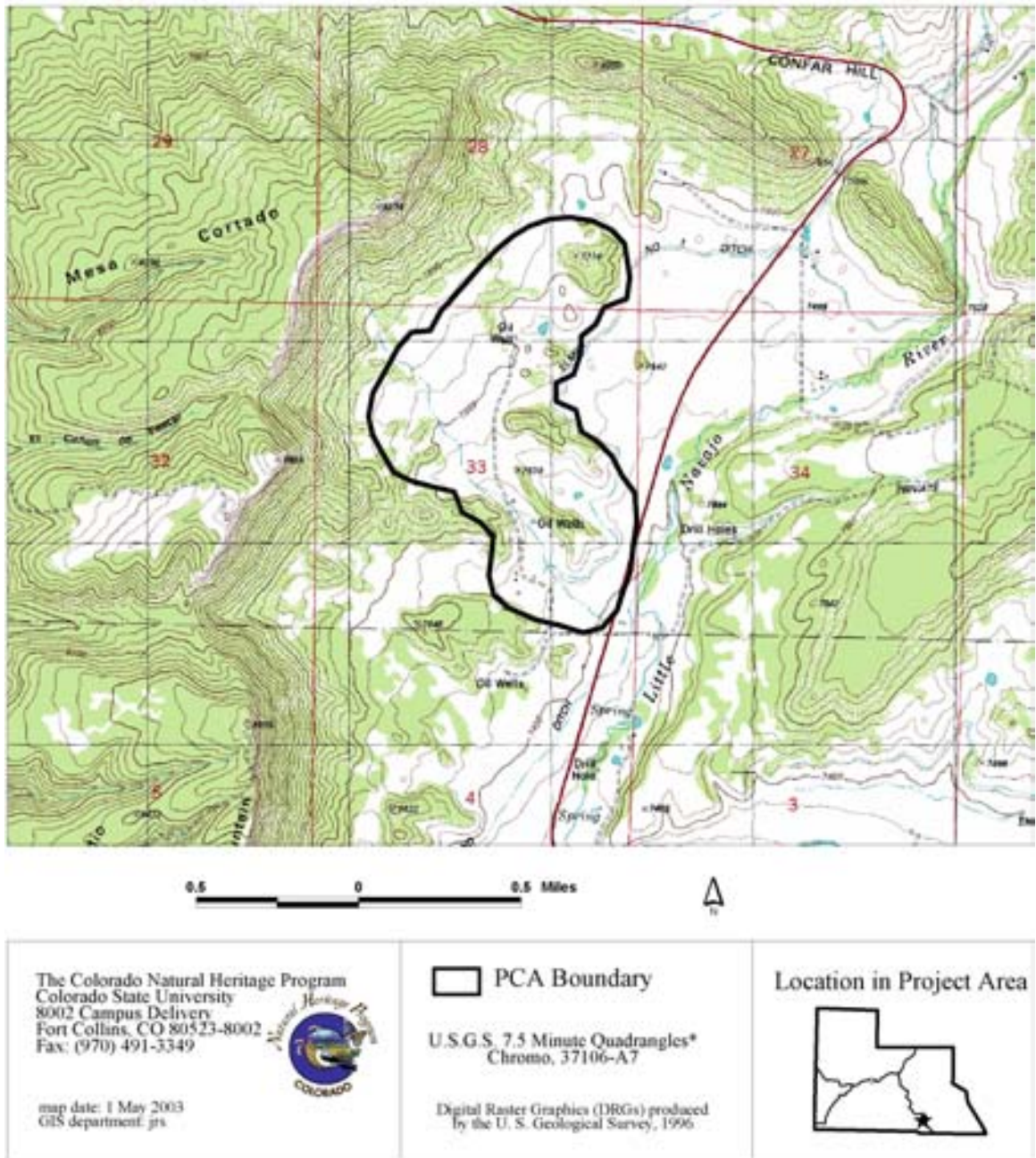


Fig 12. Chromo Potential Conservation Area.

## Devil Creek at Middle Mountain

**Biodiversity Rank: B2 (Very high significance)**

The rank for this PCA is based on one good (B rank) occurrence of a Box elder-Narrowleaf Cottonwood/Red-osier Dogwood (*Acer negundo*-*Populus angustifolia*/*Cornus sericea*) Riparian Forest, a globally imperiled (G2 S2) community. This community type is restricted to approximately 15 locations in Colorado and is not known from outside the state. Most areas that may have supported past occurrences of this community type have been altered by agriculture and development.

**Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. The mixed ownership between USFS land and private in holdings might dictate reevaluation of the protection rank if land use practices change in the future.

**Management Urgency Rank: M3 (Moderate urgency)**

New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Management actions addressing non-native plant invasion and impacts from recreational use may be needed to maintain current quality of the PCA.

**Location:** Archuleta County, at Devil Creek, 0.6 miles upstream of its confluence with West Fork Devil Creek.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Chris Mountain  
T35NR3W S20, 21

**Size:** 329 ac (133 ha)

**Elevation:** 7,360 to 8,200 ft (2,243 to 2,499 m)

**General Description:** The site occurs at the bottom of a narrow, 300-400 foot wide canyon on slightly sloping toeslopes and terraces on the floodplain of Devil Creek, a tributary of the Piedra River. The slopes of the canyon are steep dropping nearly 400 feet from the canyon's rim to its floor where an undeveloped trail runs through the relatively flat canyon bottom. The adjacent mountain ridges to the east and west have been logged but still contain ponderosa pine-spruce-fir forests. Within the PCA the riparian forests contains a 60% cover of trees including blue spruce (*Picea pungens*), narrowleaf cottonwood (*Populus angustifolia*) and box elder (*Acer negundo*). The understory is dominated by a 20% cover of river hawthorn (*Crataegus rivularis*) with a 50% cover of graminoids including sedges (*Carex* spp.), Kentucky bluegrass (*Poa pratensis*) and orchard grass (*Dactylis glomerata*), and a 60% cover of forbs. Although the area is not pristine its secluded location has left it in good ecological condition. This is the site of a rare plant community, the Box elder-Narrowleaf Cottonwood/Red-osier Dogwood (*Acer negundo*-*Populus angustifolia*/*Cornus sericea*) Riparian Forest. A healthy occurrence of

this riparian forest association is found along the banks of Devil Creek within the PCA. This western Colorado riparian forest occurs on broad alluvial floodplains with strongly meandering stream channels, where it can form extensive stands. It can also occur in small stands on narrow streams at high elevation. Stands have a 4 to 8 meter multi-layered, broad-leaved, deciduous tree canopy that is codominated by *Acer negundo* and *Populus angustifolia* with a broad-leaved deciduous shrub layer dominated by *Cornus sericea*.

**Biodiversity Rank Comment:** The rank for this PCA is based on one good (B rank) occurrence of a Box elder-Narrowleaf Cottonwood (*Acer negundo*-*Populus angustifolia*/*Cornus sericea*) Riparian Forest, a globally imperiled (G2S2) community. This association is a narrow regional endemic, which is undergoing continued fragmentation and degradation throughout its range due to agricultural impacts and fluvial instability (Richter 1999). It is presently recorded only from approximately 15 western Colorado locations in broad alluvial valleys from 6000-7000 feet elevation, and has significantly declined from historical distributions. It occurs along rivers in broad alluvial valleys at low elevation, where habitat degradation has been extensive. There are few occurrences in protected status, and the poor regeneration of dominant trees, habitat instability, and presence of non-native understory species within protected stands are sources of ongoing concern. The watershed processes necessary to maintain this association are strongly influenced by surrounding land use in the watershed and poorly controlled at present (Richter 1999). Most areas that may have supported past occurrences of this community type have been altered by agriculture and development.

**Table 13. Natural Heritage element occurrences at the Devil Creek at Middle Mountain PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
<b>Plant Communities</b>								
<i>Acer negundo</i> - <i>Populus angustifolia</i> / <i>Cornus sericea</i>	<b>Box elder-Narrowleaf Cottonwood/Red-osier Dogwood Riparian Forest</b>	<b>G2</b>	<b>S2</b>				<b>B</b>	<b>1994-07-26</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses the Narrowleaf Cottonwood Riparian Forest and includes a buffer of approximately 1,000-feet. This boundary should protect the occurrence from direct disturbance, and is thought to protect the avian, macroinvertebrate and periphyton communities (Noel et al. 1986, Spackman and Hughes 1995) associated with the riparian forest. Maintenance of this 1,000-foot buffer should also protect against impacts from sedimentation (Karr and Schlosser 1978) resulting from increased erosion, which occurs in areas where streamside vegetation is removed or degraded. Recharge of Devil Creek from snowmelt and groundwater occurring at a scale larger than the PCA's size are important for long-term survival of the riparian community. Any changes to these hydrologic processes will compromise the viability of the riparian forest.

**Protection Comments:** No protection actions are foreseen in the near future, although the mixed ownership between USFS land and private in holdings might dictate reevaluation of the protection rank if land use practices change in the future. Currently livestock grazing occurs at the PCA and although it is not imminent, there is potential for development of the private property.

**Management Comments:** New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Management which addresses non-native plant invasion and threats from recreational use may be needed within 5 years. Increased recreational use in the riparian zone including trail enhancement if improperly placed could lead to increased erosion and sedimentation of the stream.

Recharge of Devil Creek from snowmelt and groundwater occurring at scales larger than the PCA's size are important for long-term survival of the riparian forest. Viability of the riparian forest will be compromised by changes to these hydrologic processes and projects affecting surface or groundwater hydrology in the drainage have the potential to affect the rare riparian forest within this PCA. Monitoring of cumulative watershed impacts may be necessary.

# Devil Creek at Middle Mountain Potential Conservation Area

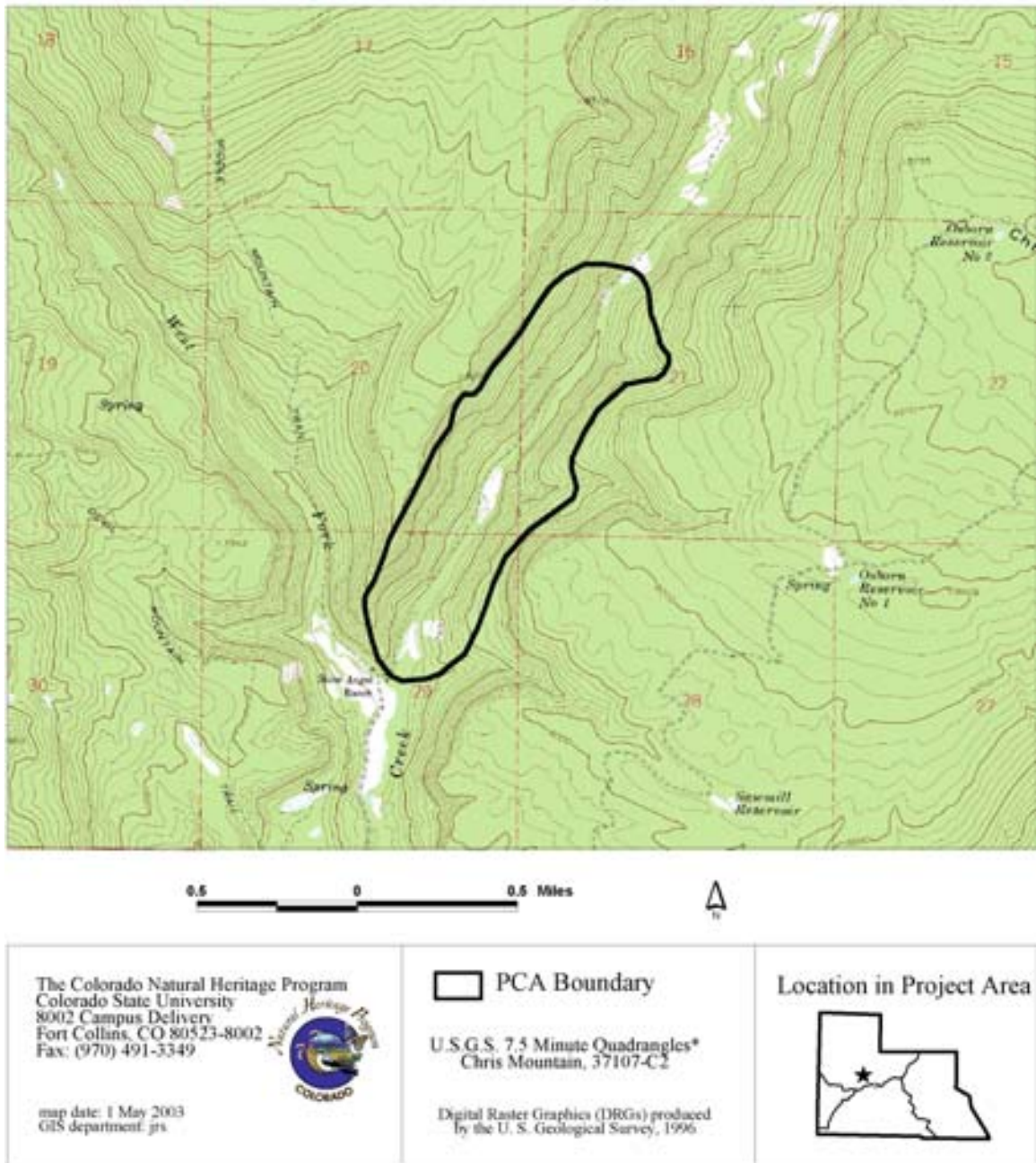


Fig. 13. Devil Creek at Middle Mountain Potential Conservation Area.

## East Fork San Juan River

**Biodiversity Rank: B2 (Very high significance)**

This PCA supports a good (B rank) occurrence of Smith's whitlow-grass, a globally imperiled (G2) plant.

**Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. The PCA is entirely within the San Juan National Forest

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. The steep cliff areas that harbor the rare plants are relatively protected from disturbance.

**Location:** Archuleta County, East Fork of the San Juan River, about 11 miles northeast of Pagosa Springs.

**Legal Description:**

U.S.G.S. 7.5 minute quadrangle: Wolf Creek Pass.  
T36N R1E S5

**Size:** 112 ac (45 ha)

**Elevation:** 7,800 to 8,200 ft (2,377 to 2,500 m)

**General Description:** This PCA includes a narrow canyon of the East Fork of the San Juan River. A Forest Road runs along the north side of the river. On the south side, which is quite difficult to access, the very steep north-facing slopes and cliffs of Tertiary volcanics harbor a rich diversity of species that thrive in the cool, moist site. This is the location of the state rare fern, slender rock-brake (*Cryptogramma stelleri*). The fern was found under shallow overhangs in the cliffs. On the opposite side of the river, above the road, the warmer south-facing slopes support the county's only known occurrence of Smith's whitlow-grass (*Draba smithii*). This species is abundant in a small mossy seep, and also is scattered on steep hillsides under shrubs, and in crevices of vertical cliffs. Another unusual, although not rare, plant in the site is mountain leaftail (*Pericome caudata*), a very showy member of the sunflower family that is abundant along the road.

**Biodiversity Rank Justification:** This PCA supports a good (B rank) occurrence of Smith's whitlow-grass, a globally imperiled (G2) plant. A Colorado endemic, there are seventeen known occurrences of Smith's whitlow-grass, mostly in Mineral and Saguache counties. The PCA also has a good (B rank) occurrence of the slender rockbrake, a state rare (S2) plant. Rattlesnake plantain (*Goodyera repens*), an orchid that was considered vulnerable in Colorado at the time of this survey, was found among mosses on the ground. This species has since been placed on a "watchlist".

**Table 14. Natural Heritage element occurrences at the East Fork San Juan River PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plants								
<b>Draba smithii</b>	<b>Smith's whitlow-grass</b>	<b>G2</b>	<b>S2</b>			<b>FS</b>	<b>B</b>	2001-09-06
<i>Cryptogramma stelleri</i>	Slender rock-brake	G5	S2			BLM	B	2001-09-06

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary is drawn to encompass the canyon sides of a section of the East Fork San Juan River. These steep, north-facing slopes support occurrences of two rare plants that require the shady, moist environment found in the narrow canyon. This site previously included broad valley areas upstream known as the East Fork Park PCA that are home to several high quality plant communities. The site has been divided into two to reflect their different landscapes and significant elements of biodiversity.

**Protection Rank Comments:** The East Fork San Juan River PCA is entirely within the San Juan National Forest. The Smith's whitlow-grass is afforded some protection because it is listed as a Forest Service Sensitive Species and no further protection should be needed.

**Management Rank Comments:** This area is a popular fishing spot, however, most activity is on the north shore, between the road and the river, and few fishermen access the steep cliff areas that harbor the rare plants. No non-native plants were observed at this site.

# East Fork San Juan River Potential Conservation Area

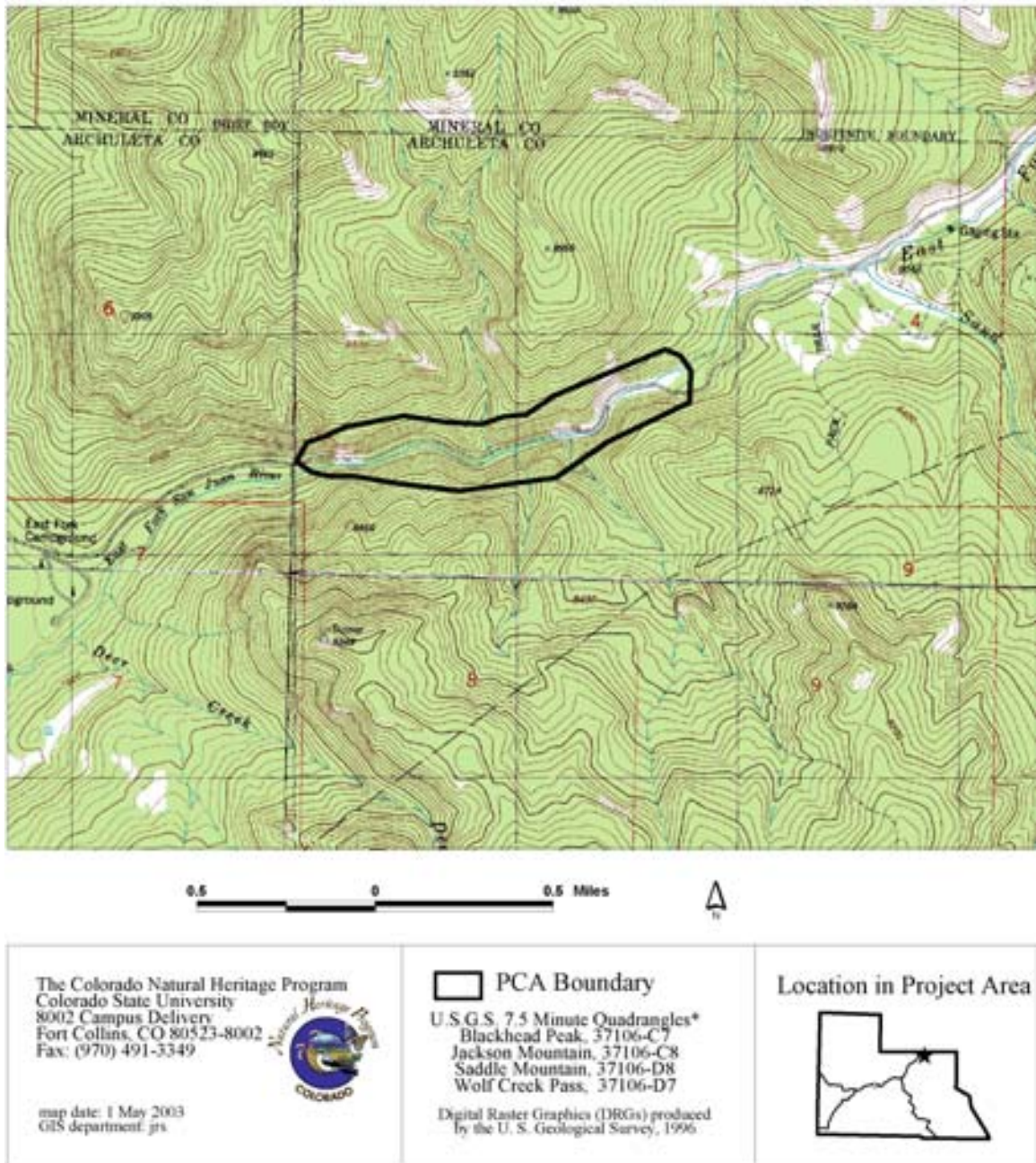


Fig. 14. East Fork San Juan River Potential Conservation Area.

## Pine Piedra Stock Trail

**Biodiversity Rank: B2 (Very high significance)**

This PCA contains a good (B rank) occurrence of Missouri milkvetch, a Colorado endemic plant subspecies considered vulnerable (G5T1) throughout its range. The PCA also has an excellent (A rank) occurrence of Pagosa phlox, a species that is considered vulnerable (S3) in Colorado.

**Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. The PCA is entirely within the San Juan National Forest.

**Management Urgency Rank: M3 (Moderate urgency)**

New management actions, including control of exotic species, may be needed within 5 years to maintain the current quality of the element plant populations in the PCA. The PCA appears to be in good condition, but continued monitoring and control of weeds would help to maintain this high quality.

**Location:** Archuleta County, south of Highway 160, about 25 miles west of Pagosa Springs.

**Legal Description:**

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

T34N R5W S6, 7

T34N R6W S1.

**Size:** 235 ac (95 ha)

**Elevation:** 8,000 to 8,750 ft (2,438 to 2667 m)

**General Description:** This PCA is located along a section of the historic Pine-Piedra Stock Trail. The portion of the trail within this PCA follows a north-south ridge top through a mixed conifer forest of ponderosa pine (*Pinus ponderosa*), Douglas fir (*Pseudotsuga menziesii*), pinyon pine (*Pinus edulis*) and Rocky Mountain juniper (*Juniperus scopulorum*). The forest understory consists of a mixed shrub community. The ridge top is composed of the Tertiary San Juan Formation.

**Biodiversity Rank Justification:** This PCA contains a good (B rank) occurrence of Missouri milkvetch, a Colorado endemic plant subspecies considered vulnerable (G5T1) throughout its range. This is the seventh known occurrence of the subspecies. The PCA also has an excellent (A rank) occurrence of Pagosa phlox, a species that is considered vulnerable (S3) in Colorado. Pagosa phlox is known from Colorado and New Mexico. Of the 29 occurrences in Colorado, all but two are in Archuleta County.

**Table 15. Natural Heritage element occurrences at the Pine-Piedra stock trail PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plants								
<i><b>Astragalus missouriensis</b></i> <b>var. humistratus</b>	<b>Missouri milkvetch</b>	<b>G5T1</b>	<b>S1</b>				<b>B</b>	<b>2001-06-23</b>
<i>Phlox caryophylla</i>	Pagosa phlox	G4	S3				A	2001-06-23

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary is drawn to include two sub-populations of Missouri milkvetch (*Astragalus missouriensis* var. *humistratus*) and Pagosa phlox (*Phlox caryophylla*). A small amount of additional potential habitat around the occurrences is included to allow for expansion of the population over time.

**Protection Rank Comments:** The PCA is entirely within the San Juan National Forest and although neither of the rare plants has special protection no protection actions are needed in the foreseeable future.

**Management Rank Comments:** The PCA appears to be in good condition, but continued monitoring and control of weeds would help to maintain this high quality. Exotic species encountered on the trail (not necessarily within the PCA) include musk thistle (*Carduus nutans*), Kentucky bluegrass (*Poa pratensis*), dandelion (*Taraxacum officinale*), smooth brome (*Bromus inermis*), orchard grass (*Dactylis glomerata*), salsify (*Tragopogon dubius*), and alfalfa (*Medicago sativa*). Further surveys during the flowering season (April and May) of Pagosa phlox could reveal that the population is more extensive.

# Pine Piedra Stock Trail

## Potential Conservation Area

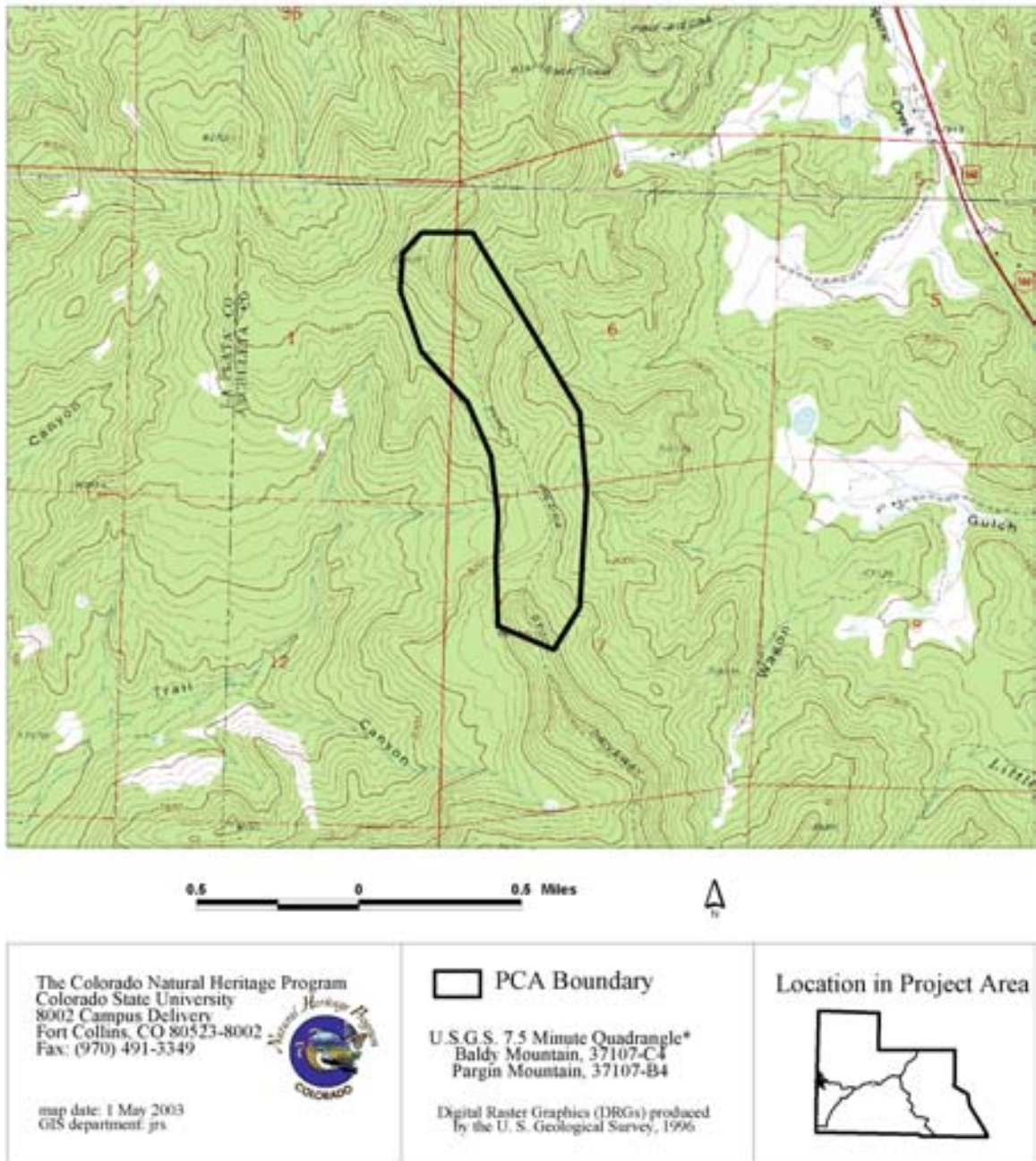


Fig. 15. Pine Piedra Stock trail Potential Conservation Area.

## Rio Blanco

**Biodiversity Rank: B2 (Very high significance)**

The rank for this PCA is based on one good (B rank) occurrence of Strapleaf Willow-Coyote Willow (*Salix eriocephala* var *ligulifolia*-*Salix exigua*) Riparian Shrubland, a globally imperiled (G2G3) natural community. This community type is known from only six locations in Colorado and may occur in New Mexico, although it has never been recorded there. Closely related *Salix lutea* communities occur in Montana, eastern Wyoming, western Idaho, and Nevada.

**Protection Urgency Rank: P1 (Very high urgency)**

Protection actions needed immediately. It is estimated that stresses may reduce the viability of the elements in the PCA within one year. This PCA includes both USFS land (San Juan National forest) and private land in an area where the private lands have been divided into smaller acre lots (<5 acres) for residential development. Conservations easements or open space planning that includes the PCA and surrounding area would aid in protecting the willow community.

**Management Urgency Rank: M3 (Moderate urgency)**

New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. There is a small amount of Canada thistle (*Cirsium arvense*) and yellow sweetclover (*Melilotus officinalis*) within the PCA and some Russian olive (*Elaeagnus angustifolia*) exists upstream of the PCA. A monitoring program would aid in tracking the weed invasion and changes in the quality of the rare plant populations requiring weed management actions.

**Location:** Archuleta County, between Trujillo Road and U.S. Highway 84 approximately 8 miles due south of the city of Pagosa Springs.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Oakbrush Hill

T34NR2W S1

T34NR1W S36

T33NR1W S1

**Size:** 96 ac (39 ha)

**Elevation:** 6,800 to 7,100 ft (2,073 to 2,164 )

**General Description:** This PCA includes a short, one half mile, stretch of the meandering Rio Blanco River in an area where the valley bottom is moderately sloped. Mixed riparian shrublands occur on point bars and floodplains along the length of the PCA. Narrowleaf Cottonwood (*Populus angustifolia*) is found in the PCA, but back from the streamside. The north facing slope of the valley is wet and is dominated by spruce (*Picea* sp.) and fir while the drier south facing slope contains ponderosa pine (*Pinus ponderosa*) and Gambel oak (*Quercus gambelii*). The herb layer in the PCA is quite

diverse and is dominated by numerous species. Common species include Northwest Territory sedge (*Carex utriculata*), Kentucky bluegrass (*Poa pratensis*), golden sedge (*Carex aurea*), arctic rush (*Juncus arcticus*), yellow sweetclover (*Melilotus officinalis*) and goldenbanner (*Thermopsis* spp.). This PCA is the location of a rare community, the Strapleaf Willow-Coyote Willow (*Salix eriocephala* var *Ligulifolia-Salix exigua*) Riparian Shrubland that is known only from Colorado, but could occur in New Mexico, although it has never been documented there. This occurrence of the community is of moderate size and is highly productive, probably because it occurs on a stream where natural hydrological processes are intact and seasonal flooding still occurs. The majority of this PCA is on USFS property, but the surrounding area up and downstream from the PCA is privately owned property that has been sectioned into small acre lots for residential development.

**Biodiversity Rank Comment:** The rank for this PCA is based on one good (B rank) occurrence of Strapleaf Willow-Coyote Willow (*Salix eriocephala* var *ligulifolia-Salix exigua*) Riparian Shrubland, a globally imperiled (G2G3) natural community. This community type is known from only six locations in Colorado and may occur in New Mexico, although it has never been recorded there. Closely related *Salix lutea* communities occur in Montana, eastern Wyoming, western Idaho, and Nevada. This medium to tall willow shrub association occurs on saturated point bars and active stream channels along broad, sandy-bottom or braided streams in the foothills (5,700-8,000 feet). The herb layer is typically quite diverse and is dominated by any number of species.

**Table 16. Natural Heritage element occurrences at the Rio Blanco PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plant Communities								
<b><i>Salix eriocephala</i> var <i>ligulifolia-Salix exigua</i></b>	<b>Strapleaf Willow-Coyote Willow</b>	<b>G2G3</b>	<b>S2S3</b>				<b>B</b>	<b>1994-06-20</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses the occurrence and includes a buffer of approximately 1,000-feet. Eliminating disturbance within this 1,000-foot buffer would assist in maintaining the integrity of the occurrence, and the integrity of the avian, macroinvertebrate and periphyton communities (Noel et al. 1986, Spackman and Hughes 1995) associated with the riparian forest. Maintenance of this 1,000-foot buffer would also aid in reducing impacts from sedimentation (Karr and Schlosser 1978) resulting from increased erosion, which occurs in areas where streamside vegetation is removed or degraded.

**Protection Comments:** Protection actions needed immediately. It is estimated that stresses may reduce the viability of the elements in the PCA within one year. This PCA includes both USFS land (San Juan National Forest) and private land in an area where the private lands have been divided into smaller acre lots (<5 acres) for residential

development. Such development could adversely affect ground water runoff, increase stream sedimentation and impact the hydrology, which is necessary for health of the willow community within the PCA. Conservations easements or open space planning that includes the PCA and surrounding area would aid in protecting the willow community.

**Management Comments:** New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. There is a small amount of Canada thistle (*Cirsium arvense*) and yellow sweetclover (*Melilotus officinalis*) within the PCA and some Russian olive (*Elaeagnus angustifolia*) exists upstream of the PCA. The surrounding private land is grazed and cattle may graze within the PCA. A monitoring program would aid in tracking the weed invasion and changes in the quality of the rare plant populations requiring weed management actions or changes in grazing activities.

Hydrological processes originating outside of the planning boundary, including water quality, quantity, timing and flow must be managed to maintain site viability. Private property along the Rio Blanco, both up and downstream of the PCA have been divided into small size lots of five acres or less in preparation for what appears to be residential development. Archuleta County defines the existing landuse in the area as vacant land, but this appears to be changing and high density development along the Rio Blanco would adversely affect the natural community within the PCA. Such development would have the potential to affect ground surface water runoff, increasing stream sedimentation and impact the hydrology, which is necessary for health of the willow community within the PCA.

# Rio Blanco Potential Conservation Area

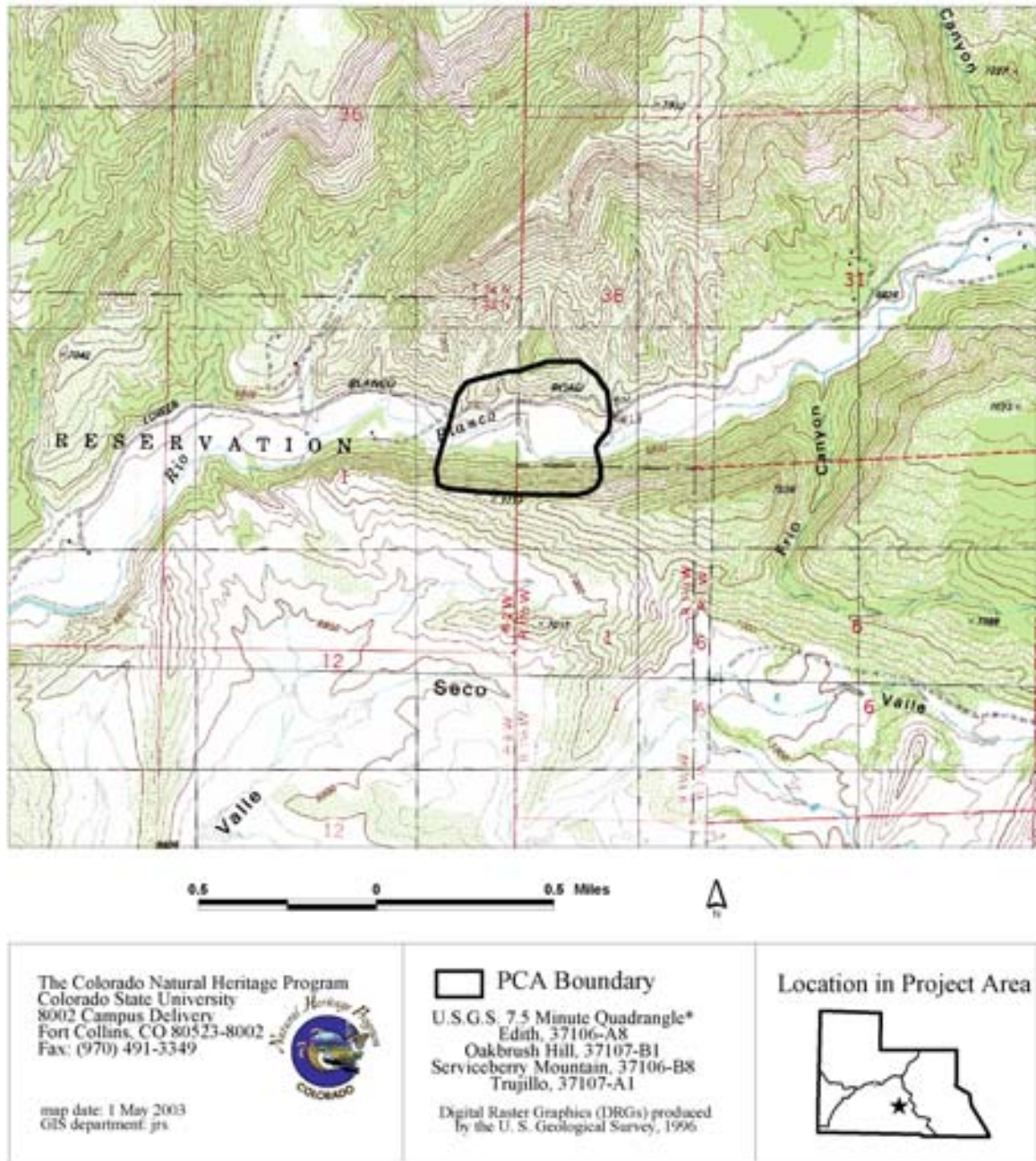


Fig. 16. Rio Blanco Potential Conservation Area.

## Stollsteimer Creek North

**Biodiversity Rank: B2 (Very high significance)**

This PCA includes a good (B rank) occurrence, one of only two known occurrences in the entire world, of the critically imperiled (G1) Pagosa gilia (*Ipomopsis polyantha*). The site also contains good (B), unranked (E) and poor (D) occurrences of the Pagosa bladderpod (*Lesquerella pruinoso*), a globally imperiled (G2) plant.

**Protection Urgency Rank: P 2 (High urgency)**

Protection actions may be needed to protect the private land from development within 5 years. It is estimated that development may reduce the viability of the plant populations in the PCA within this approximate timeframe.

**Management Urgency Rank: M2 (High urgency)**

New management actions (weed control) may be needed within 5 years to prevent the decline of the rare plant occurrences within the PCA. The Pagosa gilia population is extremely vulnerable to highway maintenance activities and grazing management.

**Location:** Archuleta County, along State Highway 160 and north, about 11 miles west of Pagosa Springs.

**Legal Description:**

U.S.G.S. 7.5 minute quadrangle: Lonetree Canyon, Chris Mountain.

T34 N R3W S2-5, 8-11, 16

T35N R3W S32-34

**Size:** 3,018 ac (1,221 ha)

**Elevation:** 6,750 to 7,614 ft (2,057 to 2,321 m)

**General Description:** The PCA comprises disturbed areas along Highway 160 at Dyke, and foothills north of the highway to the National Forest boundary. It is characterized by low hills of Mancos Shale, with sparse to moderately dense vegetation including Rocky Mountain juniper (*Juniperus scopulorum*), skunkbrush (*Rhus trilobata*), rabbitbrush (*Chrysothamnus nauseosus*), chokecherry (*Prunus virginiana* var. *melanocarpa*), bitter brush (*Purshia tridentata*), Gambel oak (*Quercus gambelii*) and a mixture of native and introduced grasses and forbs, including Indian rice grass (*Oryzopsis hymenoides*), blue grama (*Bouteloua gracilis*) and galleta (*Hilaria jamesii*). Upper slopes have ponderosa pine (*Pinus ponderosa*) and Gambel oak, with Douglas fir (*Pseudotsuga menziesii*) present on cooler sites. The PCA also includes an irrigated pasture on the south side of the highway. The Pagosa gilia was observed to be abundant along the highway and in the pasture south of the highway in 2001. However, in 2002 only a few plants were found, and in May of 2003 none were located. This is probably an effect of the drought in 2002. It remains to be seen whether this population will recover when there is more moisture available.

**Biodiversity Rank Justification:** This PCA includes a good (B rank) occurrence, one of only two known occurrences in the entire world of the critically imperiled (G1) Pagosa gilia (*Ipomopsis polyantha*), both of which are within Archuleta County (see Mill Creek at Pagosa PCA). The B rank is based on the observations made in 2001. However the reduction in the population in 2002 and possible extirpation in 2003 may require that the rank be changed. Although it is a roadside site, the continuing existence of this species requires that no location be lost. The site also contains good (B), unranked (E) and poor (D) occurrences of the Pagosa bladderpod (*Lesquerella pruinos*), a globally imperiled (G2) plant. The Pagosa bladderpod is restricted to soils derived from Mancos shale and currently known from 16 occurrences, all within a small area in Archuleta County, Colorado and one recently discovered population in New Mexico. Habitat destruction is the biggest threat to *L. pruinos*, especially considering its limited range. Residential growth and development around the city of Pagosa Springs could threaten nearby populations of the bladderpod.

There is also a fair (C rank ) occurrence of the Gunnison's prairie dog (*Cynomys gunnisoni*), a species that is globally secure (G5S5). Gunnison's prairie dogs are endemic to the southwestern United States and have a broad distribution within Arizona, Colorado, New Mexico and Utah. Gunnison's prairie dogs are declining throughout their range, although extent of the decline is unknown. Indiscriminate poisoning, habitat conversion, and plague have drastically reduced numbers and range (Miller and Cully 2001, Cully and Williams 2001). Plague is probably the greatest threat at this time. Gunnison's prairie dog is a keystone species upon which many other prairie species depend (Miller and Cully 2001). The Burrowing Owl (*Athene cunicularia*, G4), hawks, fox and coyote are among those animals that are found in greatest numbers on prairie dog towns.

**Table 17. Natural Heritage element occurrences at the Stollsteimer Creek North PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
<b>Plants</b>								
<b><i>Ipomopsis polyantha</i></b>	<b>Pagosa gilia</b>	<b>G1</b>	<b>S1</b>			<b>FS/BLM</b>	<b>B</b>	2001
<i>Lesquerella pruinos</i>	Pagosa bladderpod	G2	S2			FS/BLM	B	2001
<i>Lesquerella pruinos</i>	Pagosa bladderpod	G2	S2			FS/BLM	E	2001
<i>Lesquerella pruinos</i>	Pagosa bladderpod	G2	S2			FS/BLM	D	2001
<b>Mammals</b>								
<i>Cynomys gunnisoni</i>	Gunnison's prairie dog	G5	S5				C	2002-09-05

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The PCA encompasses three occurrences of the Pagosa bladderpod (*Lesquerella pruinos*) and one occurrence of the Pagosa gilia (*Ipomopsis polyantha*), along with some unoccupied or unsurveyed but suitable adjacent habitat. The

boundaries incorporate areas of Mancos Shale and alluvial soils that are subject to some degree of natural erosion. The boundary is also intended to represent the area needed to protect the prairie dog population and allow for suitable areas into which the population can expand. The boundary includes the grasslands grazed by the cattle, which mimics the historic disturbance processes of fire, and herbivory by bison, natural disturbances that influenced evolution of prairie dogs.

**Protection Rank Comments:** The majority of this PCA is privately owned. There is a small area (approximately 100 ac) of National Forest on the north, and three isolated parcels of BLM land comprising about 320 acres, surrounded by private land. One occurrence of Pagosa bladderpod is located on BLM land. The other occurrences in this PCA are on private land within an area undergoing rapid development. The Archuleta Community Plan designates the area of this PCA for very low density residential development consisting of lots of 35 acres or more in size. Protection of this site should be a high priority. Although small isolated parcels of BLM land are often identified for disposal or exchange, BLM could help to preserve this site by continuing its ownership and giving special protection, such as designation as an Area of Critical Environmental Concern (ACEC), to these three very important parcels. The site is included in the area that The Nature Conservancy has identified as a high priority for conservation action in their Southern Rocky Mountain Ecoregional Plan.

**Management Rank Comments:** The Pagosa gilia population is extremely vulnerable to highway maintenance activities and grazing management. State highway personnel should be made aware of the location of the Pagosa gilia along Highway 160 and avoid spraying or other actions that would threaten the plants. The plants on the south side of the highway may be vulnerable to changes in grazing and irrigation management of the pasture in which they occur. Present management of this area is unknown. Most of the Pagosa gilia occurrences are on private property in an area where development pressures are increasing and development of the area would result in the loss of the species.

The current practices of the landowner are beneficial to the continued existence of the prairie dog complex, but any changes in activity such as implementation of a poisoning or other eradication program could cause extirpation of this population within one or two breeding seasons. Cattle are grazed on this PCA and continued grazing of livestock will probably have no detrimental impacts on the prairie dogs, which traditionally occur in association with livestock (Kotliar et al. 1999). Conversion of habitat to residential development would, however, be detrimental and continued grazing of livestock is preferable. Research identifying whether this population of prairie dogs has been exposed to plague would assist in understanding its conservation value.

# Stollsteimer Creek North

## Potential Conservation Area

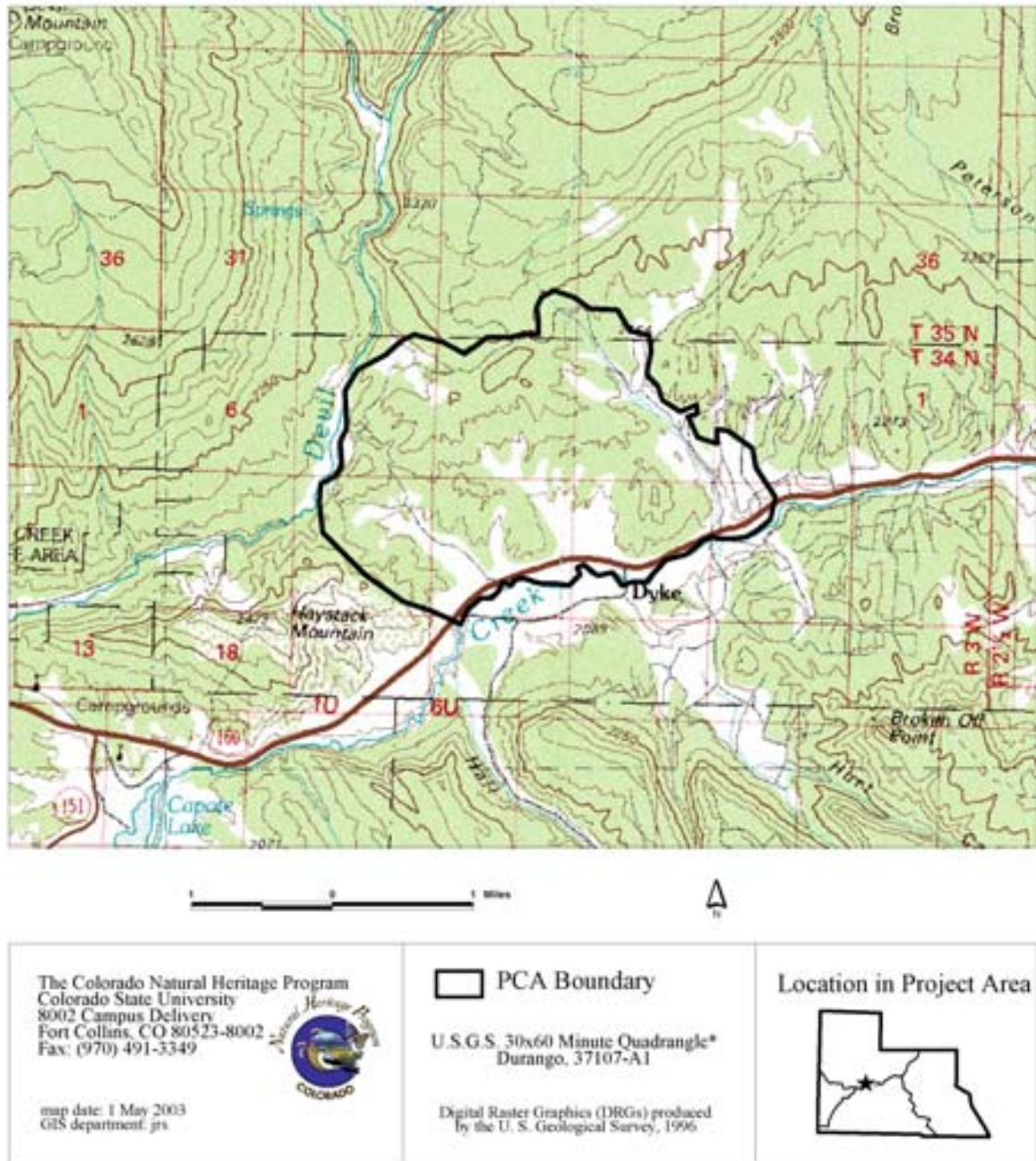


Fig. 17. Stollsteimer Creek North Potential Conservation Area.

## Taylor Canyon at San Juan River

**Biodiversity Rank: B2. (Very high significance)**

The PCA has a good occurrence of a plant that is imperiled globally.

**Protection Urgency Rank: P3 (Moderate urgency)**

Although there is a definable threat to the area, it is unknown when it will affect the occurrence. The land is privately owned and residential growth and development around the city of Pagosa Springs could result in loss of the rare plants within this PCA.

**Management Urgency Rank: M3 (Moderate urgency)**

New management actions may be needed within 5 years to maintain the current quality of the occurrence. Roadside patches of Pagosa bladderpod may be threatened by road maintenance activities and any weed spraying or grading should consider the rare plants. Implementation of a poisoning or other eradication program by private landowners could cause extirpation of the prairie dog population within one or two breeding seasons.

**Location:** Archuleta County, Trujillo Road and Taylor Canyon, about 1.2 miles south of Pagosa Springs.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Oakbrush Hill

T34N R2W Sections 1-3, 8-17, 21-23, 26 and 27

T35N R2W Sections 26, 27, 34 and 35

**Size:** 4,391 ac (1,777ha)

**Elevation:** 6,880 ft. to 7,600 ft (2,097 to 2,317 m)

**General Description:** The Taylor Canyon PCA encompasses two tributaries of the San Juan River, Stinking Springs Canyon and Taylor Canyon. The two join the San Juan River just to the south of the PCA boundary. Soils in the PCA are derived from Mancos shale. Areas mapped as Dakota sandstone have alluvium of Mancos shale in microsites that support the Pagosa bladderpod. The land is privately owned, within the Southern Ute Reservation, but is accessed by county roads. Vegetation of the site is a mosaic of grasslands, sagebrush (*Artemisia* sp.) and ponderosa pine (*Pinus ponderosa*) forest. San Juan National Forest personnel observed the westernmost occurrence of Pagosa bladderpod in Taylor Canyon in 1996. Approximately 100 individuals were seen in an open area of about five acres. None of the plants were flowering. Associated species included Gambel oak (*Quercus gambelii*), Oregon grape (*Mahonia repens*), ponderosa pine, Indian rice grass (*Oryzopsis hymenoides*) and Rocky Mountain juniper (*Juniperus scopulorum*).

**Biodiversity Rank Justification:** The Taylor Canyon PCA supports a good (B rank) and two fair (C rank) occurrence of Pagosa bladderpod (*Lesquerella pruinosus*), a species that is imperiled (G2) on a global scale. The Pagosa bladderpod is restricted to soils derived

from Mancos shale and currently known from 16 occurrences, all within a small area in Archuleta County, Colorado and one occurrence in New Mexico.. Habitat destruction is the biggest threat to *L. pruinosa*, especially considering its limited range. Residential growth and development around the city of Pagosa Springs could threaten nearby populations of the bladderpod. There are also four occurrences of Pagosa phlox within the PCA, a species that is secure (G4) globally, but vulnerable (S3) in Colorado.

The PCA also contains a good (B rank) occurrence of the Gunnison's prairie dog (*Cynomys gunnisoni*), a species that is globally secure (G5S5). Gunnison's prairie dogs are endemic to the southwestern United States and have a broad distribution within Arizona, Colorado, New Mexico and Utah. Gunnison's prairie dogs are declining throughout their range, although extent of the decline is unknown. Indiscriminate poisoning, habitat conversion, and plague have drastically reduced numbers and range (Miller and Cully 2001, Cully and Williams 2001). Plague is probably the greatest threat at this time. Gunnison's prairie dog is a keystone species upon which many other prairie species depend (Miller and Cully 2001). The Burrowing Owl (*Athene cunicularia*, G4), hawks, and fox and coyote are among those animals that are found in greatest numbers on prairie dog towns.

**Table 18. Natural Heritage element occurrences at the Taylor Canyon at San Juan River PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
<b>Plants</b>								
<b><i>Lesquerella pruinosa</i></b>	<b>Pagosa bladderpod</b>	<b>G2</b>	<b>S2</b>			<b>BLM/FS</b>	<b>B</b>	<b>1996-05-29</b>
<i>Lesquerella pruinosa</i>	Pagosa bladderpod	G2	S2			BLM/FS	C	2002-05-04
<i>Lesquerella pruinosa</i>	Pagosa bladderpod	G2	S2			BLM/FS	C	1985-06-04
<i>Phlox caryophylla</i>	Pagosa phlox	G4	S3				B	1985-06-04
<i>Phlox caryophylla</i>	Pagosa phlox	G4	S3				C	1985
<i>Phlox caryophylla</i>	Pagosa phlox	G4	S3				D	2002-05-04
<i>Phlox caryophylla</i>	Pagosa phlox	G4	S3				D	1985-06-04
<b>Mammals</b>								
<i>Cynomys gunnisoni</i>	Gunnison's prairie dog	G5	S5				B	2002-09-01

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary is drawn to include two occurrences of Pagosa bladderpod, and adjacent suitable habitat to allow for expansion or movement of the populations over time. The boundary is also intended to represent the area needed to protect the prairie dog population and allow for suitable areas into which the population can expand. The boundary includes the grasslands grazed by the cattle, which mimics the historic disturbance processes of fire, and herbivory by bison, natural disturbances that influenced evolution of prairie dogs.

**Protection Comments:** The land is privately owned and a small part of the PCA containing one of the three Pagosa bladderpod populations is Southern Ute land. The remaining private property has been designated for industrial development, and for very low and low density residential development. Development could result in loss of the rare plant and animal occurrences within this PCA. Conservation easements or management agreements with private landowners on property where the occurrences are would aid in conservation of the Pagosa bladderpod. Some incentive would probably be required.

**Management Comments:** Pagosa bladderpod at the west end of Taylor Canyon was observed to be quite resilient to vehicle traffic that passed through the area on the way to a prescribed burn. Roadside patches of Pagosa bladderpod may be threatened by road maintenance activities. On the other hand, the bare ground of road cuts have provided habitat for the species that is free from competition from other plants. Road grading may not be harmful unless the plants are directly removed; however, spraying could damage these populations.

The current practices of the landowner are beneficial to the continued existence of the prairie dog complex, but any changes in activity such as implementation of a poisoning or other eradication program could cause extirpation of this population within one or two breeding seasons. Cattle are grazed on this PCA and continued grazing of livestock will probably have no detrimental impacts on the prairie dogs, which traditionally occur in association with livestock (Kotliar et al. 1999). Research identifying whether this population of prairie dogs has been exposed to plaque would assist in understanding its conservation value.

# Taylor Canyon at San Juan River

## Potential Conservation Area

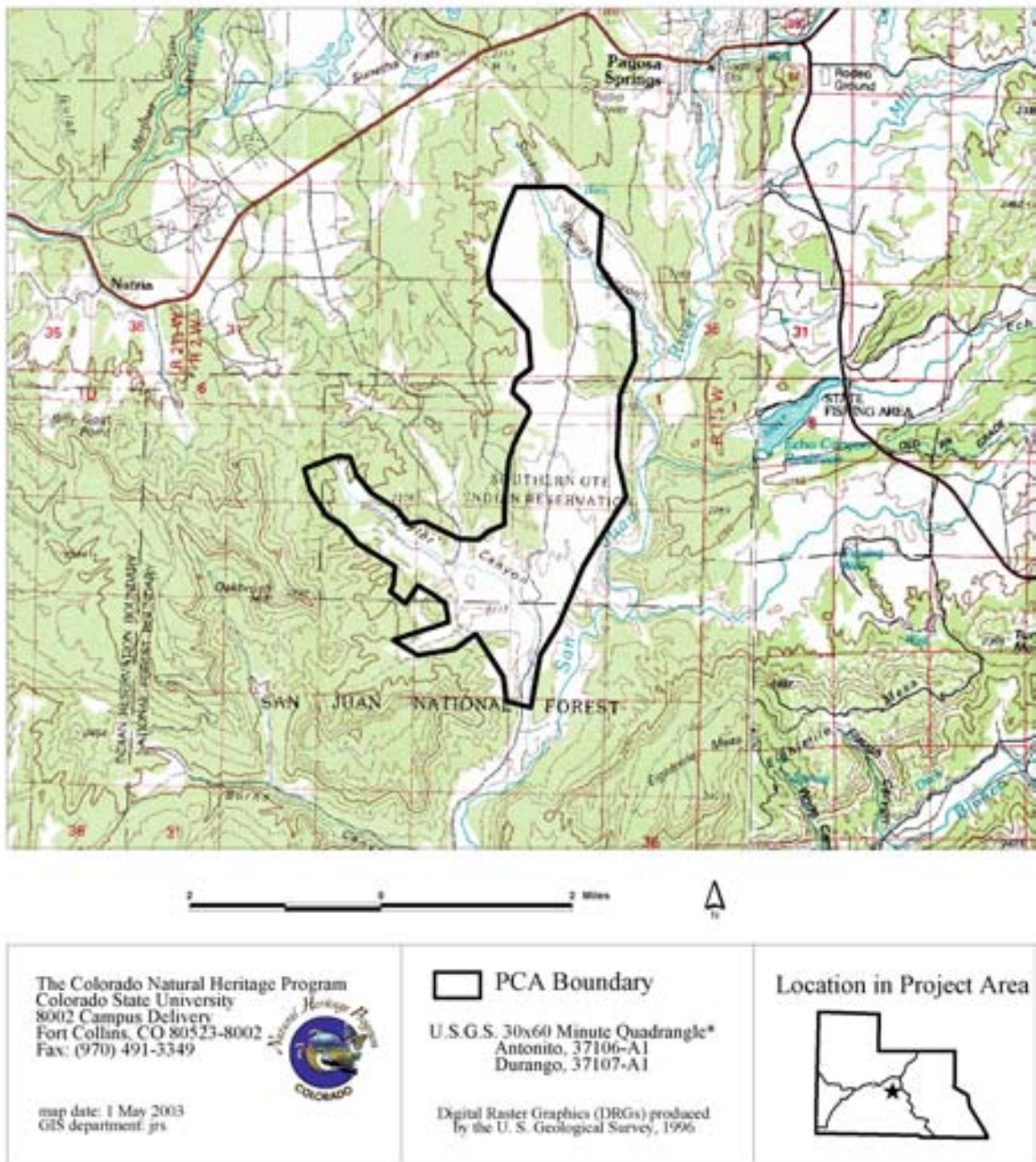


Fig. 18. Taylor Canyon at San Juan River Potential Conservation Area.

## The Ant Hill

**Biodiversity Rank: B2 (Very high significance)**

This is the largest known occurrence of the Pagosa bladderpod, a globally imperiled plant.

**Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. Ownership is divided between private land, part of which is in a conservation easement, and U. S. Forest Service land, including the O'Neal Hill Special Botanical Area. 510 acres are included in a registered State Natural Area.

**Management Urgency Rank: M2 (High urgency)**

New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Light grazing is ongoing within the site; however, it has not been shown to be negatively affecting the occurrence. Weed control by the Forest Service is ongoing. Implementation of a poisoning or other eradication program by private landowners could cause extirpation of the prairie dog population within one or two breeding seasons.

**Location:** Northern Archuleta County, extending slightly into Hinsdale County, along the Piedra Road, about 12 miles northwest of Pagosa Springs.

**Legal Description:**

U.S.G.S. 7.5 minute quadrangles: Oakbrush Ridge, Chris Mountain, Pagosa Springs, Pagosa Peak.

T36N R2W Sections 6, 7, 18

T36N R2.5W Sections 1-3, 10, 11, 13, 14

T36N R3W Sections 1- 3, 11-13, 24-26

T37N R2.5W Section 13

T37N R3W Sections 21-23

**Size:** 5,674 ac (2296 ha)

**Elevation:** 7,800 to 8,800 ft (2,377 to 2,682 m)

**General Description:** The Ant Hill PCA consists of gentle to steep slopes of the Mancos shale formation. Rare plants are found in somewhat disturbed areas with mixed grasses and forbs. Common associated species include curlyhead goldenweed (*Pyrrocoma crocea*), fringed sage (*Artemisia frigida*), trailing fleabane (*Erigeron flagellaris*), rosy pussytoes (*Antennaria rosea*), hairy golden aster (*Heterotheca villosa*), shrubby cinquefoil (*Pentaphylloides floribunda*), wooly cinquefoil (*Potentilla hippiana*), and baby goldenrod (*Solidago nana*). Upper slopes are dominated by ponderosa pine (*Pinus ponderosa*), Gambel oak (*Quercus gambelii*) and Arizona fescue (*Festuca arizonica*). The PCA includes the O'Neal Hill Special Botanical Area, designated by the USFS for

the protection of the Pagosa bladderpod. This area was the site of the largest known population of the plant, and is being monitored for changes in the population size. Although thousands of plants were present in 2001, there were few in 2002 and 2003. Simultaneously, a large increase in the prairie dog colony was noted. It was originally thought that the plants' decline was due to drought. However, other nearby populations of the bladderpod appear to be healthy in 2003. Further investigation and monitoring are critical to determine the causes of the population decline of the Pagosa bladderpod at this site.

**Biodiversity Rank Justification:** This rank is based on an excellent (A rank) and a good (B rank) occurrence of the Pagosa bladderpod (*Lesquerella pruinosa*), a globally imperiled (G2) plant species. The Pagosa bladderpod is restricted to soils derived from Mancos shale and currently known from 16 occurrences, all within a small area in Archuleta County, Colorado and one recently discovered population in New Mexico. Habitat destruction is the biggest threat to *L. pruinosa*, especially considering its limited range. Residential growth and development around the city of Pagosa Springs could threaten nearby populations of the bladderpod. Although the element occurrence rank of the population at O'Neal Hill may have to be revised if the plants fail to recover, the PCA rank would remain the same. The PCA also contains an occurrence of the Pagosa phlox (*Phlox caryophylla*), a plant considered vulnerable (S3) in Colorado, last seen at this location in 1985.

There is also an excellent (A rank) occurrence of the Gunnison's prairie dog (*Cynomys gunnisoni*), a species that is globally secure (G5S5). Gunnison's prairie dogs are endemic to the southwestern United States and have a broad distribution within Arizona, Colorado, New Mexico and Utah. Gunnison's prairie dogs are declining throughout their range, although extent of the decline is unknown. Indiscriminate poisoning, habitat conversion, and plague have drastically reduced numbers and range (Miller and Cully 2001, Cully and Williams 2001). Plague is probably the greatest threat at this time. Gunnison's prairie dog is a keystone species upon which many other prairie species depend (Miller and Cully 2001). The Burrowing Owl (*Athene cunicularia*, G4), hawks, and fox and coyote are among those animals that are found in greatest numbers on prairie dog towns.

**Table 19. Natural Heritage element occurrences at The Ant Hill PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
<b>Plants</b>								
<b><i>Lesquerella pruinosa</i></b>	<b>Pagosa bladderpod</b>	<b>G2</b>	<b>S2</b>			<b>BLM/FS</b>	<b>A</b>	<b>2001-07-09</b>
<i>Lesquerella pruinosa</i>	Pagosa bladderpod	G2	S2			BLM/FS	B	1996-07-25
<i>Phlox caryophylla</i>	Pagosa phlox	G4	S3				E	1985-06-03
<b>Mammals</b>								
<i>Cynomys gunnisoni</i>	Gunnison's prairie dog	G5	S5				A	2002-09-05

\*EO rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses the populations of Pagosa bladderpod and Pagosa phlox, and provides a buffer to allow for additional habitat that may become colonized by these species in the future. The PCA includes the O'Neal Hill Special Botanical Area and a conservation easement for the bladderpod held by The Nature Conservancy. Adjacent private property with suitable habitat for the bladderpod is included in the site, although it has not been surveyed. The boundary is also intended to represent the area needed to protect the prairie dog population and allow for suitable areas into which the population can expand. The boundary includes the grasslands grazed by the cattle, which mimics the historic disturbance processes of fire, and herbivory by bison, natural disturbances that influenced evolution of prairie dogs.

**Protection Comments:** A Special Botanical Area established by the Forest Service in 1993 after it was purchased from The Nature Conservancy should assure conservation of the Pagosa bladderpod population at that site provided that the plants recover from their current decline. The Nature Conservancy holds one parcel of private land in a conservation easement, and the bladderpod appears to be healthy at that site. Part of the PCA falls within the area identified as a high priority for protection by the Nature Conservancy in their Southern Rocky Mountains Ecoregional Plan.

**Management Comments:** Ongoing monitoring of the Pagosa bladderpod population at the O'Neal Hill Special Botanical Area by the Forest Service seeks to determine what if any impacts grazing may have on the bladderpod. Monitoring was begun in 1999, and continued under a revised plan implementing permanent plots in 2001. The Nature Conservancy continues to monitor the easement property on private land. Several patches of yellow toadflax (*Linaria vulgaris*) are present in the site. The Forest Service has been treating these areas with herbicides, but has not succeeded in eradicating the weeds. Further surveys during the flowering season (April and May) of the Pagosa phlox could reveal that the population is more extensive.

The current practices of the landowner are beneficial to the continued existence of the prairie dog complex, but any changes in activity such as implementation of a poisoning or other eradication program could cause extirpation of this population within one or two breeding seasons. Cattle are grazed on this PCA and continued grazing of livestock will probably have no detrimental impacts on the prairie dogs, which traditionally occur in association with livestock (Kotliar et al. 1999). Research identifying whether this population of prairie dogs has been exposed to plague would assist in understanding its conservation value.

# The Ant Hill

## Potential Conservation Area

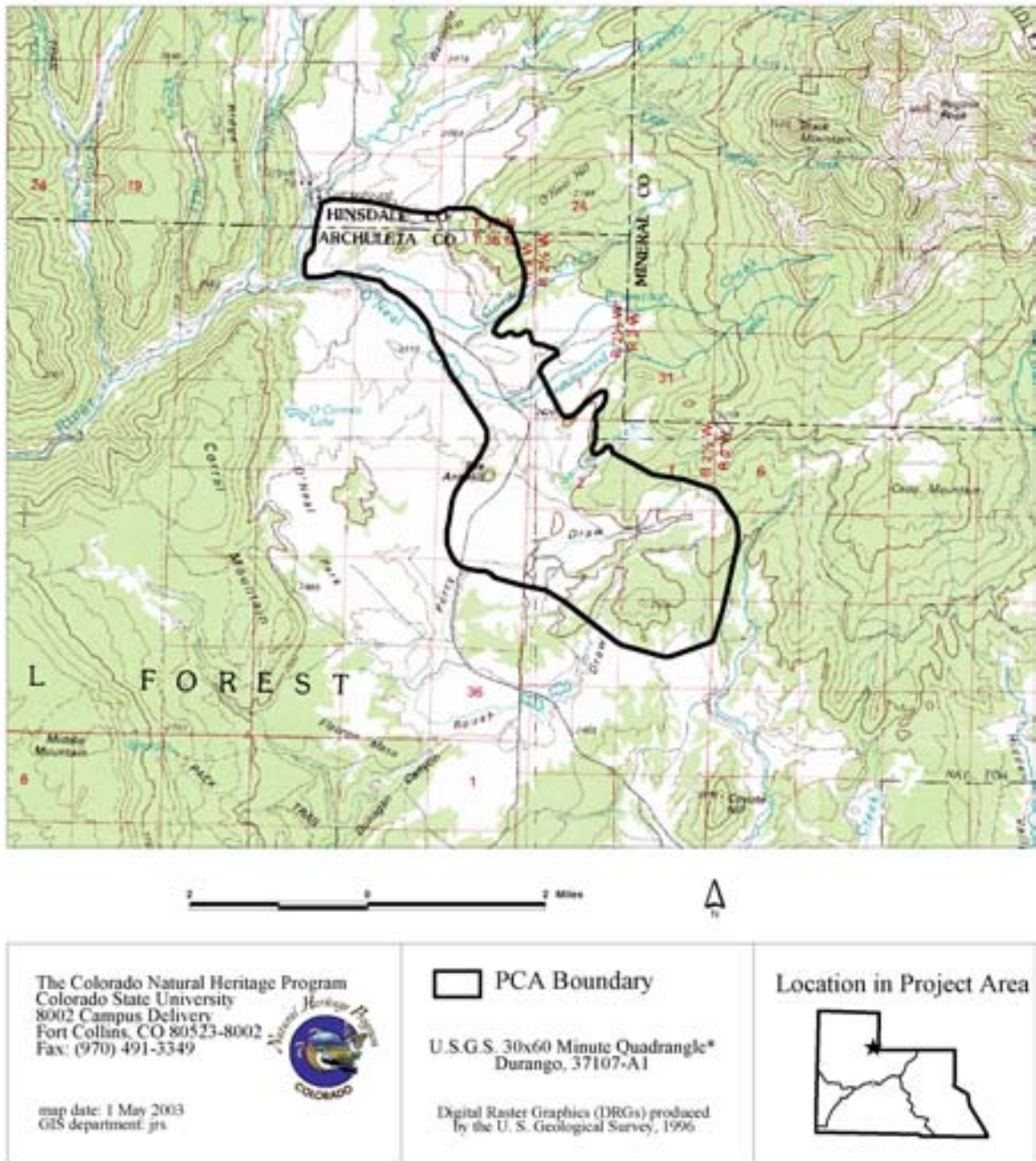


Fig. 19. The Ant Hill Potential Conservation Area.

## Turkey Mountain

**Biodiversity Rank: B2 (Very high significance)**

The PCA contains the largest known population of a globally imperiled (G2) plant.

Protection actions may be needed, but probably not within the next 5 years. It is estimated that stresses may reduce the viability of the elements in the PCA if protection action is not taken. Private land in this area is likely to be developed as the county grows.

New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. All four rare plant populations observed in 2001 and 2002 may be vulnerable to road maintenance or modifications. Other concerns include weeds, grazing management and OHV use.

**Location:** Archuleta County, northwest and northeast flanks of Turkey Mountain, about 6 miles southeast of Pagosa Springs, along Highway 84 and Eight Mile Mesa Road.

**Legal Description:**

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

T34N R1W Sections 10, 11, 14-17, 20-22

**Size:** 1,803 ac (801 ha)

**Elevation:** 7,400 to 7,858 ft (2,256 to 2,395 m)

**General Description:** This PCA includes the gentle slopes of Turkey Mountain, on soils derived from the Mancos Shale Formation. Dominant vegetation includes ponderosa pine (*Pinus ponderosa*), Gambel oak (*Quercus gambelii*) and flat meadow openings. Other common species include Oregon grape (*Mahonia repens*), serviceberry (*Amelanchier alnifolia*), orange sneezeweed (*Dugaldia hoopsii*), western wheatgrass (*Pascopyrum smithii*), redroot buckwheat (*Eriogonum racemosum*), yarrow (*Achillea lanulosa*), Louisiana sagewort (*Artemisia ludoviciana*), and yucca (*Yucca harrimanniae*). Four rare plant species were observed along Eight Mile Mesa Road, which runs through the site, in 2001 and 2002. Pagosa bladderpod (*Lesquerella pruinoso*) and Missouri milkvetch (*Astragalus missouriensis* var. *humistrata*) were growing together in disturbed areas just off an unmapped spur road, while Pagosa phlox (*Phlox caryophyllaea*) was found on the sparsely vegetated roadside. Townsend's Easter daisy (*Townsendia glabella*) was found on a west facing hillside, in barren shale areas within the ponderosa pine forest, with hairy golden aster (*Heterotheca villosa*).

**Biodiversity comments:** This PCA includes an excellent (A rank) occurrence of Townsend's Easter daisy (*Townsendia glabella*), a plant thought to be globally imperiled (G2?); and one good (B rank) occurrences of Pagosa bladderpod (*Lesquerella pruinoso*), a globally imperiled (G2) plant. It also contains a good (B rank) occurrence of a globally

imperiled variety (G5T1) of Missouri milkvetch (*Astragalus missouriensis* var. *humistratus*), and two good (B rank) occurrences of Pagosa phlox (*Phlox caryophylla*), which is vulnerable in Colorado (S3). Townsend's Easter daisy is endemic to Montezuma, La Plata and Archuleta counties, Colorado, and is known from only 22 locations. Most occurrences have no information as to abundance. This occurrence is the largest one known.

**Table 20. Natural Heritage element occurrences at the Turkey Mountain PCA**

	Common Name	Global Rank	State Rank	Federal Status	Status	Federal Sensitive	EO Rank	Last Observed
Plants								
<b><i>Townsendia glabella</i></b>	<b>Townsend's Easter daisy</b>	<b>G2?</b>	<b>S2?</b>				<b>A</b>	<b>2002-05-05</b>
<i>Lesquerella pruinosa</i>	Pagosa bladderpod	G2	S2			BLM/FS	B	2002-05-05
<i>Astragalus missouriensis</i> ssp. <i>humistrata</i>	Missouri milkvetch	G5T1	S1				B	2002-06-22
<i>Phlox caryophylla</i>	Pagosa phlox	G4	S3				B	2001-06-21

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses occurrences of four rare plants and adjacent suitable habitat, as well as providing a buffer that will allow for expansion of the populations over time.

**Protection Rank Comments:** The site is a mixture of San Juan National Forest and private land. The proximity of the PCA to Pagosa Springs suggests that development of the private land may be a potential threat. The area is recognized by the county as a residential development zone designated for very low density development of 35 acre or larger home sites. The Pagosa bladderpod plants that occur on National Forest are afforded some protection by their listing as a forest sensitive species.

**Management Rank Comments:** All four rare plant populations observed in 2001 and 2002 may be vulnerable to road maintenance or modifications. Exotic species observed at the site were smooth brome (*Bromus inermis*), Canada thistle (*Cirsium arvense*), alfalfa (*Medicago sativa*), yellow sweet clover (*Melilotus officinalis*), salsify (*Tragopogon dubius*), Kentucky bluegrass (*Poa pratensis*) and dandelion (*Taraxacum officinalis*). Other concerns within the PCA are grazing management and OHV use. Further surveys in a moister year during the flowering season (April and May) of Pagosa phlox could reveal that the population is more extensive.

# Turkey Mountain Potential Conservation Area

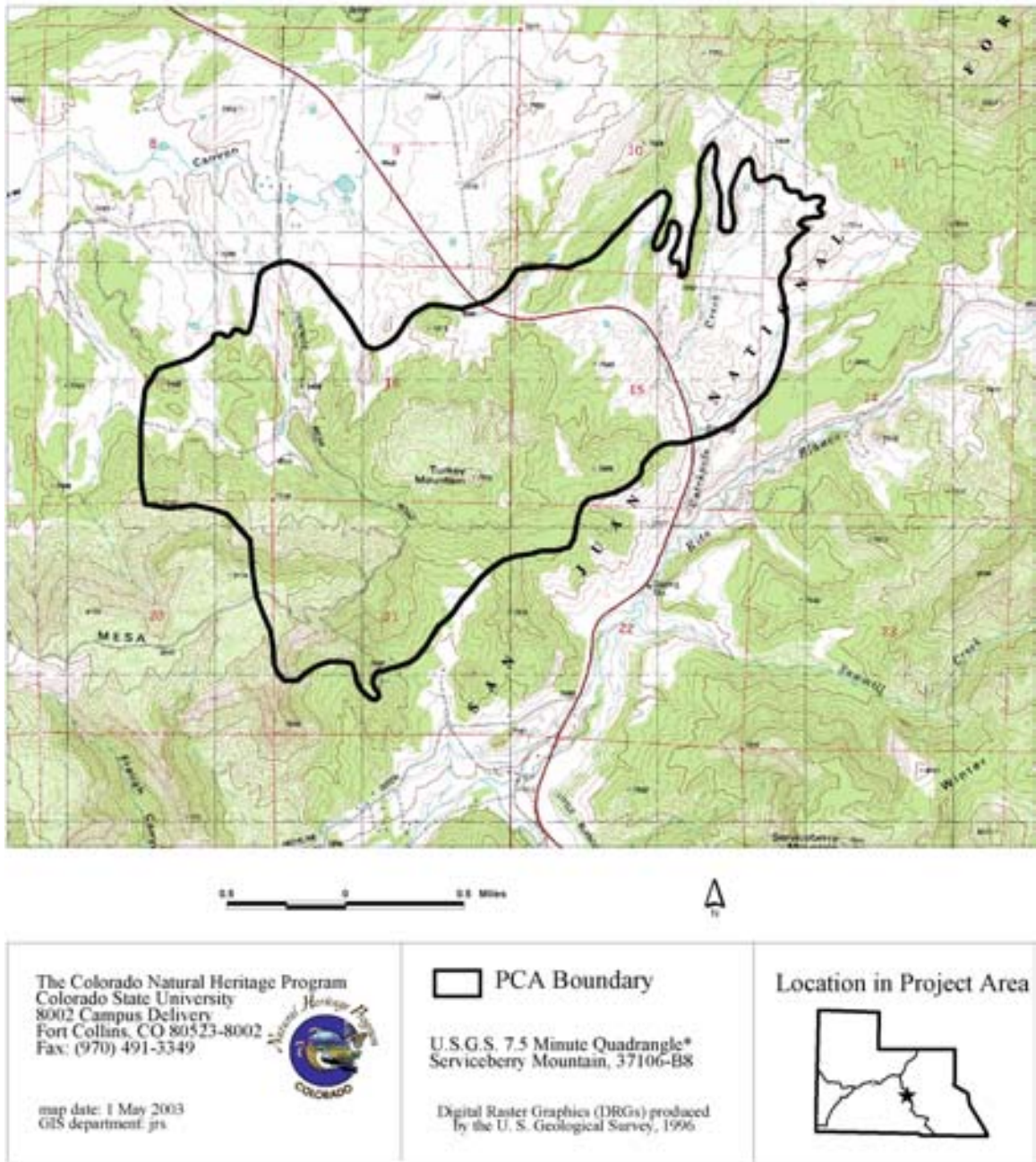


Fig. 20. Turkey Mountain Potential Conservation Area.

## Potential Conservation Area Profiles: B3 PCAs

### Buckles Lake

**Biodiversity Rank: B3 (High significance)**

The Buckles Lake PCA contains an excellent (A rank) occurrence of a Montane Riparian Willow Carr (*Salix monticola*/Mesic Graminoid) wetland community that is globally vulnerable (G3). There are also excellent (A rank) occurrences of *Carex* (*Carex aquatilis*-*Carex utriculata*) and *Caltha leptosepala* Montane Wet Meadow communities in the PCA, both of which are globally secure (G4).

**Protection Urgency Rank: P5 (No urgency)**

Land protection is complete and no protection actions are needed; this PCA is entirely within the Sam Juan National Forest.

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the wetlands in this PCA, but management actions may be needed in the future to maintain the current quality of the area. Recreation and grazing should be monitored as they may impact sedimentation rates and result in the introduction of non-native plants. Exotic plant species along the southern boundary of the PCA should be monitored for encroachment into the PCA.

**Location:** Archuleta County, approximately 0.7 miles south of Harris Lake and 1 1/4 mile NW of V mountain.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Harris Lake  
T34NR1E S35

**Size:** 39 ac (16 ha)

**Elevation:** 9,500 to 9,600 ft (2,896 to 2,926 m)

**General Description:** This wetland PCA lies in a small basin west of the Chalk Mountains. Buckles Lake feeds the wetland from the north and due north another mile lies Harris Lake. A number of small ponds and marsh areas lie in the small basin in a chain between the two lakes, forming a mosaic of wetland and riparian habitats with abundant standing water and tiny channels. Runoff from numerous small drainages of the Chalk Mountains to the east supplies water to the basin. The basin including Buckles and Harris Lakes feeds a number of small drainages to the west that supply Big Branch a tributary of the Rio Blanco River. An abundance of birds and insects occupy the basin and a trail skirts Buckles Lake on its west side. A forest service road ends within one quarter mile of the lake and recreational use by hikers, fisherman and hunters in the basin is high. A number of uncommon wetland and riparian communities are found in the PCA including two types of Montane Wet Meadows (*Carex aquatilis*-*Carex utriculata* and *Caltha leptosepala*) and Montane Riparian Willow Carr (*Salix monticola*/mesic

*graminoid*). Shrubs cover 30% of the PCA, graminoids 50% and forbs 27%. Common species include Rocky Mountain willow (*Salix monticola*), plane-leaf willow (*Salix planifolia*), water sedge (*Carex aquatilis*), Northwest Territory sedge (*Carex utriculata*), marsh marigold (*Caltha leptosepala*) and bedstraw (*Galium* spp.).

**Biodiversity Rank Comment:** The Buckles Lake PCA contains an excellent (A rank) occurrence of a Montane Riparian Willow Carr (*Salix monticola*/*Mesic Graminoid*) wetland community that is globally vulnerable (G3). This association is a tall (5-8 ft., 1.5-2.5 m), deciduous shrubland, with an open to closed canopy of willows on broad, gentle floodplains, or in narrow canyon bottoms. It is known only from Colorado at six documented locations, and an additional twenty to fifty stands are estimated to occur. Stands with intact, native, herbaceous undergrowth are threatened by improper livestock grazing, inappropriate stream flow alterations, and heavy recreational use.

There are also excellent (A rank) occurrences of *Carex* (*Carex aquatilis*-*Carex utriculata*) and *Caltha leptosepala* Montane Wet Meadow communities in the PCA, both of which are globally secure (G4).

**Table 21. Natural Heritage element occurrences at the Buckles Lake PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
<b>Plant Communities</b>								
<b><i>Salix monticola</i>/ <i>Mesic Graminoid</i></b>	<b>Montane Riparian Willow Carr Wetland</b>	<b>G3</b>	<b>S3</b>				<b>A</b>	<b>1994-06-23</b>
<b><i>Carex aquatilis</i>- <i>Carex utriculata</i></b>	<b>Carex Montane Wet Meadows</b>	<b>G4</b>	<b>S4</b>				<b>A</b>	<b>1994-06-23</b>
<b><i>Caltha leptosepala</i></b>	<b>Marsh Marigold Montane Wet Meadows</b>	<b>G4</b>	<b>S4</b>				<b>A</b>	<b>1994-06-23</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundaries incorporate an area that will allow natural hydrological processes such as seasonal flooding, sediment deposition, and new channel formation to maintain a viable population of the wetland communities within the PCA. The boundaries also provide a small buffer from nearby trails and roads where surface runoff may contribute excess nutrients and sediment. It should be noted that the hydrological processes necessary to the elements are not fully contained by the site boundaries. Given that the elements are dependent on natural hydrological processes associated with runoff from the Chalk Mountains, activities such as water diversions, impoundments in the mountains, and improper livestock grazing along the wetland are detrimental to the hydrology of the riparian area. This boundary indicates the minimum area that should be considered for any conservation management plan.

**Protection Comments:** No protection actions are needed as this PCA is within the San Juan National Forest.

**Management Comments:** Current management seems to favor the persistence of the wetlands in this PCA, but management actions may be needed in the future to maintain the current quality of the area. There is evidence of grazing nearby, but it does not appear to be heavy at this time. Recreation and grazing should be monitored as they may impact sedimentation rates and result in the introduction of non-native plants. Exotic plant species along the southern boundary of the PCA should be monitored for encroachment into the PCA. A population of northern leopard frogs is recorded from the area and its exact location needs verification.

# Buckles Lake

## Potential Conservation Area

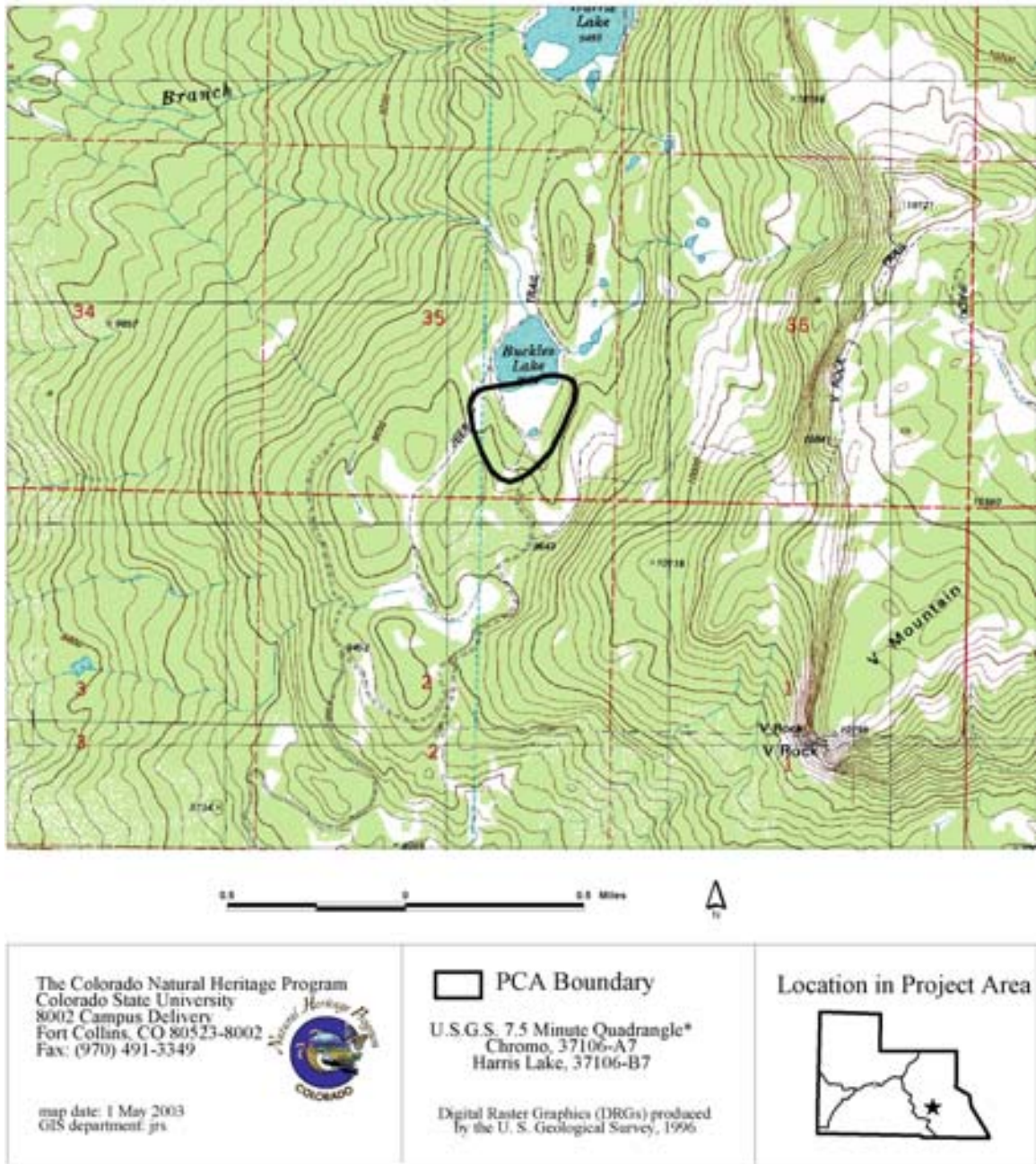


Fig. 21. Buckles Lake Potential Conservation Area.

## Death Valley Creek

**Biodiversity Rank: B3 (High significance)**

The Death Valley Creek PCA is drawn for a good (B rank) occurrence of a Box elder/Red-oiser dogwood (*Acer negundo*/*Cornus sericea*), Montane Riparian Deciduous Forest, a globally vulnerable (G3) plant community.

**Protection Urgency Rank: P5 (No urgency)**

Land protection is complete and no protection actions are needed. The PCA is entirely within the San Juan Forest and protection should be adequate.

**Management Urgency Rank: M4 (Low urgency)**

Current management practices seem to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. Management of non-native plant species may be needed in the near future and the upper watershed has a history of timber harvest, which may continue in the future.

**Location:** Archuleta County, at Death Valley Creek, 0.3 miles upstream of its confluence with Sheep Creek in northwestern Archuleta County.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Devil Mountain, Baldy Mountain  
T35NR5W S12

**Size:** 121 ac (49 ha)

**Elevation:** 7,480 to 8,000 ft (2,280 to 2,438 m)

**General Description:** The Death Valley PCA lies within a narrow steeply banked valley cut by Death Valley Creek, a tributary of Sheep Creek. The creek originates in a meadow system that has been heavily logged. Some areas along the steep sides of the valley with up to a 60% slope are eroded with less vegetation, while other areas are rocky and contain large boulders. Death Valley Creek is a small intermittent creek with several yet smaller creeks and drainages flowing into it from both sides of the valley. Hydrological processes appear to be intact and seasonal flooding appears to occur in the area. The area is forested with box elder (*Acer negundo*) and blue spruce (*Picea pungens*) dominating the overstory; mountain maple (*Acer glabrum*), dogwood (*Cornus sericea*) and alder (*Alnus incana*) are also present. A dense understory of mesic forbs covers the ground. A Box elder/Red-oiser Dogwood (*Acer negundo*/*Cornus sericea*) Montane Riparian Deciduous Forest occurs along the creek within the boundaries of the PCA.

**Biodiversity Rank Comment:** The Death Valley Creek PCA is drawn for a good (B rank) occurrence of a Box elder/Red-oiser dogwood (*Acer negundo*/*Cornus sericea*), Montane Riparian Deciduous Forest, a globally vulnerable (G3) plant community. This plant association is known from lower montane canyons in Utah and western Colorado.

There are less than fifty known global occurrences while there are less than ten stands known in Colorado.

**Table 22. Natural Heritage element occurrences at the Death Valley Creek PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plant Communities								
<i>Acer negundo/</i> <i>Cornus sericea</i>	<b>Box elder/</b> <b>Red-oiser</b> <b>dogwood</b> <b>Montane</b> <b>Riparian</b> <b>Deciduous</b> <b>Forest</b>	<b>G3?</b>	<b>S2</b>				<b>B</b>	<b>1994-07-03</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses the occurrence and an approximate 1000 foot buffer drawn to ensure all or most of the small drainages would continue to supply the hydrological input necessary to the natural water quality of the creek. This is vital to maintaining viability of the riparian montane forest. This boundary should protect the occurrence from direct disturbance, and is thought to protect the avian, macroinvertebrate and periphyton communities and limit impacts from sedimentation (see Noel et al. 1986, Spackman and Hughes 1995, Karr and Schlosser 1978). The PCA boundaries were not intended to capture the entire upstream watershed, although consideration of these areas is important to ensure that adequate hydrological processes continue acting in the watershed and maintain the riparian system's health.

**Protection Comments:** This PCA occurs in the San Juan National Forest and no protection actions are needed.

**Management Comments:** Current management practices seem to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. Hydrological processes originating outside of the planning boundary, including water quality, quantity, timing and flow must be managed to maintain site viability. Management of non-native plant species may be needed in the near future and the upper watershed has a history of timber harvest, which may continue in the future.

# Death Valley Creek Potential Conservation Area

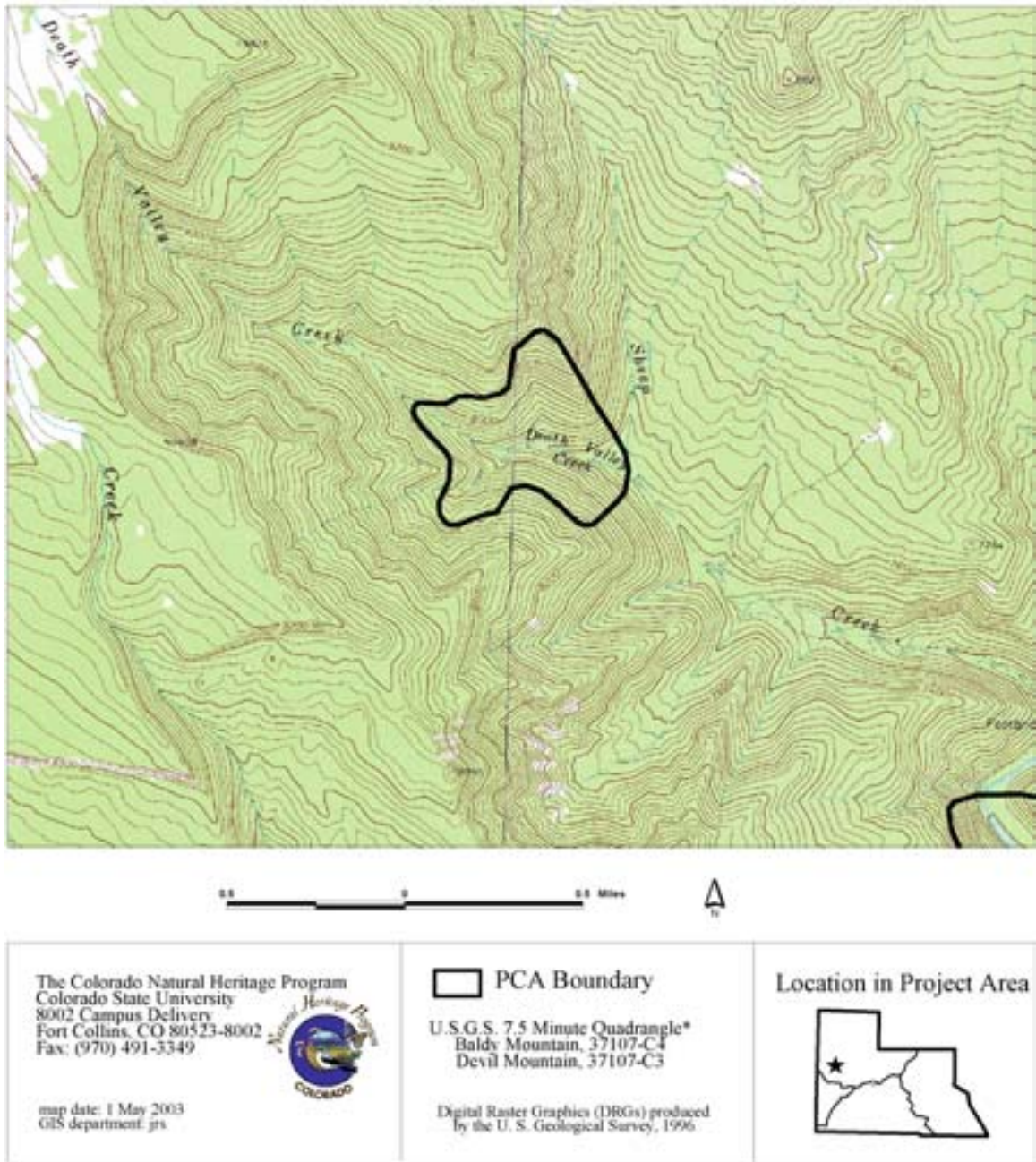


Fig. 22. Death Valley Creek Potential Conservation Area.

## Hunter Campground

**Biodiversity Rank: B3 (Moderate significance)**

This PCA contains a good (B rank) occurrence of Blue Spruce/Thinleaf Alder (*Picea pungens*/*Alnus incana*) Montane Riparian Forest, a plant community that is globally vulnerable (G3). This riparian plant association is somewhat widespread on the western slope of Colorado, and may also occur in Wyoming and New Mexico. While livestock grazing has negatively impacted many stands, and dams or hydrologic alterations are threats, the association does not appear to be rare or severely threatened.

**Protection Urgency Rank: P4 (Low urgency)**

This PCA is entirely within the San Juan National Forest and no protection actions are needed in the foreseeable future.

**Management Urgency Rank: M3 (Moderate urgency)**

New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. A monitoring program would aid in detecting non-native plant introductions and in indicating when management actions are needed to maintain the quality of the montane riparian forest community within the PCA.

**Location:** Archuleta County, at the end of First Fork Road (FDR 622) and northeast along the Piedra Trail to Hot Springs on river.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Devil Mountain  
T36NR4W S22, 27

**Size:** 298 ac (121 ha)

**Elevation:** 7,000 to 7,600 ft (2,134 to 2,317 m)

**General Description:** This PCA is situated along a relatively straight reach of the Piedra River just below Box Canyon in a narrow deep shaded canyon with side slopes dropping over 500 feet from steep ridges. The riparian forest along the Piedra River within the PCA contains a 35% cover of trees including blue spruce (*Picea pungens*) and Douglas fir (*Pseudotsuga menziesii*) with a 45% understory cover of shrubs consisting of thinleaf alder (*Alnus incana*), Utah serviceberry (*Amelanchier utahensis*) and chokecherry (*Prunus virginiana*). Forbs and graminoids including hooded coralroot (*Corallorrhiza striata*) and Geyer's sedge (*Carex geyeri*) cover over 30% of the ground. Just outside the south boundary of the PCA is the Piedra Hunter Campground and the Piedra Trail runs through the PCA along the river. As a result the area experiences heavy recreational use from hikers and horse riders.

**Biodiversity Rank Comment:** This PCA contains a good (B rank) occurrence of Blue Spruce/Thinleaf Alder (*Picea pungens*/*Alnus incana*) Montane Riparian Forest, a plant community that is globally vulnerable (G3). This riparian plant association is somewhat

widespread on the western slope of Colorado, and may also occur in Wyoming and New Mexico. In Colorado, it has been found in the Routt National Forest, south to the Rio Grande and San Juan National Forests. This association occurs along narrow to moderately wide floodplains and stream benches in narrow canyons subject to cold air drainage and limited sunlight, typically in small patches and scattered locations. Recent inventory efforts by the Colorado Natural Heritage Program have found this association to be more common in Colorado than previously thought. While livestock grazing has negatively impacted many stands, and dams or hydrologic alterations are threats, the association does not appear to be rare or severely threatened.

**Table 23. Natural Heritage element occurrences at the Hunter Campground PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plant Communities								
<i>Picea pungens</i> / <i>Alnus incana</i>	Blue Spruce/ Thinleaf Alder Montane Riparian Forest	G3	S3				B	1985-08-02

\*EO rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundaries incorporate an area that will allow natural hydrological processes such as seasonal flooding, sediment deposition, and new channel formation to maintain viable populations of the plant community along Piedra River. It should be noted that the hydrological processes necessary to the montane riparian forest are not fully contained by the site boundaries. Given that the community is dependent on natural hydrological processes associated with Piedra River, upstream activities such as water diversions, impoundments, and improper livestock grazing are detrimental to the hydrology of the riparian area. This boundary indicates the minimum area that should be considered for any conservation management plan.

**Protection Comments:** This PCA is entirely within the San Juan National Forest and no protection actions are needed in the foreseeable future.

**Management Comments:** New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. There is a potential for non-native species to increase with high recreation use (hiking and horseback riding). The area is easily accessed from the top of First Fork Road and recreational use of the trail along the Piedra River is intense. There is a potential for non-native species to increase with high recreation use (hiking and horseback riding). A monitoring program would aid in detecting non-native plant introductions and in indicating when management actions are needed to maintain the quality of the montane riparian forest community within the PCA.

Hydrological processes originating outside of the planning boundary, including water quality, quantity, timing and flow must be managed to maintain site viability.

# Hunter Campground

## Potential Conservation Area

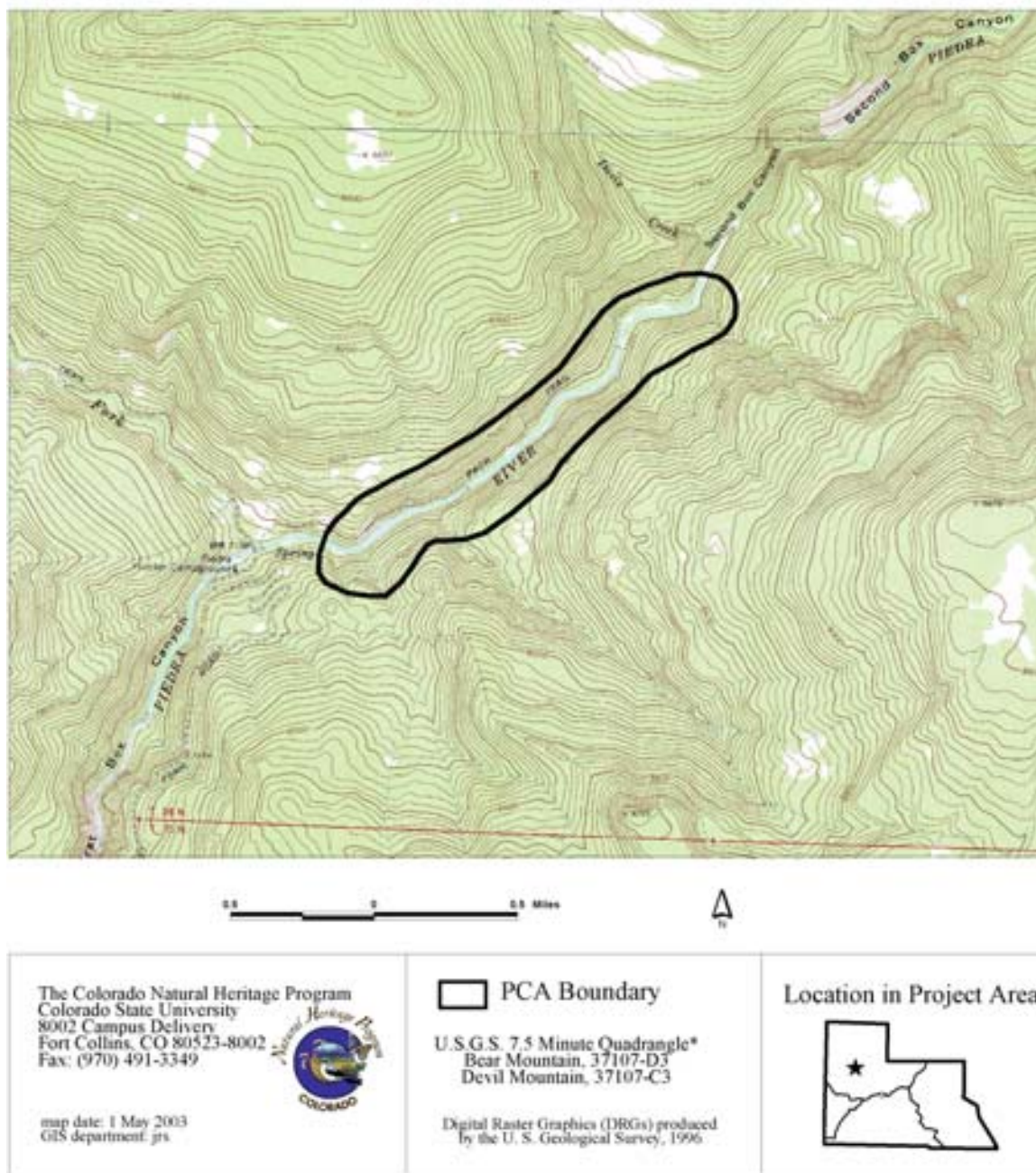


Fig. 23. Hunter Campground Potential Conservation Area.

## Indian Creek at Piedra River

**Biodiversity Rank: B3 (Moderate significance)**

The Indian Creek at Piedra River PCA contains three riparian community associations including one good (B rank) occurrence of Thinleaf Alder-Red-oiser Dogwood (*Alnus incana*-*Cornus sericea*) Riparian Shrubland that is globally vulnerable (G3).

**Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. A small bit of private land within the PCA has a conservation easement and the rest of the PCA is within the San Juan National Forest.

**Management Urgency Rank: M3 (Moderate urgency)**

New management actions may be needed within 5 years to maintain the current quality of the plant community occurrences in the PCA. Impacts resulting from timber harvest, and invasion of non-native species along the trail present in the PCA may require management action.

**Location:** Archuleta County, along First Fork Road at Indian Creek, 100 yards upstream from its confluence with the Piedra River.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Devil Mountain  
T35NR4W S17, 18  
T35NR5W S24

**Size:** 633 ac (256 ha)

**Elevation:** 6,800 to 7,800 ft (2,073 to 2,377 m)

**General Description:** The Indian Creek at Piedra River PCA includes a small creek (Heflin Creek) that runs through upland meadows and aspen-ponderosa pine forests that are logged and grazed before falling into a hole cut through the limestone into a narrow canyon with steep sides that include intermittent cliffs. Beaver ponds are present in the upstream meadows and natural flooding appears to occur along Heflin Creek within the PCA. On the steep slopes are found mixed conifer forests with ponderosa pine (*Pinus ponderosa*), white fir (*Abies lasiocarpa*), blue spruce (*Picea pungens*) and Engelmann spruce (*Picea engelmannii*). There are huge boulders in intermittent locations along the base of the canyon and little soil is evident in these areas except for in tiny pockets. Shrubs including thinleaf alder (*Alnus incana*), red-oiser dogwood (*Cornus sericea*), coyote willow (*Salix exigua*) and dewystem willow (*Salix irrorata*) form a riparian shrub zone along Heflin Creek. There is a thick covering of mesic forbs in the understory with some Geyer's sedge (*Carex geyeri*). There is also a prominent population of non-native species including dandelion (*Taraxacum officinale*) and Kentucky bluegrass (*Poa pratensis*). A number of uncommon riparian plant communities occupy the PCA including Box elder Red-oiser Dogwood Riparian Deciduous Forest (*Acer*

*Negundo/Cornus sericea*), Thinleaf Alder/Red-oiser Dogwood Riparian shrubs (*Alnus incana-Cornus sericea*) and a Coyote Willow/Mesic Graminoid community (*Salix exigua*/Mesic Graminoid).

**Biodiversity Rank Comment:** The Indian Creek at Piedra River PCA contains three riparian community associations including one good (B rank) occurrence of Thinleaf Alder-Red-oiser Dogwood (*Alnus incana-Cornus sericea*) Riparian Shrubland that is globally vulnerable (G3). This riparian plant association is widely spread throughout the western U.S. and in Colorado it is an uncommon association restricted to small tributaries and narrow, constricted reaches of larger rivers.

There is also a fair (C rank) occurrence of a globally vulnerable (G3) Box elder/Red-oiser Dogwood (*Acer negundo/Cornus sericea*) Montane Riparian Deciduous Forest and a good (B rank) occurrence of a globally secure (G5) Coyote Willow (*Salix exigua*)/Mesic Graminoid community in this PCA.

**Table 24. Natural Heritage element occurrences at the Indian Creek at Piedra River PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plant Communities								
<i>Alnus incana-Cornus sericea</i>	<b>Thinleaf Alder-Red-oiser Dogwood Riparian Shrubland</b>	<b>G3Q</b>	<b>S3</b>				<b>B</b>	<b>1994-07-02</b>
<i>Acer negundo/Cornus sericea</i>	Box elder/Red-oiser Dogwood Montane Riparian Deciduous Forest	G3	S2				C	1994-07-02
<i>Salix exigua</i> /Mesic Graminoid	Coyote Willow/Mesic Graminoid	G5	S5				C	1994-07-02

\*EO rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses the occurrence and includes a buffer of approximately 1,000-feet. Eliminating disturbance within this 1,000-foot buffer would assist in maintaining the integrity of the occurrence, and the integrity of the avian, macroinvertebrate and periphyton communities (Noel et al. 1986, Spackman and Hughes 1995) associated with the riparian forest. Maintenance of this 1,000-foot buffer would also aid in reducing impacts from sedimentation (Karr and Schlosser 1978) resulting from increased erosion, which occurs in areas where streamside vegetation is removed or degraded.

**Protection Comments:** The PCA occurs within the San Juan National forest with a small part occupying private land along the Piedra River. This private land, however, has a conservation easement and no protection actions are needed.

**Management Comments:** New management actions may be needed within 5 years to maintain the current quality of the plant community occurrences in the PCA. Management actions may be needed to address upstream and cumulative watershed impacts resulting from timber harvest, and invasion of non-native species along the trail present in the PCA.

Hydrological processes originating outside of the planning boundary, including water quality, quantity, timing and flow must be managed to maintain site viability.

# Indian Creek at Piedra River

## Potential Conservation Area

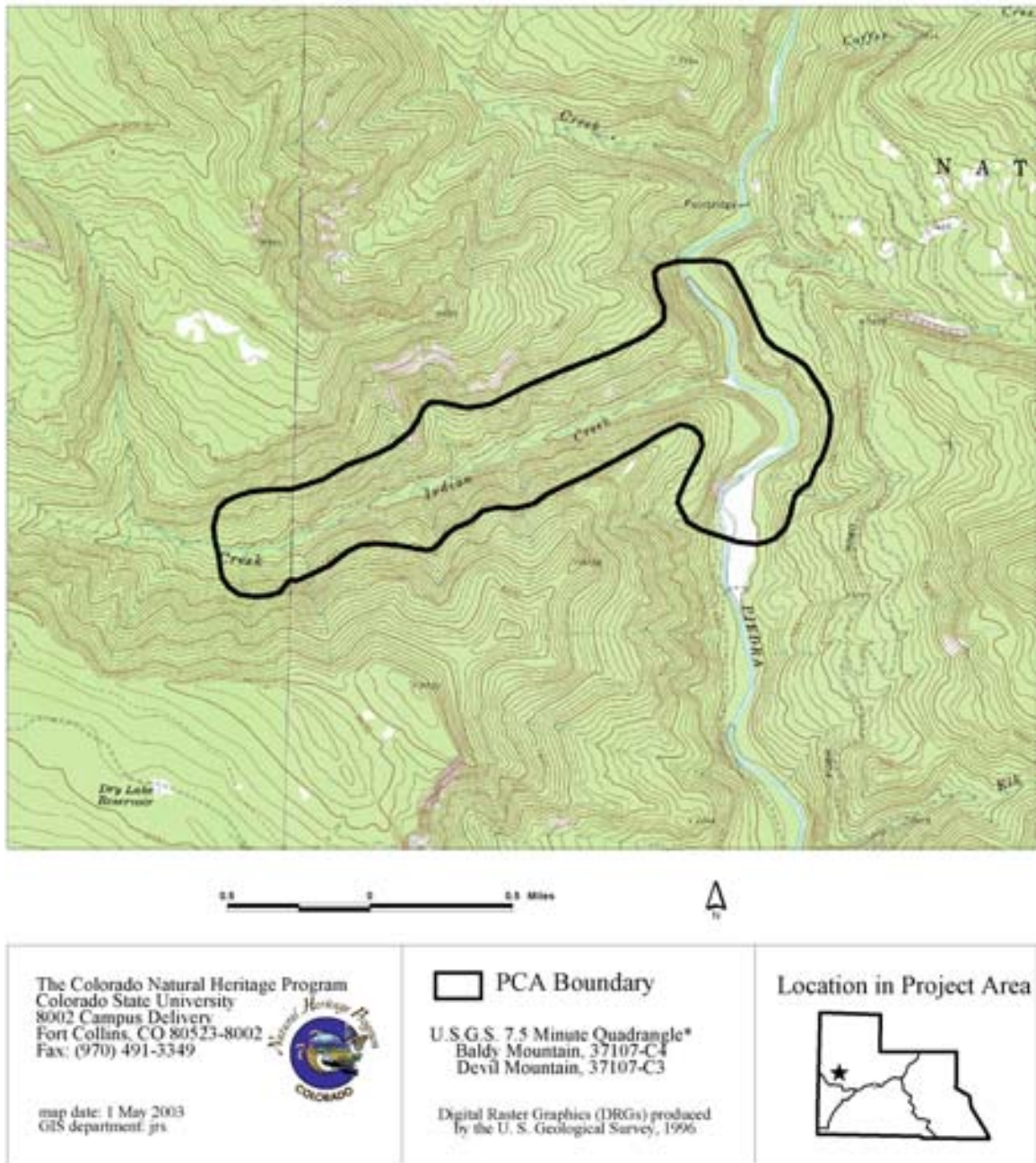


Fig. 24. Indian Creek at Piedra River Potential Conservation Area.

## Newt Jack Spring Reservoir

**Biodiversity Rank: B3 (High significance)**

The Newt Jack Spring Reservoir PCA includes one good (B rank) occurrence of a rare wetland community the Beaked Willow (*Salix bebbiana*) Montane Carr, which is globally vulnerable (G3?). This plant association is found in the montane regions and western plains of the United States, ranging from South Dakota and Montana south to New Mexico. There is also a fair (C rank) occurrence of the globally secure (G5) Beaked Sedge Montane Wetland (*Carex utriculata*). This wetland association is found at montane and subalpine elevations throughout much of the western U.S.

**Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. There has been much residential development in the vicinity of this PCA in the last 5 years. However, This PCA is located on the San Juan National Forest and current protection is adequate.

**Management Urgency Rank: M4 (Low urgency)**

New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Expected increases in recreational use at this PCA have the potential to introduce non-native plant species and new management actions may be needed to maintain the current quality of the montane wetlands in the PCA.

**Location:** Archuleta County, Newt Jack Springs 1.2 miles east of Turkey Spring Reservoir approximately 5 miles due northwest of the city of Pagosa Springs.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Chris Mountain  
T35NR2W S2, 3

**Size:** 92 ac (37 ha)

**Elevation:** 7,920 to 7,970 ft (2,414 to 2,429 m)

**General Description:** The Newt Jack Spring Reservoir PCA encompasses a wet meadow with a small pond dominated by aquatic vegetation. On the outer edges of the pond are drier meadows. Only about 50 square meters of the pond is actually open water the remainder is filled with aquatic vegetation. This wetland is mapped as Newt Jack Spring Reservoir, but no embankment is visible and although the area appears pristine it may have been cleared of vegetation and dammed in the distant past. This spring fed wetland appears to have seasonal and intermittent flow that drains to the southeast although no channel is apparent.

Near the spring aspen (*Populus tremuloides*) and ponderosa pine (*Pinus ponderosa*) dominate the overstory with beaked willow (*Salix bebbiana*) in the understory. There is a dense covering of graminoids and forbs including smallwing sedge (*Carex microptera*), redtop (*Agrostis gigantea*), northern bedstraw (*Galium boreale*), beautiful cinquefoil

(*Potentilla pulcherrima*) and aster (*Aster* spp.). Areas upslope from the spring are dominated by ponderosa pine and Gambel oak (*Quercus gambelii*). The area surrounding the spring supports a Beaked Willow (*Salix bebbiana*) Montane Carr.

There is a road that runs directly to the west of the wetland an older, closed road runs through the west edge of the PCA. Because of this road access, the area sees a great deal of recreational use, which has resulted in the introduction of non-native plant species including Kentucky bluegrass (*Poa pratensis*), meadow timothy (*Phleum pratense*) and dandelions (*Taraxacum officinale*).

**Biodiversity Rank Comment:** The Newt Jack Spring Reservoir PCA includes one good (B rank) occurrence of a rare wetland community the Beaked Willow (*Salix bebbiana*) Montane Carr, which is globally vulnerable (G3?). This plant association is found in the montane regions and western plains of the United States, ranging from South Dakota and Montana south to New Mexico. This community is a briefly flooded scrub-shrub wetland on slightly to moderately alkaline soils, usually near low-gradient streams. This shrubland is typically dominated by a dense growth of shrubs 0.5-3 m tall. The most abundant species in the shrub layer are *Salix bebbiana*, *Salix scouleriana*, and *Salix lucida* ssp. *caudata* (= *Salix fendleriana*).

There is also a fair (C rank) occurrence of the globally secure (G5) Beaked Sedge (*Carex utriculata*) Montane Wetland. This wetland association is found at montane and subalpine elevations throughout much of the western U.S. Stands occur in montane and subalpine areas around the edges of lakes and beaver ponds, along the margins of slow-moving reaches of streams and rivers, and in marshy swales and overflow channels on broad floodplains. Sites are flat to undulating, often with a hummocky micro-topography. The water table is usually near the surface for most of the growing season. Stands often appear to be nearly pure *Carex utriculata*, but a variety of other graminoid species may be present as well.

**Table 25. Natural Heritage element occurrences at the Newt Jack Spring Reservoir PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plant Communities								
<b><i>Salix bebbiana</i></b>	<b>Beaked Willow Montane Carr</b>	23?5	S2				<b>B</b>	<b>1994-06-14</b>
<i>Carex utriculata</i>	Beaked Sedge Montane Wetland	G5	S4				C	1994-06-14

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses the occurrence and includes a buffer of approximately 1,000-feet. Eliminating disturbance within this 1,000-foot buffer would assist in maintaining the integrity of the occurrence, and the integrity of the avian, macroinvertebrate and periphyton communities (Noel et al. 1986, Spackman and Hughes

1995) associated with the riparian forest. Maintenance of this 1,000-foot buffer would also aid in reducing impacts from sedimentation (Karr and Schlosser 1978) resulting from increased erosion, which occurs in areas where streamside vegetation is removed or degraded.

**Protection Comments:** No protection actions are needed in the foreseeable future. There has been much residential development in the vicinity of this PCA in the last 5 years. However, This PCA is located on the San Juan National Forest and current protection is adequate.

**Management Comments:** New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Population growth in the surrounding area has increased recreational pressures and this easily accessed PCA will continue to see increased numbers of recreational users in the future. Increased recreational use has the potential to introduce non-native plant species and new management actions may be needed within 5 years to maintain the current quality of the montane wetlands within the PCA.

# Newt Jack Spring Reservoir

## Potential Conservation Area

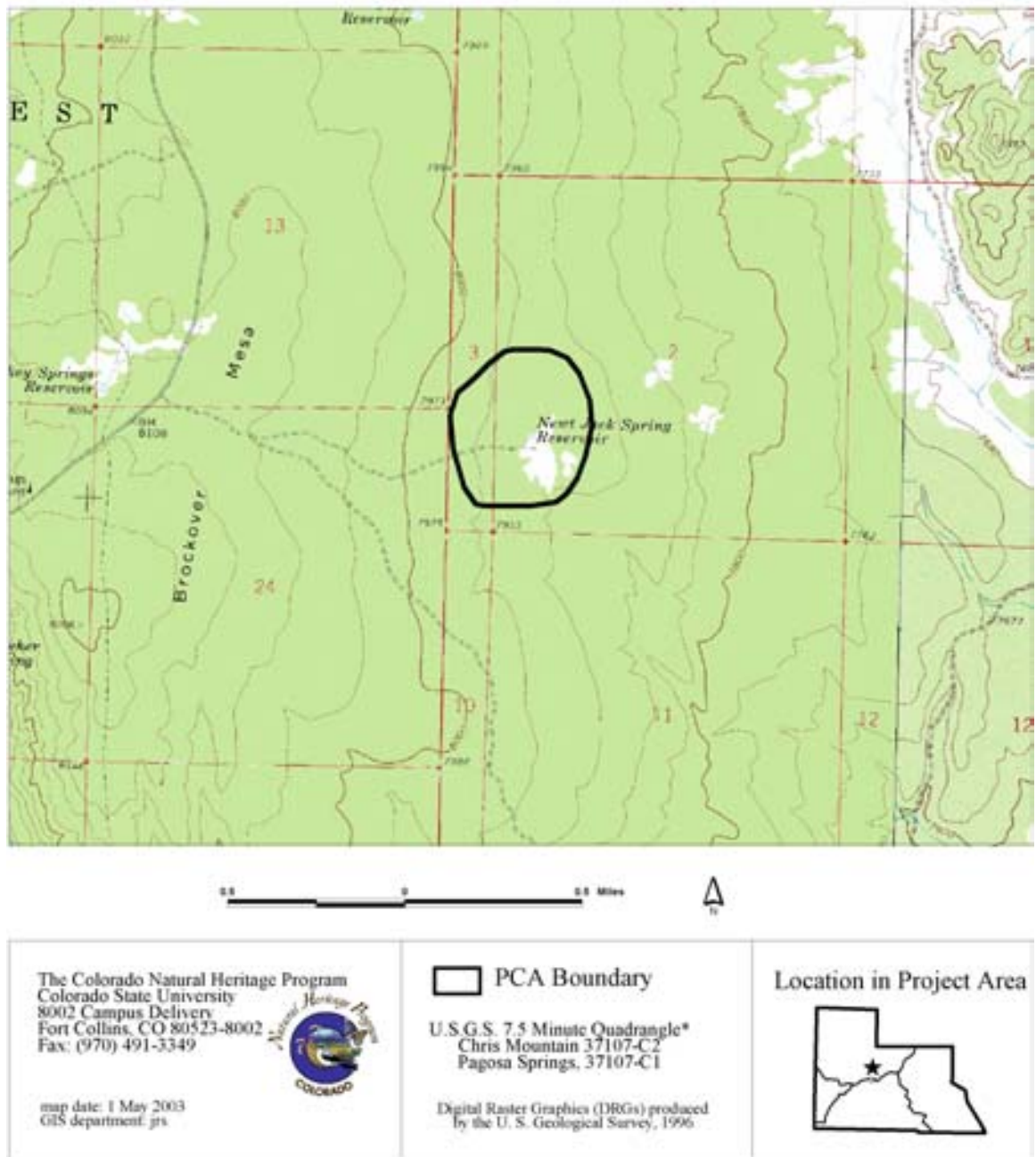


Fig. 25. Newt Jack Spring Reservoir Potential Conservation Area.

## Piedra

**Biodiversity Rank: B3 (Moderate significance)**

This PCA is home to three plant species that are rare (S2) in Colorado, although apparently secure (G4) globally. There is also a good (B rank) occurrence of the canyon bog orchid (*Limnorchis ensifolia*), vulnerable in Colorado (S3) and a fair (C rank) occurrence of Philadelphia fleabane (*Erigeron philadelphicus*), which is very rare in Colorado (S1).

**Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. The PCA is entirely within the San Juan National Forest.

**Management Urgency Rank: M3 (Moderate urgency)**

New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. The seep area is vulnerable to maintenance of the power line that passes through it, and is also dependent on continuation of the present hydrology.

**Location:** Archuleta County, north of Highway 160 at Piedra on First Fork Road, about 17 miles west of Pagosa Springs.

**Legal Description:**

U.S.G.S. 7.5 minute quadrangle: Chimney Rock

T34N R4W S5, 8

T35N R4W S32

**Size:** 410 ac (166 m)

**Elevation:** 6,600 to 7,800 ft (2,012 to 2,377 m)

**General Description:** The Piedra PCA is located on the hillsides above the Piedra River, in ponderosa pine (*Pinus ponderosa*) and Douglas fir (*Pseudotsuga menziesii*) forest. A seep above First Fork Road about a tenth of a mile north of the National Forest boundary is the site of three rare plants, the helleborine (*Epipactis gigantea*), canyon bog orchid (*Limnorchis ensifolia*) and Philadelphia fleabane (*Erigeron philadelphicus*). This small area has a powerline running through it and a road adjacent. The Aztec milkvetch (*Astragalus proximus*) was found on the west side of the river, in ponderosa pine and Gambel oak forest, south of the Lower Piedra campground.

**Biodiversity Rank Justification:** This PCA is home to three plant species that are rare (S2) in Colorado, although apparently secure (G4) globally. The site rank is based on good (B rank) occurrences of Aztec milkvetch (*Astragalus proximus*) and helleborine (*Epipactis gigantea*), both rare in Colorado (S2). There is also a good (B rank) occurrence of the canyon bog orchid (*Limnorchis ensifolia*), vulnerable in Colorado (S3) and a fair (C rank) occurrence of Philadelphia fleabane (*Erigeron philadelphicus*), which

is very rare in Colorado (S1). The Aztec milkvetch occurs in New Mexico and twelve known locations in Colorado.

**Table 26. Natural Heritage element occurrences at the Piedra PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
<b>Plants</b>								
<i>Astragalus proximus</i>	<b>Aztec milkvetch</b>	<b>G4</b>	<b>S2</b>			<b>FS/BLM</b>	<b>B</b>	<b>2001-06-20</b>
<i>Epipactis gigantea</i>	<b>Helleborine</b>	<b>G4</b>	<b>S2</b>			<b>FS/BLM</b>	<b>B</b>	<b>2001-07-11</b>
<i>Epipactis gigantea</i>	Helleborine	G4	S2			FS/BLM	E	
<i>Limnorchis ensifolia</i>	Canyon bog orchid	G4G5T 3?	S3				B	2001-07-11
<i>Erigeron philadelphicus</i>	Philadelphia fleabane	G5	S1				C	2001-07-11

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary includes the four element occurrences, located on the hillsides on both sides of the Piedra River, north of State Highway 160. The site was enlarged in 2001 to include the new location of Aztec milkvetch.

**Protection Rank Comments:** The PCA is entirely within the San Juan National Forest, and should need no further protection beyond that provided by the sensitive species status of Aztec milkvetch and helleborine.

**Management Rank Comments:** New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. The seep area is vulnerable to maintenance of the power line that passes through it, and is also dependent on continuation of the present hydrology. Coordination between power company personnel and the Forest Service when maintenance activities are planned would help prevent future damage to the rare plants. The seep hydrology is an important consideration when activities such as logging are initiated by the National Forest in this area.

# Piedra

## Potential Conservation Area

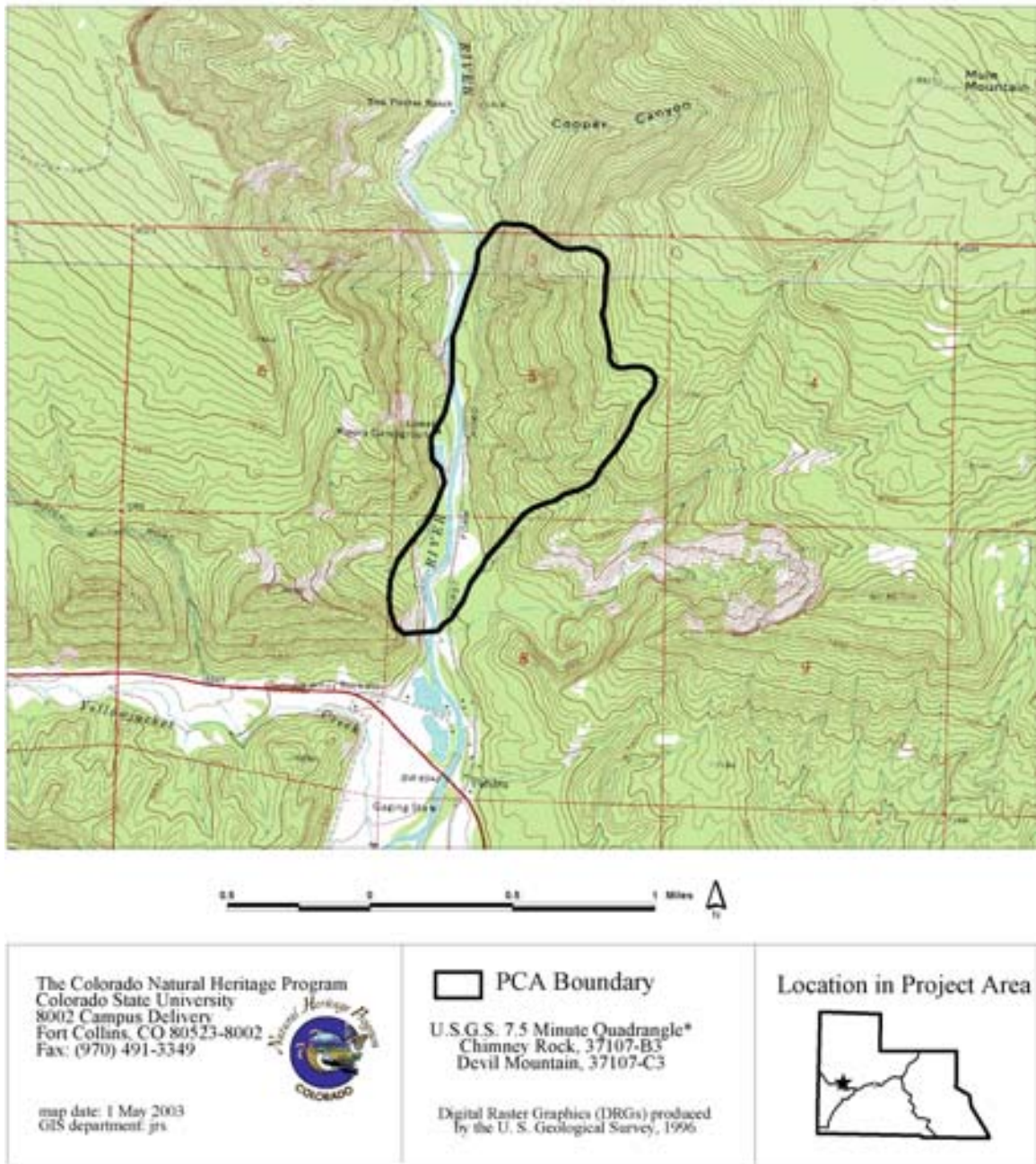


Fig. 26. Piedra Potential Conservation Area.

## Sand Creek

**Biodiversity Rank: B3 (High significance)**

This site contains excellent (A rank) and good (B rank) occurrences of two riparian plant communities, one of which is vulnerable (G3), the other secure (G4), on a global scale. The Thinleaf Alder (*Alnus incana*)/Mesic Graminoid Montane Riparian Shrubland in Colorado is known from only 15 locations. This shrubland association is a widespread community of limited extent in the western states of Idaho, Colorado, Utah, Wyoming and Nevada. A Narrowleaf Cottonwood-Blue Spruce/Thinleaf Alder (*Populus angustifolia*-*Picea pungens*/*Alnus incana*) Montane Riparian Forest also occurs within this PCA. This plant association is a common (S4) riparian woodland in Colorado.

**Protection Urgency Rank: P4 (low urgency)**

No protection actions are needed in the foreseeable future. This PCA ownership is mixed between US Forest Service land and Southern Ute Tribal Land. Current protection is adequate.

**Management Urgency Rank: M3 (Moderate urgency)**

New management actions may be needed within 5 years to maintain the current quality of the riparian plant communities in the PCA. Intensive recreational use in the area including camping has the potential to increase introduction of exotic plant species. A trail above the creek along the first two miles of the PCA increases the potential for erosion. Monitoring for erosion and exotic plant species would aid in determining the need and timing of management actions necessary to prevent degradation of the riparian communities within the PCA.

**Location:** Archuleta County, in the northeastern portion of the county at Sand Creek, approximately 1000 feet upstream of its confluence with the East Fork of the San Juan River.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Blackhead Peak, Wolf Creek Pass  
T36NR1E S3, 4

**Size:** 863 ac (349 ha)

**Elevation:** 8,000 to 8,840 ft (2,438 to 2,694 m)

**General Description:** The Sand Creek PCA encompasses a montane riparian area along Sand Creek, a tributary of the East Fork of the San Juan River. A moderately narrow canyon with steep slopes characterizes the area with over 400 feet in relief from rim to canyon bottom. Terraces and floodplains of the canyon bottom are scattered with pockets of narrowleaf cottonwood (*Populus angustifolia*), blue spruce (*Picea pungens*) and Douglas fir (*Pseudotsuga menziesii*). Thinleaf alder (*Alnus incana*) and Drummond's willow (*Salix drummondiana*) also occur along the banks of the creek. An upland trail follows the creek from its confluence with the San Juan River,

which after two miles drops to the streamside and follows along the riparian area of Sand Creek.

Two rare plant communities occur along Sand Creek within the PCA including a Thinleaf Alder (*Alnus incana*)/Mesic Graminoid Montane Riparian Shrubland and a Narrowleaf Cottonwood-Blue Spruce/Thinleaf Alder (*Populus angustifolia*-*Picea pungens*/*Alnus incana*) Montane Riparian Forest. Other shrubs within these communities include sandbar willow (*Salix exigua*), bluestem willow (*Salix irrorata*), yellow willow (*Salix ligulifolia*) and Rocky Mountain willow (*Salix monticola*). All told, shrubs cover 100% of the riparian zone within the PCA and there is a 50% cover of graminoids and forbs including Canada reedgrass (*Calamagrostis canadensis*), horsetail (*Equisetum arvense*) and willow herb (*Epilobium saximentanum*). Within the forested areas the tree canopy forms a cover of 80% canopy cover and graminoids and forbs, including Virginia strawberry (*Fragaria virginiana*) and sidebells wintergreen (*Orthilia secunda*), cover 43% of the ground.

The entire PCA is near a major forest service road and the area receives high recreational use including camping, but the riparian plant communities seem unaffected and are very productive, diverse and pristine with few exotic plants. The natural flow characteristics along Sand Creek including seasonal flooding are also intact. Recreational activity could introduce new populations of non-native plants and increase erosion through reduction of vegetation cover and destabilization of the slope above the creek, along the trail.

**Biodiversity Rank Comment:** This site contains excellent (A rank) and good (B rank) occurrences of two riparian plant communities, one of which is vulnerable (G3), the other secure (G4), on a global scale. Thinleaf Alder (*Alnus incana*)/Mesic Graminoid Montane Riparian Shrubland is known from only 15 locations in Colorado. This shrubland association is a widespread community of limited extent in the western states of Idaho, Colorado, Utah, Wyoming and Nevada. Stands occur in narrow to moderately wide floodplains on stream benches, in association with abandoned meanders, on islands and pointbars and on hillside seeps. These shrublands are characterized by stands of medium-tall and tall, deciduous shrubs and a thick herbaceous undergrowth of wetland-indicator grasses, and little to no overstory tree canopy. Total shrub cover is usually over 50% and is dominated by thinleaf alder (*Alnus incana*), the diagnostic shrub. Other shrubs include, willow (*Salix* spp.), water birch (*Betula occidentalis*) and red-osier dogwood (*Cornus sericea*). The understory of undisturbed stands has a dense herbaceous cover including mannagrass (*Glyceria* spp.), sedge (*Carex* spp.) and horsetail (*Equisetum* spp.). Heavily disturbed stands have abundant non-native grasses. Several stands in Colorado are undisturbed with the undergrowth dominated by native graminoid cover.

A Narrowleaf Cottonwood-Blue Spruce/Thinleaf Alder (*Populus angustifolia*-*Picea pungens*/*Alnus incana*) Montane Riparian Forest also occurs within this PCA. This plant association is a common (S4) riparian woodland in Colorado. Stands have a mixed deciduous-evergreen tree canopy with narrowleaf cottonwood (*Populus angustifolia*) and blue spruce (*Picea pungens*) as codominants. Frequently, other conifer trees are present,

but not as abundant as blue spruce. The shrub understory is typically dense and diverse, but thinleaf alder (*Alnus incana*) is always present.

**Table 27. Natural Heritage element occurrences at the Sand Creek PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
<b>Plant Communities</b>								
<i>Alnus incana</i> / Mesic Graminoid	<b>Thinleaf Alder/Mesic Graminoid Montane Riparian Shrubland</b>	<b>G3</b>	<b>S3</b>				<b>A</b>	<b>1994-08-15</b>
<i>Populus angustifolia</i> - <i>Picea pungens</i> / <i>Alnus incana</i>	Narrowleaf Cottonwood-Blue Spruce/Thinleaf Alder Montane Riparian Forest	G4	S4				B	1994-08-15

\*EO rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundaries incorporate an area that will allow natural hydrological processes such as seasonal flooding, sediment deposition, and new channel formation to maintain viable populations of the riparian shrubland and forest along Sand Creek. It should be noted that the hydrological processes necessary to the riparian communities are not fully contained by the site boundaries. Given that the riparian communities are dependent on natural hydrological processes associated with Sand Creek and its tributaries, upstream activities such as water diversions, impoundments, improper livestock grazing, and development are detrimental to the hydrology of the riparian area. This boundary indicates the minimum area that should be considered for any conservation management plan. The boundary also includes an approximate 1000 foot buffer to control sedimentation, protect the aquatic and plant communities from direct disturbance such as trampling (See Karr and Schlosser 1978), and to allow additional individuals to become established over time.

**Protection Comments:** This PCA is mostly within the South San Juan Wilderness in the San Juan National Forest. This area has been identified as a potential Research Natural Area (RNA), but there is uncertainty surrounding its designation. Although, no protection actions are currently needed designation as and RNA will increase protection to this area, which sees intensive recreational use.

**Management Comments:** New management actions may be needed within 5 years to maintain the current quality of the riparian plant communities in the PCA. Intensive recreational use in the area including camping has the potential to increase introduction of exotic plant species. A trail above the creek along the first two miles of the PCA increases the potential for erosion. Portions of the trail running along Sand Creek also have the potential to increase sedimentation, erosion and thinning of the riparian

vegetation within the PCA. Monitoring for erosion and exotic plant species would aid in determining the need and timing of management actions necessary to prevent degradation of the riparian communities within the PCA.

Hydrological processes originating outside of the planning boundary, including water quality, quantity, timing and flow must be managed to maintain site viability.

# Sand Creek Potential Conservation Area

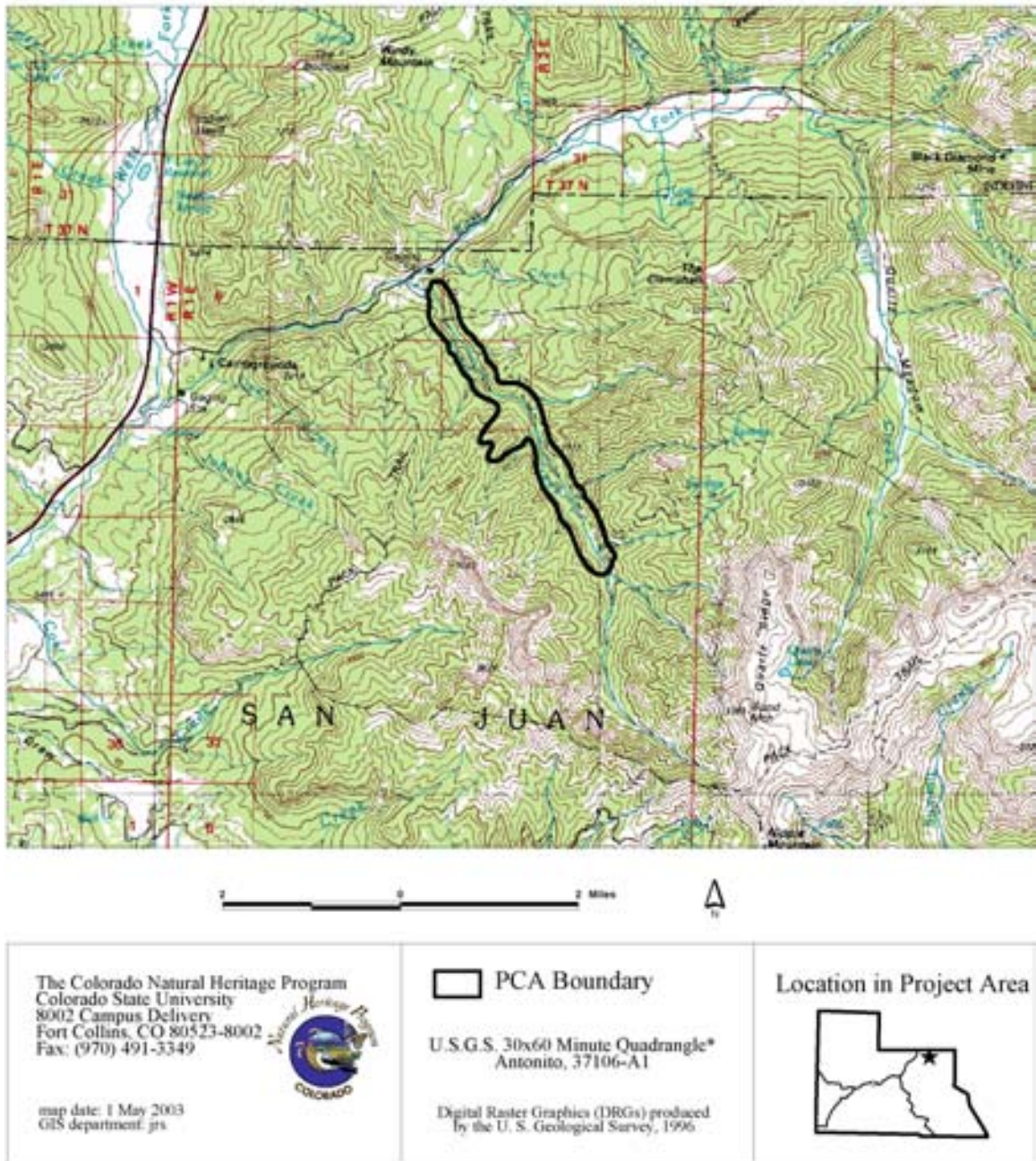


Fig. 27. Sand Creek Potential Conservation Area.

## Turkey Creek at Stollsteimer

**Biodiversity Rank: B3 (High significance)**

The Turkey Creek at Stollsteimer PCA contains a good (B rank) occurrence of Narrowleaf Cottonwood/Skunkbrush (*Populus angustifolia*/*Rhus trilobata*) Woodland, globally vulnerable (G3) plant community. This deciduous riparian woodland occurs on stream terraces and adjacent floodplains in canyons, mountains, and plateaus of Utah, Colorado, Wyoming and Idaho.

**Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. This PCA ownership is mixed between US Forest Service land and Southern Ute Tribal Land. Current protection is adequate.

**Management Urgency Rank: M4 (Low urgency)**

New management actions may be needed within 5 years to maintain the current quality of the narrowleaf cottonwood community and to reduce the potential effects on the occurrence from sedimentation, erosion and invasion by non-native plant species associated with recreational use and well drilling.

**Location:** Archuleta County, less than one half mile west of the Stollsteimer town site. Turn onto the Turkey Creek Road from Forest Service Road 613 and take a right at the fork in the road. Follow the road 1.7 miles from 613 to the meadow where this PCA is located.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Chimney Rock

T34NR5W S35

T33NR5W S2

**Size:** 179 ac (72 ha)

**Elevation:** 6,360 to 6,600 ft (1,939 to 2,012 m)

**General Description:** The Turkey Creek at Stollsteimer PCA occupies a wide valley along Turkey Creek, a tributary of the Piedra River. The valley is steeply sloped on its east side with more gentle slopes to the west. A Forest Service road runs through the PCA along Turkey Creek and the area experiences high use by hunters, other recreational users and from traffic along an access road to a drill pad located in the drainage. Turkey Creek is an intermittent stream, gullied in spots and with a strip of riparian vegetation tightly restricted to the streamside. Narrowleaf cottonwood (*Populus angustifolia*) is common in the valley bottom areas of the PCA, but becomes more intermittent towards the top of the drainage. Shrubs, including barberry (*Berberis fendleri*), skunkbrush (*Rhus trilobata*), wild rose (*Rosa woodsii*) and chokecherry (*Prunus virginiana*) form a dense understory cover of 85%. Forbs including starry false lily of the valley (*Maianthemum stellatum*) and Fendler's meadow-rue (*Thalictrum fendleri*) cover the ground. Ponderosa

pine (*Pinus ponderosa*) woodlands dominate the upslope areas. Along Turkey Creek there is a rare Narrowleaf Cottonwood/Skunkbrush (*Populus angustifolia/Rhus trilobata*) Woodland that has been little disturbed by the recreational and oil activity in the area.

**Biodiversity Rank Comment:** The Turkey Creek at Stollsteimer PCA contains a good (B rank) occurrence of the Narrowleaf Cottonwood/Skunkbrush (*Populus angustifolia/Rhus trilobata*) woodland, a globally vulnerable (G3) plant community. This deciduous riparian woodland occurs on stream terraces and adjacent floodplains in canyons, mountains, and plateaus of Utah, Colorado, Wyoming and Idaho. This community is one of the drier narrowleaf cottonwood plant associations. The association has an open, upper tree canopy that is dominated by narrowleaf cottonwood or lanceleaf cottonwood (*Populus X acuminata*). Other tree species may include box elder (*Acer negundo*), eastern cottonwood (*Populus deltoids*), water birch (*Betula occidentalis*), and Gambel oak (*Quercus gambelii*). A moderately dense to dense short-shrub layer dominated by skunkbush is diagnostic of this type.

**Table 28. Natural Heritage element occurrences at the Turkey Creek at Stollsteimer PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plant Communities								
<b><i>Populus angustifolia/Rhus trilobata</i></b>	<b>Narrowleaf Cottonwood/Skunkbrush Woodland</b>	<b>G3</b>	<b>S3</b>				<b>B</b>	<b>1994-06-06</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses the occurrence and includes a buffer of approximately 1,000-feet. Eliminating disturbance within this 1,000-foot buffer would assist in maintaining the integrity of the occurrence, and the integrity of the avian, macroinvertebrate and periphyton communities (Noel et al. 1986, Spackman and Hughes 1995) associated with the riparian forest. Maintenance of this 1,000-foot buffer would also aid in reducing impacts from sedimentation (Karr and Schlosser 1978) resulting from increased erosion, which occurs in areas where streamside vegetation is removed or degraded.

**Protection Comments:** Ownership of this PCA is mixed between the US Forest Service land and the Southern Ute. It is not expected that protection action will be needed in the foreseeable future, but any changes in use of the land or ownership may necessitate action.

**Management Comments:** New management actions may be needed within 5 years to maintain the current quality of the narrowleaf cottonwood community and to reduce the potential effects on the occurrence from sedimentation, erosion and invasion by non-native plant species associated with recreational use and well drilling.

Hydrological processes originating outside of the planning boundary, including water quality, quantity, timing and flow must be managed to maintain site viability.

# Turkey Creek at Stollsteimer Potential Conservation Area

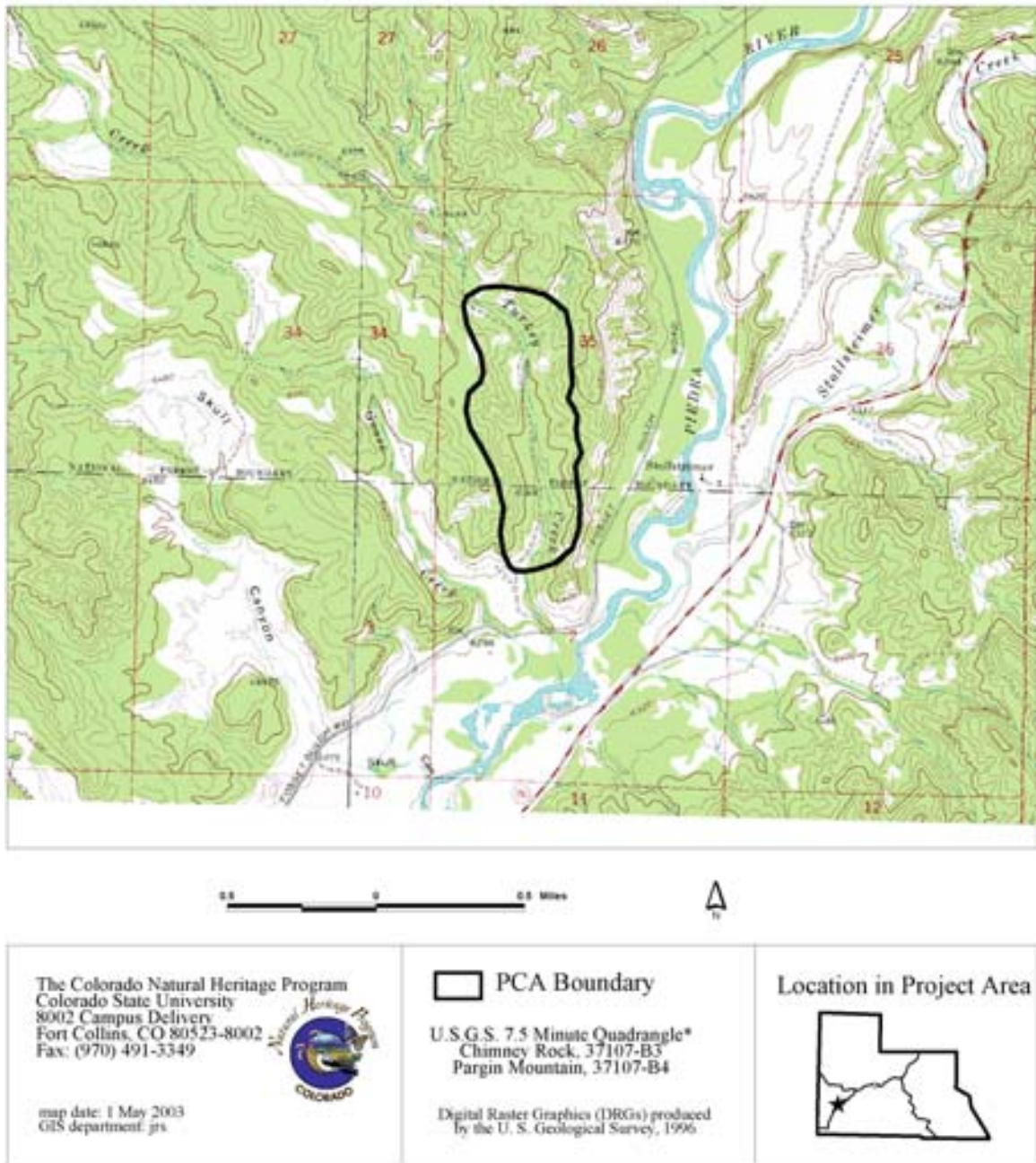


Fig. 28. Turkey Creek at Stollsteimer Potential Conservation Area.

## Upper Ignacio Creek

**Biodiversity Rank: B3 (High significance)**

The Upper Ignacio Creek PCA supports a good (B rank) occurrence of Narrowleaf Cottonwood-Douglas fir (*Populus angustifolia-Pseudotsuga menziesii*) Montane Riparian Forest, a globally imperiled (G2) plant community. This plant association is found only along small active streams in rocky, cool canyons and valleys in Colorado, Utah and Nevada. There are only 15 records of this community type in Colorado including locations in Archuleta, Chaffee, Fremont, Mineral, Park, Pitkin, San Juan and Teller counties.

**Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. The Upper Ignacio Creek PCA is entirely within the San Juan National Forest, in an isolated area that is difficult to access.

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor persistence of the Montane Riparian Forest in the PCA, but management actions may be needed in the future to maintain the current quality of the plant community. Roads in the area could allow access to off road recreational users and horse riders along the stream, which could cause disturbance, erosion and the introduction of non-native plant species. In addition, any expansion of oil development in the area could have deleterious effects on the PCA.

**Location:** Archuleta County, up Ignacio Creek from U.S. Highway 151 approximately four miles northwest of the Stollsteimer town site.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Pargin Mountain  
T34NR5W S29, 30

**Size:** 118 ac (48 ha)

**Elevation:** 6,960 to 7280 ft (2,121 to 2,219 m)

**General Description:** The PCA encompasses a steep, moderately sinuous stream with cascades and ponds. This isolated area can be accessed only from an undeveloped and unmarked trail, which has left the streamside plant community relatively undisturbed. As a result, there are few non-native plants in the PCA and the natural ecological processes such as stream recharge from snow melt and runoff are still functioning.

A healthy Narrowleaf Cottonwood-Douglas fir (*Populus angustifolia-Pseudotsuga menziesii*) Montane Riparian Forest exists along the stream. Old and tall narrowleaf cottonwoods dominate the streamside and some Douglas fir and Ponderosa pine (*Pinus ponderosa*) are also present. Sandbar willow (*Salix exigua*) forms a continuous cover along the streamside. The understory community is diverse, containing a 25% cover of

shrubs, 10% cover of grasses and 20% cover of forbs, and includes Gambel oak (*Quercus gambelii*), hawthorn (*Crataegus rivularis*), snowberry (*Symphoricarpos* spp.), common gooseberry (*Ribes inerme*) and starry false lily of the valley (*Maianthemum stellatum*).

**Biodiversity Rank Comment:** The Upper Ignacio Creek PCA supports a good (B rank) occurrence of Narrowleaf Cottonwood-Douglas fir (*Populus angustifolia*-*Pseudotsuga menziesii*) Montane Riparian Forest, a globally imperiled (G2) plant community. This community type occupies approximately two to three miles of Ignacio Creek at the PCA and is found only along small active streams in rocky, cool canyons and valleys in Colorado, Utah and Nevada. There are only 15 records of this community type in Colorado including locations in Archuleta, Chaffee, Fremont, Mineral, Park, Pitkin, San Juan and Teller counties.

**Table 29. Natural Heritage element occurrences at the Upper Ignacio Creek PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plant Communities								
<i>Populus angustifolia</i> - <i>Pseudotsuga menziesii</i>	<b>Narrowleaf Cottonwood-Douglas fir Montane Riparian Forest</b>	<b>G3</b>	<b>S2</b>				<b>B</b>	<b>1994-06-07</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses the occurrence and includes a buffer of approximately 1,000-feet. Eliminating disturbance within this 1,000-foot buffer would assist in maintaining the integrity of the occurrence, and the integrity of the avian, macroinvertebrate and periphyton communities (Noel et al. 1986, Spackman and Hughes 1995) associated with the riparian forest. Maintenance of this 1,000-foot buffer would also aid in reducing impacts from sedimentation (Karr and Schlosser 1978) resulting from increased erosion, which occurs in areas where streamside vegetation is removed or degraded.

**Protection Comments:** No protection actions are needed in the foreseeable future. The Upper Ignacio Creek PCA is entirely within the San Juan National Forest, in an isolated area that is difficult to access. The PCA experiences limited recreational use and moderate grazing and no further protection actions are needed.

**Management Comments:** Current management seems to favor persistence of the Montane Riparian Forest in the PCA, but management actions may be needed in the future to maintain the current quality of the plant community. There is a road servicing an oil well on Sheep Canyon, a tributary to Ignacio Creek that could allow access to off road recreational users and horse riders. Such activities have the potential to degrade the plant communities along the stream through disturbance, erosion and the introduction of non-native plant species. In addition, any expansion of oil development in the area could have deleterious effects on the PCA.

Hydrological processes originating outside of the planning boundary, including water quality, quantity, timing and flow must be managed to maintain site viability.

# Upper Ignacio Creek Potential Conservation Area

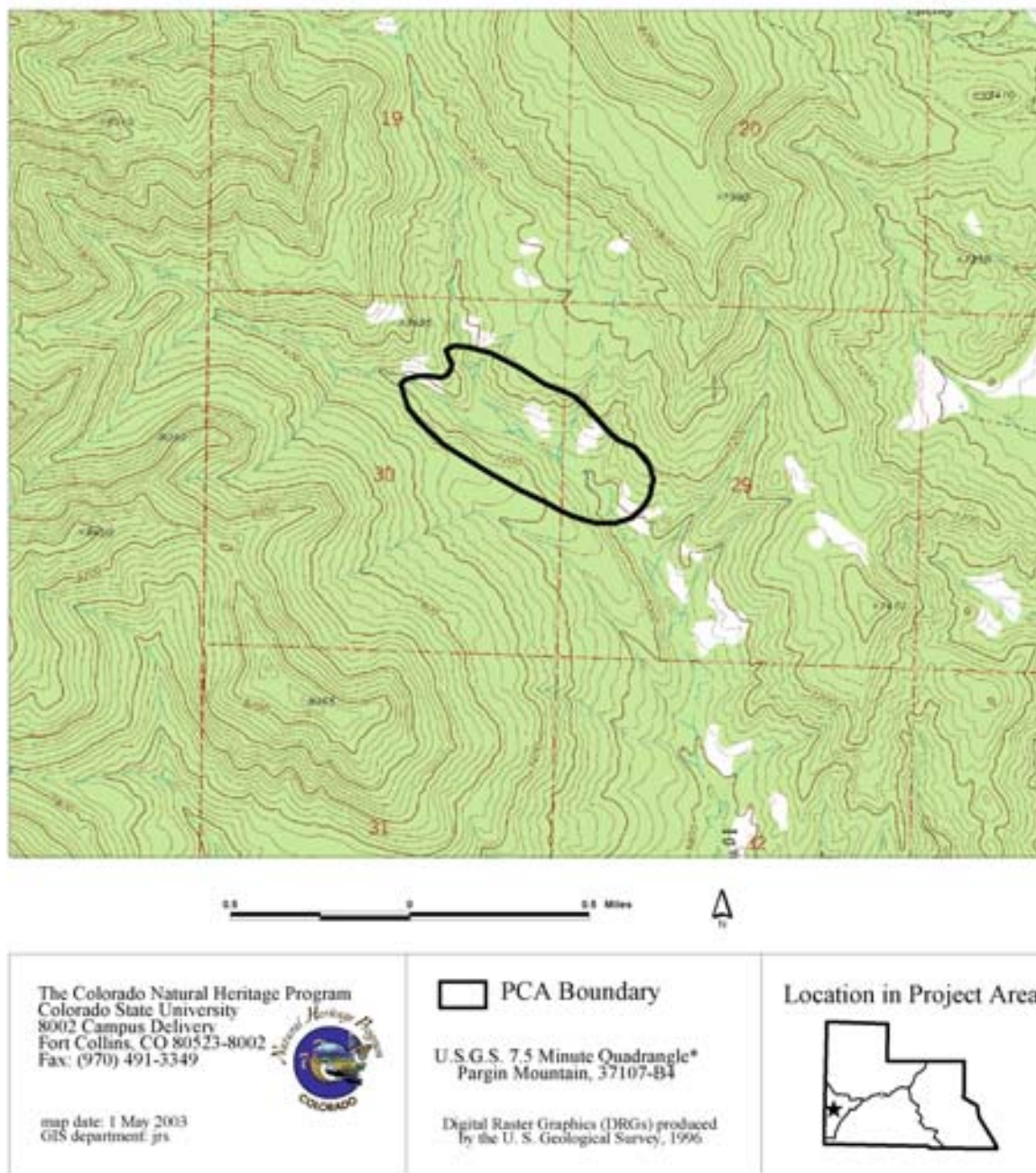


Fig. 29. Upper Ignacio Creek Potential Conservation Area.

## Weminuche Creek

**Biodiversity Rank: B3 (High significance)**

The Weminuche Creek PCA includes a number of rare plant communities including a good (B rank) occurrence of the globally vulnerable (G3) Blue Spruce/Thinleaf Alder (*Picea pungens*/*Alnus incana*) Montane Riparian Forest. This association is known from Wyoming to New Mexico. Fewer than 100 stands exist in Colorado, and very few of these are in pristine condition.

**Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. The PCA is entirely within the San Juan National Forest and although this does not protect the rare communities from recreational use no protection actions are needed in the foreseeable future.

**Management Urgency Rank: M3 (Moderate urgency)**

New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Recreational use in the area is high and has the potential to decrease vegetation cover increasing erosion, particularly within the riparian area. Management actions to prevent erosion may be necessary.

**Location:** Archuleta County, at Weminuche Creek from about 0.2 miles upstream from its confluence with the Piedra River in northwestern portion of the county.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Oakbrush Ridge  
T36NR3W S3, 4  
T37NR3W S20, 21

**Size:** 1,375 ac (557 ha)

**Elevation:** 7,600 to 8,000 ft (2,317 to 2,438 m)

**General Description:** The Weminuche Creek PCA encompasses canyon bottomlands, alluvial flood planes and some of the upland areas of the canyon slopes along parts of a number of waterways. Portions of the Piedra and the East Fork of the Piedra River, and Weminuche, Williams and O'Neal Creeks are all included within the PCA. The riparian areas contain mixed forest that includes a 40% overstory of blue spruce (*Picea pungens*) and narrowleaf cottonwood (*Populus angustifolia*) with a 20% cover of shrubs including sandbar willow (*Salix exigua*) and thinleaf alder (*Alnus incana*). There is a dense herb groundcover with dominant species including sedges (*Carex* spp.), redtop (*Agrostis stolonifera*), Canadian reedgrass (*Calamagrostis canadensis*) and cow parsnip (*Heracleum lanatum*). Non-native Kentucky bluegrass (*Poa pratensis*) is also present in the PCA. Upland areas include ponderosa pine (*Pinus ponderosa*) with an understory of Arizona fescue (*Festuca arizonica*) and mountain muhly (*Muhlenbergia montana*).

A number of rare plant communities occur within the PCA including Blue Spruce-Thinleaf Alder (*Picea pungens*-*Alnus incana*) Riparian Forest, Arizona Fescue-Mountain Muhly (*Festuca arizonica*-*Muhlenbergia montana*) Montane Grassland and Ponderosa Pine/Arizona Fescue (*Pinus ponderosa*/*Festuca arizonica*) Lower Montane Forest.

**Biodiversity Rank Comment:** The Weminuche Creek PCA includes a number of rare plant communities including a good (B rank) occurrence of the globally vulnerable (G3) Blue Spruce/Thinleaf Alder (*Picea pungens*/*Alnus incana*) Montane Riparian Forest. This association is known from Wyoming to New Mexico. Fewer than 100 stands exist in Colorado, and very few of these are in pristine condition. This association is threatened by development, road building and maintenance, heavy recreational use, improper livestock grazing, and stream flow alterations. The Blue Spruce/Thinleaf Alder Montane Riparian Forest occurs in deep, shaded canyons and narrow valleys along relatively straight stream reaches. It generally forms small patches, but can be continuous for several river miles.

The PCA also contains an unranked (E) occurrence of another globally vulnerable (G3) community, the Arizona Fescue-Mountain Muhly (*Festuca arizonica*-*Muhlenbergia montana*) Montane Grassland and a good (B rank) occurrence of Ponderosa Pine/Arizona Fescue (*Pinus ponderosa*/*Festuca arizonica*) Lower Montane Forest a community that is globally unranked because information is lacking on the extent of its distribution.

**Table 30. Natural Heritage element occurrences at the Weminuche Creek PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
<b>Plant Communities</b>								
<b><i>Picea pungens</i>/ <i>Alnus incana</i></b>	<b>Blue Spruce/ Thinleaf Alder Montane Riparian Forest</b>	G3	S3				B	1986-06-06
<i>Festuca arizonica</i> - <i>Muhlenbergia montana</i>	Arizona Fescue-Mountain Muhly Montane Grassland	G3	S2				E	1988-08-22
<i>Pinus ponderosa</i> / <i>Festuca arizonica</i>	Ponderosa Pine/Arizona Fescue Lower Montane Forest	GU	S?				B	1988-08-22

\*EO rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses two occurrences of Pagosa bladderpod and some additional potential habitat between them to allow for expansion of the populations over time. Also included within the boundary is a 1,000-foot buffer. Eliminating disturbance within this 1,000-foot buffer would assist in maintaining the

integrity of the occurrence, and the integrity of the avian, macroinvertebrate and periphyton communities (Noel et al. 1986, Spackman and Hughes 1995) associated with the riparian forest. Maintenance of this 1,000-foot buffer would also aid in reducing impacts from sedimentation (Karr and Schlosser 1978) resulting from increased erosion, which occurs in areas where streamside vegetation is removed or degraded.

**Protection Comments:** The PCA is entirely within the San Juan National Forest and although this does not protect the rare communities from recreational use it is not expected that protection action will be needed in the foreseeable future. However, any changes in use of the land or ownership may necessitate action.

**Management Comments:** New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Recreational use in the area is high and new management actions may be needed within five years to maintain the current quality of the plant communities. Recreational use has the potential to decrease vegetation cover increasing erosion, particularly within the riparian area. Livestock grazing has been excluded since 1996.

Hydrological processes originating outside of the planning boundary, including water quality, quantity, timing and flow must be managed to maintain site viability.

# Weminuche Creek Potential Conservation Area

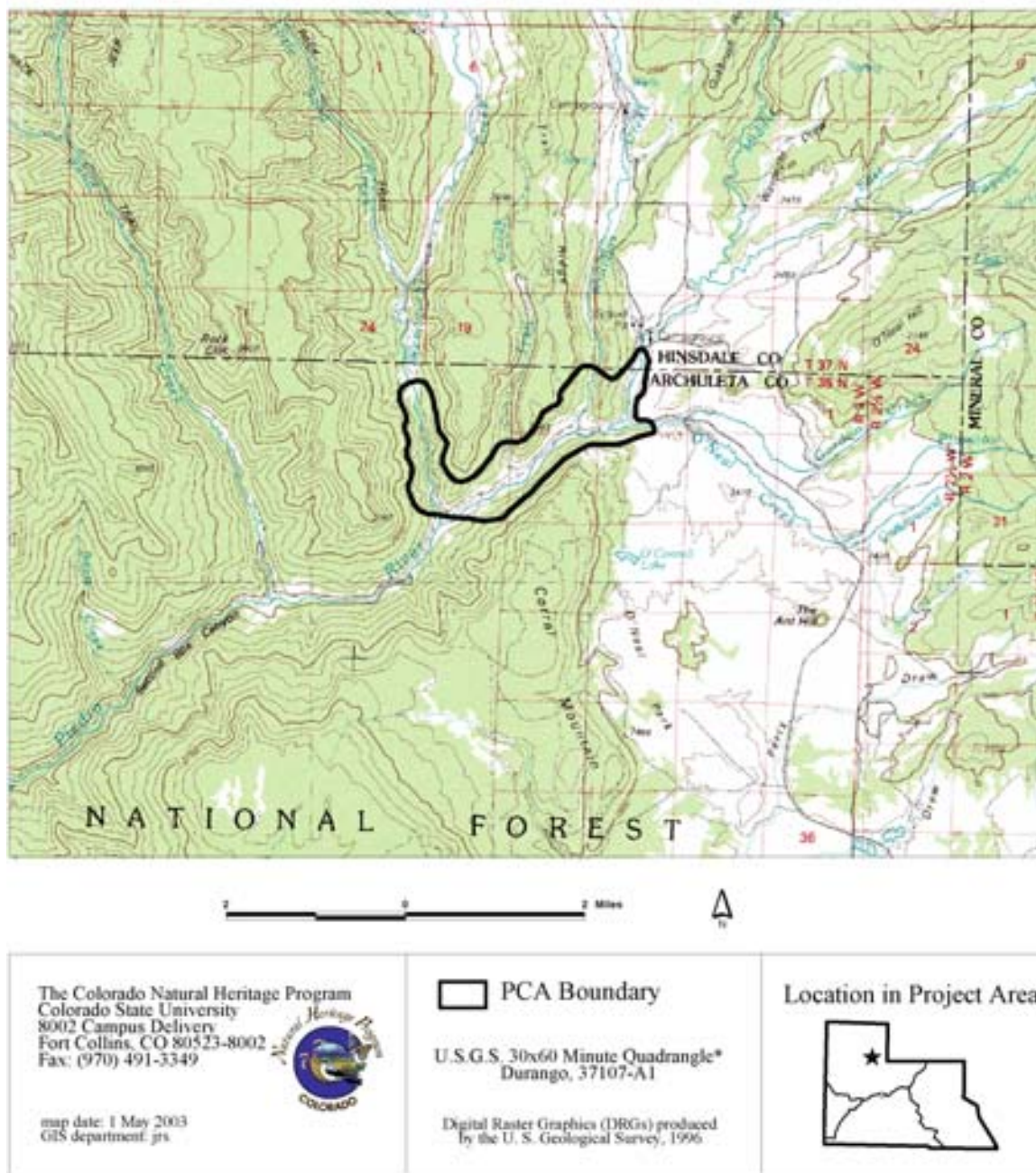


Fig. 30. Weminuche Creek Potential Conservation Area.

## West Fork at Devil Creek

**Biodiversity Rank: B3 (High significance)**

This PCA supports a good (B rank) example of the globally vulnerable (G3G4Q) Thinleaf Alder (*Alnus incana*)/Mesic Forb Shrubland. This plant association was once common and widespread, but is now declining. It is rarely found in good condition without non-native species in the undergrowth. Because this community can change significantly with improper grazing, this plant association may not be recognized as the same type across state lines, and thus the taxonomy is in question (a Q in the rank). There are over 30 documented occurrences of this plant association in Colorado. However, none are very large and only one or two are in pristine condition.

**Protection Urgency Rank: P5 (No urgency)**

Land protection is complete and no protection actions are needed. The PCA is entirely within the San Juan National Forest and given current use levels and management, no protection actions are currently needed.

**Management Urgency Rank: M3 (Moderate urgency)**

Current management seems to favor the persistence of the riparian shrubland in the PCA, but management actions may be needed in the future to maintain the current quality of the shrubland. Human activity associated with the nearby trail have resulted in the introduction of exotic plant species and a monitoring program would aid in detecting expansion of the exotics and the introduction of new populations of non-native plants.

**Location:** Archuleta County, at the West Fork Devil Creek, approximately 1.4 miles northwest of its confluence with Devil Creek and about three miles northwest of the Aspen Springs development.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Chris Mountain, Devil Mountain  
T35NR3W S18, 19

**Size:** 584 ac (236 ha)

**Elevation:** 7,360 to 8,200 ft (2,243 to 2,499 m)

**General Description:** The West Fork at Devil Creek PCA encompasses a narrow canyon along the West Fork as it joins with Devil Creek at an elevation of approximately 7,500 feet. This narrow canyon includes slopes of approximately 400 vertical feet and is 200 feet across at its bottom. The upland areas are dominated by a mixed conifer forest that includes spruce (*Picea* sp.), fir (*Pseudotsuga menziesii*) and ponderosa pine (*Pinus ponderosa*) with multiple canopy layers and with many standing snags and beard lichen (*Usnea* sp.) on the trees. The understory is dominated by Gambel oak (*Quercus gambelii*) and snowberry (*Symphoricarpos oreophilus*). The riparian area along The West Fork also includes mixed conifers, but alder (*Alnus incana*) and willows (*Salix* spp.) dominate the understory.

A Thinleaf Alder (*Alnus incana*)/Mixed Forb Riparian Shrubland occurs along the West Fork and also includes yellow willow (*Salix ligulifolia*) creating a dense shrub layer with a 95% cover. Forbs and grasses completely cover the ground layer and include Canada wildrye and reedgrass (*Elymus canadensis* and *Calamagrostis canadensis*), fowl mannagrass (*Glyceria striata*), coneflower (*Rudbeckia lacinata*), heartleaf bittercress (*Cardamine cordifolia*) cow parsnip (*Heracleum lanatum*) and Franciscan bluebells (*Mertensia franciscana*). There are also non-native plant species within the PCA including Kentucky bluegrass (*Poa pratensis*) and dandelion (*Taraxacum officinale*).

**Biodiversity Rank Comment:** This PCA supports a good (B rank) example of the globally vulnerable (G3G4Q) Thinleaf Alder (*Alnus incana*)/Mesic Forb Shrubland. This plant association was once common and widespread, but is now declining. It is rarely found in good condition without non-native species in the undergrowth. Because this community can change significantly with improper grazing, this plant association may not be recognized as the same type across state lines, and thus the taxonomy is in question (a Q in the rank). There are over 30 documented occurrences of this plant association in Colorado. However, none are very large and only one or two are in pristine condition. All stands are highly threatened (see protection comments) by improper livestock grazing, stream flow alterations, road and railroad improvements and maintenance and heavy recreational use.

This plant association is characterized by stands of medium-tall, deciduous shrubs and thick herbaceous undergrowth of forbs and wetland-indicator grasses. Undisturbed stands have abundant forbs and native grasses. Stands disturbed by season-long livestock grazing have reduced forb cover and an increase in non-native grasses including Kentucky bluegrass (*Poa pratensis*) and redtop (*Agrostis stolonifera*).

**Table 31. Natural Heritage element occurrences at the West Fork at Devil Creek PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plant Communities								
<b><i>Alnus incana</i>/ Mesic Forb</b>	<b>Thinleaf Alder/ Mesic Forb Shrubland</b>	<b>G3G4Q</b>	<b>S3</b>				<b>B</b>	<b>1994-07-27</b>

\*EO rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundaries incorporate an area that will allow natural hydrological processes such as seasonal flooding, sediment deposition, and new channel formation to maintain viable populations of the elements along the West Fork.. It should be noted that the hydrological processes necessary to the riparian shrubland are not fully contained by the site boundaries. Given that the elements are dependent on natural hydrological processes associated with the West Fork, upstream activities such as water diversions, impoundments, improper livestock grazing, and development are detrimental to the hydrology of the riparian area. This boundary indicates the minimum area that should be considered for any conservation management plan. The boundary also includes

an approximate 1000 foot buffer. Eliminating disturbance within this 1,000-foot buffer would aid in reducing impacts from sedimentation (Karr and Schlosser 1978), and assist in maintaining the integrity of the occurrence and its associated avian, macroinvertebrate and periphyton communities (Noel et al. 1986, Spackman and Hughes 1995).

**Protection Comments:** The PCA is entirely within the San Juan National Forest and although this does not assure perpetual protection for the rare communities it is not expected that protection actions will be needed in the foreseeable future. However, any changes in use of the land or ownership may necessitate action.

**Management Comments:** Current management seems to favor the persistence of the riparian shrubland in the PCA, but management actions may be needed in the future to maintain the current quality of the shrubland. Human activity associated with the nearby trail have resulted in the introduction of exotic plant species and a monitoring program would aid in detecting expansion of the exotics and the introduction of new populations of non-native plants. Such information would aid in determining the timing and need for weed management actions necessary for maintaining the quality of the shrubland community.

Hydrological processes originating outside of the planning boundary, including water quality, quantity, timing and flow must be managed to maintain site viability.

# West Fork at Devil Creek Potential Conservation Area

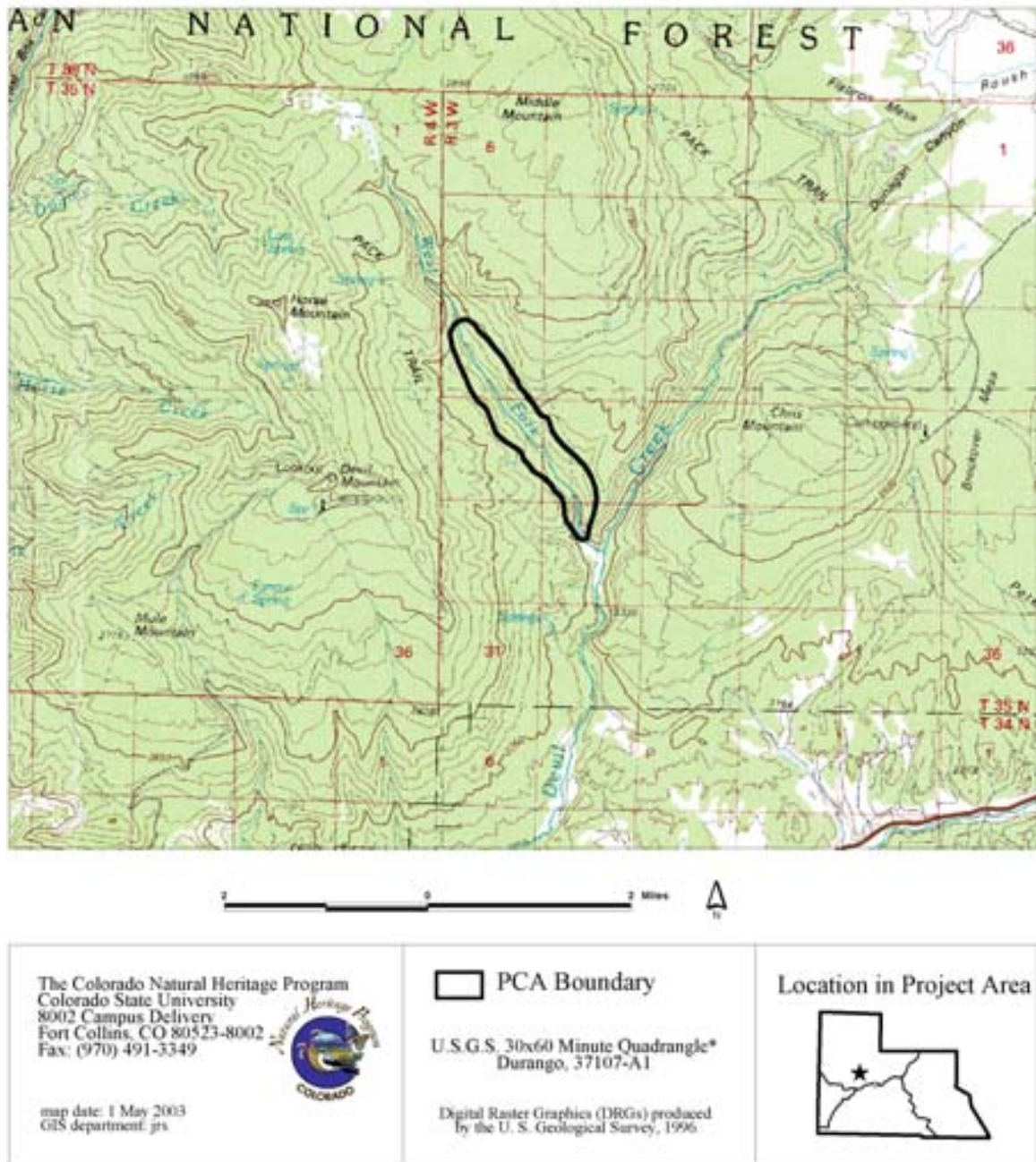


Fig. 31. West Fork at Devil Creek Potential Conservation Area.

## White Creek at Opal Lake

**Biodiversity Rank: B3 (High significance)**

The White Creek at Opal Lake PCA rank is based on one excellent (A rank) example of the globally vulnerable (G3/S3) Thinleaf Alder-Drummond Willow (*Alnus incana* ssp. *tenuifolia*/*Salix drummondiana*) Montane Riparian Shrubland. This plant association has only been documented from Colorado and is limited in distribution, but widespread in Colorado. The PCA also includes one good (B rank) example of Blue Spruce/Thinleaf Alder (*Picea pungens*/*Alnus incana*) Montane Riparian Forest, a community that is also globally vulnerable (G3). This association is known from Wyoming to New Mexico. Fewer than 100 stands exist in Colorado, and very few of these are in pristine condition.

**Protection Urgency Rank: P5 (No urgency)**

Land protection is complete and no protection actions are needed. This PCA is entirely within the San Juan National Forest

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the plant communities in the PCA, but management actions may be needed in the future to maintain the current quality of the communities. Management of grazing, stream use, weeds from adjacent areas, and horse and recreation use may be needed to maintain the current quality of the communities.

**Location:** Archuleta County, west and northwest of Opal Lake on White Creek in the east-central portion of the county.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Harris Lake  
T34NR2E S7, 8

**Size:** 174 ac (70 ha)

**Elevation:** 8,520 to 9,200 ft (2,597 to 2,804 m)

**General Description:** The White Creek at Opal Lake PCA encompasses Opal Lake and a dry beaver pond situated just below the lake. The PCA lies beneath the wonderfully erosive Chalk Mountains, which are forested in aspen (*Populus tremuloides*), blue spruce (*Picea pungens*) and fir. Along the sides of a trail running past the dry pond to the lake dandelion (*Taraxacum officinale*) have invaded, while on the other side of the dry pond sedges and shrubs are present. Below the dry pond the creek bed is gullied as if cut by a flood and along the creek there is a dense and healthy willow (*Salix* spp.) carr. It is here along the creek that a rare Thinleaf Alder-Drummond's Willow (*Alnus incana*-*Salix drummondiana*) Montane Riparian Shrubland occurs. Shrubs cover 58% of this riparian area and include Rocky Mountain willow (*Salix monticola*) as well as those shrubs mentioned above. Only about 10% of the understory is covered with herbs including Northwest Territory sedge (*Carex utriculata*) and licorice-root (*Ligusticum* sp.).

Below this riparian shrubland White Creek opens into a valley with moderate to slightly steep slopes that are densely forested with conifers and aspen (*Popyulus tremuloides*). The creek appears to periodically flood and many overflow channels are present. Riparian vegetation is found in the flood plain terrace and overflow channels. A rare Blue Spruce/Thinleaf Alder (*Picea pungens*/*Alnus incana*) Montane Riparian Forest occurs here with subalpine fir (*Abies lasiocarpa*) also present in the overstory. A forb understory that includes Richardson's geranium (*Geranium richardsonii*), sprucefir fleabane (*Erigeron eximius*) and cutleaf coneflower (*Rudbeckia ampla*) is also present. Non-native Kentucky bluegrass (*Poa pratensis*) has invaded the herb layer.

**Biodiversity Rank Comment:** The White Creek at Opal Lake PCA rank is based on an excellent (A rank) example of the globally vulnerable (G3/S3) Thinleaf Alder-Drummond Willow (*Alnus incana* ssp. *tenuifolia*/*Salix drummondiana*) Montane Riparian Shrubland. This plant association has only been documented from Colorado and is limited in distribution, but widespread in Colorado. It is highly threatened by improper livestock grazing and stream impoundments. This association is generally found along steep-gradient streams with stable, shaded stream banks.

The PCA also includes one good (B rank) example of Blue Spruce/Thinleaf Alder (*Picea pungens*/*Alnus incana*) Montane Riparian Forest, a community that is also globally vulnerable (G3). This woodland occurs in deep, shaded canyons and narrow valleys along relatively straight stream reaches. It generally forms small patches, but can be continuous for several river miles. This association is known from Wyoming to New Mexico. Fewer than 100 stands exist in Colorado, and very few of these are in pristine condition. This association is threatened by development, road building and maintenance, heavy recreational use, improper livestock grazing, and stream flow alterations.

**Table 32. Natural Heritage element occurrences at the White Creek at Opal Lake PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plant Communities								
<i>Alnus incana</i> ssp. <i>tenuifolia</i> / <i>Salix drummondiana</i>	<b>Thinleaf Alder-Drummond Willow Montane Riparian Shrubland.</b>	<b>G3</b>	<b>S3</b>				<b>A</b>	<b>1994-06-22</b>
<i>Picea pungens</i> / <i>Alnus incana</i>	Blue Spruce/ Thinleaf Alder Montane Riparian Forest	<b>G3</b>	<b>S3</b>				<b>B</b>	<b>1999-09-09</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundaries incorporate an area that will allow natural hydrological processes such as seasonal flooding, sediment deposition, and new channel formation to maintain viable populations of the plant communities along White Creek. It should be noted that the hydrological processes necessary to the elements are not fully contained by the site boundaries. Given that the elements are dependent on natural hydrological processes associated with White Creek, upstream activities such as water diversions, impoundments, and improper livestock grazing are detrimental to the hydrology of the riparian area. This boundary indicates the minimum area that should be considered for any conservation management plan. The boundary also includes a buffer of approximately 1,000-feet. Eliminating disturbance within this 1,000-foot buffer would aid in reducing impacts from sedimentation (Karr and Schlosser 1978), and assist in maintaining the integrity of the occurrence and its associated avian, macroinvertebrate and periphyton communities (Noel et al. 1986, Spackman and Hughes 1995).

**Protection Comments:** The PCA is entirely within the San Juan National Forest and although this does not assure perpetual protection for the rare communities it is not expected that protection actions will be needed in the foreseeable future. However, any changes in use of the land or ownership may necessitate action.

**Management Comments:** Current management seems to favor the persistence of the plant communities in the PCA, but management actions may be needed in the future to maintain the current quality of the communities. Management of grazing and stream use to minimize impact would benefit the natural communities within the PCA. Management of weeds from adjacent areas, and horse and recreation use may also be needed to maintain the current quality of the communities.

Hydrological processes originating outside of the planning boundary, including water quality, quantity, timing and flow must be managed to maintain site viability.

# White Creek at Opal Lake Potential Conservation Area

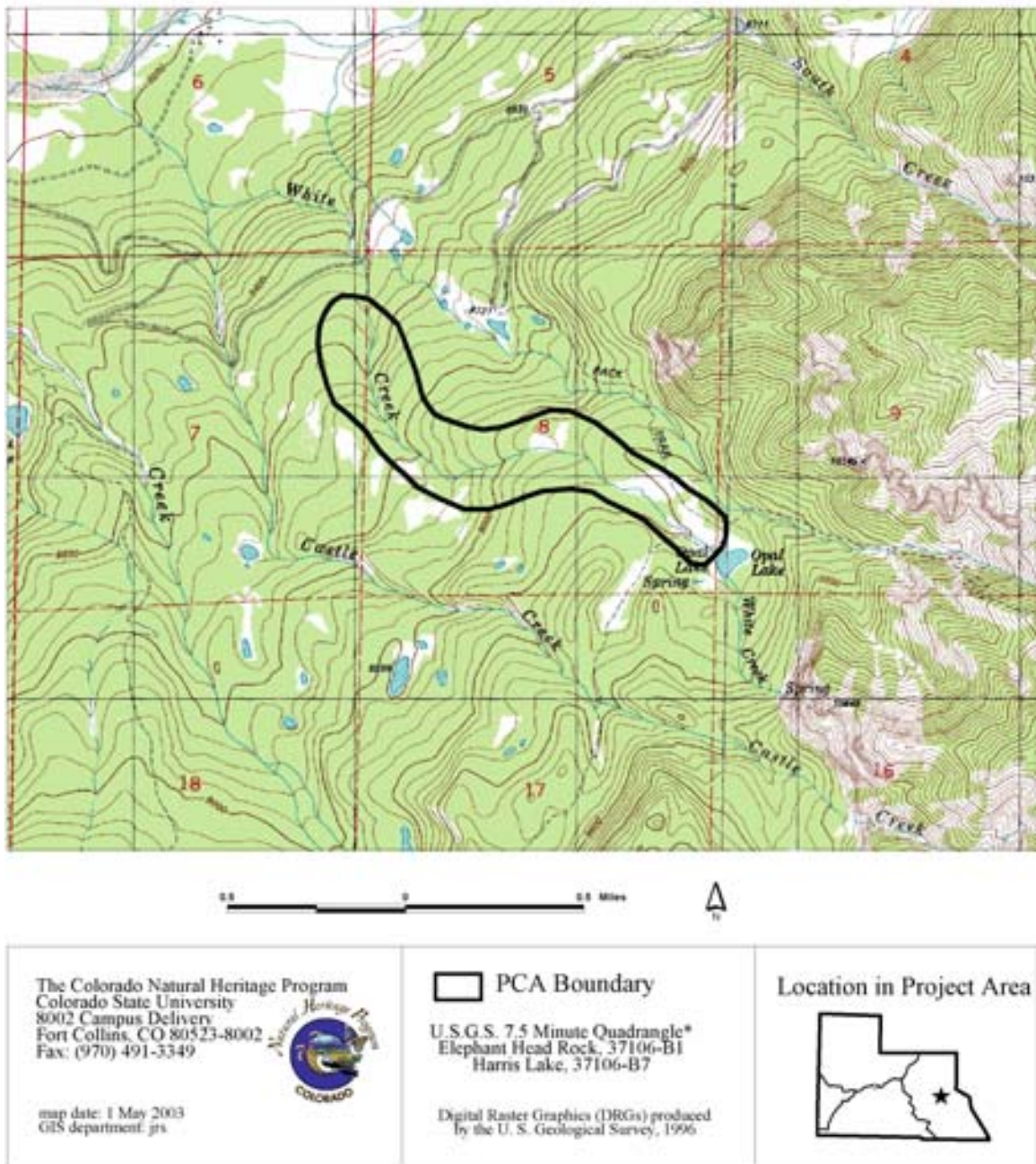


Fig. 32. White Creek at Opal Lake Potential Conservation Area.

## Potential Conservation Area Profiles: B4 PCAs

### Beaver Creek at TNY Spring

**Biodiversity Rank: B4 (Moderate significance)**

This PCA contains an excellent (A rank) occurrence of a Subalpine Fir-Englemann Spruce/Thinleaf Alder (*Abies lasiocarpa*-*Picea engelmannii*/*Alnus incana*) Montane Riparian Forest community, which is secure (G5) on a global scale.

**Protection Urgency Rank: P5 (No urgency)**

No management needs are known or anticipated in the PCA. The PCA is entirely within the San Juan National Forest.

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. Management may be needed in the future to address the cumulative impacts from grazing and logging.

**Location:** Archuleta County, on Beaver Creek, approximately 1.6 miles due southwest of Beaver Meadow Spring.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Baldy Mountain

T36NR5W S30, 31

T36NR6W S25, 36

T35R6W S1

**Size:** 309 ac (125 ha)

**Elevation:** 8,200 to 9,200 ft (2,499 to 2,804 m)

**General Description:** The Beaver Creek at TNY Spring PCA encompasses a narrow valley or canyon with slopes that drop some 200 feet to the valley bottom. The slopes are gradual and vary, but on average are around 20%. There is a narrow band of riparian vegetation within the valley bottom that is dominated by subalpine fir (*Abies lasiocarpa*), Douglas fir (*Pseudotsuga menziesii*) and thinleaf alder (*Alnus incana*). Throughout the valley bottom there are pockets of Drummond's willow (*Salix drummondiana*) and mountain maple (*Acer glabrum*). A small amount of mountain ash (*Sorbus scopulina*) is present on the west facing slopes of the valley. A dense covering of herbs covers the valley floor including Geyer's sedge (*Carex geyeri*), Porter's licorice-root (*Ligusticum porteri*), Richardson's geranium (*Geranium richardsonii*), cow parsnip (*Heracleum lanatum*), Franciscan bluebells (*Mertensia franciscana*) and western bracken fern (*Pteridium aquilinum*). The subalpine fir-Englemann Spruce/Thinleaf Alder (*Abies lasiocarpa*-*Picea Engelmannii*/*Alnus incana*) Montane Riparian Forest community

occurs along Beaver Creek within the PCA. There is a Forest Service road (FS135A) on the west facing slope. Grazing is prevalent and logging has occurred in the drainage.

**Biodiversity Rank Comment:** This PCA contains an excellent (A rank) occurrence of a Subalpine Fir-Englemann Spruce/Thinleaf Alder (*Abies lasiocarpa*-*Picea englemannii*/*Alnus incana*) Montane Riparian Forest community, which is globally secure (G5). Only 50 occurrences of this riparian forest type are known in Colorado.

**Table 33. Natural Heritage element occurrences at the Beaver Creek at TNY Spring PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plant Communities								
<i>Abies lasiocarpa</i> - <i>Picea englemannii</i> / <i>Alnus incana</i>	<b>Subalpine Fir-Englemann Spruce/Thinleaf Alder Montane Riparian Forest</b>	<b>G5</b>	<b>S5</b>				<b>A</b>	<b>1994-06-28</b>

\*EO rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary incorporates an area that will allow natural hydrological processes such as seasonal flooding and sediment deposition to maintain a viable population of the riparian forest along Beaver Creek. The adjacent steep slopes that would most likely impact the riparian forest if altered are also included. The boundary also provides a small buffer from nearby roads where surface runoff may contribute excess nutrients, toxicants, and sediment. It should be noted that the hydrological processes necessary to the riparian forest are not fully contained by the site boundaries. Given that the riparian forest is dependent on natural hydrological processes associated with Beaver Creek upstream activities such as water diversions, impoundments, improper livestock grazing, and development are detrimental to the hydrology of the riparian area. This boundary indicates the minimum area that should be considered for any conservation management plan. Also included within the boundary is a buffer of 1,000-feet. Eliminating disturbance within this 1,000-foot buffer would aid in reducing impacts from sedimentation (Karr and Schlosser 1978), and assist in maintaining the integrity of the occurrence and its associated avian, macroinvertebrate and periphyton communities (Noel et al. 1986, Spackman and Hughes 1995).

**Protection Comments:** The PCA is entirely within the San Juan National Forest and although this does not assure perpetual protection for the rare community no protection actions are currently needed. However, any changes in use of the land or ownership may necessitate action.

**Management Comments:** Current management seems to favor the persistence of the montane riparian forest in the PCA, but management actions may be needed in the future to maintain the current quality of the riparian forest. Livestock grazing occurs in the area and logging has occurred in the drainage. Both activities have the potential to influence runoff, sedimentation and the natural hydrology on which the riparian forest depends.

Management may be needed in the future to address the cumulative impacts from such activities. The area is surprisingly free of non-native plant species, however, activity from the road and recreational users has the potential to introduce exotics and monitoring for such introductions should be persistent. Hydrological processes originating outside of the planning boundary, including water quality, quantity, timing and flow must be managed to maintain site viability.

# Beaver Creek at TNY Spring Potential Conservation Area

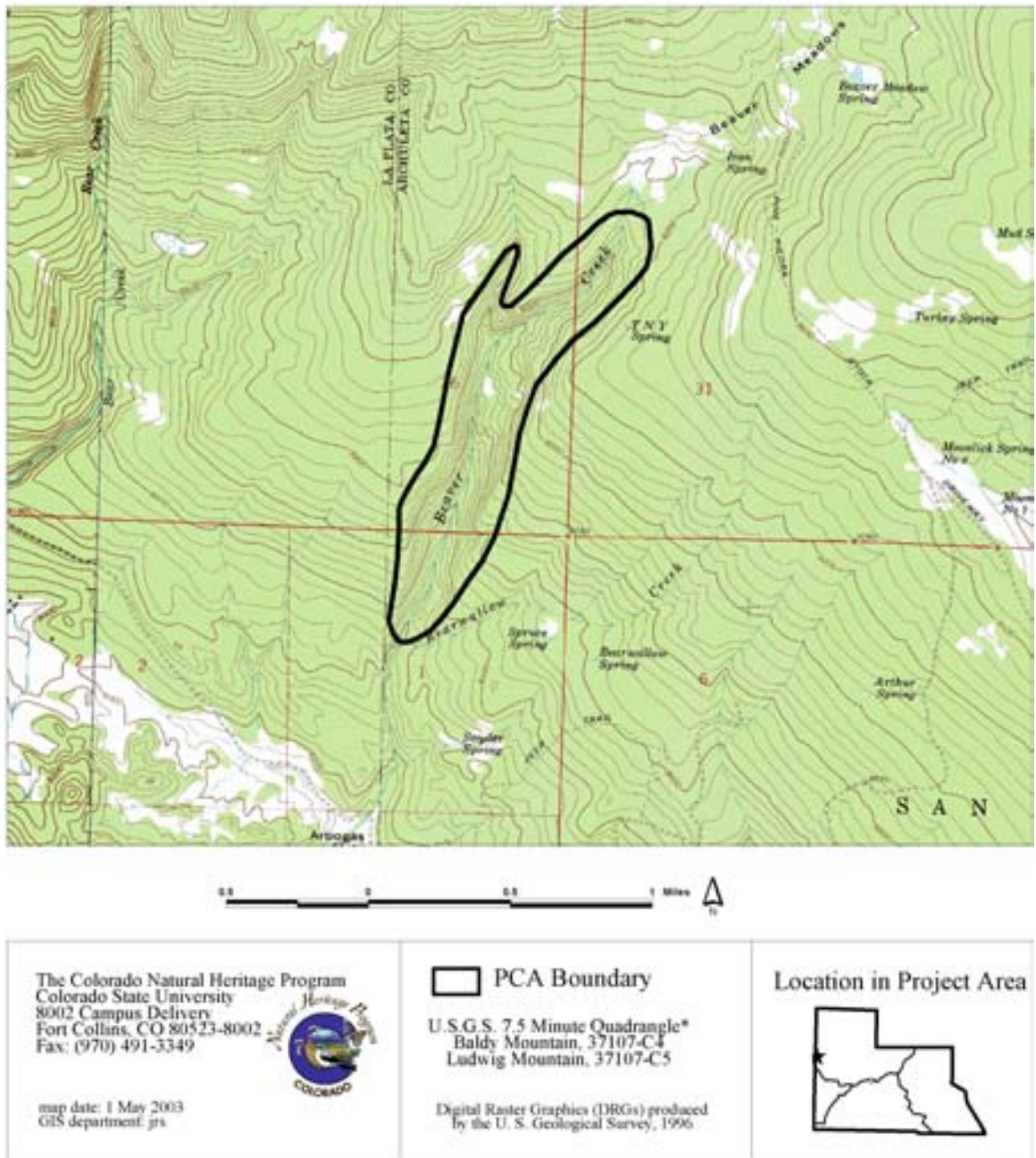


Fig. 33. Beaver Creek at TNY Spring Potential Conservation Area.

## Blackhead Peak

**Biodiversity Rank: B4 (Moderate significance)**

This PCA supports an unranked (E) occurrence of the reflected moonwort (*Botrychium echo*), a globally imperiled (G2) species, as well as the western moonwort (*B. hesperium*) a vulnerable (G3) species, and Mingan moonwort (*B. minganense*) and the northern moonwort (*B. pinnatum*), both state rare (S1) species. All occurrences are ranked E, or extant, since several consecutive years' observation are necessary to assign an element occurrence rank for *Botrychiums*.

**Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. The PCA is entirely within the San Juan National Forest.

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. There is use by recreational hikers and some hunters, but it is unlikely that current levels of use are disturbing the moonworts.

**Location:** Archuleta County, about 12 miles east of Pagosa Springs.

**Legal Description:**

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

T35N R1E S1, 12

T35N R2E S6, 7

**Size:** 224 ac (91 ha)

**Elevation:** 10,200 to 10,800 ft (3,109 to 3,291 m)

**General Description:** This PCA encompasses a clear cut in a spruce forest. New tree growth is about 3 to 5 feet tall. Moonworts (*Botrychiums*) were found in moist areas under grasses and forbs. The dominant tree species at the site is Engelmann spruce (*Picea engelmannii*). Understory species include rock jasmine (*Androsace septentrionalis*), Parry's thistle (*Cirsium parryi*), Sierra corydalis (*Corydalis caseana*), fireweed (*Epilobium angustifolium*), wild strawberry (*Fragaria virginiana*), pennycress (*Noccaea montana*), Whipple penstemon (*Penstemon whippleanus*), bracken fern (*Pteridium aquilinum* var. *pubescens*), and Carolina bugbane (*Trautvetteria caroliniensis*).

**Biodiversity Rank Justification:** This PCA supports a fair (C rank) occurrence of the western moonwort (*B. hesperium*) a plant species that is globally vulnerable (G3).

There are also occurrences of the reflected moonwort (*Botrychium echo*), a globally imperiled (G2) species, and the Mingan moonwort (*B. minganense*) and northern moonwort (*B. pinnatum*), both state rare (S1) species. All of these three occurrences are

ranked E, or extant, since several consecutive years' observation are necessary to assign an element occurrence rank for *Botrychiums*. Photocopies of collections made in 2001 were sent to Dr. Peter Root at the Denver Botanical Garden for identification. He, in turn, sent the sheets to Peter Zika in Seattle, for further confirmation. The species listed below are those confirmed by both botanists.

**Table 34. Natural Heritage element occurrences at the Blackhead Peak PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plants								
<b><i>Botrychium hesperium</i></b>	<b>Western moonwort</b>	<b>G3</b>	<b>S2</b>				<b>C</b>	<b>2001-08-01</b>
<i>Botrychium echo</i>	Reflected moonwort	G3	S2			FS	E	2001-08-01
<i>Botrychium minganense</i>	Mingan moonwort	G4	S1				E	2001-08-01
<i>Botrychium pinnatum</i>	Northern moonwort	G4?	S1				E	1996-08-08

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses the known locations of several species of moonworts. The entire clearcut area has potential habitat for this genus, but only areas surveyed were included in this boundary. Further survey could lead to enlarging the PCA. Moonworts prefer naturally or human disturbed sites; however, trampling, road maintenance, or other continued impacts may threaten the occurrence. The PCA includes the occurrence and a small buffer to protect against these disturbances and to allow suitable habitat where additional individuals can become established over time.

**Protection Rank Comments:** The PCA is entirely within the San Juan National Forest. The reflected moonwort is afforded some protection by its listing as a forest sensitive species and no protection action is needed for the foreseeable future. However, any changes in use of the land or ownership may necessitate action.

**Management Rank Comments:** The area should be managed as though it contained the forest sensitive species, *B. pallidum*, since several species of moonworts tend to grow together. Current management seems to favor the persistence of the moonworts (*Botrychium*) at this PCA, but management actions may be needed in the future to maintain the quality of the moonworts. The PCA is located at the end of Mill Creek Road and is impassable except by four wheel drive vehicle at the site of the PCA. There is use by recreational hikers and some hunters, but it is unlikely that current levels of use are disturbing the moonworts. The clearcut is 30 years old with little tree regrowth. The USFS has no further activities planned for the area.

# Blackhead Peak

## Potential Conservation Area

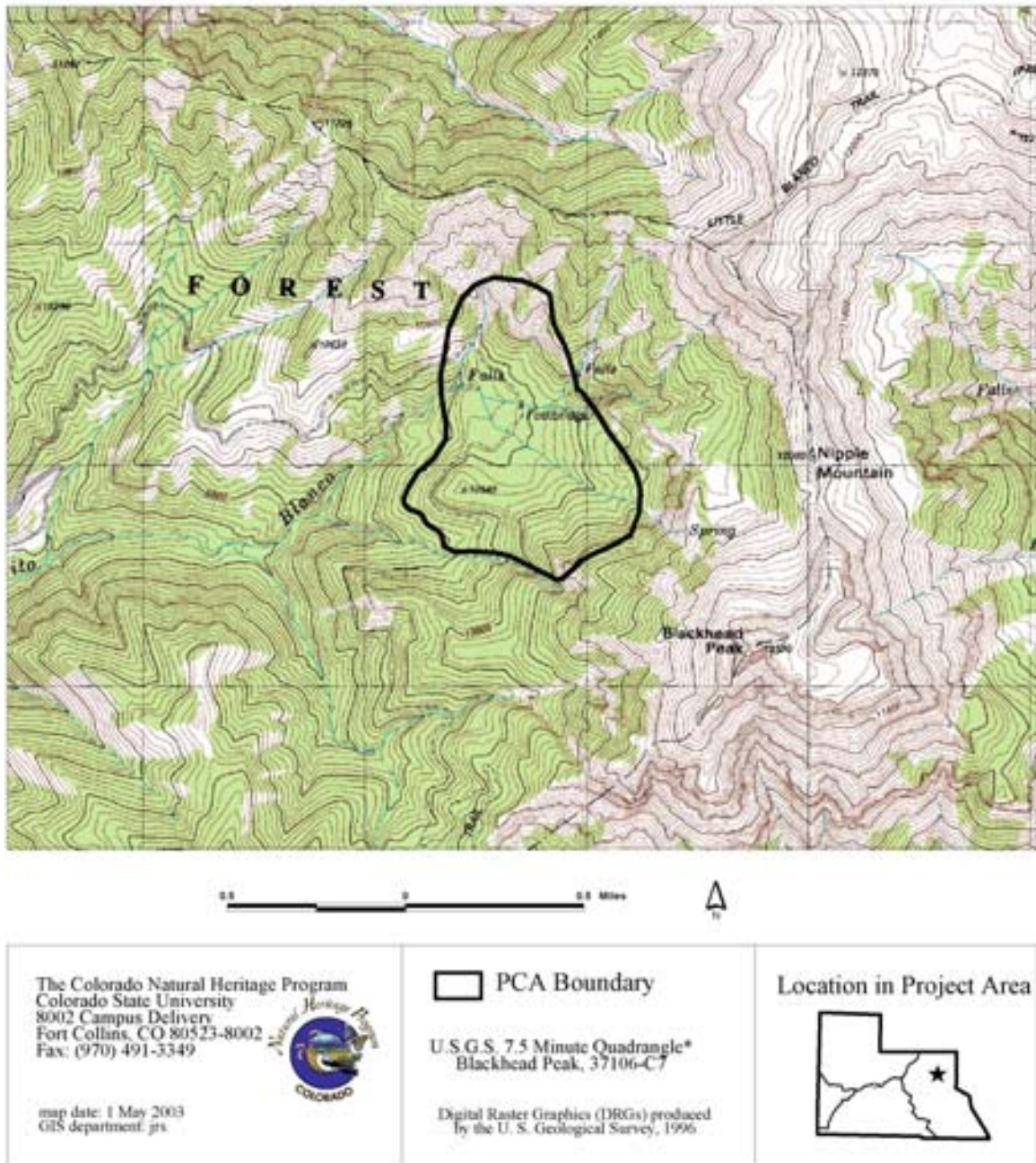


Fig. 34. Blackhead Peak Potential Conservation Area.

## Blue Creek

**Biodiversity Rank: B4 (Moderate significance)**

This site supports one good (B rank) occurrence of a globally secure (G4) riparian plant association, the Narrowleaf Cottonwood/Red-osier Dogwood (*Populus angustifolia*/*Cornus sericea*) Riparian Forest.

**Protection Urgency Rank: P3 (Moderate urgency)**

Protection actions may be needed, but probably not within the next 5 years. It is estimated that stresses may reduce the viability of the elements in the PCA if protection action is not taken. A portion of the PCA occurs on private property and is without any protection.

**Management Urgency Rank: M4 (Low urgency)**

New management actions may be needed within 5 years to prevent the degradation of the riparian forest within the PCA. Weed management is needed within the PCA and continued monitoring of weeds would aid in measuring the success of any weed eradication actions and in identifying new weed invasions. Enforcement of weed free feed for horses would aid in preventing future introductions of non-native plants.

**Location:** Archuleta County, along Blue Creek, 0.8 miles upstream of its confluence with the Rito Blanco

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Serviceberry Mountain

T34NR1E S7, 18

T34NR1W S12, 13

**Size:** 250 ac (101 ha)

**Elevation:** 7,400 to 8,000 ft (2,256 to 2,438 m)

**General Description:** The Blue Creek PCA encompasses a narrow valley with a small intermittent stream which is deeply entrenched. A dense cover of riparian vegetation is scattered along the stream, but it drops off in drier more impacted areas. Valley slopes are dominated by ponderosa pine (*Pinus ponderosa*) and Gambel oak (*Quercus gambelii*) on south facing slope and ponderosa pine and Douglas fir (*Pseudotsuga menziesii*) on the north facing slopes. The riparian area includes an 80% cover of trees dominated by Narrowleaf cottonwood (*Populus angustifolia*) and Douglas fir (*Pseudotsuga menziesii*), and there is a dense (90%) cover of shrubs with the more dominant species including, red-osier dogwood (*Cornus sericea*), strapleaf willow (*Salix ligulifolia*), hawthorn (*Crataegus rivularis*) and Gambel oak (*Quercus gambelii*). The groundcover is somewhat sparse and includes a 30% cover of dryspike sedge (*Carex foenea*), starry false lily of the valley (*Maianthemum stellatum*) and cutleaf coneflower (*Rudbeckia laciniata*). An uncommon riparian community, Narrowleaf Cottonwood/Red-osier Dogwood (*Populus angustifolia*/*Cornus sericea*) Riparian Forest, occupies the PCA. A road runs through the

PCA and cattle grazing is apparent. An outfitter on private land just downstream of the PCA uses horses in the PCA. All of these factors have contributed to a large number of introduced plants that includes Kentucky bluegrass (*Poa pratensis*), smooth brome (*Bromus inermis*) and yellow sweet clover (*Melilotus officinalis*).

**Biodiversity Rank Comment:** This site supports one good (B rank) occurrence of a globally secure (G4) riparian plant association, the Narrowleaf Cottonwood/Red-oiser Dogwood (*Populus angustifolia*/*Cornus sericea*) Riparian Forest. This plant community is found along moderate-size rivers in the montane zone and is a widespread plant association in Nevada, Idaho, Wyoming, New Mexico, and Colorado. Many stands occur in Colorado, but they are highly threatened by improper livestock grazing, development, highway corridors, and stream flow alterations. No large, pristine stands are known to remain in Colorado.

**Table 35. Natural Heritage element occurrences at the Blue Creek PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
<b>Plant Communities</b>								
<b><i>Populus angustifolia</i>/ <i>Cornus sericea</i></b>	<b>Narrowleaf Cottonwood/ Red-oiser Dogwood Riparian Forest</b>	<b>G4</b>	<b>S3</b>				<b>B</b>	<b>1994-06-24</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary for this PCA was drawn to encompass the ecological processes believed necessary for long-term viability of the riparian forest. The boundary will assist in maintaining natural surface flow and thus allow fluvial processes such as flood scouring, lateral flow, and channel meandering, to maintain a dynamic distribution of riparian and wetland plant associations along the drainage. Also included within the boundary is a buffer of 1,000-feet. Eliminating disturbance within this 1,000-foot buffer would aid in reducing impacts from sedimentation (Karr and Schlosser 1978), and assist in maintaining the integrity of the occurrence and its associated avian, macroinvertebrate and periphyton communities (Noel et al. 1986, Spackman and Hughes 1995).

**Protection Comments:** This PCA for the most part is within the San Juan National Forest but some private property occurs at its western edge. Protection actions may be needed, but probably not within the next 5 years. It is estimated that stresses associated with recreation, grazing and the infestation of weeds may reduce viability of the riparian forest if protection action is not taken.

**Management Comments:** New management actions may be needed within 5 years to prevent the degradation of the riparian forest within the PCA. A road bisects the PCA allowing access of the area to hikers, horse riders, and hunters. Grazing also occurs within the PCA and all of these uses have resulted in the introduction of numerous non-native plants into the area. Weed management is needed within the PCA and continued

monitoring would aid in measuring the success of any weed eradication actions and in identifying new weed invasions. Enforcement of weed free feed for horses would aid in preventing future introductions of non-native plants.

# Blue Creek Potential Conservation Area

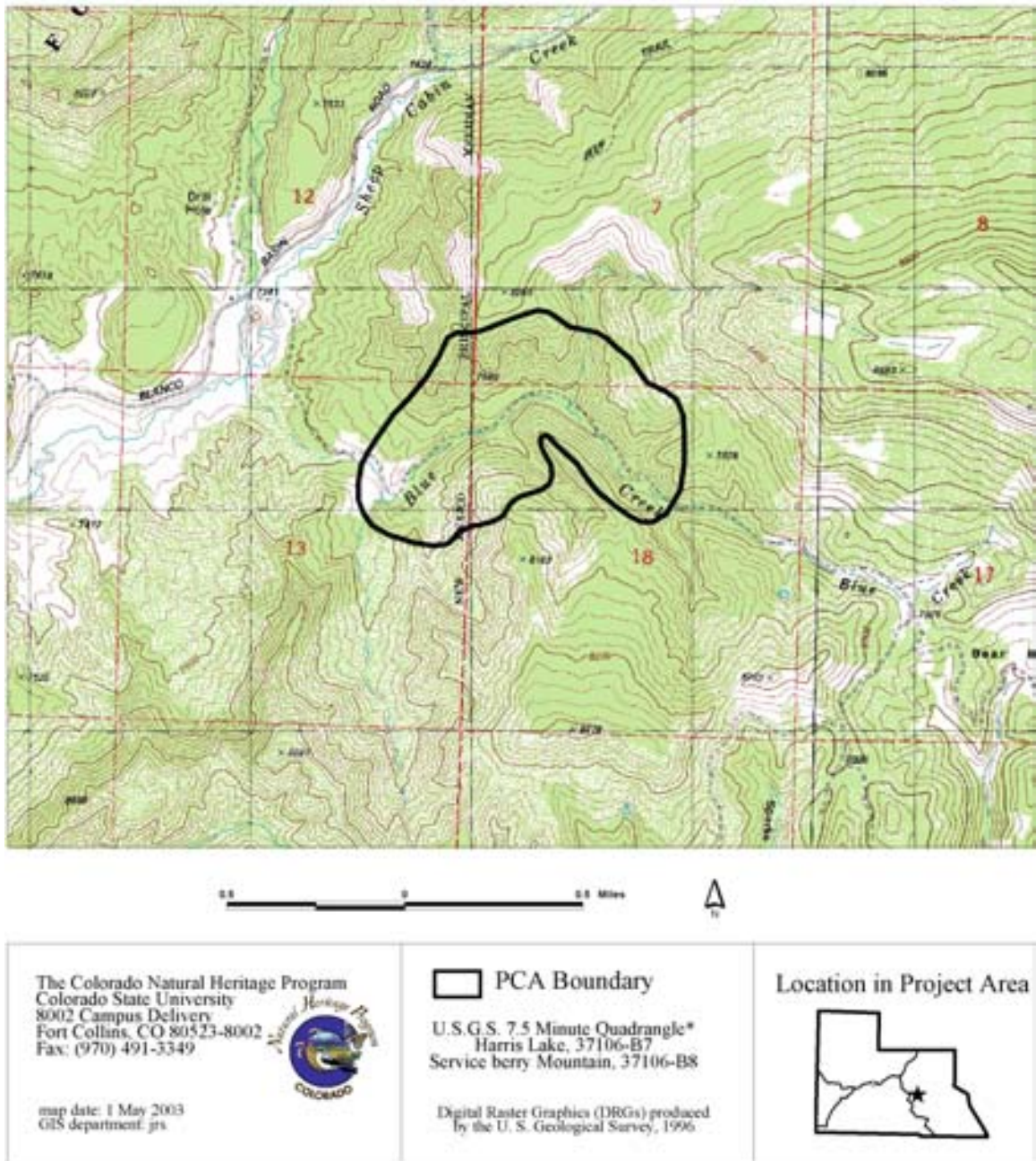


Fig. 35. Blue Creek Potential Conservation Area.

## Burns Canyon

**Biodiversity Rank: B4 (General significance)**

This site contains a fair (C rank) occurrence of marsh meadow Indian paintbrush, a plant that is extremely rare in Colorado (S1).

**Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. The site is within the San Juan National Forest.

**Management Urgency Rank: M3 (Moderate urgency)**

New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Monitoring of the population is recommended to detect weed invasion or change in the quality of the occurrence.

**Location:** Archuleta County, about 8 miles south-southwest of Pagosa Springs.

**Legal Description:**

U.S.G.S. 7.5 minute quadrangle: Oakbrush Hill  
T34N R2W S29

**Size:** 67 ac (27 ha)

**Elevation:** 7,120 to 7,400 ft (2,170 to 2,256 m)

**General Description:** This PCA occupies parts of Burns Canyon and a small side canyon (Pollito Canyon). It is forested with ponderosa pine (*Pinus ponderosa*) and Gambel oak (*Quercus gambelii*), and includes openings with Arizona fescue (*Festuca arizonica*). Marsh meadow Indian paintbrush (*Castilleja lineata*) was found in grassy openings near the Pollito Canyon Road, which runs through the PCA. Other associated species at the site include wooly cinquefoil (*Potentilla hippiana*), Rocky Mountain juniper (*Juniperus scopulorum*), Louisiana sagewort (*Artemisia ludoviciana*), prairie smoke (*Geum triflorum*), wax current (*Ribes cereum*), blue grama (*Bouteloua gracilis*), and an unidentified milkvetch (*Astragalus* sp). In May 2002, an estimated 2000 plants were observed. Old flower stalks from the previous year were more easily seen than new growth, which was only beginning and consisted of two inch long tufts at the base of some old plants. Many had no evidence of growth in the very dry 2002 season.

**Biodiversity Rank Justification:** This site contains an excellent (A rank) occurrence of marsh meadow Indian paintbrush, a plant that is extremely rare in Colorado (S1). Although the species is known from New Mexico and Arizona, this is the first occurrence to be documented in the CNHP database for Colorado.

**Table 36. Natural Heritage element occurrences at the Burns Canyon PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plants								
<i>Castilleja lineata</i>	<b>Marsh meadow Indian paintbrush</b>	<b>G4?</b>	<b>S1</b>				<b>A</b>	<b>2002-05-04</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary was drawn to enclose the occurrence of marsh meadow Indian paintbrush and includes some adjacent potential habitat to allow for movement of the plants over time. Future surveys of the area may result in enlargement of the site.

**Protection Rank Comments:** The PCA is within the San Juan National Forest and although this does not afford perpetual protection no protection actions are needed in the foreseeable future. Private land to the north of the site was not surveyed, but contains similar habitat. The entire area of the PCA is recognized by Archuleta County as critical wildlife habitat. Any changes in use of the land or ownership may necessitate action.

**Management Rank Comments:** New management actions may be needed within 5 years to maintain the current quality of the marsh meadow Indian paintbrush in the PCA. Although the area is in relatively good condition, a few exotic species were found nearby, including common mullein (*Verbascum thapsus*), cheatgrass (*Bromus tectorum*), smooth brome (*Bromus inermis*), yellow sweet clover (*Melilotus officinalis*), and Kentucky bluegrass (*Poa pratensis*). Monitoring of the population is recommended to detect weed invasion or change in the quality of the occurrence.

# Burns Canyon

## Potential Conservation Area

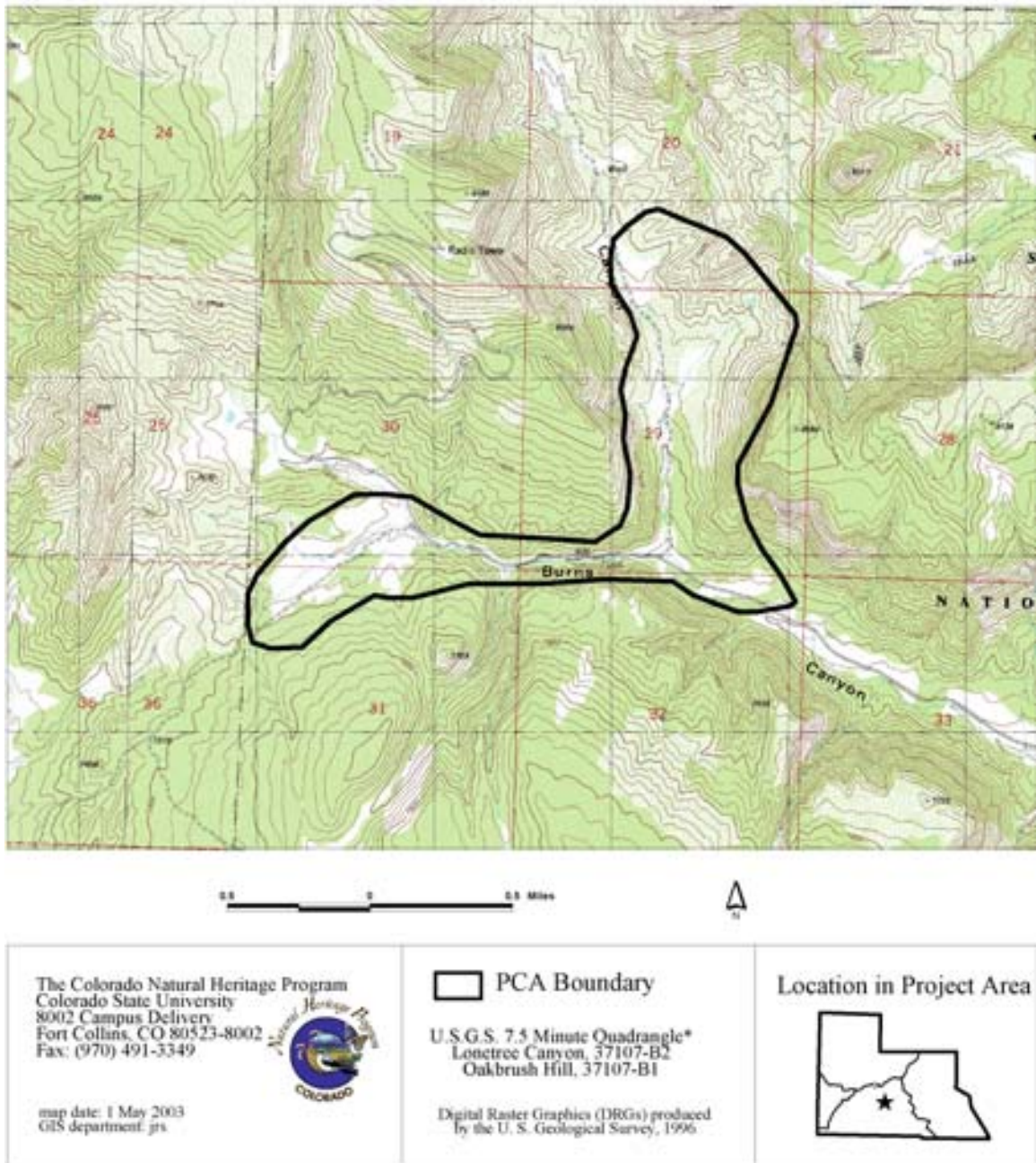


Fig. 36. Burns Canyon Potential Conservation Area.

## Chimney Rock AA Site

**Biodiversity Rank: B4 (Moderate significance)**

The Chimney Rock AA Site is home to an excellent (A rank) occurrence of the state rare (S2) Aztec milkvetch (*Astragalus proximus*).

**Protection Urgency Rank: P5 (No urgency)**

Land protection is adequate. The site is within the San Juan National Forest, and is designated a Research Natural Area.

**Management Urgency Rank: M3 (Moderate urgency)**

New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Weed eradication and monitoring of the rare plant population would benefit the long-term survival of Aztec milkvetch at this location.

**Location:** Chimney Rock AA Site is located on the west side of State Highway 151, about 3 miles south of the intersection with Highway 160, and about 14 air miles west-southwest of Pagosa Springs.

**Legal Description:**

U.S.G.S. 7.5 minute quadrangle: Chimney Rock  
T34N R4W S20, 21

**Size:** 178 ac (72 ha)

**Elevation:** 6,240 to 6,800 ft (1,902 to 2,073 m)

**General Description:** This PCA is located within the Chimney Rock Archaeological Site, an area of Indian ruins that receives many visitors each year. The area includes steep slopes of Mancos Shale with barren areas on convex slopes. Ponderosa pine and Gambel oak grow on concave slopes and in the draws. An interesting inversion of plant communities occurs here, with pinyon (*Pinus edulis*) and juniper (*Juniperus* sp.) occupying the higher elevations, while ponderosa pine is found at the lower elevations (Schmoll 1932). Aztec milkvetch (*Astragalus proximus*) was found on these barren lower slopes and flats, while at higher elevations it is replaced by the similar but more common bent milkvetch (*Astragalus flexuosus*).

**Biodiversity Rank Justification:** The Chimney Rock AA Site is home to an excellent (A rank) occurrence of the state rare (S2) Aztec milkvetch (*Astragalus proximus*). The population consists of at least 6 sub-populations that are separated by less than a mile from each other. Four of these sub-populations were documented in 2001. The Aztec milkvetch occurs in New Mexico and twelve known locations in Colorado. During a re-visit to the site in May, 2002, a year of extreme drought conditions, no *Astragalus proximus* was found at the locations where it was documented in 2001. A subsequent visit in May 2003 to one sub-population also failed to reveal any plants. It remains to be seen if this population can recover from the effects of drought. A historic record of

another rare milkvetch, *Astragalus iodopetalus*, dates from a 1934 collection by Hazel Schmoll, but this species has not been relocated in recent years.

**Table 37. Natural Heritage element occurrences at the Chimney Rock AA PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plants								
<i><b>Astragalus proximus</b></i>	<b>Aztec milkvetch</b>	<b>G4</b>	<b>S2</b>			<b>FS/BLM</b>	<b>A</b>	<b>2001-06-18</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary is drawn to encompass six known sub-populations of the Aztec milkvetch, with some surrounding potential habitat to allow for expansion or movement of the population over time. The boundary was enlarged in 2001 to include four new sub-populations.

**Protection Rank Comments:** This PCA is located in the San Juan National Forest, and has been designated a Research Natural Area. Further protection should not be necessary.

**Management Rank Comments:** New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Although the site attracts many visitors, the locations of the milkvetch are not heavily used. Any future development of roads or the visitor center should take into account the locations of the Aztec milkvetch. A number of exotic plants were noted in the site, including smooth brome (*Bromus inermis*), cheatgrass (*Bromus tectorum*), Japanese brome (*Bromus japonicus*), littlepod false flax (*Camelina microcarpa*), prickly lettuce (*Lactuca serriola*), alfalfa (*Medicago sativa*), and yellow sweet clover (*Melilotus officinalis*). Another non-native species, false salsify (*Scorzonera laciniata*) that was previously unknown from western Colorado, was found near the parking area at the visitors' center. This species could pose a new threat to native plants and should be controlled before it spreads further. Weed eradication and monitoring of the rare plant population would benefit the long-term survival of Aztec milkvetch at this location.

# Chimney Rock Archaeological Area

## Potential Conservation Area

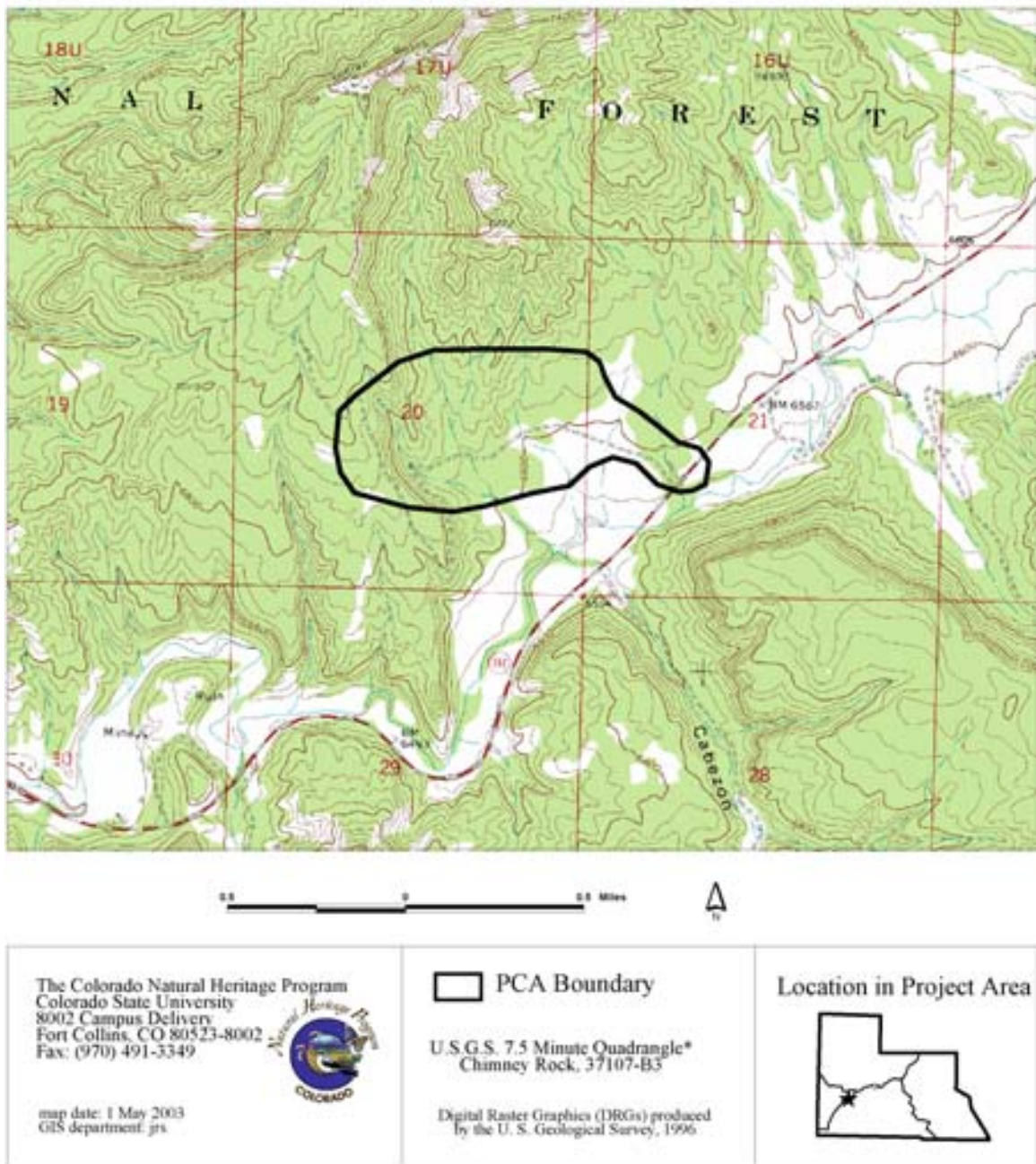


Fig. 37. Chimney Rock AA Potential Conservation Area.

## Cimarrona Creek

**Biodiversity Rank: B4 (General significance)**

This PCA contains an excellent (A rank) occurrence of the Subalpine Fir-Engelmann Spruce/Thinleaf Alder (*Abies lasiocarpa*-*Picea engelmannii*/*Alnus incana*) Montane Riparian Forest plant community, which is secure (G5) on a global scale. There are only 50 locations for this community known in Colorado.

**Protection Urgency Rank: P5 (No urgency)**

Protection is complete and no protection actions are needed. This PCA is entirely within the San Juan National Forest and half of the planning boundary falls within the Weminuche Wilderness.

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. The campground and trail at this PCA have the potential to adversely affect the riparian forest through the introduction of non-native plants. Monitoring to detect such introductions should be continuous.

**Location:** Archuleta County, follow Cimarrona Creek trail from FS Road 640

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Cimarrona Peak

T38NR3W S5, 6

T39NR3W S33

**Size:** 392 ac (159 ha)

**Elevation:** 8,380 to 10,400 ft (2,554 to 3,170 m)

**General Description:** The Cimarrona Creek PCA encompasses a narrow canyon on the south end of Cimarrona Creek just prior to its confluence with Williams Creek. In the area of the confluence the terrain opens into a broad valley that includes the very southern tip of the Cimarrona Creek PCA. The canyon includes steep walls that drop as much as 500 feet to a narrow valley. Subalpine fir (*Abies lasiocarpa*) and Englemann spruce (*Picea engelmannii*) dominate the overstory along the creek and thinleaf alder (*Alnus incana*) is the dominant shrub. Forbs dominate the ground cover. There are very few grasses and litter covers 57% of the ground. The riparian area is highly productive, healthy with little disturbance and the hydrology of the area is functioning properly. Although the creek within the PCA is intermittent the riparian area is fed by a persistent seep. The north half of the PCA is within the Weminuche Wilderness Area. A common plant association, Subalpine Fir-Engelmann Spruce/Thinleaf Alder Montane Riparian Forest, dominates the riparian area within the PCA. The upland communities surrounding the creek are little disturbed except for a trail leading into the wilderness area.

**Biodiversity Rank Comment:** This PCA contains an excellent (A rank) occurrence of a plant community that is secure (G5) on a global scale. There are only 50 known locations of the Subalpine Fir-Engelmann Spruce/Thinleaf Alder (*Abies lasiocarpa*-*Picea engelmannii*/*Alnus incana*) Montane Riparian Forest known in Colorado and this occurrence represents the best known from the study area.

**Table 38. Natural Heritage element occurrences at the Cimarrona Creek PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plant Communities								
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Alnus incana</i>	<b>Subalpine fir-Engelmann Spruce/Thinleaf Alder Montane Riparian Forest</b>	<b>G5</b>	<b>S5</b>				<b>A</b>	<b>1995-07-13</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary incorporates an area that will allow natural hydrological processes such as seasonal flooding and sediment deposition to maintain the riparian forest along Cimarrona Creek. The adjacent steep slopes that would most likely impact the riparian forest if altered are also included. It should be noted that the hydrological processes necessary to the riparian forest are not fully contained by the site boundaries. Given that the riparian forest is dependent on natural hydrological processes associated with Cimarrona Creek upstream activities such as water diversions, impoundments, improper livestock grazing, and development are detrimental to the hydrology of the riparian area. This boundary indicates the minimum area that should be considered for any conservation management plan. The boundary also includes an approximate 1000-foot buffer. Eliminating disturbance within this 1,000-foot buffer would aid in reducing impacts from sedimentation (Karr and Schlosser 1978), and assist in maintaining the integrity of the occurrence and its associated avian, macroinvertebrate and periphyton communities (Noel et al. 1986, Spackman and Hughes 1995).

**Protection Comments:** This PCA is entirely within the San Juan National Forest and half of the planning boundary falls within the Weminuche Wilderness. Although this does not assure perpetual protection for the rare community no protection actions are currently needed. However, any changes in use of the land or ownership may necessitate action.

**Management Comments:** Current management seems to favor the persistence of the riparian forest in the PCA, but management actions may be needed in the future to maintain the current quality of the riparian area. Increases in recreational use may require management actions to maintain the excellent quality of the PCA. The campground and trail have the potential to adversely affect the riparian forest through the introduction of non-native plants and monitoring to detect such introductions should be continuous. Hydrological processes originating outside of the planning boundary, including water quality, quantity, timing and flow must be managed to maintain site viability.

# Cimarrona Peak

## Potential Conservation Area

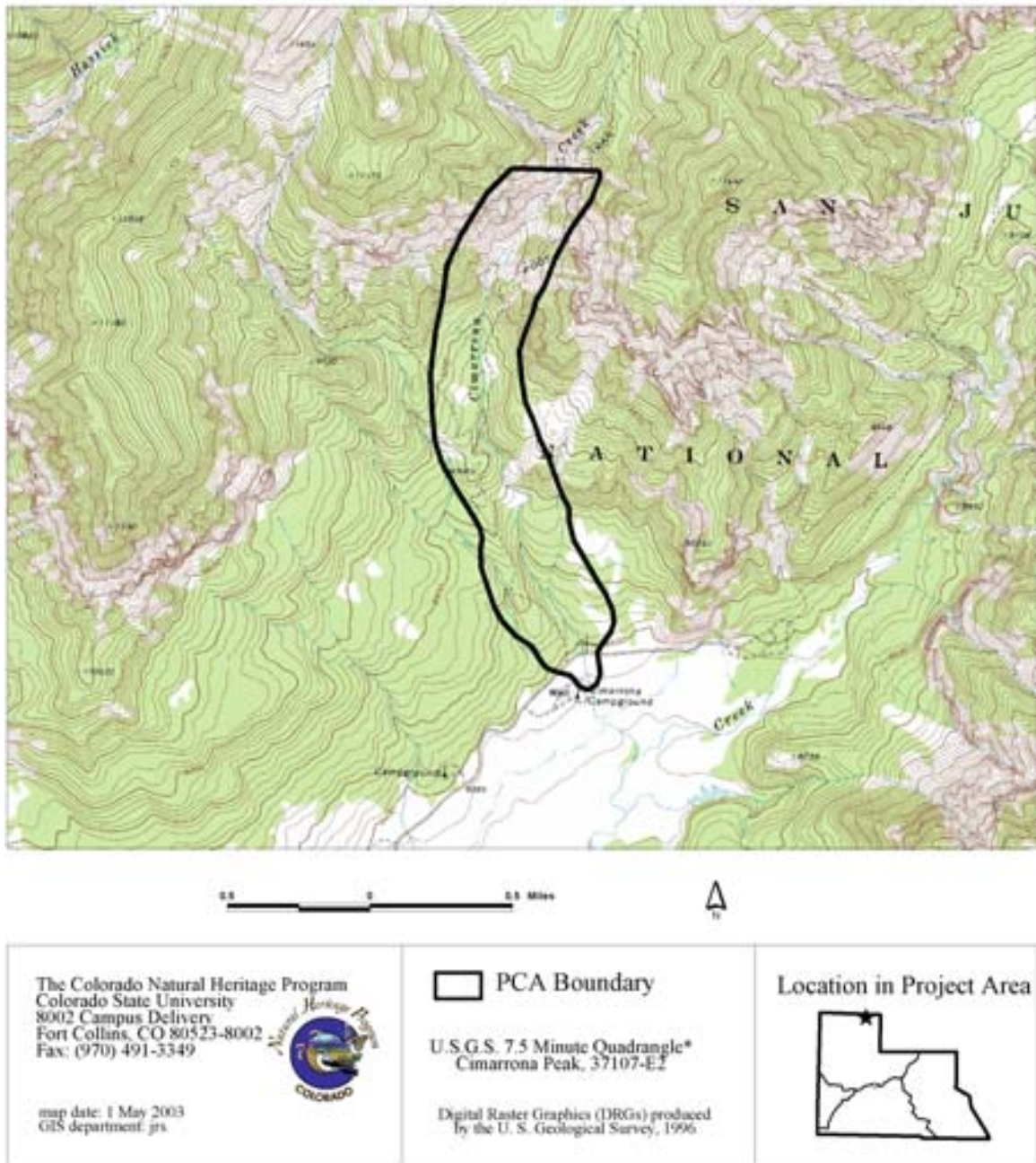


Fig. 38. Cimarrona Creek Potential Conservation Area.

## Coldwater Creek at Skunk Creek

**Biodiversity Rank: B4 (Moderate significance)**

This site contains an excellent (A rank) occurrence of the common Aspen/Tall Forb (*Populus tremuloides*/Tall Forb) Montane Forest community, which is globally secure (G5).

**Protection Urgency Rank: P5 (No urgency)**

Land protection is complete and no protection actions are needed. This PCA is entirely within the San Juan National Forest.

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. Monitoring of the PCA would aid in the detection of exotic plant species introduced by recreational users of the area and through livestock grazing.

**Location:** Archuleta County, at a drainage on the east side of Coldwater Creek approximately one mile north of its confluence with the First Fork of the Piedra River.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Bear Mountain  
T36NR4W S17, 18

**Size:** 161 ac (65 ha)

**Elevation:** 7,800 to 8,840 ft (2,377 to 2,694 m)

**General Description:** The Coldwater Creek at Skunk Creek PCA encompasses a small drainage on the east slope of Coldwater Creek with a flow that seems to diminish down slope towards the creek. This unique spot is free of impacts from the nearby trail running along Coldwater Creek and the entire area of the PCA seems wet, although flow in the drainage is low. Within the PCA white fir (*Abies concolor*) and aspen (*Populus tremuloides*) dominate the overstory, but comprise a cover of only 5%. The shrub layer is dominated by wild rose (*Rosa woodsii*) and serviceberry (*Amelanchier alnifolia*). The most common forbs are Richardson's geranium (*Geranium richardsonii*) and cutleaf coneflower (*Rudbeckia lacinata*). Aspen (*Populus tremuloides*) and Spruce (*Picea* spp.) dominate the riparian area along Coldwater Creek and a large population of wood lily (*Lilium philadelphicum*), an uncommon plant in Colorado, is present in the ground cover. This species was formerly tracked by CNHP, but is now watchlisted. Within the PCA is a highly productive and vigorous Aspen/Tall Forb (*Populus tremuloides*/Tall Forb) Montane Forest with surprisingly very few exotic plants considering the PCA is near a trail along Coldwater Creek that sees high use by horse riders and cattle.

**Biodiversity Rank Comment:** This site contains an excellent (A rank) occurrence of the common Aspen (*Populus tremuloides*)/Tall Forbs Montane Forest community, which is

globally secure (G5). This particular montane aspen forest is the best known occurrence of the plant association in Archuleta County.

**Table 39. Natural Heritage element occurrences at the Coldwater creek at Skunk Creek PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plant Communities								
<b><i>Populus tremuloides/</i></b> <b>Tall Forb</b>	<b>Aspen/Tall Forb</b> <b>Montane Forest</b>	<b>G5</b>	<b>S5</b>				<b>A</b>	<b>1994-07-05</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses the montane aspen forest and the wood lily (*Lilium philadelphicum*) population as well as a small buffer to limit direct disturbance from activities associated with the trail along Coldwater Creek. It should be noted that the hydrological processes necessary to the plant population and aspen forest are not fully contained by the site boundaries. Given that the montane forest and plant population are dependent on natural hydrological processes associated with the drainage, activities within the drainage such as water diversions, impoundments, improper livestock grazing, logging, and development are detrimental to the hydrology necessary for the forest and plants. This boundary indicates the minimum area that should be considered for any conservation management plan.

**Protection Comments:** This PCA is entirely within the San Juan National Forest and although this does not assure perpetual protection for the rare community no protection actions are currently needed. However, any changes in use of the land or ownership may necessitate action.

**Management Comments:** Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. Game trails, recreation trails, livestock trails are all within the PCA and have the potential to adversely affect the plant population and aspen forest through the introduction of non-native plant species. Monitoring of the PCA would aid in the detection of introduced exotic plant species.

Hydrological processes originating outside the planning boundary, including water quality, quantity, timing and flow must be managed to maintain viability of the Aspen/Tall Forb Montane Forest.

# Coldwater Creek at Skunk Creek

## Potential Conservation Area

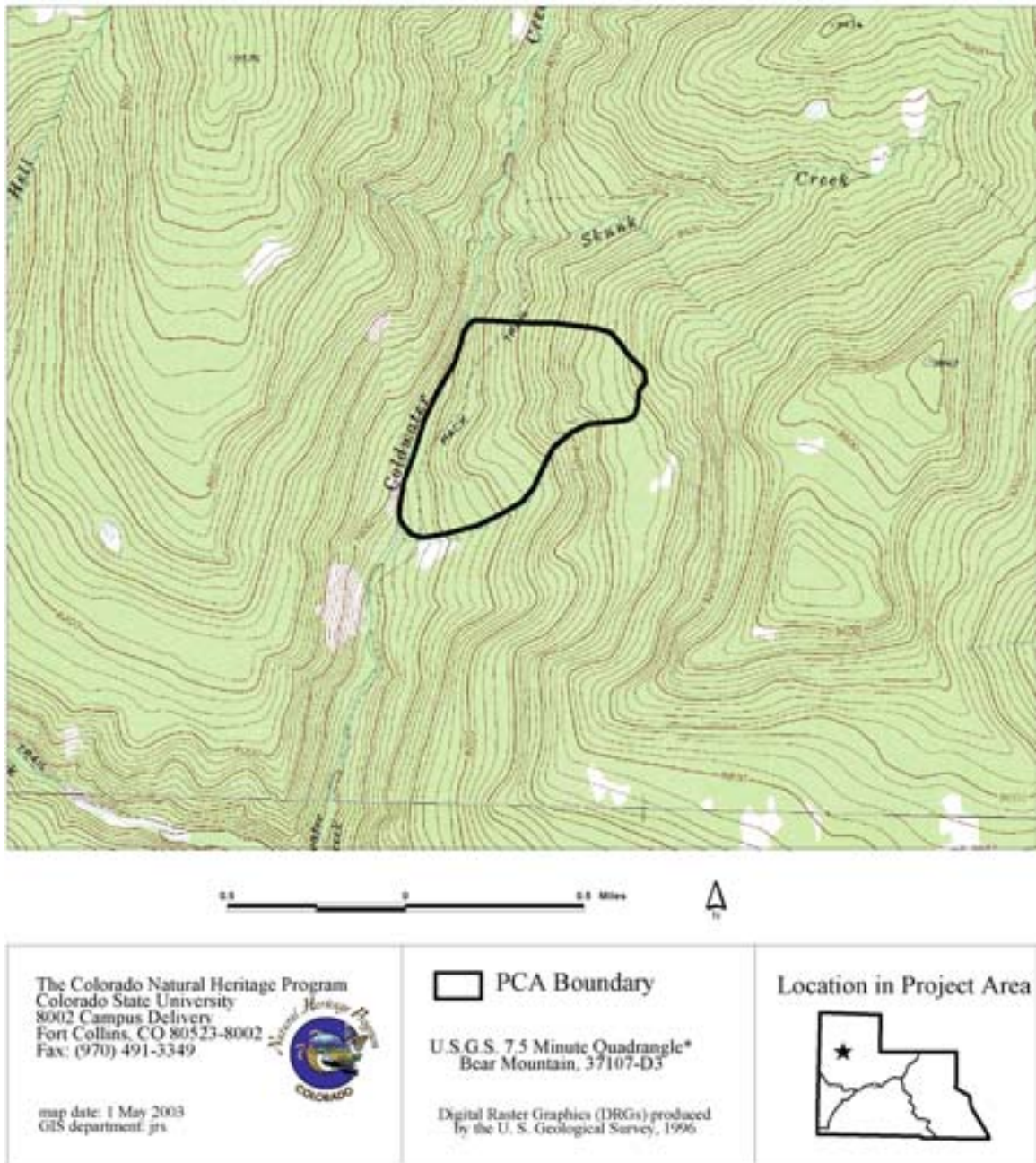


Fig. 39. Coldwater Creek at Skunk Creek Potential Conservation Area.

## Davis Creek

**Biodiversity Rank: B4 (Moderate significance)**

The Davis Creek PCA contains an excellent (A rank) occurrence of a Douglas Fir/Mountain Maple (*Pseudotsuga menziesii*/*Acer glabrum*) Lower Montane Forest community, which is globally secure (G4), but extremely rare (S1) in Colorado

**Protection Urgency Rank: P5 (No urgency)**

Land protection is complete and no protection actions are needed. This PCA is not easily accessed and is entirely within the San Juan National Forest

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. Logging or inappropriate grazing in the upper watershed above the PCA could impair hydrologic functioning needed for continued viability of the montane forest. Monitoring would detect any newly introduced exotic plants and aid in determining weed management needs.

**Location:** Archuleta County, at Davis Creek, 900 feet upstream of confluence with the Piedra River.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Devil Mountain  
T36NR4W S22

**Size:** 91 ac (37 ha)

**Elevation:** 7,200 to 8,000 ft (2,195 to 2,438 m)

**General Description:** The Davis Creek PCA encompasses a short stretch of the south end of Davis Creek at its confluence with the Piedra River. There is a narrow valley with moderate slopes of between 20 and 40 percent. Davis Creek is a relatively short, four mile long creek that starts in mountain meadows and drops some 2,000 feet in those four miles. The ephemeral spring stream is usually dry by mid-summer. Large boulders are strewn along the stream's side and a trail crosses the creek just above its confluence with the river at the southern boundary of the PCA. Blue spruce (*Picea pungens*) and Douglas fir (*Pseudotsuga menziesii*) are the dominant trees in the overstory within the PCA and there is a dense 90% cover of shrubs including thinleaf alder (*Alnus incana*), mountain maple (*Acer glabrum*) and red-osier dogwood (*Cornus sericea*) in the understory. Ground cover includes a 10% cover of grasses and a 30% cover of forbs. A Douglas fir/Mountain Maple (*Pseudotsuga menziesii*/*Acer glabrum*) Lower Montane Forest community occurs within the PCA.

**Biodiversity Rank Comment:** The Davis Creek PCA contains an excellent (A rank) occurrence of a plant community that is globally secure (G4), but extremely rare (S1) in

Colorado. This occurrence of this Douglas Fir/Mountain Maple (*Pseudotsuga menziesii/Acer glabrum*) Lower Montane Forest community represents the best known occurrence in Archuleta County.

**Table 40. Natural Heritage element occurrences at the Davis Creek PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plant Communities								
<i>Pseudotsuga menziesii/Acer glabrum</i>	<b>Douglas Fir/ Mountain Maple Lower Montane Forest</b>	<b>G4?</b>	<b>S1</b>				<b>A</b>	<b>1994-07-04</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses the occurrence and an approximate 1000 foot buffer. Eliminating disturbance within this 1,000-foot buffer would aid in reducing impacts from sedimentation (Karr and Schlosser 1978), and assist in maintaining the integrity of the occurrence and its associated avian, macroinvertebrate and periphyton communities (Noel et al. 1986, Spackman and Hughes 1995).

**Protection Comments:** This PCA is not easily accessed, is entirely within the San Juan National Forest and although this does not assure perpetual protection for the rare community no protection actions are currently needed. However, any changes in use of the land or ownership may necessitate action.

**Management Comments:** Any activity in the upper drainage of the PCA has the potential to adversely affect the montane forest. Logging or inappropriate grazing in the upper watershed above the PCA could impair hydrologic functioning needed for continued viability of the montane forest. The trail within the PCA offers access to hikers, horse riders and mountain bikers and such activity has the potential to introduce non-native plant species. Monitoring would detect any newly introduced exotic plants and aid in determining weed management needs.

# Davis Creek

## Potential Conservation Area

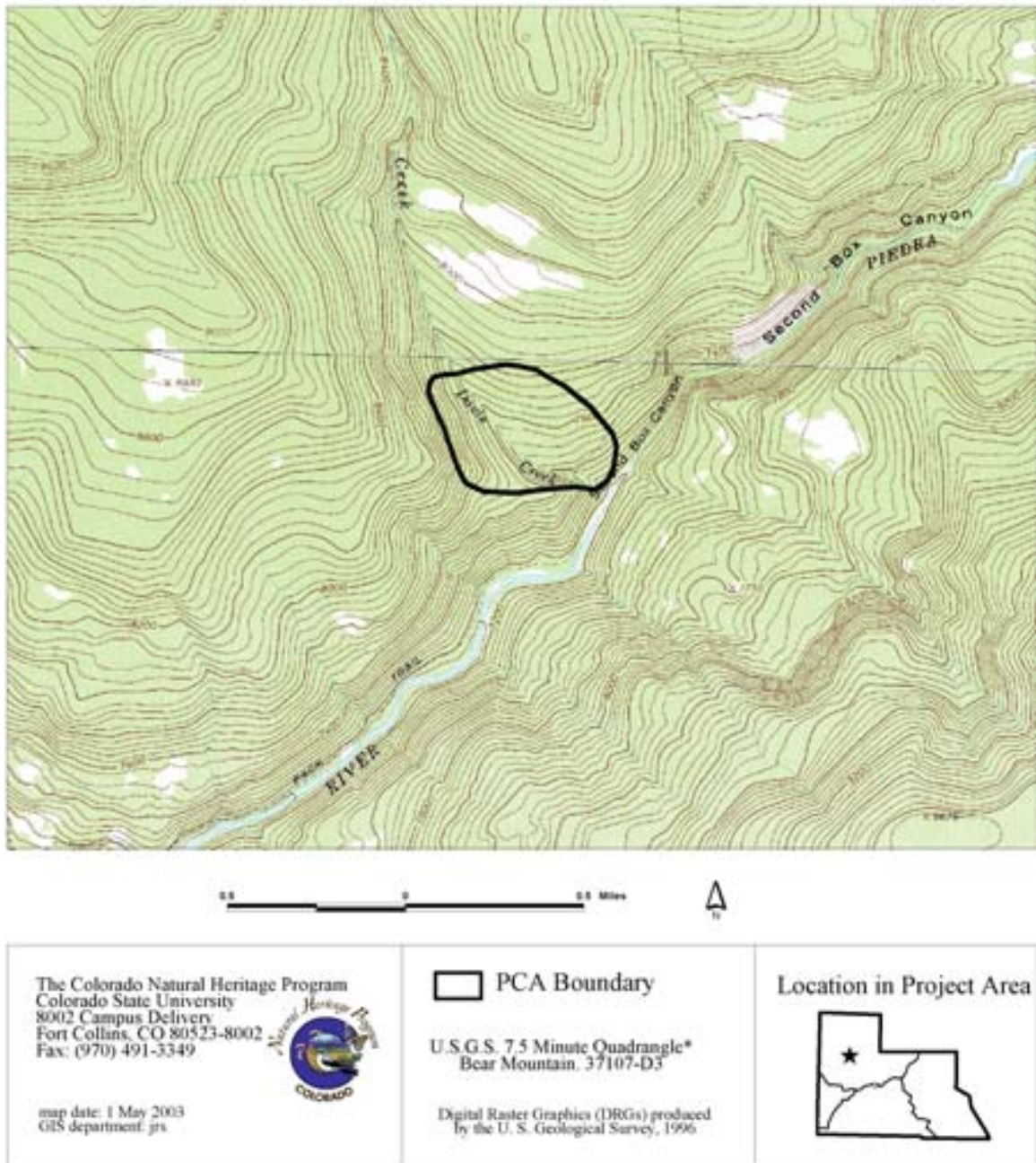


Fig. 40. Davis Creek Potential Conservation Area.

## East Fork Park

**Biodiversity Rank: B4 (Moderate significance)**

This PCA supports a fair (C rank) example of the globally vulnerable (G3) Alder/Mixed Willow (*Alnus incana*-mixed *Salix* species) riparian shrubland that is known from sixteen locations in and around the San Juan Mountains of Colorado. This PCA also includes several good occurrences of plant communities, one of which is critically imperiled in Colorado. It also contains breeding populations of Peregrine Falcon (*Falco peregrinus anatum*).

**Protection Urgency Rank: P2 (High urgency)**

Protection actions may be needed within 5 years. It is estimated that stresses may reduce the viability of the elements in the PCA within this approximate timeframe. This PCA is located on private land and although proposed plans for a ski area have been abandoned, the property could be developed for other recreational uses. A conservation easement on the private land is warranted.

**Management Urgency Rank: M2 (High urgency)**

New management actions may be needed within 5 years to prevent the loss of the rare plant communities and the Peregrine Falcon occurrences within the PCA. Much of the riparian system is in need of weed management and willow restoration. Regeneration of native plants especially willows, alders, and cottonwoods would increase the biological value of this PCA. Continuation of the current stream restoration work and maintenance and restoration of the natural hydrology will also increase the biological value of the PCA.

**Location:** Archuleta and Hinsdale counties, along the East Fork of the San Juan River from its confluence with Sand Creek to its confluence with Quartz Creek.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Wolf Creek Pass

T37NR1E S35, 36

T37NR2E S27, 28

**Size:** 2,530 ac (1,024 ha)

**Elevation:** 7,720 to 9,520 ft (2,353 to 2,901 m)

**General Description:** Population occurs on north-facing slopes of south side of the river gorge. The East Fork Park site includes an upper section of the East Fork of the San Juan River and adjacent upland forest. This section of the river opens up into a one-half mile wide valley below the Quartz Creek confluence and narrows again some five miles downstream. The river is low gradient, shallow, and braided, with a cobble bottom. The riparian vegetation is composed of a mosaic of three vegetation types, including narrowleaf cottonwood-blue spruce/thinleaf alder (*Populus angustifolia*-*Picea pungens*/*Alnus incana*) in the upper portion, with thinleaf alder-mixed willow (*Alnus*

*incana*-mixed *Salix* species) shrubland and perched wetlands of beaked sedge (*Carex utriculata*) in the lower half. Beavers (*Castor Canadensis*) are found on the secondary channels and help to maintain the wetlands. Grassy-forb meadows, often weedy, dominate the terraces and lower slopes and grade slopes. North-facing slopes support a good stand of old growth Douglas fir (*Pseudotsuga menziesii*) forest with a moist forb dominated understory. Small natural ponds and wetlands provide excellent habitat for deer, elk, and possibly frogs. Ponderosa pine (*Pinus ponderosa*) or Gambel oak (*Quercus gambelii*) dominate the south facing slopes. Grazing by cattle has been the dominant use of this site, although this is currently changing. There are no ditches, dams, man-made ponds, or irrigated hay meadows at this site-an unusual event given the elevation and geomorphology of the river.

**Biodiversity Rank Comment:** This PCA supports a fair (C rank) example of the globally vulnerable (G3) Alder/Mixed Willow (*Alnus incana*/Mixed *Salix* species) riparian shrubland that is known from sixteen locations in and around the San Juan Mountains of Colorado. This association occurs widely from 7,200-8900 feet in the Southern Rocky Mountains in Colorado and likely occurs in adjacent New Mexico and possibly southern Wyoming. This association is a more general type than other alder types. It has a high diversity of associated shrub species, unlike the nearly pure stands of alder found in other alder-dominated plant associations. The abundance of other shrubs may represent a transition in the physical setting, for example, from a broad floodplain dominated by willows to a narrow valley bottom and channel lined with only alder. This PCA also includes several good occurrences of plant communities, one of which is critically imperiled in Colorado. It also contains breeding populations of Peregrine Falcon (*Falco peregrinus anatum*).

**Table 41. Natural Heritage element occurrences at the East Fork Park PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
<b>Birds</b>								
<i>Falco peregrinus anatum</i>	American Peregrine Falcon	G4T3	S3B	LE	SC			1995
<b>Plant Communities</b>								
<b><i>Alnus incana</i>-mixed <i>Salix</i> species</b>	<b>Thinleaf Alder-mixed Willow Shrubland</b>	<b>G3</b>	<b>S3</b>				<b>C</b>	<b>1998-08-11</b>
<i>Populus angustifolia</i> - <i>Picea pungens</i> / <i>Alnus incana</i>	Narrowleaf Cottonwood-Blue Spruce/Thinleaf Alder Montane Riparian Forest	G3	S4				B	1998-08-11
<i>Pseudotsuga menziesii</i>	Douglas Fir/Creeping	G5	S1				B	1998-08-11

<i>Mahonia repens</i>	Oregon-Grape Forest							
<i>Carex utriculata</i>	Beaked Sedge Montane Wet Meadows	G5	S4				<b>B</b>	1998-08-11

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses the element occurrence and provides a small buffer to limit direct disturbance. This boundary is drawn to include the wetland/riparian complex and uplands that supports the elements of biodiversity found at the PCA. Digital elevation models, the 7.5 minute topographic map, and on-the-ground survey were referenced for delineating boundaries for this site.

**Protection Comments:** Protection actions may be needed within 5 years. It is estimated that stresses may reduce the viability of the elements in the PCA within this approximate timeframe. This PCA is located on private land and although proposed plans for a ski area have been abandoned, the property could be developed for other recreational uses. Over 75 % of the site is a privately owned ranch that is also an in holding in the Rio Grande National Forest. The private land has no formal conservation protection, although the owner is interested in protecting the area from large development projects. A conservation easement on the private land is warranted.

**Management Comments:** New management actions may be needed within 5 years to prevent the loss of the rare plant communities and the Peregrine Falcon occurrences within the PCA. Currently the area is not being grazed, but there is moderate recreational use in summer. Current management of the riparian zone on private lands is directed towards a reduction and eventual elimination of livestock grazing. Much of the riparian system is in need of weed management and willow restoration. The private property owner is aware and concerned about the weeds. Some stream restoration work has occurred along the upper elevations, and there may be plans for further work downstream. We recommend researching the historical geomorphology to determine if the current braided character of the stream is natural. If research finds that it has always been braided, we believe stream restoration should maintain its braided nature. Regeneration of native plants especially willows, alders, and cottonwoods would increase the biological value of this site. A reduction in livestock grazing may enhance natural reproduction of the native vegetation. The natural hydrology should be maintained or restored.

# East Fork Park Potential Conservation Area

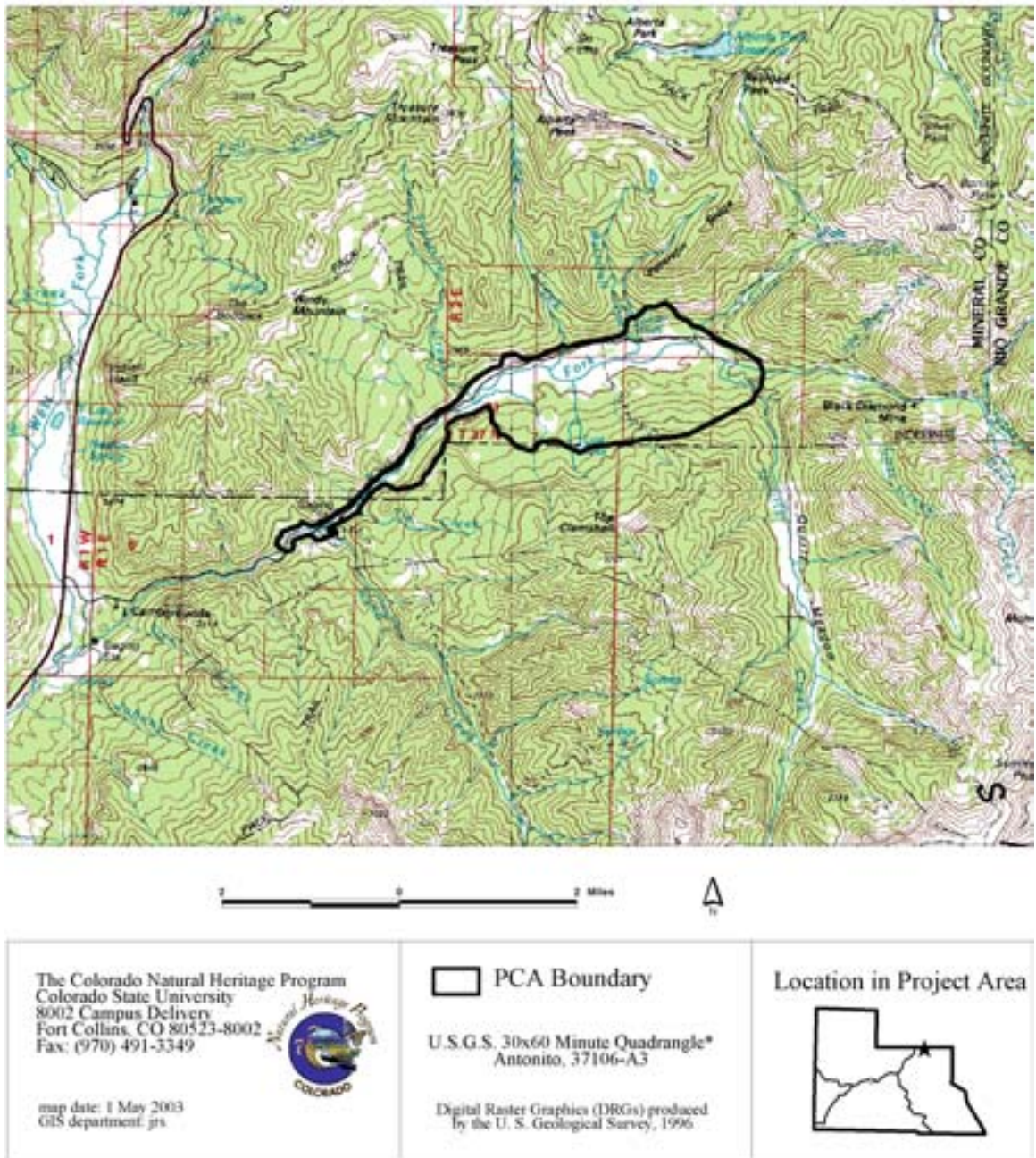


Fig. 41. East Fork Park Potential Conservation Area.

## East Fork Quartz Creek

**Biodiversity Rank: B4 (Moderate significance)**

This site contains an excellent (A-rank) occurrence of a plant community that is apparently secure (G4) on a global scale. This is the best known occurrence of the Heartleaf Bittercress-Tall Fringed Bluebells-Arrowleaf Ragwort (*Cardamine cordifolia-Mertensia ciliata-Senecio triangularis*) Alpine Wetland type in Archuleta County.

**Protection Urgency Rank: P5 (No urgency)**

Land protection is complete and no protection actions are needed. This PCA is in an isolated area, is difficult to access and is entirely within the San Juan National Forest.

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the alpine wetland in the PCA, but management actions may be needed in the future to maintain the current quality of the wetland community. This area sees heavy recreational use and monitoring would aid in detecting the introduction of exotic plants and in determining when erosion, particularly along the trailside, is threatening the stability of the snowmelt basin.

**Location:** Archuleta County, in the extreme northeast of the county at the top of a tributary feeding Quartz Creek.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Summit Creek  
T36NR2E S22, 23

**Size:** 55 ac (22 ha)

**Elevation:** 10,960 to 11,280 ft (3,341 to 3,438 m)

**General Description:** The East Fork Quartz Creek PCA encompasses a high alpine wetland at 11,000 feet in the heart of the San Juan Mountains. The area bounded by the PCA contains a Heartleaf Bittercress-Tall Fringed Bluebell-Arrowleaf Ragwort (*Cardamine cordifolia-Mertensia ciliata-Senecio triangularis*) Alpine Wetland. Approximately 80% of the wetland is covered with heartleaf bittercress and tall fringed bluebells. The meadow is productive, appears pristine with little degradation and has a consistent source of water supplied from a rocky and steep riparian area that drains a snowmelt basin. Horse riders and hikers use a trail crossing the PCA above the riparian area, which has lead to some erosion of the hillside above the meadow. Cattle also graze in the area. The adjacent hillsides are populated with an open forest of Douglas fir (*Pseudotsuga menziesii*) and Englemann spruce (*Picea engelmannii*). Ground cover is dominated by subalpine mesic forbs and graminoids.

**Biodiversity Rank Comment:** This site contains an excellent (A-rank) occurrence of a plant community, which is apparently secure (G4) on a global scale. This is the best known occurrence of the Heartleaf Bittercress-Tall Fringed Bluebells-Arrowleaf Ragwort

(*Cardamine cordifolia*-*Mertensia ciliata*-*Senecio triangularis*) Alpine Wetland type in Archuleta County. The generally small stands of this plant association are found in and near running water of small streams, seeps, and springs. Associated taxa may vary greatly with this plant association, but the dominance of *Cardamine cordifolia*, *Mertensia ciliata* or *Senecio triangularis* is clear. All of these species may be present or only one of the three.

**Table 42. Natural Heritage element occurrences at the East Fork Quartz Creek PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plant Communities								
<b><i>Cardamine cordifolia</i>-<i>Mertensia ciliata</i>-<i>Senecio triangularis</i></b>	<b>Heartleaf Bittercress-Tall Fringed Bluebell-Arrowleaf Ragwort Alpine Wetland</b>	<b>G4</b>	<b>S4</b>				<b>A</b>	<b>1994-08-12</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** Two primary ecological processes were considered when designing the site boundary: 1) surface water and 2) ground water. Both are critical to the alpine wetland that this PCA captures. The native plants rely on a good quality and quantity of surface water. The PCA boundary captures the snowmelt basin and its drainage that is so important to maintaining the viability of the alpine wetland. The boundary also includes an approximate 1000 foot buffer that will aid in preventing disturbance of the wetland.

**Protection Comments:** This PCA is entirely within the San Juan National Forest and accessed only by a long hike. Although this does not assure perpetual protection for the rare community no protection actions are currently needed. However, any changes in use of the land or ownership may necessitate action.

**Management Comments:** Current management seems to favor the persistence of the alpine wetland in the PCA, but management actions may be needed in the future to maintain the current quality of the wetland community. Recreational use of the trail by hikers and horse riders as well as grazing cattle have the potential to adversely affect the PCA through introduction of non-native plants and increased erosion. Disturbance of the snow melt basin has the potential to increase erosion and adversely affect the alpine wetland. In addition, enforcing a "weed-free" rule for horse feed on the trail would aid in limiting the introduction of non-native plants. Monitoring would aid in detecting the introduction of exotic plants and in determining when erosion, particularly along the trailside, is threatening the stability of the snowmelt basin.

# East Fork Quartz Creek Potential Conservation Area

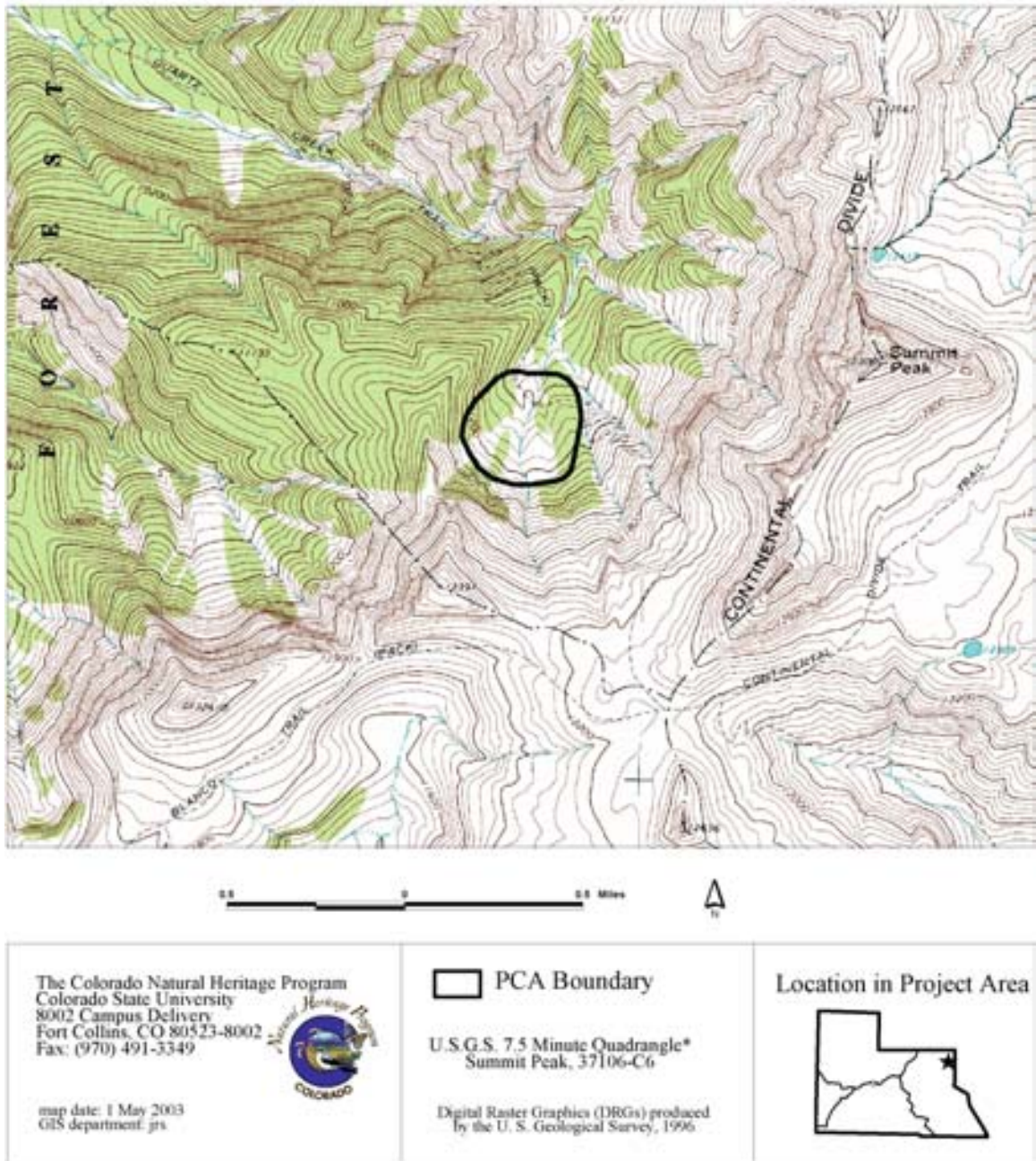


Fig. 42. East Fork Quartz Creek Potential Conservation Area.

## Hatcher Reservoir

**Biodiversity Rank: B4 (Moderate significance)**

The Hatcher Reservoir PCA is home to an excellent (A-rank) occurrence of Pagosa phlox, a species that is vulnerable (S3) in Colorado.

**Protection Urgency Rank: P2 (High urgency)**

Protection actions may be needed within 5 years. It is estimated that stresses associated with residential development may reduce the viability of the elements in the PCA within this approximate timeframe.

**Management Urgency Rank: M3 (Moderate urgency)**

New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Monitoring would aid in determining the effect that development and grazing have on the rare plant population.

**Location:** Archuleta County, four miles northwest of Pagosa Springs.

**Legal Description:**

U.S.G.S. 7.5 minute quadrangle: Pagosa Springs

T36N R2.5W S23-26, 36

T36N R2W S 30-32

T35N R2W S6

**Size:** 1384 ac (560 ha)

**Elevation:** 7,720 to 8,160 ft (2,353 to 2,487 m)

**General Description:** This PCA is characterized by xeric to somewhat mesic conditions in ponderosa pine (*Pinus ponderosa*) savanna and Gambel oak (*Quercus gambelii*) communities. The loamy soils are derived from Mancos Shale. Other plants that occur in the PCA include mules ears (*Wyethia* sp.), fleabane (*Erigeron* sp.), and bluegrass (*Poa* spp). This PCA was identified in 1985, and was not visited in 2001, so current condition is not known.

**Biodiversity Rank Justification:** The Hatcher Reservoir PCA is home to an excellent (A-rank) occurrence of Pagosa phlox, a species that is vulnerable (S3) in Colorado. This plant species has a broad distribution in New Mexico and Colorado and is known from 32 locations in Colorado.

**Table 43. Natural Heritage element occurrences at the Hatcher Reservoir PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plants								
<b><i>Phlox caryophylla</i></b>	<b>Pagosa phlox</b>	<b>G4</b>	<b>S3</b>				<b>A</b>	<b>1985-06-03</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary includes the occurrence and a small buffer of suitable habitat to allow for additional individuals to become established over time.

**Protection Rank Comments:** The PCA includes a combination of private and San Juan National Forest lands. Plans of private landowners are unknown, but could include development and other activities that would threaten the rare plant population. The Archuleta County Community Plan designates the area of the PCA west of the Piedra Road (CR 600) for medium and high density residential housing. It is estimated that without protection, stresses associated with residential development may reduce the viability of the population within five year.

**Management Rank Comments:** New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. There are many roads in the PCA, as well as heavy grazing. Further surveys during the flowering season (April and May) of the Pagosa phlox could reveal that the population is more extensive. Monitoring would aid in determining the effect that development and grazing have on the rare plant population.

# Hatcher Reservoir Potential Conservation Area

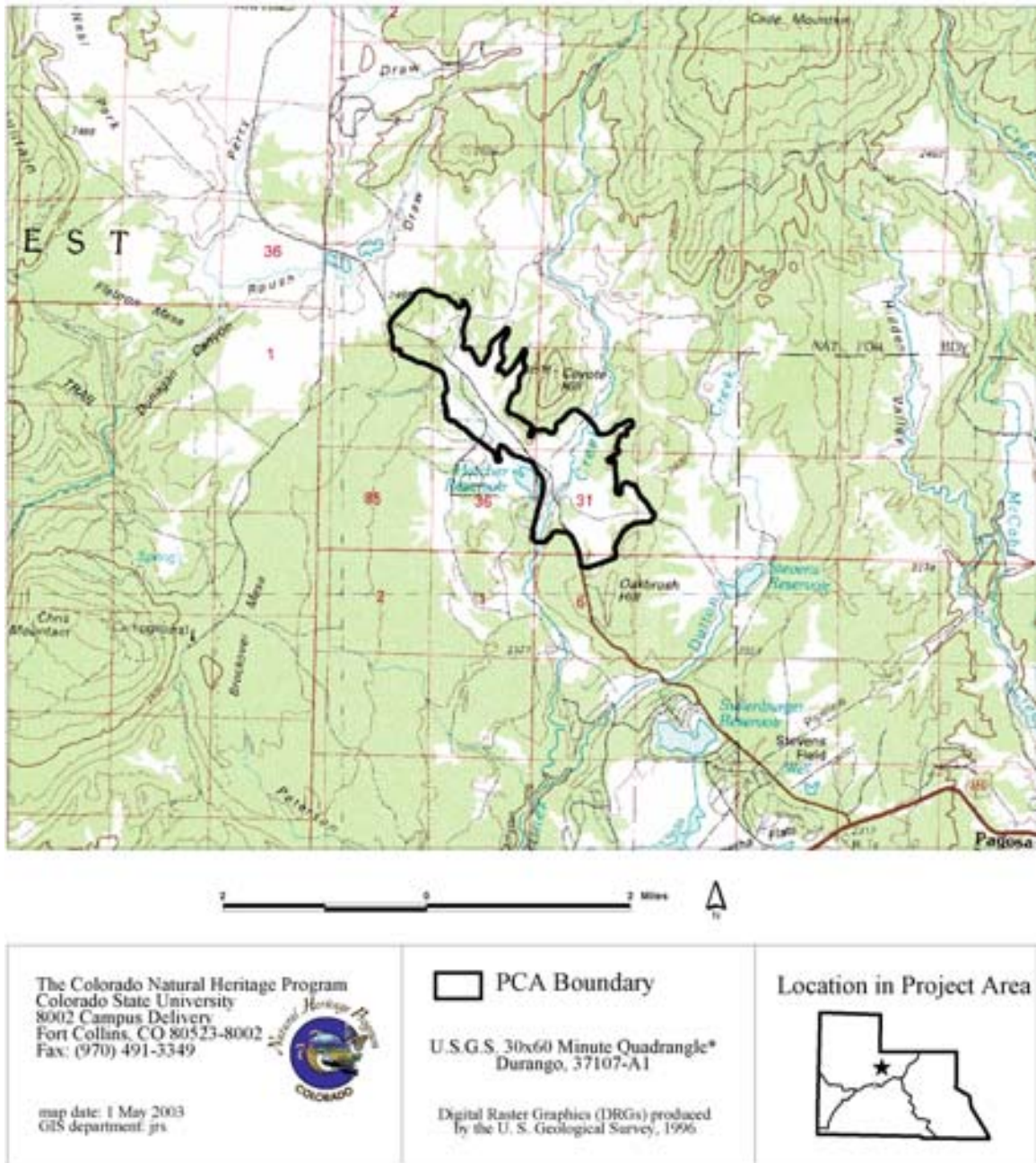


Fig. 43. Hatcher Reservoir Potential Conservation Area.

## Headwaters of Summit Creek

**Biodiversity Rank: B4 (Moderate significance)**

This PCA supports a good (B rank) occurrence of an alpine wetland (*Carex vernacula*), a plant community for which the status has not yet been determined (GUSU). This alpine meadow association is known from only four localities in San Juan County and one locality in Archuleta County, Colorado.

**Protection Urgency Rank: P5 (No urgency)**

Land protection is complete and no protection actions are needed. The PCA is entirely within the San Juan Wilderness.

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the alpine wetland in the PCA, but management actions may be needed in the future to maintain the current quality of the wetland community. A monitoring program would aid in detecting non-native plant introductions and in indicating when management actions are needed to maintain the quality of the wetland community within the PCA.

**Location:** Northeast Archuleta County, at the extreme headwaters of Summit Creek, 500 feet west of the continental divide.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Summit Peak  
T36NR2E S26

**Size:** 30 ac (12 ha)

**Elevation:** 12,200 to 12,240 ft (3,719 to 3,731 m)

**General Description:** The Headwaters of Summit Creek PCA is located high in the San Juan Mountains in an area surrounded by 13,000 foot peaks. The PCA lies just to the west of the continental divide on the west side of a high mountain pass. The area is breath taking and although two trails (the Continental Divide Trail and the trail from Quartz Meadow) intersect within the PCA the area is pristine with little degradation. The Summit Creek headwaters originate here in a snowmelt basin at 12,200 feet of elevation. The area is characterized by very healthy alpine tundra with a shallow and wide rivulet running through it that is the beginning of the Summit Creek drainage. Within the PCA there is a Native Sedge (*Carex vernacula*) Alpine Wetland that is extremely rare both in Colorado and North America. Graminoids cover approximately 60% of the alpine wetland and native sedge and tufted hairgrass (*Deschampsia cespitosa*) are dominant with marsh marigold (*Caltha leptosepala*) covering another 30% of the wetland. Hikers and horse riders use the trails present in the area, but the wetland is undisturbed because its wetness deters recreational activity.

**Biodiversity Rank Comment:** This PCA supports a good (B rank) occurrence of an Native Sedge (*Carex vernacula*) Alpine Wetland, a plant community for which the status has not yet been determined (GUSU). This alpine meadow association is known from only four localities in San Juan County and one locality in Archuleta County, Colorado. This wetland occurs along narrow and sinuous stream channels in gently sloping, glaciated, alpine basins. *Carex vernacula* dominates the vegetation cover with marsh marigold (*Caltha leptosepala*) and tufted hairgrass (*Deschampsia caespitosa*) as common subdominants.

**Table 44. Natural Heritage element occurrences at the Headwaters of Summit Creek PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plant Communities								
<i>Carex vernacula</i>	<b>Native Sedge Alpine Wetland</b>	GU	SU				<b>B</b>	<b>1994-08-12</b>

\*EO rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** Two primary ecological processes were considered when designing the site boundary: 1) surface water and 2) ground water. Both are critical to the alpine wetland that this PCA captures. The native plants rely on a good quality and quantity of surface water. The site boundary captures the snowmelt basin and its drainage that is so important to maintaining the viability of the alpine wetland.

**Protection Comments:** This PCA is entirely within the San Juan Wilderness of the San Juan National Forest and present land protection is adequate. However, future changes in status or use of the land may warrant action.

**Management Comments:** Current management seems to favor the persistence of the alpine wetland in the PCA, but management actions may be needed in the future to maintain the current quality of the wetland community. Recreational use of the trails present in the PCA by hikers and horse riders has the potential to introduce non-native plants into the PCA. A monitoring program would aid in detecting non-native plant introductions and in indicating when management actions are needed to maintain the quality of the wetland community within the PCA.

Hydrological processes originating outside of the planning boundary, including water quality, quantity, timing and flow must be managed to maintain site viability.

# Headwaters of Summit Creek Potential Conservation Area

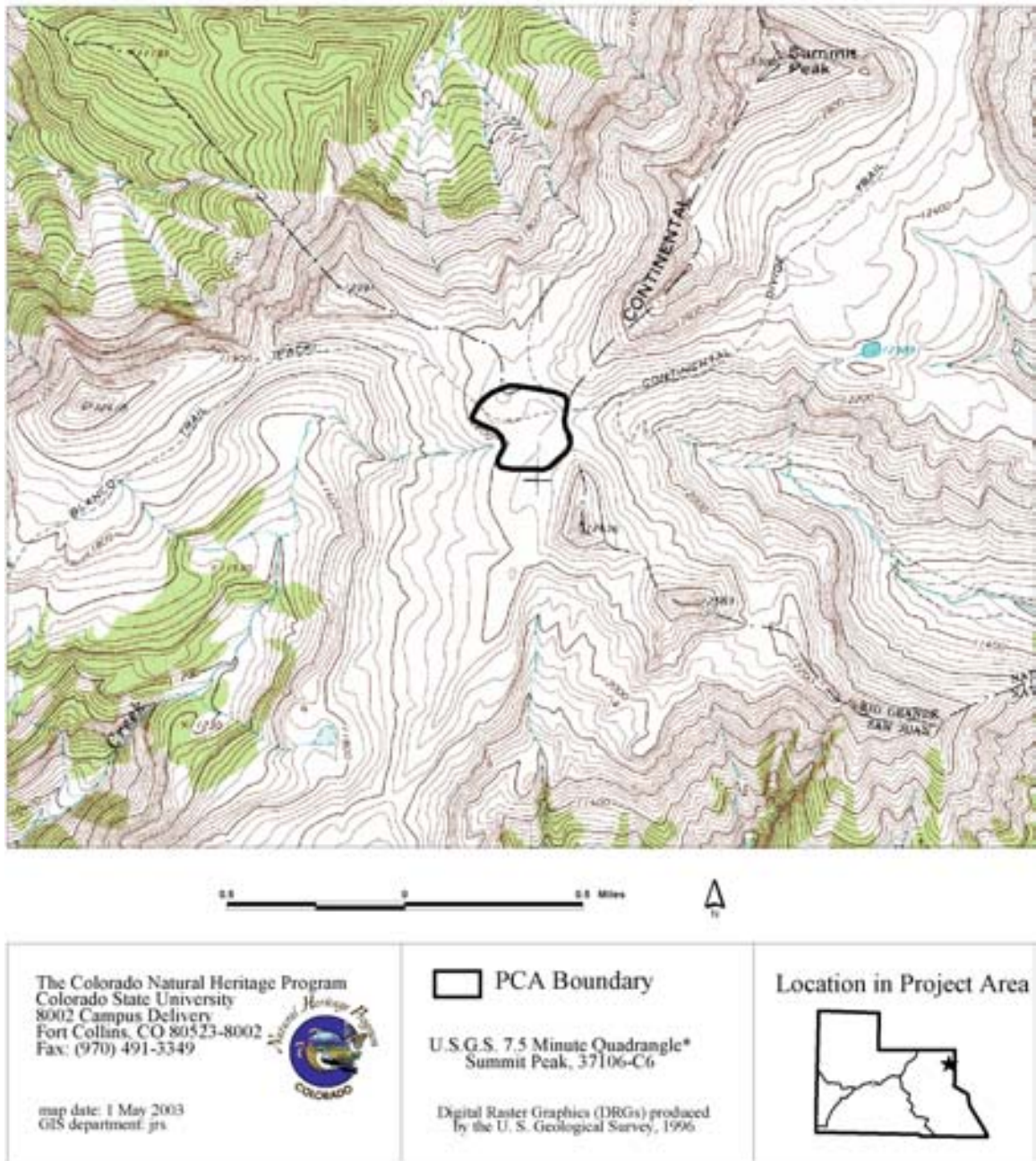


Fig. 44. Headwaters of Summit Creek Potential Conservation Area.

## Hondo Creek

**Biodiversity Rank: B4 (Moderate significance)**

This PCA contains an excellent (A rank) occurrence of a plant community that is apparently secure (G4) on a global scale. The Drummond's Willow (*Salix drummondiana*) Mesic Forb community within this PCA represents the best known occurrence of this community type in Archuleta County.

**Protection Urgency Rank: P5 (No urgency)**

Land protection is complete and no protection actions are needed. This PCA is entirely within the South San Juan Wilderness of the San Juan National Forest.

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the willow-mesic forb community in the PCA, but management actions may be needed in the future to maintain the current quality of the plant community. Recreational use of a trail in the PCA, particularly by horse riders, has the potential to introduce exotic plant species. A monitoring program would aid in identifying the need for weed management actions.

**Location:** Northeast Archuleta County, at Hondo Creek just below the Hondo Creek Falls.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Blackhead Peak  
T35NR2E S5, 8

**Size:** 43 ac (17 ha)

**Elevation:** 9,600 to 10,200 ft (2,926 to 3,110 m)

**General Description:** The Hondo Creek PCA encompasses a narrow canyon high in the San Juan Mountains at an elevation of 9,500 feet. Hondo Creek, a tributary of the Rio Blanco, bisects the PCA and has created a narrow bottomed canyon with a rocky streamside, with many boulders and some small overflow channels. The creek, which drains a basin northeast of Blackhead Peak, has a bottom consisting of bedrock, cobble and gravel.

The upper reaches of Hondo Creek and the basin above the creek are barren with steep slopes, dropping into large avalanche chutes that cut through an old growth Engelmann spruce (*Picea engelmannii*) and fir (*Pseudotsuga menziesii*) forest. There are a number of drainages on the steep north and south slopes of this east-west flowing creek that appear prone to flooding and have prominent washout areas. There is a lot of bear and elk sign in the valley and a trail crosses through the PCA, but this wilderness area is not easily accessed and the trail appears little used except by hunters. There is a Drummond's Willow (*Salix drummondiana*) Mesic Forb plant community along Hondo Creek within the PCA. Approximately 90% of the streambank within this plant community is covered

by shrubs including Drummond's willow and thinleaf alder (*Alnus incana*) and 80% of the understory consists of forbs including cow parsnip (*Heracleum lanatum*), fumewort (*Corydalis caseana*) and waterleaf (*Hydrophyllum fendleri*). The entire community is very large, pristine and highly productive.

**Biodiversity Rank Comment:** This PCA contains an excellent (A rank) occurrence of a plant community that is apparently secure (G4) on a global scale. The Drummond's Willow (*Salix drummondiana*) Mesic Forb community within this PCA represents the best known occurrence of this community type in Archuleta County. This riparian shrubland most commonly occurs on relatively steep streams and rarely forms more than a narrow, 5 to 25 feet wide, band along streambanks. The closed to partially open canopy of *Salix drummondiana* and a thick carpet of many forb species characterize this plant association.

**Table 45. Natural Heritage element occurrences at the Hondo Creek PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plant Communities								
<i>Salix drummondiana</i>	<b>Drummond's Willow/ Mesic Forb</b>	<b>G4</b>	<b>S4</b>				<b>A</b>	<b>1994-09-10</b>

\*EO rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundaries incorporate an area that will allow natural hydrological processes such as seasonal flooding, sediment deposition, and new channel formation to maintain viable populations of the plant community along Hondo Creek. It should be noted that the hydrological processes necessary to the willow-forb community are not fully contained by the site boundaries. Given that the community is dependent on natural hydrological processes associated with Hondo Creek, upstream activities such as water diversions, impoundments, and improper livestock grazing are detrimental to the hydrology of the riparian area. This boundary indicates the minimum area that should be considered for any conservation management plan.

The boundary also includes a buffer of approximately 1,000-feet that should protect the plant communities from direct disturbance, and is thought to protect the avian, macroinvertebrate and periphyton communities (Noel et al. 1986, Spackman and Hughes 1995) associated with the riparian areas. Maintenance of this 1,000-foot buffer should also protect against impacts from sedimentation (Karr and Schlosser 1978) resulting from increased erosion, which occurs in areas where vegetation is removed or degraded.

**Protection Comments:** Land protection is complete and no protection actions are needed. This PCA is entirely within the South San Juan Wilderness of the San Juan National Forest. However, future changes in status or use of the land may warrant action.

**Management Comments:** Current management seems to favor the persistence of the willow-mesic forb community in the PCA, but management actions may be needed in the future to maintain the current quality of the plant community. Non-native plant species,

mainly Canada thistle (*Cirsium avense*) and hay grasses occur in the PCA and may require management action in the future. Recreational users on the trail, particularly horse riders, have the potential to increase the adverse affects through additional introduction of exotic plant species. Monitoring would aid in identifying needed weed management actions prior to degradation of the area.

Hydrological processes originating outside of the planning boundary, including water quality, quantity, timing and flow must be managed to maintain site viability.

# Hondo Creek

## Potential Conservation Area

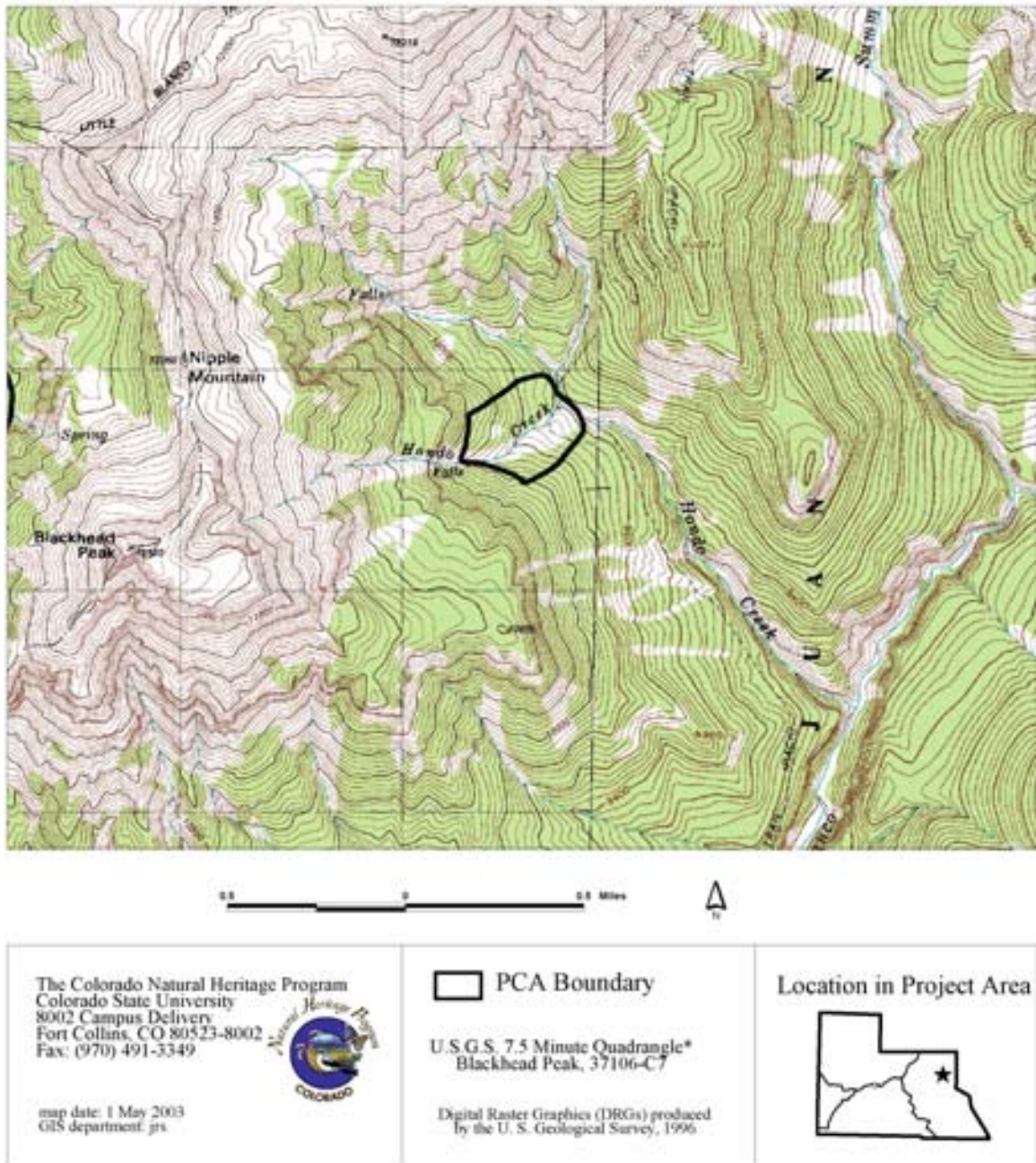


Fig. 45. Hondo Creek Potential Conservation Area.

## Indian Creek at Williams Creek Reservoir

### **Biodiversity Rank: B4 (Moderate significance)**

This PCA contains an excellent (A rank) occurrence of Drummond's Willow (*Salix drummondiana*)/Mesic Forb Riparian Shrubland, a plant community that is secure on a global scale (G4). This riparian shrubland is restricted to the Wyoming Basin and the Southern Rocky Mountain ecoregions

### **Protection Urgency Rank: P5 (No urgency)**

Land protection is complete and no protection actions are needed. This PCA is contained entirely within the Weminuche Wilderness in the San Juan National Forest and is adequately protected.

### **Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the willow/forb plant community in the PCA, but management actions may be needed in the future to maintain the current quality of the area. A monitoring program would aid in the detection of introduced exotic plants and identify necessary management actions to maintain the current quality of the PCA.

**Location:** Hinsdale County, at Indian Creek pack trail, 3.4 miles east of the confluence of Indian Creek and Williams Creek.

### **Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Cimarrona Peak  
T38NR3W S2, 3

**Size:** 64 ac (26 ha)

**Elevation:** 9,200 to 10,000 ft (2,804 to 3,048 m)

**General Description:** The Indian Creek at Williams Creek Reservoir PCA encompasses a riparian area along Indian Creek at 9,500 feet in the San Juan Mountains of Hinsdale County. The narrow valley within which the PCA lies runs north south and drains Palisade Meadow into Williams Creek. The area of the PCA is characterized by a steep canyon with slopes of over 50% and there are numerous slides forming pockets of open riparian area along Indian Creek that are dominated by willow (*Salix* sp.). Drummond's Willow (*Salix drummondiana*)/Mesic Forb Riparian Shrublands dominate these willow areas. Willows, including Rocky Mountain willow (*Salix monticola*) cover 100% of these areas and forbs including woodreed (*Cinna latifolia*), cow parsnip (*Heracleum lanatum*), waterleaf (*Hydrophyllum capitatum*) and Franciscan bluebells (*Mertensia franciscana*) cover 70% of the ground. In more forested areas outside of the slides thinleaf alder (*Alnus incana*) dominates. The upland areas of the hillside contain a mix of spruce (*Picea* sp.), fir and aspen (*Populus tremuloides*). A trail runs directly through the PCA. The area of the PCA is quite pristine. However, there are a few exotic plant species present that were probably introduced through activities on the trail.

**Biodiversity Rank Comment:** This PCA contains an excellent (A rank) occurrence of Drummond's Willow (*Salix drummondiana*)/Mesic Forb, a plant community that is secure on a global scale (G4). This riparian shrubland occurs in the Wyoming Basin and the Southern Rocky Mountain ecoregions and is most commonly found on relatively steep streams, rarely forming more than a narrow, 5 to 25 feet wide, band along streambanks. The closed to partially open canopy of Drummond's willow and a thick carpet of many forb species characterize this plant association.

**Table 46. Natural Heritage element occurrences at the Indian Creek at Williams Creek Reservoir PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plant Communities								
<b><i>Salix drummondiana</i>)/ Mesic Forb</b>	<b>Drummond's Willow Riparian Shrubland</b>	<b>G4</b>	<b>S4</b>				<b>A</b>	<b>1994-07-31</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The PCA includes the occurrence and a small buffer up and downstream, and uphill of the creek. This buffer is created to prevent impacts from trampling and to provide suitable habitat where additional plants can become established over time. Eliminating disturbance within this 1,000-foot buffer would also aid in reducing impacts from sedimentation (Karr and Schlosser 1978), and assist in maintaining the integrity of the occurrence and its associated avian, macroinvertebrate and periphyton communities (Noel et al. 1986, Spackman and Hughes 1995). It should be noted that the hydrological processes necessary to the willow-forb community are not fully contained by the site boundaries. Given that the community is dependent on natural hydrological processes associated with Indian Creek, upstream activities such as water diversions, impoundments, and improper livestock grazing are detrimental to the hydrology of the riparian area. This boundary indicates the minimum area that should be considered for any conservation management plan.

**Protection Comments:** This PCA is contained entirely within the Weminuche Wilderness in the San Juan National Forest and present land protection is adequate. However, future changes in status or use of the land may warrant action.

**Management Comments:** Current management seems to favor the persistence of the willow/forb plant community in the PCA, but management actions may be needed in the future to maintain the current quality of the area. A trail through the area is creating disturbance and could potentially lead to trampling and the introduction of exotic plant species. A monitoring program would aid in the detection of introduced exotic plants and identify necessary management actions to maintain the current quality of the PCA.

# Indian Creek at Williams Creek Reservoir Potential Conservation Area

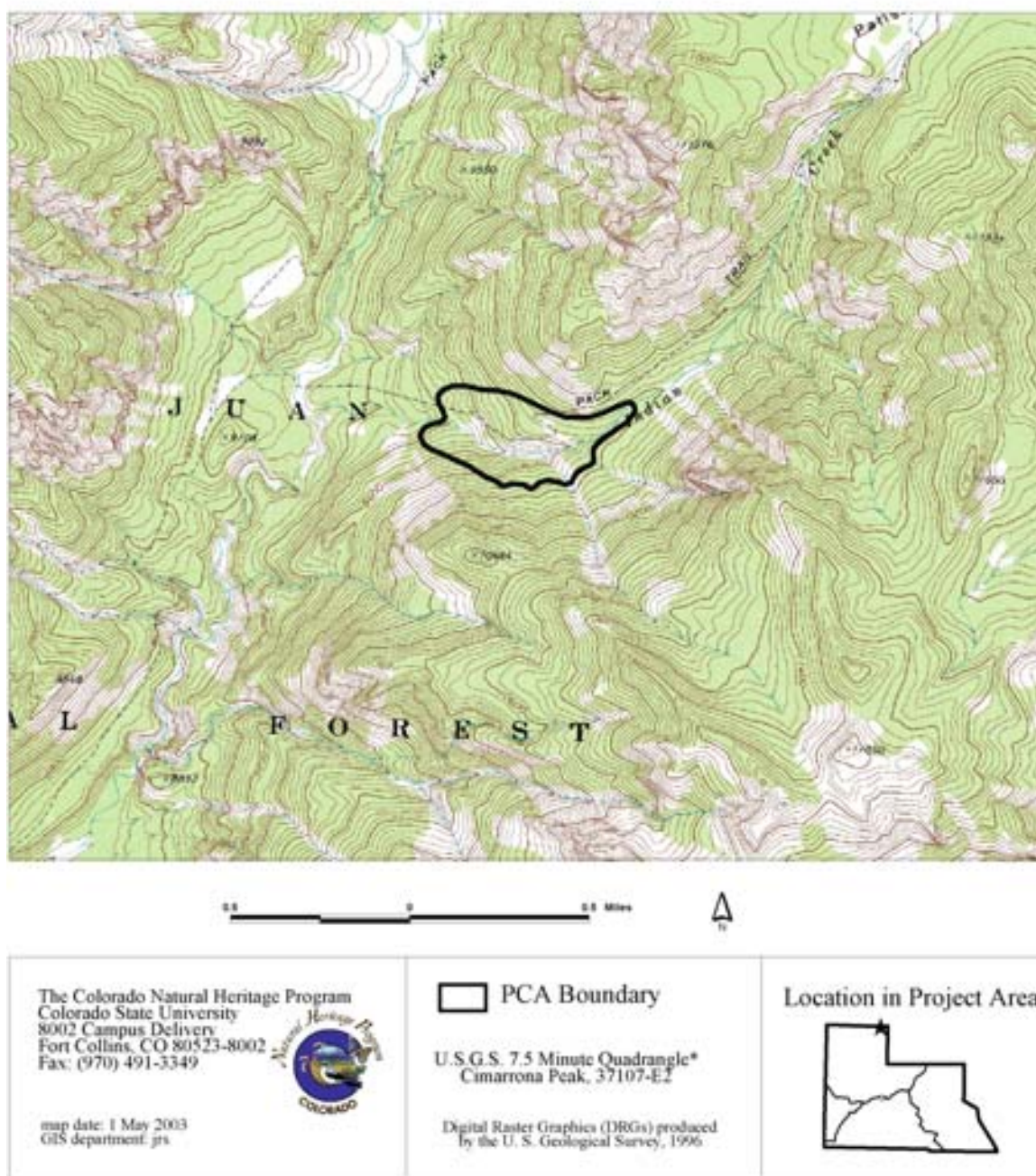


Fig. 46. Indian Creek at Williams Creek Reservoir Potential Conservation Area.

## Montezuma Creek

### **Biodiversity Rank: B4 (Moderate significance)**

This PCA encompasses an excellent (A rank) occurrence of the Aztec milkvetch (*Astragalus proximus*), a species that is rare (S2) in Colorado.

### **Protection Urgency Rank: P3 (Moderate urgency)**

Protection actions may be needed, but probably not within the next 5 years. It is estimated that stresses may reduce the viability of the elements in the PCA if protection action is not taken.

### **Management Urgency Rank: M4 (Low urgency)**

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

**Location:** Archuleta County, north of Montezuma Creek on County Road 522, about 14 air miles south of Pagosa Springs.

### **Legal Description:**

U.S.G.S. 7.5 minute quadrangle: Edith, Trujillo

T33N R1W S30, 31

T33N R1.5W S25, 36

**Size:** 88 ac (36 ha)

**Elevation:** 7,400 ft (2,256 m)

**General Description:** This PCA consists of dry, open, south facing slopes with about 30% bare ground, on both sides of a county road. Vegetation includes Gambel oak, grasses and forbs. The site was not visited in 2001.

**Biodiversity Rank Justification:** This PCA encompasses an excellent (A rank) occurrence of the Aztec milkvetch (*Astragalus proximus*), a species that is rare (S2) in Colorado. The population is comprised of five sub-populations. The Aztec milkvetch occurs in New Mexico and there are also twelve known locations in Colorado.

**Table 47. Natural Heritage element occurrences at the Montezuma Creek PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plants								
<i><b>Astragalus proximus</b></i>	<b>Aztec milkvetch</b>	<b>G4</b>	<b>S2</b>			<b>FS/BLM</b>	<b>A</b>	<b>1997-07-07</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary was drawn to encompass five sub-populations of Aztec milkvetch, which occur on the southeast facing slopes, and to provide a small buffer around them to limit disturbance.

**Protection Rank Comments:** The majority of the site is on private land, along a public road. The northern 20% of the PCA is on the San Juan National Forest.

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

# Montezuma Creek Potential Conservation Area

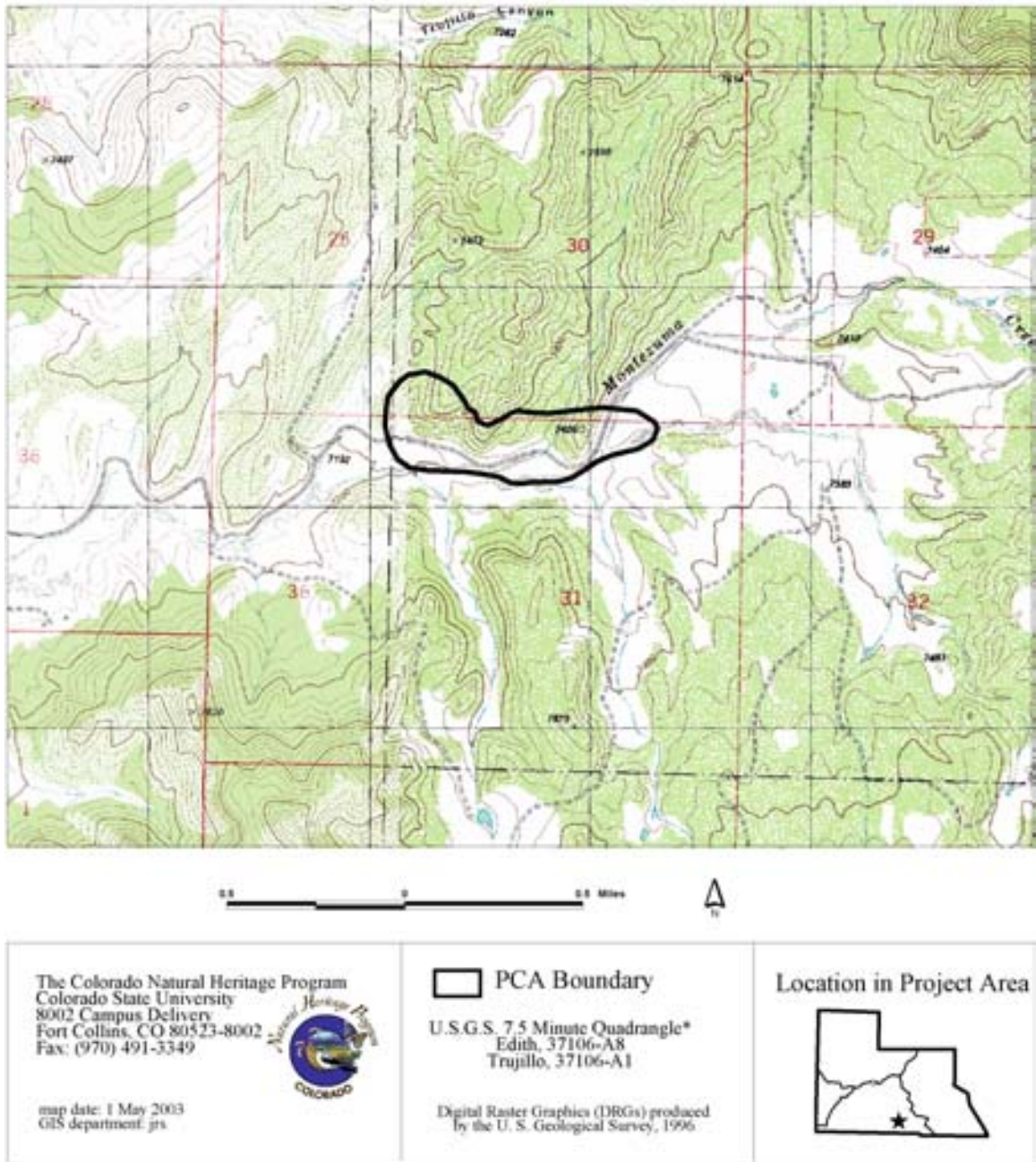


Fig. 47. Montezuma Creek Potential Conservation Area.

## Nabor Creek

**Biodiversity Rank: B4 (Moderate significance)**

This site includes a good (B rank) occurrence of the Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*), a fish that is globally secure (G4), but vulnerable (S3) in Colorado. Although this species is considered secure globally, it has a small range in the Rio Grande drainage of Colorado and New Mexico. There are at least 13 large, genetically pure, unthreatened populations and 200+ smaller, hybridized, or otherwise threatened populations.

**Protection Urgency Rank: P3 (Moderate urgency)**

Protection actions may be needed, but probably not within the next 5 years. It is estimated that stresses may reduce the viability of the elements in the site if protection action is not taken. The site is entirely on private ranchland and the owner's intentions for the property are unknown. The Archuleta Community Plan designates the area for very low density development of 35 acre or larger home sites.

**Management Urgency Rank: M3 (Moderate urgency)**

Current management seems to favor the persistence of the cutthroat population in the PCA, but management actions may be needed in the future to maintain the current quality of the population. Management and protection of the elements found within this site would require prevention of introduced fish stock and minimization of grazing impacts on the riparian vegetation.

**Location:** Archuleta County; Nabor Creek is most easily accessed from Forest Service Road 121 off of Highway 17 in New Mexico.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Archuleta Creek, Chama, Chromo Mountain

**Size:** 172 ac (70 ha)

**Elevation:** 8,400 to 10,000 ft (2,560 to 3,048 m)

**General Description:** The Nabor Creek site encompasses the headwaters of its namesake stream and follows the creek from its origin in Colorado at 10,000 feet to Nabor Lake in New Mexico at an elevation of 8,400 feet. A total of 3.5 creek miles are included within the site. The creek follows a narrow valley with moderate slopes, but at times drops through narrow chutes with steep walls of over 100 feet. A jeep trail follows along the creek for almost the entire length of the PCA. A mixed aspen-spruce-fir forest (*Populus tremuloides*-*Picea engelmannii*-*Abies lasiocarpa*) dominates the upland areas of the PCA at higher elevation and ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) are more prominent below 9,200 feet. There are occasional stands of cottonwoods (*Populus* sp.) spread along some reaches of the stream. At lower elevations, open meadows dominated by grasses occur sporadically along the stream bottom. A population of Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*)

occupies Nabor Creek within the PCA. A man-made barrier at Nabor Lake in New Mexico protects this cutthroat population from invasion and subsequent hybridizing with non-native trout species. The population is of 95% genetic purity, qualifying it as a Core Conservation Population with the Colorado Division of Wildlife.

**Biodiversity Rank Comment:** This PCA includes a good (B rank) occurrence of the Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*) that is globally secure (G4), but vulnerable (S3) in Colorado. Although this species is considered secure globally, it has a small range in the Rio Grande drainage of Colorado and New Mexico. There are at least 13 large, genetically pure, unthreatened populations and 200+ smaller, hybridized, or otherwise threatened populations. Rio Grande cutthroat readily hybridize with other spring spawning trout such as introduced rainbow trout or other subspecies of cutthroat (Sublette et al. 1990). Favorable protection and management makes the species secure and with continued active management its conservation status is likely to improve.

**Table 48. Natural Heritage element occurrences at the Nabor Creek PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Fish								
<i>Oncorhynchus clarki pleuriticus</i>	Rio Grande cutthroat trout	G4T3	S3				B	2003

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundaries are drawn to provide habitat for the occurrence of the Rio Grande cutthroat trout. The boundary of this PCA is limited to 100 meters on either side of the creek to provide adequate riparian vegetation for cover and possible prey (insect) needs, yet this potential conservation area, in and of itself, may not be sufficient to ensure the persistence of the population. Ecological processes or environmental impacts such as logging and sedimentation from runoff that originate upstream of the site or elsewhere in the immediate watershed may affect the viability of this occurrence.

**Protection Comments:** Protection actions may be needed, but probably not within the next 5 years. It is estimated that stresses may reduce the viability of the elements in the site if protection action is not taken. The site is entirely on private ranchland and the owner's intentions for the property are unknown. Existing use of the area consists of livestock ranching, however, the Archuleta Community Plan designates the area for very low density development of 35 acre or larger home sites.

**Management Comments:** Current management seems to favor the persistence of the cutthroat population in the PCA, but management actions may be needed in the future to maintain the current quality of the population. Management and protection of the elements found within this site would require prevention of introduced fish stock and minimization of grazing impacts on the riparian vegetation, cover of which is necessary to prevent undue erosion and sedimentation of the stream channel.

# Nabor Creek

## Potential Conservation Area

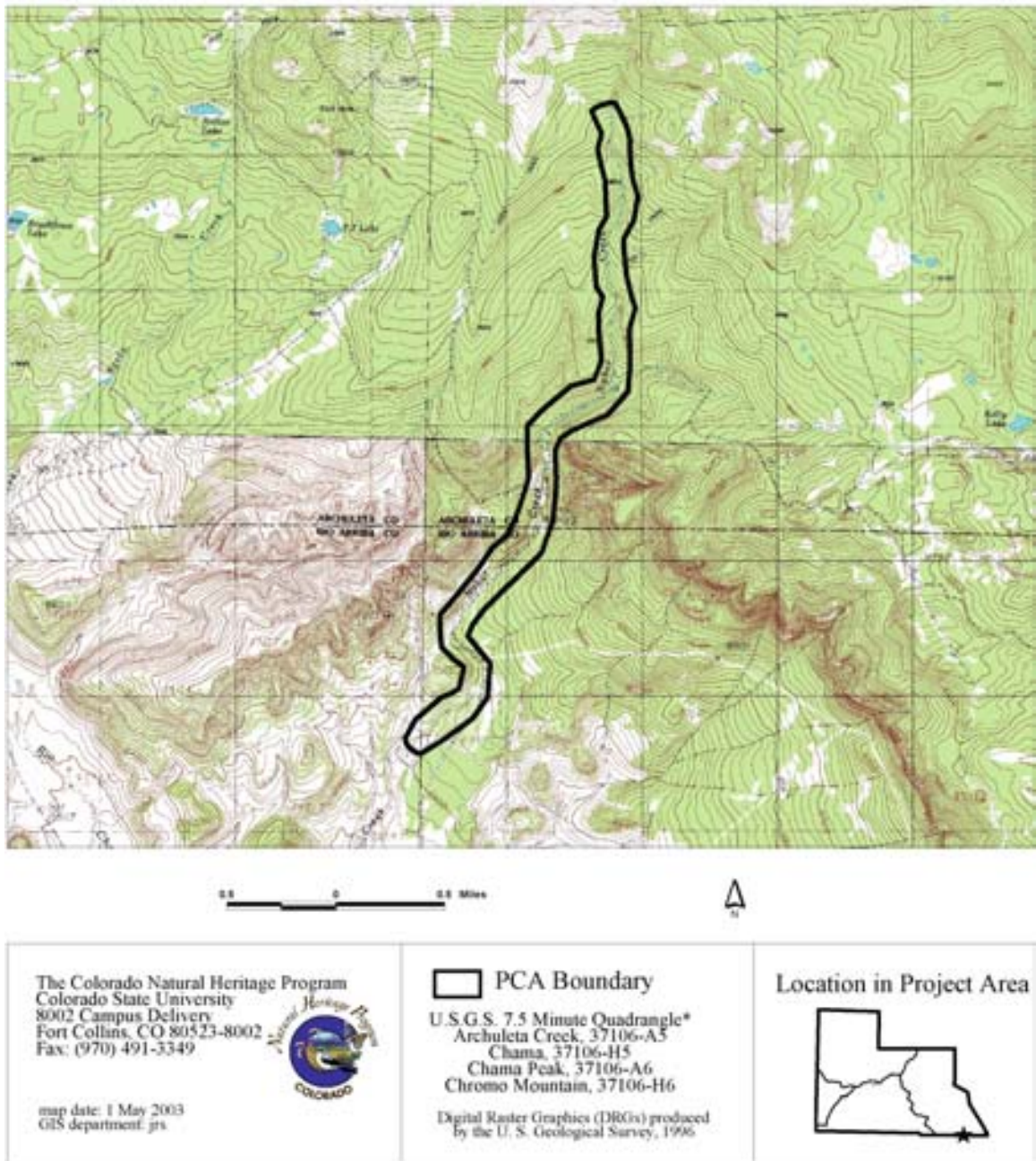


Fig. 48. Nabor Creek Potential Conservation Area.

## Navajo Peak Trail

**Biodiversity Rank: B4 (Moderate significance)**

This PCA contains a good occurrence of retrorse sedge (*Carex retrorsa*), a plant that is very rare (S1) in Colorado, although not threatened globally.

**Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. The PCA is entirely within the San Juan National Forest, and partly within the South San Juan Wilderness.

**Management Urgency Rank: M2 (High urgency)**

New management actions (weed control) may be needed within 5 years to prevent the loss of the element occurrences within the PCA. Management is needed to control exotic plant invasion.

**Location:** Archuleta County, Price Lakes area, about 19 miles southeast of Pagosa Springs.

**Legal Description:**

U.S.G.S. 7.5 minute quadrangle: Chromo, Chama Peak  
T33N R2E S16, 17, 20, 21, 28, 29

**Size:** 281 ac (114 ha)

**Elevation:** 9,400 to 9,600 ft (2,865 to 2,927 m)

**General Description:** This PCA is located in the Price Lakes area, which encompasses numerous small lakes, beaver ponds and associated wetlands. Vegetation in moist forested areas includes white fir (*Abies concolor*), Engelmann spruce (*Picea engelmannii*), and aspen (*Populus tremuloides*), with an understory of snowberry (*Symphoricarpos oreophilus*). Other common wetland plants are horsetails (*Equisetum arvense*) and American speedwell (*Veronica americana*). Exotic species include Canada thistle (*Cirsium arvense*) and several others (see below). Northern leopard frogs (*Rana pipiens*), a species formerly tracked by CNHP but now watchlisted, were found in abundance in small ponds.

**Biodiversity Rank Justification:** This PCA contains a good occurrence of retrorse sedge (*Carex retrorsa*), a plant that is very rare (S1) in Colorado, although not threatened globally. Retrorse sedge has a broad distribution throughout the north half of North America, but is known from only two locations in Colorado, both in Archuleta County.

**Table 49. Natural Heritage element occurrences at the Navajo Peak Trail PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plants								
<i>Carex retrorsa</i>	<b>Retrorse sedge</b>	<b>G5</b>	<b>S1</b>				<b>B</b>	<b>2001-08-31</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary was drawn to include the occurrence of retrorse sedge with a buffer of approximately 1000 feet. There are hundreds of other small lakes, streams and wetlands in the area with potential habitat for retrorse sedge that are not included within this boundary. Further survey could result in enlargement of this site.

**Protection Rank Comments:** The PCA is entirely within the San Juan National Forest, and partly within the South San Juan Wilderness, which should provide adequate protection. However, future changes in status or use of the land may warrant action.

**Management Rank Comments:** Management is needed to control exotic plant invasion. Canada thistle (*Cirsium arvense*) is present in the PCA, and in some areas it is abundant. Other exotics observed in the PCA include musk thistle (*Carduus nutans*), common plantain (*Plantago major*), tarweed (*Madia glomerata*), red clover (*Trifolium pratense*), white clover (*Trifolium repens*), nodding beggartick (*Bidens cernua*), and dandelion (*Taraxacum officinale*). Non-native pasture grasses such as smooth brome (*Bromus inermis*), orchard grass (*Dactylis glomerata*), Kentucky bluegrass (*Poa pratensis*), and meadow timothy (*Phleum pratense*) are common along roads and trails.

# Navajo Peak Trail Potential Conservation Area

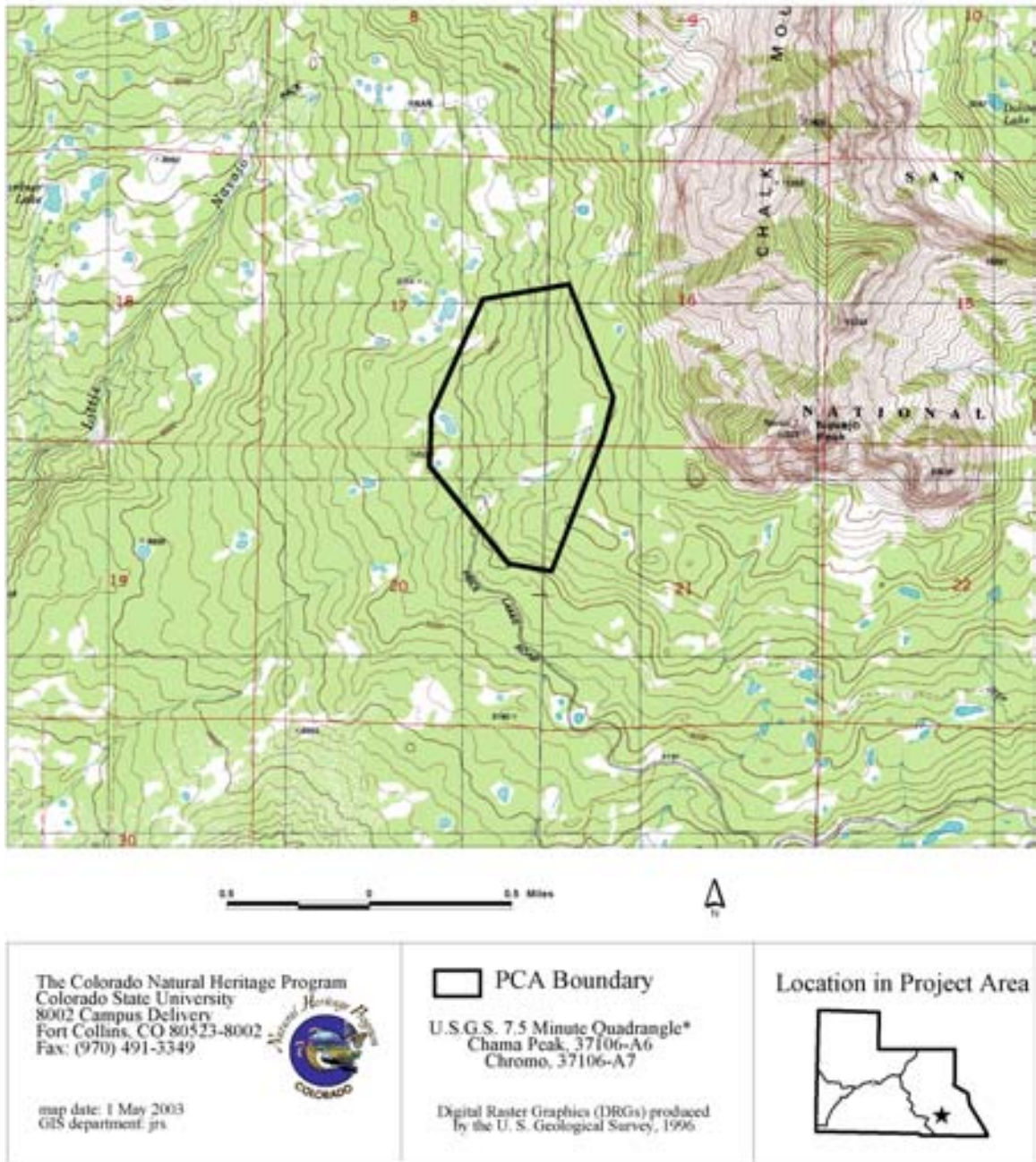


Fig. 49. Navajo Peak Trail Potential Conservation Area.

## Navajo River

### **Biodiversity Rank: B4 (Moderate significance)**

The biodiversity rank for this PCA is based on an excellent (A rank) population of cutthroat trout (*Oncorhynchus clarki pleuriticus*), a fish species that is globally secure (G4T3). This population is one of only a few Colorado River cutthroat trout populations that are genetically pure. The population is protected from invasion by non-native trout by a natural barrier and is considered a Conservation Population because of its genetic purity and security from introduced non-native trout populations. Most remaining populations of this trout have hybridized with introduced non-native trout (Young et al. 1996).

### **Protection Urgency Rank: P3 (Moderate urgency)**

Protection actions may be needed, but probably not within the next 5 years. It is estimated that stresses may reduce the viability of the elements in the PCA if protection action is not taken. The site is entirely privately owned and development is possible in the future.

### **Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. Monitoring of the population would aid in tracking the weed invasion and change in the quality of the rare plant populations requiring weed management. Continuing the traditional ranching activities of the area and avoiding residential development would be beneficial to the population of rare plants.

**Location:** Archuleta County, in the southeastern portion of the county East of Pagosa-Blanco Basin Rd (FS 657) to Fish Creek trailhead on the Navajo River and Augustora Creek.

### **Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Elephant Head Rock

T34NR2E S12, 13

T34NR3E S2, 3

T35NR3E S20, 21

**Size:** 4,6165 ac (1,868 ha)

**Elevation:** 9,000 to 12,800 ft (2,743 to 3,901 m)

**General Description:** This PCA encompasses the high elevation headwaters of the Navajo River including Augustora Creek and the Navajo River. The north half of the PCA lies within the South San Juan Wilderness in the San Juan and Rio Grande National Forests. The southern part of the PCA is within the Navajo Headwaters Ranch, a privately owned working ranch. The landowners are interested in the conservation of the

ranch's natural resources and are working with members of the local community including biologists to maintain the quality of the area.

Navajo Creek and its headwaters are home to a population of native Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*). This particular population of cutthroat trout is genetically pure and believed to be indigenous to the area. The Colorado Division of Wildlife has classified this trout population as a Conservation Population because of its genetic purity. The population is above a falls on the Navajo River and is thereby protected from invasion by non-native trout.

**Biodiversity Rank Comment:** The biodiversity rank for this PCA is based on an excellent (A rank) population of cutthroat trout (*Oncorhynchus clarki pleuriticus*), a fish species that is globally secure (G4T3). This population is one of only a few Colorado River cutthroat trout populations that are genetically pure. The population is protected from invasion by non-native trout by a natural barrier and is considered a Conservation Population because of its genetic purity and security from introduced non-native trout populations. Most remaining populations of this trout have hybridized with introduced non-native trout (Young et al. 1996). Historically Colorado River cutthroat trout were distributed throughout the colder headwaters of the Green and Colorado rivers as far south as the San Juan River; they perhaps occupied portions of the lower reaches of large rivers in winter (Young 1995). Currently Colorado River cutthroats are limited to a few small headwater streams of the Green and upper Colorado rivers in Colorado, Utah, and Wyoming, including the Escalante River drainage in southern Utah (Hepworth et al. 2001).

**Table 50. Natural Heritage element occurrences at the Navajo River PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Fish								
<b><i>Oncorhynchus clarki pleuriticus</i></b>	<b>Colorado River cutthroat trout</b>	<b>G4T3</b>	<b>S3</b>		<b>SC</b>	<b>FS/BLM</b>	<b>A</b>	<b>1993</b>

\*EO rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** Since the cutthroat trout population within this PCA depends exclusively on the local hydrology for their life needs, the extent of the watershed was included from the headwaters of Navajo Creek in Conejos County to reaches of Navajo Creek within the ranch valley. Thus, the floodplain and immediate watershed, which are necessary to support natural hydrological processes, are included to ensure the long-term maintenance of the riparian ecosystems and the fish population. Activities within these boundaries have the potential to impact the local hydrology and dependent ecology.

**Protection Comments** Half of this PCA is within the South San Juan Wilderness Area, while the other half is within the Navajo Headwaters Ranch. The owners of the ranch are conservation minded, with interest in protecting the natural resources on the ranch including the cutthroat trout population. No protection actions are currently needed;

however, future change of ownership to a less conservation minded land steward could pose a problem.

**Management Comments:** Current management seems to favor the persistence of the fish population in the PCA, but management action may be needed in the future to maintain current quality of the PCA. Recreational use is limited because access of the site is restricted to only the north end of the PCA and requires an extensive hike. Hydrological processes originating outside of the planning boundary, including water quality, quantity, timing and flow must be managed to maintain site viability.

# Navajo River

## Potential Conservation Area

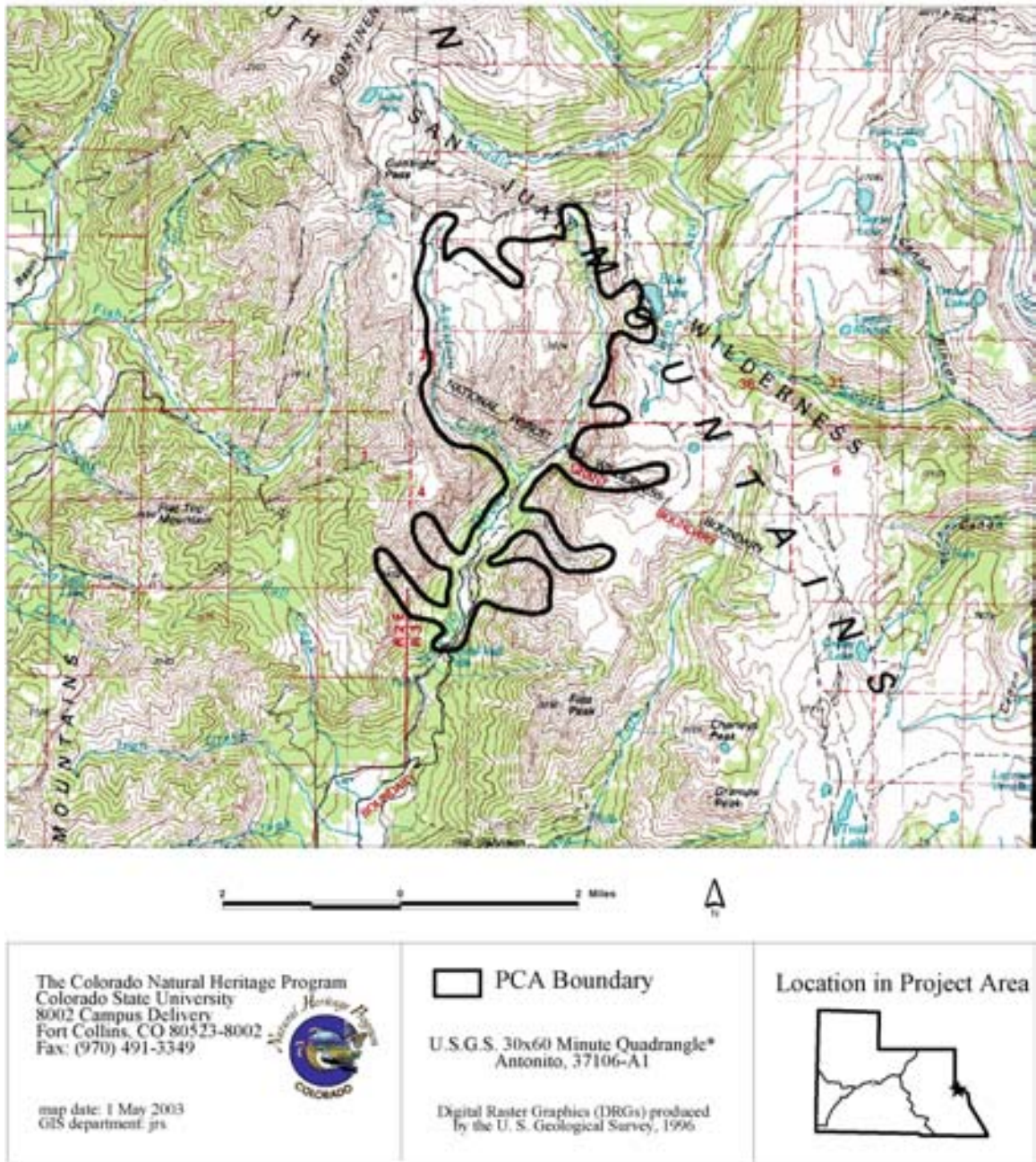


Fig. 50. Navajo River Potential Conservation Area.

## Opal Lake

### **Biodiversity Rank: B4 (Moderate significance)**

The PCA contains a good (B rank) occurrence of retrorse sedge (*Carex retrorsa*), a plant that is extremely rare (S1) in Colorado, although not threatened globally (G5).

### **Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. The PCA is entirely within the San Juan National Forest.

### **Management Urgency Rank: M3 (Moderate Urgency)**

New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. The area is a popular destination for day hikers. Vegetation around the lake could be impacted if visitation is increased. Continued monitoring and control of weeds would help maintain the quality of the PCA.

**Location:** Archuleta County, wetlands around Opal Lake, about 15 miles east-southeast of Pagosa Springs in the San Juan National Forest.

### **Legal Description:**

U.S.G.S. 7.5 minute quadrangle: Harris Lake, Elephant Head Rock  
T34N R2E S8, 9

**Size:** 11 ac (4.5 ha)

**Elevation:** 8800 ft (2,682 m)

**General Description:** This PCA comprises the wetlands around Opal Lake, with diverse riparian and wetland vegetation. There are several beaver ponds just below the lake. The lake is a popular destination for hikers, via a pack trail to the north of the PCA. Retrorse sedge (*Carex retrorsa*) was found on the east shore of the lake.

**Biodiversity Rank Justification:** The PCA contains a good (B rank) occurrence of retrorse sedge (*Carex retrorsa*), a plant that is extremely rare (S1) in Colorado, although not threatened globally (G5). Retrorse sedge has a broad distribution throughout the north half of North America, but is known from only two locations in Colorado, both in Archuleta County.

**Table 51. Natural Heritage element occurrences at the Opal Lake PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plants								
<b><i>Carex retrorsa</i></b>	<b>Retrorse sedge</b>	<b>G5</b>	<b>S1</b>				<b>B</b>	<b>2001-08-31</b>

\*EO rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary was drawn to include the wetlands around Opal Lake, where an occurrence of retrorse sedge (*Carex retrorsa*) was found, and a small part of White Creek that contains similar habitat.

**Protection Rank Comments:** The PCA is entirely within the San Juan National Forest. No special protection is in place, and should not be required if present management and level of public use continue.

**Management Rank Comments:** The area is a popular destination for day hikers. Vegetation around the lake could be impacted if visitation is increased. Exotic plant species observed at Opal Lake were Canada thistle (*Cirsium arvense*) and meadow timothy (*Phleum pratense*). Management of these and other potential invasive species that can be transported by hikers and horses may be needed in the future. In addition, hydrological processes originating outside of the planning boundary, including water quality, quantity, timing and flow are critical for maintaining the quality of the riparian and wetland communities.

# Opal Lake

## Potential Conservation Area

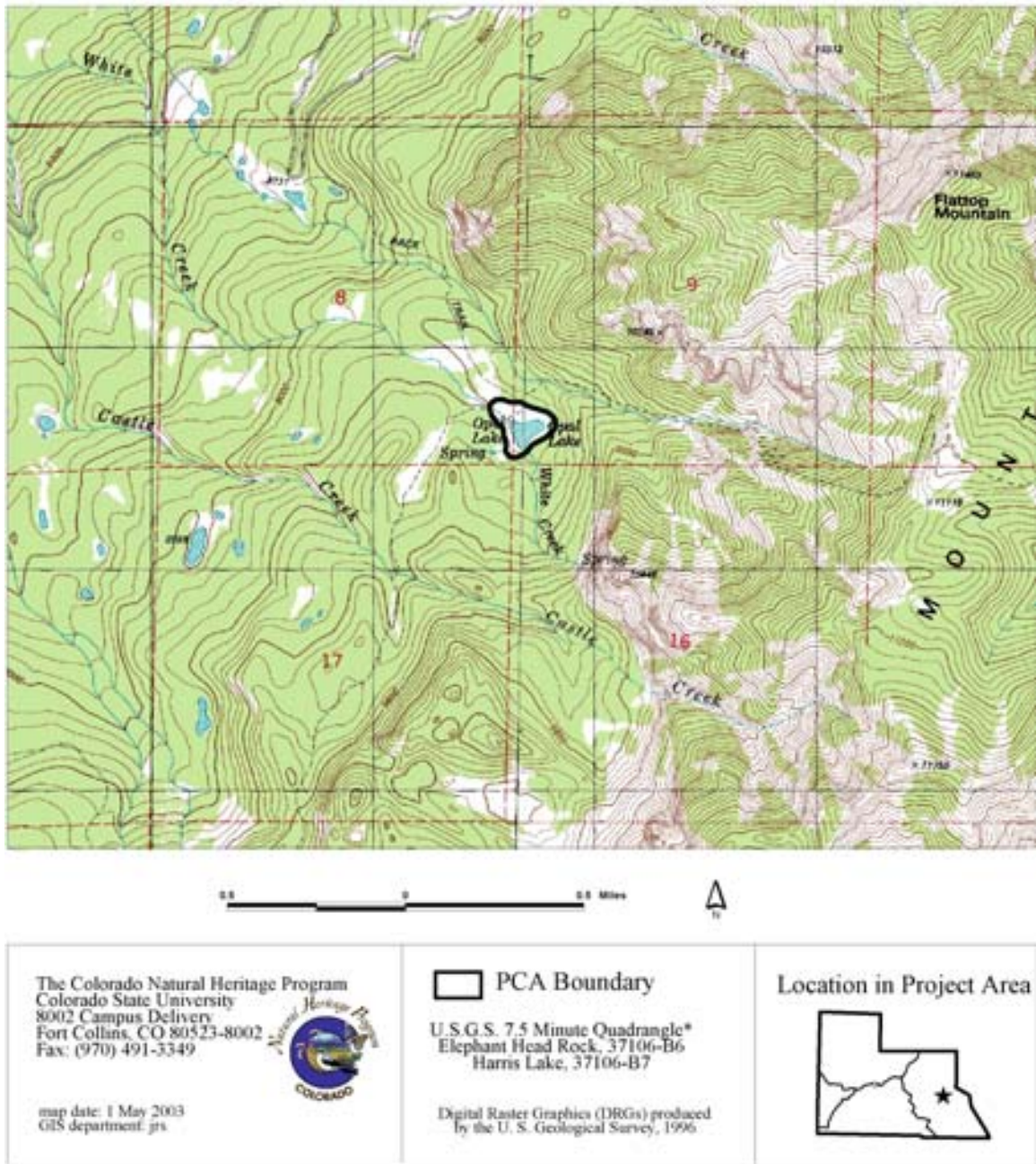


Fig. 51. Opal Lake Potential Conservation Area.

## Rio Blanco at Deadman Canyon

**Biodiversity Rank: B4 (Moderate significance)**

This PCA supports a good (B rank) occurrence of Silver Buffaloberry (*Shepherdia argentea*) Foothills Riparian Shrubland, a globally vulnerable (G3G4) plant community that is extremely rare (S1) in Colorado. This mesic buffaloberry shrubland community is found in the northern Great Plains of the United States and Canada. In Colorado this community type is known from only 11 locations and the majority of these are located in southwestern Colorado.

**Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. This PCA is just inside the San Juan National Forest, and if forest ownership is maintained this area should be adequately protected.

**Management Urgency Rank: M1 (Very high urgency)**

Management actions may be required within one year or the riparian shrubland could be irretrievably degraded. Management of non-native plant species is needed to prevent further degradation of the community and implementation of appropriate grazing practices would benefit the riparian shrubland.

**Location:** Archuleta County, just east of highway 84 approximately 12 miles south of the city of Pagosa Springs along the Rio Blanca.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Serviceberry Mountain  
T34NR1W S35, 36

**Size:** 46 ac (19 ha)

**Elevation:** 7,160 to 7,400 ft (2,182 to 2,256 m)

**General Description:** The Rio Blanco at Deadman Canyon PCA encompasses a riparian area along the Rio Blanco where the river opens into a one half mile wide valley. At the start of the valley the river has just exited a long, narrow and sloped canyon. The river channel has been controlled here and there are large levees on each side of the channel with flood plain terraces beyond the levees; although it is unclear if flooding of the terraces still occurs. The PCA is only one half mile from Highway 84, just inside of the San Juan National Forest boundary and there are houses just outside the PCA. Heavy grazing by cattle occurs throughout the area. There are a number of non-native plant species present and in grassy areas Kentucky bluegrass (*Poa pratensis*) makes up as much as 40% of the cover. The overstory in the riparian area is sparse and consists of a 20% cover of blue spruce (*Picea punnogens*). However, the shrub understory is dense, comprising a cover of 100%.

The riparian vegetation within the PCA is dominated by a large occurrence of the rare Silver Buffaloberry (*Shepherdia argentea*) Foothills Riparian Shrubland, which includes a 60% cover of buffaloberry. Other associated shrubs include strapleaf and narrowleaf willow (*Salix ligulifolia* and *S. exigua*), hawthorn (*Crataegus rivularis*), gooseberry (*Ribes inerme*) and wild rose (*Rosa woodsii*). There is a 50% cover of forbs including starry false lily of the valley (*Mainthemun stellatum*) and Canada goldenrod (*Solidago canadensis*). Grasses cover 50% of the PCA with non-native Kentucky bluegrass (*Poa pratensis*) dominating. The area sees much recreational use, particularly fishing, and weed control within the PCA is needed.

**Biodiversity Rank Comment:** This PCA supports a good (B rank) occurrence of Silver Buffaloberry (*Shepherdia argentea*) Foothills Riparian Shrubland, a globally vulnerable (G3G4) plant community that is extremely rare (S1) in Colorado. This mesic buffaloberry shrubland community is found in the northern Great Plains of the United States and Canada. Stands occur on stream terraces, rolling uplands, and badlands, and where moisture is more plentiful than on the surrounding landscape, such as in swales, ravines, near streams, and on northwest- to east-facing slopes. A moderate to dense canopy of medium-tall shrubs dominates the vegetation. The most abundant of these, *silver buffaloberry*, is typically 1.5 to 3 m tall. Other common shrub species are chokecherry (*Prunus virginiana*), currant (*Ribes* spp.), fragrant sumac (*Rhus aromatica*), wild rose (*Rosa woodsii*) and snowberry (*Symphoricarpos occidentalis*). Graminoids and forbs may have only half the coverage of the shrub layer. Graminoids include Kentucky bluegrass (*Poa pratensis*), western wheatgrass (*Pascopyrum smithii*), and brome (*Bromus* spp.). Common forbs are yarrow (*Achillea lanulosa*), and Louisiana sagewort (*Artemisia ludoviciana*). Elsewhere, this community occurs in a predominantly prairie landscape as either narrow bands along streams or in small thickets. In Colorado this community type is known from only 11 locations and the majority of these are located in southwestern Colorado.

**Table 52. Natural Heritage element occurrences at the Rio Blanco at Deadman Canyon PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plant Communities								
<i>Shepherdia argentea</i>	<b>Silver Buffaloberry Foothills Riparian Shrubland</b>	<b>G3G4</b>	<b>S1</b>				<b>B</b>	<b>1994-08-09</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary incorporates an area that will allow natural hydrological processes such as seasonal flooding and sediment deposition to maintain a viable population of the riparian shrubland along the Rio Blanco, although it is unclear if the levees present in the river channel prevent natural flooding of the terrace. The adjacent steep slopes that would most likely impact the riparian shrubland if altered are also included. The boundary also provides a small buffer from nearby roads where surface runoff may contribute excess nutrients, toxicants, and sediment. Eliminating

disturbance within this buffer would also aid in reducing impacts from sedimentation (Karr and Schlosser 1978), and assist in maintaining the integrity of the occurrence and its associated avian, macroinvertebrate and periphyton communities (Noel et al. 1986, Spackman and Hughes 1995).

The hydrological processes necessary to the riparian shrubland are not fully contained by the site boundaries. Given that the riparian shrubland is dependent on natural hydrological processes associated with the Rio Blanco and its tributaries, upstream activities such as water diversions, impoundments, improper livestock grazing, and development are detrimental to the hydrology of the riparian area. This boundary indicates the minimum area that should be considered for any conservation management plan.

**Protection Comments:** No protection actions are needed in the foreseeable future. This PCA is just inside the San Juan National Forest, and there is development on the private land adjacent to the boundary. If forest ownership is maintained this area should be adequately protected and no protection actions are needed in the foreseeable future.

**Management Comments:** Management actions may be required within one year or the riparian shrubland could be irretrievably degraded. Management of non-native plant species is needed to prevent further degradation of the community and implementation of appropriate grazing practices would benefit the riparian shrubland.

The map is a topographic representation of the Serviceberry Mountain area. It features contour lines indicating elevation, with labels such as 7000, 7200, 7400, 7600, 7800, 8000, 8200, 8400, 8600, 8800, 9000, 9200, 9400, 9600, 9800, and 10000. The map includes several labeled canyons: Rust Canyon, Left Minium Canyon, Deadman Canyon, and Spiller Canyon. A road labeled 'R-10' is shown. A black outline indicates the PCA Boundary. The map also shows 'Spiller Lake' and 'Blanco'. A scale bar at the bottom indicates 0.5, 0, and 0.5 Miles. A north arrow is located at the bottom right of the map.

0.5 0 0.5 Miles

PCA Boundary

U.S.G.S. 7.5 Minute Quadrangle\*  
Serviceberry Mountain, 37106-B8

Digital Raster Graphics (DRGs) produced  
by the U. S. Geological Survey, 1996

The Colorado Natural Heritage Program  
Colorado State University  
8002 Campus Delivery  
Fort Collins, CO 80523-8002  
Fax: (970) 491-3349

map date: 1 May 2003  
GIS department: jrs

Location in Project Area

185

## Turkey Creek Road

**Biodiversity Rank: B4 (Moderate significance)**

This PCA contains a good (B rank) occurrence of Pagosa phlox (*Phlox caryophylla*), a plant that is considered rare (S2) in Colorado.

**Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. The PCA is entirely within the San Juan National Forest.

**Management Urgency Rank: M3 (Moderate urgency)**

New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Oil and gas development or new road construction could lead to potential management concerns, such as weed invasion.

**Location:** Archuleta County, about 22 miles west-southwest of Pagosa Springs.

**Legal Description:**

U.S.G.S. 7.5 minute quadrangle: Pargin Mountain  
T34N R5W S21, 28

**Size:** 99 ac (40 ha)

**Elevation:** 6,800 to 7,000 ft (2,073 to 2,134 m)

**General Description:** This PCA includes a grassy sagebrush opening in ponderosa pine (*Pinus ponderosa*) and Gambel oak (*Quercus gambelii*) forest at the end of Forest Road 615A. About 200 individuals of Pagosa phlox (*Phlox caryophylla*), a state rare (S2) plant, were observed at the PCA. Some of the other plants found in the open area include black sage (*Artemisia nova*), Arboles milkvetch (*Astragalus oocalycis*), longflower rabbitbrush (*Chrysothamnus depressus*), King's lupine (*Lupinus kingii*), western wheatgrass (*Pascopyrum smithii*), Rocky Mountain milkvetch (*Astragalus scopulorum*), trailing fleabane (*Erigeron flagellaris*), redroot buckwheat (*Eriogonum racemosum*) and mule's ears (*Wyethia* sp.). Exotic species at the site were cheatgrass (*Bromus tectorum*) and yellow sweet clover (*Melilotus officinalis*).

**Biodiversity Rank Justification:** This PCA contains a good (B rank) occurrence of Pagosa phlox (*Phlox caryophylla*), a plant that is considered rare (S2) in Colorado. This plant species occurs in New Mexico and Colorado and is known from 32 locations in Colorado.

**Table 53. Natural Heritage element occurrences at the Turkey Creek Road PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plants								
<b><i>Phlox caryophylla</i></b>	<b>Pagosa phlox</b>	<b>G4</b>	<b>S2</b>				<b>B</b>	<b>2001-06-17</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary is drawn to encompass the area where the Pagosa phlox was found.

**Protection Rank Comments:** The PCA is entirely within the San Juan National Forest. Oil and gas development could pose potential threats to this occurrence, but no protection actions are needed in the foreseeable future.

**Management Rank Comments:** New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Oil and gas development or new road construction could lead to potential management concerns, such as weed invasion, to the rare plants at this PCA. Further surveys during the flowering season (April and May) of the Pagosa phlox could reveal that the population is more extensive.

# Turkey Creek Road

## Potential Conservation Area

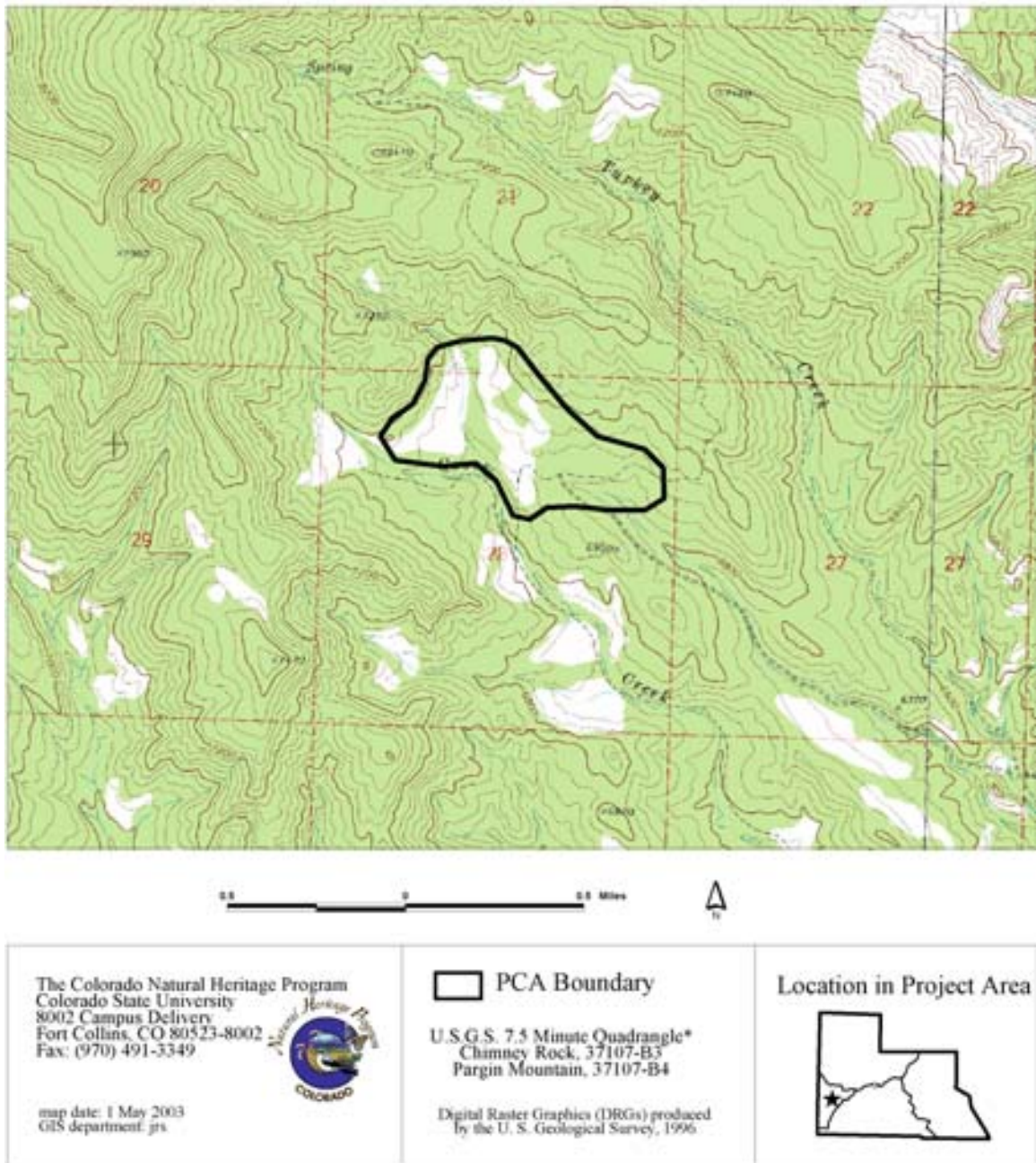


Fig. 53. Turkey Creek Road Potential Conservation Area.

## Upper Mosca Creek

The Upper Mosca Creek PCA contains an unranked (E) occurrence of a plant subspecies that is vulnerable (G3?T3Q) throughout its range, and an excellent (A rank) occurrence of a plant community that is vulnerable (S3) in Colorado.

No protection actions are needed in the foreseeable future. The PCA is located in the Bear Park Potential Research Natural Area of the San Juan National Forest.

**Management Urgency Rank: M4 (Low urgency)**

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

**Location:** Archuleta and Hinsdale Counties.

**Legal Description:**

U.S.G.S. 7.5 minute quadrangle: Granite Peak, Bear Mountain  
T36N R5W S1, 2, 11-14  
T37N R5W S36

**Size:** 655 ac (265 ha)

**Elevation:** 7,860 to 9,400 ft (2,396 to 2865)

**General Description:** This PCA is comprised of the riparian area along Upper Mosca Creek. Forested uplands are covered with spruce (*Picea engelmannii*) and fir (*Abies lasiocarpa*), while the upper watershed has been logged. There are many open meadows along the drainage, where several hundred individuals of a globally vulnerable plant species, *Draba spectabilis*, were located in 1995.

**Biodiversity Rank Justification:** The Upper Mosca Creek PCA contains an excellent (A rank) occurrence of Subalpine Fir-Engelmann Spruce (*Abies lasiocarpa*-*Picea engelmannii*/*Ribes spp.*) Coniferous Wetland Forest, a plant community that is vulnerable (S3) in Colorado, and an unranked (E) occurrence of showy whitlow-grass (*Draba spectabilis* ssp. *oxyloba*), a plant subspecies that is vulnerable (G3?T3Q) throughout its range. In Colorado, the Subalpine Fir-Engelmann Spruce Coniferous Wetland Forest is a facultative riparian forest with a wide elevation range, 8,200 to 12,000 feet. Stands occur along very steep streams where the riparian area is narrow and dominated by species of the surrounding forest. These forests are heavily shaded with a very open shrub layer of just a few individuals. Subalpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea engelmannii*) dominate the dense tree canopy, while any of the following four *Ribes* species may be present in the shrub layer: gooseberry (*Ribes inerme*), prickly currant

(*Ribes lacustre*), alpine prickly currant (*Ribes montigenum*) or western currant (*Ribes wolfii*).

**Table 54. Natural Heritage element occurrences at the Upper Mosca Creek PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
<b>Plant Communities</b>								
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Ribes spp.</i>	<b>Subalpine Fir-Engelmann Spruce Coniferous Wetland Forest</b>	<b>G5</b>	<b>S3</b>				<b>A</b>	<b>1995-07-12</b>
<b>Plants</b>								
<i>Draba spectabilis</i> ssp. <i>oxyloba</i>	Showy whitlow-grass	G3?T3 Q	S3				E	1995-07-12

\*EO rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses the occurrence and an approximate 1,000 foot buffer. Eliminating disturbance within this 1,000-foot buffer would aid in reducing impacts from sedimentation (Karr and Schlosser 1978), and assist in maintaining the integrity of the occurrence and its associated avian, macroinvertebrate and periphyton communities (Noel et al. 1986, Spackman and Hughes 1995).

**Protection Rank Comments:** The PCA is located in the Bear Park Potential Research Natural Area of the San Juan National Forest. The RNA has not yet been designated but has been highly recommended. Designation would change this rank to P5.

**Management Rank Comments:** Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. There is evidence of impacts from logging at the site, but it appears to be recovering. Access roads to timber sale areas may provide potential for non-native species invasion. Hydrological processes originating outside of the PCA boundaries, including water quality, quantity, timing and flow must be managed to maintain the current quality of the conifer wetland forest.

# Upper Mosca Creek Potential Conservation Area

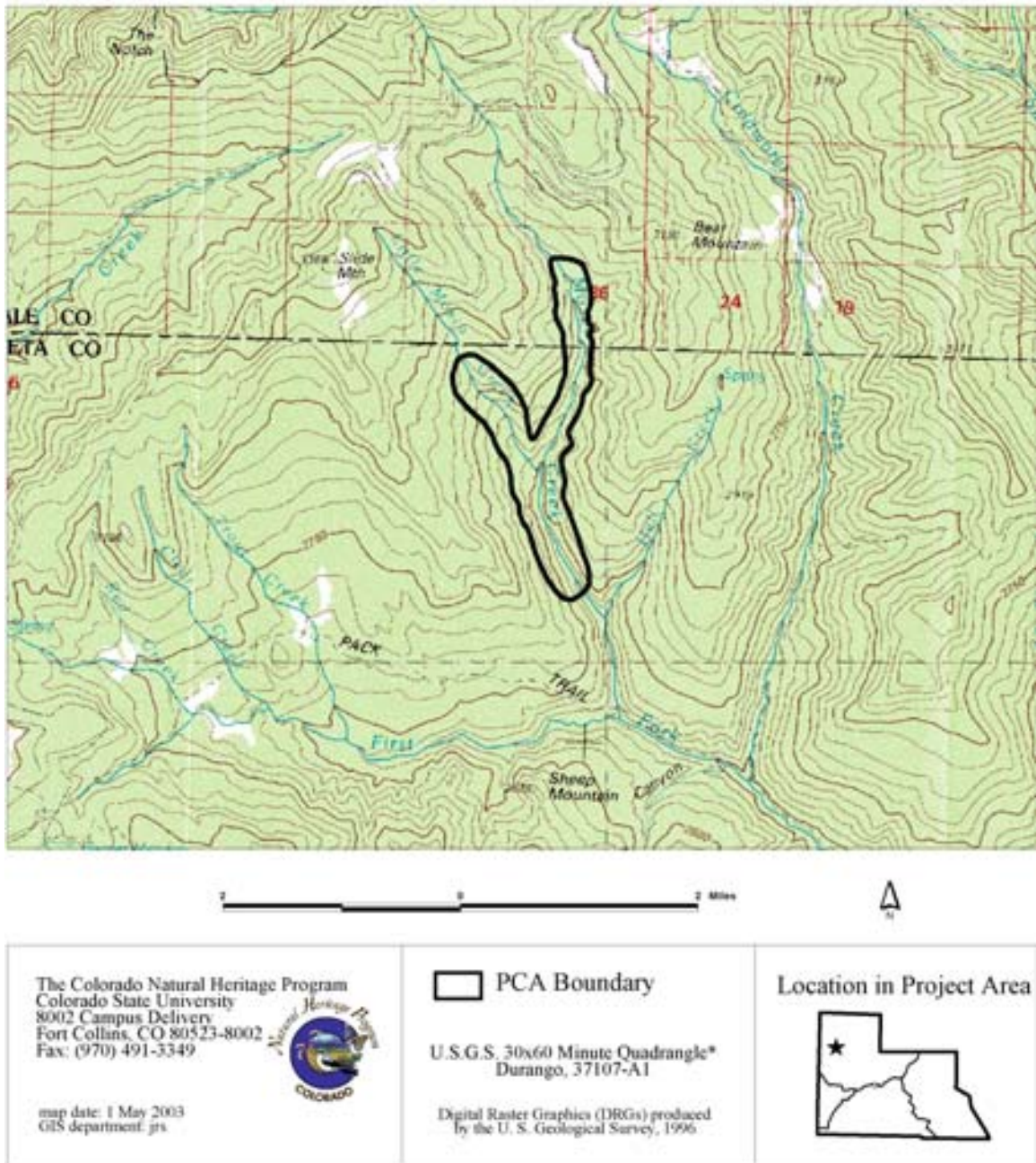


Fig. 54. Upper Mosca Creek Potential Conservation Area.

## Potential Conservation Area Profiles: B5 PCAs

### Adams Fork of the Conejos River

**Biodiversity Rank: B5 (General significance)**

(*Oncorhynchus clarki virginalis*) a fish subspecies that is vulnerable (G4T3) on a global scale.

**Protection Urgency Rank: P5 (No urgency)**

Land protection is complete and no protection actions are needed. The majority of this PCA is within the South San Juan Wilderness of the Rio Grande National Forest

Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. Management and protection of the cutthroat population found within this PCA requires prevention of introduced fish stock and minimization of grazing impacts on the riparian vegetation

**Location:** Archuleta County and Conejos counties. This site is located approximately one mile southwest of Platoro Reservoir in Conejos County.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Platoro, Summit Peak

035N003E S1, 2

036N004E S6

036N002E S25, 26

036N003E S27, 28

036N004E S31

**Size:** 1,583 ac (641 ha)

**Elevation:** 10,000 to 11,950 ft (3,048 to 3,642 m)

**General Description:** The Adams Fork of Conejos River PCA encompasses the riparian floodplain of the Adams Fork of the Conejos River from the intersection of Conejos River to the headwaters in Archuleta County. The majority of this PCA is within Conejos County, but a portion of it, at the headwaters of the Adams Fork is within Archuleta County. The PCA encompasses approximately 6.4 miles of the Adams Fork. This site was drawn to ensure the Rio Grande cutthroat trout population inhabiting the Adams Fork has sufficient habitat at the known location and further upstream. Rio Grande cutthroat trout thrive in waters with a matrix of pools and riffles, in-stream boulders and other structure, good riparian vegetation cover, and mild slopes (Trotter 1987).

**Biodiversity Rank Comment:** This site contains a good (B rank) occurrence of a fish subspecies that is vulnerable (G4T3) on a global scale. The Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*) has a small range in the Rio Grande drainage of Colorado and New Mexico. There are at least 13 large, genetically pure, unthreatened populations; and another 200 plus smaller, hybridized, or otherwise threatened populations. Favorable protection and management are in place making the populations secure and the status of this fish is likely to improve with continued, active management.

**Table 55. Natural Heritage element occurrences at the Adams Fork of the Conejos River PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Fish								
<b><i>Oncorhynchus clarki virginalis</i></b>	<b>Rio Grande cutthroat trout</b>	<b>G4T3</b>	<b>S3</b>		<b>SC</b>	<b>BLM/FS</b>	<b>B</b>	<b>1996-08-26</b>

\*EO rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundaries are drawn to provide habitat for the occurrence of cutthroat trout. The boundary of this site is limited to 300 meters on either side of the creek to provide adequate riparian vegetation for cover and possible prey (insect) needs, yet this potential conservation area, in and of itself, may not be sufficient to ensure the persistence of the population. Ecological processes or environmental impacts such as logging and sedimentation from runoff that originate upstream of the site or elsewhere in the immediate watershed may affect the viability of this occurrence.

**Protection Comments:** The majority of this PCA is within the South San Juan Wilderness of the Rio Grande National Forest and no protection actions are currently needed. However, future changes in status or use of the land may warrant action.

**Management Comments:** Current management seems to favor the persistence of the cutthroat population in the PCA, but management actions may be needed in the future to maintain the current quality of the population. Management and protection of the cutthroat population found within this PCA requires prevention of introduced fish stock and minimization of grazing impacts on the riparian vegetation. Streamside vegetation cover is necessary to prevent undue erosion and sedimentation of the stream channel.

# Adams Fork of the Conejos River Potential Conservation Area



Fig. 55. Adams Fork of the Conejos River Potential Conservation Area.

## Boone Creek Ponds

### **Biodiversity Rank: B5 (General significance)**

species that is rare (S2) in Colorado.

### **Protection Urgency Rank: P5 (No urgency)**

Present land protection is adequate and no protection actions are needed. The site is entirely within the San Juan National Forest, and should be adequately protected as long as forest ownership continues.

### **Management Urgency Rank: M3 (Moderate urgency)**

New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Livestock grazing, exotic plant species, and stock pond maintenance may have deleterious effects on the prairie violet population. A weed management plan and monitoring of the area is needed to control the exotic species and to assess trends of the non-native plants.

**Location:** Archuleta County, just east of State Highway 84 approximately eight miles north of Chromo.

### **Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Edith  
T33NR1W S13  
T33NR1E S18

**Size:** 49 ac (20 ha)

**Elevation:** 7,600 to 7,760 ft (2,317 to 2,365 m)

**General Description:** This PCA is a small, intermittent drainage between two stock ponds. The moist stream banks of Boone Creek are home to the prairie violet (*Viola pedatifida*), growing along with variety of grasses, sedges and forbs. Only a few plants were still blooming in early June 2001.

**Biodiversity Rank Comment:** This PCA supports a fair (C rank) occurrence of the prairie, or bird's foot, violet, a species that is rare (S2) in Colorado. There are only 35 known populations this violet in Colorado including populations in 11 front range counties. There are three populations known from the west slope of Colorado, all in Archuleta County.

**Table 56. Natural Heritage element occurrences at the Boone Creek Ponds PCA.**

Element	Common Name	Global Rank	State Rank	Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plants								
<i>Viola pedatifida</i>	Prairie violet	G5	S2				C	2001-06-11

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary is drawn to encompass the occurrence of the prairie violet and includes a buffer to limit direct disturbance such as trampling and to allow for movement of the population both upstream and downstream.

**Protection Comments:** This PCA is entirely within the San Juan National Forest, and should be adequately protected as long as forest ownership continues. Forest personnel are aware of the plant population and no protection actions are currently needed.

**Management Comments:** Future surveys should include other streams in the area, early in the season. Livestock grazing, exotic plant species, and stock pond maintenance may have deleterious effects on the prairie violet population. Stock ponds upstream of the occurrence are degraded and may cause the invasion of exotic species along the stream. Exotics found in the site were bull thistle (*Cirsium vulgare*), Kentucky bluegrass (*Poa pratensis*), and alsike clover (*Trifolium hybridum*). Upstream areas have been invaded by tarweed (*Madia glomerata*), and this poses a threat to the entire area. Other exotics noted upstream of the site are yellow sweet clover (*Melilotus officinalis*), and chamomile (*Matricaria perforata*). A weed management plan and monitoring of the area is needed to control the exotic species and to assess trends of the non-native plants.

# Boone Creek Ponds Potential Conservation Area

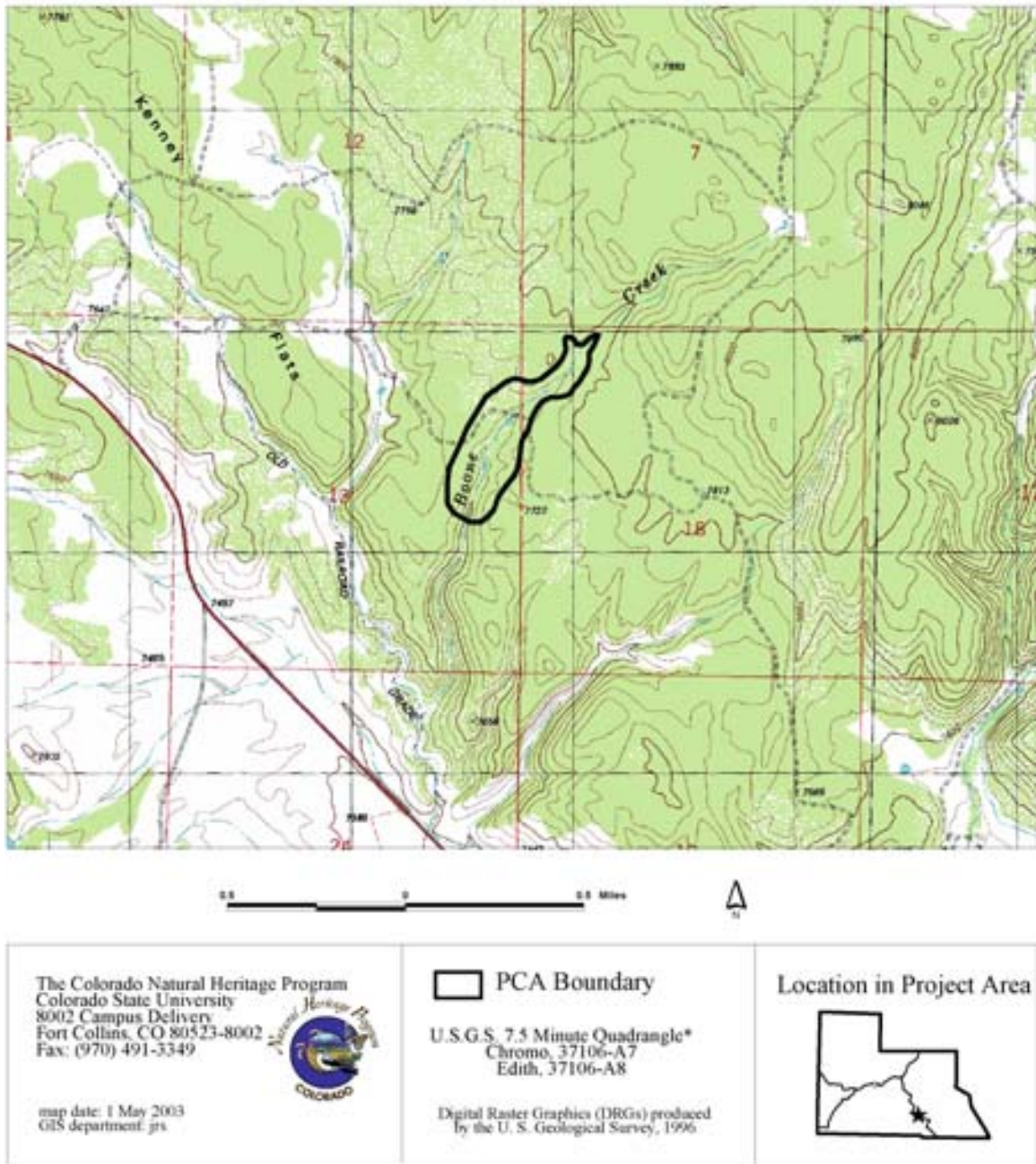


Fig. 56. Boone Creek Farms Potential Conservation Area.

## Coyote Park

**Biodiversity Rank: B5 (Very high significance)**

This PCA has one fair (C rank) occurrence of Pagosa phlox, a globally secure (G4) plant that is vulnerable (S3) in Colorado.

**Protection Urgency Rank: P2 (High urgency)**

Protection actions may be needed within 5 years. It is estimated that stresses may reduce the viability of the elements in the PCA within this approximate timeframe. Part of this PCA is on private land with development and road construction a possibility. Such disturbance could negatively impact the plant population within 5 years and protection actions may be needed.

**Management Urgency Rank: M3 (Moderate urgency)**

New management actions may be needed within 5 years to maintain the current quality of the Pagosa phlox population in the PCA. The infrastructure and roads associated with the development of single family housing in the area has the potential to adversely affect the Pagosa phlox population. Any such development should take into consideration the location of this population.

**Location:** Archuleta County, at the junction of State Highway 84 and Coyote Park Road.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Edith  
T33NR1W S13, 24

**Size:** 17 ac (7 ha)

**Elevation:** 7,440 to 7,457 ft (2,268 to 2,273 m)

**General Description:** The Coyote Park PCA occupies parkland in south-central Archuleta county that is dominated by perennial and annual grasses and mixed forbs. There is no tree cover within the PCA, however, sagebrush is scattered nominally within the area, but never makes up more than a few percent of the ground cover. The clay soils of the area originated from Mancos Shale. The PCA supports a population of the Pagosa phlox (*Phlox caryophylla*), which is uncommon in Colorado.

**Biodiversity Rank Comment:** This PCA contains a fair (C rank) occurrence of Pagosa phlox (*Phlox caryophylla*), a plant that is vulnerable in Colorado (S3) with only 35 populations known in the state. The total range is very small, extending from Pagosa Springs to Durango, and in only one adjacent county in New Mexico. Of the 35 occurrences in Colorado, all but two are in Archuleta County.

**Table 57. Natural Heritage element occurrences at the Coyote Park PCA.**

			State Rank					
<i>Phlox caryophylla</i>	Pagosa phlox	G4	S3				C	1985-06-04

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses two occurrences of Pagosa bladderpod and some additional potential habitat between them to allow for expansion of the populations over time.

**Protection Comments:** Protection actions may be needed within 5 years. It is estimated that stresses may reduce the viability of the elements in the PCA within this approximate timeframe. Most of this PCA is within the San Juan National Forest, but part of it is located on private land that the Archuleta Community Plan has identified for low density residential development and which has been divided into separate 35 acre parcels. Development and road construction within the area could negatively impact the plant population and protection actions may be needed within 5 years. It is estimated that such above mentioned stresses may reduce the viability of the plant population in the PCA within this approximate timeframe.

**Management Comments:** New management actions may be needed within 5 years to maintain the current quality of the Pagosa phlox population in the PCA. The infrastructure and roads associated with the development of single family housing in the area has the potential to adversely affect the Pagosa phlox population. Any such development should take into consideration the location of this population. Also the area is near the roadside and weed spraying could have deleterious effects on the plant population. County spraying crews should be aware of the plants and avoid them.

# Coyote Park Potential Conservation Area

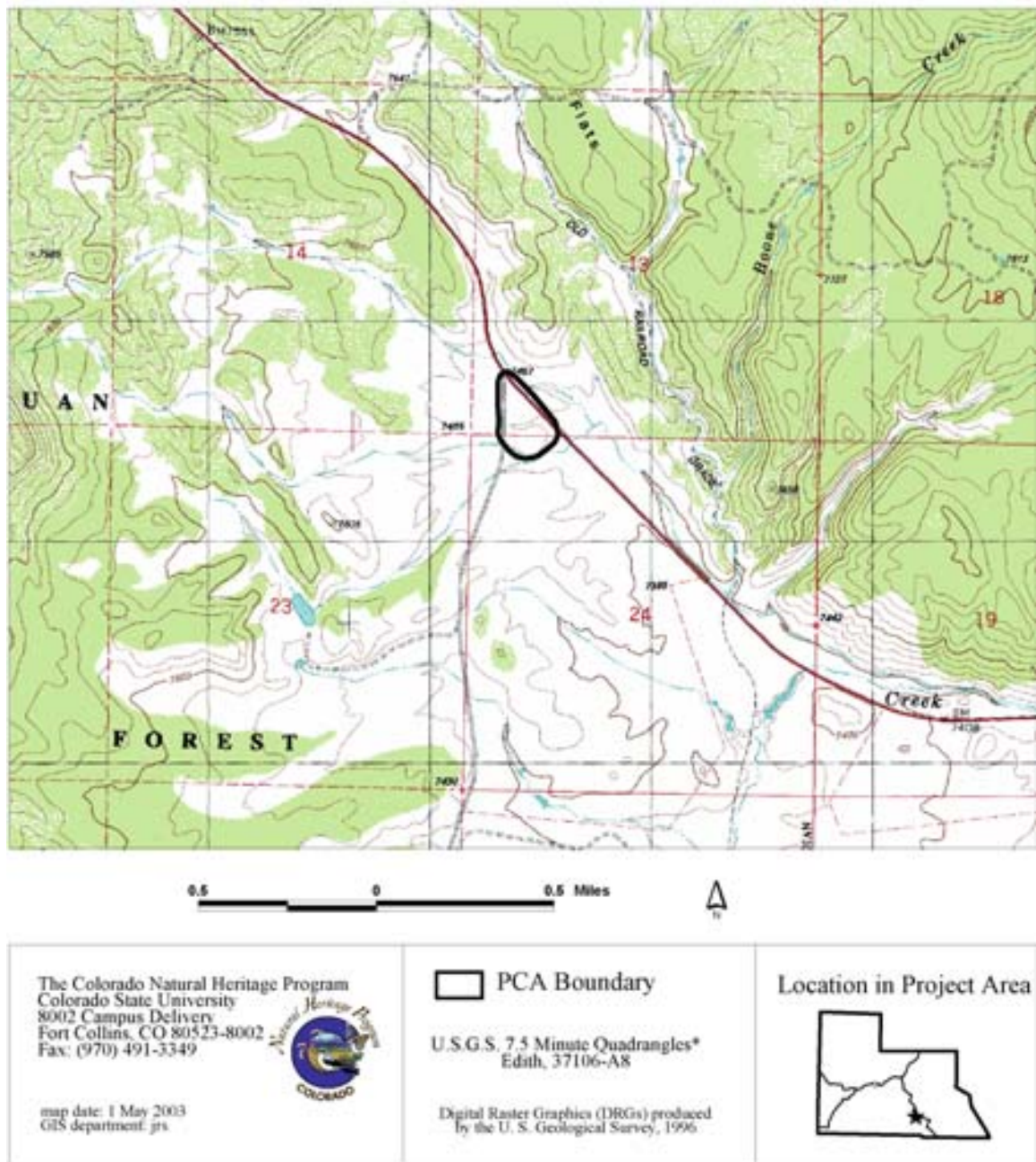


Fig. 57. Coyote Park Potential Conservation Area.

## Dunagan Canyon

**Biodiversity Rank: B5 (General significance)**

This PCA contains a good (B rank) occurrence of prairie violet, a plant that is globally secure, but rare in Colorado (G5S2).

**Protection Urgency Rank: P4 (Low urgency)**

This PCA is entirely within the San Juan National Forest and no protection actions are needed in the foreseeable future.

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. Monitoring for changes in the population would help to ensure the long-term viability of this rare plant occurrence.

**Location:** Archuleta County, Devil Creek, about eight miles west-northwest of Pagosa Springs.

**Legal Description:** U.S.G.S. 7.5-minute quadrangles: Chris Mountain T35n R3W Sections 2, 3, 10, 11

**Size:** 59 ac (24 ha)

**Elevation:** 7,600 to 8,000 ft (2,317 to 2,438 m)

**General Description:** The Dunagan Canyon PCA is located at the intersection of two branches of Devil Creek. A hiking trail runs along the valley floor from the forest road to the north. The canyon bottom is level with a small meandering creek and sedge meadows. The hillsides are forested with aspen and scattered ponderosa pine (*Pinus ponderosa*), and have hawthorne (*Crataegus* sp.) and poison ivy (*Toxicodendron rydbergii*) in the understory. The prairie violet (*Viola pedatifida*) was found in a rocky area of small angular sandstone fragment, about 15 feet above the valley floor.

**Biodiversity Rank Justification:** This PCA contains a good (B rank) occurrence of prairie violet, a plant that is globally secure, but rare in Colorado (G5S2). This plant species has a broad range throughout North America. Except for three small occurrences in Archuleta County, of the other 32 Colorado occurrences are from the Front Range.

**Table 58. Natural Heritage element occurrences at the Dunagan Canyon PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plants								
<i><b>Viola pedatifida</b></i>	<b>Prairie violet</b>	<b>G5</b>	<b>S2</b>				<b>B</b>	<b>2002-05-07</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary is drawn to contain three sub-populations of prairie violet, the intervening area and a small buffer to allow for expansion of the population over time.

**Protection Comments:** The site is entirely within the San Juan National Forest and no protection actions are needed in the foreseeable future. However, there is no special designation assuring perpetual protection for the rare plant and any changes in land use or ownership may necessitate action.

**Management Comments:** There is some cattle grazing in the area, but cattle probably avoid the rocky area where the violets are found. There is potential for the introduction of non-native plant species from human and horse rider use of the hiking trail in the bottom of the canyon. Monitoring for changes in the population would help to ensure the long-term viability of this rare plant occurrence.

# Dunagan Canyon Potential Conservation Area

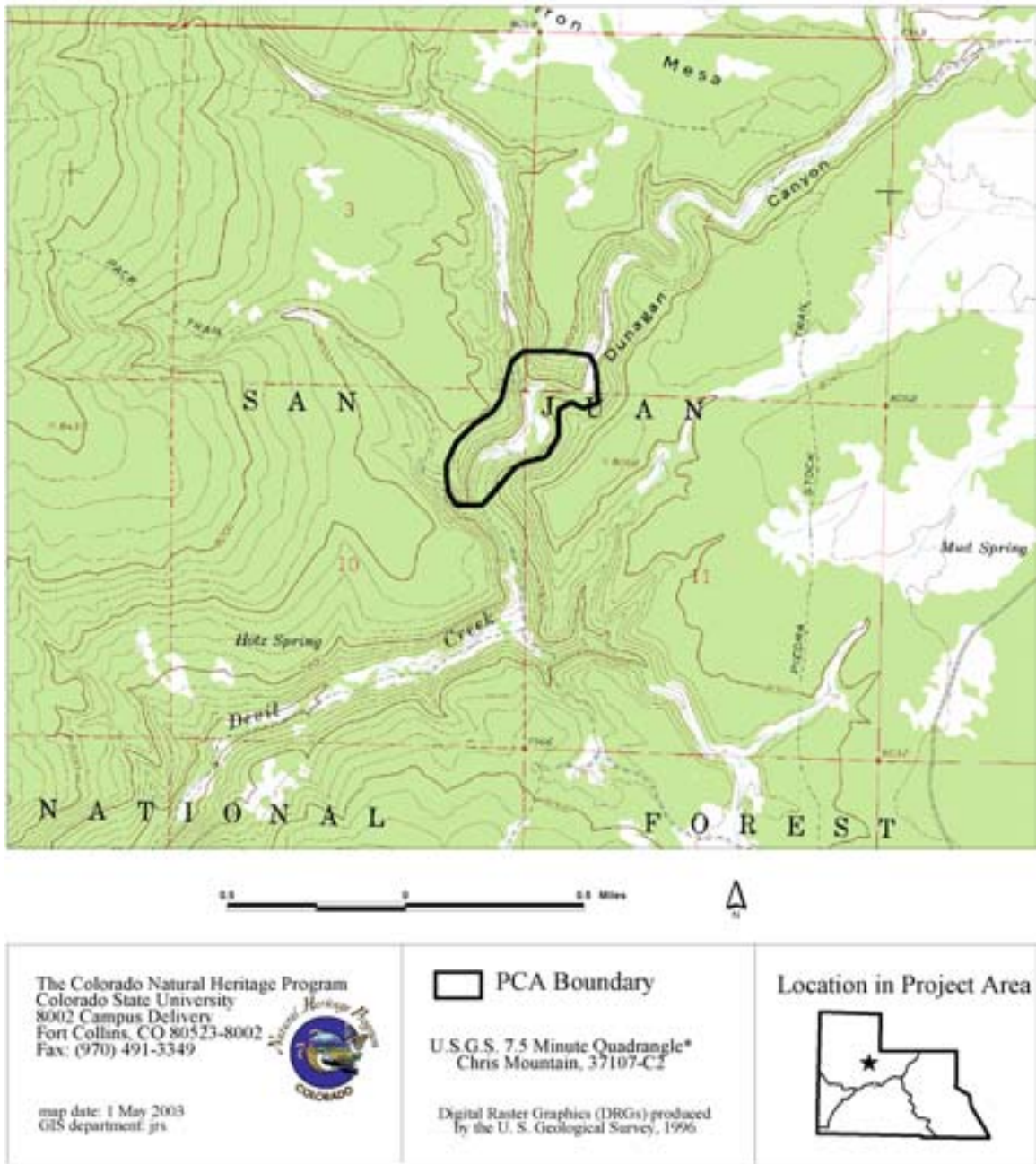


Fig. 58. Dunagan Canyon Potential Conservation Area.

## Elephant Head Rock

**Biodiversity Rank: B5 (General significance)**

This PCA contains a good (B rank) occurrence of a globally vulnerable (G4T3) Peregrine Falcon (*Falco peregrinus anatum*) subspecies. Peregrine Falcon were markedly reduced in numbers by pesticide and PCB poisoning during the 1950s through the mid-1970s.

**Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future, but change of ownership may warrant reevaluation of the protection status of this PCA. The PCA is located within a private ranch and the owner and current ranch Manager are conservation minded and desire to conserve the natural resources of the area.

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the Peregrine Falcon aerie. Lack of access through private land to the cliff face will probably prevent disturbances to the peregrines.

**Location:** Archuleta County, at the Navajo Headwaters Ranch, 0.5 miles southwest of Beaver Creek and 0.5 miles northwest of Elephant Head Rock.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles Elephant Head Rock  
T34NR2E S26, 27

**Size:** 385 ac (156 ha)

**Elevation:** 9,000 to 10,340 ft (2,743 to 3,152 m)

**General Description:** The Elephant Head Rock PCA encompasses a cliff face containing a Peregrine Falcon (*Falco peregrinus anatum*) aerie. The aerie rests on a granite cliff facing southwest at about 250 feet up the 500 vertical foot face of the cliff. The vegetation at the cliff top consists of a mixed conifer forest with spruce and fir dominant. At the cliff's base is a ponderosa pine (*Pinus ponderosa*) forest. The aerie is located on private land and the lowland beneath the base of the cliff is grazed pastureland. One half mile north of the aerie is Beaver Creek, a tributary of the Navajo River, which runs through the valley ranchland. Fall View Lake on the valley floor, is within two miles of the aerie.

**Biodiversity Rank Comment:** This PCA contains a good (B rank) occurrence of a globally vulnerable (G4T3) Peregrine Falcon (*Falco peregrinus anatum*) subspecies. Peregrine Falcons were markedly reduced in numbers by pesticide and PCB poisoning during the 1950s through the mid-1970s. This poisoning resulted in extirpation of the species from large areas of its former range, particularly along the eastern coast of the United States. Currently the Peregrine Falcon is recovering throughout much of its range

(USFWS 1999). In the western region of the United States there were an estimated 250 to 350 breeding site occurrences in 1973, but these dropped to approximately 200 by 1983. However, in 1998, there were at least 535 breeding pairs in the western region.

**Table 59. Natural Heritage element occurrences at the Elephant Head Rock PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Birds								
<b><i>Falco peregrinus anatum</i></b>	<b>American Peregrine Falcon</b>	<b>G4T3</b>	<b>S2B</b>	<b>LE</b>	<b>SC</b>		<b>B</b>	<b>1996</b>

\*EO rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary of this PCA includes the cliff face inhabited by the nesting Peregrine Falcons and a buffer to protect the ecological integrity of the entire peak complex. This buffer includes the mountaintop above the cliff face and aerie. Note that feeding areas extend far outside of the site boundaries, warranting landscape management that is compatible with the long-term viability of the site.

**Protection Comments:** No protection actions are needed in the foreseeable future, but change of ownership may warrant reevaluation of the protection status of this PCA. This PCA is entirely within the Navajo Headwaters and Catspaw Ranches, which share the same owner. The owner and current ranch manager are conservation minded and desire to conserve the natural resources of the ranch.

**Management Comments:** Current land use seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the Peregrine Falcon nesting habitat. Lack of access through private land to the cliff face will probably prevent disturbances to the peregrines. Because the land is privately owned the PCA and aerie are protected from recreational disturbances such as hiking, horse packing, climbing or off-road vehicle use during the nesting season. Such activities have the potential to force the Peregrines from the aerie, leading to abandonment of the nest site.

# Elephant Head Rock

## Potential Conservation Area

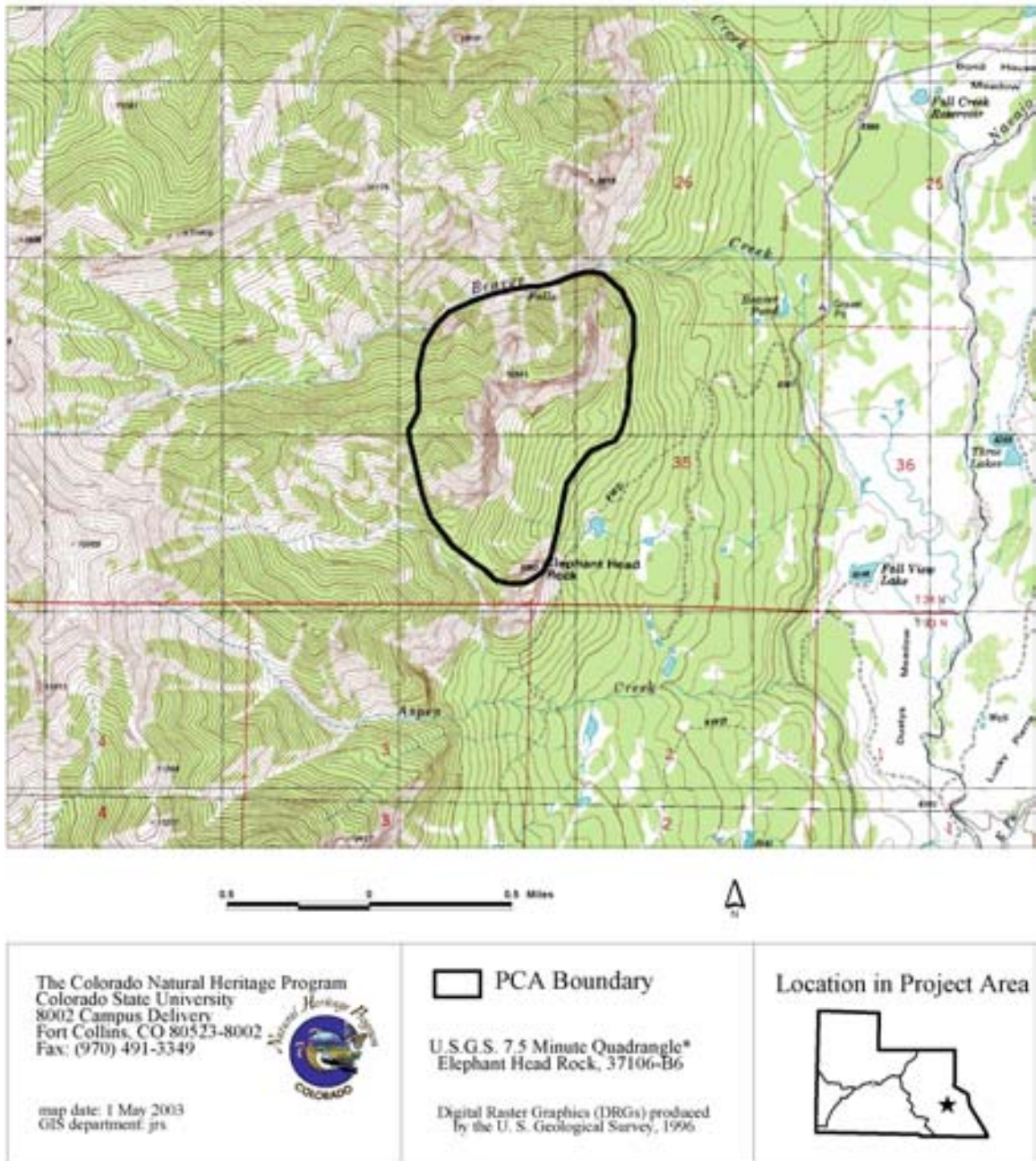


Fig. 59. Elephant Head Rock Potential Conservation Area.

## Jackson Mountain

### **Biodiversity Rank: B5 (General significance)**

There is a small (C rank) occurrence of a state rare (S2) plant at this site.

### **Protection Urgency Rank: P4 (Low urgency)**

The site is completely within the San Juan National Forest and no protection actions are needed in the foreseeable future.

### **Management Urgency Rank: M3 (Moderate urgency)**

New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Recreational use by hunters and heavy cattle grazing may have deleterious effects on the rare plant population found within this PCA. Monitoring for changes in the population would help to ensure the long-term viability of this rare plant occurrence.

**Location:** Archuleta County, off Jackson Mountain Road (Forest Road 037), northwest of Highway 160, about seven miles northeast of Pagosa Springs.

### **Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Jackson Mountain  
T36N R1W Sections 10, 15

**Size:** 35 ac (14 ha)

**Elevation:** 7,800 to 8,000 ft (2,377 to 2,438 m)

**General Description:** The Jackson Mountain PCA is located on the west side of a small rocky hill, in fairly level terrain, at the intersection of a dirt road and a trail. Soils in the area are derived from volcanics, and support an open plant community of ponderosa pine (*Pinus ponderosa*), Gambel oak (*Quercus gambelii*), Oregon grape (*Mahonia repens*), grasses and forbs. In 2002 a small population of prairie violet (*Viola pedatifida*) was found within the PCA. The plants appeared to be negatively affected by drought.

**Biodiversity Rank Justification:** This PCA supports a small, fair (C rank) occurrence of prairie violet (*Viola pedatifida*), a plant that is globally common, but rare in Colorado (G5S2). This plant species has a broad range throughout North America. Except for three small occurrences in Archuleta County, all of the other 32 Colorado occurrences are from the Front Range.

**Table 60. Natural Heritage element occurrences at the Jackson Mountain PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plants								
<i>Viola pedatifida</i>	<b>Prairie violet</b>	<b>G5</b>	<b>S2</b>				<b>C</b>	<b>2002-05-28</b>

\*EO rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary is drawn to encompass two small sub-populations of prairie violet, with a small buffer to allow for expansion of the population over time.

**Protection Comments:** This PCA is completely within the San Juan National Forest. However, there is no special designation assuring perpetual protection for the rare plant and any changes in land use or ownership may necessitate action.

**Management Comments:** The area has several dirt roads, and appears to be popular for hunting. Some trampling of the area was noted near a hunting camp. Grazing may also be a concern for the violet occurrence. Heavy cattle use was evident along a nearby stream. Monitoring in a year of more moisture could show that the population is larger than was observed in 2002.

# Jackson Mountain

## Potential Conservation Area

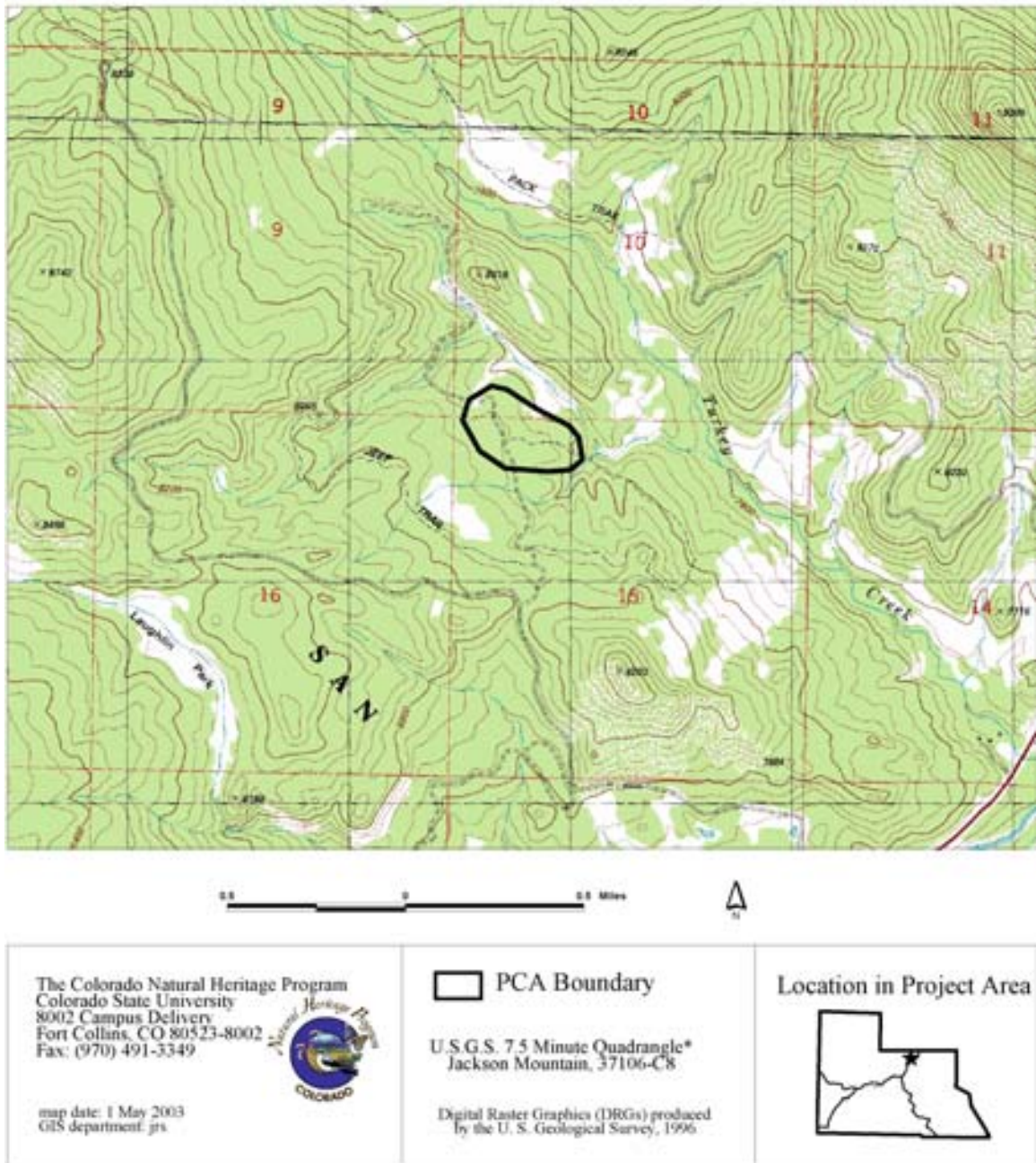


Fig. 60. Jackson Mountain Potential Conservation Area.

## Kenney Flats

**Biodiversity Rank: B5 (General significance)**

This PCA has a fair (C rank) occurrence of a state rare (S1) plant.

**Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. The PCA is entirely within the San Juan National Forest.

**Management Urgency Rank: M3 (Moderate urgency)**

New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Large areas of tarweed (*Madia glomerata*) have invaded the broad swales in the non-forested areas uphill from the pond where the variegated scouring rush was found. This exotic plant population should be monitored to identify weed control needs.

**Location:** Archuleta County, about 13 miles south southeast of Pagosa Springs.

**Legal Description:** U.S.G.S. 7.5 minute quadrangle: Edith  
T33 N R1E S7, 12

**Size:** 227 ac (92 ha)

**Elevation:** 7,600 to 7,900 ft (2,317 to 2,408)

**General Description:** The Kenny Flats PCA is characterized by ponderosa pine (*Pinus ponderosa*) savanna, with large grassy meadows, and less Gambel oak (*Quercus gambelii*) than in most of Archuleta County. The PCA has some excellent stands of bunchgrasses, including Arizona fescue (*Festuca arizonica*), needle and thread (*Stipa comata*), Indian rice grass (*Oryzopsis hymenoides*), mountain muhly (*Muhlenbergia montana*), and pine dropseed (*Blepharoneuron tricholepis*). However, the quality of the understory is patchy, and non-native species such as smooth brome (*Bromus inermis*) and bluegrass (*Poa pratensis*) are also present. Of greater concern are large areas of tarweed (*Madia glomerata*) that have invaded in the broad swales.

**Biodiversity Rank Justification:** This PCA has a fair (C rank) occurrence of a state rare (S1) plant. Variegated scouring rush (*Hippochaete variegatum* var. *variegatum*) is a smaller plant than its close relative, common scouring rush (*H. hyemalis*), and can be found from moderately low to high elevations. At this PCA it was growing in mud surrounding a stock pond. Although the species is widespread throughout the United States and Canada, there are only two other known locations in Colorado. However, it may be more common and just overlooked. Other nearby stock ponds and muddy areas should be checked for this plant.

**Table 61. Natural Heritage element occurrences at the Kenney Flats PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plants								
<i>Hippochaete variegatum</i> var. <i>variegatum</i>	Variegated scouring rush	G5T5	S1				c	2001-09-07

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary is drawn to include the occurrence of variegated scouring rush, and areas uphill from the pond that contain exotic plant species that may threaten this occurrence.

**Protection Rank Comments:** The PCA is entirely within the San Juan National Forest, and should be adequately protected as long as forest ownership is maintained.

**Management Rank Comments:** New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Large areas of tarweed (*Madia glomerata*) have invaded the broad swales in the non-forested areas uphill from the pond where the variegated scouring rush was found. Although this exotic plant has not been identified as a noxious weed, the degree to which it poses a threat to natural communities should be investigated. Monitoring would aid in identifying the need for control of this exotic plant population.

# Kenney Flats

## Potential Conservation Area

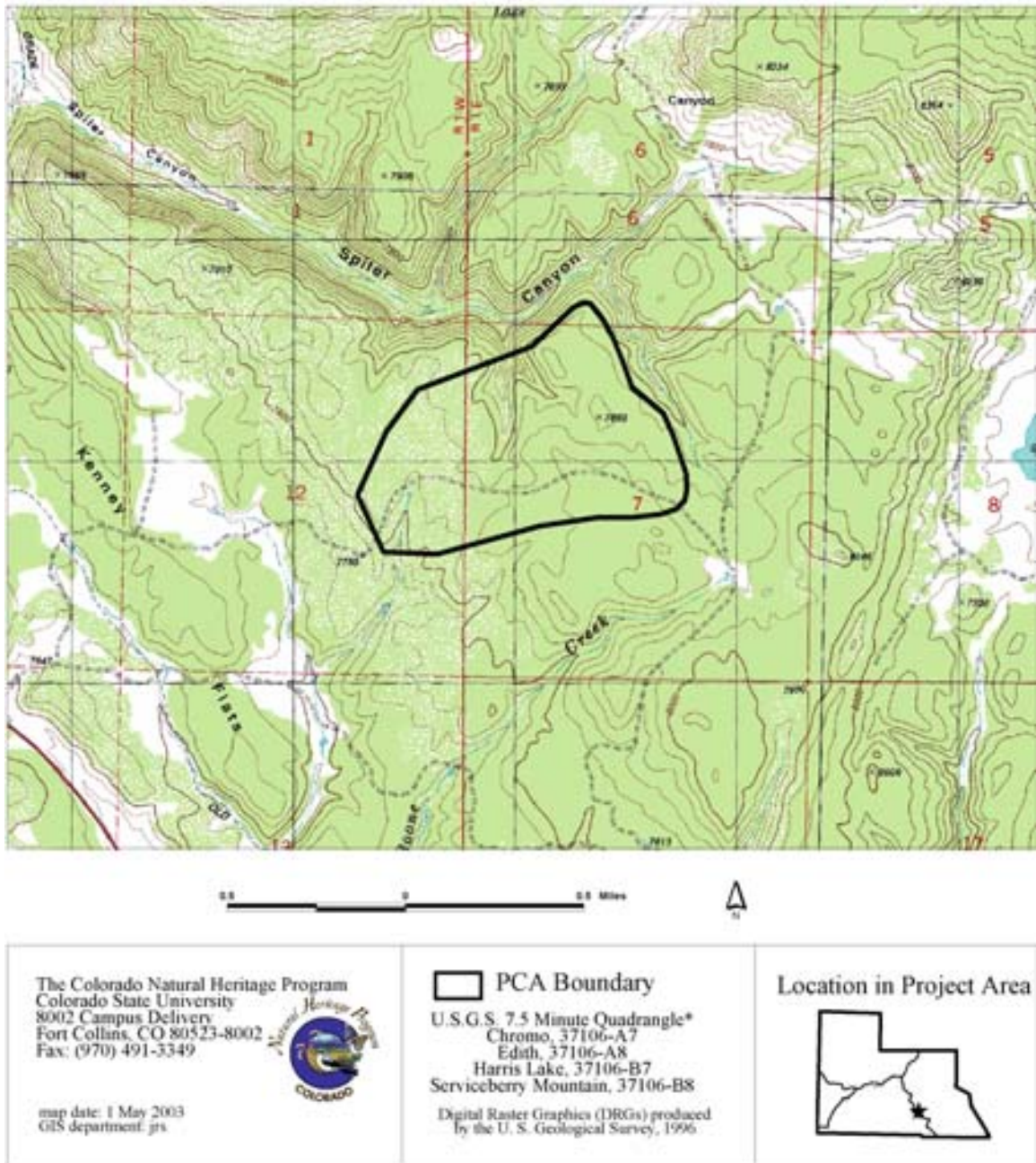


Fig. 61. Kenney Flats Potential Conservation Area.

## Mule Mountain

**Biodiversity Rank: B5 (General significance)**

This PCA contains a good (B rank) occurrence of the Peregrine Falcon (*Falco peregrinus anatum*) a globally vulnerable (G4T3) subspecies that is vulnerable (S3) in Colorado. In the western United States there were an estimated 250 to 350 breeding site occurrences in 1973, but these dropped to approximately 200 by 1983. However, in 1998, there were at least 535 breeding pairs in the western region.

**Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. This PCA is entirely within the San Juan National Forest and current protection is adequate.

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the peregrine aerie in the PCA, but management actions may be needed in the future to maintain the current quality of the aerie. Closing the forest in the area of the aerie to human use, including off road vehicle traffic and rock climbing during the nesting season (March through July) would serve to protect the Peregrine Falcons.

**Location:** Archuleta County, on the lower Piedra River, 1.5 miles south of Indian Creek.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Devil Mountain

T35NR4W S30, 31

T35N005W S25, 36

**Size:** 772 ac (312 ha)

**Elevation:** 6,490 to 8,600 ft (1978 to 2,621 m)

**General Description:** The Mule Mountain PCA encompasses a cliff face containing a Peregrine Falcon (*Falco peregrinus anatum*) aerie. The aerie rests about 270 feet up a south facing granite cliff with a 350 foot face that is surrounded by a ponderosa pine (*Pinus ponderosa*) forest. The aerie is located within the San Juan National Forest and the lowland beneath the base of the cliff consists of riparian areas associated with the Piedra River. The river is located less than one half mile east of the aerie and one half mile north of the aerie is Heflin Creek, a tributary of the Piedra River.

**Biodiversity Rank Comment:** This PCA contains a good (B-rank) occurrence of a globally vulnerable (G4T3) subspecies that is vulnerable (S3) in Colorado. Peregrine Falcon were markedly reduced in numbers by pesticide and PCB poisoning during the 1950s through the mid-1970s. This poisoning resulted in extirpation of the species from large areas of its former range, particularly along the eastern coast of the United States. Currently the Peregrine falcon is recovering throughout much of its range (USFWS 1999). In the western region of the United States there were an estimated 250 to 350

breeding site occurrences in 1973, but these dropped to approximately 200 by 1983. However, in 1998, there were at least 535 breeding pairs in the western region.

**Table 62. Natural Heritage element occurrences at the Mule Mountain PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plants								
<b><i>Falco peregrinus anatum</i></b>	<b>American Peregrine Falcon</b>	<b>G4T3</b>	<b>S3</b>	<b>LE</b>	<b>SC</b>		<b>B</b>	<b>1994-07-02</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The planning boundary includes the known Peregrine Falcon aerie and a buffer to protect the ecological integrity of the canyon. Note that feeding areas extend far outside of the PCA boundaries, warranting landscape management that is compatible with the long-term viability of the PCA.

**Protection Comments:** No protection actions are needed in the foreseeable future. The PCA is entirely within the San Juan National Forest, and should be adequately protected as long as forest ownership is maintained.

**Management Comments:** Current management seems to favor the persistence of the peregrine aerie in the PCA, but management actions may be needed in the future to maintain the current quality of the nesting habitat. There are a number of roads and trails in the area that allow access to both the valley floor along the Piedra River beneath the aerie and the mountain top above the aerie. Although no road or trail is closer than one half mile to the cliff face supporting the aerie it is still accessible to recreational users who might travel off trail. Closing the forest in the area of the aerie to human use, including off road vehicle traffic and rock climbing during the nesting season (March through July) would serve to protect the Peregrine Falcons. Beneath the cliff supporting the aerie is a parcel of private land that has a conservation easement. It is unknown if the public is allowed access across this parcel; if not it would probably prevent disturbances to the peregrines from recreational users in the Piedra River Valley.

# Mule Mountain

## Potential Conservation Area

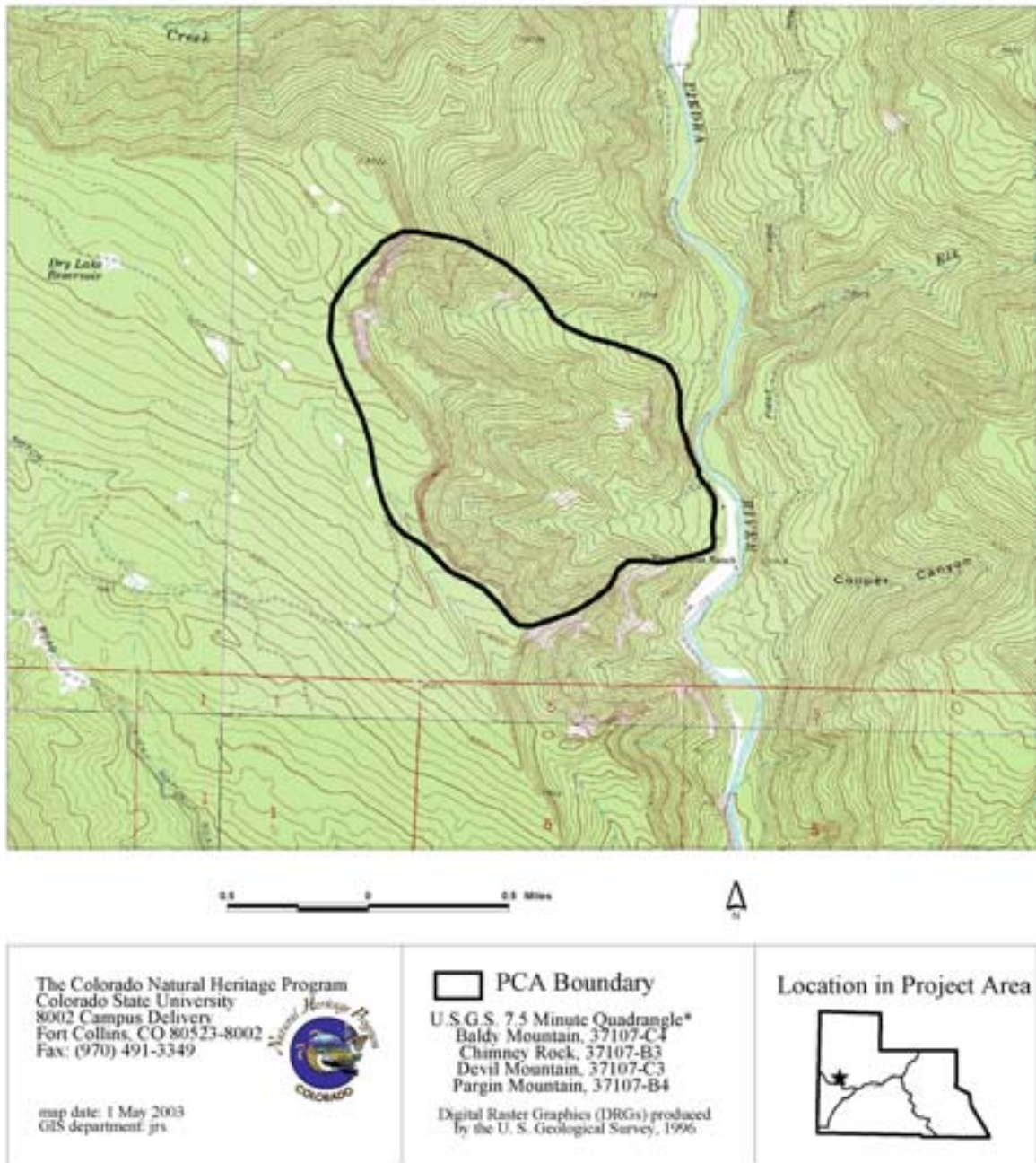


Fig. 62. Mule Mountain Potential Conservation Area.

## Navajo Peak

**Biodiversity Rank: B5 (Very high significance)**

This PCA contains a good (B rank) occurrence of the Peregrine Falcon (*Falco peregrinus anatum*) a globally vulnerable (G4T3) subspecies that is vulnerable (S3) in Colorado. In the western United States there were an estimated 250 to 350 breeding site occurrences in 1973, but these dropped to approximately 200 by 1983. However, in 1998, there were at least 535 breeding pairs in the western region.

**Protection Urgency Rank: P5 (No urgency)**

No protection actions are needed in the foreseeable future. This PCA is entirely within the San Juan National Forest and current protection is adequate.

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the peregrine aerie in the PCA, but management actions may be needed in the future to maintain the current quality of the aerie. Closing the forest in the area of the aerie to human use, including off road vehicle traffic and rock climbing during the nesting season (March through July) would serve to protect the Peregrine Falcons. Repeated disturbance at the nest site itself often leads to abandonment.

**Location:** Archuleta County, at Navajo Peak in southeastern portion of the county.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Chama Peak  
T33NR2E S15, 16

**Size:** 201 ac (81 ha)

**Elevation:** 9,640 to 11,300 ft (2,938 to 3,444 m)

**General Description:** The Navajo Peak PCA encompasses a cliff face containing a Peregrine Falcon (*Falco peregrinus anatum*) aerie. The aerie consists of two nests located on a south facing granite cliff with a 800 foot face surrounded by a mixed forest of Engelmann spruce (*Picea engelmannii*), Douglas fir (*Pseudotsuga menziesii*) and aspen (*Populus tremuloides*). The aerie is located within the San Juan National Forest and the vegetation beneath the base of the cliff consists of mixed forest dominated by ponderosa pine (*Pinus ponderosa*) and Gambel oak (*Quercus gambelii*) in addition to the already mentioned species. One half miles north of the aerie is Peterson Creek, a tributary of the Navajo River.

**Biodiversity Rank Comment:** This PCA contains a good (B rank) occurrence of a globally vulnerable (G4T3) subspecies that is vulnerable (S3) in Colorado. Peregrine Falcons were markedly reduced in numbers by pesticide and PCB poisoning during the 1950s through the mid-1970s. This poisoning resulted in extirpation of the species from large areas of its former range, particularly along the eastern coast of the United States.

Currently the Peregrine Falcon is recovering throughout much of its range (USFWS 1999). In the western region of the United States there were an estimated 250 to 350 breeding site occurrences in 1973, but these dropped to approximately 200 by 1983. However, in 1998, there were at least 535 breeding pairs in the western region.

**Table 63. Natural Heritage element occurrences at the Navajo Peak PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Birds								
<b><i>Falco peregrinus anatum</i></b>	<b>American Peregrine Falcon</b>	<b>G4T3</b>	<b>S3</b>	<b>LE</b>	<b>SC</b>		<b>B</b>	<b>1996</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The planning boundary includes the known Peregrine Falcon aerie and a buffer to protect the ecological integrity of the Navajo Peak Complex. Note that feeding areas extend far outside of the PCA boundaries, warranting landscape management that is compatible with the long-term viability of the PCA.

**Protection Comments:** This PCA is entirely within the San Juan National Forest and no protection actions are needed in the foreseeable future. Protection should be adequate as long as forest ownership is maintained.

**Management Comments:** Current management seems to favor the persistence of the peregrine aerie in the PCA, but management actions may be needed in the future to maintain the current quality of the aerie. There is a road and trail in the area that allow access to the valley floor along the Piedra River beneath the aerie. Although the trail is no closer than one half mile from the cliff face supporting the aerie it is still accessible to recreational users who might travel off trail. Closing the forest in the area of the aerie to human use, including off road vehicle traffic and rock climbing during the nesting season (March through July), would serve to protect the Peregrine Falcons. Repeated disturbance at the nest site itself often leads to abandonment.

# Navajo Peak

## Potential Conservation Area

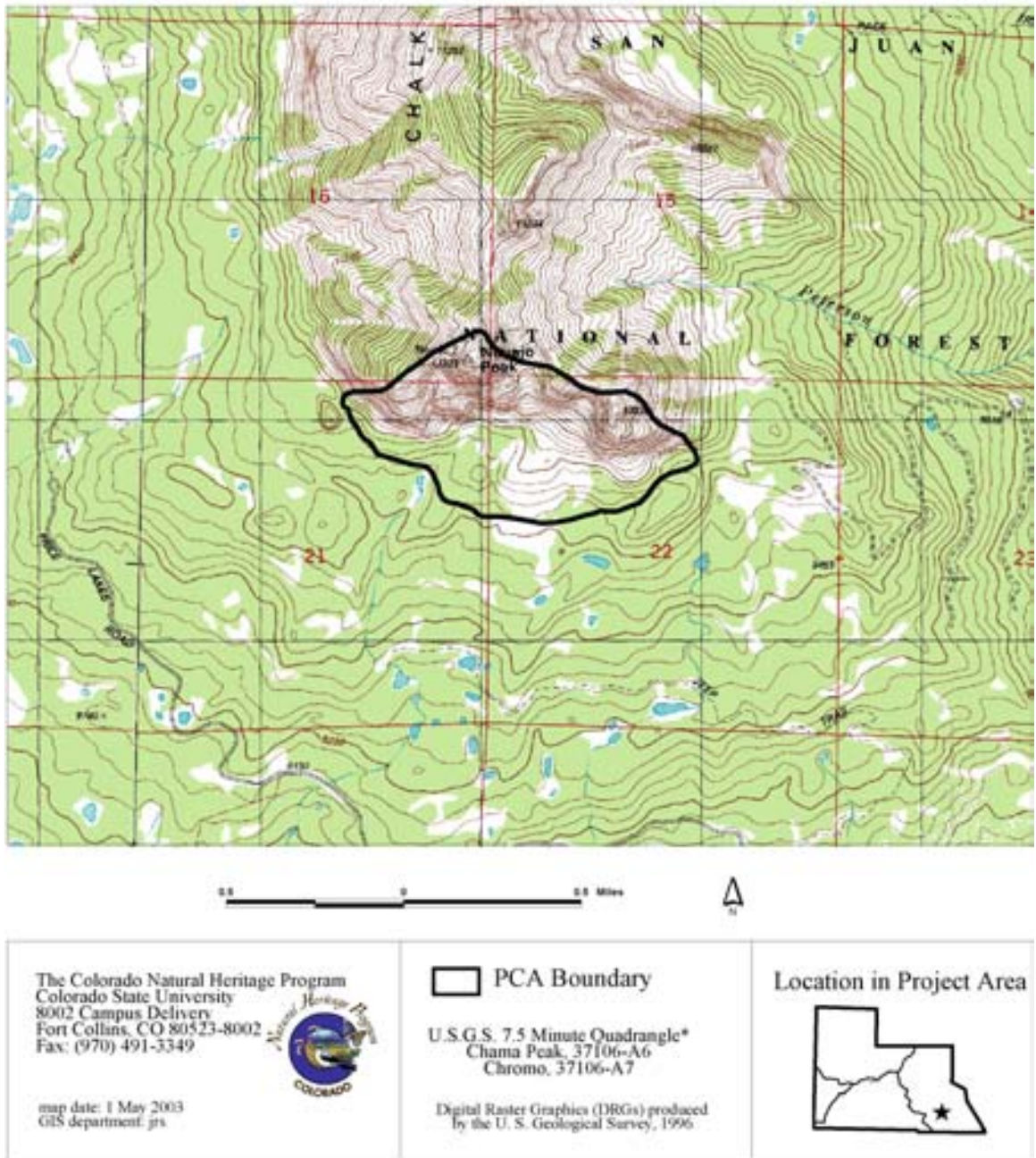


Fig. 63. Navajo Peak Potential Conservation Area.

## Piedra Forks Site

**Biodiversity Rank: B5 (General significance)**

This PCA contains an unranked (E) occurrence of the Peregrine Falcon (*Falco peregrinus anatum*), a globally vulnerable (G4T3) subspecies that is vulnerable (S3) in Colorado. Peregrine Falcon were markedly reduced in numbers by pesticide and PCB poisoning during the 1950s through the mid-1970s. In the western United States there were an estimated 250 to 350 breeding site occurrences in 1973, but these dropped to approximately 200 by 1983. However, in 1998, there were at least 535 breeding pairs in the western region.

**Protection Urgency Rank: P3 (Moderate urgency)**

Land protection is complete and no protection actions are needed. This PCA is entirely within the San Juan National Forest and current protection is adequate.

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the peregrine aerie in the PCA, but management actions may be needed in the future to maintain the current quality of the aerie. Closing the forest in the area of the aerie to human use, including off road vehicle traffic and rock climbing during the nesting season (March through July) would serve to protect the Peregrine Falcons. Repeated disturbance at the nest site itself often leads to abandonment.

**Location:** Hinsdale County, in the upper Piedra drainage just north of the East Fork of the Piedra River at the Hinsdale-Mineral county line.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Oakbrush Ridge, Pagosa Peak

T37NR2W S6

T37NR3W S1

T38NR3W S36

T38NR2W S31

**Size:** 280 ac (113 ha)

**Elevation:** 8,680 to 10,080 ft (2,646 to 3,072 m)

**General Description:** The Piedra Forks PCA encompasses a cliff face containing a Peregrine Falcon (*Falco peregrinus anatum*) aerie. The aerie rests about 400 feet up a southeast facing granite cliff with a 900 foot face. It surrounded by a mixed forest of ponderosa pine (*Pinus ponderosa*), spruce (*Picea engelmannii*), fir (*Pseudotsuga menziesii*), aspen (*Populus tremuloides*) and Gambel oak (*Quercus gambelii*). The aerie is located within the San Juan National Forest and the East and Middle Forks of the Piedra River are one half mile southeast and northwest of the aerie, respectively.

**Biodiversity Rank Comment:** This PCA contains an unranked (E) occurrence of the Peregrine Falcon (*Falco peregrinus anatum*), a globally vulnerable (G4T3) subspecies that is vulnerable (S3) in Colorado. Peregrine Falcons were markedly reduced in numbers by pesticide and PCB poisoning during the 1950s through the mid-1970s. This poisoning resulted in extirpation of the species from large areas of its former range, particularly along the eastern coast of the United States. Currently the Peregrine Falcon is recovering throughout much of its range (USFWS 1999). In the western region of the United States there were an estimated 250 to 350 breeding site occurrences in 1973, but these dropped to approximately 200 by 1983. However, in 1998, there were at least 535 breeding pairs in the western region.

**Table 64. Natural Heritage element occurrences at the Piedra Forks PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Birds								
<b><i>Falco peregrinus anatum</i></b>	<b>American Peregrine Falcon</b>	<b>G4T3</b>	<b>S3</b>	<b>LE</b>	<b>SC</b>		<b>E</b>	<b>1994-07-19</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The planning boundary includes the known Peregrine Falcon aerie and a buffer to protect the ecological integrity of the Rock Mountain Complex. Note that feeding areas extend far outside of the PCA boundaries, warranting landscape management that is compatible with the long-term viability of the PCA.

**Protection Comments:** This PCA is entirely within the San Juan National Forest and no protection action is needed. Protection should be adequate as long as forest ownership is maintained.

**Management Comments:** Current management seems to favor the persistence of the Peregrine aerie in the PCA, but management actions may be needed in the future to maintain the current quality of the aerie. There is a road one mile south of the aerie that would allow access to the cliff face on Rock Mountain, although absence of a trail would require bushwhacking through difficult terrain. Consequently disturbance by human users is unlikely, but prudence suggests closing the forest in the area of the aerie to human use, including off road vehicle traffic and rock climbing during the nesting season (March through July). Such an action would serve to protect the Peregrine Falcons. Repeated disturbance at the nest site itself often leads to abandonment.

# Piedra Forks Potential Conservation Area

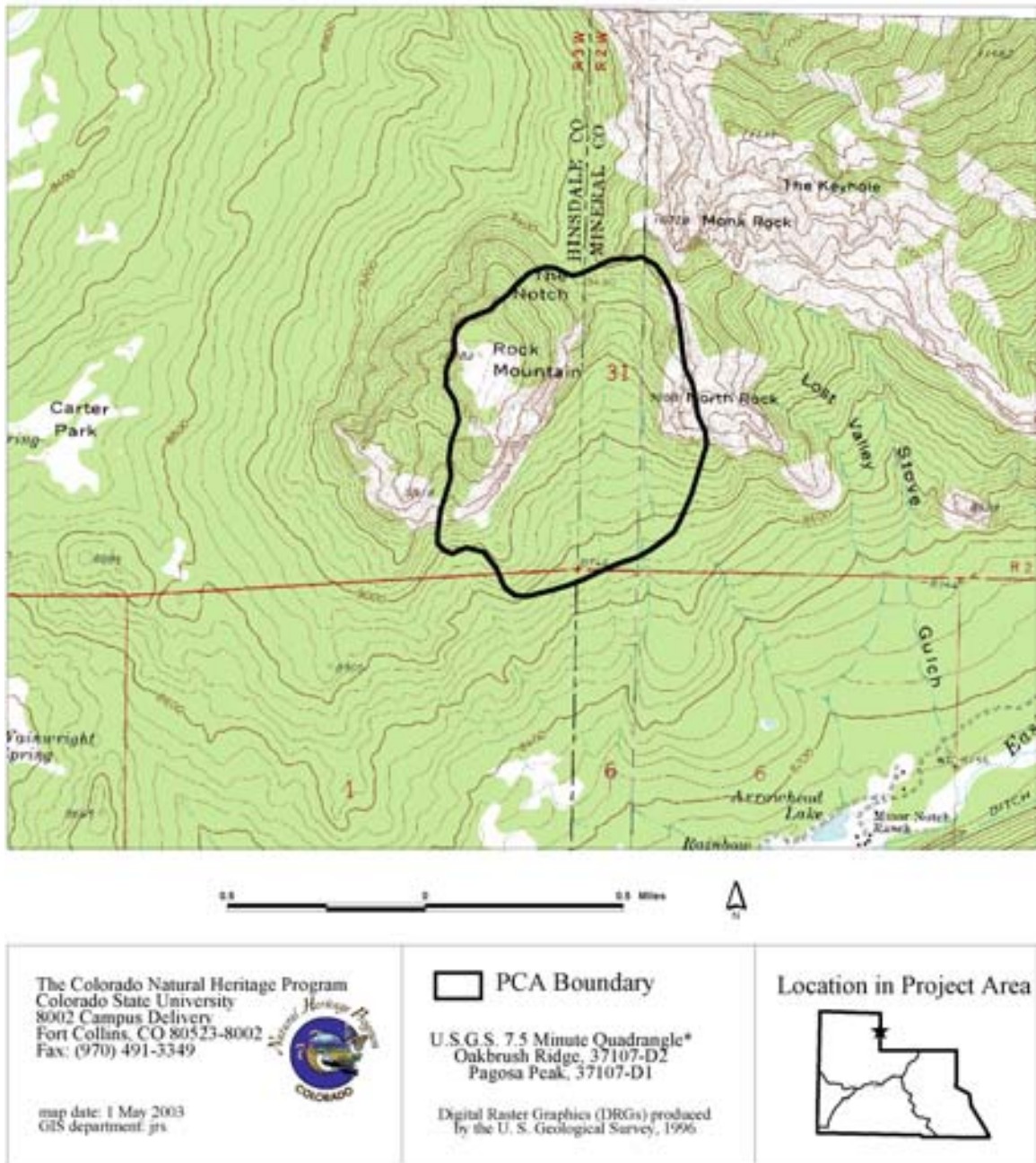


Fig. 64. Piedra Forks Potential Conservation Area.

## Piedra River Trail

**Biodiversity Rank: B5 (General significance)**

This PCA supports a fair (C rank) population of the western polypody, a fern that is rare in Colorado (S1S2).

**Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. This PCA is entirely within the San Juan National Forest.

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. Monitoring and controlling the spread of the invasive weeds within the PCA would benefit the rare plant population.

**Location:** Archuleta County, about 15 miles northwest of Pagosa Springs.

**Legal Description:**

U.S.G.S. 7.5 minute quadrangle: Oakbrush Ridge  
T36N R3W S3

**Size:** 94 ac (38 ha)

**Elevation:** 7,600 to 7,800 ft (2,117 to 2,377 m)

**General Description:** This PCA includes a small area along the Piedra River trail, which runs through a canyon of the Piedra River just south of the Hinsdale County line. The western polypody (*Polypodium hesperium*) was found at the moist base of large boulders on the west side of the river. Other species in the area were Reeves' bladderfern (*Cystopteris reevesiana*), starry false solomonseal (*Maianthemum stellatum*), and northern bedstraw (*Galium boreale*). The adjacent hillsides were dry and covered with oak (*Quercus gambelii*) and other shrubs.

**Biodiversity Rank Justification:** This PCA supports a fair (C rank) occurrence of western polypody, a fern that is rare in Colorado (S1S2). This species of fern has a broad distribution throughout the western mountains of North America, but is known from only eight locations in Colorado.

**Table 65. Natural Heritage element occurrences at the Piedra River Trail PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plants								
<b><i>Polypodium hesperium</i></b>	<b>Western polypody</b>	<b>G5</b>	<b>S1S2</b>				<b>C</b>	<b>2001-07-13</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary is drawn to include the occurrence of the western polypody and some adjacent area with similar habitat, to allow for expansion or movement of the population over time.

**Protection Rank Comments:** This PCA is entirely within the San Juan National Forest and no protection action is needed. Protection should be adequate as long as forest ownership is maintained.

**Management Rank Comments:** Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. Although it is located along a popular hiking trail, there are no known direct threats to the western polypody occurrence. Several non-native species were found along the trail, however, including burdock (*Arctium minus*), orchard grass (*Dactylis glomerata*), quackgrass (*Elytrigia repens*), and toadflax (*Linaria vulgaris*). Monitoring and controlling the spread of the invasive weeds would benefit the rare plant population.

# Piedra River Trail

## Potential Conservation Area

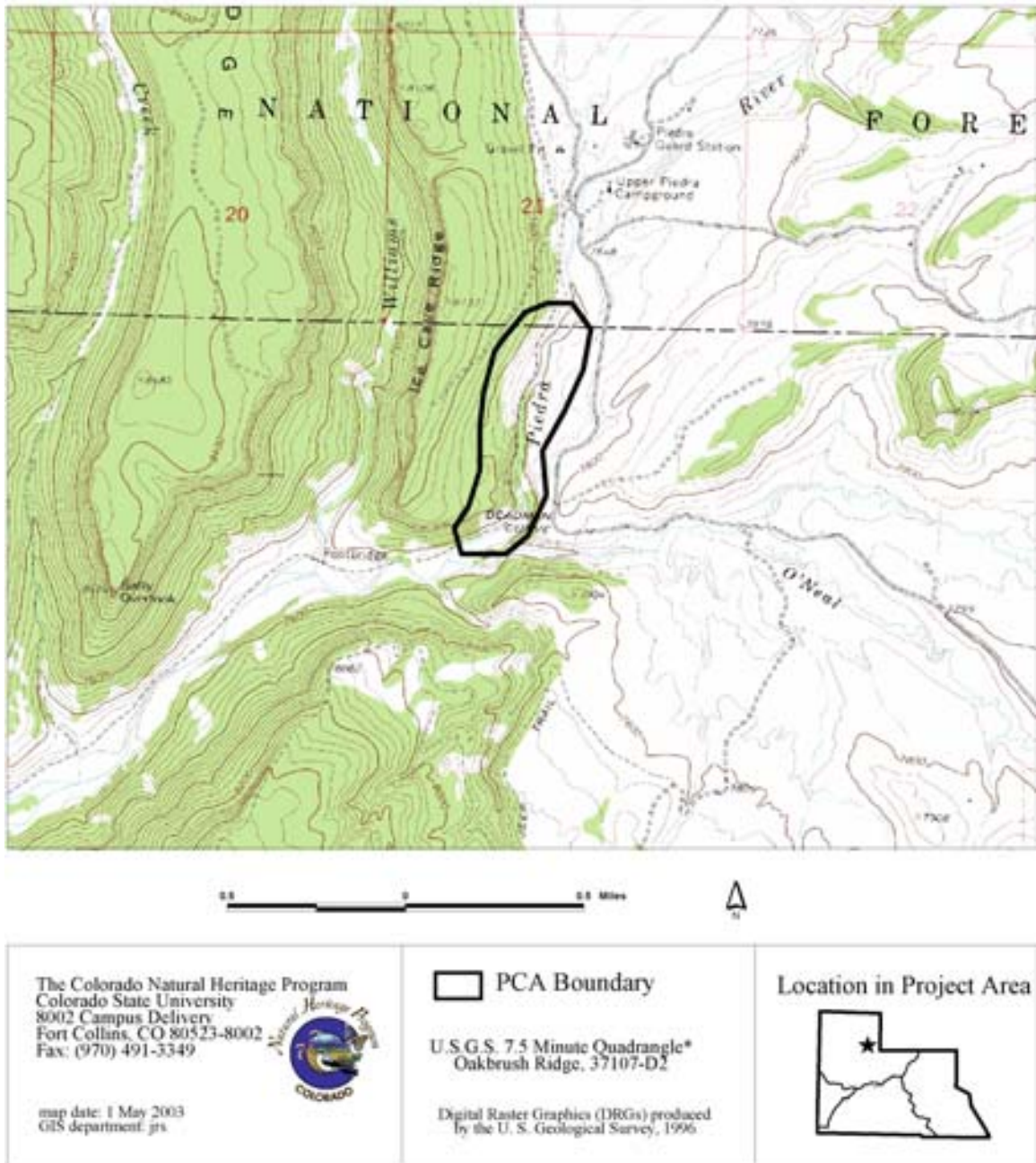


Fig. 65. Piedra River Trail Potential Conservation Area.

## Quartz Creek Trail

**Biodiversity Rank: B5 (General significance)**

This PCA contains a good (B rank) occurrence of Steller's cliff brake, a fern that is rare in Colorado (S2), although globally secure (G5).

**Protection Urgency Rank: P5 (No urgency)**

Land protection is complete and no protection actions are needed. The site is within the South San Juan Wilderness of the San Juan National Forest.

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. Disturbance of the rare plant population is unlikely because of its location on the cliff face.

**Location:** Archuleta County, about 1.5 miles west of the Continental Divide, and 17 air miles east northeast of Pagosa Springs.

**Legal Description:**

U.S.G.S. 7.5 minute quadrangle: Summit Peak  
T36N R2E S22

**Size:** 6 ac (2 ha)

**Elevation:** 9,680 10,000 ft (2,951 to 3,048)

**General Description:** This PCA encompasses a small area of cliffs along Quartz Creek by a waterfall. Steller's cliff brake (*Cryptogramma stelleri*) was found growing in horizontal crevices in the rock, with mosses and mat saxifrage (*Cilaria austromontana*), kept moist by spray from the falls, or in one place by a seep in an alcove. The surrounding area is Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) forest, with an understory of whortleberry (*Vaccinium* spp.). The entire area is in excellent condition. The only non-native plants observed were a few red clover plants along the lower part of the trail.

**Biodiversity Rank Justification:** This PCA contains a good (B rank) occurrence of Steller's cliff brake, a fern that is rare in Colorado (S2), although globally secure (G5). This species of fern has a broad distribution throughout the north half of North America, but is known from only 19 locations in Colorado and only two locations in Archuleta County.

**Table 66. Natural Heritage element occurrences at the Quartz Creek Trail PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plants								
<b>Cryptogramma stelleri</b>	<b>Steller's cliff brake</b>	<b>G5</b>	<b>S2</b>			<b>BLM</b>	<b>B</b>	<b>2001-07-27</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary is drawn to encompass the cliffs that support the Steller's cliff brake. Although the continuation of the current hydrology is essential to the long-term survival of the cliff brake, the larger watershed was not included in the boundary.

**Protection Rank Comments:** This PCA is within the South San Juan Wilderness of the San Juan National Forest, and is well protected. Protection should be adequate as long as forest ownership is maintained.

**Management Rank Comments:** Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. This trail is popular with hikers, but damage to the cliff brake is unlikely due to its location on cliff sides that are difficult to access. The rare plant population depends on the continued supply of water to the site.

# Quartz Creek Trail Potential Conservation Area

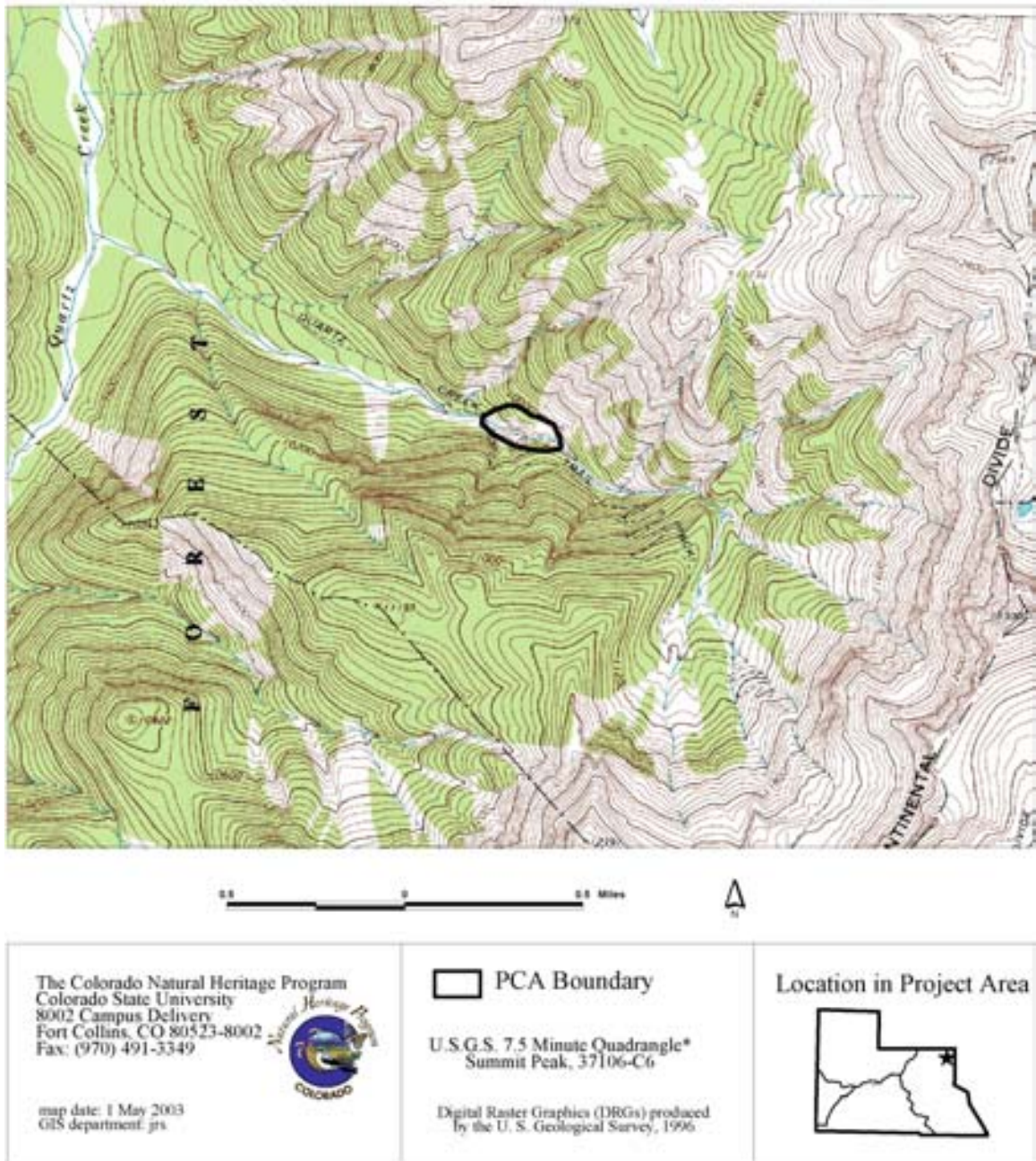


Fig. 66. Quartz Creek Trail Potential Conservation Area.

## Squaw Canyon

**Biodiversity Rank: B5 (General significance)**

The PCA contains a good (B-rank) occurrence of the Gunnison's prairie dog (*Cynomys gunnisoni*), a species that is globally secure (G5/S5). Gunnison's prairie dogs are endemic to the southwestern United States and have a broad distribution within Arizona, Colorado, New Mexico and Utah.

**Protection Urgency Rank: P1 (Very High urgency)**

Protection actions needed immediately. It is estimated that stresses may reduce the viability of the elements in the PCA within 1 year. This area is currently undergoing residential development with lot sizes of between 3 and 17 acres. Continued conversion of suitable habitat within the complex to residential homesites has the potential to eradicate this prairie dog complex.

**Management Urgency Rank: M2 (High urgency)**

New management for this PCA may be needed within five years to prevent the loss of the prairie dog complex. Management activities beneficial to the prairie dogs include prohibition of the presence of free-ranging dogs and minimization of human disturbances and activities in and near the colonies. Efforts to "environmentally educate" the residents of subdivisions that lie near the prairie dog colonies may reduce the incidence and magnitude of conflicts between people and prairie dogs.

**Location:** Archuleta County, south of Pagosa Springs off of U.S. Highway 84, in the Loma Linda subdivision.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Serviceberry Mountain  
T34NR1W S7, 8

**Size:** 1,686 ac (682 ha)

**Elevation:** 7,150 to 7,295 ft (2,179 to 2,224 m)

**General Description:** The Squaw Canyon site encompasses a large open, flat valley with numerous low hills and several different types of habitats. Elevation within the site varies by about 150 feet and all of this elevation gain is associated with the hills, otherwise the site is extremely flat. The area is dominated by grassland and pastures, but also includes areas of mixed grass and sagebrush (*Artemisia* sp.), Gambel oak (*Quercus gambelii*) and even some pockets of ponderosa pine (*Pinus ponderosa*). Much of the area is under residential development and each lot is 3 to 17 acres in size. The PCA contains a large Gunnison's prairie dog (*Cynomys gunnisoni*) complex with an estimated 300 individuals. Some of the houses already built in the Loma Linda development have prairie dog mounds in their yards. Grazing of domestic livestock occurred historically on most or all of the site, and today it continues on some portions.

**Biodiversity Rank Comment:** The PCA contains a good (B-rank) occurrence of the Gunnison's prairie dog (*Cynomys gunnisoni*), a species that is globally secure (G5/S5). Gunnison's prairie dogs are endemic to the southwestern United States and have a broad distribution within Arizona, Colorado, New Mexico and Utah. Gunnison's prairie dogs are declining throughout their range, although extent of the decline is unknown. Indiscriminate poisoning, habitat conversion, and plague have drastically reduced numbers and range (Miller and Cully 2001, Cully and Williams 2001). Plague is probably the greatest threat at this time. The Gunnison's prairie dog is a keystone species upon which many other prairie species depend (Miller and Cully 2001). The Burrowing Owl (*Athene cunicularia*, G4), hawks, and fox and coyote are among those animals that are found in greatest numbers on prairie dog towns.

**Table 67. Natural Heritage element occurrences at the Squaw Canyon PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Birds								
<b><i>Cynomys gunnisoni</i></b>	<b>Gunnison's prairie dog</b>	<b>G5</b>	<b>S5</b>				<b>B</b>	<b>1994-07-20</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses the entire extent of the prairie dog complex and the (mostly) unoccupied space among these colonies. Scattered within the unoccupied areas are several small clusters of occupied prairie dog mounds. The PCA is bounded on all sides by land that is unsuitable for use by prairie dogs because it is much too hilly and wooded. The boundary also includes unoccupied habitat outside of the edge of the prairie dog complex and is intended to allow for suitable areas into which the population can expand. The boundary includes the grasslands grazed by cattle, which mimics the historic disturbance processes of fire, and herbivory by bison, natural disturbances that influenced evolution of prairie dogs.

**Protection Comments:** Protection actions needed immediately. It is estimated that stresses may reduce the viability of the elements in the PCA within 1 year. This area is currently undergoing residential development with lot sizes of between 3 and 17 acres. There are a number of newly constructed houses scattered throughout the prairie dog complex and some of these homes have prairie dog mounds in their yards. Some areas of the complex will be lost to development, but the colony should persist through expansion onto adjacent lands. Continued conversion of suitable habitat within the complex to residential homesites has the potential to eradicate this prairie dog complex.

**Management Comments:** New management for this PCA may be needed within five years to prevent the loss of the prairie dog complex. Management activities beneficial to the prairie dogs include prohibition of free-ranging dogs and minimization of human disturbances and activities in and near the colonies. Efforts to "environmentally educate" the residents of subdivisions that lie near the prairie dog colonies may reduce the incidence and magnitude of conflicts between people and prairie dogs. Cattle are grazed on portions of the site and continued grazing of livestock will probably have no

detrimental impacts on the prairie dogs, which traditionally occur in association with livestock (Kotliar et al. 1999). Conversion of habitat to residential development would, however, be detrimental and continued grazing of livestock is preferable. Research identifying whether this population of prairie dogs has been exposed to plague would assist in understanding its conservation value.

# Squaw Canyon Potential Conservation Area

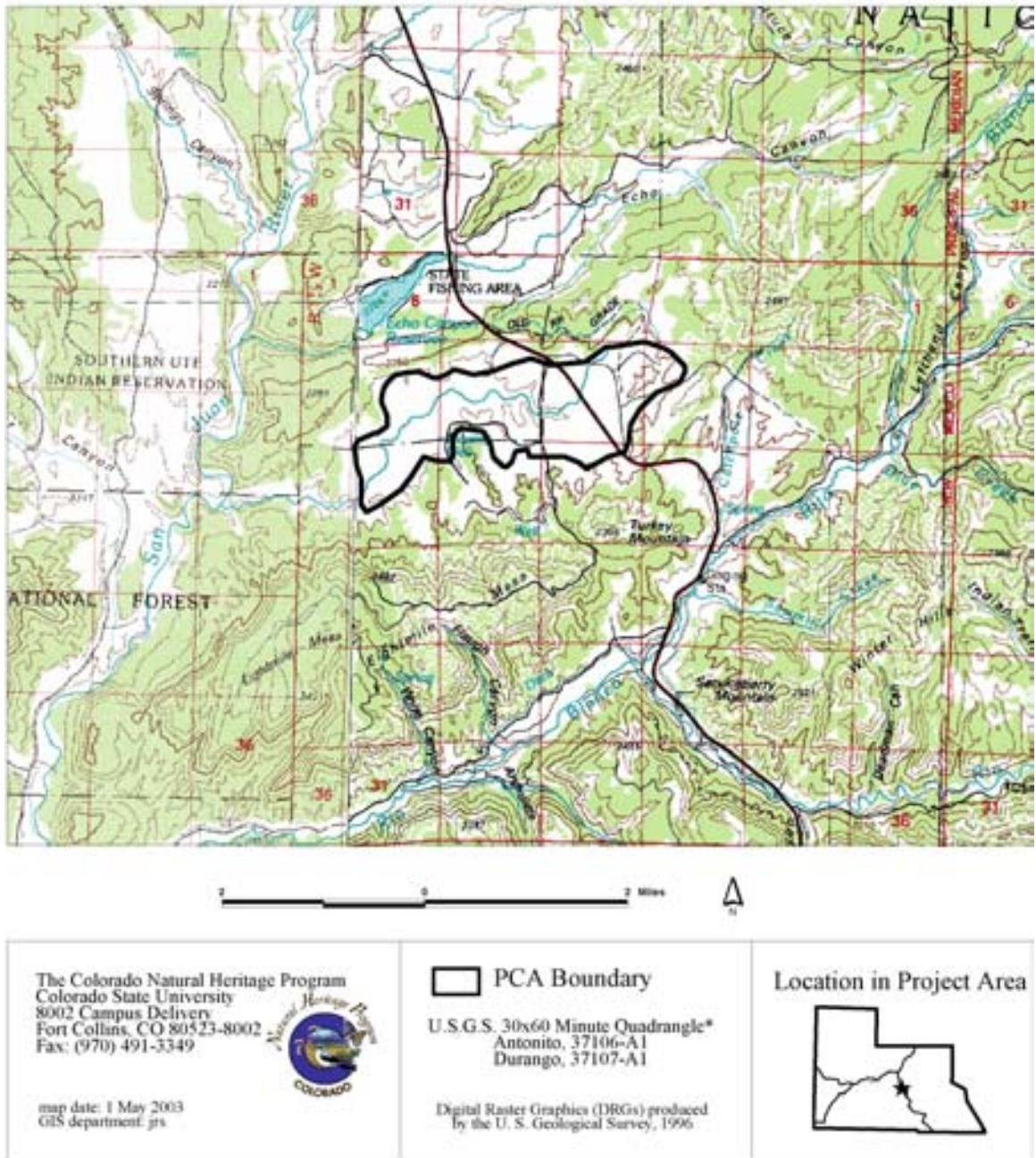


Fig. 67. Squaw Canyon Potential Conservation Area.

## Stollsteimer Site

### **Biodiversity Rank: B5 (General significance)**

This PCA contains a good (B rank) occurrence of Peregrine Falcon (*Falco peregrinus anatum*), a globally vulnerable (G4T3) subspecies that is vulnerable (S3) in Colorado. Peregrine Falcon were markedly reduced in numbers by pesticide and PCB poisoning during the 1950s through the mid-1970s. In the western region of the United States there were an estimated 250 to 350 breeding site occurrences in 1973, but these dropped to approximately 200 by 1983. However, in 1998, there were at least 535 breeding pairs in the western region.

### **Protection Urgency Rank: P5 (No urgency)**

Land protection is complete and no protection actions are needed. This PCA is located entirely within the Chimney Rock Archeological Area in the San Juan National Forest and has been designated a Research Natural Area.

### **Management Urgency Rank: M2 (High urgency)**

Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. Interpretive trails and tours within the archeological area should be kept to a distance of 700 feet from the aerie and any activities within 700 feet of the aerie should be undertaken outside of the nesting season (March through July), as human disturbance is known to result in aerie abandonment.

**Location:** Archuleta County, at Chimney Rock Archeological Area off of U.S. Highway 151, west and south of the city of Pagosa Springs.

### **Legal Description:**

U.S.G.S. 7.5-minute quadrangles: Chimney Rock  
T34NR4W S16, 17

**Size:** 332 ac (134 ha)

**Elevation:** 6,600 to 7,900 ft (2,012 to 2,408 m)

**General Description:** This PCA is located within the Chimney Rock Archaeological Site, an area of Indian ruins that receives many visitors each year. The area includes steep slopes of Mancos Shale with barren areas on convex slopes. Ponderosa pine (*Pinus ponderosa*) and Gambel oak (*Quercus gambelii*) grow on concave slopes and in the draws. The PCA encompasses a cliff face containing a Peregrine Falcon (*Falco peregrinus anatum*) aerie. The aerie rests about 150 feet up a northwest facing sandstone cliff with 300 feet of vertical relief. Bedrock is exposed across the cliff top and along the Peak of Chimney Rock. The Chimney Rock Archeological Area is a working archeological site with developed trails and a designated tour that approaches within 750 feet of the peregrine nest site. The Piedra River, Stollsteimer Creek and Capote Lake are all within two miles of the PCA.

**Biodiversity Rank Comment:** This PCA contains a good (B rank) occurrence of Peregrine Falcon (*Falco peregrinus anatum*), a globally vulnerable (G4T3) subspecies that is vulnerable (S3) in Colorado. Peregrine Falcon were markedly reduced in numbers by pesticide and PCB poisoning during the 1950s through the mid-1970s. This poisoning resulted in extirpation of the species from large areas of its former range, particularly along the eastern coast of the United States. Currently the Peregrine Falcon is recovering throughout much of its range (USFWS 1999). In the western region of the United States there were an estimated 250 to 350 breeding site occurrences in 1973, but these dropped to approximately 200 by 1983. However, in 1998, there were at least 535 breeding pairs in the western region.

**Table 68. Natural Heritage element occurrences at the Stollsteimer PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Birds								
<i><b>Falco peregrinus anatum</b></i>	<b>American Peregrine Falcon</b>	<b>G4T3</b>	<b>S3</b>	<b>LE</b>	<b>SC</b>		<b>B</b>	<b>1994-07-20</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The planning boundary includes the known Peregrine Falcon aerie and a buffer to protect the ecological integrity of the Chimney Rock complex. Note that feeding areas extend far outside of the PCA boundaries, warranting landscape management that is compatible with the long-term viability of the aerie.

**Protection Comments:** Land protection is complete and no protection actions are needed. This PCA is located entirely within the Chimney Rock Archeological Area, San Juan National Forest and has been designated a Research Natural Area. Further protection should not be necessary.

**Management Comments:** Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. Care should be taken to assure that dig sites do not intrude upon the peregrine aerie during nesting season (March through July), as human disturbance is known to result in abandonment of aeries by peregrines. Interpretive trails and tours within the archeological area should be kept to a distance of 700 feet from the aerie and any activities within 700 feet of the aerie should be undertaken during the non-nesting season. Absence of peregrines at the aerie should be verified before activities commence.

# Stollsteimer Potential Conservation Area

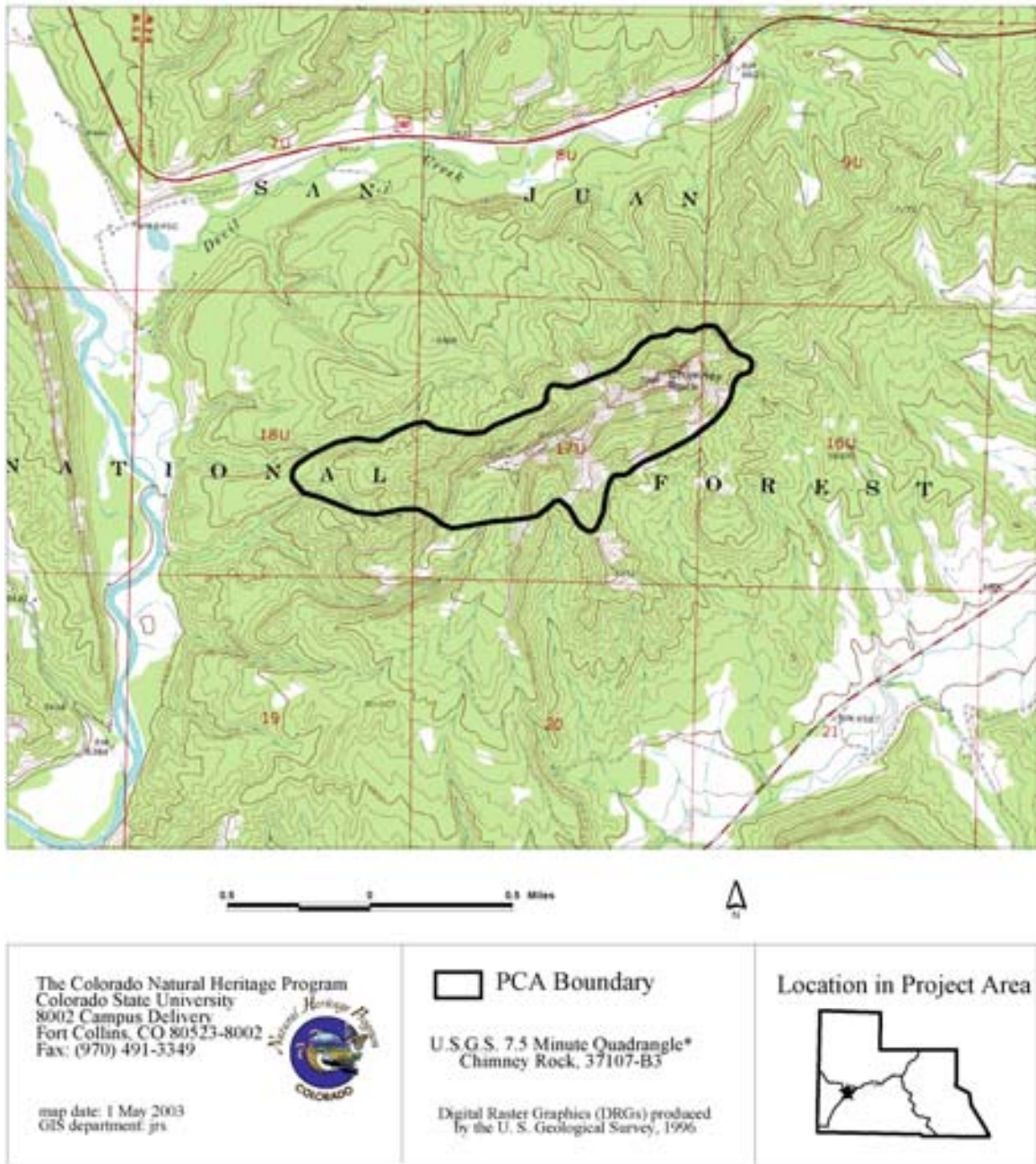


Fig. 68. Stollsteimer Potential Conservation Area.

## Stollsteimer Creek at Capote Lake

### **Biodiversity Rank: B5 (General significance)**

The PCA contains an excellent (A rank) occurrence of the Gunnison's prairie dog (*Cynomys gunnisoni*), a species that is globally secure (G5/S5). Gunnison's prairie dogs are endemic to the southwestern United States and have a broad distribution within Arizona, Colorado, New Mexico and Utah. Gunnison's prairie dogs are declining throughout their range, although extent of the decline is unknown. Prairie dogs are often referred to as keystone species upon which many other prairie species depend (Miller and Cully 2001).

### **Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. This PCA is entirely within the Southern Ute Tribal Land and the area historically and currently has been used for ranching. Develop is not currently considered for the area.

### **Management Urgency Rank: M3 (Moderate urgency)**

Current practices of the landowner seem to favor persistence of the prairie dog colony in the PCA, but management actions may be needed in the future to maintain the current quality of the colony. Management and protection of the prairie dog colony found within this PCA would require prevention of poisoning or other eradication measures, and would allow for natural colony expansion or contraction. Cattle currently graze the area and continued grazing of livestock is preferable to conversion of habitat to residential development, which has the potential to eliminate the prairie dogs.

**Location:** Archuleta County; from the City of Pagosa Springs, go westward along U.S. Rte 160 for about 17 miles to the junction of 160 and Colorado Rte 151. Turn left and go southward along Rte 151 for 0.1 mile to the prairie dog town which is located along the west side (and later the east side) of Rte 151.

### **Legal Description:**

U.S.G.S. 7.5-minute quadrangle: Chimney Rock  
T34NR4W S10, 11, 21, 22

**Size:** 492 ac (200 ha)

**Elevation:** 6,550 to 6,750 ft (1,996 to 2,057 m)

**General Description:** This site encompasses a low lying, flat valley along Stollsteimer Creek just west and south of Capote Lake. The valley is approximately 0.5 miles at its widest and extends for a length of approximately three miles along the creek. The elevation within the site varies from 6,550 to 6,750 feet. Stollsteimer Creek is the major feature of the site and the area is characterized by grass and pasture land with a mosaic of sagebrush (*Artemisia* sp.) and Gambel oak (*Quercus gambelii*) sporadically occurring within portions of the PCA. A large Gunnison's prairie dog (*Cynomys gunnisoni*) colony, with an estimated population of 300 individuals, occupies the PCA.

**Biodiversity Rank Comment:** The PCA contains an excellent (A rank) occurrence of the Gunnison's prairie dog (*Cynomys gunnisoni*), a species that is globally secure (G5/S5). Gunnison's prairie dogs are endemic to the southwestern United States and have a broad distribution within Arizona, Colorado, New Mexico and Utah. Gunnison's prairie dogs are declining throughout their range, although extent of the decline is unknown. Indiscriminate poisoning, habitat conversion, and plague have drastically reduced numbers and range (Miller and Cully 2001, Cully and Williams 2001). Plague is probably the greatest threat at this time. Prairie dogs are often referred to as keystone species upon which many other prairie species depend (Miller and Cully 2001). The Burrowing Owl (*Athene cunicularia*, G4), hawks, and fox and coyote are among those animals that are found in greatest numbers on prairie dog towns.

**Table 69. Natural Heritage element occurrences at the Stollsteimer creek at Capote Lake PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Mammals								
<b><i>Cynomys gunnisoni</i></b>	<b>Gunnison's prairie dog</b>	<b>G5</b>	<b>S5</b>				<b>A</b>	<b>2002-08-30</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses the entire extent of the prairie dog complex and the (mostly) unoccupied space among these colonies. Scattered within the unoccupied areas are several small clusters of occupied prairie dog mounds. The site is bounded on all sides by land that is unsuitable for use by prairie dogs because it is much too hilly and wooded. The boundary also includes unoccupied habitat outside of the edge of the prairie dog complex and is intended to allow for suitable areas into which the population can expand. The boundary includes the grasslands grazed by the cattle, which mimics the historic disturbance processes of fire, and herbivory by bison, natural disturbances that influenced evolution of prairie dogs.

**Protection Comments:** Land protection is complete and no protection actions are needed. This PCA is entirely within the Southern Ute Tribal Land and the area historically and currently has been used for ranching. The intent of the current landowner is unknown, but there are no current plans to develop the area and no protection actions are needed in the foreseeable future.

**Management Comments:** Current practices of the landowner seem to favor persistence of the prairie dog colony in the PCA, but management actions may be needed in the future to maintain the current quality of the colony. There is a great deal of available habitat adjacent to the occupied areas and much room for colony expansion along the floodplain of Stollsteimer Creek. Management and protection of the prairie dog colony found within this PCA would require prevention of poisoning or other eradication measures, and would allow for natural colony expansion or contraction. Cattle are grazed on this PCA and continued grazing of livestock will not impact the prairie dogs, which traditionally occur in association with livestock (Kotliar et al. 1999). Conversion of habitat to residential development would, however, be detrimental and continued grazing

of livestock is preferable. Research identifying whether this population of prairie dogs has been exposed to plague would assist in understanding its conservation value.

# Stollsteimer Creek at Capote Lake Potential Conservation Area

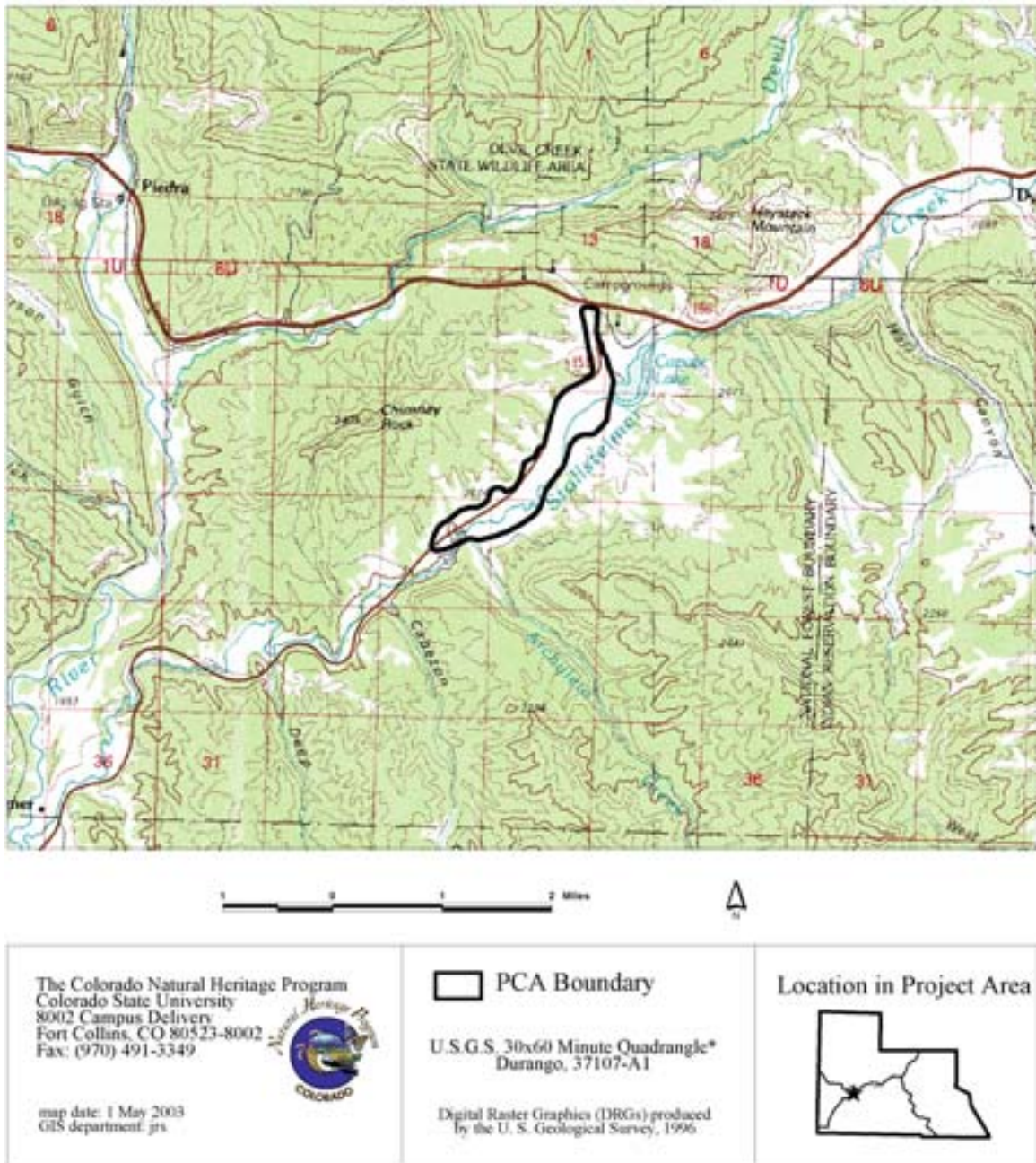


Fig. 69. Stollsteimer Creek at Capote Lake Potential Conservation Area.

## Valle Seco

**Biodiversity Rank: B5 (General significance)**

This PCA contains a fair (C rank) occurrence of Pagosa phlox (*Phlox caryophylla*), a plant that is vulnerable (S3) in Colorado.

**Protection Urgency Rank: P4 (Low urgency)**

No protection actions are needed in the foreseeable future. The site is within the San Juan National Forest.

**Management Urgency Rank: M4 (Low urgency)**

Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences. Monitoring for invasive plants would aid in determining weed management needs, necessary for protection of the plant population.

**Location:** Archuleta County, about 9 miles south southeast of Pagosa Springs.

**Legal Description:**

U.S.G.S. 7.5 minute quadrangle: Serviceberry Mountain  
T33N R1W S6

**Size:** 74 ac (30 ha)

**Elevation:** 6,900 to 7,200 ft (2,103 to 2,195 m)

**General Description:** This PCA includes a sagebrush meadow and an open, east-facing hillside within a ponderosa pine (*Pinus ponderosa*) and Gambel oak (*Quercus gambelii*) forest. Soils are derived from Mancos shale, and support several shale-loving species, including Arboles milkvetch (*Astragalus oocalycis*) and Hayden's milkvetch (*Astragalus haydenianus*). Other plants at the site included squirreltail (*Elymus elymoides*), hairy golden aster (*Heterotheca villosa*), trailing fleabane (*Erigeron flagellaris*), fernleaf biscuitroot (*Lomatium dissectum*), and prickly pear cactus (*Opuntia fragilis*).

**Biodiversity Rank Justification:** This PCA contains a fair (C rank) occurrence of Pagosa phlox (*Phlox caryophylla*), a plant that is vulnerable (S3) in Colorado. The total range is very small, extending from Pagosa Springs to Durango, and in only one adjacent county in New Mexico.

**Table 70. Natural Heritage element occurrences at the Valle Seco PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
<b>Phlox caryophylla</b>	<b>Pagosa phlox</b>	<b>G4</b>	<b>S2</b>				<b>C</b>	<b>2001-06-11</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary encompasses the location of the Pagosa phlox, with a small buffer to allow for movement of the population over time..

**Protection Rank Comments:** The site is within the San Juan National Forest and no protection actions are needed in the foreseeable future. Protection should be adequate as long as forest ownership is maintained.

**Management Rank Comments:** Current management seems to favor the persistence of the Pagosa phlox population in the PCA, but management actions may be needed in the future to maintain the current quality of the plant occurrence. Non-native species observed at the site include crested wheatgrass (*Agropyrum cristatum*) and Kentucky bluegrass (*Poa pratensis*). Monitoring for invasive plants would aid in determining weed management needs, necessary for protection of the plant population. Further surveys during the flowering season (April and May) of the Pagosa phlox could reveal that the population is more extensive.

# Valle Seco Potential Conservation Area

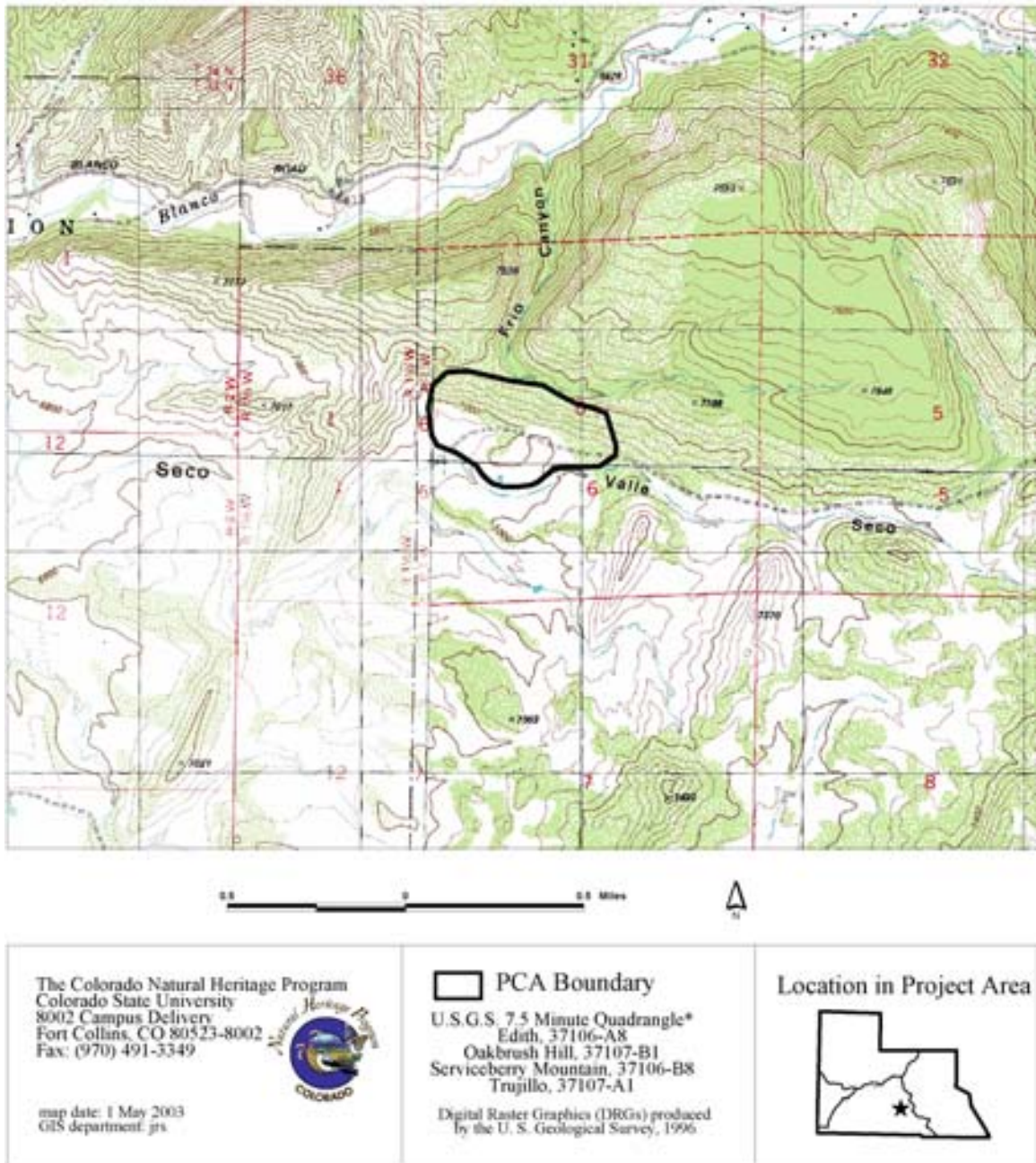


Fig. 70. Valle Seco Potential Conservation Area.

## Williams Creek Trail

**Biodiversity Rank: B5 (General significance)**

This PCA supports a small, fair (C-ranked) occurrence of New Mexico cliff fern (*Woodsia neomexicana*), a species that is rare (S2) in Colorado. This plant is known from 32 locations in Colorado.

**Protection Urgency Rank: P5 (No urgency)**

Land protection is complete and no protection actions are needed. The PCA is almost entirely within the San Juan National Forest, and most of it is within the Weminuche Wilderness.

**Management Urgency Rank: M4 (Low urgency)**

New management actions may be needed within five years to maintain the current quality of the fern population. The forest is generally in excellent condition, with few weeds. However some non-native plants were observed along the trail, probably brought in by horses. Monitoring would aid in detecting the size of the weed infestation and in determining needed weed control measures. Enforcement of regulations requiring weed-free hay should help to prevent further weed invasion. Continued searches in other nearby rocky areas could reveal more of the cliff fern, and raise the rank of this occurrence.

**Location:** Hinsdale County; the Williams Creek Trail PCA is located along Williams Creek, about 22 miles north-northwest of Pagosa Springs.

**Legal Description:**

U.S.G.S. 7.5-minute quadrangle: Cimarrona Peak  
T38NR3W S4, 9

**Size:** 84 ac (34 ha)

**Elevation:** 8,500 to 9,550 ft (2,590 to 2,910 m)

**General Description:** This PCA is in a mixed conifer forest along Williams Creek, with some barren rock outcrops. Dominant trees include white fir (*Abies concolor*), subalpine fir (*Abies lasiocarpa*), and Rocky Mountain maple (*Acer glabrum*). A popular hiking trail follows the creek. The state rare New Mexico cliff fern (*Woodsia neomexicana*) was found in crevices of rock outcrops, growing along with brittle fern (*Cystopteris fragilis*), woodsorrel (*Oxalis* sp.), Porter's oniongrass (*Melica porteri*), and hairy golden aster (*Heterotheca villosa*). Rattlesnake plantain (*Goodyera repens*), a small orchid that was considered vulnerable (S3) in Colorado at the time of this survey, was found along the trail to Indian Creek. This species has since been placed on a "watchlist" and is no longer tracked by CNHP.

**Biodiversity Rank Comment:** This PCA supports a small, fair (C-ranked) occurrence of New Mexico cliff fern (*Woodsia neomexicana*), a species that is rare (S2) in Colorado.

This fern has a broad distribution in Arizona, Colorado, New Mexico, Oklahoma, South Dakota and Texas, and is known from 32 locations in Colorado.

**Table 71. Natural Heritage element occurrences at the Williams Creek Trail PCA.**

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank	Last Observed
Plants								
<b><i>Woodsia neomexicana</i></b>	<b>New Mexico cliff fern</b>	<b>G4?</b>	<b>S2</b>				<b>C</b>	<b>2001-08-11</b>

\*Eo rank is "Element Occurrence" Rank

\*\* Bold type indicates the primary element of concern upon which the PCA rank is based.

**Boundary Justification:** The boundary is drawn to encompass the location of the New Mexico cliff fern, and some adjacent habitat that has not been thoroughly surveyed.

**Protection Comments:** Land protection is complete and no protection actions are needed. The PCA is almost entirely within the San Juan National Forest, and most of it is within the Weminuche Wilderness. The ferns should not need additional protection since they are located on steep cliffs that are not normally used by hikers.

**Management Comments:** New management actions may be needed within five years to maintain the current quality of the fern population. The forest is generally in excellent condition, with few weeds. However, some non-native plants were observed along the trail, probably brought in by horses. These include cheatgrass (*Bromus tectorum*), meadow timothy (*Phleum pratense*), common plantain (*Plantago major*), common dandelion (*Taraxacum officinale*), red clover (*Trifolium pratense*), white clover (*Trifolium repens*), bluegrass (*Poa pratensis*), and probably most serious, hound's tongue (*Cynoglossum officinale*). Monitoring would aid in detecting the size of the weed infestation and in determining needed weed control measures. Enforcement of regulations requiring weed-free hay should help to prevent further weed invasion. Continued searches in other nearby rocky areas could reveal more of the cliff fern, and raise the rank of this occurrence.

# Williams Creek Trail

## Potential Conservation Area

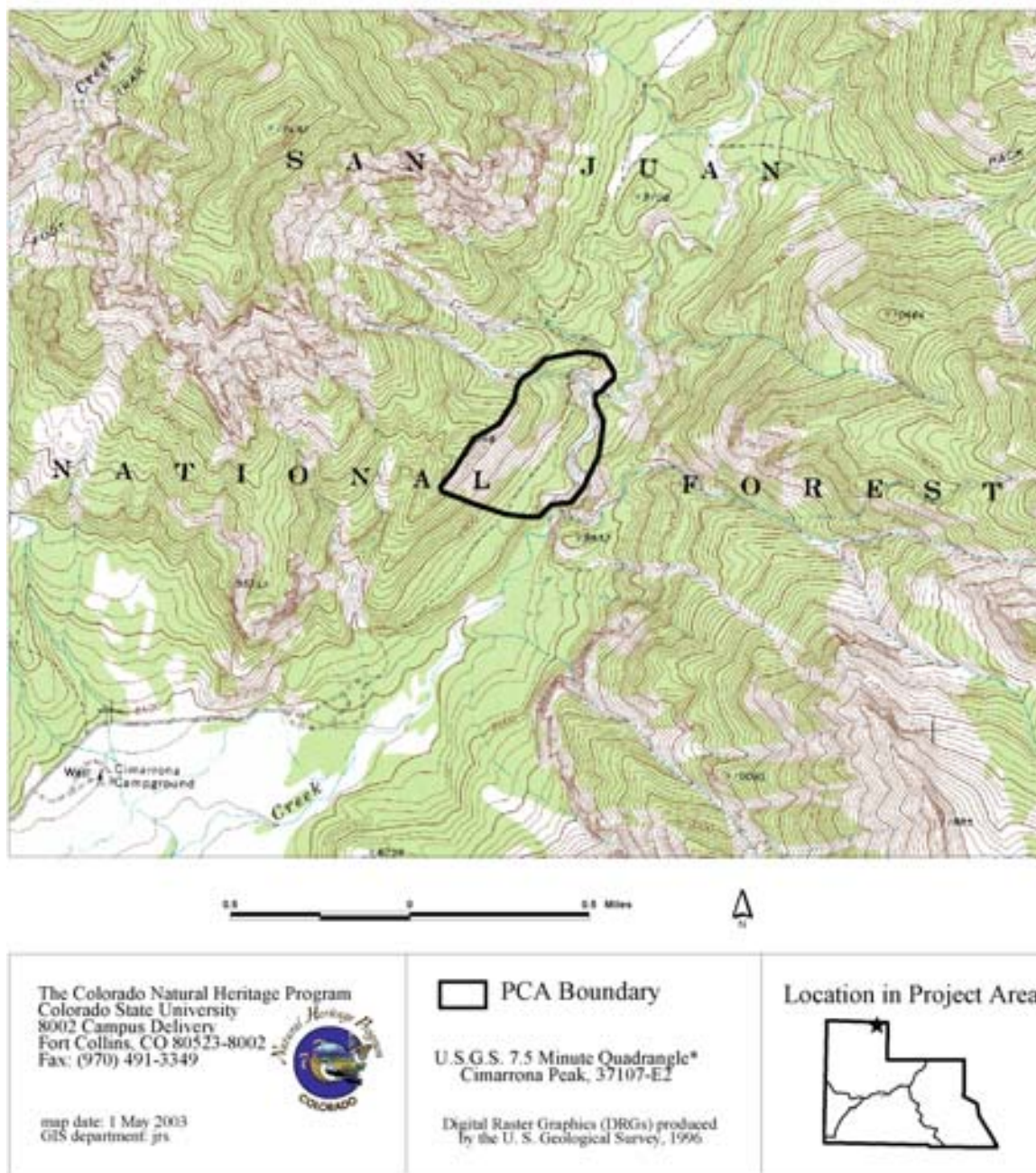


Fig. 71. Williams Creek Trail Potential Conservation Area.

## Chapter 5. Selected Species Profiles and the Associated PCAs

### Plants

#### *Astragalus iodopetalus* (Violet milkvetch)

##### Taxonomy

Class: Dicotyledoneae

Order: Fabales

Family: Fabaceae

Genus: *Astragalus*

Taxonomic Comments: *Astragalus iodopetalus* (Rydberg) Barneby. Type specimen from Arboles, CO, Baker 1899.

CNHP Ranking: G2 S1

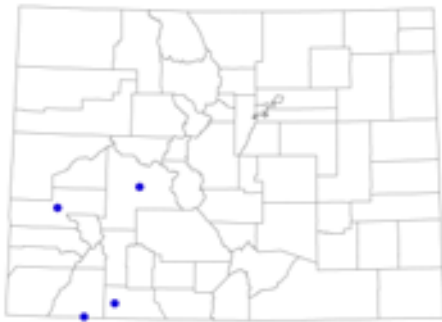
State/Federal Status: None



Photo copyright © 1995 by K. Heil

Phenology: *Astragalus iodopetalus* is a perennial legume with reddish violet flowers that grows to 10 or 20 cm tall. It has silky-pilose pinnate leaves with 19 to 27 leaflets. Its crescent-shaped fruit is about 20-30 mm long, and glabrous (Harrington 1979). The plants flower in late May and June.

Habitat Comments: This species occurs on dry stony hillsides and benches, commonly on granite, often about oak thickets, in the pinyon-juniper and ponderosa pine zones, in oak-pinyon forests, or among sagebrush, 6000-8100 feet (Barneby 1964). Weber and Wittmann (1996) report that this species is found in sagebrush habitat in Colorado.



*Colorado Distribution*

Global Range: The violet milkvetch is restricted in range to south-central Colorado and north-central New Mexico.

State Range: This species has been documented at one location in Archuleta County. There are three specimens at the University of Colorado herbarium from Archuleta, Gunnison and Montrose counties in Colorado. The San Juan College Herbarium in Farmington NM also reports the species from La Plata, Mineral and Hinsdale counties.

Distribution/Abundance: There are at least 12 locations in Colorado and New Mexico. It is described as locally plentiful.

Known Threats and Management Issues: This is an extremely rare species that warrants further search in the area.

Potential Conservation Areas that support *Astragalus iodopetalus*:

Hazel Schmoll first located the population in Archuleta County in 1924, and Mary Edwards subsequently made a collection in 1993. It was not found during this survey; however, 2002 was an extremely dry year, and many *Astragalus* plants failed to appear in sites where they were previously known. Because its exact location is not known, it has not been included in a PCA; however, it is probably in the vicinity of the Chimney Rock AA Site PCA (page 134).

## *Astragalus missouriensis* var. *humistratus* (Missouri milkvetch)

### Taxonomy

Class: Dicotyledoneae

Order: Fabales

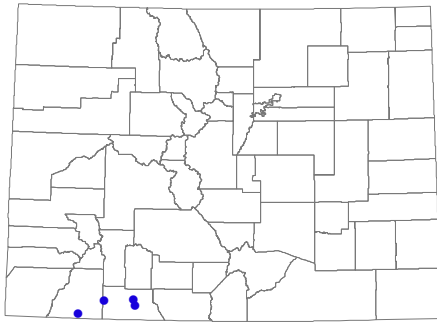
Family: Fabaceae

Genus: *Astragalus*

Taxonomic Comments: *Astragalus missouriensis* Nuttall var. *humistratus* Isley is closely related to the more common and widespread var. *missouriensis*, and var. *amphilobus* which is found in La Plata County and eastern Utah. The type specimen was collected at Pagosa Springs in 1951. This taxon should not be confused with *Astragalus humistratus* A. Gray, which is an entirely different species.



Photograph copyright © CNHP



Colorado Distribution

CNHP Ranking: G4T2 S1?

State/Federal Status: None

Phenology: *A. missouriensis* var. *humistratus* is a perennial purple-flowered legume with pinnate basal leaves. Plants flower in May, and set fruit in June.

Habitat Comments: The Missouri milkvetch is found in clay soils derived from Mancos Shale.

Global Range: Although the species *Astragalus missouriensis* is widespread throughout the central U. S. and Canada, the variety *humistratus* is known only from Colorado.

State Range: There are two documented occurrences in Archuleta County and one historic record from La Plata County.

Distribution/Abundance: In 2001, the existing historic (1978) record from Turkey Mountain was updated, and a new population was found on the Pine Piedra stock trail, growing with *Phlox caryophylla*. Plants were in fruit on June 22. Additional sub-populations in the Turkey Mountain site were found in 2002. It is included in the Turkey Mountain and Pine-Piedra Stock Trail PCAs.

Known Threats and Management Issues: Loss of habitat from development and road building is probably the greatest threat to this species. Further research may lead to locating additional populations.

Potential Conservation Areas that support *Astragalus missouriensis* var. *humistratus*:

Pine Piedra Stock Trail	on page 53
Turkey Mountain	on page 72

## *Astragalus proximus* (Aztec milkvetch)

### Taxonomy

Class: Dicotyledoneae

Order: Fabales

Family: Fabaceae

Genus: *Astragalus*

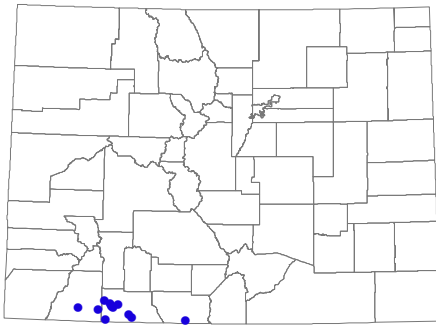
Taxonomic Comments: *Astragalus proximus* (Rydb.) Wooten and Standley was first described in 1915. The type specimen was collected at Arboles in 1899.

CNHP Ranking: G4 S2

State/Federal Status: Forest Service Sensitive



Photo copyright © 1999 by B. Jennings



Colorado Distribution

Phenology: *A. proximus* is a perennial legume with erect stems and small purple flowers. It resembles *A. flexuosus*, a much more common species, but can be distinguished by its smaller (10-15mm) glabrous pods. It flowers in late April to July and produces fruit in June and July.

Habitat Comments: Mesas, bluffs, and low hills in sandy, often alkaline clay soils derived from Lewis Shale of Mancos Shale. Grows among junipers and sometimes sagebrush. Elevation 5,400 to 7,300 ft.

Global Range: This milkvetch is known from northern

New Mexico and southwestern Colorado.

State Range: The Aztec milkvetch is known from twelve occurrences in Archuleta and La Plata counties in Colorado.

Distribution/Abundance: It is known from northern New Mexico, where it is reported to be quite common, and from twelve occurrences in Archuleta and La Plata counties in Colorado. Aztec milkvetch was documented in 2001 at one new location near Piedra, and new sub-populations were located at Chimney Rock Archaeological Center. Plants were in fruit by early June. In a subsequent visit to the Chimney Rock site in 2002, a year of extreme drought, no plants were visible. One of the sub-populations at Chimney Rock was visited again in May 2003, and again no plants were found. It remains to be seen whether this population will recover from the effects of drought.

Known Threats and Management Issues: Further survey of all sub-populations at Chimney Rock is needed to determine the status of this species since the drought of 2002.

Potential Conservation Areas that support *Astragalus proximus*:

Chimney Rock AA Site on page 134

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

### Taxonomy

Class: Ophioglossopsida

Order: Ophioglossales

Family: Ophioglossaceae

Genus: *Botrychium*

Taxonomic Comments: *Botrychium echo* W. H. Wagner hybridizes with western moonwort, *B. hesperium* (see below). Often, several species of *Botrychiums* will be found growing together in the same site.

CNHP Ranking: G2 S2

State/Federal Status: Forest Service Sensitive



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Colorado Distribution

Phenology: *B. echo* is a small fern with two different fronds, one fertile, bearing spores, and one sterile, with shiny green lobes. Its spore producing period is ins July with fonds appearing in June and dying in September.

Habitat Comments: *B. echo* occurs on disturbed sites such as avalanche chutes, rock streams, unstable moraines, gravel bars, roadcuts, and logged areas. Although it is somewhat tolerant of, and even thrives on some disturbance, it cannot withstand trampling from sheep grazing and it can be forage for animals. It usually is found at elevations between 9,500 ft and 11,500 ft.

Global Range: *Botrychium echo* is known from locations scattered across northern Utah and central Colorado. There is also an unverified report of the species in northern Arizona. Many occurrences consist of fewer than ten individuals. However, since the plants are extremely small and difficult to find, numbers may actually be much higher.

State Range: The majority of documented occurrences of *B. echo* (42) are from Colorado, in 23 counties (Archuleta, Boulder, Clear Creek, Conejos, Custer, Delta, Eagle, El Paso, Gilpin, Gunnison, Hinsdale, Huerfano, Jackson, Lake, Larimer, Mineral, Montezuma, Park, Rio Grande, Saguache, San Juan, San Miguel, Summit and Teller counties).

Distribution/Abundance: Although the total number of documented plants is low, the species may be more abundant than is presently known. As with all *Botrychiums*, the number of above ground stems does not necessarily indicate the number of plants in the population because a root base may not send up a stem every year. In order to evaluate an occurrence of *Botrychiums* several years of observation are required

Known Threats and Management Issues: Strategies for protection and management of this rare species include monitoring known occurrences for changes in population size; determining the effects of grazing; further documenting of the abundance of population and trends; and protecting the highest quality occurrences.

Potential Conservation Areas that support *Botrychium echo*:

Blackhead Peak on page 124

## ***Botrychium hesperium* (Western moonwort)**

No Photo Available

### Taxonomy

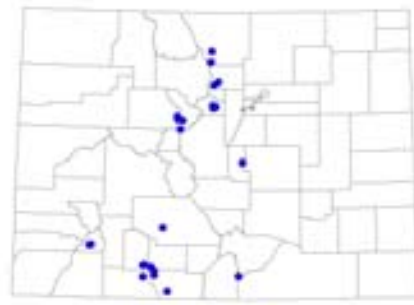
Class: Ophioglossopsida

Order: Ophioglossales

Family: Ophioglossaceae

Genus: *Botrychium*

Taxonomic Comments: Synonyms of *Botrychium hesperium* (Maxon and Clauson) Wagner and Lellinger include *Botrychium lunaria* (L.) Sw. ssp. *occidentale* A. & D. Löve & Kapoor; *Botrychium matricariifolium* (A. Braun ex Dowell) A. Braun ex Koch ssp. *hesperium* Maxon & Clausen; and *Botrychium matricariifolium* (A. Braun ex Dowell) A. Braun ex Koch var. *hesperium* (Maxon & Clausen) Broun.



Colorado Distribution

According to Karen Myhre (Minnesota HP Botanist; 9/22/98 message to Sharron Nelson), experts plan to separate the eastern (Michigan and Minnesota) plants of *B. hesperium* from the western (Colorado) plants and call the eastern plants *B. michiganense*.

CNHP Ranking: G3 S2

State/Federal Status: None

Phenology: *B. hesperium* is similar to other *Botrychiums* but is a duller green color than *B. echo*, and has ovate to oblong lower pinnae. Leaves appear in midspring and die in early fall. Spores are produced in July.

Habitat Comments: *Botrychium hesperium* occurs primarily in early successional habitats and others that require periodic disturbance. In the western portion of its range, *B. hesperium* tends to occur at higher elevations along roadsides, in grassy, meadow-like areas, in sandy fields, in flat roadside ditches, and at edges of lakes. In the eastern portion of its range, it occurs in sand dune habitats, in moist, shrubby jack pine forest in dune valleys, in grassy roadsides and fields, and in mature, mesic northern forests dominated by sugar maple, yellow birch, and hemlock.

Global Range: *Botrychium hesperium* occurs in both eastern and western North America. In the West it is widely distributed in the Rocky Mountains, ranging from the southern Rocky Mountains in Arizona through Colorado to the northern Rockies in western Montana, southwestern Alberta, and Saskatchewan. In eastern North America, western moonwort occurs from northern Lower Michigan and Upper Michigan to localities along the shore of Lake Superior in southern Ontario.

State Range: There are 27 occurrences from 13 counties in Colorado documented in the CNHP database. The occurrence documented here was from a clearcut at Nipple Mountain, and is included in the Blackhead Peak PCA.

Distribution/Abundance: *Botrychium hesperium* occurs infrequently, in localized areas, and with small population sizes, but over a large geographical range. Although it can occur in large numbers in pure stands, it more often occurs as one or a few individuals scattered among plants of other *Botrychium* species. This species can remain dormant for long periods and root bases may not produce an aboveground leaf every year (Lesica and Ahlenslager 1995). Because *B. hesperium* is small and inconspicuous, it may at times be overlooked and underrepresented by population surveys.

Known Threats and Management Issues: Threats to *B. hesperium* are not well understood. Because this species occurs in both naturally and artificially disturbed sites, threats include natural plant succession as well as the same human activities (recreation, road and trail maintenance activities, selection of grazing areas) that have also apparently resulted in suitable habitat. Agriculture and forestry activities may also threaten this species in some areas. Strategies for the protection of this species include determining its specific habitat requirements and its sensitivity to disturbance. Long term monitoring would help to determine its life history characteristics, population stability, and dynamics over time.

Potential Conservation Areas that support *Botrychium hesperium*:  
Blackhead Peak on page 124

## ***Botrychium minganense* (Mingan moonwort)**

No Photo Available

### Taxonomy

Class: Ophioglossopsida

Order: Ophioglossales

Family: Ophioglossaceae

Genus: *Botrychium*

Taxonomic Comments: *Botrychium minganense*

Victorin has been considered a variety of *B. lunaria*,

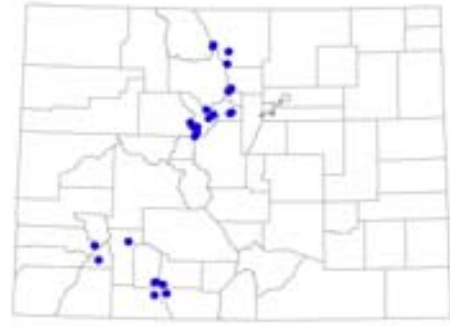
but is tetraloid while *B. lunaria* is diploid. Dr. Peter

Root recognizes the species as occurring in Colorado,

although Weber and Wittman (1992) state that

Colorado records are in error and evidently apply to *B.*

*pallidum*. Collections made in Archuleta County in 2001 were identified by Dr. Root and Dr. Peter Zika as *B. minganense*.



*Colorado Distribution*

CNHP Ranking: G4 S1

State/Federal Status: None

Phenology: *B. minganense* is similar to other *Botrychiums* in having two fronds, one sterile and the other bearing spores. The sterile frond is dull green to yellow-green. Leaves appear in spring and throughout summer, and spores are produced in July.

Habitat Comments: *Botrychium minganense* shares the same habitat requirements, including some natural disturbance, as the other *Botrychium* species described here.

Global Range: *Botrychium minganense* is one of the most widespread moonworts in North America, occurring across most of Canada, into Alaska, and south into the United States in almost all of the western states.

State Range: In Colorado, there are records from 14 counties, but most of these are unranked, and abundance is not known.

Distribution/Abundance: *Botrychium minganense* is widespread across most of Canada, into Alaska, and south into the United States, occurring in almost all of the western states. It is rare in each state and province throughout its range, but its distribution is great enough that it is considered to be globally secure.

Known Threats and Management Issues: Threats to *B. minganense* are not well understood. Because this species occurs in both naturally and artificially disturbed sites, threats include natural plant succession as well as the same human activities (recreation, road and trail maintenance activities, selection of grazing areas) that have also apparently resulted in suitable habitat. Agriculture and forestry activities may also threaten this species in some areas. Strategies for the protection of this species include determining its specific habitat requirements and its sensitivity to disturbance. Long term monitoring would help to determine its life history characteristics, population stability, and dynamics over time.

Potential Conservation Areas that support *Botrychium minganense*:

Blackhead Peak on page 124

## ***Botrychium pinnatum* (Northern moonwort)**

No Photo Available

### Taxonomy

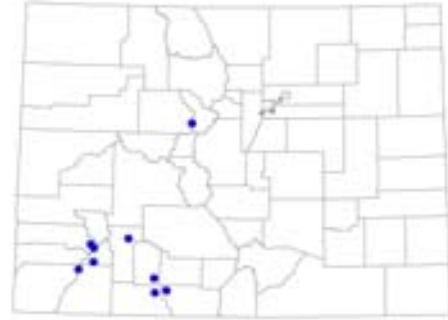
Class: Ophioglossopsida

Order: Ophioglossales

Family: Ophioglossaceae

Genus: *Botrychium*

Taxonomic Comments: *Botrychium pinnatum* St. John has also been known as *Botrychium boreale* ssp *obtusilobum* .



*Colorado Distribution*

CNHP Ranking: G4? S1

State/Federal Status: None

Phenology: *B. pinnatum* is similar to other *Botrychiums* in having two fronds, one sterile and the other bearing spores. Sterile fronds are bright shiny green, with numerous symmetrical lobes. Leaves appear in spring and throughout summer, and spores are produced in July.

Habitat Comments: *Botrychium pinnatum* shares the same habitat requirements, including some natural disturbance, as the other *Botrychium* species described here. It is commonly found at grassy slopes, streambanks and woods.

Global Range: *Botrychium pinnatum* is known from Alaska and the Yukon, south to California, Arizona, and Colorado.

State Range: In Colorado, there are eleven occurrences in nine counties.

Distribution/Abundance: Although *Botrychium pinnatum* is widespread in North America, it is rare and local over almost its entire range.

Known Threats and Management Issues: Threats to *B. pinnatum* are not well understood. Because this species occurs in both naturally and artificially disturbed sites, threats include natural plant succession as well as the same human activities (recreation, road and trail maintenance activities, selection of grazing areas) that have also apparently resulted in suitable habitat. Agriculture and forestry activities may also threaten this species in some areas. Strategies for the protection of this species include determining its specific habitat requirements and its sensitivity to disturbance. Long term monitoring would help to determine its life history characteristics, population stability, and dynamics over time.

Potential Conservation Areas that support *Botrychium pinnatum*:

Blackhead Peak on page 124

## *Carex retrorsa* (Retrorse sedge)

### Taxonomy

Class: Monocotyledoneae

Order: Cyperales

Family: Cyperaceae

Genus: *Carex*

Taxonomic Comments: None

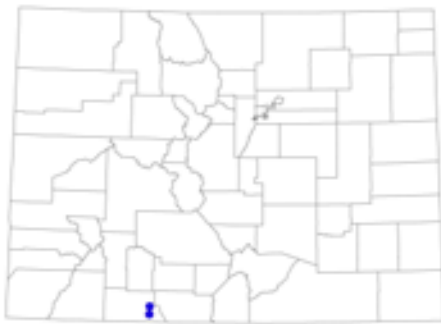
CNHP Ranking: G5 S1

State/Federal Status: *Carex retrorsa* Schweinitz has also been reported as *C. lupulina*. The type specimen is from Durango, CO.



Photo copyright © by R. Francies

Phenology: *C. retrorsa* is a tall perennial sedge with short rhizomes and staminate and pistillate flowers on separate spikes. Perigynia are widely spreading to reflexed.



Colorado Distribution

Habitat Comments: *Carex retrorsa* is uncommon in scattered marshes, wet meadow, or sloughs, in foothills and the montane zone.

Global Range: *Carex retrorsa* is known from northern Canada, south to Nevada, Utah, Colorado east to Maine.

State Range: In Colorado, *Carex retrorsa* is reported to occur in the northwest and southwest portions of the State. The two records from Archuleta County identified through this project are the first in CNHPs database.

Distribution/Abundance: Retrorse sedge is common globally, but rare or possibly overlooked in Colorado. Since it has recently been added to the tracked species list for CNHP, there

is little data available as to its abundance in the state. Harrington (1979) mentions only two state records, one from northwestern and one from southwestern Colorado. The two populations found in Archuleta County during this survey represent the first occurrences in the CNHP database.

Known Threats and Management Issues: Threats to *Carex retrorsa* include human activities (recreation, road and trail maintenance activities, selection of grazing areas) and invasion by exotic plant species. Changes in hydrology could negatively affect populations.

Potential Conservation Areas that support *Carex retrorsa*:

Navajo Peak Trail	on page 172
Opal Lake	on page 179

## ***Castilleja lineata* (Marsh-meadow Indian paintbrush)**

### Taxonomy

Class: Dicotyledoneae  
Order: Scrophulariales  
Family: Scrophulariaceae  
Genus: *Castilleja lineata*

Taxonomic Comments: *Castilleja lineata* Greene was described in 1900. The type specimen for this species was collected in Archuleta County at Pagosa Springs by Baker in 1899.

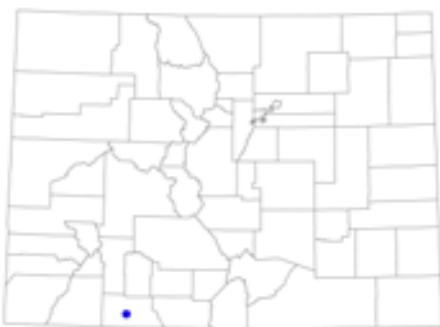
CNHP Ranking: G4? S1

State/Federal Status: None

Phenology: A perennial plant, *Castilleja lineata* has gray-green, densely tomentose flowers and bracts. The new season's growth is evident in early spring, and flowers appear by July. Previous year's flower stalks remain through the winter.



Photograph copyright © CNHP



Colorado Distribution

Habitat Comments: During this survey *Castilleja lineata* was found in a Ponderosa pine and Gambel oak community.

Global Range: *Castilleja lineata* is known from Colorado, New Mexico and Arizona.

State Range: The record of *Castilleja lineata* identified from Archuleta County during this project is the first in CNHPs database.

Distribution/Abundance: *Castilleja lineata* is known from Colorado, New Mexico and Arizona. It is apparently most common in New Mexico, where it is ranked SR. It was documented in the CNHP database for the first time in Archuleta County at Pollito Canyon in 2001. A subsequent visit in 2002 resulted in the discovery of additional sub-populations in Burns Canyon. Local volunteers have also reported individual plants from northwest of Pagosa Springs.

Known Threats and Management Issues: Threats to *Castilleja lineata* include human activities (recreation, road and trail maintenance activities, selection of grazing areas) and invasion by exotic plant species.

Potential Conservation Areas that support *Castilleja lineata*:

Burns Canyon on page 131

## *Cryptogramma stelleri* (Slender rock-brake)

Taxonomy  
Class: Filicopsida  
Order: Filicales  
Family: Pteridaceae  
Genus: *Cryptogramma*

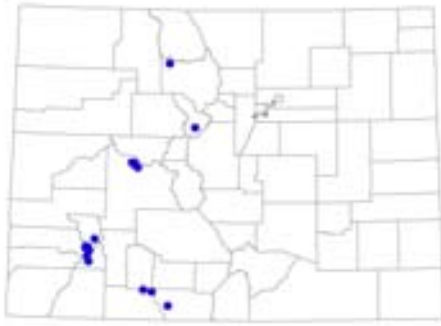
Taxonomic Comments: *C. stelleri* (S. G. Gmelin) Prantl. Synonyms include *Pteris stelleri* S. G. Gmelin; *Allosorus stelleri* Rupr. Beitr. Flanzenk; *Pellaea gracilis* Hooker

CNHP Ranking: G5 S2

State/Federal Status: BLM Sensitive Species



Photograph copyright © CNHP



Colorado Distribution

Phenology: This delicate slender perennial fern has two kinds of fronds, sterile and fertile. New growth is produced in spring and may dry up by late summer.

Habitat Comments: *Cryptogramma stelleri* grows in horizontal crevices of moist, shaded cliffs, often associated with waterfalls and under shallow rock overhangs. These habitats tend to be mossy, and support other ferns such as brittle bladderfern (*Cystopteris fragilis*) and American rock-brake (*Cryptogramma acrostichoides*).

Global Range: *Cryptogramma stelleri* is extremely widespread, with a nearly circumpolar distribution

State Range: *Cryptogramma stelleri* is known from only 19 locations in Colorado and only two locations in Archuleta County.

Distribution/Abundance: *Cryptogramma stelleri* is extremely widespread, although its habitat requirements are very specific and its abundance may not be great at any single location. *Cryptogramma stelleri* was found along the East Fork of the San Juan River, and at a new location on cliffs above Quartz Creek during this project.

Known Threats and Management Issues: Changes in the hydrologic regime may negatively impact this species. Direct disturbance is not likely on steep cliff habitats.

Potential Conservation Areas that support *Cryptogramma stelleri*:

East Fork San Juan River on page 50  
Quartz Creek Trail on page 225

## ***Draba smithii* (Smith whitlow-grass)**

### Taxonomy

Class: Dicotyledoneae

Order: Capparales

Family: Brassicaceae

Genus: *Draba*

Taxonomic Comments: *D. smithii* Gilg ex O. E. Schulz

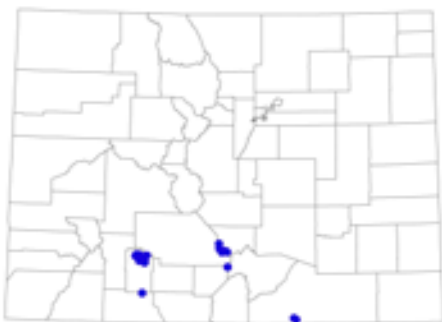
Type specimen from Mt. Baldy, 1891.

CNHP Ranking: G2 S2

State/Federal Status: Forest Service Sensitive Species



Photograph copyright © CNHP



### Phenology

: A perennial mustard with white flowers, *Draba smithii* flowers in late spring and fruits in late summer.

Habitat Comments: *Draba smithii* commonly occurs at seeps and springs in cliff faces and on talus slopes at moderate to high elevation.

Global Range: Endemic to Colorado, in six southern Colorado counties.

### ***Colorado Distribution***

State Range: *Draba smithii* is known only from six southern Colorado counties (Alamosa, Archuleta, Custer, Las Animas, Mineral, and Saguache).

Distribution/Abundance: A Colorado endemic, the species is known from six southern Colorado counties. It was first located in Archuleta County along the East Fork of the San Juan River in 2000 by Ken Heil. The boundaries of this population were mapped in 2001 and were found to extend both upstream and downstream from the original location.

Known Threats and Management Issues: Threats to *Draba smithii* include changes in hydrology and direct disturbance, although this is not likely at the location in Archuleta County.

Potential Conservation Areas that support *Draba smithii*:

East Fork San Juan River on page 50

***Draba spectabilis* var. *oxyloba* (Showy whitlow-grass)**

No photo available

**Taxonomy**

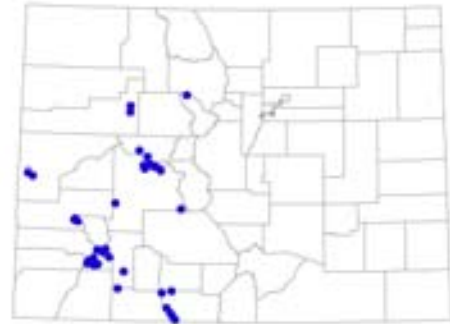
Class: Dicotyledoneae

Order: Capparales

Family: Brassicaceae

Genus: *Draba*

**Taxonomic Comments:** *D. spectabilis* var. *oxyloba* (Greene) Gilg and Schulz. Synonyms include *D. oxyloba* E. L. Greene and *D. spectabilis* var. *bella* O. E. Schulz.. It is distinguished from var. *spectabilis* by having sessile appressed malpighiaceous or cruciform trichomes on its lower stems, as opposed to the spreading simple trichomes of var. *spectabilis*. This variety is not recognized by Weber & Wittmann (1992). However, it is recognized by Rollins (1993).



*Colorado Distribution*

CNHP Ranking: G3?T3Q S3

State/Federal Status: None

**Phenology:** *D. spectabilis* var. *oxyloba* is a perennial, sometimes rhizomatous yellow flowered mustard. Plants flower in mid-summer and produce fruit in late summer.

**Habitat Comments:** *Draba spectabilis* var. *oxyloba* grows in spruce-fir forests or in open meadows, along streams or on wet slopes, sometimes in the shade of willows and other meadow species. The plants were found to be locally abundant in San Juan County, under false hellebore (*Veratrum tenuipetalum*).

**Global Range:** *Draba spectabilis* var. *oxyloba* occurs from southwestern Colorado and extends north to Wyoming.

**State Range:** There are 44 known occurrences in Colorado, in 12 counties.

**Distribution/Abundance:** The number of known occurrences of this plant is few and it is distributed across a restricted range. It can be locally abundant in the San Juans.

**Known Threats and Management Issues:** Threats to *Draba spectabilis* var. *oxyloba* include human activities (recreation, road and trail maintenance activities, selection of grazing areas) and invasion by exotic plant species.

**Potential Conservation Areas that support *Draba spectabilis* var. *oxyloba*:**

Upper Mosca Creek                      on page 189

## *Epipactis gigantea* (Giant helleborine)

### Taxonomy

Class: Monocotyledoneae

Order: Orchidales

Family: Orchidaceae

Genus: *Epipactis*

Taxonomic Comments: *Epipactis gigantea* Douglas ex Hooker.

Synonyms include *Limodorum giganteum* Kuntze; *Peramium giganteum* J. . Coulter; *Helleborine gigantea* Druce.s.

CNHP Ranking: G3 S2

State/Federal Status: None



*Colorado Distribution*

Photograph copyright © CNHP

Phenology: *E. gigantea* is a tall (3 –7 dm) bog orchid with several leafy stems and greenish and brownish-purple flowers in racemes. Flowering occurs from June to July with the fruiting period extending from August to September.

Habitat Comments: *Epipactis gigantea* is found in wet habitats, including seeps in sandstone cliffs and hillsides, springs, streamsides and sometimes at hot springs

Global Range: *Epipactis gigantea* has a wide geographic distribution in western North America, and is found occasionally from Mexico to Canada.

State Range: There are 26 known locations in Colorado, distributed over eight counties (Spackman *et al.* 1997).

Distribution/Abundance: The number of known occurrences of this plant is few and it is restricted to a specific wet habitat.

Known Threats and Management Issues: Threats to the plants include diversion of the water feeding the seeps, and trampling.

Potential Conservation Areas that support *Epipactis gigantea*:

Piedra on page 93

## *Erigeron philadelphicus* (Philadelphia fleabane)

### Taxonomy

Class: Dicotyledoneae

Order: Asterales

Family: Asteraceae

Genus: *Erigeron*

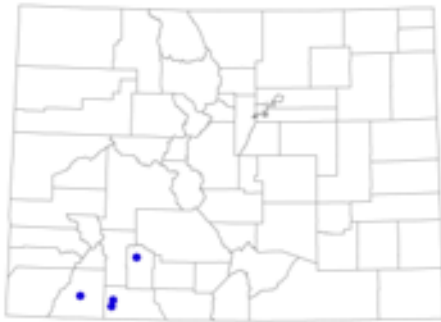
Taxonomic Comments: *E. philadelphicus* L. Weber and Wittman (1992) note that generic segregation of the group to which *E. philadelphicus* belongs may be warranted.



Photo copyright © 1989 by R.H. Mehlonbrock

CNHP Ranking: G5 S1

State/Federal Status: National wetland indicator



### Colorado Distribution

State Range: There are occurrences of *Erigeron philadelphicus* in La Plata and Archuleta counties, and a 1990 specimen collection at the University of Colorado Herbarium from Mineral County. The population found in 2001 in a seep above First Fork Road, east of the Piedra River brings the total number of populations for Colorado to four.

Distribution/Abundance: This species is very common and abundant in most of North America, but rare in Colorado and Wyoming.

Known Threats and Management Issues: Threats to *Erigeron philadelphicus* include human activities, particularly activities resulting in changes in hydrology that cause decreased soil moisture content.

Potential Conservation Areas that support *Erigeron philadelphicus*:

Piedra on page 93

## *Hippochaete variegatum* var. *variegatum* (Variegated scouring rush)

### Taxonomy

Class: Equisetopsida

Order: Equisetales

Family: Equisetaceae

Genus: *Hippochaete*

Taxonomic Comments: *Hippochaete variegatum* var. *variegatum* Schleich. ex Weber & Mohr is also known as *Equisetum* var. *variegatum* and *Equisetum hyemale* var. *variegatum*

CNHP Ranking: G5T5 S1

State/Federal Status: None

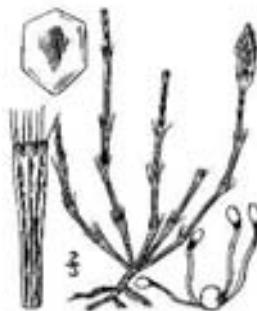
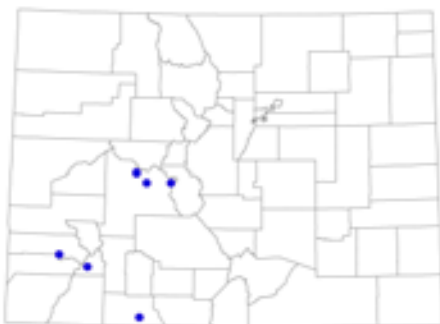


Illustration copyright © 1913 by  
N.L. Britton and A. Brown



Colorado Distribution

Phenology: *Hippochaete variegatum* var. *variegatum* is a perennial herbaceous plant with rough-surfaced evergreen stems. Its cones can mature in late summer, or they can overwinter and shed spores in spring. It is distinguished from the more common *H. hyemalis* by its smaller and more slender stems.

Habitat Comments: *Equisetum variegatum* var. *variegatum* is found at lakeshores, riverbanks, ditches and in wet woods. In Archuleta County it was found at the margin of a stock pond.

Global Range: The range of *Equisetum variegatum* var. *variegatum* is circumpolar in the north temperate zone, extending into the Arctic

State Range: There are five records of the species in the CNHP database, in Gunnison, Archuleta, San Miguel and San Juan counties. Specimens at the University of Colorado Herbarium represent seven additional counties. In Archuleta County it was found growing on the margin of a disturbed stock pond at Kenney Flats

Distribution/Abundance: This species may be more common than believed, and merely overlooked.

Known Threats and Management Issues: Threats to the variegated scouring rush include human activities (recreation, road and trail maintenance activities, selection of grazing areas), invasion by exotic plant species and changes in hydrology.

Potential Conservation Areas that support *Hippochaete variegatum* var. *variegatum*:

Kenney Flats on page 210

## *Ipomopsis polyantha* (Pagosa gilia)

### Taxonomy

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

Taxonomic Comments: *Ipomopsis polyantha* (Rydb) V. Grant is sometimes placed in the genus *Gilia*. As treated by Kartesz (2/99 review draft dataset), the plants sometimes called *Gilia polyantha* var. *whitingii* are included here, without recognition of varieties or subspecies. CNHP believes plants of Colorado (the typical variety) are distinct from those of New Mexico and Arizona (locality of var. *whitingii*).



CNHP Ranking: G1 S1

Photo copyright © 1999 by B. Jennings

State/Federal Status: Forest Service and BLM Sensitive



Colorado Distribution

Phenology: *Ipomopsis polyantha* is a biennial to short-lived perennial herbaceous plant with a rosette of basal leaves. It produces a stalk of white flowers from June to August. Its fruiting period extends from August to September.

Habitat Comments: *Ipomopsis polyantha* is restricted to clay soils derived from Mancos Shale, which forms a wide swath through the center of Archuleta County from northwest to southeast. The plants often grow in areas that are recently disturbed. Although presumably there are areas where disturbance is natural, for instance by natural erosion or burrowing animals, all populations that we observed were disturbed by human activities.

Global Range: *Ipomopsis polyantha*, a species with only three confirmed locations in the world, both in Archuleta County, was a high priority for this survey.

State Range: Nearly all the suitable habitat for this species is on private land in the vicinity of Pagosa Springs, and is subject to development. The other major habitat is along the Highway 84 right-of-way, where it is vulnerable to road maintenance or improvement activities. There are several small patches in vacant lots, roadsides and pastures scattered throughout sub-divisions south of Pagosa Springs, but they are fragmented, and may be too small to be viable in the long term. A new population was found in 2002 on private land along Mill Creek, more than a mile east of the closest known location.

Distribution/Abundance: *Ipomopsis polyantha* is one of the most rare species in Colorado, and threatened with extinction.

Known Threats and Management Issues: The extreme rarity of this species may call for unusual measures to prevent its extinction. Several private landowners have expressed interest in the plant, and could be approached for conservation easements or management agreements. Most of the plants are on very small parcels, containing only a fragment of the total population. Areas of this size are usually considered too small for easements. However, the risk of losing an entire species may dictate that small easements are worthwhile in this case.

Management strategies for the Pagosa gilia are complicated by the fact that the species often colonizes disturbed areas. However, extreme disturbances such as horse grazing have been shown to extirpate the species. Much of the population in this site is along the right of way of Highway 84. Widening of the highway would probably exterminate these plants. On the other hand, it has been noted that the population has been extended southward along the highway, perhaps due to movement of soils from shoulder maintenance. Spraying of roadside weeds would probably be extremely detrimental.

Another possible conservation strategy would be to collect seed and introduce the plants in suitable habitat that is protected. The area around Echo Canyon Reservoir, owned by the Colorado Division of Wildlife is within a mile of the southern extent of the plant population in this site, and appears to have the required soils. City park land of Pagosa Springs could also offer a potential location for propagation. This species would also be a reasonable candidate for seed banking and cultivation for reintroduction.

Potential Conservation Areas that support *Ipomopsis polyantha*:

Mill Creek at Pagosa springs	on page 36
Stollsteimer Creek North	on page 60

## *Lesquerella pruinos* (Frosty bladderpod)

### Taxonomy

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

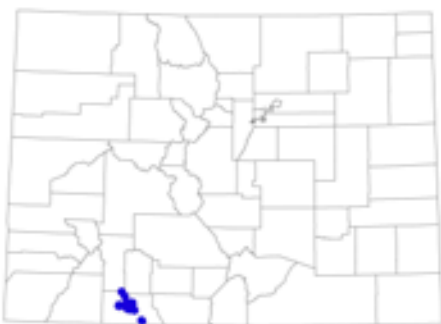
Taxonomic Comments: *L. pruinos* Greene. Type specimen from Pagosa Springs, 1899.

CNHP Ranking: G2 S2

State/Federal Status: Forest Service and BLM Sensitive



Photo copyright © 1999 by C. Dawson



Colorado Distribution

Phenology: *L. pruinos* is a yellow-flowered mustard with gray-green basal leaves in a rosette. The species blooms early, and seeds are dropped by May. By August, many new seedlings have sprouted, many of which may not survive to maturity.

Habitat Comments: *Lesquerella pruinos* grows in clay soils derived from Mancos Shale. It is found in barren areas and pastures, often in disturbed areas, surrounded by montane grasslands or open ponderosa pine stands with scrub oak.

Global Range: *Lesquerella pruinos* has a very restricted range, centered in Archuleta County and extending slightly into Hinsdale County and New Mexico.

State Range: Populations of *Lesquerella pruinos* occur at Turkey Mountain, The Ant Hill, near Chromo and in the Upper Piedra River area at the O'Neal Hill Special Botanical Area, .

Distribution/Abundance: *Lesquerella pruinos* records at Turkey Mountain and The Ant Hill PCAs were updated in 2001 and 2002. A new sub-population was located at Turkey Mountain (Eight Mile Mesa Road), where *Lesquerella* was growing with two other rare species, *Phlox caryophylla* and *Astragalus missouriensis*. All three species seemed to prefer disturbed areas. Another new population was found in 2002 at Chromo. . In two years of observation, we witnessed extreme variability in population numbers. Areas at O'Neal Hill that had abundant plants in 2001 were nearly devoid of any in 2002, a year of extreme drought. However, the plants at the Turkey Mountain site did not seem to be as impacted. The O'Neal Hill site was again visited in May, 2003, and no plants were found, whereas those in the adjacent property appeared to be doing well. Simultaneously, a large increase in the prairie dog colony at O'Neal Hill was noted

Known Threats and Management Issues: Habitat destruction is the biggest threat to *Lesquerella pruinos*, especially considering its limited range. Because the city of Pagosa Springs lies in the center of the plant's range, residential growth and development of resort homes could decrease essential habitat.

Populations in the Piedra Valley may be vulnerable to the effects of livestock grazing. Though cattle pose a minimum threat of grazing the plants (they contain chemicals which render the plants unpalatable), cattle

grazing tends to promote erosion and up-rooting where plants occur on slopes by severely disturbing the soil (Anderson 1988). These populations are at risk mainly where cattle trails traverse the shale barrens (Neely 1990). Horse pastures, which are often severely overgrazed, associated with second homes could also present a new threat to the species. In areas that are accessible to humans, *L. pruinosa* may be prone to the effects of recreational use of the land, such as off-road vehicle use.

Further research and monitoring are urgently needed at the O'Neal Hill site to determine the cause of the decline of the bladderpod.

Potential Conservation Areas that support *Lesquerella pruinosa*:

Chromo	on page 43
Stollsteimer Creek North	on page 60
Taylor Canyon at San Juan River	on page 64
The Ant Hill	on page 68
Turkey Mountain	on page 72

## *Limnorchis ensifolia* (Canyon bog orchid)

### Taxonomy

Class: Monocotyledoneae

Order: Orchidales

Family: Orchidaceae

Genus: *Limnorchis*

Taxonomic Comments: The genus is also classified by some botanists as *Habenaria* or *Platanthera*. The species has been known as *Habenaria sparsiflora* and *Platanthera sparsiflora*.

CNHP Ranking: G4G5T4? S3

State/Federal Status: None

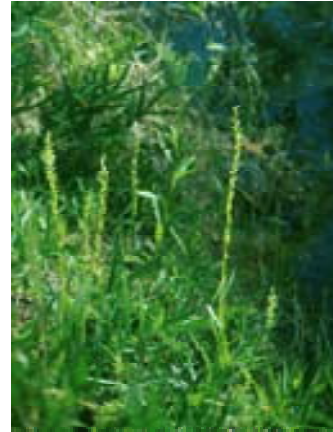
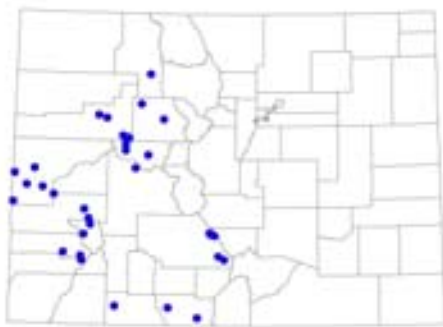


Photo copyright © 1999 CNHP



Colorado Distribution

Phenology: *L. ensifolia* is a glabrous plant, 3 to 6 dm. Tall, growing from a fascicle of fleshy roots. Its flower stalk is slender, with greenish flowers spaced farther apart than on other related bog orchids. Plants flower in May or June, and set fruit by August or September.

Habitat Comments: *Limnorchis ensifolia* grows in moist or wet soil in mountain meadows, marshes, swamps, fens, open or dense forests, on stream banks and open seepage, frequently about springs.

Global Range: *Limnorchis ensifolia* has a wide range, from Oregon to Mexico, but good habitat is limited.

State Range: *Limnorchis ensifolia* is widespread throughout western Colorado. There are 36 known populations in 12 Colorado counties extending from Routt County in the north to Conejos County in south-central Colorado.

Distribution/Abundance: *Limnorchis ensifolia* is widespread occurring wherever suitable habitat is found. Because good habitat is limited the species, although widespread, is not abundant anywhere within its range. We found it to be sparse but present at a spring on First Fork Road, above the Piedra River, growing with two other rare plants, *Epipactis gigantea* (giant helleborine) and *Erigeron philadelphicus* (Philadelphia fleabane).

Known Threats and Management Issues: Threats to *Limnorchis ensifolia* include human activities, particularly activities resulting in changes in hydrology that cause decreased soil moisture content. The orchid's survival depends on a reliable year-round supply of moisture. The combination of grazing and trampling by livestock in the mucky areas where the orchid grows may eradicate the plant. Removal of overstory vegetation may cause sites to become too dry for the orchids.

Potential Conservation Areas that support *Limnorchis ensifolia*:

Piedra on page 93

## *Phlox caryophylla* (Pagosa phlox)

### Taxonomy

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

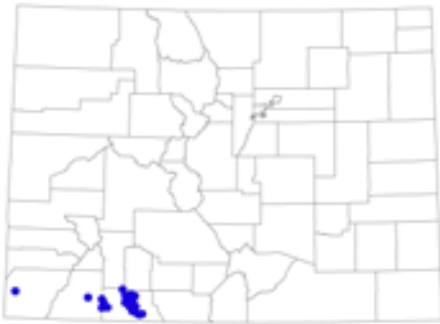
Taxonomic Comments: *Phlox caryophylla* Wherry differs from its near relative, *P. longifolia*, in the *absence of a* pleated calyx, and has little or no hyaline membrane separating segments of the calyx.

CNHP Ranking: G4 S3

State/Federal Status: None



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Colorado Distribution

Phenology: *Phlox caryophylla* blooms in April and May, and plants we observed in June 2001 were withered and dried up.

Habitat Comments: *Phlox caryophylla* grows in open areas within the ponderosa pine zone.

Global Range: *Phlox caryophylla* is known only from Colorado, in Archuleta and La Plata counties, and one county in New Mexico.

State Range: In Colorado the total range of ***Phlox caryophylla*** is very small, extending from Pagosa Springs to Durango.

Distribution/Abundance: Although *Phlox caryophylla* has a very limited distribution it is fairly abundant with 35 populations recorded within its limited range. *Phlox caryophylla* was found in five new locations during this survey.

Known Threats and Management Issues: Threats to *Phlox caryophylla* include human activities (residential development, recreation, road and trail maintenance activities, selection of grazing areas) and invasion by exotic plant species.

### Potential Conservation Areas that support *Phlox caryophylla*:

Mill Creek at Pagosa Springs	on page 36
Pine-Piedra Stock Trail	on page 53
Taylor Canyon at San Juan River	on page 64
The Ant Hill	on page 68
Turkey Mountain	on page 72
Valle Seco	on page 239

## ***Townsendia glabella* (Gray's townsend-daisy)**

### Taxonomy

Class: Dicotyledoneae

Order: Asterales

Family: Astetaceae

Genus: *Townsendia*

Taxonomic Comments: None

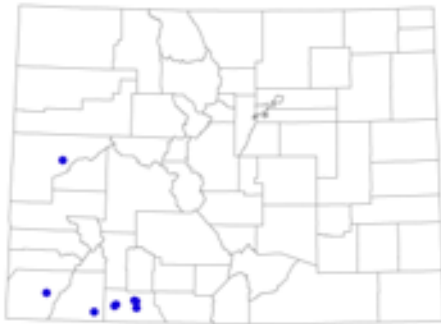
CNHP Ranking: G2? S2?

State/Federal Status: None

Phenology: *T. glabella* is an herbaceous caespitose perennial, with bluish-white flowers. Leaves are glabrous, distinguishing it from the more common *T. incana* which has cinereous leaves. Plants flower in May and June.



Photo copyright © 2003 CNHP



Colorado Distribution

Habitat Comments: *Townsendia glabella* grows on level to steeply sloping shale slopes with clay soils derived from Mancos Shale in the ponderosa pine zone, between 6500 and 8500 ft.

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

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

Distribution/Abundance: *Townsendia glabella* has a very limited distribution it is rare throughout its limited range. Prior to this survey there were three occurrences known from Colorado, in La Plata, Archuleta and Montezuma counties. Two new locations were found in Archuleta County.

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

Potential Conservation Areas that support *Townsendia glabella*:

Mill Creek at Pagosa Springs	on page 36
Turkey Mountain	on page 72

## Insects

### *Speyeria nokomis nokomis* (Nokomis fritillary)

Taxonomy:  
Class: Insecta  
Order: Lepidoptera  
Family: Nymphalidae  
Genus: *Speyeria*

Taxonomic Comments: *Speyeria nokomis nokomis* is synonymized with *S. n. nokomis* in Miller (1992). Otherwise the subspecies of this species seem unusually clearcut for a *Speyeria*.



Photo copyright © by Paul Opler.

CNHP Ranking: G3T1 S1

State/Federal Status: None.



Colorado Distribution  
(adapted from Stanford and  
Opler 1993)

Phenology: One brood emerging in mid-July through late September in Colorado (Opler and Bartlett-Wright 1999). Males patrol all day about the seeps and meadows in search of females (Scott 1986).

Larval Hostplant: The hostplant is the violet, *Viola nephrophylla*.

Global range: This species is widespread throughout the southern Rocky Mountains, into the Great Basin and south into northern Mexico.

State range: In Colorado the Nokomis fritillary is widespread across the west slope and into the south-central Rocky Mountains of the State. It is known from 11 Colorado counties ranging from Moffat County in the northwest to Costilla County, which borders New Mexico in south-central Colorado.

Habitat Comments: *Speyeria nokomis nokomis* inhabits wet alpine meadows and seeps and springs and associated marshes with flowing water at lower elevation where adults will nectar avidly at thistles (Opler and Bartlett-Wright 1999)

Distribution/Abundance: The Nokomis fritillary, although widespread is extremely local, restricted in habitat and decidedly rare over the major portion of its range (Ferris and Brown 1981).

Known Threats and Management Issues: Habitat loss is a major problem for *S. n. nokomis*. Many populations have disappeared because of capping of springs, lowering of water tables by pumping and habitat modification (Opler and Bartlett-Wright 1999).

Potential Conservation Areas supporting *Speyeria nokomis nokomis*:

The Nokomis fritillary does not inhabit any PCAs, but it is recorded from a spring along Highway 84 south of Chromo and from along Round Meadow Creek at Le Vega Redondo meadow between Stollsteimer and Pagosa Junction.

## Reptiles

### *Chrysemys picta* (Painted turtle)

#### Taxonomy

Class: Reptilia

Order: Squamata

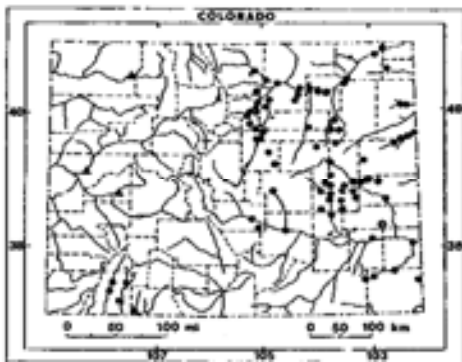
Family: Testudines

Genus: *Chrysemys*

Taxonomic Comments: The species in Colorado is recognized as the distinct subspecies *Chrysemys picta belli* (Gray, 1831)

CNHP Ranking: G5 S5

State/Federal Status: None.



*Colorado Distribution*  
(adapted from  
Hammerson 1999)

Phenology: In Colorado painted turtles emerge from hibernation in March or April and remain active through at least mid-November. Courtship and mating occur in spring and more rarely in summer in fall with nesting taking place from mid-May to mid-July (Hammerson 1999). Turtles hibernate in water and are reported to burrow into anoxic bottom mud.

Global Range: *Chrysemys picta* is widespread throughout southern Canada, south through Oregon, northern Idaho, Colorado and the rest of the central and eastern United States, but not in Florida (Hammerson 1999). There is a disjunct population occupying southwestern Colorado, New Mexico, Texas and Chihuahua, Mexico.

State Range: *Chrysemys picta* occurs below 6,000 feet in the plains of eastern Colorado and at elevations of 6,000 to 8,500 feet in southwestern Colorado (Hammerson 1999). However, this inventory noted one individual at over 8,500 feet at Price Lakes north of Chromo.

Habitat Comments: Typical habitat includes permanent ponds, reservoirs, marshes, river backwaters and slow moving portions of streams.

Distribution/Abundance: *Chrysemys picta* is numerous throughout its range in North America and within northeastern Colorado, but is extremely local and less common in southwestern Colorado. The regional population of painted turtles likely will remain stable and secure for the foreseeable future (Hammerson 1999).

Known Threats and Management Issues: Human created ponds and reservoirs have augmented native habitat throughout the range of the painted turtle. Various local populations, however, have suffered from habitat alteration associated with residential, commercial and agricultural development. Availability of suitable nesting habitat may be more of a problem for a shallow nesting turtle like *Chrysemys picta* in the dry climate of Colorado (Hammerson 1999). Nesting painted turtles are sensitive to human disturbance such as fishing and management of recreational use at known populations of turtles during nesting (mid-May to mid-July) would benefit painted turtle populations.

Potential Conservation Areas supporting *Chrysemys picta*:

Although no PCAs were created this species, it was observed at Price Lakes north of Chromo and just west of the junction of Highways 160 and 151 during this inventory, and populations are reported at Navajo Reservoir.

## Amphibians

### *Rana pipiens* (Northern leopard frog)

Taxonomy  
Class: Amphibia  
Order: Anura  
Family: Ranidae  
Genus: *Rana*

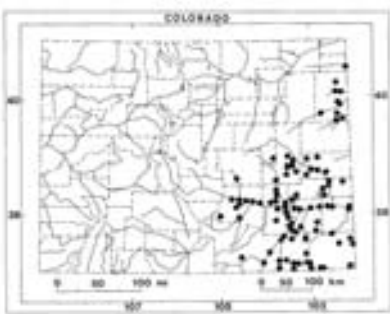
Taxonomic Comments: Much published information on "*Rana pipiens*" actually pertains to other species that have been described or recognized since the early 1970s.

CNHP Ranking: G5 S3

State/Federal Status: Species of special concern (Colorado), and a BLM and Forest Service Sensitive Species.



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Colorado Distribution  
(adapted from  
Hammerson 1999)

Phenology: *Rana pipiens* emerges from winter retreats in March and activity continues until October or November. Breeding commences in March or April and eggs are laid from mid-April through May (Hammerson 1999).

Global Range: *Rana pipiens* ranges from southern Canada and the northern United States south to Maryland, West Virginia, Kentucky, northern Illinois, Missouri, Nebraska, New Mexico, Arizona, and eastern California (Hammerson 1999).

State Range: *Rana pipiens* ranges throughout Colorado except for the southeastern portion of the state.

Habitat Comments: Northern leopard frogs are found in a variety of temporary and permanent aquatic habitats, including streams, rivers, ponds, lakes, ditches, and marshes (Degenhardt *et al.* 1996). Mass movements away from breeding ponds are sometimes undertaken by adults and young after summer rains (Fitch 1958).

Distribution/Abundance: The formerly abundant northern leopard frog has become scarce in many areas of its range due in part to changes in habitat. In some areas the decline in northern leopard frogs are associated with the presence of increasingly abundant bullfrogs, which may eat Northern leopard frogs.

Known Threats and Management Issues: *Rana pipiens* has become scarce or absent at some locations where non-native bullfrogs have been introduced (Hammerson 1999). Bullfrog larvae that overwinter readily eat *Rana pipiens* eggs (Ehrlich 1979), and could greatly reduce reproductive success of northern leopard frogs (Hammerson 1999). Flood control measures and diversion of water for irrigation has reduced the availability of breeding habitat (Hammerson 1999).

Potential Conservation Areas supporting *Rana pipiens*:

Buckles Lake	75
Mill Creek at Pagosa Springs	36
Rio Blanco at Deadman Canyon	182
The Ant Hill	68

## Fish

### *Oncorhynchus clarki pleuriticus* (Colorado River cutthroat trout)

#### Taxonomy

Class: Osteichthyes

Order: Salmoniformes

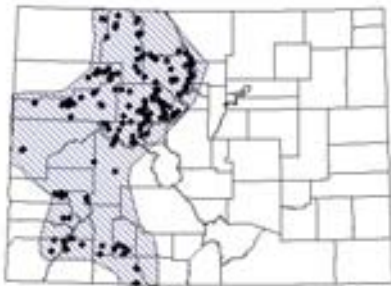
Family: Salmonidae

Genus: *Oncorhynchus*



**Taxonomic Comments:** Colorado River cutthroat trout are closely related to Greenback River cutthroat trout (*Oncorhynchus clarki stomias*) and Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*). Colorado River cutthroat trout hybridize with various species and subspecies of the genus *Oncorhynchus* and therefore local cutthroat populations can range in appearance from "pure-looking" to obvious hybrids (U.S. Fish and Wildlife Service 1998). Genetic variation is under study by D. Shiozawa and R. Evans at BYU (Starnes 1995).

CNHP Ranking: G4T3 S3



*Colorado Distribution*

**State/Federal Status:** BLM and Forest Service Sensitive Species; State of Colorado Species of Concern.

**Phenology:** *Oncorhynchus clarki pleuriticus* spawn in late spring when temperature reaches about 45 F. Spawning begins after flows have peaked in spring or early summer and ends before runoff subsides. Emergence of fry tends to occur in mid-to late summer and subadults become sexually mature in 2-3 years. In Trappers Lake (Colorado), repeat spawners comprised 16% of the spawning run and most Colorado River cutthroat had spawned the previous year, but the incidence of repeat spawning in fluvial or resident populations is poorly known (Spahr et al. 1991, Young 1995).

**Global Range:** Historically *Oncorhynchus clarki pleuriticus* was distributed throughout the colder headwaters of the Green and Colorado rivers as far south as the San Juan River and perhaps occupied portions of the lower reaches of large rivers in winter (Young 1995). Currently the distribution is limited to a few small headwater streams of the Green and upper Colorado rivers in Colorado, Utah, and Wyoming, including the Escalante River drainage in southern Utah (Hepworth et al. 2001). Formerly Colorado River cutthroat trout may have occurred in northeastern Arizona in the Chuska Mountains (speculation by Behnke 1992). As a result of stocking, they now also occur in several high elevation lakes in the Rocky Mountains; most of these populations are not self-sustaining due to lack of adequate spawning streams (Spahr et al. 1991).

**State Range:** In Colorado, *Oncorhynchus clarki pleuriticus* is at present limited to a few small headwater streams of the Green and Colorado River drainages.

**Habitat Comments:** Inhabits clear, cold, well-oxygenated mountain streams with moderate gradients, rocky to gravelly substrates, and abundant riparian vegetation; also is found in ponds and lakes (Trotter 1987).

**Distribution/Abundance:** Pure populations of the Colorado River cutthroat trout have disappeared from most of the historical range (Behnke 1992) and presently less than 1% of the historical range may be

occupied. An estimated 318 populations (some not recently verified as extant) may still exist within the historical range in Colorado, Utah, and Wyoming, with an additional 55 reintroduced populations; not all of these reintroduced populations are self-sustaining (Young et al. 1996). Only 83 of the populations are known to be genetically pure (Young et al. 1996), and only about 20 populations are indigenous, genetically pure, above a barrier, and in a drainage not recently stocked. And some of these 20 populations may be too small to remain viable (Young et al. 1996).

The Colorado Division of Wildlife has reintroduced Colorado River cutthroat trout at many sites in the Green and Colorado River drainages.

**Known Threats and Management Issues:** The decline in Colorado River cutthroat trout populations was caused by several factors related to human activities. The major factor was the introduction of non-native salmonid species (rainbow trout, brook trout, brown trout, and Yellowstone cutthroat trout) into their historic range. Rainbow trout and various cutthroat subspecies readily hybridize with Colorado River cutthroat trout (Everhart and Seaman 1971, U.S. Fish and Wildlife Service 1998). Introduced brook trout (Behnke and Zarn 1976, Behnke 1979) and brown trout (Wang 1989) tend to outcompete and ultimately displace Colorado River cutthroat trout. Finally, because cutthroat trout are more easily caught than other salmonid species, harvest by anglers may have played an important role in reducing Colorado River cutthroat populations, particularly in waters where non-native species were present with Colorado River cutthroat trout (U.S. Fish and Wildlife Service 1998).

Other factors that contributed to the decline of Colorado River cutthroat trout populations also were associated with the human settlement and development of the Rockies. Exploitation of land, water, minerals, timber resources, and fisheries adversely affected Colorado River cutthroat trout and their habitat (U.S. Fish and Wildlife Service 1998). The diversion of streams and the removal of water for irrigation of agricultural lands had major impacts on the ecology and hydrology of waters occupied by Colorado River cutthroat trout.

Whirling disease (caused by a microscopic, water-borne parasite *Myxobolus cerebralis*), which causes skeletal deformities and ultimately death in trout species is also a concern within the current range of the Colorado River cutthroat trout.

Potential Conservation Areas supporting *Oncorhynchus clarki pleuriticus*:  
Navajo River on page 175

## *Oncorhynchus clarki virginalis* (Rio Grande cutthroat trout)

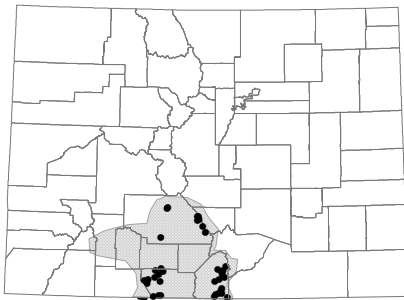
### Taxonomy

Class: Osteichthyes  
Order: Salmoniformes  
Family: Salmonidae  
Genus: *Oncorhynchus*



**Taxonomic Comments:** Rio Grande cutthroat trout are closely related to Greenback River cutthroat trout (*Oncorhynchus clarki stomias*) and Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*). Rio Grande cutthroat trout hybridize with various species and subspecies of the genus *Oncorhynchus* and therefore local cutthroat populations can range in appearance from "pure-looking" to obvious hybrids (U.S. Fish and Wildlife Service 1998). Genetic variation is under study by D. Shiozawa and R. Evans at BYU (Starnes 1995).

CNHP Ranking: G4T3 S3



*Colorado Distribution*

**State/Federal Status:** BLM and Forest Service Sensitive Species; State of Colorado Species of Concern.

**Phenology:** *Oncorhynchus clarki virginalis* spawn from March through July, depending on water temperature (Sublette et al. 1990). In colder waters, growth is slow, and age at maturity may be 4 years (Rinne 1995).

**Global Range:** The historic range of *Oncorhynchus clarki virginalis* is not definitely known, but it probably encompassed all the colder headwaters in the Rio Grande drainage, including the Chama, Jemez, and Rio San Jose drainages along with those of the Pecos and Canadian drainages (Sublette et al. 1990, Behnke 1992). *Oncorhynchus clarki pleuriticus* may

also have occurred in Texas and Mexico (see Behnke 1992). The present range includes New Mexico and Colorado. The southernmost distribution is at Indian Creek in the Lincoln National Forest and Animas Creek in the Gila National Forest, southern New Mexico (Rinne 1995).

**State Range:** In Colorado, *Oncorhynchus clarki virginalis* is at present limited to a few small headwater tributary streams in the Rio Grande and San Juan national forests in southwestern Colorado. There are also few lake and introduced populations within the forests.

**Habitat Comments:** Inhabits clear, cold, well-oxygenated mountain streams with moderate gradients, rocky to gravelly substrates, and abundant riparian vegetation; also is found in ponds and lakes (Trotter 1987).

**Distribution/Abundance:** The total abundance of the Rio Grande cutthroat trout is unknown. Currently they occupy 480 miles of stream and 1,120 acres of lake habitats in Colorado, and 260 miles of stream habitat in New Mexico (USFWS 1998). Approximately 106 populations currently exist in New Mexico, and 161 in Colorado (see USFWS 2002). Some of these populations are hybridized, small, and/or include non-native competing salmonids. At least 30 genetically pure remnant populations are distributed rangewide (USFWS 2002); including transplanted populations, there are about 100 pure populations (USFWS 2002). The United States Fish and Wildlife Service (2002) identified 13 populations that are pure (confirmed by appropriate genetic testing), that have over 2,500 fish, are secured by a barrier, and do not coexist with non-natives. Because of the habitat conditions and tubifex worm scarcity, these 13 populations are not threatened by whirling disease (USFWS 2002).

The Colorado Division of Wildlife has reintroduced the Rio Grande cutthroat trout at many sites in the Rio Grande and San Juan national forests in southwestern Colorado.

Known Threats and Management Issues: The decline in Rio Grande cutthroat trout populations was caused by several factors related to human activities. The major factor was the introduction of non-native salmonid species (rainbow trout, brook trout, brown trout, and Yellowstone cutthroat trout) into their historic range. Rainbow trout and various cutthroat subspecies readily hybridize with Rio Grande cutthroat trout (Everhart and Seaman 1971, U.S. Fish and Wildlife Service 1998). Introduced brook trout (Behnke and Zarn 1976, Behnke 1979) and brown trout (Wang 1989) tend to outcompete and ultimately displace Rio Grande cutthroat trout. Finally, because cutthroat trout are more easily caught than other salmonid species, harvest by anglers may have played an important role in reducing Rio Grande cutthroat populations, particularly in waters where non-native species were present with Rio Grande cutthroat trout (U.S. Fish and Wildlife Service 1998).

Other factors that contributed to the decline of Rio Grande cutthroat trout populations also were associated with the human settlement and development of the Southern Rockies. Exploitation of land, water, minerals, timber resources, and fisheries adversely affected Rio Grande cutthroat trout and their habitat (U.S. Fish and Wildlife Service 1998). The diversion of streams and the removal of water for irrigation of agricultural lands had major impacts on the ecology and hydrology of waters occupied by Rio Grande cutthroat trout.

Whirling disease (caused by a microscopic, water-borne parasite *Myxobolus cerebralis*), which causes skeletal deformities and ultimately death in trout species is also a concern within the current range of the Rio Grande cutthroat trout.

Potential Conservation Areas supporting *Oncorhynchus clarki virginalis*:

Adams Fork of Conejos River	on page 192
Nabor Creek	on page 169

## Birds

### *Aegolius funereus* (Boreal Owl)

Taxonomy  
Class: Aves  
Order: Strigiformes  
Family: Tytonidae  
Genus: *Aegolius*

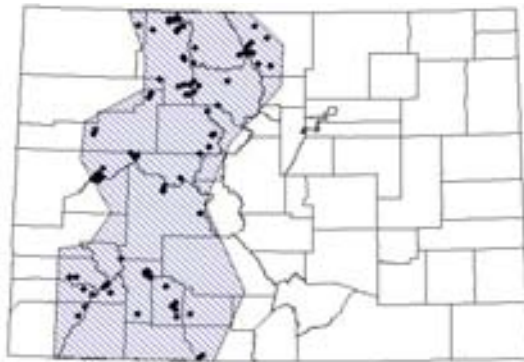
Taxonomic Comments: Known as Tengmalm's Owl in European literature (AOU 1998).

CNHP Ranking: G5 S2

State/Federal Status: Forest Service Sensitive Species

Phenology: : In Colorado, nest initiation for Boreal Owls range from late-May to late-June. The summer home ranges of three radio marked adults near Cameron Pass averaged 731 acres, while the winter ranges averaged 2796 acres (Kingery 1998).

Habitat Comments: In Colorado, boreal owls occur mainly in mature to old-age (150+ years) Engelmann spruce and sub alpine fir above 9500 feet in elevation, but also frequent higher-elevation lodge pole pine and aspen stands (Hayward and Hayward 1993). They prefer wet areas near streams or bogs because these often have good populations of small rodents (CBBA 1998).



*Colorado Distribution*

Global Range: The boreal owl inhabits spruce-fir/lodge pole pine forests from the Rocky Mountains of Colorado northwest into Canada and Alaska (National Geographic Society 1987). Scattered populations also occur in northern Minnesota, the Cascade ranges, and south in the Rocky Mountains into north-central New Mexico.

State Range: Field workers have found boreal owls in most Colorado mountain ranges, including the Elk, San Juan, Sanger de Crisco, and Wet mountain ranges, as well as the Grand Mesa, Park range, and Flat Tops areas (CBBA 1998).

Distribution/Abundance: The widespread range of the Boreal Owl, its apparently large numbers and occurrences seem to make this species secure. Reliable information on population numbers are unavailable. Their nomadic habit, caused by fluctuating prey density complicates estimates of population size (Hayward and Hayward 1993). The population is considered "stable" in Canada (COSEWIC 1995 unpubl. report). Although Boreal Owls were recently discovered breeding far to the south of previously known locations, this is probably due to the season and location of breeding (high elevation in February-April) rather than range expansion (Stahlecker and Duncan 1996).

Known Threats and Management Issues: No population trends are available for the Colorado Boreal Owls since large areas remain unsurveyed for this species. However, Stokes Field Guide (1996) reports a small downward trend for the Boreal Owl based on Christmas Bird Count data. There are few obvious threats to this species, except where development alters nesting habitat.

Potential Conservation Areas supporting the Boreal Owl:

No PCAs were created for the Boreal Owl. However, there is one record of Boreal Owl in Hinsdale County within the project area. The Boreal Owl is probably more abundant on National Forest within the project area, however, it is difficult to observe these solitary raptors.

## *Dendroica graciae* (Grace's Warbler)

Taxonomy  
Class: Aves  
Order: Passeriformes  
Family: Parulidae  
Genus: *Dendroica*

Taxonomic Comments: Grace's Warbler may constitute a superspecies with *D. dominica*, *D. adelaidae* and *D. pityphila* (AOU 1998).



CNHP Ranking: G5 S3B, SZN

Photo copyright © by Jim Stasz

State/Federal Status: None.

Phenology: Grace's Warblers begin arriving at nesting areas in late-April with mating and nest building taking place in May. Incubation of eggs extends from late-May to early-June and young leave the nest from late-June to mid-July (Levad 1998).



*Colorado Distribution*  
(adapted from Kingery 1999)

Global Range: The Grace's Warbler subspecies found in Colorado (*D. g. graciae*) breeds from southern Nevada, southern Utah, southwestern Colorado, northern New Mexico, and western Texas south through eastern Sonora and western Chihuahua

State Range: In Colorado, Grace's Warblers occupy the southwest portion of the state including Mesa, Montrose, San Miguel, Montezuma, La Plata and Archuleta counties. There is a disjunct population in the Wet Mountains of Custer County.

Habitat Comments: Grace's Warbler is found in open pine forest, pine-oak association and pine savanna (Tropical to

Temperate zones; AOU 1998). They usually nest on the outer limbs of pine, anywhere from six to 18 meters above ground.

Distribution/Abundance: Grace's Warbler is quite common in the appropriate habitat. The species has expanded its range northward and recent population trends appear stable, but there is some evidence of declines in the southwest. North American Breeding Bird Survey (BBS) data is probably most reliable for the recent period from 1980 to 1996, for which trends are stable survey-wide (0.0 percent average annual population change, n=29 survey routes). Thirty-year BBS data, 1966-1996, show steeply negative trends but none are statistically significant. The thirty-year trend estimates may be confounded by low sample sizes for the period 1966-1979 when only 9 routes were run survey-wide, so they must be interpreted with caution. Trend estimates for 1966-1979 show steep, statistically significant declines but are based on too few samples to be reliable (Sauer et al. 1997). A reanalysis by Miller (1992 cited in Hall et al. 1997), however, found declining trends on selected BBS routes in Arizona (n=5) and New Mexico (n=6) that run through managed ponderosa pine forests. In the 1970s, Grace's Warblers expanded their range into California and Nevada where they were previously unknown, and breeding populations were established in five mountain ranges in southern Nevada by the early 1970s (Johnson 1994). DeSante and George (1994) suggest populations have increased in Colorado and Nevada due to a northward range expansion. Brawn and Balda (1988) hypothesized that populations in the southwestern U.S. have increased from presettlement times due to an increase in intermediate-aged trees, and hence an increase in foliage productivity. Scurlock and Finch (1997) compared relative abundance descriptions from accounts in 1911, 1928, and 1961 and

suggest the species has increased in this century. Of historical note, in the 1860s Dr. Elliott Coues, who first described Grace's Warbler for western science, wrote that it was the most abundant bird after the Audubon's warbler (*Dendroica coronata*) in montane Arizona pine forests (Bent 1953).

**Known Threats and Management Issues:** There is little knowledge of direct threats, but large-scale clearcutting and extensive overstory removal is detrimental (NatureServe Explorer 2003). Current pressures to harvest timber at accelerated rates in Mexico and Central America will likely impact the species. Fires that kill canopy trees are also detrimental. The absence of Grace's Warblers from burned and salvage-logged plots in a large wildfire in a northern Arizona ponderosa pine forest was presumably related to loss of the forest canopy (Finch et al. 1997). In New Mexico, Johnson and Wauer (1996) studied changes over 14 years after the 1977 La Mesa wildfire and found that abundance declined on plots where scorch or crown fire killed trees. Note, however, that fire plays an important role in ponderosa pine forests and fire patterns in southwestern ponderosa pine have changed dramatically in this century. Ponderosa pine forests evolved with frequent, low intensity fires, which created open stands of larger trees. Today, fire suppression has altered the forest structure, allowing the growth of more small-diameter trees per acre, creating "ladder fuels" that carry fire to the forest crown, and leading to larger, more severe or lethal fires (see Moir et al. 1997). Understory burns that do not kill the canopy foliage may not significantly affect Grace's Warbler, but the response to different fire regimes and post-fire ecology needs study. No information is available on response to urbanization or recreation, but Marzluff (1997) hypothesizes that the abundance or productivity of canopy-nesting warblers may moderately decline from effects of urbanization through increased predation, habitat loss, and road development; and through the effects of camping and hiking through habitat changes and disturbance. In summary, the upper canopy of pine forests is important foraging and nesting habitat and activities that reduce or clear pine forests or degrade the forest canopy or prey availability would be detrimental. Activities that reduce or remove understory shrubs and other vegetation (e.g. shrub eradication, grazing, fire) may have less impact, but the importance of understory vegetation to this species is poorly understood. Szaro and Balda (1979a), however, found that Gambel oak on open forest sites was used more often than predicted based on the shrub's availability. In addition, Brawn and Balda (1988) reported higher breeding densities in plots with moderate or high oak density than in plots with no oak or low oak density.

**Potential Conservation Areas that support *Dendroica graciae*:**

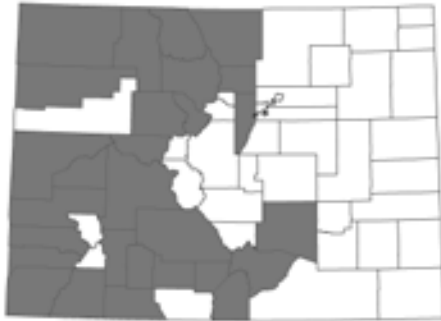
Grace's Warbler does not occupy any of the PCAs, however three separate observations of this warbler have been made in the Piedra River drainage north of Piedra. The most recent observation was made along Indian Creek during this survey.

## *Empidonax trailii* (Willow Flycatcher)

Taxonomy  
Class: Aves  
Order: Passeriformes  
Family: Tyrannidae  
Genus: *Empidonax*



**Taxonomic Comments:** The Willow Flycatcher is sometimes treated as *E. brewsteri*, a junior synonym, which was formerly regarded as conspecific with *E. alnorum* and *E. trailii*, Traill's Flycatcher (AOU 1998). See Phillips (1948) for a review of geographic variation in morphology, with the original descriptions of subspecies *alascensis* and *extimus*. Unitt (1987) reviewed infraspecific variation and concluded that four subspecies (*brewsteri*, *extimus*, *adatus*, and *trailii*) are recognizable. Sedgwick (2001) demonstrated that *E. t. adatus* and *E. t. extimus* each have distinctive songs and used vocal signatures to determine distributional limits of the two subspecies. The two song types seem to be largely allopatric, separated by latitude and/or elevation. The two groups appear to be evolving independently of one another and warrant at least subspecific status. The two subspecies *E. t. adatus* and *E. t. extimus* are the likely subspecies observed in Archuleta County during this survey.



*Colorado Distribution*  
(adapted from Kingery 1999)

**State/Federal Status:** The subspecies *extimus* (southwestern willow flycatcher) present in southwestern Colorado is listed by USFWS as Endangered (USFWS 1995)

**Phenology:** Willow Flycatchers begin nesting in early to mid-June. Incubation of eggs ends in late-June and young leave the nest from mid-July to mid-August (Sedgwick 1998).

**Global Range:** Willow Flycatchers breeds from southern Canada, south throughout the United States.

**State Range:** In Colorado, Willow Flycatchers breed largely west of the Continental Divide except for North Park, which has a large breeding population. Throughout the breeding range in Colorado Willow Flycatchers exhibit a patchy distribution that mimics their preferred habitat.

**Habitat Comments:** Breeding Willow Flycatchers are strongly tied to brushy areas of willow (*Salix* spp.) and similar shrubs. During breeding season they are found in thickets, swamps, wetlands, streamsides, and open woodland (AOU 1983). The presence of water (running water, pools, or saturated soils) and willow, alder (*Alnus* spp.), or other deciduous riparian shrubs are essential habitat elements (Sanders and Flett 1989, USDA Forest Service 1994). Willow Flycatchers occur in both mesic and drier upland conditions, but apparently reach highest densities on wet sites (Sedgwick and Knopf 1992). They are associated with dense riparian deciduous shrub cover separated by open areas, but large contiguous willow thickets without openings are typically avoided. They will not occur in dense tree cover but will use scattered trees for song and foraging perches and gleaning substrate (USDA Forest Service 1994).

**Distribution/Abundance:** North American Breeding Bird Survey (BBS) data indicate a significant survey-wide population decline between 1966 and 1996, and in the period from 1980 to 1996 (Sauer et al. 1997). Significant declines are evident in the western region for the period from 1966-1996 and 1980-1996. Most recent analysis for Canada indicates a stable overall trend from 1967 to 1998 (Canadian Wildlife Service 1999). Mapped long-term trends for 1966-1996 show strong declines throughout the western range, from British Columbia to the Southwest, and a mosaic of declines and increases in the central and eastern states and provinces. It is estimated that fewer than 500 breeding pairs of *E. t. extimus* remain at widely scattered

and isolated breeding sites within its range (Arizona Partners in Flight 1999). In California, Willow Flycatchers were once common and widespread but they have been extirpated from most of their range in that state (USFWS 1996). In Arizona in 1997, *extimus* bred only in 45 sites statewide (Latta et al. 1999). Once common along the Colorado River, willow flycatchers are now very rare except for in the few undammed miles of Glen Canyon and in the Grand Canyon, and they no longer breed in the Lower Colorado River Valley (Sogge 1995). The Grand Canyon population is dynamic, localized, and small, and only one or two sites are occupied in a given year (Sogge et al. 1997).

**Known Threats and Management Issues:** Threats include factors that destroy or degrade shrubby riparian vegetation. Riparian areas are particularly vulnerable to high-intensity livestock grazing, recreation and development pressure, flooding of nesting sites, and water diversions and flood control that prevent shrub and tree regeneration (Ohmart 1996, Saab and Rich 1997). Habitat loss and alteration is thought to be the principle cause of decline of Willow Flycatchers in the western United States. Riparian habitats, particularly cottonwood (*Populus* spp.) and willow (*Salix* spp.) communities, have been dramatically reduced and degraded by urban development, roads, off-road vehicle use, recreation, livestock grazing, agriculture, water development projects, channelization, willow control, and encroachment by non-native species (USFWS 1996). Tamarisk or saltcedar (*Tamarix* spp.) and Russian olive (*Elaeagnus angustifolia*) have invaded riparian areas throughout the West, and particularly the southwest, and are likely factors in the flycatcher's decline. Tamarisk has replaced some riparian communities completely, but is less common in others. Tamarisk replaces the preferred multi-layered shrub community with a monotypic stand with one shrub layer, decreases plant and insect diversity, and can increase the frequency and intensity of fire. Dams and flood control, and irrigation water high in salts also give tamarisk a competitive edge over native vegetation. Although Willow Flycatchers may nest in tamarisk where it provides the right vegetation structure, tamarisk may provide poor quality habitat and some studies have documented low breeding densities and low reproductive success in tamarisk (USFWS 1995, 1996; Sogge et al. 1997). Willow Flycatchers are a common host to brood parasitism by the brown-headed cowbird (Sanders and Flett 1989). Brood parasitism may pose a significant threat, particularly in its western range where habitat is limited and fragmented, and where livestock are often present in meadows and riparian habitats. Cattle and sheep browse on shrubs in the mid-level portions of the shrub cover that are preferred by willow flycatchers, and consume or trample young woody plants (Sanders and Flett 1989). Heavy or poorly timed livestock grazing damages deciduous shrubs and can prevent shrub regeneration, reducing flycatcher habitat. Cattle prefer willow and cottonwood shoots to tamarisk and other non-natives, further depleting flycatcher habitat. Streambank trampling and soil compaction also adversely affect the water table, reduce free water, and discourage shrub growth (Flett and Sanders 1987). Impoundments, channelization, and water diversions have greatly reduced and modified native riparian habitats. Reservoirs flood native riparian communities, and regulated flows reduce the seasonal flooding that many riparian plants need for regeneration. Non-native plants (such as tamarisk in the southwest) often invade new habitat created along reservoir shorelines, or riparian communities of rivers with controlled or reduced flows from water diversion and dams. Channelization also alters the river system dynamics needed to maintain native riparian communities (USFWS 1996). Fluctuating reservoir levels and flooding threatened some populations of Willow Flycatchers remaining in Arizona (Latta et al. 1999).

Willow flycatchers will benefit from maintaining communities of deciduous shrubs in riparian areas and meadows, with patches of dense shrubs interspersed with openings, and with open water nearby. In areas where populations have declined, existing breeding areas should be protected from habitat loss. It should be noted that unoccupied sites are not necessarily unsuitable, as populations may be dynamic (Harris et al. 1987). The species requires saturated soils, and standing water or flowing water near nesting sites. Natural flooding and channel meandering can promote native riparian vegetation and maintaining wetlands and wet meadows will help sustain willow communities. Recommendations include managing water diversions and groundwater withdrawal to maintain streamside vegetation and mimic natural stream flow regimes, including periodic floods (Latta et al. 1999). One study has shown that Willow Flycatcher populations dramatically increased after reducing cattle grazing and ceasing the poisoning and removal of riparian willows (Taylor and Littlefield 1986). Reducing or eliminating grazing during the nestling period would reduce direct damage by livestock (USDA Forest Service 1994). Flycatchers will nest near cattle trails (Sanders and Flett 1989), and in some circumstances cattle might be used to create trails and openings in exceptionally dense willow stands (outside the breeding season) to benefit flycatchers. Livestock

management recommendations include: (1) eliminate livestock use during the breeding period from early June to mid-August; (2) manage stocking rates and timing to encourage riparian shrub growth and vigor; (3) use exclosures to protect sensitive areas from browsing and soil compaction (USDA Forest Service 1994). Brood parasitism is an ongoing problem and cowbird trapping and control is intensive, expensive, and must be ongoing to be effective. Management recommendations to reduce the impacts of cowbirds include: (1) manage livestock to prevent aggregations near breeding habitat during nest building, egg-laying and incubation, late May to late July; (2) ideally, corrals, pack stations, and other facilities that concentrate stock should be 5 to 10 kilometers from important habitat areas, and at least 1 kilometer from nest sites; (3) implement cowbird trapping if necessary in coordination with state fish and wildlife agencies (USDA Forest Service 1994).

Potential Conservation Areas that support *Empidonax trailii*:

No PCAs were created for the Willow Flycatcher. However, there were two sightings of Willow Flycatchers in Archuleta County during this project. One bird was observed along the San Juan River north of Trujillo. And one bird was observed along the Navajo River 0.4 miles southeast of Edith at the Colorado and New Mexico border. The U. S. Forest Service has additional data on the distribution of Willow Flycatchers in the vicinity of the project area that are not recorded in this report.

## ***Falco peregrinus anatum* (American Peregrine Falcon)**

### Taxonomy

Class: Aves

Order: Falconiformes

Family: Falconidae

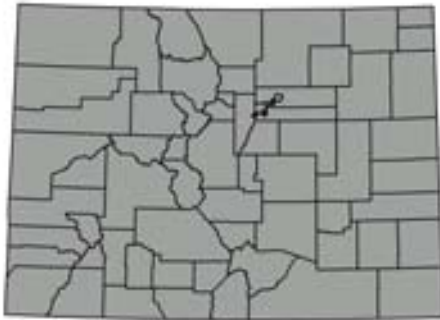
Genus: *Falco*

**Taxonomic Comments:** Three of the approximately 20 recognized subspecies occur in North America (Brown and Amadon 1968); only *Falco peregrinus anatum* (the American Peregrine Falcon) occurs in Colorado (U.S. Fish and Wildlife Service 1984).

**CNHP Ranking:** G4T3 S3B, SZN

**State/Federal Status:** Colorado species of special concern; removed from federal endangered species list in August 1999.

**Habitat Comments:** In western North America, Peregrine Falcons



***American Peregrine Falcon distribution (all seasons) in Colorado (adapted from Andrews and Righter 1992)***

nest on ledges of high cliffs in the foothills and mountains from 4,500 to over 9,000 ft (1,388 to 2,776 m) in elevation (U.S. Fish and Wildlife Service 1984). The steepest and most inaccessible locations on the tallest cliffs are preferred, especially those that offer flat, protected ledges at least 18 inches wide, with sheer rock above and below (Johnsgard 1979). Peregrine Falcons formerly nested at sites that were much more accessible than tall cliffs; human disturbance at these accessible sites has precluded their use by the birds (Kingery 1998). In Colorado, pinyon/juniper woodland occurs in the vicinity of about half of all Peregrine Falcon nest sites, and ponderosa pine woodland or forest is found at about one-quarter of the sites (Kingery 1998). Peregrine Falcons in the midwestern and eastern states, where high cliffs generally are unavailable, often nest on human-made

structures such as buildings, bridges, and smokestacks (87 percent of midwestern pairs (Tordoff *et al.* 1998) and 33 percent of eastern pairs (Cade *et al.* 1996)). Preferred habitats for hunting include agricultural lands, meadows, drainage bottoms, marshes, and lakes (U.S. Fish and Wildlife Service 1984). Migrating and wintering birds often are associated with reservoirs, rivers, and marshes, but they also use grasslands and agricultural areas (Enderson 1965, Andrews and Righter 1992).

**Distribution/Abundance:** The Peregrine Falcon was once one of the most widely-distributed birds in the world, occurring on all continents except Antarctica, and on many islands (Hickey and Anderson 1969). Throughout its range, the species has undergone major reductions in numbers and density (Hickey 1969). From 1950 to 1965, a severe decline in numbers occurred in Peregrine Falcon breeding populations in North America and in parts of Europe (Hickey 1969). In the Rocky Mountain region, only one-third of historical Peregrine nest sites were still occupied by 1965 (Enderson 1969). By 1971, the North American breeding range, which had formerly covered most of the continent, included only Canada, Alaska, and Baja, California (Cade 1971). In 1977, the Colorado population reached a low of four breeding pairs (Gray 1995). By 1995, due to an intensive program of captive breeding and reintroduction, Peregrines occupied 71 breeding sites in Colorado (Kingery 1998). Today, Peregrine Falcons breed along the foothills of Colorado's Front Range and (in higher concentrations) in the river valleys and canyons of the Western Slope (Kingery 1998). *Falco peregrinus anatum* nests across Alaska and Canada and throughout much of the western United States to central Mexico (U.S. Fish and Wildlife Service 1999). More northerly-



*Photo courtesy USFWS*

breeding members of this subspecies migrate long distances to wintering areas in South America, whereas more southerly-breeding individuals show more variable migratory behavior (some migrate relatively short distances within western North America and others do not migrate at all) (Yates *et al.* 1988).

**Important Life History Characteristics:** Peregrine Falcons show very strong fidelity to nesting territories; individual birds commonly return to the same territories year after year (Tordoff and Redig 1997). Peregrine Falcons do not build their own nests, but instead they use old nests of eagles, hawks, or ravens (Hickey and Anderson 1969). A nest site may be reused by Peregrines (different individuals) for decades (Hickey 1942, Cade *et al.* 1967) or even centuries (Ferguson-Lees 1957). Mated pairs of Peregrines defend an area of about 90 m around the nest by performing a sky dance and a high, circling display (Kingery 1998). The female does most of the incubating of the eggs; the male supplies her with food and sometimes relieves her at the nest (Johnsgard 1979). The female also does most of the brooding and feeding of the young during the first two weeks after hatching; later, both parents drop prey items into the nest, where the young must compete for them (Johnsgard 1979). After the young have left the nest, they remain in the area for several weeks (mid-June to mid-July) and they are fed and protected by both adults (U.S. Fish and Wildlife Service 1984). Peregrine Falcons may travel up to 17 miles from their nesting sites to the areas where they hunt (Porter and White 1973, Enderson and Craig 1997). Mated pairs of Peregrines sometimes hunt cooperatively, with one falcon frightening potential prey (birds) into flight paths along which they are vulnerable to attack by the other falcon (Snow 1972). Prey of the Peregrine Falcon includes many types of birds, especially domestic pigeons, wild ducks and other waterfowl, and shorebirds, as well as mammals, fishes (see White and Roseneau 1970), and invertebrates (i.e., beetles, dragonflies, butterflies) (Hickey and Anderson 1969, Terres 1980). Flight speeds of 62 mph (horizontal flight, Portal 1922 [cited by Terres 1980]) and 175 mph (diving for prey, Lawson 1930 [cited by Terres 1980]) have been recorded for Peregrine Falcons.

**Known Threats and Management Issues:** The severe population declines experienced by Peregrine Falcons in North America were primarily due to the effects of pesticides, particularly DDT and dieldrin (Nisbet 1988, Peakall and Kiff 1988, Risebrough and Peakall 1988). Reproductive symptoms of pesticide exposure included failure to lay eggs, reduced clutch size, excessively thin eggshells, embryonic mortality, nestling mortality, and failure to re-lay after loss of the first clutch (Cade *et al.* 1988). Through captive breeding and reintroduction programs, many agencies and organizations have successfully restored Peregrine Falcon populations to portions of the species' historical range, including Colorado (Andrews and Righter 1992). Direct, human-caused mortality may result from shooting (Bond 1946, Cade 1960, Enderson 1965), poisoning (Enderson 1965, Reichel *et al.* 1974), egg collecting (Rice 1969:159) or capture-related deaths caused by falconers (Bailey and Niedrach 1965). Historically, the direct killing of Peregrines by pigeon fanciers caused serious reductions in Peregrine populations in the United States and Europe (Mebs 1960 [cited by Olsen and Olsen 1980], Mebs 1969, Herbert and Herbert 1969, Hickey and Anderson 1969). Peregrines sometimes are killed by collisions with powerlines as they dive at high speeds after prey (Herren 1969, U.S. Fish and Wildlife Service 1984), and collisions with human-made objects are the leading cause of death and injury among midwestern Peregrines (Redig and Tordoff 1994, cited by Sweeney *et al.* 1997). Human disturbance at nest sites may cause nest abandonment (Herbert and Herbert 1965, Mebs 1969, Snow 1972, Olsen and Olsen 1980, U.S. Fish and Wildlife Service 1984). The increasing popularity of recreational rock climbing in North America is becoming a serious problem for natural resource managers who are trying to protect nesting Peregrine Falcons (Ratcliffe 1969, U.S. Fish and Wildlife Service 1999).

**Potential Conservation Areas that support *Falco peregrinus anatum*:**

East Fork Park	on page 146
Elephant Head Rock	on page 204
Mule Mountain	on page 213
Navajo Peak	on page 216
Piedra Forks Site	on page 219
Stollsteimer Site	on page 232

## *Haliaeetus leucocephalus* (Bald Eagle)

Taxonomy  
Class: Aves  
Order: Falconiformes  
Family: Accipitridae  
Genus: *Haliaeetus*

Taxonomic Comments: none.

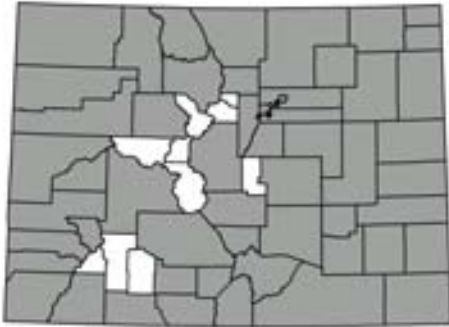
CNHP Ranking: G4 S1B, S3N

State/Federal Status: Listed as federally threatened.



Photo copyright © M. Kiesling

Habitat Comments: Breeding habitat for Bald Eagles consists of forested areas near large bodies of water (Andrew and Mosher 1982, Usgaard and Higgins 1995). Nests typically are placed in tops of tall trees located near suitable foraging habitat (Anthony *et al.* 1982, Anthony and Isaacs 1989, Kralovec *et al.* 1992). Factors affecting the quality of foraging habitats include the characteristics of the prey base (Livingston *et al.* 1990), the structure of the aquatic habitat (MacDonald and Austin-Smith 1989), and the extent of human development and disturbance (McGarigal *et al.* 1991). Sites used for diurnal perching tend to include tall trees located near shoreline foraging habitat (Chandler *et al.* 1995). Winter habitats occur along major river systems and along eastern and western North American coasts (Millsap 1986) and are characterized by the presence of abundant food, protected roost sites, and little or no human disturbance (Keister *et al.* 1987). Roosting habitat consists of tall trees that offer protection from prevailing winds and are generally located near aquatic foraging areas (Buehler *et al.* 1991b). Most roosting sites for Bald Eagles in western North America are in coniferous (or sometimes in riparian) trees (Grubb *et al.* 1989).



Distribution/Abundance: Bald Eagles breed in suitable habitats throughout much of North America, including Alaska, Canada, all 48 contiguous states in the U.S. except Vermont and Rhode Island, and parts of Mexico (Buehler 2000). No records exist of Bald Eagles breeding outside North America (Buehler 2000). Most wintering areas for Bald Eagles are located in the lower 48 states and in coastal areas of Alaska and Canada, in aquatic habitats where open water persists for foraging (Millsap 1986). Some adult Bald Eagles migrate seasonally as necessary when food becomes unavailable (Harmata and Stahlecker 1993), whereas others remain in the vicinity of their breeding territories throughout the year (Jenkins and Jackman 1993). Many of the Bald Eagles that winter in Colorado migrate to breeding areas in Saskatchewan and Manitoba in January-March (Harmata and Stahlecker

1993). Bald Eagles breed in northwestern, southwestern, and north-central Colorado (Andrews and Righter 1992).

Important Life History Characteristics: Bald Eagles are opportunistic foragers and their diet varies greatly, depending upon the location and the availability of various types of prey (Todd *et al.* 1982). In most regions Bald Eagles forage in aquatic habitats and prefer fishes (Stalmaster and Kaiser 1998). Mammals and birds, however, are important components of the diet at many sites (Kralovec *et al.* 1992). Bald Eagles typically hunt from perches or while soaring, but they also feed on carrion on the ground in areas where humans do not disturb them (Buehler 2000). At some wintering sites, ungulate carrion is a critical component of the diet (Swenson *et al.* 1986). Bald Eagles often engage in kleptoparasitism or food piracy; typically they steal fishes or other prey items from other Bald Eagles or from Ospreys while in flight or on

the ground (Hansen 1986). Bald Eagles use sticks and branches to build large nests, which often are reused each year (Buehler 2000). A well-known nest in Ohio was used for 34 years before the tree in which it was located blew down (Herrick 1924). Bald Eagles roost communally (or sometimes solitarily) at traditional winter roosting sites (Grubb *et al.* 1989), and, in some cases, at post-breeding-season summer roosting sites (Chester *et al.* 1990). Mated pairs of Bald Eagles defend their breeding territories against encroachments by other Bald Eagles (Buehler 2000). Male and female Bald Eagles exhibit strong fidelity to their mates and to their nest sites (Jenkins and Jackman 1993). A female Bald Eagle in Saskatchewan, for example, used the same territory for 13 years (Gerrard *et al.* 1992a). If one member of a mated pair dies or disappears, the surviving eagle typically continues to occupy the same territory and finds a new mate (Jenkins and Jackman 1993). Many Bald Eagles also show fidelity (i.e., they return year after year) to their wintering areas (Harmata and Stahlecker 1993).

**Known Threats and Management Issues:** Major threats to the Bald Eagle include the loss of critical habitat components such as nest trees (Weekes 1974), perch sites, and winter roosts (Hansen *et al.* 1981) to natural or human-induced causes. Throughout the range of the Bald Eagle, loss of critical breeding and wintering habitats is a serious problem (Therres *et al.* 1993). Human activities and disturbance can affect populations of Bald Eagles and other birds in many important ways. These factors can alter foraging patterns, distribution, and habitat use (Brown and Stevens 1997), reduce reproductive success (White and Thurow 1985) and foraging efficiency (Stalmaster and Kaiser 1998), and increase energy expenditures (Stalmaster 1983) and stress (Fernandez and Azkona 1993). Additional threats to the Bald Eagle include shooting (Reichel *et al.* 1984), trapping, electrocution (Hamerstrom *et al.* 1975), and poisoning by pesticides or lead shot (Kramer and Redig 1997).

Potential Conservation Areas for which roosting areas of *Haliaeetus leucocephalus* overlap portions of the PCA:

Mill Creek at Pagosa Springs	on page 36
Stollsteimer Creek at Capote Lake	on page 235

## Mammals

### *Cynomys gunnisoni* (Gunnison's Prairie Dog)

#### Taxonomy

Class: Mammalia

Order: Rodentia

Family: Sciuridae

Genus: *Cynomys*

**Taxonomic Comments:** The subspecies *Cynomys gunnisoni gunnisoni*, which is extinct over most of its former range, inhabits western Archuleta County. Gunnison's prairie dog exhibits low within-population genetic diversity and significant differentiation between colonies (Travis et al. 1997).

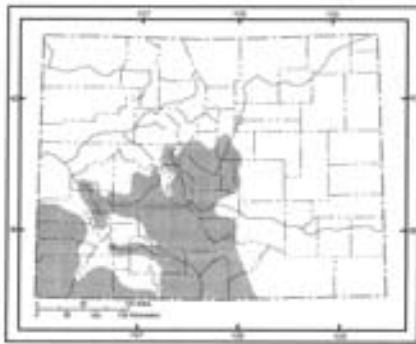


CNHP Ranking: G5 S5

State/Federal Status: None.

Photo by R. B. Forbes  
Sevilleta LTR Data, [sevilleta.unm.edu](http://sevilleta.unm.edu)

**Phenology:** Mating occurs shortly after emerging from hibernation in late-May and April with birthing occurring in late-May and early-June. Pups will appear above ground in July.



*Gunnison's prairie dog distribution in Colorado (from Fitzgerald et al. 1994)*

**Global Range:** Gunnison's prairie dogs inhabit the montane valleys and high plateaus of the "Four Corners" area of Colorado, Utah, Arizona, and New Mexico, where they occur at elevations from 6,000 to 12,000 ft (1,830 to 3,660 m) (Pizzimenti and Hoffmann 1973). In many parts of their range pronounced physical barriers such as rivers and mountain ranges limit their distribution. *Cynomys gunnisoni zuniensis* occurs in parts of all four states, but *C. g. gunnisoni* occurs only from central Colorado through north-central New Mexico (Pizzimenti and Hoffmann 1973).

**State Range:** Gunnison's prairie dogs occupy southwestern Colorado and the valleys in the central and south-central Rocky Mountains within the state. South Park, Colorado marks the northern limit of the range of Gunnison's prairie dog (Pizzimenti and Hoffmann 1973).

**Habitat Comments:** Suitable habitat for Gunnison's prairie dogs includes grasslands and semidesert and montane shrublands (Fitzgerald et al. 1994). Flat or gently-rolling terrain with friable soils (to allow excavation of burrow systems) is preferred. The presence of prairie dog towns greatly increases the biological diversity of prairie ecosystems by providing vertical structure (the burrows and mounds), which affords sites for vertebrates and invertebrates to forage, breed, rest, and seek shelter (i.e., Wilcomb 1954, Clark et al. 1982).

**Important Life History Characteristics:** All five species of North American prairie dogs are diurnal, terrestrial, colonially-dwelling herbivores that excavate elaborate burrow systems for shelter and protection from predators (Nowak 1999). Gunnison's prairie dogs differ from the more common and widespread black-tailed prairie dogs (*Cynomys ludovicianus*) in several ways. Gunnison's prairie dogs are smaller-bodied, have a whitish (rather than blackish) tail tip, and hibernate (Pizzimenti and Hoffmann 1973, Rayor et al. 1987, Hoogland 1995). Less social than *C. ludovicianus*, Gunnison's prairie dogs have a relatively limited social behavioral repertoire and less well-developed cohesive behavior (Rayor 1988). Burrow and

mound construction are less complex and colonies are smaller and less densely settled than in black-tailed prairie dogs (Fitzgerald *et al.* 1994). Gunnison's colonies are characterized by the presence of more protective plant cover than colonies of black-tailed prairie dogs because the latter species clips standing vegetation (non-food plants) to enhance detection of approaching predators (King 1955, Fitzgerald *et al.* 1994).

Distribution/Abundance: Gunnison's prairie dog is declining throughout its range, although the extent of the decline is unknown.

Known Threats and Management Issues: Extermination programs (public and private) have targeted Gunnison's prairie dogs for more than 100 years (Pizzimenti and Hoffmann 1973). Classified as a small game species in Colorado, Gunnison's prairie dogs receive no protection from harvest, and so poisoning and shooting campaigns continue unabated. Plague (caused by the bacillus *Yersinia pestis* and transmitted by fleas) historically has greatly influenced the distribution of this species in Colorado (Lechleitner *et al.* 1962, 1968; Rayor 1985, Fitzgerald *et al.* 1994) and will likely continue to do so. As in the past, however, the greatest threats to the Gunnison's prairie dog will come from humans due to real or perceived conflicts with agricultural economics.

Potential Conservation Areas supporting *Cynomys gunnisoni*:

Mill Creek at Pagosa Springs	on page 36
Stollsteimer Creek North	on page 60
Stollsteimer Creek at Capote Lake	on page 235
Squaw Canyon	on page 228
Taylor Canyon at San Juan River	on page 64
The Ant Hill	on page 68

## *Gulo gulo* (Wolverine)

Taxonomy:  
Class: Mammalia  
Order: Carnivora  
Family: Mustelidae  
Genus: *Gulo*

Taxonomic Comments: Some authors (e.g., Hall 1981) have regarded the North American wolverine as a species (*Gulo luscus*) distinct from the Eurasian wolverine (*Gulo gulo*). Most recent accounts (Pasitschniak-Arts and Lariviere 1995) generally treat *luscus* as a subspecies of *Gulo gulo*, following Degerbol (1935) and Kurten and Rausch (1959).

CNHP Ranking: G4 S1

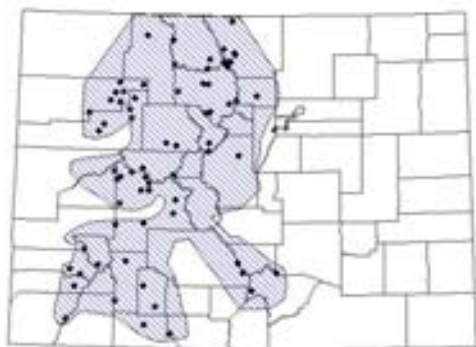
State/Federal Status: Colorado State  
Endangered and Forest Service Sensitive  
Species.



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Phenology: Wolverines are active all year and breeding can take place anytime from late spring until early fall. Delayed implantation of the fertilized egg delays the onset fetal development until January or February. Young are usually born in March or April.

Global Range: Historically, the wolverine ranged from central Colorado and northeastern Utah across the Rockies into Canada and Alaska.



State Range: In Colorado, recent reports of this species are restricted to the central mountains of the Park and Gore ranges south to the San Juans (Fitzgerald et al. 1994). Colorado mountain habitats represent the extreme southernmost edge of the species' historic and present range.

Habitat Comments: Wolverines are animals of boreal forests and tundra and prefer marshy areas such as the lowland spruce forests that support extensive wetlands (Fitzgerald et al. 1994).

### *Colorado Distribution*

Important Life History Characteristics: Wolverines are mostly nocturnal and active year round. They are typically solitary, with pairing occurring only during the brief mating season. Home ranges for the wolverine vary from 94 to 288 km<sup>2</sup> for females, and 422 to 666 km<sup>2</sup> for males (Fitzgerald et al. 1994).

Distribution/Abundance: The wolverine is widespread in northern Canada and Alaska, where populations probably are in good condition. Total population size is unknown but probably in the hundreds of thousands. Substantial populations occur in northern Canada and Alaska and in British Columbia the population was estimated at 5,000 to 8,000 individuals (Munro and Jackson 1979 [1980?]). Outside of Alaska, Montana has the largest population in the U.S. (Wilson 1982).

Known Threats and Management Issues: The status of the wolverine is due to the critically low number of occurrences, lack of verifiable records, low population density in any remaining pockets of habitat, and habitat fragmentation by roads (Fitzgerald et al. 1994).

Potential Conservation Areas supporting *Gulo gulo*:

Wolverines are nomadic animals with large home ranges and creating PCAs for such an animal is impractical and uninformative. Wolverine may occur at any of a number of forested PCAs in the project area that are remote and with little human activity, including, but not limited to the following PCAs:

Cimarrona Creek	on page 137
East Fork Park	on page 146
Navajo River	on page 175
Piedra Forks Site	on page 219
Quartz Creek Trail	on page 225
Williams Creek Trail	on page 242
Upper Mosca Creek	on page 189

## *Lynx Canadensis* (Lynx)

Taxonomy:  
Class: Mammalia  
Order: Carnivora  
Family: Felidae  
Genus: Lynx

Taxonomic Comments: The lynx is placed in genus *Felis* by some authors. Some authors regard *L. lynx canadensis*, and *L. lynx pardinus* as conspecific (see Tumlison 1987). Jones et al. (1992) treated *L. Canadensis* and *L. lynx* as conspecific. Wozencraft (in Wilson and Reeder 1993) listed *Canadensis*, *lynx*, and *pardinus* as separate species.



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CNHP Ranking: G5 S1

State/Federal Status: State of Colorado Endangered, Forest Service Sensitive and Federally Listed



*Colorado Distribution*

Global Range: Historically, the lynx ranged from Oregon across the U.S. to northern Virginia and Delaware and throughout the continent to the north (Fitzgerald et al. 1994).

State Range: Since 1999 the Colorado Division of Wildlife has released 140 Lynx into southwestern Colorado in an attempt to reestablish the species in the state (CDOW 2003a). In spring 2003, breeding was verified for the first time within this introduced population. Five females produced a total of 14 kittens during the 2003 denning season (CDOW 2003b).

Excluding the introduced population in

southwestern Colorado, no definitive data exist concerning the population status of this species in the state. However, studies indicate that existing records may represent sporadic populations based more upon wandering and dispersing individuals rather than viable, long-term populations (Ruggiero 1994; Halfpenny et al. 1980).

Habitat Comments: Northern coniferous forests are the preferred habitat of the lynx. Uneven-aged stands with relatively open canopies and well-developed understories form good habitat for the snowshoe hare, which is the lynx's primary prey (Fitzgerald et al. 1994). Studies of lynx in Colorado suggest a preference for dense spruce-fir stands in association with rock outcrops and large boulders (Fitzgerald et al. 1994).

Important Life History Characteristics: Lynx breed in March, April, or May in Canada and Alaska. The single annual litter contains an average of three young. Females raise the litter and the young disperse in the fall or the following spring. Lynx mortality appears to be primarily due to loss of kittens during cycles of low snowshoe hare availability (Fitzgerald et al. 1994).

Distribution/Abundance: The lynx is wide ranging in northern North America and has declined in some areas, but apparently lynx are still widespread and relatively abundant in most of their historic range. Population data are lacking for many areas and habitat loss, fragmentation and susceptibility to overharvest

are the major concerns. In the contiguous United States, the overall numbers and range are substantially reduced from historical levels. At present, numbers have not recovered from overexploitation by both regulated and unregulated harvest that occurred in the 1970s and 1980s. Forest management practices that result in the loss of diverse age structure, fragmentation, roading, urbanization, agriculture, recreational developments, and unnatural fire frequencies have altered suitable habitat in many areas. As a result, many states may have insufficient habitat quality and/or quantity to sustain lynx or their prey. Human access into habitat has increased dramatically over the last few decades contributing to direct and indirect mortality and displacement from suitable habitat. Although legal take is highly restricted, existing regulatory mechanisms may be inadequate to protect small, remnant populations or to conserve habitat. Competition with bobcats and coyotes may be a concern in some areas.

**Known Threats and Management Issues:** The lynx is considered globally secure but critically imperiled in Colorado due to an extremely small population size, few occurrences, and significant threats including habitat fragmentation, increased backcountry access by humans and habitat conversions.

**Potential Conservation Areas supporting *Lynx canadensis*:**

Lynx are nomadic animals with large home ranges and creating PCAs for such an animal is impractical and uninformative. Lynx may occur at any of a number of forested PCAs (particularly those PCAs in the spruce-fir zone) in the project area that are remote and with little human activity, including, but not limited to the following PCAs:

Cimarrona Creek	on page 137
East Fork Park	on page 146
Navajo River	on page 175
Piedra Forks Site	on page 219
Quartz Creek Trail	on page 225
Williams Creek Trail	on page 242
Upper Mosca Creek	on page 189

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## Appendix. Known Natural Heritage Elements in El Paso County.

Elements are listed in alphabetical order.

Element Scientific Name	Element Common Name	GRank	SRank
<b>Plants</b>			
<i>Astragalus iodopetalus</i>	A milkvetch	G2	S1
<i>Astragalus missouriensis</i> var. <i>humistrata</i>	Missouri milkvetch	G4T2	S1?
<i>Astragalus proximus</i>	Aztec milkvetch	G4	S2
<i>Botrychium echo</i>	Reflected moonwort	G2	S2
<i>Botrychium hesperium</i>	Western moonwort	G3	S2
<i>Botrychium minganense</i>	Mingan moonwort	G4	S1
<i>Botrychium pinnatum</i>	Northern moonwort	G4?	S1
<i>Carex retrorsa</i>	Retorse sedge	G5	S1
<i>Castilleja lineata</i>	Marsh-meadow Indian paintbrush	G4?	S1
<i>Cryptogramma stelleri</i>	Slender rock-brake	G5	S2
<i>Draba smithii</i>	Smith whitlow-grass	G2	S2
<i>Draba spectabilis</i> var. <i>oxyloba</i>	Showy whitlow-grass	G3?T3Q	S3
<i>Epipactis gigantea</i>	Giant helleborine	G3	S2
<i>Hippochaete variegatum</i>	Variegated horse-tail	G5T5	S1
<i>Erigeron philadelphicus</i>	Philadelphia fleabane	G5	S1
<i>Ipomopsis polyantha</i>	Pagosa gilia	G1	S1
<i>Lesquerella pruinosa</i>	Frosty bladderpod	G2	S2
<i>Limnorchis ensifolia</i>	Canyon bog orchid	G4G5T4?	S3
<i>Phlox caryophylla</i>	Pagosa phlox	G4	S3
<i>Polypodium hesperium</i>	Western polypody	G5	S1S2
<i>Townsendia glabella</i>	Gray's townsend-daisy	G2?	S2?
<i>Viola pedatifida</i>	Prairie violet	G5	S2
<i>Woodsia neomexicana</i>	New Mexico cliff fern	G4?	S2
<b>Plant Communities</b>			
<i>Abies lasiocarpa</i> - <i>Picea puigens</i> - <i>Populus angustifolia</i> / <i>Acer glabrum</i>	Montane riparian forest	G2	S2
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Alnus incana</i>	Montane riparian forest	G5	S5
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Mertensia ciliata</i>	Montane riparian forest	G5	S5
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Ribes</i> spp.	Coniferous wetland forests	G5	S3
<i>Abies lasiocarpa</i> - <i>Picea engelmannii</i> / <i>Salix drummondiana</i>	Montane riparian forest	G5	S4
<i>Acer negundo</i> / <i>Cornus sericea</i>	Montane riparian deciduous forest	G3?	S2
<i>Acer negundo</i> - <i>Populus angustifolia</i> / <i>Cornus sericea</i>	Narrowleaf cottonwood riparian forests	G2	S2
<i>Alnus incana</i> / <i>Mesic forb</i>	Thinleaf alder/mesic forb riparian shrubland	G3	S3
<i>Alnus incana</i> / <i>Mesic graminoid</i>	Montane riparian shrubland	G3	S3

Plant Communities (cont.)			
<i>Alnus incana</i> -Mixed <i>Salix</i> species	Thinleaf alder –mixed willow species	G3	S3
<i>Alnus incana</i> - <i>Salix drummondiana</i>	Montane riparian shrubland	G3	S3
<i>Caltha leptosepala</i>	Montane wet meadows	G4	S4
<i>Cardamine cordifolia</i> - <i>Mertensia ciliata</i> - <i>Senecio triangularis</i>	Alpine wetlands	G4	S4
<i>Carex aquatilis</i> - <i>Carex utriculata</i>	Montane wet meadows	G4	S4
<i>Carex utriculata</i>	Beaked sedge-montane wet meadows	G5	S4
<i>Carex vernaculata</i>	Alpine wetlands	G1	S1
<i>Danthonia parryi</i>	Montane grassland	G3	S3
<i>Festuca arizonica</i> - <i>Muhlenbergia montana</i>	Montane grassland	G3	S2
<i>Picea pungens</i> / <i>Alnus incana</i>	Montane riparian forests	G3	S3
<i>Pinus ponderosa</i> / <i>Festuca arizonica</i> phase <i>Danthonia parryi</i>	Lower montane forests	GU	S?
<i>Populus angustifolia</i> / <i>Alnus incana</i>	Montane riparian forests	G3	S3
<i>Populus angustifolia</i> / <i>Cornus sericea</i>	Cottonwood riparian forest	G4	S3
<i>Populus angustifolia</i> / <i>Crataegus rivularis</i>	Narrowleaf cottonwood riparian forests	G2?	S2?
<i>Populus angustifolia</i> / <i>Rhus trilobata</i>	Narrowleaf cottonwood/skunkbrush	G3	S3
<i>Populus angustifolia</i> / <i>Salix eriocephala</i> var. <i>ligulifolia</i> - <i>Shepherdia argentea</i>	Narrowleaf cottonwood riparian forests	G1	S1
<i>Populus angustifolia</i> - <i>Juniperus scopulorum</i>	Montane riparian forests	G2G3	S2
<i>Populus angustifolia</i> - <i>Picea pungens</i> / <i>Alnus incana</i>	Montane riparian forests	G3	S4
<i>Populus angustifolia</i> - <i>Pseudotsuga mensiezii</i>	Montane riparian forests	G3	S2
<i>Populus tremuloides</i> / <i>Alnus incana</i>	Montane riparian forests	G3	S3
<i>Populus tremuloides</i> / <i>Cornus sericea</i>	Montane riparian forests	G4	S2S3
<i>Populus tremuloides</i> /tall forbs	Montane aspen forest	G5	S5
<i>Pseudotsuga mensiezii</i> / <i>Acer glabrum</i>	Lower Montane Forest	G4?	S1
<i>Quercus gambelii</i> / <i>Symphoricarpos oreophilus</i>	Mixed montane shrublands	G5	S3S4
<i>Salix bebbiana</i>	Montane willow carrs	G3?	S2
<i>Salix drummondiana</i> / <i>Calamagrostis canadensis</i>	Lower montane willow carrs	G3	S3

Plant Communities (cont.)			
<i>Salix drummondiana/Carex utriculata</i>	Montane willow carr	G4	S3
<i>Salix drummondiana /mesic forb</i>	Drummonds willow/mesic forb	G4	S4
<i>Salix eriocephala</i> var <i>ligulifolia-Salix exigua</i>	Strapleaf willow-coyote willow	G2G3	S2S3
<i>Salix exigua/mesic graminoid</i>	Coyote willow/mesic graminoid	G5	S5
<i>Salix monticola/mesic forb</i>	Montane riparian willow carr	G3	S3
<i>Salix monticola/mesic graminoid</i>	Montane riparian willow carr	G3	S3
<i>Salix planifolia/Caltha leptosepala</i>	Subalpine riparian willow carr	G4	S4
<i>Salix planifolia/mesic forbs</i>	Planeleaf willow/mesic forbs	G4	S4
<i>Shepherdia argentea</i>	Foothills riparian shrubland	G3G4	S1
Insects			
<i>Speyeria nokomis nokomis</i>	Nokomis fritillary	G3T1	S1
Fish			
<i>Gila pandora</i>	Rio Grande chub	G3	S1?
<i>Gila robusta</i>	Roundtail chub	G3	S2
<i>Oncorhynchus clarki pleuriticus</i>	Colorado River cutthroat trout	G4T3	S3
<i>Oncorhynchus clarki virginalis</i>	Rio Grande cutthroat trout	G4T3	S3
Amphibians			
<i>Rana pipiens</i>	Northern leopard frog	G5	S3
Reptiles			
<i>Chrysemys picta</i>	Painted turtle	G5	S5
Birds			
<i>Accipite gentilis</i>	Northern Goshawk	G5	S2B, SZN
<i>Aegolius funereus</i>	Boreal Owl	G5	S2
<i>Cypseloides niger</i>	Black Swift	G4	S3B
<i>Dendroica graciae</i>	Grace's Warbler	G5	S3B,SZN
<i>Empidonax traillii</i>	Willow Flycatcher	G5	S4
<i>Falco peregrinus anatum</i>	American Peregrine Falcon	G4T3	S2B,SZN
<i>Haliaeetus leucocephalus</i>	Bald Eagle	G4	S1B,S3N
Mammals			
<i>Cynomys gunnisoni</i>	Gunnison's prairie dog	G5	S5
<i>Gulo gulo</i>	Wolverine	G4	S1
<i>Lontras Canadensis</i>	Northern river otter	G5	S3S4
<i>Lynx canadensis</i>	Lynx	G5	S1

\*The American Ornithologist's Union (AOU) recognizes common names as the official name for the species, thus common names are capitalized.