

Survey of Critical Biological Resources of Pueblo County, Colorado



**Colorado Natural Heritage Program
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**Colorado
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Knowledge to Go Places

Survey of Critical Biological Resources of Pueblo County, Colorado

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May 2003

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USER'S GUIDE

The *Survey of Critical Biological Resources of Pueblo County* was conducted one year after the *Survey of Critical Wetland and Riparian Areas in El Paso and Pueblo Counties*. The projects, both conducted by the Colorado Natural Heritage Program, are two distinct projects that are highly integrated with respect to methodology and fieldwork. Both projects utilized the same Natural Heritage methodology that is used throughout the globe, and both searched for and assessed the plants, animals, and plant communities on the Colorado Natural Heritage Program's list of rare and imperiled elements of biodiversity. Each report prioritizes potential conservation areas based on the relative significance of the biodiversity they support and the urgency for protection of the site. All information explaining Natural Heritage methodology and ranks is repeated in each report, so that each report can stand alone and be used independently of the other.

This report, *Survey of Critical Biological Resources of Pueblo County*, presents *all* potential conservation areas identified in Pueblo County that support rare and imperiled plants, animals, and significant plant communities, including wetland and riparian areas. The *Survey of Critical Wetland and Riparian Areas in El Paso and Pueblo Counties* presents results of surveys within wetland and riparian areas in both Pueblo and El Paso counties. The wetland and riparian report differs from the more comprehensive Pueblo County report in that it includes wetlands and riparian areas in El Paso County, and includes an assessment of the restoration potential and the wetland functions performed at each site that was surveyed. Functional assessments are intended to provide the user with a more complete picture of the value wetlands and riparian areas provide to El Paso and Pueblo county residents. To obtain a copy of the *Survey of Critical Wetland and Riparian Areas in El Paso and Pueblo Counties*, please contact the Colorado Natural Heritage Program.

ACKNOWLEDGEMENTS

Financial support for this study was provided by the Great Outdoors Colorado Trust Fund (GOCO), the David and Lucile Packard Foundation, Pueblo County, the City of Pueblo, and the Bureau of Land Management (BLM). We greatly appreciate the support and assistance of Joan Armstrong, Matt Sturgeon, Kim B. Headley, and Ann Cotton of the Pueblo County Planning Department, Scott Hobson with the city of Pueblo, Mary Gunn with the Packard Foundation, and Erik Brekke with the BLM.

This project would not have been possible without the help of many dedicated individuals. We appreciate the support of the Pueblo County Commissioners and Planning Department. We express our sincere appreciation to the private landowners who allowed us to survey their properties and shared their rich history of the land. We were welcomed onto many ranches and truly enjoyed spending time with and learning from these generous land stewards. Special thanks to Gary and Georgia Walker, and the Thatcher, Hudson, Hobson, and Blake ranches for allowing us to survey their lands. Colorado Division of Wildlife provided expertise on the wide range of wildlife species in the County. Gary Dowler and Jim Melby, Division of Wildlife Aquatic Biologists provided information on the native fishes. Land managers, including Max Canestorp of Pueblo Chemical Depot and Duke Phillips of the Chico Basin Ranch were very helpful in allowing us repeated access to their properties and providing valuable local insight. Steve Kettler and Julie Farrell of the southeastern office of The Nature Conservancy provided much appreciated support in countless ways; sharing of local expertise, discussing ecology, and providing lodging at the Bohart Ranch. Tass Kelso, professor of Botany at Colorado College, provided many leads on locations of botanically and ecologically interesting areas in the County and generously shared her expertise. Rich Rhodes of the Natural Resources Conservation Service and Scott Cotton of Pueblo County Colorado State University Extension Service were extremely helpful in getting us oriented to the County. Laurie and Greg Clark provided an excellent camping location, which assisted greatly with our fieldwork.

Our staff in Fort Collins, including Jodi Peterson, Renée Rondeau, Jodie Bell, Jeremy Siemers, Jill Handwerk, Amy Lavender, Alison Loar, and Tara Santi, all worked with us patiently.

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EXECUTIVE SUMMARY

Citizens of Pueblo County are concerned about issues of open space, wildlife habitat, and conservation of their unique natural surroundings. They recognize the need to plan for the conservation of the plants, animals and plant communities that are native to Pueblo County. They also recognize that with limited resources, it is important to prioritize their conservation efforts. The need for information on the locations of the most significant biological resources of the area is urgent. In 2000, the Colorado Natural Heritage Program (CNHP), in cooperation with Pueblo County Planning Department, proposed to GOCO to survey for critical biological resources of Pueblo County. The goal of the project was to identify the localities of rare, threatened, or endangered species and the locations of significant natural plant communities. This study complements the *Survey of Critical Wetland and Riparian Areas in El Paso and Pueblo Counties* that was conducted by CNHP in 2000.

This project complements and supports at least two other local projects: the Pueblo Natural Resource and Environmental Education Strategic Plan (PNREESP) and the Arkansas River Legacy Project. The PNREESP document resulted in the creation of the Pueblo Natural Resource and Environmental Education Council (PNREEC), which meets monthly to implement the PNREESP. Biological data provided by this project will assist this council with prioritizing future projects. The Arkansas River Project will incorporate wildlife habitat restoration, open space, recreation, and environmental education projects identified along the Arkansas River, and this project will provide valuable data for that planning effort. This project will also provide valuable data to the Wet Mountain Open Space Coalition and Pueblo Beautiful Association—two local groups interested in land trusts and land conservation. Pueblo County recently adopted Planned Unit Development regulations and is currently preparing cluster development regulations. This report will provide assistance in discussions regarding which lands warrant preservation from a biological resource standpoint.

Field surveys were conducted September through November of 2001 and May through November 2002. Survey locations were identified by: (1) examining existing biological data for rare or imperiled plant and animal species and significant plant communities (collectively called **elements**) from the Colorado Natural Heritage Program's database, (2) accumulating additional existing information on these elements and, (3) conducting field surveys. Areas that were found to contain significant elements were delineated as "Potential Conservation Areas." These areas were prioritized by their biological urgency (the most rare or imperiled) and their ability to maintain viable populations of the elements (degree of threat).

Results of the survey confirm that Pueblo County contains areas with high biological significance that support a wide variety of plants, animals, and plant communities. At least 27 plant communities, 18 plants, and 22 animals (4 mammal, 6 bird, 3 fish, 3 reptiles, 1 amphibian, and 5 invertebrate species) from the CNHP list of rare and imperiled plants, animals, and plant communities are known to occur in Pueblo County.

Thirty-three sites of biodiversity significance are profiled in this report as Potential Conservation Areas (PCAs). CNHP believes these sites include those areas that most merit conservation efforts, while emphasizing that protecting only these sites will, in no way, adequately protect all the values associated with Pueblo County. Despite the best efforts, it is likely that some elements that are present were not documented during the survey due to either lack of access, phenology (reproductive timing) of species, or time constraints. Future surveys will almost certainly locate additional biologically significant areas, especially in undersurveyed areas such as USFS lands and Fort Carson. The delineation of PCA boundaries in this report does not confer any regulatory protection on recommended areas. They are intended to be used to support wise planning and decision making for the conservation of these significant areas.

All of the Potential Conservation Areas presented in this report represent unique opportunities for Pueblo County to conserve significant components of its natural heritage, and each is worthy of conservation attention. However, some areas of the county stand out on a statewide or global scale, either because the species present are extremely rare and localized in their distribution, or because a suite of significant species and communities co-occur in a high quality landscape setting. These areas are: the rare plant concentration west of the City of Pueblo, the shortgrass prairie/wetland complex in northeastern Pueblo County; and the prairie canyon landscape in southeastern Pueblo County.

Of the 33 PCAs, we identified two of **outstanding significance** (B1), 11 of **very high significance** (B2), seven of **high significance** (B3), seven of **moderate significance** (B4), and six of **general significance** (B5). Overall, the concentration and quality of imperiled elements and habitats attest to the fact that conservation efforts in Pueblo County will have both state and global significance.

The results of the survey will be provided to the County in GIS format and will be available to the public on the CNHP website (<http://www.cnhp.colostate.edu>).

INTRODUCTION

Pueblo County is home to a vast array of plants, animals and plant communities, but the numbers and diversity of these organisms is not fully understood. Landowners, local and state governments, and federal agencies, particularly in rapidly growing parts of the state, are expressing a desire to better understand their natural heritage resources. The Colorado Natural Heritage Program (CNHP) approached this project with the intent of addressing this need.

This survey of critical biological resources of Pueblo County is a part of an ongoing biological inventory of Colorado counties by CNHP. To date, similar inventories have been conducted in all or parts of 22 Colorado counties.

The primary objective of this project was to identify biologically significant areas within Pueblo County, with an emphasis on private lands. The *Survey of Critical Biological Resources in Pueblo County* used the methods that are used worldwide throughout Natural Heritage Programs and Conservation Data Centers. The primary focus was to identify the locations of the plant and animal populations and plant communities on CNHP's list of rare and imperiled elements of biodiversity, assess their conservation value, and systematically prioritize these for conservation action.

The locations of biologically significant areas were identified by:

- Examining existing biological data for rare or imperiled plant and animal species and significant plant communities (collectively called **elements**);
- Accumulating additional existing information (e.g., interviews of local experts)
- Conducting extensive field surveys.

Locations in the county with natural heritage significance (those places where elements have been documented) are presented in this report as potential conservation areas (PCAs). The goal is to identify a land area that can provide the habitat and ecological needs upon which a particular element or suite of elements depends for their continued existence. The best available knowledge of each species' life history is used in conjunction with information about topographic, geomorphic, and hydrologic features, vegetative cover, and current and potential land uses to delineate PCA boundaries.

The PCA boundaries delineated in this report do not confer any regulatory protection of the site, nor do they automatically recommend exclusion of all activity.

It is hypothesized that some activities will prove degrading to the element(s) or the ecological processes on which they depend, while others will not. The boundaries represent the best professional estimate of the primary area supporting the long-term survival of the targeted species or plant communities and are presented for planning purposes. They delineate ecologically sensitive areas where land-use practices should be carefully planned and managed to ensure that they are compatible with protection of natural heritage resources and sensitive species. Please note that these boundaries are based primarily on our understanding of the ecological systems. A thorough analysis of

the human context and potential stresses was not conducted. All land within the conservation planning boundary should be considered an integral part of a complex economic, social, and ecological landscape that requires wise land-use planning at all levels.

CNHP uses the Heritage Ranking Methodology to prioritize conservation actions by identifying those areas that have the greatest chance of conservation success for the most imperiled elements. The sites are prioritized according to their **biodiversity significance rank**, or “B-rank,” which ranges from B1 (outstanding significance) to B5 (general or statewide significance). These ranks are based on the conservation (imperilment or rarity) ranks for each element and the element occurrence ranks (quality rank) for that particular location. Therefore, the highest quality occurrences (those with the greatest likelihood of long-term survival) of the most imperiled elements are the highest priority (receive the highest B-rank). See the section on Natural Heritage Ranking System for more details. The B1-B3 sites are the highest priorities for conservation actions. Based on current knowledge, the sites in this report represent the area CNHP recommends for protection in order to preserve the natural heritage of Pueblo County.

CONSERVATION ASSESSMENT

Significant Landscapes in Pueblo County

All of the Potential Conservation Areas presented in this report represent unique opportunities for Pueblo County to conserve significant components of its natural heritage, and each is worthy of conservation attention. However, some areas of the county stand out on a statewide or global scale, either because the species present are extremely rare and localized in their distribution, or because a suite of significant species and communities co-occur in a high quality landscape setting. These areas are: the rare plant concentration west of the City of Pueblo, the shortgrass prairie/wetland complex in northeastern Pueblo County; and the prairie canyon landscape in southeastern Pueblo County.

Rare Plant Concentration Area

The rare plant concentration area is west of the City of Pueblo, roughly between Highway 96 and Fort Carson, from Pueblo West to the county line. PCAs included in this area are Pumpkin Hollow, Pueblo State Wildlife Area, Red Creek, and Beaver Creek. While some of these PCAs contain additional natural heritage values, they are most significant for the suite of globally rare plants that occur in this area. This section of Pueblo County, and extending west to Fremont County, supports the only known populations of three plant species: the round leaf four-o'clock, the golden blazing star, and the Pueblo goldenweed. Two other globally rare plants, the Arkansas River feverfew and the Arkansas Valley evening primrose, have significant portions of their global distribution in this area as well.

Because these plants (with the exception of the Arkansas River feverfew and the Arkansas Valley evening primrose) are only known to occur in Pueblo and Fremont counties, and nowhere else in the world, activities in Pueblo County can have significant influence over whether or not these species remain in existence. Primary issues related to conservation of these plants include residential development, limestone mining, and roadwork. In addition, if Pueblo Reservoir were to undergo future expansion, potential habitat and existing plants would be destroyed.

Protection of habitat on private lands from permanent conversion (e.g., residential development) and extreme surface disturbance (e.g., limestone mining) will be the most effective conservation strategy to ensure that populations of these species remain viable in perpetuity. Existing populations on private lands are in generally good condition, and traditional land uses such as grazing are thought to be compatible with conservation of the plants. If land protection through conservation easement, purchase/transfer of development rights, or other incentives could be used to support local landowners in their efforts to maintain the existing landscape, the rare plants would benefit.

On public lands, appropriate maintenance of transportation right-of-ways and management of recreation would be important contributions to the protection of these plants. The Colorado Department of Transportation (CDOT) is aware of the significance of state highway right-of-ways to these plants, and plans are underway to employ best management practices along state and federal highways in the area. Similar efforts by the County to govern maintenance of local roads would be useful. In addition, careful planning to direct hiking, ORV use, fishing, and camping at the Pueblo State Wildlife Area and Pueblo State Recreation Area would benefit the rare plants.

Shortgrass Prairie/Wetland Complex

The shortgrass prairie/wetland complex occurs in northeastern Pueblo County, east of I-25 and north of Highway 50. PCAs included in this area are Chico Basin Shortgrass Prairie, Buffalograss Playas, Signal Rock Sandhills, Chico Creek, Boone Creek, Haynes Creek, Highland Road, Edison Road, and Midway Prairie. This area includes extensive, contiguous tracts of native shortgrass prairie, along with high quality low-elevation riparian/wetland areas, and an exemplary occurrence of sandsage prairie. The large acreage and wide range of wetland community types found in this landscape are unique for Colorado's shortgrass prairie. The most significant species in this area is the Mountain Plover, a bird that is currently proposed for listing as Threatened under the Endangered Species Act. In addition, this landscape mosaic supports several other rare or declining prairie species, including Ferruginous Hawk, Burrowing Owl, Long-billed Curlew, Arkansas darter, black-tailed prairie dog, swift fox, and massasauga rattlesnake.

Much of this area is publicly owned land that includes Pueblo Chemical Depot and the Department of Transportation Test Track, as well as large holdings of the Colorado State Land Board. Most of the land in this area, including both public and private land, is used primarily for livestock grazing. The most important issues relative to conservation of the species and plant communities in this area include increasing pressure from residential development in some areas and future disposition of Pueblo Chemical Depot once this installation is decommissioned. A longer-term issue is the possibility of the State Land Board selling the property to maximize their return on the land. Increases in land value resulting from growth of Colorado Springs may cause this to be a real concern in the future.

This area is relatively unfragmented compared to many other parts of the county. Although subdivision in 35-acre parcels has occurred in some places, most parcels are quite large and under similar management (i.e., grazing). Although the ownership pattern is variable, the area effectively functions as a single, large prairie landscape. Maintaining large, essentially unbroken tracts of grazing land will be the most effective strategy for long-term conservation of this native prairie. Ideally, rangeland would consist of a mixed grass/short grass mosaic that is free from tilling and seeding with exotic grasses. The use of varying grazing regimes (heavy, moderate, light) would help maintain a shifting mosaic more closely resembling historic vegetation patterns (i.e., a continuum of habitat types from tall grass to bare ground).

Continuing the existing management of publicly owned lands, in combination with incentives to support continued ranching operations on private land, will be important to the viability of significant prairie species. This is particularly true of the Mountain Plover (requires heavily grazed habitat) and the Ferruginous Hawk (very sensitive to human disturbance). If protection of this prairie ecosystem is a goal of Pueblo County and its citizens, additional expansion of residential development and roadways should be avoided to the maximum extent practicable.

Prairie Canyon Landscape

The prairie canyon landscape occurs in southeastern Pueblo County, and generally includes the area of the historic Vigil St. Vrain land grant. PCAs in this area include Vigil and St. Vrain, Huerfano River at Cedarwood, Madden Canyon, and Flying A Road. This landscape is quintessential prairie – large, intact expanses of shortgrass punctuated with juniper breaks and dissecting canyons that were formed by the Huerfano and Cucharas Rivers and other smaller streams. The entire area is very scenic, and supports abundant wildlife, including elk, both whitetail and mule deer, pronghorn antelope, swift fox and red fox, coyote, mountain lion, and bear. In addition, the globally rare Colorado triploid checkered whiptail is found here. This small reptile is endemic to Colorado, with its known worldwide distribution limited to Pueblo, Fremont, Otero, and Las Animas counties. We estimate that there are fewer than five locations in Colorado that support this unique system on a scale comparable (in terms of both size and quality) to this portion of Pueblo County.

This landscape consists primarily of large private ranches in the southern portion, and a mix of state and private lands in the eastern portion. Overall, the ownership pattern is comparatively simple. Subdivision has occurred throughout the lands to the north and west of this area, but much of the subdivided land has yet to be built out. Expansion of residential development from the west may be slowed somewhat by the presence of the railroad. Future residential development pressure may be more likely to expand into this area from the north. The most likely limiting factor on actual build-out of these adjacent subdivisions may be availability of well permits. Meanwhile, much of this landscape is fairly remote in terms of currently developing urban/suburban/exurban areas. With the exception of some weed infestation and grazing pressure in riparian areas, the overall condition of this landscape is quite good, with upland areas dominated by native species and ecological processes apparently intact.

The primary issue relative to long-term persistence of this landscape mosaic is the potential for future residential development. Although medium-high density residential development does not seem likely in the immediate future, the area may be highly desirable for second home or low-density residential development. As previously noted, the area is very scenic, and adjacent lands have already been subdivided. Maintaining existing patterns of land ownership and land use would be the most effective strategy for long-term maintenance of this landscape. Pueblo County is not likely to have influence over the economics of the ranching industry. However, land protection tools such as

conservation easement, purchase/transfer of development rights, or other incentives could be used to support local landowners in their efforts to maintain the landscape in its current condition.

Potential Impacts to Biodiversity in Pueblo County

General threats that may affect biodiversity on a large, landscape-level scale in Pueblo County are summarized below. More specific information on threats to particular species or sites is presented in the Potential Conservation Area profiles.

Hydrological Modifications

River impoundment in the form of lakes, reservoirs, irrigation ditches, and canals can affect aquatic dependent plants and animals (Chien 1985, Friedman et al. 1998). 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 large tributaries of the Arkansas River, and of many of the smaller tributaries. These periodic floods are necessary for continued viability of most riparian vegetation. For example, many plants, including cottonwood trees, can only reproduce with flooding events (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 impoundment, rivers have also been altered by stream bank stabilization projects (e.g., 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 number of species supported by a manmade pond with

minimal edge habitat is generally less than the number supported by an extensive intact seep and spring wetlands or naturally occurring ponds.

Development

Residential development is increasing in Pueblo County, especially along the I-25 corridor, in the foothills, and along Highway 50. Development creates a number of stresses, including habitat loss and fragmentation, introduction and proliferation of non-native species, fire suppression, and predation and disturbance from domestic animals (dogs and cats) (Oxley et al. 1974, Coleman and Temple 1994). Increasing human density in an area can lead to a change in the composition of wildlife populations (e.g., numbers of foxes and coyotes may increase, or numbers of bird species present may decrease), and may also alter movement patterns and behavior of wildlife. Loss of habitat to development is considered irreversible.

Livestock Grazing

Domestic livestock grazing has been a traditional livelihood in Pueblo County since the late 1800s (Whittemore 1967), and has left a broad and sometimes subtle impact on the landscape. For some prairie species such as the Mountain Plover, properly managed grazing is not only a compatible activity, but is, in fact, considered essential. However, some range management practices can adversely affect the region's biological resources. Many riparian areas in Pueblo County 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 (slight shifts in species composition) to severe and essentially irreversible (extensive gullying, introduction of non-native forage 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). The Forest Service monitors logging closely; nonetheless, problems can still occur.

Recreation

Recreation, once very local and perhaps even unnoticeable, is increasing and becoming a potential threat to natural ecosystems in Pueblo County. Different types of recreation (e.g., motorized versus non-motorized activities) typically have different effects on ecosystem processes. ATV's 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. ATV's have also been identified as a vector for the invasion of non-native plant species.

Non-motorized recreation, mostly hikers but also some mountain biking and rock climbing, presents a different set of issues (Cole and Knight 1990; Knight and Cole 1991; Miller et al. 1998, 2001). Wildlife behavior can be significantly altered by repeat visits of hikers/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 Pueblo County due primarily to livestock activities and residential developments. Expansion of the existing road network in some areas will detrimentally affect the natural heritage values 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 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 alter landscape spatial patterns and inhibit important interior species (Forman and Alexander 1998).

Effects on wildlife can be attributed to road avoidance (a species avoids crossing a road) and occasionally 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). Some of the rare plants documented in Pueblo County grow along roadsides, and are therefore subject to direct deleterious impacts from road construction and maintenance.

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 essentially dominate a previously natural area (e.g., 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 changes into another type of habitat (e.g., edge of a conifer forest adjacent to a meadow) (Forman & Godron 1986). Edges are often created by naturally occurring processes such as floods, fires, and wind and will recover naturally over time. Edges can also be created by human activities such as roads, timber harvesting, agricultural practices, and rangeland management. Human induced 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 (e.g., large mammals or migratory waterbirds).

Conservation Strategies

Conservation strategies can be classified as three major types:

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

The first necessary step, identification of the significant elements of biodiversity in the county, and their locations, has been taken with this survey. The next step is to use this information to conserve these elements and sites. Specific protection and management needs are addressed under the descriptions of individual PCAs. However, some general recommendations for conservation of biological diversity in Pueblo County are given here:

1. Develop and implement a plan for protecting the Potential Conservation Areas profiled in this report, with most attention directed toward sites with biodiversity rank (B-rank) B1, B2 and B3. The sites in this report provide a basic framework for implementing a comprehensive conservation program. The B1, B2 and B3 sites, because they have global significance, are in need of priority attention. Consider incentive-based programs such as purchasing development rights or outright purchase from willing owners of land for significant sites that are in need of protection. Support local organizations, such as land trusts, in purchasing or acquiring conservation easements for

protection of biological diversity or open space. Explore opportunities to form partnerships to access state and federal funding for conservation projects, such as those offered through the Colorado Division of Wildlife or the Farm Bill. Continue to promote cooperation among local entities to preserve the county's biodiversity.

Pueblo County does not currently have either a county-sponsored open space program, or a county-based land trust. Surveys completed during the county's recent comprehensive planning process indicated a high level of citizen support for open space. However, there is no organized effort underway to create and implement such a program. It is likely that someone within the county, such as a government representative or a private citizen, will need to assume a leadership role and 'lead the charge,' so to speak. Current economics may not support implementation of new taxes for open space within the next few years. Other counties in Colorado with open space programs were not necessarily successful on their first attempt to create their programs. However, sustained and organized efforts can be successful if widely supported by local citizens. Meanwhile, there are statewide or national organizations that could work with interested Pueblo County citizens on land protection projects, including The Nature Conservancy, Colorado Open Lands, American Farmland Trust, Rocky Mountain Elk Foundation, and Colorado Cattleman's Association. There are also private land trusts in neighboring counties that may be willing to work with interested parties in Pueblo County.

2. Use this report in the review of proposed activities in or near Potential Conservation Areas to determine whether or not activities adversely affect elements of biodiversity. All of the areas presented contain natural heritage elements of state or global significance. Also, consider the potential natural heritage values of all other sites for which land use decisions are made, using this report as a guide for values to be considered. Insist on careful assessments of potential damages, including weed invasion and fragmentation.

Certain land use activities in or near a site may affect the element(s) present there. Wetland and riparian areas are particularly susceptible to impacts from off-site activities if the activities affect water quality or hydrologic regimes. In addition, cumulative impacts from many small changes can have effects as profound and far-reaching as one large change. As proposed land use changes within Pueblo County are considered, they should be compared to the maps presented herein. If a proposed project has the potential to impact a site, planning personnel should contact persons, organizations, or agencies with the appropriate biological expertise for input in the planning process. The Colorado Natural Heritage Program routinely conducts site-specific environmental reviews and should be considered a valuable resource. To contact CNHP's Environmental Review Coordinator call 970-491-7331. In addition, one of our key partners, the Colorado Division of Wildlife, should be consulted.

3. Recognize the importance of all natural communities and lands at all elevations. Although much effort in the past has been directed at protecting the most scenic, high elevation areas, the lower elevations, such as shortgrass prairie or shale breaks along the foothills, have received less attention. While the specific sites identified here contain the

known locations of significant elements of natural diversity, protection of large areas in each vegetation type, especially where these are connected, may ensure that we do not lose species that have not yet been located. Work to protect large blocks of land in each of the major vegetation types in the counties, and avoid fragmenting large natural areas unnecessarily with roads, trails, etc. Although large migrating animals like deer and elk are not tracked by CNHP as rare species, they are a part of our natural diversity, and their needs for winter range and protected corridors to food and water should be taken into consideration. Fragmentation of the landscape also affects smaller animals and plants, opening more edge habitats and introducing exotic species. Encourage cluster developments that designate large common areas for preservation of natural communities, as an alternative to scattering residences over the landscape with a house on each 35-acre parcel. Work with developers early in the planning process to educate them about the benefits of retaining natural areas. Locate trails and roads to minimize impacts on native plants and animals. See Forman and Alexander (1998) for an excellent review of the literature on the ecological effects of roads. See *Planning Trails with Wildlife in Mind* published by the State Trails Program (Colorado Department of Natural Resources 1998) for suggestions regarding planning trails with minimum impacts to wildlife.

4. Increase efforts to protect biodiversity, promote cooperation and incentives among landowners, pertinent government agencies, and non-profit conservation organizations, and increase public awareness of the benefits of protecting significant natural areas. Involve all stakeholders in land use planning. The long-term protection of natural diversity in Pueblo County will be facilitated with the cooperation of many 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. Expand public and staff awareness of Pueblo County's natural heritage and its need for protection by providing community education and forums where protection of our natural heritage is discussed.

5. Promote wise management of the biodiversity resources that exist within Pueblo County, recognizing that delineation of potential conservation areas does not by itself provide protection of the plants, animals, and plant communities. Development of a site-specific conservation plan is a necessary component of the long-term protection of a Potential Conservation Area. Because some of the most serious impacts to Pueblo County's ecosystems are at a large scale (e.g., 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 the Colorado Natural Heritage Program, the Colorado Division of Wildlife, 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 continue to decline if not given appropriate protection. Increasing the public's knowledge of the remaining significant areas will build support for the initiatives necessary to protect them, and allow proactive planning. Encourage good management by supporting incentives to

landowners for improvements such as fencing riparian areas, controlling weeds, and restoring wildlife habitat.

6. Stay informed and involved in public land management decisions. About 15% of Pueblo County is managed by the State Land Board, with an additional 3% managed by the U.S. Forest Service and Bureau of Land Management. Many of the sites identified here are on public land that may be protected from development, but not from incompatible uses. Even ownership is not always secure, since the federal and state agencies are becoming more and more involved in land exchanges. Encourage protection for the most biologically significant sites on public lands by implementation of compatible management designated in Forest Management Plans, Grazing Management Plans, etc.

7. Continue inventories and monitoring where necessary, including inventories for species that cannot be surveyed adequately in one field season and inventories on lands that CNHP could not access in 2002. Not all targeted inventory areas can be field surveyed in one year due to either lack of access, phenology of species, 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 Pueblo County.

8. Continue to take a proactive approach to weed control in the counties. Give adequate support, in funding and staff, to the county Weed Management offices for weed control. Recognize that weeds affect both agriculture and native plant communities. Discourage the introduction and/or sale of non-native species that are known to significantly impact natural areas. These include, but are not limited to, tamarisk, Russian olive, purple loosestrife, and non-native fish species. Natural area managers, public agencies, and private landowners should be encouraged to remove these species from their properties. Enforce the use of weed-free forage on horse trails. Encourage the use of native species for revegetation and landscaping efforts. Ideally, seed should be locally harvested. This includes any seeding done on county road right-of ways. The Colorado Natural Areas Program has published a book entitled *Native Plant Revegetation Guide for Colorado* that describes appropriate species to be used for revegetation. This resource is available on the World Wide Web at http://parks.state.co.us/cnap/Revegetation_Guide/Reveg_index.html.

9. Encourage public education functions and publications. One of the greatest tools in conserving land for biodiversity is to explain the value of such areas to the public. As described in this report, Pueblo County is rich in animal and plant diversity, and houses some of the most unique environments in Colorado. Conveying the value and function of these habitats and the species that inhabit them to the public can generate greater interest in conserving lands. Conducting forums or presentations that highlight the biodiversity of Pueblo County should increase awareness of the uniqueness of the habitats within the county. Similarly, providing educational pamphlets or newsletters that explain why these

areas are so valuable can increase public interest and support for biodiversity conservation. Ensure that results of this inventory effort are communicated to the Pueblo Natural Resources and Environmental Education Council for inclusion in their ongoing education efforts. Encourage elected officials, advisory groups, planning boards, city and town councils, resources agencies, planners, and landowners to use the information provided in this report in their decision-making. Consider developing a community conservation website to provide information on natural resources, biological diversity, and conservation opportunities in Pueblo County. Enlist the assistance of local media in public education efforts.

10. 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 (e.g., 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 Pueblo County wetlands. Such an effort could provide a blueprint for wetland conservation in the county. Encourage and support statewide wetland protection efforts such as CDOW's Wetlands Program. County governments are encouraged to support research efforts on wetlands to aid in their conservation. Countywide 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 Pueblo County. Utilize the expertise and breadth of experience within the Playa Lakes/Arkansas River Wetland Focus Area Committee.

THE NATURAL HERITAGE NETWORK RANKING SYSTEM

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. But, 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 Pikes Peak spring parsley (a wildflower), the Arkansas darter (a fish), and the Pawnee montane skipper (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 existing 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 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 '70s.

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

The Natural Heritage Methodology is used by Natural Heritage Programs throughout North, Central, and South America, forming an international database network. 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 species 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 all are important for the well being of humans. It stands to reason that biological diversity should be of concern to all people.

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

1. **Genetic Diversity** — the genetic variation within a population and among populations of a plant or animal species. The genetic makeup of a species 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.
2. **Species Diversity** — the total number and abundance of plant and animal species and subspecies in an area.

3. **Community Diversity** — the variety of plant communities within an area that represent the range of species relationships and inter-dependence. These communities may be diagnostic or even restricted to an area. It is within communities that all life dwells.
4. **Landscape Diversity** — the type, condition, pattern, and connectedness of natural communities. A landscape consisting of a mosaic of natural communities may contain one multifaceted ecosystem, such as a wetland ecosystem. A landscape also may contain several distinct ecosystems, such as a riparian corridor meandering through shortgrass prairie. Fragmentation of landscapes, loss of connections and migratory corridors, and loss of natural communities all result in a loss of biological diversity for a region. Humans and the results of their activities are integral parts of most landscapes.

The conservation of biological diversity must include all levels of diversity: genetic, species, community, and landscape. Each level is dependent on the other levels and inextricably linked. In addition, and all too often omitted, humans are also 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.

Colorado's Natural Heritage Program

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

CNHP is the state's primary comprehensive biological diversity data center, gathering information and field observations to help develop statewide conservation priorities. After operating in 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 ever since.

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

The Biological and Conservation Data System (BCD), developed by The Nature Conservancy, is used by all natural heritage programs to house data about imperiled species. This data 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. CNHP also uses the Biological Diversity Tracking System (BIOTICS) 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 such as:

- 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 precisely are these priority species or communities found?
- What is their 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 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 information gathering and inventory. 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 woefully underfunded, 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 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 or otherwise threatened, more detailed information is needed. Because of these species' very rarity, gathering comprehensive and detailed population data on them is possible, even if difficult. Gathering similarly comprehensive information on more abundant species would pose a far greater challenge.

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 is the size of the geographic range, the number of individuals, trends in population and distribution, identifiable threats, and the number of already protected occurrences.

Element imperilment ranks are assigned both in terms of the element's degree of imperilment within Colorado (its State or S-rank) and the element's imperilment over its entire range (its Global or G-rank). Taken together, these two ranks 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 5 current locations in Colorado, is ranked G5 S1 (globally secure, but critically imperiled in this state). The Rocky Mountain Columbine (*Aquilegia saximontana*), 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 (restrictiveness of habitat), 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 1.

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

Table 1. Definition of Natural Heritage Program Imperilment Ranks.

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

G/S1	Critically imperiled globally/state because of rarity (5 or fewer occurrences in the world/state; or 1,000 or fewer individuals), or because some factor of its biology makes it especially vulnerable to extinction.
G/S2	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.
G/S3	Vulnerable through its range or found locally in a restricted range (21 to 100 occurrences, or 3,000 to 10,000 individuals).
G/S4	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.
G/S5	Demonstrably secure globally/state, though it may be quite rare in parts of its range, especially at the periphery.
G/SX	Presumed extinct globally, or extirpated within the state.
G#?	Indicates uncertainty about an assigned global rank.
G/SU	Unable to assign rank due to lack of available information.
GQ	Indicates uncertainty about taxonomic status.
G/SH	Historically known, but usually not verified for an extended period of time.
G#T#	Trinomial rank (T) is used for subspecies or varieties. These taxa are ranked on the same criteria as G1-G5.
S#B	Refers to the breeding season imperilment of elements that are not permanent residents.
S#N	Refers to the non-breeding season imperilment of elements that are not permanent residents. Where no consistent location can be discerned for migrants or non-breeding populations, a rank of SZN is used.
SZ	Migrant whose occurrences are too irregular, transitory, and/or dispersed to be reliably identified, mapped, and protected.
SA	Accidental in the state.
SR	Reported to occur in the state but unverified.
S?	Unranked. Some evidence that species may be imperiled, but awaiting formal rarity ranking.

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

Legal Designations

Natural Heritage imperilment ranks should not be interpreted as legal designations.

Although most species protected under state or federal endangered species laws are extremely rare, not all rare species receive legal protection. Legal status is designated by either the U.S. Fish and Wildlife Service under the Endangered Species Act or by the Colorado Division of Wildlife under Colorado Statutes 33-2-105 Article 2. In addition, the U.S. Forest Service recognizes some species as “Sensitive,” as does the Bureau of Land Management. Table 2 defines the special status assigned by these agencies and provides a key to 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 will continue to maintain them in its Biological and Conservation Data system for reference.

Table 2. Federal and State Agency Special Designations.

Federal Status:	
1. U.S. Fish and Wildlife Service (58 Federal Register 51147, 1993) and (61 Federal Register 7598, 1996)	
LE	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.
2. U.S. Forest Service (Forest Service Manual 2670.5) (noted by the Forest Service as “S”)	
FS	Sensitive: those plant and animal species identified by the Regional Forester for which population viability is a concern as evidenced by: <ul style="list-style-type: none">• 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.
3. Bureau of Land Management (BLM Manual 6840.06D) (noted by BLM as “S”)	
BLM	Sensitive: those species found on public lands, designated by a State Director, that could easily become endangered or extinct in a state. The protection provided for sensitive species is the same as that provided for C (candidate) species.

State Status:

The Colorado Division of Wildlife has developed categories of imperilment for nongame 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 Occurrence Ranking

Actual locations of elements, whether they are single organisms, populations, or plant communities, are referred to as **element occurrences**. The element occurrence is considered the most fundamental unit of conservation interest and is at the heart of the Natural Heritage Methodology. 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 3.

Table 3. Natural Heritage Program Element Occurrence Ranks and their Definitions.

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

Potential Conservation Areas

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 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 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 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.

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) (Table 4).

Table 4. Natural Heritage Program Biological Diversity Ranks and their Definitions.

B1	Outstanding Significance (indispensable): only known occurrence of an element A-ranked occurrence of a G1 element (or at least C-ranked if best available occurrence) concentration of A- or B-ranked occurrences of G1 or G2 elements (four or more)
B2	Very High Significance: B- or C-ranked occurrence of a G1 element A- or B-ranked occurrence of a G2 element One of the most outstanding (for example, among the five best) occurrences rangewide (at least A- or B-ranked) of a G3 element. Concentration of A- or B-ranked G3 elements (four or more) Concentration of C-ranked G2 elements (four or more)
B3	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)
B4	Moderate Significance: Other A- or B-ranked occurrences of a G4 or G5 community C-ranked occurrence of a G3 element

	<p>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)</p> <p>Concentration of A- or B-ranked occurrences of G4 or G5 N1-N2, S1-S2 elements (four or more)</p> <p>D-ranked occurrence of a G2 element</p> <p>At least C-ranked occurrence of a disjunct G4 or G5 element</p> <p>Concentration of excellent or good occurrences (A- or B-ranked) of G4 S1 or G5 S1 elements (four or more)</p>
B5	General or Statewide 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 5).

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

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

A protection action involves increasing the current level of legal protection accorded one or more tracts within a potential conservation area. It may also include activities such as educational or public relations campaigns, or collaborative planning efforts with public or private entities, to minimize adverse impacts to element occurrences at a site. It does not include management actions. 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 6).

Table 6. Natural Heritage Program Management Urgency Ranks and their Definitions.

M1	Very high urgency. Management actions may be required within one year or the element occurrences could be lost or irretrievably degraded.
M2	High urgency. New management actions may be needed within 5 years to prevent the loss of the element occurrences within the PCA.
M3	Moderate urgency. New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA.
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.
M5	Low urgency. No management needs are known or anticipated in the PCA.

PROJECT BACKGROUND

Location and Physical Characteristics of Study Area

Pueblo County is located along the convergence of the high plains and the Rocky Mountains in south-central Colorado (Figure 1). The County encompasses 2,396 square miles (621,000 hectares, or approximately 1.5 million acres) and ranges in elevation from 4,320 feet (1,317 m) where the Arkansas River flows into Crowley and Otero counties to 12,347 feet (3,763 m) at Greenhorn Mountain in the Wet Mountains. Counties that surround Pueblo County include El Paso, Lincoln, Crowley, Otero, Las Animas, Huerfano, Custer, and Fremont (Figure 1).



Figure 1. Location of Pueblo County in Colorado.

The principal mountainous features located within Pueblo County are the Wet Mountains. Foothills form the transition between the mountains and the plains. The other major physiographic feature within the County is the Arkansas River Valley in western Pueblo County.

Pueblo County is located within the Central Shortgrass Prairie and Southern Rocky Mountains ecoregions as defined by The Nature Conservancy (modified from Bailey (1994)) (Figure 2). The Central Shortgrass Prairie ecoregion is characterized by rolling plains and tablelands dissected by streams, canyons, badlands, and buttes, and is dominated by shortgrass, mixed-grass, and sandsage prairie (The Nature Conservancy 1998). Small patches of remnant tallgrass prairie may occur along the base of the foothills and in other areas where the soils and moisture regime are appropriate. The Southern Rocky Mountain ecoregion includes two major mountain systems and the intervening valleys and parks from southern Wyoming to northern New Mexico. The major ecological zones are alpine, subalpine, upper montane, lower montane and foothill (Neely *et al.* 2001).

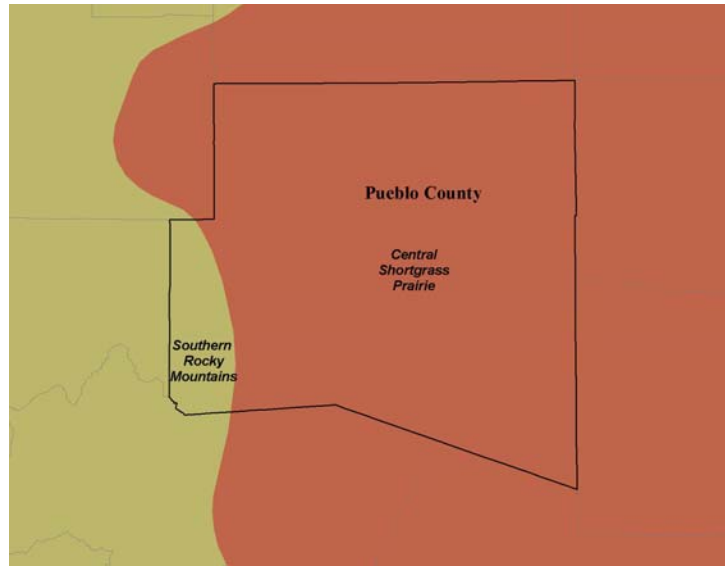


Figure 2. Ecoregions of Pueblo County (modified from Bailey 1994).

The principal drainage within the County is the Arkansas River (Figure 3). The principal tributaries to the Arkansas River include Fountain Creek, Chico Creek, Saint Charles River, and Huerfano River.

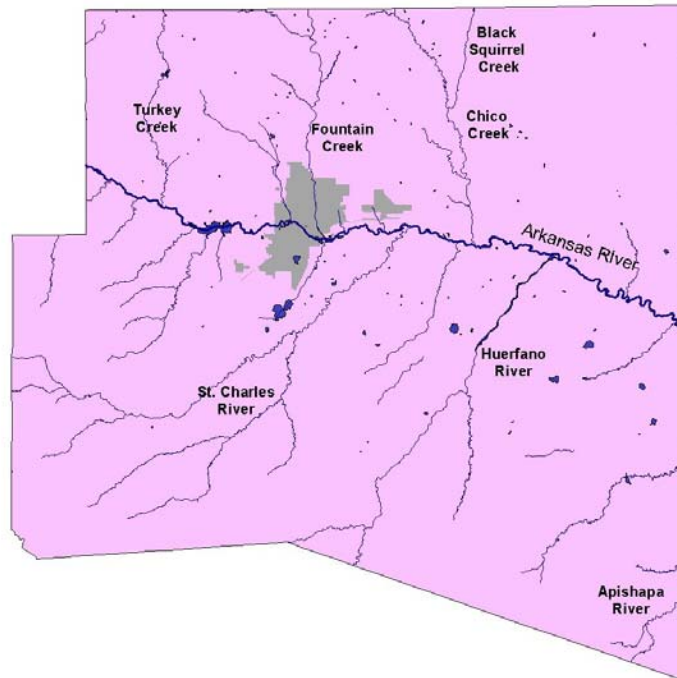


Figure 3. Major Drainages in Pueblo County.

The climate within the County varies greatly with elevation. Average annual precipitation within the region ranges from less than 12 inches (31 cm) per year in eastern Pueblo County to over 30 inches (76 cm) per year at Greenhorn Mountain in western Pueblo County (Figure 4). The wettest (highest rainfall) months are July and August, when the rain often falls in severe, localized thunderstorms (Western Regional Climate Center 2001). July is the hottest month; the city of Pueblo has a mean maximum temperature of 92.4 degrees F (33.6 degree C). January is the coldest month with a mean low temperature of 13.8 degrees F (-10.1degree C) in Pueblo (Western Regional Climate Center 2001).

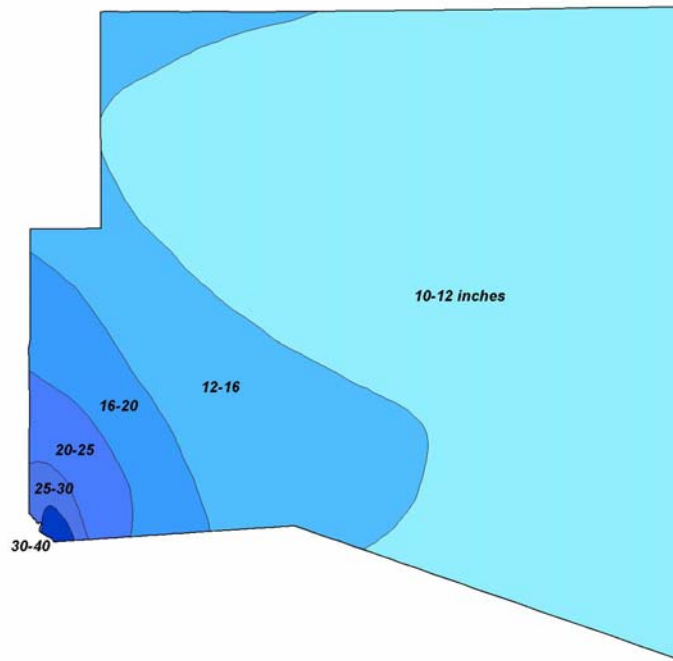


Figure 4. Average Annual Precipitation in Pueblo County.

Pueblo County is experiencing human population growth. Between 1990 and 2000, the population in Pueblo County has increased by 15 percent (U.S. Census Bureau 2001). Current population estimates for Pueblo County is 141,472 (U.S. Census Bureau 2001). The primary population center is the City of Pueblo (Figure 5); however, a significant number of new home starts are occurring outside of the City (Pueblo Area Council of Governments 2002). Overall, development is spreading west into the foothills, east onto the plains, and north and south along the foothills/Wet Mountains corridor. Residential development is occurring at all scales including high-density subdivisions and 35-acre ranchettes.

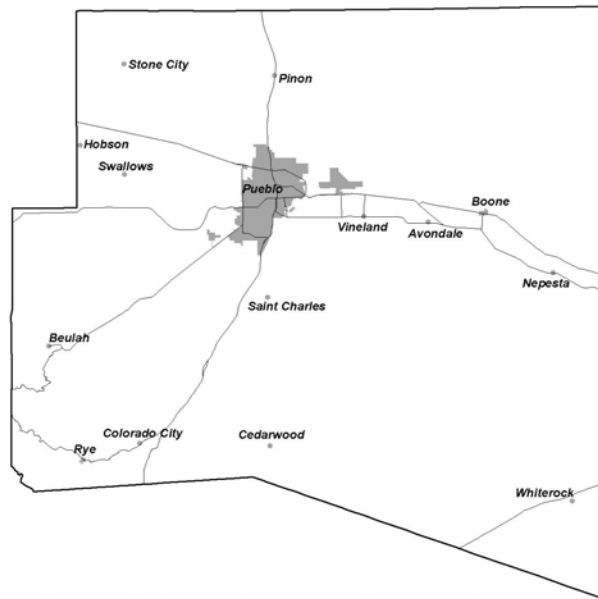


Figure 5. Municipalities and Major Towns in Pueblo County.

More than 75 percent of the land within the County is privately owned (Figure 6) (Colorado Division of Wildlife 1998). The Colorado State Land Board manages about 15 percent, primarily in a contiguous area in north-central Pueblo County. The Department of Defense (Fort Carson Military Reservation and Pueblo Chemical Depot) is the third largest ownership category with five percent. The U.S. Forest Service manages the San Isabel National Forest in Pueblo County, which includes a portion of the Greenhorn Mountain Wilderness Area. The Colorado Division of Wildlife manages the Pueblo Reservoir State Wildlife Area.

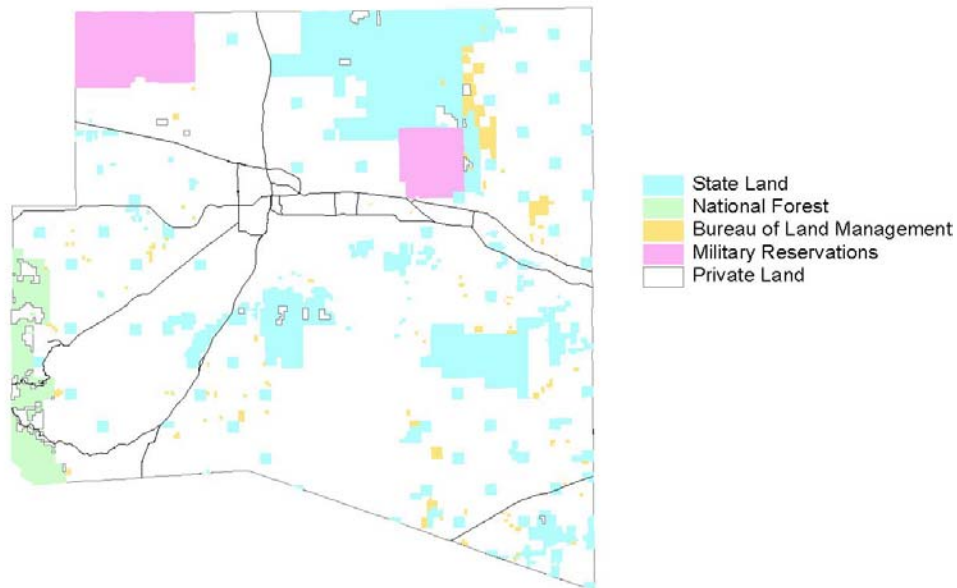


Figure 6. Land Ownership in Pueblo County.

Geology and Hydrology

The geologic features of the County range from quaternary alluvial deposits to Precambrian rocks exposed in the Wet Mountains (Green 1992). Throughout much of the County, the bedrock is covered by alluvial (carried by water) and eolian (wind blown) deposits except along the flanks of deeply cut streams (Romero 1992).

Pierre Shale is a relatively impermeable bedrock formation beneath parts of the County. Beneath the Pierre Shale is the Niobrara Shale, a series of interbedded limestones and shales, which outcrops in the Arkansas River Valley in Pueblo County. Beneath the Niobrara Formation is the Dakota Sandstone, the formation making up the Dakota Hogback, the intermittent ridge that can be traced along the edge of the mountains from Wyoming to New Mexico (Chronic 1980). Dakota Sandstone forms the walls of strikingly beautiful canyons along portions of the St. Charles and Huerfano rivers.

Soils

Soils in the County are highly variable. Mountain soils are normally rocky and shallow, except in areas where groundwater discharges or slope wetlands occur. These areas often form organic soils (e.g., peat or muck) due to organic matter production, persistent soil saturation and the resultant anaerobic conditions, and cool year-round temperatures. Along drainages, both in the mountains and on the plains, wetland plant communities occur on alluvial soils. Detailed soil survey information is available through the Soil Conservation Service (Larsen et al. 1979).

METHODS

The methods for assessing and prioritizing conservation needs over a large area are necessarily diverse. The Colorado Natural Heritage Program follows a general method that is continuously being developed specifically for this purpose. The Natural Heritage Inventory described in this report was conducted in several steps summarized below. Additionally, input from a committee of individuals representing local public and private interests was used to help guide the inventory effort.

Collect Available Information

CNHP databases were updated with information regarding the known locations of species and significant plant communities within Pueblo County. 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 wide variety of species including native fishes. 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. Such information covers basic species and community biology including range, habitat, phenology (reproductive timing), food sources, and substrates.

Identify Rare or Imperiled Species and Significant Plant Communities with Potential to Occur in Pueblo County

The information collected in the previous step was used to refine the potential element list and to refine our search areas. In general, species and plant communities that have been recorded from Pueblo County, or from adjacent counties, 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 (Table 7). 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.

Table 7. Species and Communities Targeted in the Pueblo County Inventory.

Please note that some of these species and communities have not been documented in the County. For a list of all of the **known** elements, please see Table 8. Please see the Natural Heritage Ranking System (Table 1) and Legal Designations (Table 2) for rank and status definitions.

Element	Common Name	Global Rank	State Rank	Federal and State Status
Plants				
<i>Agastache foeniculum</i>	Lavender hyssop	G4G5	S1	
<i>Aletes lithophilus</i>	Rock-loving neoparya	G3	S3	FS, BLM
<i>Ambrosia linearis</i>	Plains ambrosia	G3	S3	FS
<i>Aquilegia saximontana</i>	Rocky Mountain columbine	G3	S3	
<i>Amorpha nana</i>	Dwarf wild indigo	G5	S2S3	
<i>Asclepias uncialis</i>	Dwarf milkweed	G3?	S1S2	FS, BLM
<i>Asplenium platyneuron</i>	Ebony spleenwort	G5	S1	
<i>Astragalus brandegeei</i>	Brandegee milkvetch	G3G4	S1S2	BLM
<i>Bolophyta tetraneuris</i>	Arkansas River feverfew	G3	S3	
<i>Carex crawei</i>	Crawe sedge	G5	S1	
<i>Carex leptalea</i>	Bristle-stalk sedge	G5	S1	
<i>Carex oreocharis</i>	Sedge	G3	S1	
<i>Carex peckii</i>	Peck sedge	G4G5	S1	
<i>Cheilanthes eatonii</i>	Eaton's lip fern	G5?	S2	
<i>Chenopodium cycloides</i>	Sandhill goosefoot	G3	S1	FS
<i>Cypripedium calceolus</i> ssp. <i>parviflorum</i>	Yellow lady's slipper	G5	S2	
<i>Draba crassa</i>	Thick-leaf whitlow-grass	G3	S3	
<i>Echinocereus reichenbachii</i> var. <i>perbellus</i>	Lace hedgehog cactus	G5T?	S1	
<i>Eriophorum gracile</i>	Slender cottongrass	G5	S2	BLM
<i>Festuca campestris</i>	Big rough fescue	G4?	SH	
<i>Grindelia inornata</i>	Colorado gumweed	G2?	S2?	
<i>Heuchera richardsonii</i>	Richardson alum-root	G5	S1	
<i>Hypoxis hirsuta</i>	Yellow stargrass	G5	SH	
<i>Juncus brachycephalus</i>	Small-headed rush	G5	S1	
<i>Juncus brevicaudatus</i>	Narrow-panicked rush	G5	S1	
<i>Lesquerella calcicola</i>	Rocky Mountain bladderpod	G2	S2	
<i>Liatris ligulistylis</i>	Gay-feather	G5?	S1S2	
<i>Nuttallia chrysantha</i>	Golden blazing star	G1G2	S1S2	BLM
<i>Oenothera harringtonii</i>	Arkansas Valley evening primrose	G2	S2	
<i>Oenopsis puebloensis</i>	Pueblo goldenweed	G1G2	S1S2	
<i>Oxybaphus rotundifolius</i>	Round-leaf four-o'clock	G2	S2	
<i>Potentilla ambigens</i>	Southern Rocky Mountain cinquefoil	G3	S1S2	
<i>Ptilagrostis porteri</i>	Porter's feathergrass	G2	S2	FS, BLM
<i>Ribes americanum</i>	American current	G5	S2	
<i>Ribes niveum</i>	Snow gooseberry	G3?	S1	
<i>Salix serissima</i>	Autumn willow	G4	S1	
<i>Spiranthes diluvialis</i>	Ute ladies' tresses orchid	G2	S2	
<i>Stellaria irrigua</i>	Altai chickweed	G4?	S2	
<i>Unamia alba</i>	Prairie goldenrod	G5	S2S3	
<i>Viola pedatifida</i>	Prairie violet	G5	S2	
<i>Woodsia neomexicana</i>	New Mexico cliff fern	G4?	S2	

Element	Common Name	Global Rank	State Rank	Federal and State Status
Plant Communities				
<i>Abies concolor</i> - <i>Picea pungens</i> - <i>Populus angustifolia</i> / <i>Acer glabrum</i>	Montane riparian forest	G2	S2	
<i>Andropogon hallii</i> - <i>Calamovilfa longifolia</i>	Northern sandhill prairie	G5	S2	
<i>Artemisia bigelovii</i> / <i>Oryzopsis hymenoides</i>	Plains escarpment prairie (limestone breaks)	G3	S3?	
<i>Artemisia filifolia</i> / <i>Andropogon hallii</i>	Northern sandhill prairie	G3?	S2	
<i>Atriplex canescens</i> / <i>Sporobolus airoides</i>	Great Plains shrubland	G5Q	SU	
<i>Atriplex canescens</i> / <i>Bouteloua gracilis</i>	Shortgrass prairie	G3	S3	
<i>Atriplex canescens</i> / <i>Hilaria jamesii</i>	Shortgrass prairie	G3G4	SU	
<i>Bouteloua gracilis</i> - <i>Hilaria jamesii</i>	Shortgrass prairie	G3G4	S3	
<i>Bouteloua gracilis</i> herbaceous vegetation	Blue grama shortgrass prairie	G4Q	S4	
<i>Carex nebrascensis</i>	Wet meadow	G4	S3	
<i>Carex praegracilis</i>	Clustered-sedge wetland	G3G4	S2	
<i>Distichlis spicata</i>	Salt meadow	G5	S3	
<i>Eleocharis palustris</i>	Emergent wetland	G5	S4	
<i>Frankenia jamesii</i> / <i>Hilaria jamesii</i> - <i>(Bouteloua gracilis)</i>	James' seaheath/galleta-blue grama shrubland	G2	S2	
<i>Frankenia jamesii</i> / <i>Oryzopsis hymenoides</i>	Foothills shrubland	GU	SU	
<i>Juniperus monosperma</i> / <i>Bouteloua curtipendula</i>	Foothills pinyon-juniper woodland	G5	S3S4	
<i>Juniperus monosperma</i> / <i>Bouteloua gracilis</i>	Foothills pinyon-juniper woodland	G5	S3S4	
<i>Juniperus monosperma</i> / <i>Stipa neomexicana</i>	Foothills pinyon-juniper woodland	G4	S3	
<i>Opuntia imbricata</i> / <i>Hilaria jamesii</i>	Shortgrass prairie	GU	S3	
<i>Pascopyrum smithii</i> - <i>Eleocharis</i> spp.	Playa grassland	G2	S2	
<i>Phragmites australis</i>	Marsh	G5	S3	
<i>Populus angustifolia</i> / <i>Alnus incana</i>	Montane riparian forest	G3	S3	
<i>Populus angustifolia</i> / <i>Prunus virginiana</i>	Narrowleaf cottonwood/common chokecherry	G2G3	S1	
<i>Populus deltoides</i> ssp. <i>monilifera</i> -(<i>Salix amygdaloides</i>)/ <i>Salix exigua</i>	Plains cottonwood riparian woodland	G3G4	S3	
<i>Populus deltoides</i> / <i>Pascopyrum smithii</i> - <i>Panicum obtusum</i>	Plains cottonwood/western wheatgrass-vine mesquite	G2	S2	
<i>Populus deltoides</i> / <i>Sporobolus airoides</i>	Plains cottonwood/alkali sacaton	G2Q	S2	
<i>Pseudotsuga menziesii</i> / <i>Betula occidentalis</i>	Montane riparian forest	G3?	S3	
<i>Salix amygdaloides</i> / <i>Carex lanuginosa</i>	Peachleaf willow alliance	G3	SU	
<i>Salix eriocephala</i> var. <i>ligulifolia</i>	Montane willow carr	G2G3	S2S3	
<i>Salix exigua</i> /mesic graminoid	Coyote willow/mesic graminoid	G5	S5	
<i>Salix lucida</i> ssp. <i>caudata</i>	Montane riparian shrubland	G3Q	S2S3	
<i>Sarcobatus vermiculatus</i> / <i>Sporobolus airoides</i>	Saline bottom shrubland	G3?	S2	
<i>Scirpus pungens</i>	Bulrush	G3G4	S3	
<i>Scirpus tabernaemontani</i> - <i>Scirpus acutus</i>	Great Plains marsh	G3	S2S3	
<i>Spartina pectinata</i>	Prairie slough grass	G3?	S3	

Element	Common Name	Global Rank	State Rank	Federal and State Status
<i>Sporobolus airoides</i>	Great Plains salt meadow	G3Q	S3	
<i>Stipa neomexicana</i>	Great plains mixed grass prairie	G3	S3	
<i>Symphoricarpos occidentalis</i>	Snowberry shrubland	G4G5	S3	
<i>Typha angustifolia-Typha latifolia</i>	Cattail marsh	G5	S3	
Amphibians and Reptiles				
<i>Cnemidophorus neotesselatus</i>	Triploid checkered whiptail	G2Q	S2	
<i>Elaphe guttata</i>	Corn snake	G5	S3	
<i>Rana blairi</i>	Plains leopard frog	G5	S3	BLM, SC
<i>Sistrurus catenatus</i>	Massasauga	G3G4	S2	BLM, SC
<i>Thamnophis cyrtopsis</i>	Blackneck garter snake	G5	S2?	
Birds				
<i>Buteo regalis</i>	Ferruginous Hawk	G4	S3B, S4N	FS, BLM, SC
<i>Charadrius montanus</i>	Mountain Plover	G2	S2B, SZN	P, FS, BLM, SC
<i>Dendroica graciae</i>	Grace's Warbler	G5	S3B, SZN	
<i>Haliaeetus leucocephalus</i>	Bald Eagle	G4	S1B, SN	LT, T
<i>Numenius americanus</i>	Long-billed Curlew	G5	S2B, SZN	FS, BLM, SC
<i>Seiurus aurocapillus</i>	Ovenbird	G5	S2B, SZN	
<i>Strix occidentalis lucida</i>	Mexican Spotted Owl	G3T3	S1B, SUN	LT,T
Fish				
<i>Etheostoma cragini</i>	Arkansas darter	G3	S2	C, FS, T
<i>Oncorhynchus clarki stomias</i>	Greenback cutthroat trout	G4 T2T3	S2	LT,T
<i>Phoxinus erythrogaster</i>	Southern redbelly dace	G5	S1	FS, E
Mammals				
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4	C
<i>Gulo gulo</i>	Wolverine	G4	S1	FS, E
<i>Plecotus townsendii pallescens</i>	Townsend's big-eared bat subsp.	G4T4	S2	FS, BLM
<i>Vulpes velox</i>	Swift fox	G3	S3	P, FS, SC
Invertebrates				
<i>Amblyscirtes simius</i>	Simius roadside skipper	G4	S3	
<i>Anodonta grandis</i>	Giant floater	G5	S1	
<i>Atrytonopsis hianna</i>	Dusted skipper	G4G5	S2	
<i>Erynnis martialis</i>	Mottled dusky wing	G3G4	S2S3	
<i>Euphilotes rita coloradenesis</i>	Colorado blue	G3G4 T2T3	S2	
<i>Paratrytone snowi</i>	Snow's skipper	G5	S3	
<i>Polites origenes</i>	Cross-line skipper	G5	S3	
<i>Polites rhesus</i>	Rhesus skipper	G4	S2S3	
<i>Sphinx dollii</i>	A sphinx moth	G4G5	S1	

Identify Targeted Inventory Areas

Survey sites were chosen based on their likelihood of harboring rare or imperiled species or significant plant communities. Previously documented locations were targeted, and additional potential areas were chosen using available information sources. Precisely known element locations were always included so that they could be verified and updated. Areas with potentially high natural values were selected using aerial photographs, geology maps, vegetation surveys, personal recommendations from local experts, and numerous roadside surveys by our field scientists. Aerial photography is perhaps the most useful tool in this step of the process. High altitude infrared photographs at 1:40,000 scale (National Aerial Photography Program 85) were used for this project. These are well suited for assessing vegetation types and, to some extent, natural conditions on the ground.

Using the biological information stored in the CNHP databases, areas having the highest potential for supporting specific elements were identified. General habitat types can be discerned from aerial photographs. Areas chosen for survey appeared to be in the most natural condition (i.e. largest, least fragmented, and relatively free of visible disturbances such as roads, trails, fences, quarries, etc.)

The above information was used to delineate 71 targeted inventory areas (TIAs) that were believed to have relatively high probability of harboring significant natural heritage resources (Figure 7). These areas included all major habitat types in the study area.

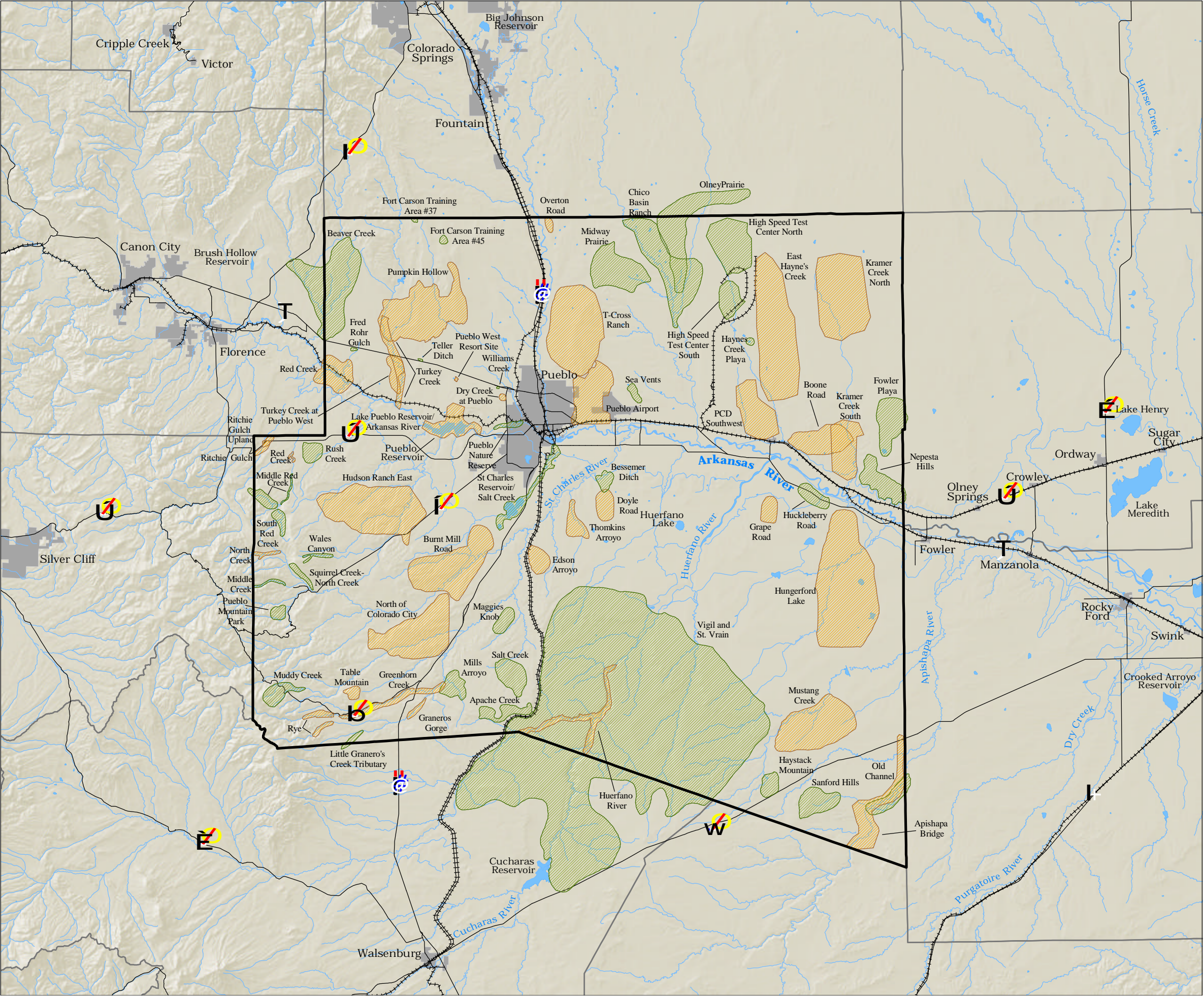
Roadside surveys were useful in further analyzing the natural condition of these areas. The condition of grasslands is especially difficult to discern from aerial photographs, and a quick survey from the road can reveal such aspects as weed infestation or heavy grazing.

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

Contact Landowners

Obtaining permission to conduct surveys on private property was essential to this project. Once targeted inventory areas (TIAs) were chosen, land ownership of these areas was determined using records at local assessor's 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 private land.

Pueblo County CNHP Targeted Inventory Areas



Colorado Natural Heritage Program

Colorado State University
8002 Campus Delivery
Fort Collins, CO 80523-8002

Map Date: 24 April 2003

Targeted Inventory Areas

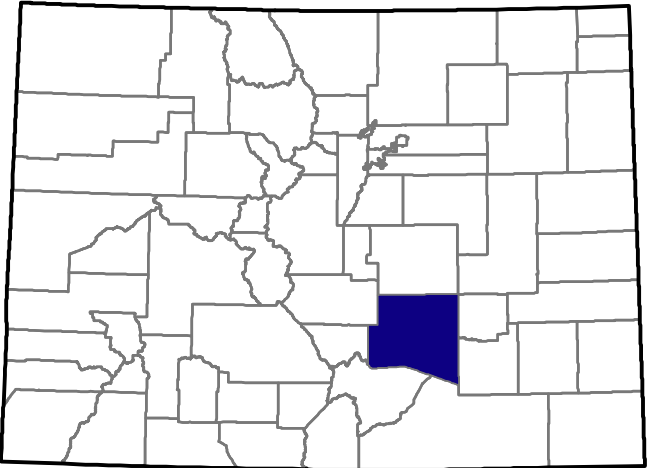
- Visited in 2000-2002
- Not Visited in 2000-2002

A Targeted Inventory Area represents a location that is believed to have a relatively high probability of harboring significant natural resources.

- Highways
- Railroads
- Pueblo County
- Counties
- Rivers, Streams
- Lakes, Reservoirs
- Municipalities

Digital Elevation Model (DEM) produced by the U.S. Geological Survey

Location in Colorado



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Coordinate System: UTM, Zone 13, NAD27



Conduct Field Surveys

Survey sites where access could be obtained were visited at the appropriate time as dictated by the seasonal occurrence (or 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 varied according to the elements being targeted. In most cases, the appropriate habitats were visually searched in a systematic fashion that would attempt to cover the area as thoroughly as possible in the given time. Some types of organisms require special techniques to document their presence. Some of these are summarized below:

Amphibians: visual or with aquatic nets

Mammals: Sherman live traps

Birds: visual or by song/call, evidence of breeding sought

Insects: aerial or aquatic net

Fishes: electroshocking, seining, barbless fly fishing, observation

Plants: visual

Plant communities: visual, collect qualitative or quantitative composition data

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

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

Site visits and assessments were conducted on the following two levels:

(1) **Roadside or adjacent land assessments.** Many of the sites could be viewed at a distance from a public road. While on the ground the field scientist can see, even from a distance, many features not apparent on maps and aerial photos. The road assessments determined the extent of human and livestock impacts on the targeted inventory area (TIA), which included ditching, adventive plant species, plant species indicative of intensive livestock use, stream bank destabilization, major hydrologic alterations,

excessive cover of non-native plant species, or new construction. Sites with one or more of these characteristics were generally excluded as potential conservation areas and no extensive data were gathered at these areas.

(2) **On-site assessments.** On-site assessment was the preferred method, as it is the only assessment technique that can yield high-confidence statements concerning the known or potential presence of rare and imperiled elements or excellent examples of common communities. On-site assessments are also the most resource intensive because of the effort required to contact landowners. In a few cases where on-site assessments were desired, they could not be conducted because either field personnel were denied access to the property by the landowner, or CNHP was unable to contact the landowner during the time frame of this study.

Delineate Potential Conservation Areas

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

RESULTS

In 2001-2002 CNHP biologists visited 34 of the 71 targeted inventory areas (TIAs), and created or updated 116 element occurrence records (locations of significant plants, animals, or plant communities). Private landowners granted permission for all research conducted on private lands, and our interactions with private landowners were positive. A total of 68 elements of biological significance (plants, animals, and plant communities) are known to occur in Pueblo County (Table 8).

A total of 228 element occurrences (locations of significant plants, animals, or plant communities) are known from Pueblo County and have been entered into CNHP's Biological Conservation Data System. Of these, 116 records were created or updated as part of this project. Most of the records document occurrences of plant species (93 records), followed by vertebrate animals (82 records), plant communities (44 records), and invertebrates (9 records).

Recently observed and accurately documented element occurrences form the basis for 33 Potential Conservation Areas (PCAs) in Pueblo County (Table 9 and Figure 8). Future surveys will almost certainly locate additional biologically significant areas, especially in undersurveyed areas such as USFS lands and Fort Carson.

The Nature Conservancy has completed assessments of the Central Shortgrass Prairie (The Nature Conservancy 1998) and Southern Rocky Mountain (Neely et al. 2001) ecoregions outlining areas with important conservation values. Figure 9 shows the five TNC priority areas that are within Pueblo County overlain by the CNHP PCAs.

Unexpected difficulties

Colorado experienced a severe drought during the summer of 2002, and the drought was particularly pronounced in the Arkansas River watershed where Pueblo County is located. Several of the rare plant species that were the primary targets of our research did not flower, making thorough research difficult. Most of the species could be identified using fruits produced during 2001, but some species did not even emerge above ground. Therefore, re-inventory of some areas may be necessary in a future, non-drought year.

We were unable to secure permission to access lands on the Fort Carson Military Reservation. We recommend further inventory work in that area when possible.

Table 8. List of Known Elements of Concern for Pueblo County.

Please see the Natural Heritage Ranking System (Table 1) and Legal Designations (Table 2) for rank and status definitions. Detailed descriptions of many of the animal species listed below can be found in the Natural History Section. See Spackman et al. (1997) for descriptions of many of the plant species.

Element	Common Name	Global Rank	State Rank	Federal and State Status
Plants				
<i>Agastache foeniculum</i>	Lavender hyssop	G4G5	S1	
<i>Ambrosia linearis</i>	Plains ambrosia	G3	S3	FS
<i>Asclepias uncialis</i>	Dwarf milkweed	G3?	S1S2	FS, BLM
<i>Bolophyta tetraeneuris</i>	Arkansas River feverfew	G3	S3	
<i>Carex peckii</i>	Peck sedge	G4G5	S1	
<i>Cheilanthes eatonii</i>	Eaton's lip fern	G5?	S2	
<i>Chenopodium cycloides</i>	Sandhill goosefoot	G3	S1	FS
<i>Cypripedium calceolus</i> ssp. <i>parviflorum</i>	Yellow lady's slipper	G5	S2	
<i>Draba crassa</i>	Thick-leaf whitlow-grass	G3	S3	
<i>Grindelia inornata</i>	Colorado gumweed	G2?	S2?	
<i>Lesquerella calcicola</i>	Rocky Mountain bladderpod	G2	S2	
<i>Nuttallia chrysantha</i>	Golden blazing star	G1G2	S1S2	BLM
<i>Oenothera harringtonii</i>	Arkansas Valley evening primrose	G2	S2	
<i>Oenopsis puebloensis</i>	Pueblo goldenweed	G1G2	S1S2	
<i>Oxybaphus rotundifolius</i>	Round-leaf four-o'clock	G2	S2	
<i>Stellaria irrigua</i>	Altai chickweed	G4?	S2	
<i>Viola pedatifida</i>	Prairie violet	G5	S2	
<i>Woodsia neomexicana</i>	New Mexico cliff fern	G4?	S2	
Plant Communities				
<i>Abies concolor</i> - <i>Picea pungens</i> - <i>Populus angustifolia</i> / <i>Acer glabrum</i>	Montane riparian forest	G2	S2	
<i>Artemisia bigelovii</i> / <i>Oryzopsis hymenoides</i>	Plains escarpment prairie (limestone breaks)	G3	S3?	
<i>Artemisia filifolia</i> / <i>Andropogon hallii</i>	Northern sandhill prairie	G3?	S2	
<i>Bouteloua gracilis</i> - <i>Hilaria jamesii</i>	Shortgrass prairie	G3G4	S3	
<i>Bouteloua gracilis</i> herbaceous vegetation	Blue grama shortgrass prairie	G4Q	S4	
<i>Carex nebrascensis</i>	Wet meadow	G4	S3	
<i>Carex praegracilis</i>	Clustered-sedge wetland	G3G4	S2	
<i>Distichlis spicata</i>	Salt meadow	G5	S3	
<i>Eleocharis palustris</i>	Emergent wetland	G5	S4	
<i>Frankenia jamesii</i> / <i>Hilaria jamesii</i> -(<i>Bouteloua gracilis</i>)	James' seaheath/galleta-blue grama shrubland	G2	S2	
<i>Frankenia jamesii</i> / <i>Oryzopsis hymenoides</i>	Foothills shrubland	GU	SU	
<i>Juniperus monosperma</i> / <i>Bouteloua curtipendula</i>	Foothills pinyon-juniper woodland	G5	S3S4	
<i>Juniperus monosperma</i> / <i>Bouteloua gracilis</i>	Foothills pinyon-juniper woodland	G5	S3S4	
<i>Juniperus monosperma</i> / <i>Stipa neomexicana</i>	Foothills pinyon-juniper woodland	G4	S3	
<i>Opuntia imbricata</i> / <i>Hilaria jamesii</i>	Shortgrass prairie	GU	S3	
<i>Phragmites australis</i>	Marsh	G5	S3	
<i>Populus angustifolia</i> / <i>Alnus incana</i>	Montane riparian forest	G3	S3	

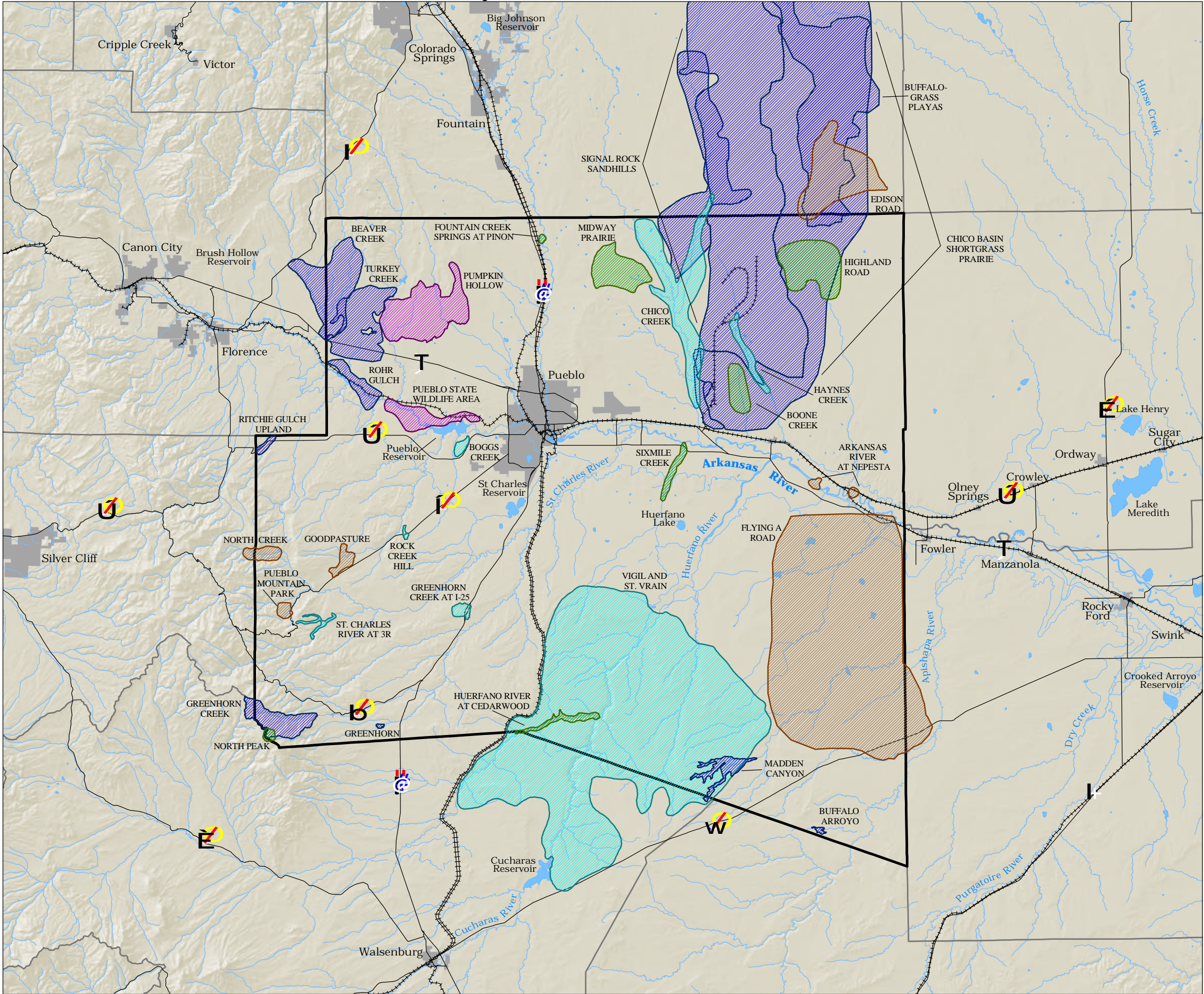
Element	Common Name	Global Rank	State Rank	Federal and State Status
<i>Populus deltoides</i> ssp. <i>monilifera</i> -(<i>Salix amygdaloides</i>)/ <i>Salix exigua</i>	Plains cottonwood riparian woodland	G3G4	S3	
<i>Populus deltoides</i> / <i>Pascopyrum smithii</i> - <i>Panicum obtusum</i>	Plains cottonwood/western wheatgrass-vine mesquite	G2	S2	
<i>Populus deltoides</i> / <i>Sporobolus airoides</i>	Plains cottonwood/alkali sacaton	G2Q	S2	
<i>Sarcobatus vermiculatus</i> / <i>Sporobolus airoides</i>	Saline bottom shrubland	G3?	S2	
<i>Scirpus pungens</i>	Bulrush	G3G4	S3	
<i>Scirpus tabernaemontani</i> - <i>Scirpus acutus</i>	Great Plains marsh	G3	S2S3	
<i>Spartina pectinata</i>	Prairie slough grass	G3?	S3	
<i>Sporobolus airoides</i>	Great Plains salt meadow	G3Q	S3	
<i>Stipa neomexicana</i>	Great plains mixed grass prairie	G3	S3	
<i>Typha angustifolia</i> - <i>Typha latifolia</i>	Cattail marsh	G5	S3	
Amphibians and Reptiles				
<i>Cnemidophorus neotesselatus</i>	Triploid checkered whiptail	G2Q	S2	
<i>Elaphe guttata</i>	Corn snake	G5	S3	
<i>Rana blairi</i>	Plains leopard frog	G5	S3	BLM, SC
<i>Sistrurus catenatus</i>	Massasauga	G3G4	S2	BLM, SC
Birds				
<i>Buteo regalis</i>	Ferruginous Hawk	G4	S3B, S4N	FS, BLM, SC
<i>Charadrius montanus</i>	Mountain Plover	G2	S2B, SZN	P, FS, BLM, SC
<i>Dendroica graciae</i>	Grace's Warbler	G5	S3B, SZN	
<i>Numenius americanus</i>	Long-billed Curlew	G5	S2B, SZN	FS, BLM, SC
<i>Seiurus aurocapillus</i>	Ovenbird	G5	S2B, SZN	
<i>Strix occidentalis lucida</i>	Mexican Spotted Owl	G3T3	S1B, SUN	LT,T
Fish				
<i>Etheostoma cragini</i>	Arkansas darter	G3	S2	C, FS, T
<i>Oncorhynchus clarki stomias</i>	Greenback cutthroat trout	G4 T2T3	S2	LT,T
<i>Phoxinus erythrogaster</i>	Southern redbelly dace	G5	S1	FS, E
Mammals				
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4	C
<i>Gulo gulo</i>	Wolverine	G4	S1	FS, E
<i>Plecotus townsendii pallescens</i>	Townsend's big-eared bat subsp.	G4T4	S2	FS, BLM
<i>Vulpes velox</i>	Swift fox	G3	S3	P, FS, SC
Invertebrates				
<i>Amblyscirtes simius</i>	Simius roadside skipper	G4	S3	
<i>Anodonta grandis</i>	Giant floater	G5	S1	
<i>Atrytonopsis hianna</i>	Dusted skipper	G4G5	S2	
<i>Euphilotes rita coloradenensis</i>	Colorado blue	G3G4 T2T3	S2	
<i>Polites rhesus</i>	Rhesus skipper	G4	S2S3	

Table 9. Potential Conservation Areas (PCAs) of Pueblo County.

The Biodiversity Significance, Protection Urgency, and Management Urgency Ranks are included (please see Tables 4 through 6 for rank definitions). PCAs are listed in approximate order recommended for conservation attention. A map of the PCAs is displayed in Figure 8.

PCA Name	Biodiversity Rank	Protection Urgency Rank	Management Urgency Rank
Pumpkin Hollow	B1	P1	M4
Pueblo State Wildlife Area	B1	P3	M3
Rohr Gulch	B2	P1	M4
Beaver Creek	B2	P2	M3
Buffalograss Playas	B2	P2	M4
Chico Basin Shortgrass Prairie	B2	P2	M4
Greenhorn	B2	P2	M4
Turkey Creek	B2	P3	M3
Ritchie Gulch Upland	B2	P3	M3
Signal Rock Sandhills	B2	P3	M4
Greenhorn Creek	B2	P4	M3
Madden Canyon	B2	P4	M4
Buffalo Arroyo	B2	P4	M4
Greenhorn Creek at I-25	B3	P2	M3
Boggs Creek	B3	P3	M2
Chico Creek	B3	P3	M3
Haynes Creek	B3	P3	M3
Vigil and St. Vrain	B3	P3	M3
St. Charles River at 3R	B3	P3	M5
Rock Creek Hill	B3	P4	M4
Sixmile Creek	B4	P1	M3
Fountain Creek Springs at Pinon	B4	P2	M3
Boone Creek	B4	P3	M3
Huerfano River at Cedarwood	B4	P3	M3
Midway Prairie	B4	P3	M4
Highland Road	B4	P4	M3
North Peak	B4	P4	M4
Arkansas River at Nepesta	B5	P2	M3
Goodpasture	B5	P3	M1
North Creek	B5	P3	M3
Edison Road	B5	P3	M5
Pueblo Mountain Park	B5	P4	M3
Flying A Road	B5	P4	M4

Pueblo County CNHP Potential Conservation Areas



Colorado Natural Heritage Program

Colorado State University
8002 Campus Delivery
Fort Collins, CO 80523-8002

Map Date: 24 April 2003

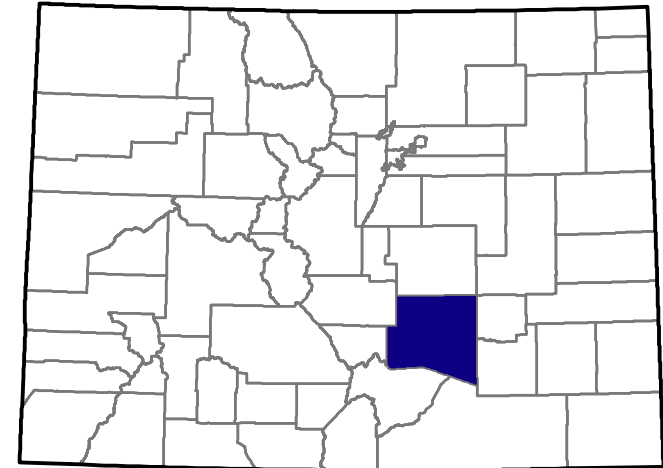
Potential Conservation Areas by Biodiversity Significance Rank

- 1: Outstanding Significance
- 2: Very High Significance
- 3: High Significance
- 4: Moderate Significance
- 5: General Biodiversity Interest

- Highways
- Railroads
- Pueblo County
- Counties
- Rivers, Streams
- Lakes, Reservoirs
- Municipalities

Digital Elevation Model (DEM) produced by the U.S. Geological Survey

Location in Colorado



Disclaimer

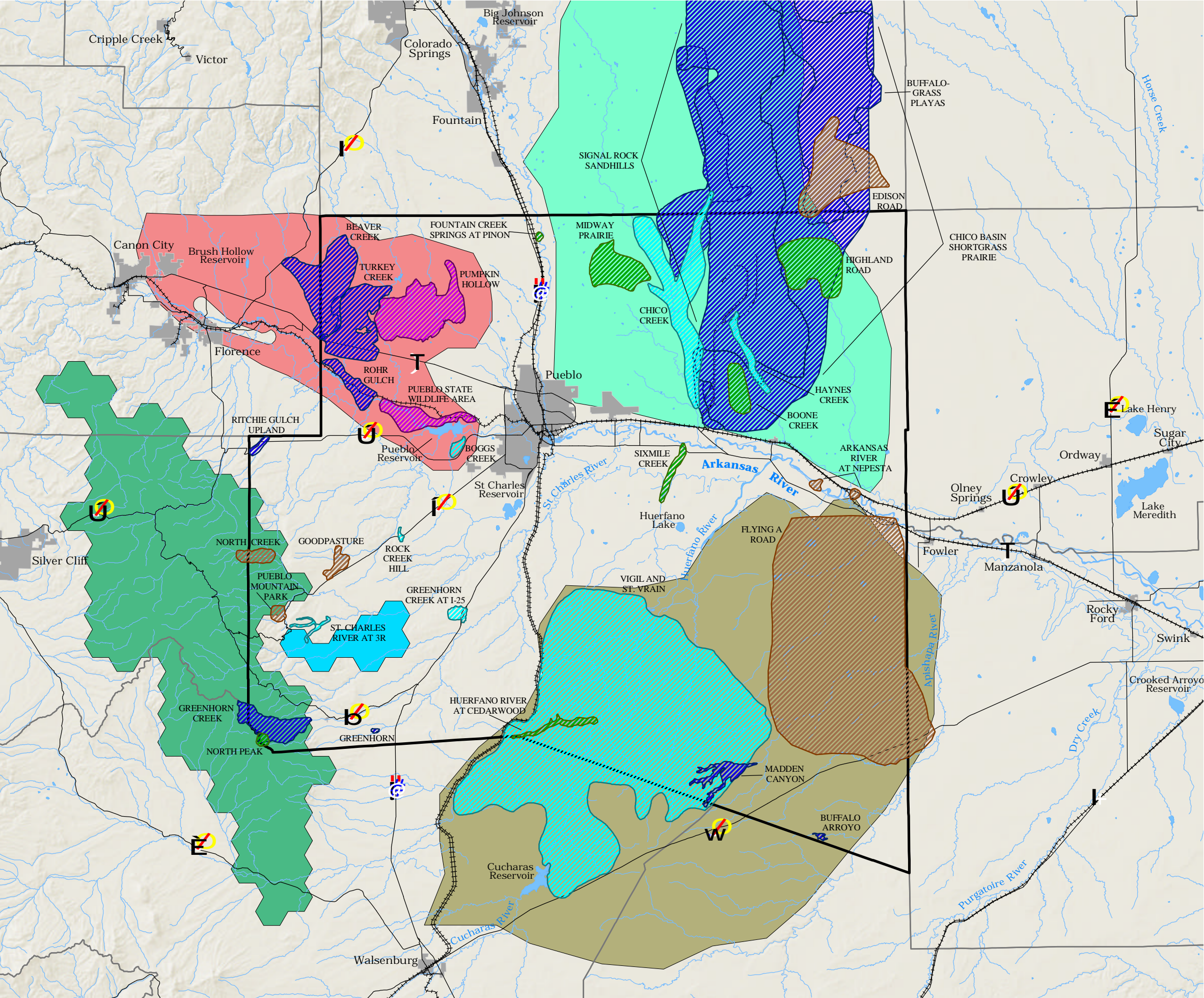
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Coordinate System: UTM, Zone 13, NAD27



Pueblo County TNC Priority Areas with CNHP Potential Conservation Areas



Colorado Natural Heritage Program

Colorado State University
8002 Campus Delivery
Fort Collins, CO 80523-8002
Map Date: 29 April 2003

The Nature Conservancy Priority Areas

- Arkansas River Valley
- Chico Basin
- Huerfano Uplands
- Greenhorn Mountain
- St. Charles River

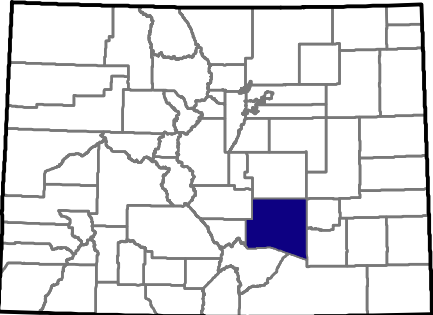
CNHP Potential Conservation Areas by Biodiversity Significance Rank

- 1: Outstanding Significance
- 2: Very High Significance
- 3: High Significance
- 4: Moderate Significance
- 5: General Biodiversity Interest

- Highways
- Railroads
- Pueblo County
- Counties
- Rivers, Streams
- Lakes, Reservoirs
- Municipalities

Digital Elevation Model (DEM) produced by the U.S. Geological Survey

Location in Colorado



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7 0 7 14 Miles

Coordinate System: UTM, Zone 13, NAD27



Potential Conservation Areas in Pueblo County

The 33 PCAs documented in Pueblo County are profiled with biodiversity ranks in this section. The PCAs are organized in ascending order according to their Biodiversity Rank (e.g., B1 to B5). Although the amount of information we have on the PCAs is highly variable, each PCA profile includes the following information:

Biodiversity Rank (B-rank): The overall significance of the PCA in terms of rarity of the Natural Heritage resources and the quality (condition, abundance, etc.) of the occurrences. Please see Table 4 for the definitions of the ranks.

Protection Urgency Rank (P-rank): An estimate of the timeframe in which conservation protection should occur. This rank generally refers to the need for a major change of protective status (e.g., ownership or designation as a natural area). Please see Table 5 for the definitions of the ranks.

Management Urgency Rank (M-rank): An estimate of the timeframe in which conservation management should occur. Using best scientific estimates, this rank refers to the need for management in contrast to protection (legal, political, or administrative measures). See Table 6 for the definitions of the ranks.

Location: General location and specific road/trail directions.

Legal Description: U.S.G.S. 7.5 minute quadrangle name and Township, Range, and Section(s).

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

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

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

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

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

B1 Potential Conservation Areas

Pumpkin Hollow Potential Conservation Area

Biodiversity Rank: B1 (Outstanding significance)

This PCA includes an excellent (A-ranked) occurrence of a globally critically imperiled (G1G2) plant species known only from the area between Canon City and Pueblo. Three other globally imperiled plant species and a fair example of a state rare plant community are also found here.

Protection Urgency Rank: P1 (Very high urgency)

This PCA includes both privately and publicly owned property. The private land in the southeastern portion of the PCA has already been impacted with residential development, and further development of Pueblo West may encroach on other areas of this PCA. To ensure long-term protection for the rare plants at this site, work with the Fort Carson Military Reservation and the private landowners.

Management Urgency: M4 (Low urgency)

Current management appears to be adequate; however, military maneuvers may impact the plant populations at the north end of the site.

Location: Pueblo County. North of Highway 50 between Pueblo West and the western county line.

Legal Description: U.S.G.S. 7.5' quadrangles: Stone City, Steele Hollow, and Swallows. T18S R66W Sections 23, 25; T19S R66W Sections 1, 2; T19S R67W Sections 1, 2.

Size: 16,759 acres (6782 hectares)

Elevation: 5150 to 5640 feet (1570 to 1720 meters)

General Description: Pumpkin Hollow, Wild Horse Creek, and Turkey Creek drain south through this PCA, and flow into the Arkansas River between Canon City and Pueblo. An old railroad grade traverses the site, as do several trails and unimproved roads.

The predominant vegetation type at the Pumpkin Hollow PCA is shortgrass prairie, dominated by blue grama (*Bouteloua gracilis*). Blue grama also occurs here in combination with other plants such as cholla cactus (*Cylindropuntia imbricata*), fourwing saltbush (*Atriplex canescens*), buffalo grass (*Buchloe dactyloides*), galleta grass (*Hilaria jamesii*), and winterfat (*Krascheninnikovia lanata*, an excellent winter forage for game).

The soils are shale and gypsum, with five to 20 acre patches of James' frankenia (*Frankenia jamesii*), and/or Bigelow sage (*Artemisia bigelovii*) found throughout. Small patches of cushion plant communities, dominated by the globally rare Arkansas Valley feverfew (*Bolophyta tetraeuris*), dot the area. Shale outcroppings bisect the grasslands, and are also associated with the rare plant species as well as breaks of widely spaced mature (150-year old) juniper trees (*Juniperus monosperma*), pinyon pines (*Pinus edulis*), and New Mexican feathergrass (*Stipa neomexicana*) grasslands.

Biodiversity Comments: This site includes an excellent occurrence of a globally rare plant species known only from the area between Canon City and Pueblo, a variety of *Oonopsis* known as Pueblo goldenweed (*Oonopsis puebloensis*) that was determined to be a new species as recently as 1991. Three other globally rare plant species occur here: the round-leaf four o'clock (*Oxybaphus rotundifolius*), the Arkansas Valley evening primrose (*Oenothera harringtonii*), and the Arkansas Valley feverfew (*Bolophyta tetraeuris*). These plants are shale endemics, meaning that they grow only in soils containing shale outcrops. Furthermore, these plants can adapt to conditions that are unfavorable to most species, such as disturbed and nutrient-poor soils.

This site also contains a foothills pinyon-juniper woodland community that is in fair condition. This woodland community includes New Mexico feathergrass (*Stipa neomexicana*), a cool-season bunchgrass typically found on rocky or shaley south-facing sites in southern Colorado.

Natural Heritage element occurrences at the Pumpkin Hollow PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plants								
<i>Bolophyta tetraeuris</i>	Arkansas River feverfew	G3	S3				B	1995-08-08
<i>Bolophyta tetraeuris</i>	Arkansas River feverfew	G3	S3				C	1998-06-03
<i>Bolophyta tetraeuris</i>	Arkansas River feverfew	G3	S3				C	1998-05-28
<i>Bolophyta tetraeuris</i>	Arkansas River feverfew	G3	S3				C	2001-07-19
<i>Oonopsis puebloensis</i>	Pueblo goldenweed	G1G2	S1S2				A	2001-07-20
<i>Oxybaphus rotundifolius</i>	Round-leaf four-o'clock	G2	S2				B	1995-07-28
<i>Oxybaphus rotundifolius</i>	Round-leaf four-o'clock	G2	S2				B	1995-08-08
<i>Oxybaphus rotundifolius</i>	Round-leaf four-o'clock	G2	S2				B	2001-07-19
<i>Oxybaphus rotundifolius</i>	Round-leaf four-o'clock	G2	S2				C	1998-05-29

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
<i>Oenothera harringtonii</i>	Arkansas Valley evening primrose	G2	S2				D	2001-05-31
Plant Communities								
<i>Juniperus monosperma/ Stipa neomexicana</i>	Foothills pinyon-juniper woodland	G4	S3				C	1983-07-21

*EO = Element Occurrence

Note: Element occurrences responsible for the B-rank are shown in bold typeface.

Boundary Justification: The boundary encompasses the element occurrences, plus unsurveyed, apparently suitable habitat in the vicinity of the occurrences. In general, PCA boundaries are drawn to represent our best estimate of the primary area needed for the survival of the occurrences. This area is sufficiently large to protect intact (or at least allow simulation of) most of the natural ecological processes necessary for survival of the species, including fire, herbivory, and hydrology. The boundaries also include the mosaic of local community types on which the species may rely.

Protection Comments: A large portion of this site is privately owed. Obtaining a conservation easement on the ranch could provide permanent protection for the species and communities of concern. Without protection planning, habitat for these species could become so restricted and fragmented that viable populations cannot be sustained.

Management Comments: Further inventory and monitoring of the area would be appropriate, to ensure that the rare plant occurrences are being adequately protected.



Photograph taken at the Pumpkin Hollow PCA

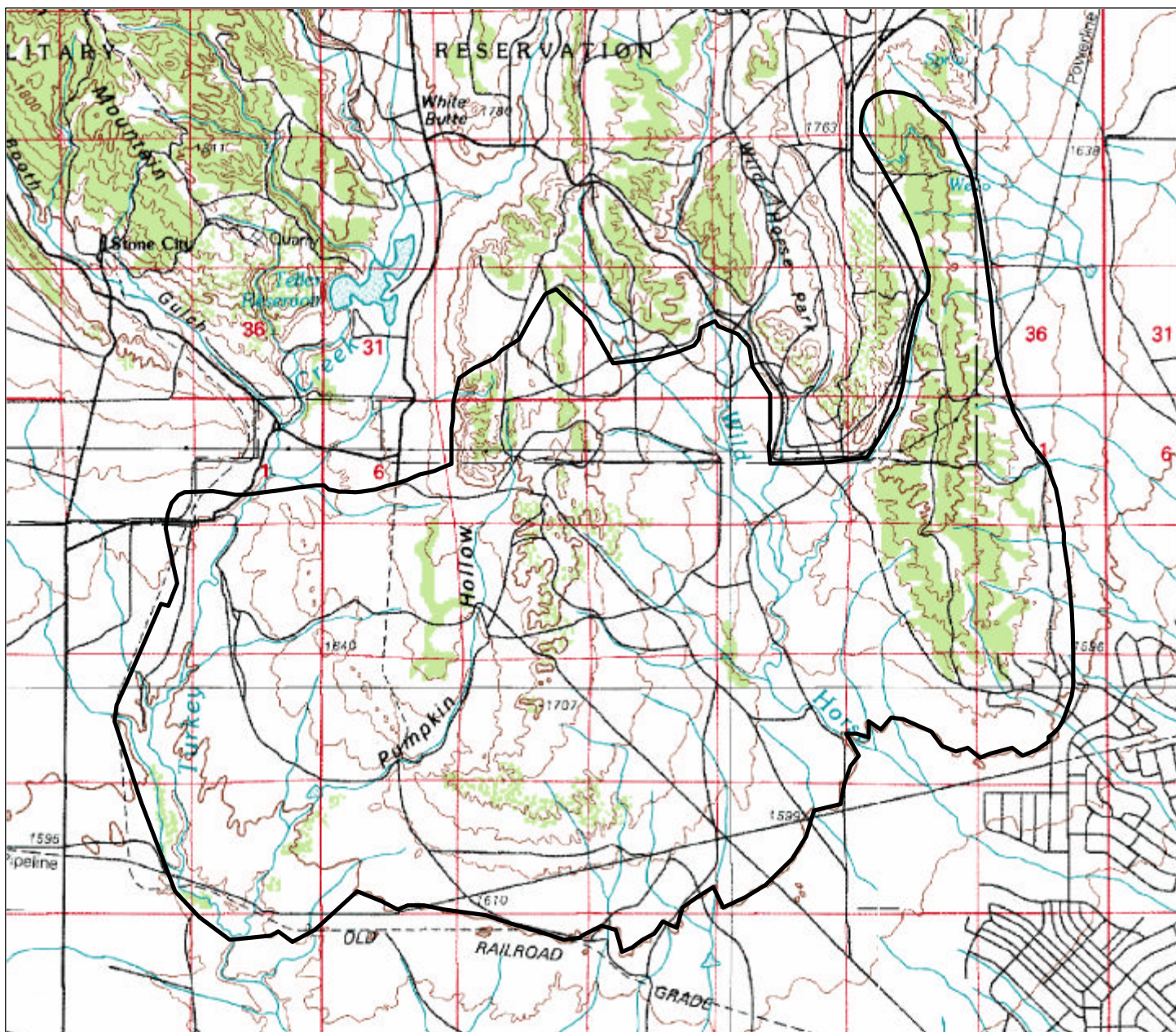


Photograph taken at the Pumpkin Hollow PCA (above)
Pueblo goldenweed (*Oenopsis puebloensis*) (below)





Arkansas Valley
evening primrose
(*Oenothera*
harringtonii)



1 0 1 Miles

Coordinate System: UTM, Zone13, NAD27

Colorado Natural Heritage Program

Colorado State University
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map created 14 April 2003

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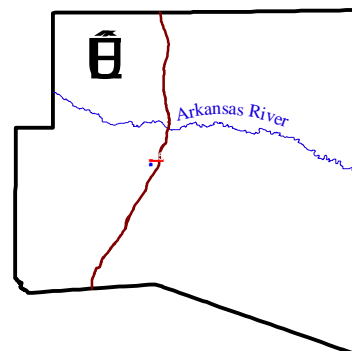
LEGEND

 PCA Boundary

Pueblo, 38104-A1
30 x 60 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



Pueblo State Wildlife Area Potential Conservation Area

Biodiversity Rank: B1 (Outstanding significance)

This PCA contains an excellent (A-ranked) occurrence of Pueblo goldenweed (*Oonopsis puebloensis*), a globally imperiled (G1G2) plant species. Overall, a total of eight significant elements of natural diversity are found in this site: Pueblo goldenweed (*Oonopsis puebloensis*) (G1G2), golden blazing star (*Nuttallia chrysantha*) (G1G2), round-leaf four-o'clock (*Oxybaphus rotundifolius*) (G2), Arkansas Valley evening primrose (*Oenothera harringtonii*) (G2), Colorado gumweed (*Grindelia inornata*) (G2?), Arkansas River feverfew (*Bolophyta tetraeuris*) (G3), dwarf milkweed (*Asclepias uncialis*) (G3?), and a *Frankenia jamesii*-*Oryzopsis hymenoides* (GU SU) foothills shrubland community.

Protection Urgency Rank: P3 (Moderate urgency)

This PCA includes a mix of private lands and public lands managed by the Colorado Division of Wildlife and Colorado State Parks. The species and communities found at this PCA are threatened by mining for cement products, off-road vehicle use, and residential/industrial expansion. The globally imperiled species and significant natural community are not afforded any specific protection. Special designation may help to protect these species at this site.

Management Urgency: M3 (Moderate urgency)

Current management appears to be adequate. Future planning efforts to prevent visitor use impacts such as trampling, and to limit all activities on shale barrens, would benefit the imperiled species.

Location: Pueblo State Wildlife Area and Pueblo Reservoir State Park. To access the northern end of site follow signs off I-25 to Pueblo Reservoir. Take the Recreation Access Road around north side of reservoir. Shale barrens at Juniper Breaks Campground are included in the site. Continue west around the reservoir. Turn south towards Lake Shore Marina, then west to Fisherman Parking. Walk north and west to shale barrens. These shale barrens comprise the northern portion of the site. To access the southern portion of the PCA, take route 96 west from Pueblo to entrance of State Park, 10.6 road miles from the junction of 96 and 45. Turn right at sign for Lake Pueblo State Park. Drive 0.6 miles, turn left onto dirt road. Continue 0.7 miles and park on right at Fishermans Access parking area. Walk west or north about 200 yards to southeast-facing shale outcrops.

Legal Description: U.S.G.S. 7.5' quadrangles: Swallows and Northwest Pueblo. T20S R65W Section 30; T20S R66W Sections 19-21, 25-35; T20S R67W Sections 13, 23-25.

Size: 5462 acres (2211 hectares)

Elevation: 4770 to 5000 feet (1460 to 1520 meters)

General Description: The Pueblo State Wildlife Area PCA is located along both the north and south sides of the Arkansas River and north side of Pueblo Reservoir. The Arkansas River flows east through the site from an elevation of 4850 to 4770 feet for approximately 3 miles before entering the west side of Pueblo Reservoir. The site is characterized by shale barrens and terraces of Niobrara Formation shale that drop off in steep slopes toward Pueblo Reservoir. Small washes dissect the area. The highest quality occurrences within the site are found in a mosaic of four plant communities: *Frankenia jamesii*-*Oryzopsis hymenoides* (GU SU), *Aristida purpurea*-*Bouteloua gracilis*, *Juniperus monosperma*-*Artemisia bigelovii*-mixed graminoid, and *Frankenia jamesii*-*Lesquerella* sp.-*Oxybaphus rotundifolius*. Shale ridges bisect the site. There are extensive populations of globally imperiled plant species Pueblo goldenweed (*Oonopsis puebloensis*) (G1G2), round-leaf four-o'clock (*Oxybaphus rotundifolius*) (G2), and Arkansas River feverfew (*Bolophyta tetraeuris*) (G3) throughout the site. The long-term pristine nature of the site is evidenced by the large juniper trees and snags (up to 3 feet in diameter), the large mats (over 1 foot wide) of Arkansas River feverfew, and the presence of cryptogamic soils. The surrounding grasslands are degraded in many areas. The area is very scenic with beautiful views of the Wet Mountains afforded from the site.

Biodiversity Comments: This PCA contains an excellent (A-ranked) occurrence of Pueblo goldenweed (*Oonopsis puebloensis*), a globally imperiled (G1G2) plant species. Overall, a total of eight significant elements of natural diversity are found in this site: Pueblo goldenweed (G1G2), golden blazing star (*Nuttallia chrysantha*) (G1G2), round-leaf four-o'clock (*Oxybaphus rotundifolius*) (G2), Arkansas Valley evening primrose (*Oenothera harringtonii*) (G2), Colorado gumweed (*Grindelia inornata*) (G2?), Arkansas River feverfew (*Bolophyta tetraeuris*) (G3), dwarf milkweed (*Asclepias uncialis*) (G3?), and a *Frankenia jamesii*-*Oryzopsis hymenoides* (GU SU) foothills shrubland community. The first six species listed above are known only from small areas in the Arkansas River Valley, and nowhere else in the world.

One excellent (A-ranked), one good (B-ranked), and two fair (C-ranked) occurrences were recorded for the globally imperiled round-leaf four-o'clock (*Oxybaphus rotundifolius*) with population estimates of several thousand individuals. There is only one other element occurrence record that documents over one thousand plants. There are two excellent (A-ranked) occurrences of the Arkansas Valley feverfew (*Bolophyta tetraeuris*). The population estimates are in the tens of thousands with many large and healthy individuals. One occurrence was first documented in 1946 indicating an excellent viability of over 50 years. One excellent (A-ranked) and two good (B-ranked) occurrences of Pueblo goldenweed (*Oonopsis puebloensis*), a newly described species that is awaiting publication, were recorded. Population estimates are in the thousands on several acres. A good (B-ranked) occurrence of the dwarf milkweed (*Asclepias uncialis*) (G3?) was recorded with a population size of 29 individuals. A good (B-ranked) occurrence of the *Frankenia jamesii*/*Oryzopsis hymenoides* community was also recorded. The community had few exotics and few human disturbances, however, there are other locations that are degraded which may impair genetic flow.

Dr. Sylvia Kelso indicates in her 1995 report that the Pueblo State Wildlife Area is one of the best sites with representation of Arkansas River Valley endemic plants.

The checkered triploid whiptail lizard (*Cnemidophorus neotesselatus*) (G2Q S2) was recorded within the PCA within juniper woodlands. This small reptile is endemic to Colorado, with its known worldwide distribution limited to Pueblo, Otero, Las Animas, and Fremont counties.

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

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plants								
<i>Oonopsis puebloensis</i>	Pueblo goldenweed	G1G2	S1S2				A	1995-06-14
<i>Oonopsis puebloensis</i>	Pueblo goldenweed	G1G2	S1S2				B	1995-06-08
<i>Oonopsis puebloensis</i>	Pueblo goldenweed	G1G2	S1S2				B	2001-07-18
<i>Nuttallia chrysanth</i>	Golden blazing star	G1G2	S1S2			BLM	B	2001-07-19
<i>Oxybaphus rotundifolius</i>	Round-leaf four-o'clock	G2	S2				A	1995-06-19
<i>Oxybaphus rotundifolius</i>	Round-leaf four-o'clock	G2	S2				B	1995-06-07
<i>Oxybaphus rotundifolius</i>	Round-leaf four-o'clock	G2	S2				C	1995-07-05
<i>Oxybaphus rotundifolius</i>	Round-leaf four-o'clock	G2	S2				C	1995-06-08
<i>Oenothera harringtonii</i>	Arkansas Valley evening primrose	G2	S2				C	2001-07-19
<i>Grindelia inornata</i>	Colorado gumweed	G2?	S2?				E	1997-08-09
<i>Bolophyta tetraeuris</i>	Arkansas River feverfew	G3	S3				A	1995-07-05
<i>Bolophyta tetraeuris</i>	Arkansas River feverfew	G3	S3				A	1995-06-08
<i>Asclepias uncialis</i>	Dwarf milkweed	G3?	S1S2			FS, BLM	B	1995-06-09
Plant Communities								
<i>Frankenia jamesii/Oryzopsis hymenoides</i>	Foothills shrubland	GU	SU				B	1995-06-14
<i>Frankenia jamesii/Oryzopsis hymenoides</i>	Foothills shrubland	GU	SU				B	1995-06-14
Reptiles								
<i>Cnemidophorus neotesselatus</i>	Triploid checkered whiptail	G2Q	S2				E	1995-07-02

*EO = Element Occurrence

Note: Element occurrence responsible for the B-rank is shown in bold typeface.

Boundary Justification: The boundary is intended to include habitat and the ecological processes to support the occurrences. Use as a fishing access, and other light recreational uses within the boundary will probably not present a problem.

Protection Comments: State lands offer some protection, from residential development for example. However, developments on private lands and developments associated with the State Park infrastructure could threaten the occurrences in the future. Juniper Breaks Campground was constructed within the globally imperiled plant populations, and although the populations are probably still viable, individual plants were destroyed, and the habitat was fragmented at this location. Imperiled plants were also lost during the construction of Pueblo Reservoir. Any expansion of the Reservoir would result in the loss of additional plants, and potentially the loss of populations. Special designation for the rare plants and their habitat could provide protection for these species in this important area.

Management Comments: The greatest threats to the species and communities at this PCA are likely related to recreational uses. Careful planning to streamline visitor use to areas away from rare plant habitat and high quality plant occurrences would help the elements of concern survive in this important area over time. Recreational uses of concern include but may not be limited to: off road vehicle use, hiking, fishing, camping. Several non-native and potentially problematic weed species were found to be abundant in places in the PCA, including cheatgrass (*Bromus tectorum*), mullein (*Verbascum thapsus*), and Russian thistle (*Salsola* sp.). Although these exotic species have not spread to the shale barrens that support the imperiled plants, monitoring the spread of noxious weeds within the PCA would help identify problems that could increase over time. Further inventory and detailed mapping of the imperiled species would also assist with management decision-making.



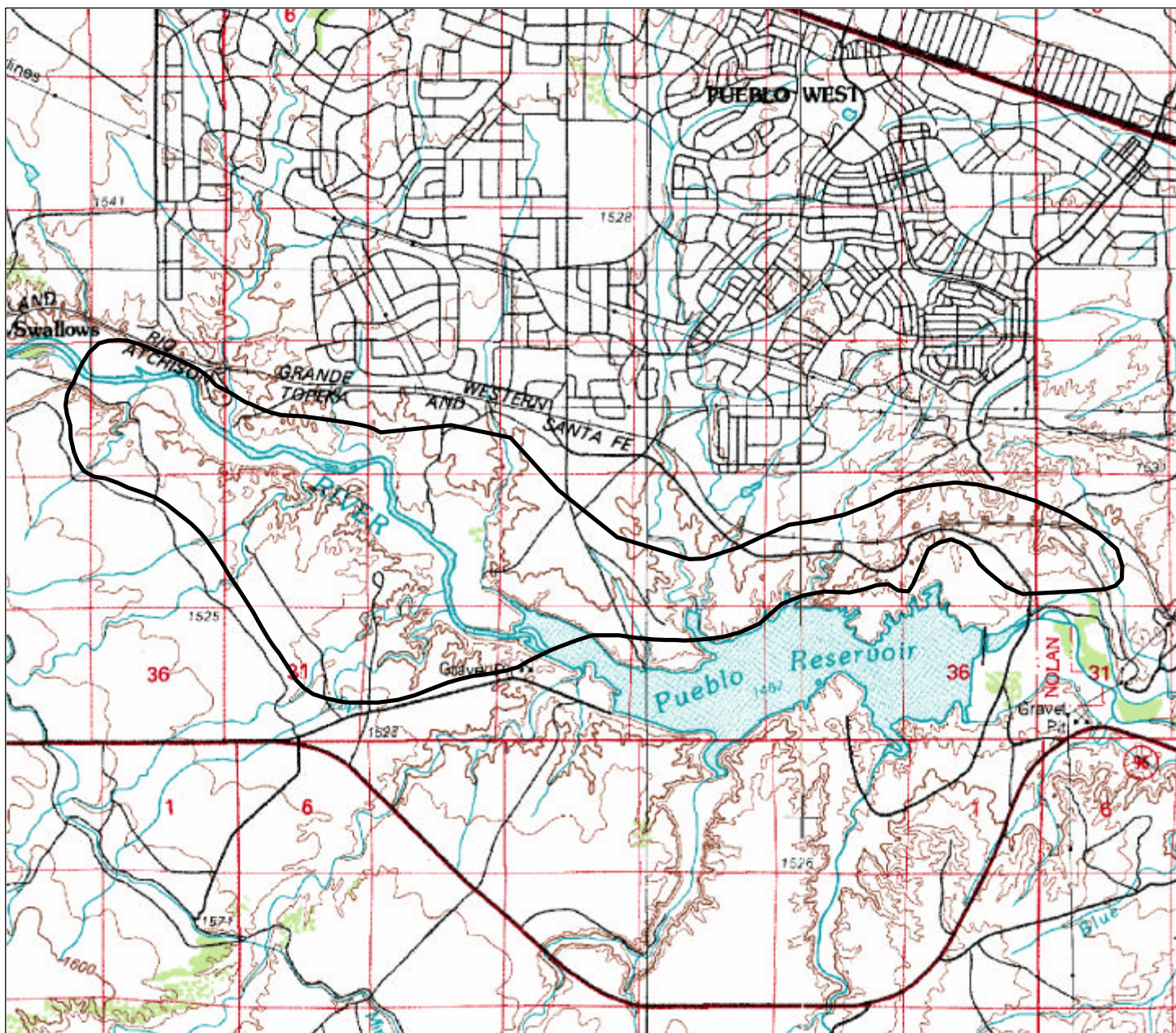
Photograph taken at the Pueblo State Wildlife Area PCA



Pueblo goldenweed (*Oenopsis puebloensis*) (above)



Golden blazing star (*Nuttallia chrysantha*) (left)



1 0 1 Miles

Coordinate System: UTM, Zone13, NAD27

Colorado Natural Heritage Program

Colorado State University
8002 Campus Delivery
Fort Collins, CO 80523-8002

map created 14 April 2003

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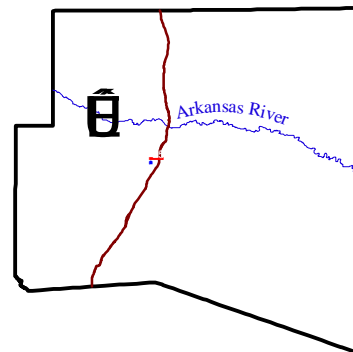
LEGEND

 PCA Boundary

Pueblo, 38104-A1
30 x 60 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



B2 Potential Conservation Areas

Rohr Gulch *Potential Conservation Area*

Biodiversity Rank: B2 (Very high significance)

This PCA includes a good (B-ranked) occurrence of golden blazing star (*Nuttallia chrysantha*), a globally imperiled (G1G2 S1S2) plant species, and a good (B-ranked) occurrence of Arkansas River feverfew (*Bolophyta tetraeuris*), a globally vulnerable (G3 S3) plant species.

Protection Urgency Rank: P1 (Very high urgency)

This PCA is primarily privately owned, and may also include some state lands. The primary threat is strip mining of limestone for asphalt.

Management Urgency: M4 (Low urgency)

Current management appears to be adequate. Further inventory and monitoring for rare plants and weeds would provide additional information to guide management decisions.

Location: Pueblo County, along the Arkansas River, near the border with Fremont County, and south of Highway 50.

Legal Description: U.S.G.S. 7.5' quadrangles: Hobson and Swallows. T19S R67W Sections 31, 32; T20S R67W Sections 4-6, 8-10, 14-16, 21-23.

Size: 3484 acres (1410 hectares)

Elevation: 4900 to 5160 feet (1490 to 1570 meters)

General Description: The Rohr Gulch PCA is characterized by shortgrass prairie grasslands deeply dissected by water cut canyons. The canyons reveal geologic strata of sedimentary rocks including limestone, shale, and sandstone. The grasslands and shale breaks also include a mosaic of pinyon-juniper woodlands (*Pinus edulis* and *Juniperus monosperma*), and Bigelow sagebrush shrublands (*Artemisia bigelovii*). The shortgrass is dominated by blue grama (*Bouteloua gracilis*), three-awn grass (*Aristida purpurea*), galleta grass (*Hilaria jamesii*), side oats grama (*Bouteloua curtipendula*), and ring muhly (*Muhlenbergia torreyi*). The sagebrush shrublands also support a mix of the grass species, and cat's eye (*Cryptantha* sp.), prickly pear cactus (*Opuntia* sp.), cholla (*Cylindropuntia imbricata*), and yucca (*Yucca glauca*) are common throughout. The shale outcrops within the relatively flat grassland areas support the globally vulnerable Arkansas Valley feverfew (*Bolophyta tetraeuris*), which is found with other mat forming plants such as stemless four-nerve daisy (*Tetraeuris acaulis*), phlox (*Phlox* sp.) and wild buckwheat (*Eriogonum* spp.), as well as Rocky Mountain zinnia (*Zinnia grandiflora*), spider milkweed (*Asclepias asperula*), and plains blackfoot daisy (*Melampodium leucanthum*). The steep shale outcrops support occurrences of the

globally imperiled golden blazing star (*Nuttallia chrysantha*). The Arkansas River runs through the PCA, and supports riparian vegetation dominated by cottonwood (*Populus deltoides*). The riparian area and floodplain are degraded and infested with invasive non-native plants including tamarisk (*Tamarix ramosissima*) and Russian olive (*Elaeagnus angustifolia*).

Biodiversity Comments: This PCA includes a good (B-ranked) occurrence of a globally imperiled (G1G2 S1S2) plant species, and a good (B-ranked) occurrence of a globally vulnerable (G3 S3) plant species. The golden blazing star is known only from the Arkansas River Valley between Canon City and Pueblo.

Natural Heritage element occurrences at the Rohr Gulch PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plants								
<i>Nuttallia chrysantha</i>	Golden blazing star	G1G2	S1S2			BLM	B	2002-08-19
<i>Bolophyta tetraeuris</i>	Arkansas River feverfew	G3	S3				B	2002-06-06

*EO = Element Occurrence

Note: Element occurrence responsible for the B-rank is shown in bold typeface.

Boundary Justification: The boundary encompasses the element occurrences and the mosaic of community types found in the immediate vicinity of the occurrences. The boundary includes some unsurveyed, potentially suitable habitat.

Protection Comments: A private landowner at this PCA indicated that he is currently involved in negotiations with Lafarge for starting strip mining. Mining of limestone for asphalt would begin within a few years. The mining would take about 30 feet of the surface material, Fort Hayes Limestone. A portion of the PCA could be mined over time.

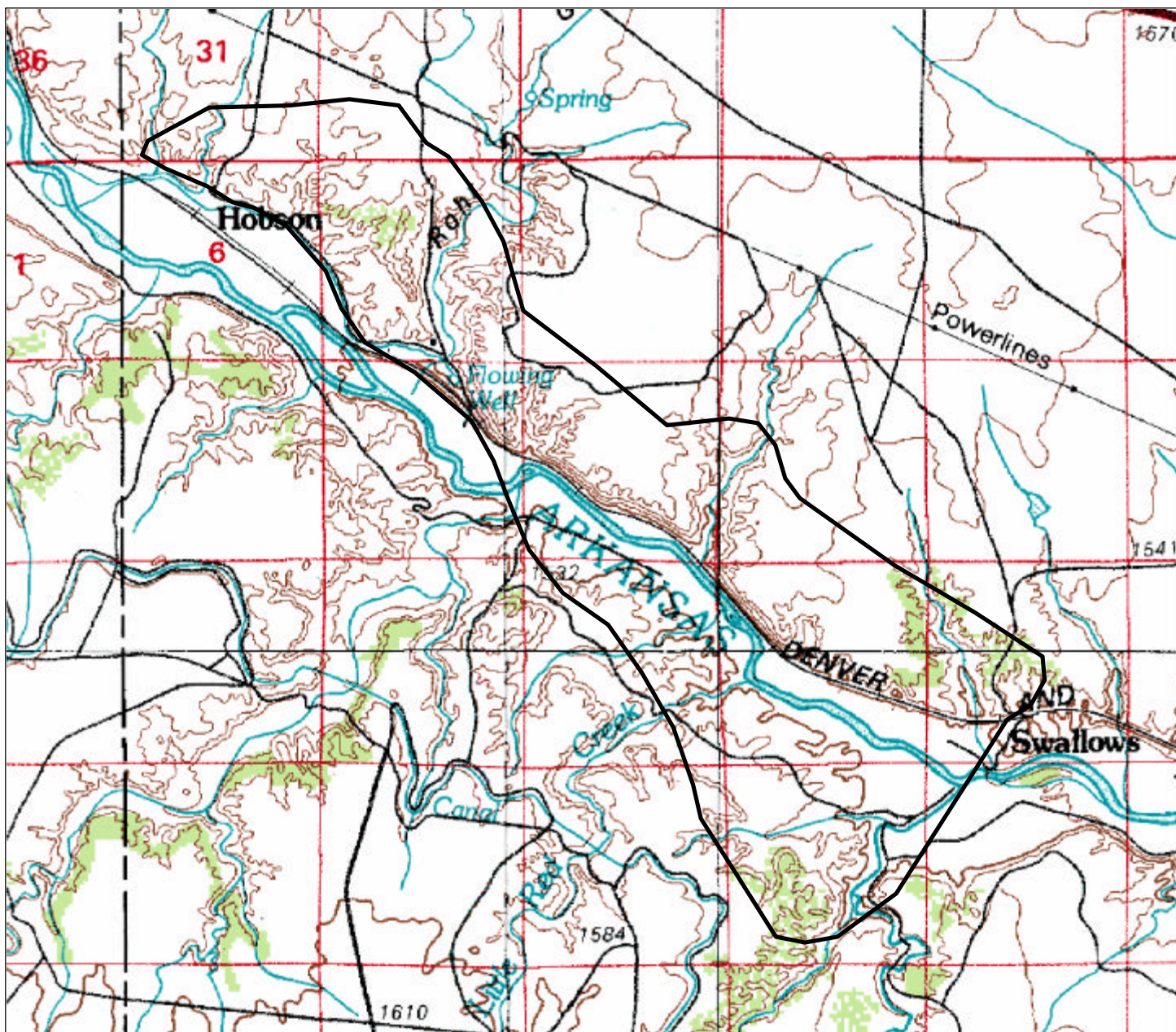
Management Comments: The primary current and historical land use at this PCA is cattle grazing, which does not appear to be presenting any management issues. Most of PCA appears to be in good condition. Populations of the invasive field bindweed (*Convolvulus arvensis*) were documented around a cattle pond, Russian thistle (*Salsola australis*) was documented along a road through the grasslands, and tamarisk and Russian olive were noted along Arkansas River. Further inventory and monitoring for rare plants and weeds would provide additional information to guide management decisions, especially since we visited during a severe drought year. This PCA had a high likelihood of supporting another globally imperiled species, round-leaf four-o'clock (*Oxybaphus rotundifolius*), as it has been documented in close proximity to this PCA, to the west in Fremont County.



Photograph
taken at the
Rohr Gulch
PCA (above)



Golden blazing
star (*Nuttallia
chrysantha*)
(left)



Coordinate System: UTM, Zone13, NAD27

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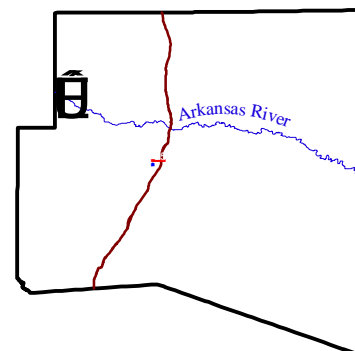
LEGEND

 PCA Boundary

Pueblo, 38104-A1
 30 x 60 Minute Series

Digital Raster Graphics produced by the U.S. Geological Survey, 1996

Location in Study Area



Beaver Creek Potential Conservation Area

Biodiversity Rank: B2 (Very high significance)

This PCA contains the following globally imperiled plant species:

- Pueblo goldenweed (*Oenopsis puebloensis*) (G1G2): one good (B-ranked) occurrence
- Golden blazing star (*Nuttallia chrysantha*) (G1G2): one fair (C-ranked) occurrence
- Round-leaf four-o'clock (*Oxybaphus rotundifolius*) (G2): two good (B-ranked) occurrences and four fair (C-ranked) occurrences.
- Arkansas River feverfew (*Bolophyta tetraeneuris*) (G3): one excellent (A-ranked), one good (B-ranked), and four fair (C-ranked) occurrences.

This site is one of only three known locations in the world where all four of these globally imperiled species have been documented.

Protection Urgency Rank: P2 (High urgency)

This PCA contains a mix of private, BLM, and U.S. military lands. Much of the site is divided into small parcels of one hundred acres or less, with many different owners.

Work with Fort Carson, BLM, private landowners, Holnam, Inc., and Colorado Department of Transportation to protect occurrences and potential habitat.

Management Urgency Rank: M3 (Moderate urgency)

Large areas of grassland are degraded and in need of restoration, while the shale barrens are minimally degraded and have high restoration potential. The Colorado Department of Transportation should be contacted regarding the roadside occurrences in the southern portion of the site. Work with Fort Carson on the management of the occurrences and potential habitat on the military reservation.

Location: About 10 miles east of Canon City, Colorado, in Pueblo and Fremont counties. North of Highway 50, south and east of Route 115. The northeastern portion of the site includes some land managed by the Fort Carson Military Reservation.

Legal Description: U.S.G.S. 7.5' quadrangles: Pierce Gulch and Hobson. T19S R68W Sections 1, 2; T19S R67W Sections 4, 5; T18S R67W Sections 8, 9; T18S R68W Sections 21, 22.

Size: 15,639 acres (6329 hectares)

Elevation: 5000 to 5600 feet (1520 to 1700 meters)

General Description: Beaver Creek flows southeast into the Arkansas River in the middle Arkansas River Valley between Canon City and Pueblo, Colorado. Pierce Gulch flows southwest into Beaver Creek. The landscape at this site is dominated by open

pinyon-juniper woodlands, grasslands (mostly degraded), and sparsely vegetated shale barrens of the Niobrara Formation. The shale barrens have flat tops and steeply eroding side slopes, and support several occurrences of four globally rare plant species.

The mixed-grass prairie found at this PCA includes New Mexico feathergrass (*Stipa neomexicana*), a cool-season bunchgrass typically found on rocky or shaley south-facing sites in southern Colorado. Because this community requires fairly specific environmental conditions, it is naturally rare throughout its range. In many areas it has been impacted by residential development, mining, and overgrazing. This occurrence may extend north onto the Fort Carson military reservation.

Biodiversity Comments: This PCA contains two good (B-ranked), three fair (C-ranked), and one poor (D-ranked) occurrences of round-leaf four-o'clock (*Oxybaphus rotundifolius*) (G1G2), one fair (C-ranked) occurrence of golden blazing star (*Nuttallia chrysantha*) (G1G2), one good (B-ranked) occurrence of Pueblo goldenweed (*Oonopsis puebloensis*) (G1G2), and one excellent (A-ranked), one good (B-ranked), and four fair (C-ranked) occurrences of Arkansas River feverfew (*Bolophyta tetraeneuris*) (G3).

The first three plant species listed above are known only from the Arkansas River Valley between Canon City and Pueblo. *Bolophyta tetraeneuris* is known primarily from this area and has been documented in a few other locations in southern Colorado. *Oonopsis puebloensis*, commonly called Pueblo goldenweed, was determined to be a new species as recently as 1991. *Oxybaphus rotundifolius*, commonly known as round-leaf four-o'clock, grows only in the Smoky Hill member of the Niobrara Formation in the Arkansas Valley of Colorado. *Nuttallia chrysantha*, golden blazing star, occurs on steep, eroding, south-facing slopes and road cuts, in alkali soils. *Bolophyta tetraeneuris*, or Arkansas River feverfew, is found on limestone and shale benches and bluffs. This PCA is one of only three known sites in the world where all four of these globally imperiled species have been documented.

Natural Heritage element occurrences at the Beaver Creek PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plants								
<i>Bolophyta tetraeneuris</i>	Arkansas River feverfew	G3	S3				A	1998-06-14
<i>Bolophyta tetraeneuris</i>	Arkansas River feverfew	G3	S3				B	1995-08-10
<i>Bolophyta tetraeneuris</i>	Arkansas River feverfew	G3	S3				C	1995-06-12
<i>Bolophyta tetraeneuris</i>	Arkansas River feverfew	G3	S3				C	1995-06-15
<i>Bolophyta tetraeneuris</i>	Arkansas River feverfew	G3	S3				C	1983-07-13
<i>Bolophyta tetraeneuris</i>	Arkansas River feverfew	G3	S3				C	1995-08-25
<i>Oonopsis puebloensis</i>	Pueblo goldenweed	G1G2	S1S2				B	1998-06-04
<i>Nuttallia chrysantha</i>	Golden blazing	G1G2	S1S2			BLM	C	1998-05-29

	star							
<i>Oxybaphus rotundifolius</i>	Round-leaf four-o'clock	G2	S2				B	1998-05-29
<i>Oxybaphus rotundifolius</i>	Round-leaf four-o'clock	G2	S2				B	1995-08-10
<i>Oxybaphus rotundifolius</i>	Round-leaf four-o'clock	G2	S2				C	1998-06-04
<i>Oxybaphus rotundifolius</i>	Round-leaf four-o'clock	G2	S2				C	1995-07-28
<i>Oxybaphus rotundifolius</i>	Round-leaf four-o'clock	G2	S2				C	1995-08-25
<i>Oxybaphus rotundifolius</i>	Round-leaf four-o'clock	G2	S2				D	1995-07-27
Plant Communities								
<i>Stipa neomexicana</i>	Great Plains mixed grass prairie	G3	S3				B	1983-07-14
<i>Stipa neomexicana</i>	Great Plains mixed grass prairie	G3	S3				B	1983-07-14

*EO = Element Occurrence

Note: Element occurrences responsible for the B-rank are shown in bold typeface.

Boundary Justification: The boundary encompasses the concentration of element occurrences found in the Beaver Creek drainage north of Highway 50, plus unsurveyed, apparently suitable habitat in the vicinity of the occurrences. In general, PCA boundaries are drawn to represent our best estimate of the primary area needed for the survival of the occurrences. This area is sufficiently large to protect intact (or at least allow simulation of) most of the natural ecological processes necessary for survival of the species, including fire, reproductive ecology, herbivory, and hydrology. The boundaries also include the mosaic of local community types on which the species may rely (knowledge of these plant species is incomplete).

Protection Comments: Work with private landowners, the Fort Carson Military Reservation, and the Colorado Department of Transportation to protect the highest quality occurrences in the PCA. Priority should be placed on protecting the southern portion of the site where the G1/G2 globally imperiled species occur. These priority species have not been documented in the northern portion of the site. The Nature Conservancy has developed a range-wide conservation plan for all of the narrowly restricted endemic plants of the Arkansas Valley Shale Barrens from Canon City to Pueblo (The Nature Conservancy 2001), which could serve as a useful reference. Without protection planning, habitat for these species could become so restricted and fragmented that viable populations cannot be sustained. A portion of this PCA is on reserve for future limestone mining. Some exploratory mining has already been done. Much of the site is divided into small parcels of one hundred acres or less, with many different owners.

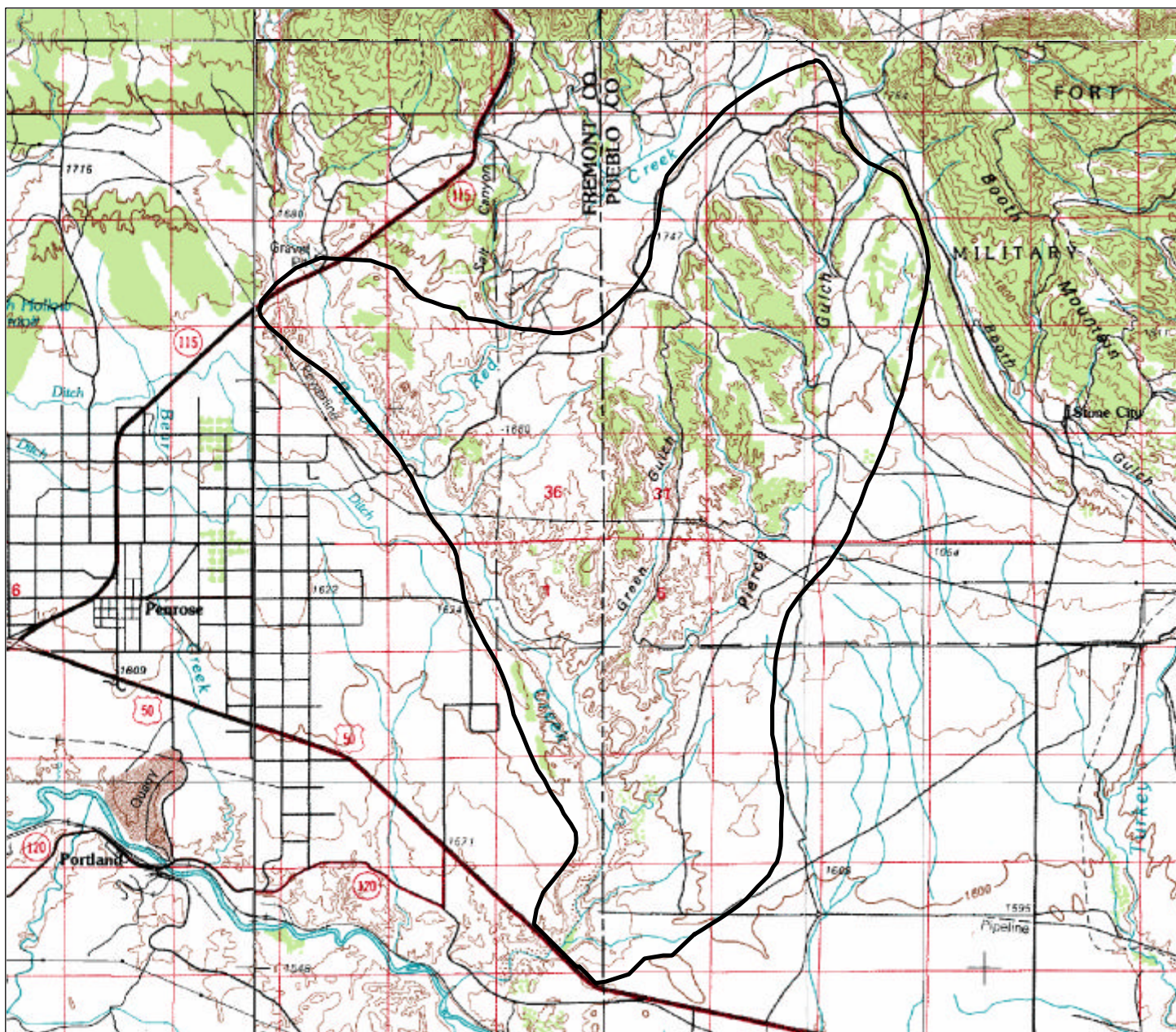
Management Comments: Further research is needed to determine the reproductive ecology and pollination biology of the four globally rare species. Populations could be monitored for long-term changes in population size. Large areas of grassland are degraded and in need of restoration, while the shale barrens are minimally degraded and

have high restoration potential. Additional investigation to learn about the plans of landowners and land managers would further benefit our understanding of management needs. The *Nuttallia chrysantha* and *Oxybaphus rotundifolius* occurring along road cuts may need to be protected from roadwork.



Round-leaf
four-o'clock
(*Oxybaphus
rotundifolius*)
(top)

Arkansas River
feverfew
(*Bolophyta
tetraeuris*)
(left)



1 0 1 Miles

Coordinate System: UTM, Zone13, NAD27

Colorado Natural Heritage Program

Colorado State University
8002 Campus Delivery
Fort Collins, CO 80523-8002

map created 14 April 2003

Disclaimer

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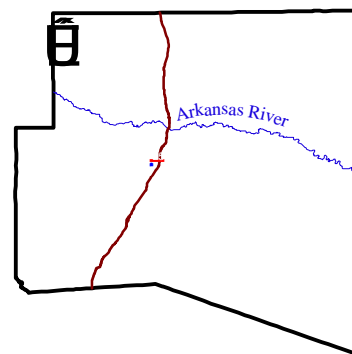
LEGEND

PCA Boundary

Pueblo, 38104-A1
30 x 60 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



Buffalograss Playas

Potential Conservation Area

Biodiversity Rank: B2 (Very high significance)

This PCA contains the best known playa habitat for the globally vulnerable (G3 S3) plains ambrosia (*Ambrosia linearis*). It also includes the best known occurrences of a globally vulnerable (G3 S3) buffalograss playa community (*Buchloe dactyloides*–*Ratibida tagetes*–*Ambrosia linearis*). Over 300 playas occur within this PCA, most of which are in good condition. It is unique to find a high concentration of playas in relatively unaltered condition. Many playas in other playa lake regions have been plowed or otherwise altered.

Protection Urgency Rank: P2 (High urgency)

Protection actions may be needed within five years primarily due to residential development pressures.

Management Urgency Rank: M4 (Low urgency)

Current management appears excellent for maintenance of the element occurrences. If development occurs, management issues will likely become more serious.

Location: Southeastern El Paso County and northeastern Pueblo County. Extends south from near the town of Yoder through the towns of Truckton and Edison to south of the El Paso/Pueblo county line.

Legal Description: U.S.G.S. 7.5' quadrangles: Big Springs Ranch, Yoder, Rush, Truckton, Truckton NE, Edison School, and Truckton SE.
T14S R61W Sections 19, 20, 28-34; T15S R60W Sections 7-10, 15-21, 28-33; T15S R61W Sections 3-6, 8-10, 13-17, 20-28, 33-36; T16S R60W Sections 3-11, 14-22, 28-33; T16S R61W Sections 1, 2, 11-15, 22-27, 34-36; T17S R60W Sections 5-8, 17-20, 30-32; T17S R61W Sections 1-3, 10-15, 22-27, 34-36; T18S R60W Sections 5, 6; T18S R61W Sections 1-3, 11.

Size: 55,350 acres (22,400 hectares)

Elevation: 5315 to 6070 feet (1620 to 1850 meters)

General Description: In southeastern El Paso County and northeastern Pueblo County, between the many low rolling hills of shortgrass prairie, are small flat-bottomed depressions. There are no surface channels draining the area, instead rainfall and runoff collect in these basins forming ephemeral wetlands. It is not clear whether these depressions are wind deflated playas (Bolen et al. 1989) or remnants of buffalo wallows (Uno 1989, F. Knopf, USGS, pers. comm.), both of which develop clay bottoms and collect runoff after heavy rainstorms. We have chosen to refer to these depressions as playas, fully acknowledging that their origin is not well understood. The area outlined by the PCA is estimated to contain over 300 playas, an average density of about three playas

per square mile. The playas are generally circular to oval-shaped, oriented roughly north south, and range in size from about 0.5 to 10 acres (0.2 to 5 ha).

These basins remain dry throughout most of the year and collect water only after heavy rainfall. In southeastern El Paso County and northeastern Pueblo County, the heavy rains generally occur in the late summer, and in many cases a series of storms are required in order for the playas to retain water (Weathers 2000, G. Paul, pers. comm., landowner). Runoff collecting in a dry playa infiltrates cracks in the clay bottom of the playa and swells the clay, effectively sealing the playa bottom (Zartman et al. 1994). After the clay has been wetted, subsequent storms can result in playa filling. The playas may hold water for periods ranging from days to weeks, depending on the size of the drainage basin and intensity of the rainstorm (Weathers 2000). In some cases, these playas may hold water from May to August (G. Paul, pers. comm., landowner) or in dry years may remain dry year round.

The vegetation in the playas is shorter than the surrounding blue grama (*Bouteloua gracilis*) shortgrass prairie and consists of different species. The dominant species in the playas is the perennial warm-season grass buffalograss (*Buchloe dactyloides*). Growing with the buffalograss are the perennial forbs plains ambrosia (*Ambrosia linearis*) (G3 S3) and short-ray prairie coneflower (*Ratibida tagetes*).

The vegetation in the playas generally occurs in bands where the outermost rim often supports the highest density of plains ambrosia and coneflower. Other plants growing in the playas include a dryland sedge (*Carex eleocharis* ssp. *stenophylla*), prostrate vervain (*Verbena bracteata*), frog-fruit (*Phyla cuneifolia*), spreading yellow cress (*Rorripa sinuata*), green thread (*Thelesperma megapotamicum*, *T. filifolium*), curly cup gumweed (*Grindelia squarrosa*), and Russian thistle (*Salsola australis*). Interestingly, buffalograss submerged during the growing season has been known to withstand more than five weeks of inundation (Porterfield 1945). In the playas that remain wet the longest, there may be a small bare ground portion in the center with very sparse cover that could include western wheatgrass (*Pascopyrum smithii*), spikerush (*Eleocharis palustris* and *E. acicularis*), goosefoot (*Chenopodium* sp.), or weedy annuals.

Plains ambrosia is a shortgrass prairie species that is restricted to an area of about 100 miles by 50 miles (primarily in El Paso and Lincoln counties). Plains ambrosia requires a little more moisture than most upland plants. The playas appear to be this plant's native habitat as the clay soils of the playas retain moisture longer than the upland soils. Roadsides also appear to provide the extra moisture required by the plains ambrosia and, as such, plains ambrosia is very prevalent on the sides of many unpaved roads in the area. The best known occurrences for this species are playas in El Paso County.

Where the playas are most concentrated, the density can exceed 10 playas per square mile. The playas provide heterogeneity within the shortgrass prairie that is important biologically to provide for the needs of a wide range of species (Knopf 1996a, Hoagland and Collins 1997). Other factors affecting grassland environmental and compositional heterogeneity include fire, soils, grazing, and prairie dogs. Playas may serve as the

primary source of heterogeneity in the region; other sources of heterogeneity, including fire, grazing, and prairie dogs are heavily managed (Hoagland and Collins 1997).

In late summer 2000, Mountain Plover (*Charadrius montanus*) (G2 S2B,SZN) were observed gathering for migration in dry playas. Mountain Plover is a declining shortgrass prairie species that is known to inhabit areas with low vegetation and a high percentage of bare ground such as prairie dog towns and heavily grazed shortgrass prairie (Knopf 1996b). Observations of concentrations of Mountain Plover exceeding 50 birds in the playas in late summer may indicate that playas may be another habitat attractive to Mountain Plover because of the low-growing vegetation. In addition, a breeding location for another shortgrass prairie bird that prefers low-growing vegetation, McCown's Longspur (*Calcarius mccownii*) (G5 S2B, SZN), was noted in the vicinity of playas (A. Versaw, pers. comm.). This may be the southernmost known current breeding location in Colorado for McCown's Longspur (Kingery 1998).

In the U.S., the area typically described as the playa lakes region includes approximately 140,000 square miles (36.2 million ha) of southwestern Kansas, southeastern Colorado, the panhandle of Oklahoma, eastern New Mexico, and the panhandle and Southern High Plains of Texas (Haukos and Smith 1997). El Paso County (the highest concentration of these playas) and northeastern Pueblo County is northwest of this area and its playas appear to differ from those further south. The El Paso/Pueblo county playas are smaller and are inundated at different times than the more southern playas. The more southern playas fill with rainwater during late winter and early spring and may remain flooded through summer and fall, and as such are considered critical to the maintenance of waterfowl and shorebirds on the central flyway (Guthrey and Bryant 1982, Batt 1996). Though these playas can fill during wet springs, they are more often inundated late in the summer and are dry during spring migration. Finally, most of the more southern playas are within areas of intense agricultural use and many have been plowed for crops, modified for collection of irrigation or feedlot runoff, or otherwise altered (Guthery and Bryant 1982, Bolen et al. 1989, Haukos and Smith 1994). The Buffalograss Playas PCA is primarily rangeland with little alteration by agriculture. The most common disturbance in the playas is roads.

The most common explanation for the origin of playas is deflation (wind erosion), though theories on playa formation are controversial (Osterkamp and Wood 1987). The consistent north-south orientation of the playas in the Buffalograss Playas PCA suggests deflation influenced their formation. As previously mentioned, these playas are also consistent with descriptions of buffalo wallows. Wallows are formed by bison pawing the ground, creating patches of bare ground in which to dust bathe (Uno 1989), or perhaps mud bathe to protect against biting insects or aid in shedding their heavy fur (Hornaday 1889, F. Knopf, pers. comm. USGS). Active wallows range from 3 to 5 meters in diameter and merging of adjacent wallows can create wallows larger than about 0.5 acre (1,400 square meters) (Uno 1989, Knopf 1996a). Bison were extirpated from the area by 1875 (Hornaday 1889), but evidence of their wallows can remain evident on the landscape for more than a hundred years (Knopf 1996a). Perennial grasses invade

wallows not used by bison (Uno 1989). It is possible that the Buffalograss Playas PCA playas result from of a combination of factors including deflation and buffalo wallowing.

The land within the PCA is primarily privately owned and used for cattle grazing. About 10 percent of the area is tilled for crops or developed for rural housing. Most of the playas in this PCA have not been plowed and retain their native vegetation for the most part. The most common modifications of the playas are unpaved roads passing through or excavation of the center of the playa to retain water longer for livestock watering. More recently, development pressure is increasing and land is being subdivided, usually into 35-acre parcels. Within these subdivided properties, in some cases homes have been placed adjacent to or within playas.

Biodiversity Comments: This PCA contains the best known playa habitat for the globally vulnerable (G3 S3) plains ambrosia (*Ambrosia linearis*). It also includes most of the known extent of the globally vulnerable (G3 S3) buffalograss playa community (*Buchloe dactyloides-Ratibida tagetes-Ambrosia linearis*). The landscape included within this PCA is fragmented by roads and some agriculture but remains largely intact. Hundreds of playas remain in good to excellent condition in the PCA. Plains ambrosia, though locally abundant, has a very limited global range (about 50 miles by 100 miles), and almost all of the habitat is privately owned.

Natural Heritage element occurrences at the Buffalograss Playas PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plants								
<i>Ambrosia linearis</i>	Plains ambrosia	G3	S3			FS	A	2000-07-19
<i>Ambrosia linearis</i>	Plains ambrosia	G3	S3			FS	A	2000-07-13
<i>Ambrosia linearis</i>	Plains ambrosia	G3	S3			FS	A	2000-07-12
<i>Ambrosia linearis</i>	Plains ambrosia	G3	S3			FS	B	2000-09-12
<i>Ambrosia linearis</i>	Plains ambrosia	G3	S3			FS	B	2000-07-13
<i>Ambrosia linearis</i>	Plains ambrosia	G3	S3			FS	B	2000-07-12
<i>Ambrosia linearis</i>	Plains ambrosia	G3	S3			FS	B	2000-06-30
<i>Ambrosia linearis</i>	Plains ambrosia	G3	S3			FS	C	2000-07-18
<i>Ambrosia linearis</i>	Plains ambrosia	G3	S3			FS	C	1993-07
<i>Ambrosia linearis</i>	Plains ambrosia	G3	S3			FS	C	1993-07
<i>Ambrosia linearis</i>	Plains ambrosia	G3	S3			FS	C	1993-07
Plant Communities								
<i>Buchloe dactyloides-Ratibida tagetes-Ambrosia linearis</i>	Buffalograss playa	G3	S3				B	2000-09-12

<i>Buchloe dactyloides- Ratibida tagetes- Ambrosia linearis</i>	Buffalograss playa	G3	S3				B	2000-07-19
<i>Buchloe dactyloides- Ratibida tagetes- Ambrosia linearis</i>	Buffalograss playa	G3	S3				B	2000-07-19
<i>Buchloe dactyloides- Ratibida tagetes- Ambrosia linearis</i>	Buffalograss playa	G3	S3				B	2000-07-13
<i>Buchloe dactyloides- Ratibida tagetes- Ambrosia linearis</i>	Buffalograss playa	G3	S3				B	2000-07-13
<i>Buchloe dactyloides- Ratibida tagetes- Ambrosia linearis</i>	Buffalograss playa	G3	S3				B	2000-07-13
<i>Buchloe dactyloides- Ratibida tagetes- Ambrosia linearis</i>	Buffalograss playa	G3	S3				B	2000-07-12
<i>Bouteloua gracilis- Buchloe dactyloides</i>	Shortgrass prairie	G4	S2?				B	2000-11-18

*EO = Element Occurrence

Note: Element occurrences responsible for the B-rank are shown in bold typeface.

Boundary Justification: The site boundary for Buffalograss Playas PCA includes the densest concentration of playas in El Paso and Pueblo counties. Playas continue for many miles north, south, and east of this PCA but not in the concentrations found within it. The entire PCA is underlain by Dwyer soils. Roadside occurrences of plains ambrosia extend for many miles beyond the boundary but these are not included because they are of lower conservation value.

Protection Comments: All land within this PCA is either privately owned or leased from the State Land Board for grazing. Historically, grazing has been the dominant land use in the area, varying in intensity from light to heavy. Increasingly, grazing lands are being subdivided and sold as 35-acre or larger parcels and residential development is progressing rapidly, mostly in the form of mobile homes on small plots.

Six sections within the PCA are owned by the State Land Board and leased for grazing. Limited areas are currently cultivated at present, but when the land was initially homesteaded there were many small cultivated areas, probably one per section or more. Most of these areas have not been farmed for many years, but the areas that were once plowed still do not exhibit a typical shortgrass prairie flora.

Management Comments: The current management appears appropriate for maintaining the element occurrences. Grazing regimes that maintain the natural mosaic nature of the shortgrass prairie should be encouraged. Introduction of additional pet animals (primarily dogs and cats) with increased residential development may negatively impact shortgrass prairie birds dependent on the playa area for breeding or brood rearing.



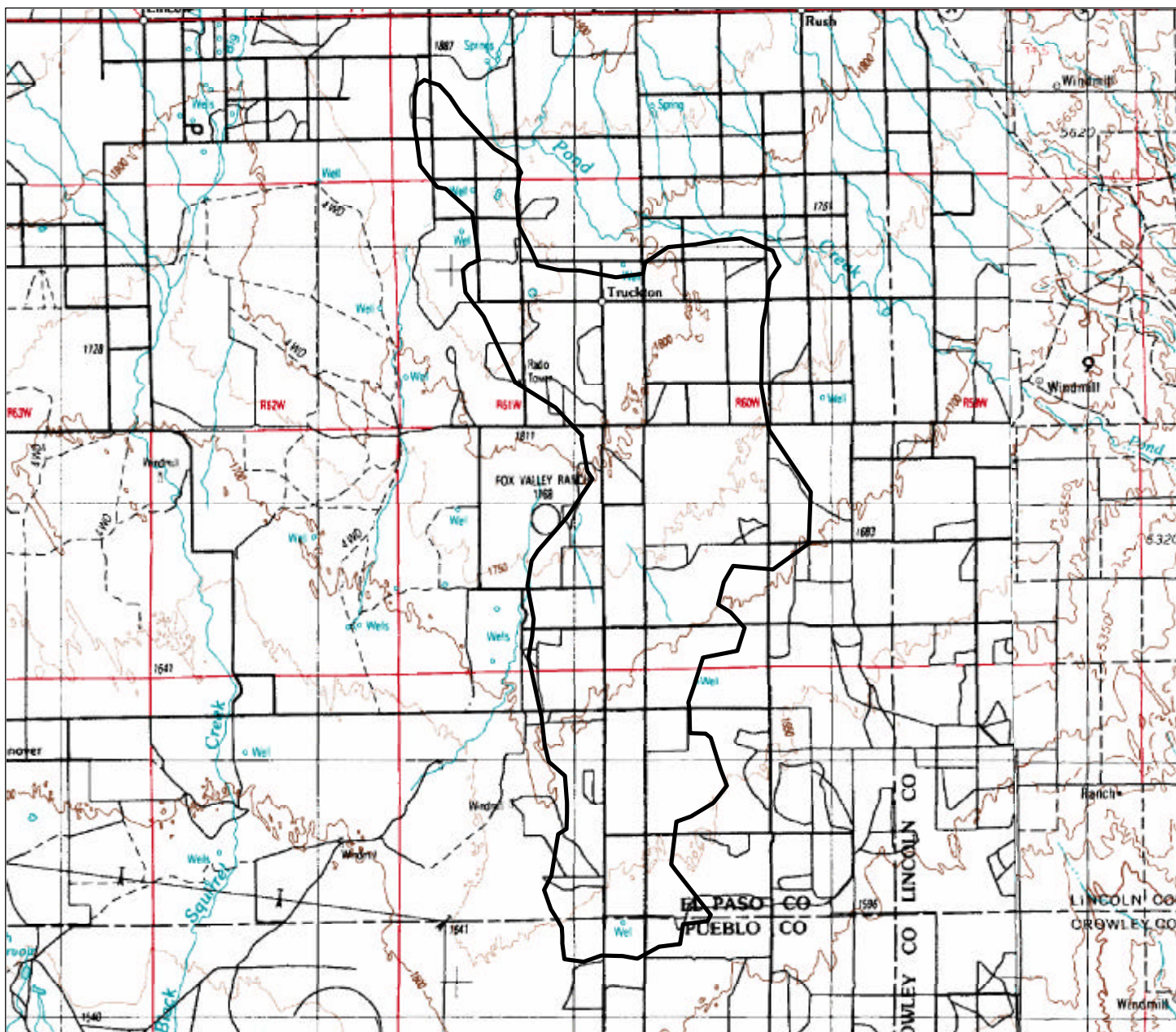
Playa with ponded water



Aerial view of the
Buffalograss Playas
PCA



Mountain Plovers
(*Charadrius montanus*) foraging
in a dry playa.
Buffalograss
(*Buchloe dactyloides*) and
plains ambrosia
(*Ambrosia linearis*)
growing on the playa
floor.



2 0 2 Miles

Coordinate System: UTM, Zone13, NAD27

Colorado Natural Heritage Program

Colorado State University
8002 Campus Delivery
Fort Collins, CO 80523-8002

map created 14 April 2003

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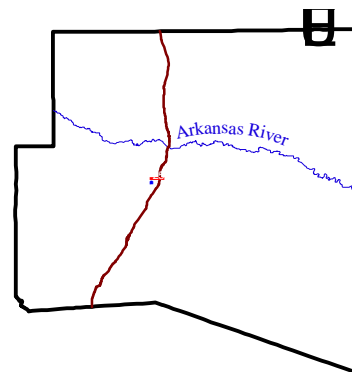
LEGEND

PCA Boundary

Pueblo, 38104-A1
1 x 2 Degree Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



B2: Buffalograss Playa

Chico Basin Shortgrass Prairie Potential Conservation Area

Biodiversity Rank: B2 (Very high significance)

The Chico Basin Shortgrass Prairie site supports several excellent and good (A- and B-ranked) occurrences of Mountain Plover (*Charadrius montanus*), a globally imperiled (G2) species designated as a candidate for federal listing as threatened, sensitive by the BLM and Forest Service, and a species of special concern by the State of Colorado. The PCA also supports an excellent occurrence of swift fox (*Vulpes velox*), a globally vulnerable (G3 S3) species proposed for federal listing as threatened, sensitive by the Forest Service, and a species of special concern by the State of Colorado. Several excellent to fair (A- to C-ranked) occurrences of black-tailed prairie dogs (*Cynomys ludovicianus*) (G4 S4), a species petitioned for federal listing as threatened and a species of special concern in Colorado, also occur within the site.

Protection Urgency Rank: P2 (High urgency)

The western portion of the PCA is privately owned or State Land Board land leased to The Nature Conservancy (Bohart Ranch), Chico Basin Ranch, or the Transportation Test Track. The eastern portion of the PCA is primarily privately owned with parcels of State Land Board land interspersed with the southernmost portion owned by the Department of Defense Pueblo Chemical Depot. Development pressures are high on privately owned portions and several small residential developments already exist within and adjacent to the site.

Management Urgency Rank: M4 (Low urgency)

Current management seems to favor the persistence of the zoological elements on this site, but new management actions may be needed in the future to maintain the current quality and mosaic of these occurrences.

Location: Eastern El Paso and Pueblo counties, approximately 20 miles east of Colorado Springs and 10 miles west of Pueblo. The boundary of the site begins four miles south of Ellicott in El Paso County and extends south to the Pueblo Chemical Depot. The PCA is bisected by the north-south trending Signal Rock Sandhills PCA.

Legal Description: U.S.G.S. 7.5' quadrangles: Bar JH Ranch, Big Springs Ranch, Boone Hill, Devine, Edison School, Hanover, Hanover NE, Hanover NW, Hanover SE, Highlands Church, North Avondale, North Avondale NE, Rush, Truckton, Truckton NE, Truckton SE, and Yoder.

T14S R 60W, T14S R61W, T15S R60W, T15S R61W, T15S R62W, T15S R63W, T16S R60W, T16S R61W, T16S R62W, T16S R63W, T17S R60W, T17S R61W, T17S R62W, T17S R63W, T18S R60W, T18S R61W, T18S R62W, T18S R63W, T19S R61W, T19S R62W, T20S R61W, T20S R62W.

Size: 186,010 acres (75,275 hectares)

Elevation: 4480 to 6245 ft (1365 to 1900 m)

General Description: The Chico Basin Shortgrass Prairie site encompasses over 250 square miles of shortgrass prairie in northern Pueblo and southern El Paso counties. The site is characterized by a mixture of open, flat areas and gently rolling terrain that drains into mostly ephemeral streams and swales, or in the northeast section of the PCA, closed-basin depressions (playas).

The PCA includes extensive tracts of native shortgrass prairie with ground cover that consists primarily of closely-grazed stands of blue grama (*Bouteloua gracilis*). Cholla (*Opuntia imbricata*) and yucca (*Yucca glauca*) occur in scattered to moderately-dense stands on some portions of the site. Plant species diversity generally is low throughout the site with dominant species including blue grama, three-awn grass (*Aristida* spp.), galleta grass (*Hilaria jamesii*), sand dropseed (*Sporobolus cryptandrus*), rabbitbrush (*Chrysothamnus nauseosus*), yucca, cholla, and prickly pear (*Opuntia* spp.).

Many large black-tailed prairie dog (*Cynomys ludovicianus*) complexes occur scattered throughout the site. Prairie dogs are thought to be a keystone species (Kotliar et al. 1999) and their presence increases the diversity of plant and animal communities within the site. Burrowing Owl (*Athene cunicularia*) (G4 S4B) are commonly seen within prairie dog colonies within the site.

Many breeding locations for Mountain Plover (*Charadrius montanus*) (G2 S2B), a declining shortgrass prairie species, are documented within the PCA. Mountain Plover are known to inhabit areas with low vegetation and a high percentage of bare ground such as prairie dog towns and heavily grazed shortgrass prairie (Knopf 1996b).

Other shortgrass prairie wildlife species known within the PCA include swift fox (*Vulpes velox*) (G3 S3), McCown's Longspur (*Calcarius mccownii*) (G5 S2B, SZN), Long-billed Curlew (*Numenius americanus*) (G5 S2B, SZN), and massasauga (*Sistrurus catenatus*) (G3G4 S2). In addition, ongoing monitoring at the Pueblo Chemical Depot in the southern portion of the site has documented 21 mammal species, 52 orthopteran species, 65 additional arthropod species from five orders, five species of herpatofauna, and numerous species of songbirds and hawks. The Depot supports a large and healthy population of black-tailed prairie dogs that is recovering from a plague epizootic of 1999.

Grazing of domestic livestock occurred historically on most of the site and continues today. Portions of Pueblo Chemical Depot have not been grazed since 1942. Small portions of the site, especially on private property, were converted to agricultural croplands during the past 100 years. The cultivation of some of these areas was subsequently abandoned, producing old-field" (weedy, early-successional) habitats. Small areas of the site remain under cultivation.

On the private land portions, some areas have been developed for rural housing. Development pressure is increasing and land is being subdivided, usually into 35-acre parcels.

Biodiversity Rank Justification: The PCA supports several excellent and good breeding occurrences of the globally and state imperiled (G2 S2B, SZN) Mountain Plover. The site also supports an excellent occurrence of swift fox, a globally vulnerable (G3 S3) species that is proposed for federal listing as a threatened species. Several excellent to fair black-tailed prairie dog complexes occur within the site as well as a wide range of shortgrass prairie wildlife species including McCown's Longspur (*Calcarius mccownii*) (G5 S2B, SZN), Long-billed Curlew (*Numenius americanus*) (G5 S2B, SZN), and massasauga (*Sistrurus catenatus*) (G3G4 S2).

Natural Heritage element occurrences at the Chico Basin Shortgrass Prairie PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Birds								
<i>Charadrius montanus</i>	Mountain Plover	G2	S2B, SZN	P	SC	BLM, FS	A	2001-04-09
<i>Charadrius montanus</i>	Mountain Plover	G2	S2B, SZN	P	SC	BLM, FS	A	2001-07-26
<i>Charadrius montanus</i>	Mountain Plover	G2	S2B, SZN	P	SC	BLM, FS	B	2002-05
<i>Charadrius montanus</i>	Mountain Plover	G2	S2B, SZN	P	SC	BLM, FS	B	2001-04-09
<i>Charadrius montanus</i>	Mountain Plover	G2	S2B, SZN	P	SC	BLM, FS	B	2001-04-10
<i>Charadrius montanus</i>	Mountain Plover	G2	S2B, SZN	P	SC	BLM, FS	D	2001-04-05
<i>Charadrius montanus</i>	Mountain Plover	G2	S2B, SZN	P	SC	BLM, FS	D	1997-04-03
<i>Charadrius montanus</i>	Mountain Plover	G2	S2B, SZN	P	SC	BLM, FS	E	2001-04-07
<i>Charadrius montanus</i>	Mountain Plover	G2	S2B, SZN	P	SC	BLM, FS	E	2001-04-07
<i>Charadrius montanus</i>	Mountain Plover	G2	S2B, SZN	P	SC	BLM, FS	E	2001-04-07
<i>Charadrius montanus</i>	Mountain Plover	G2	S2B, SZN	P	SC	BLM, FS	E	2001-04-10
<i>Charadrius montanus</i>	Mountain Plover	G2	S2B, SZN	P	SC	BLM, FS	E	2001-04-10
<i>Calcarius mccownii</i>	McCown's Longspur	G5	S2B, SZN				B	2000-08-23
<i>Calcarius mccownii</i>	McCown's Longspur	G5	S2B, SZN				C	2001-04-09
<i>Numenius americanus</i>	Long-billed Curlew	G5	S2B, SZN		SC	BLM, FS	C	2001-04-10
<i>Numenius americanus</i>	Long-billed Curlew	G5	S2B, SZN		SC	BLM, FS	D	2000-07-17
Mammals								
<i>Vulpes velox</i>	Swift fox	G3	S3	P	SC	FS	A	2001-08-25
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4				A	2002-07-25
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4				A	2002-04-18
<i>Cynomys</i>	Black-tailed	G4	S4				B	2002-04-18

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
<i>ludovicianus</i>	prairie dog							
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4				B	2002-04-17
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4				C	2002-07-25
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4				C	2002-04-17
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4				C	2001-04-20
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4				D	2002-07-25
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4				D	2001-04-03
Reptiles								
<i>Sistrurus catenatus</i>	Massasauga	G3G4	S2		SC	BLM	E	1995-05-22
Plant Communities								
<i>Bouteloua gracilis</i> herbaceous vegetation	Blue grama shortgrass prairie	G4Q	S4				C	2000-08-23

*EO = Element Occurrence

Note: Element occurrences responsible for the B-rank are shown in bold typeface.

Boundary Justification: The boundary encompasses the numerous locations at which breeding Mountain Plovers were observed and adjacent areas of suitable breeding habitat. The PCA is bisected throughout its length by a five-mile wide zone of relatively rolling terrain covered by aeolian (wind-deposited) sands and by vegetation (especially sandsage (*Artemisia filifolia*)) that render the land unsuitable for use by Mountain Plovers. Mountain Plovers prefer flat, open areas with very low-growing or closely-cropped vegetation. The borders include the best known high quality shortgrass prairie habitat. The northeast border of the PCA may expand as additional information becomes available.

Protection Comments: Present land uses are compatible with the maintenance of a viable breeding assemblage of Mountain Plovers. However, the privately-owned sections of the PCA are highly susceptible to low-density residential development pressures. On the state-leased lands, no protection actions are thought to be necessary in the foreseeable future, but protection actions are needed to secure long-term conservation. Likewise, the Pueblo Chemical Depot is facing decommissioning within the next 15 years and protection actions are needed to secure long-term conservation.

Management Comments: Current management seems to favor the persistence of the Mountain Plovers and associated shortgrass prairie species, but changes in management practices may be needed in the future to maintain the current quality of the birds' habitat. Factors that might prompt the need for new management actions might include the effects of a change in the livestock grazing regime or other agricultural practices, additional land development, and the impacts of human activities and disturbances within the site.

Continuation of current livestock grazing practices may benefit Mountain Plovers by maintaining the closely cropped vegetation preferred by these birds.



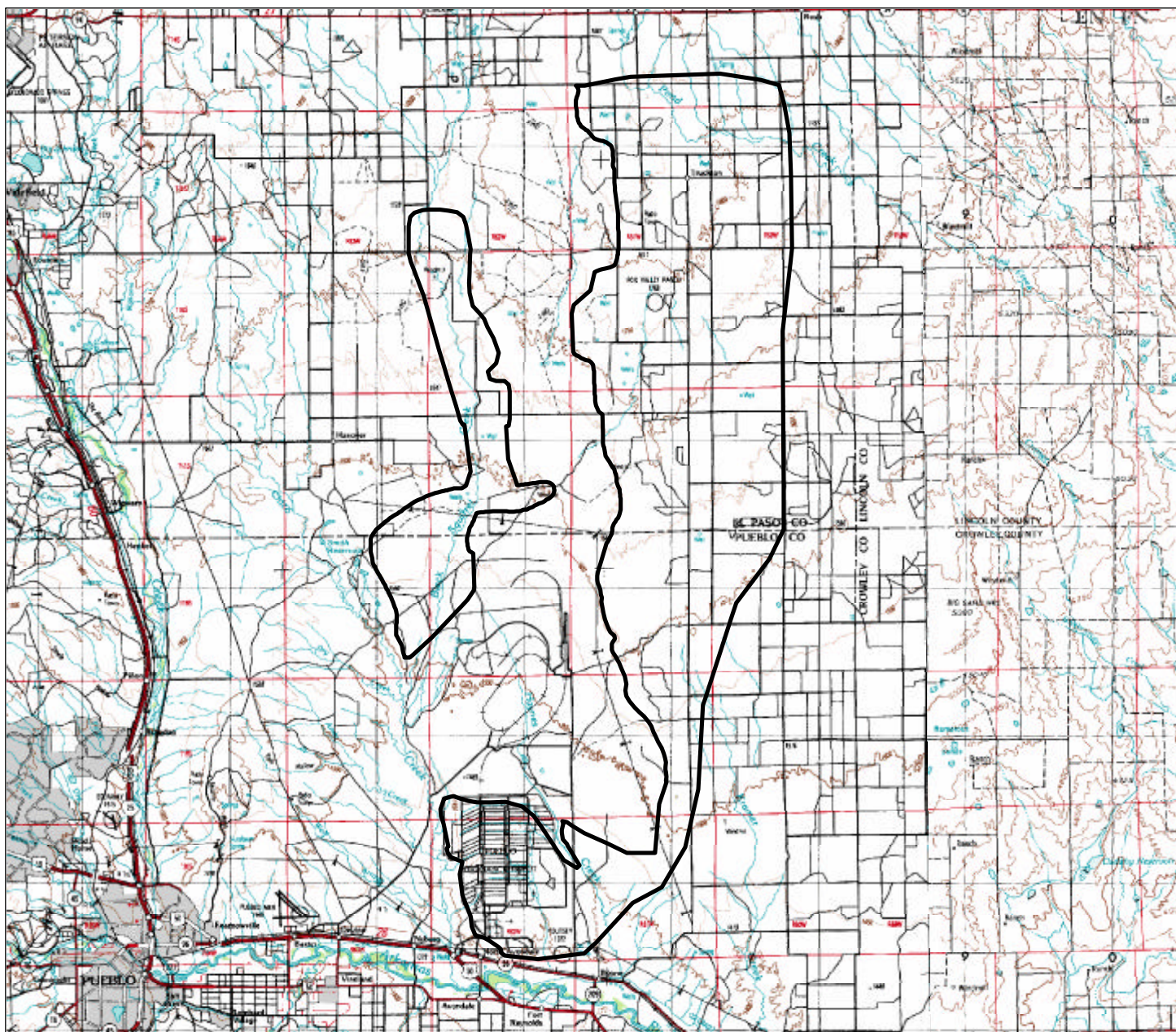
Nesting Mountain Plover (*Charadrius montanus*) (left)

Blue grama (*Bouteloua gracilis*)
shortgrass prairie (middle)



Pronghorn (*Antilocapra americana*)
(bottom)





4 0 4 8 Miles

Coordinate System: UTM, Zone13, NAD27

Colorado Natural Heritage Program

Colorado State University
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Fort Collins, CO 80523-8002

map created 14 April 2003

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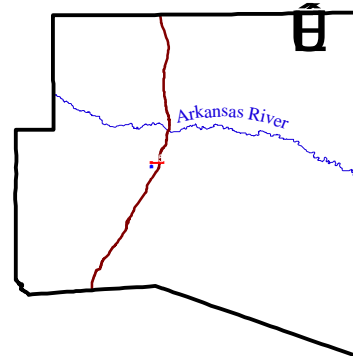
LEGEND

PCA Boundary

Pueblo, 38104-A1
Lamar, 38102-A1
1 x 2 Degree Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



Greenhorn Potential Conservation Area

Biodiversity Rank: B2 (Very high significance)

This PCA contains a good (B-ranked) occurrence of a globally imperiled (G2 S2) plant species, Rocky Mountain bladderpod (*Lesquerella calcicola*).

Protection Urgency Rank: P2 (High urgency)

Work with landowners and the local community around Greenhorn and Colorado City to assure protection of this site. The primary threat is residential development encroaching from the north and west sides of the area.

Management Urgency: M4 (Low urgency)

Current management appears to be adequate. Further inventory and monitoring would improve understanding of management needs.

Location: Directly west of and adjacent to the historic town of Greenhorn in southern Pueblo County, the Greenhorn PCA is 2.1 miles south of Route 165 and 1.3 miles west of I-25.

Legal Description: U.S.G.S. 7.5' quadrangle: Colorado City. T25S R67W Section 2; T24S R67W Section 35.

Size: 112 acres (46 hectares)

Elevation: 6000 to 6260 feet (1830 to 1910 meters)

General Description: This relatively small PCA contains a large, sparsely vegetated shale outcrop that is bordered by roads on every side. The southern boundary of the site is steep and a small ravine cuts across the eastern portion. The western portion is dominated by a hill that provides a nice overlook of the surrounding areas. Associated plant species include Gambel's oak (*Quercus gambelii*), gumweed (*Grindelia* sp.), wild buckwheat (*Eriogonum* sp.), yucca (*Yucca glauca*), and beardtongue (*Penstemon* sp.).

Biodiversity Comments: This PCA contains a good (B-ranked) occurrence of about 100 individuals of a globally imperiled (G2 S2) plant species, Rocky Mountain bladderpod (*Lesquerella calcicola*). This particular occurrence was first observed in 1921, indicating good viability over a long time period. The Rocky Mountain bladderpod occurs in shale outcrops and chalky or sandy soils. It is known from less than 20 locations worldwide, found only in El Paso, Fremont, Huerfano, Las Animas, Conejos, and Pueblo counties in Colorado, and in northeastern New Mexico. It was first observed in Colorado in 1878. Little is known about this species.

Natural Heritage element occurrences at the Greenhorn PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plants								
<i>Lesquerella calcicola</i>	Rocky Mountain bladderpod	G2	S2				B	2002-08-08

*EO = Element Occurrence

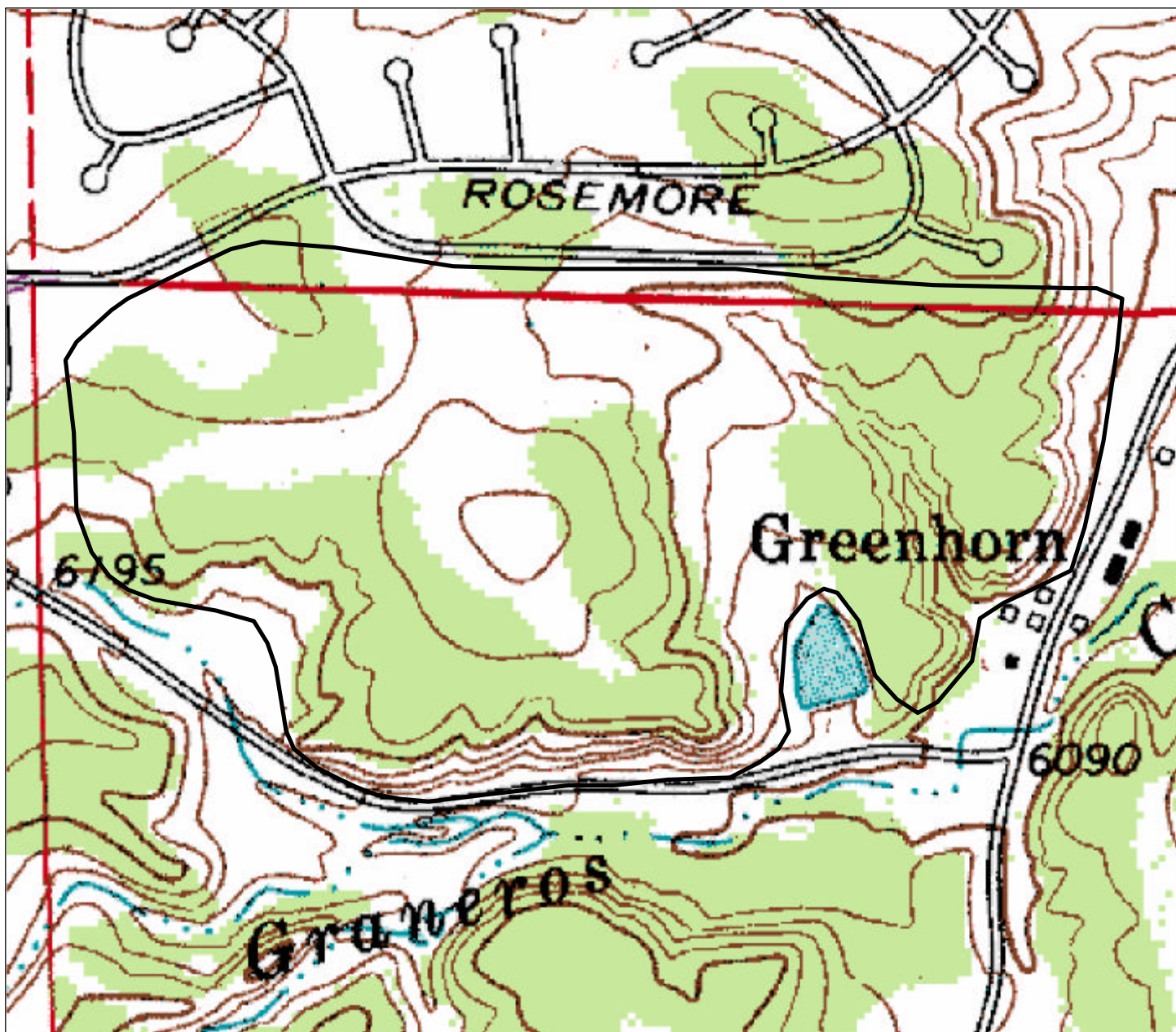
Boundary Justification: The boundary encompasses the element occurrence, plus unsurveyed, apparently suitable habitat in the vicinity of the occurrence. In general, site boundaries are drawn to represent our best estimate of the primary area needed for the survival of the occurrence. This area is estimated to be sufficiently large to protect intact (or at least allow simulation of) most of the natural ecological processes necessary for survival of the species, including reproductive ecology, and hydrology. The boundaries also include the mosaic of local community types on which the species may rely (knowledge of this species is incomplete).

Protection Comments: The Greenhorn PCA includes privately owned lands. This area may be threatened by development pressures as it is in close proximity to the growing area of Colorado City. A conservation easement or open space designation would help to protect the rare plant species found here.

Management Comments: Additional surveying for this plant is warranted, but the current data suggest that it is extremely rare.



Photograph taken at the Greenhorn PCA



0.1 0 0.1 Miles

△ Coordinate System: UTM, Zone13, NAD27

Colorado Natural Heritage Program

Colorado State University
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Fort Collins, CO 80523-8002

map created 14 April 2003

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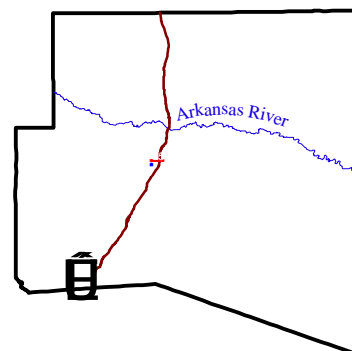
LEGEND

□ PCA Boundary

Colorado City, 37104-H7
7.5 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



Turkey Creek Potential Conservation Area

Biodiversity Rank: B2 (Very high significance)

The Turkey Creek PCA supports one good (B-ranked) occurrence of the globally imperiled (G2 S2B) Mountain Plover (*Charadrius montanus*) and a large and healthy complex (A-ranked) of the black-tailed prairie dog (*Cynomys ludovicianus*).

Protection Urgency Rank: P3 (Moderate urgency)

There is a definable threat, but it is not expected to impact the element occurrences within the next five years. The nesting population of Mountain Plovers and the largest of the three active prairie dog colonies occur on the Fort Carson Military Reservation, and are insulated from disturbance and the development pressures experienced by the surrounding area.

Management Urgency Rank: M3 (Moderate urgency)

Although not currently threatened, management may be needed in the future to maintain current quality of the element occurrences.

Location: The Turkey Creek PCA is located in northwestern Pueblo, north of Highway 50. Take Highway 50 west of Pueblo, Colorado to the Stove City Road. This PCA is adjacent to the Pumpkin Hollow and Beaver Creek PCAs.

Legal Description: U.S.G.S. 7.5' quadrangles: Stone City, Pierce Gulch, Swallows and Hobson. T18S R67W Sections 33-36; T19S R67W Sections 1-5, 7-11, 14-23, 26-35.

Size: 13,922 acres (5634 hectares)

Elevation: 5120 to 5520 feet (1560 to 1683 meters)

General Description: The Turkey Creek PCA is located in northwestern Pueblo County and includes parts of the Fort Carson Military Reservation and the private lands south of the Reservation. The PCA was drawn to include a large, reproducing and healthy complex of the black-tailed prairie dog (*Cynomys ludovicianus*) and nesting Mountain Plovers (*Charadrius montanus*), and includes lower lying prairie grassland, the suitable habitat of these species. The PCA varies in elevation from 5100 feet at its south end, rising gradually to 5500 feet at the northern boundary on Fort Carson. The terrain of the PCA is fairly flat with an 80% cover of grasses, and is dominated by blue grama (*Bouteloua gracilis*) with some purple three-awn (*Aristida purpurea*). Cholla cactus (*Cylindropuntia imbricata*) and prickly pear cactus (*Opuntia* spp.) occur at a very small percentage throughout the PCA. The PCA is situated between two distinctly different landscapes. To the east the PCA is bordered by the Turkey Creek drainage where the riparian community associated with the creek is not suitable for prairie dogs or Mountain Plovers, and to the west and north the PCA is restricted by juniper woodlands that are also unsuitable to prairie dogs and Mountain Plovers. On portions of the PCA, grazing has reduced the cover, density, and biomass of blue grama. This modification of the

rangeland appears not to have affected the prairie dogs, which generally occur in association with grazing cattle (Licht and Sanchez 1993), and may be beneficial to Mountain Plovers, which tend to associate with bare ground and disturbance (Knopf and Miller 1994). The Mountain Plovers occur on the grassland disturbed by the large prairie dog colony on Fort Carson and the colonies of the prairie dog complex are disbursed throughout the blue grama grassland of the PCA.

Biodiversity Comments: This PCA was drawn for a good (B-ranked) occurrence of the globally imperiled (G2) Mountain Plover and includes a large, healthy complex (A-ranked occurrence) of the apparently globally secure (G4) black-tailed prairie dog. Mountain Plover is a declining shortgrass prairie species that is proposed for federal listing as a threatened species. The black-tailed prairie dog complex included in this PCA is the largest known from Pueblo County.

Natural Heritage element occurrences at the Turkey Creek PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Birds								
<i>Charadrius montanus</i>	Mountain Plover	G2	S2B, SZN	P	SC	BLM, FS	B	2002-03-03
Mammals								
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4	C			A	2002-06-07

*EO = Element Occurrence

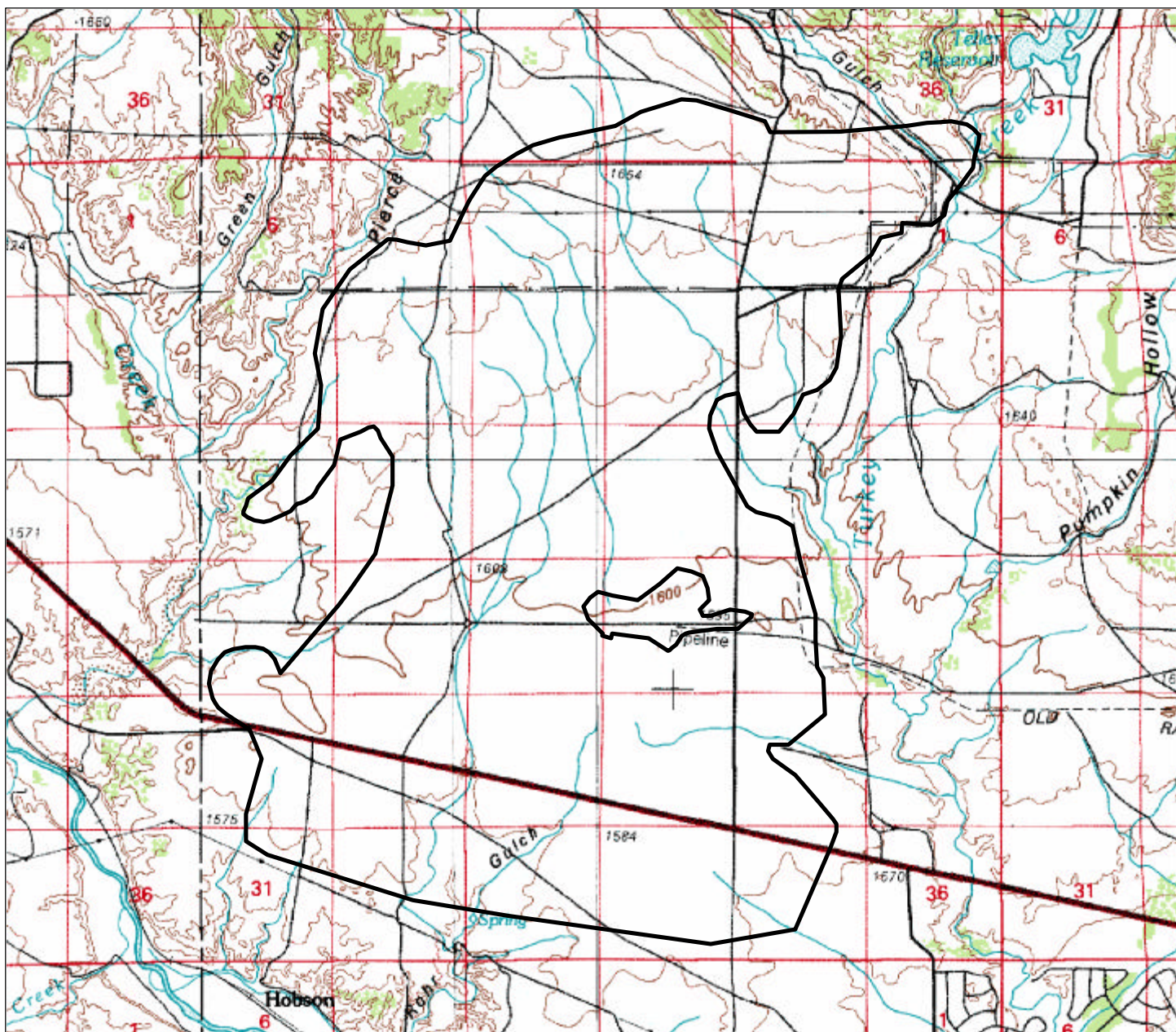
Note: Element occurrences responsible for the B-rank are shown in bold typeface.

Boundary Justification: The PCA boundary includes all of the nesting Mountain Plover locations as well as the entire extent of the black-tailed prairie dog complex, including the suitable grasslands interspersed among the five separate colonies forming the complex. The boundary is intended to represent the area needed to manage for the prairie dog and Mountain Plover populations, and includes additional areas suitable for population expansion.

Protection Comments: There is a definable threat, but it is not expected to impact the element occurrences within the next five years. This site for the most part is unprotected private ranchland and with the expansion of the population in the Pueblo West and surrounding area it may receive pressures from residential developers. Those parts of the PCA occurring within Fort Carson are insulated from residential development and recreational activities. The prairie dog complex on the private lands, however, could be subject to development pressures. If the current landowners were to sell parts of the ranch to residential developers, the impact to the prairie dogs would be severe. Reduction in the size of the prairie dog population could negatively impact the nesting plovers, which are associated with areas grazed by large herbivores (Knopf 1996b) and prairie dogs (Tyler 1968, Knowles et al. 1982, Knowles and Knowles 1984, Shackford 1991).

Management Comments: Although not currently threatened, management may be needed in the future to maintain current quality of the element occurrences. The private lands have seen a long history of extensive livestock grazing, but this land use has no

apparent detrimental impacts on the prairie dogs and may be beneficial to the Mountain Plover. Prairie dogs appear to successfully share habitat with cattle (Licht and Sanchez 1993) and the current landowner is friendly towards the prairie dogs occupying the ranch. Management activities maintaining the viability of the prairie dog population would benefit the Mountain Plovers. Breeding plovers are known to occupy areas where grazing by prairie dogs has occurred (Knowles et al. 1982) and also prefer areas grazed by cattle (Shackford 1991). Management for continued grazing by both cattle and prairie dogs should benefit the nesting plover. Although plovers have not been noted on the private lands, continued grazing by cattle and prairie dogs could facilitate expansion of the plover population.



1 0 1 Miles

Coordinate System: UTM, Zone13, NAD27

Colorado Natural Heritage Program

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map created 14 April 2003

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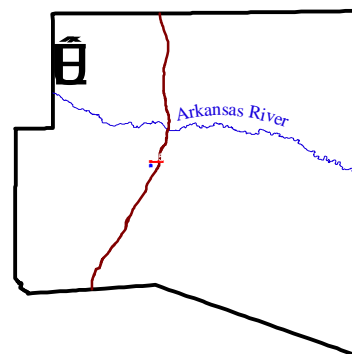
LEGEND

 PCA Boundary

Pueblo, 38104-A1
30 x 60 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



Ritchie Gulch Upland Potential Conservation Area

Biodiversity Rank: B2 (Very high significance)

This PCA contains a good (B-ranked) example of the globally imperiled (G2) round-leaf four-o'clock (*Oxybaphus rotundifolius*), and an unranked (E-ranked) occurrence of another globally imperiled (G2) plant, Rocky Mountain bladderpod (*Lesquerella calcicola*).

Protection Urgency Rank: P3 (Moderate urgency)

This PCA includes private land and state highway right of way. Plans of the private landowners are unknown.

Management Urgency: M3 (Moderate urgency)

Current management appears to be adequate. Monitoring and control of weeds that could spread along the highway would benefit the rare plants. Additional inventory and monitoring of the rare plants would benefit understanding of management needs.

Location: Pueblo and Custer counties. Take Route 96 about 25 miles southwest of Pueblo to near border with Custer County. The PCA includes shale outcrops and surrounding woodlands on both sides of Route 96.

Legal Description: U.S.G.S. 7.5' quadrangles: Florence SE and Wetmore. T20S R68W Section 32; T21S R68W Sections 5, 6.

Size: 652 acres (264 hectares)

Elevation: 5600 to 5800 feet (1710 to 1770 meters)

General Description: The Ritchie Gulch Upland PCA is characterized by open pinyon-juniper woodlands and sparsely vegetated shale outcrops. State Route 96 crosses through the site.

The woodlands include scattered juniper (*Juniperus monosperma*), pinyon pine (*Pinus edulis*), and mountain mahogany (*Cercocarpus montanus*). Other species noted include rabbitbrush (*Chrysothamnus* sp.), yucca (*Yucca glauca*), blazing star (*Nutallia decapetala*), Indian ricegrass (*Oryzopsis hymenoides*), four wing saltbush (*Atriplex canescens*), wild buckwheat (*Eriogonum fendlerianum*), gumweed (*Grindelia* sp.), bladderpod (*Lesquerella ovalifolia*), skunkbush (*Rhus trilobata*), Gambel's oak (*Quercus gambelii*), beardtongue (*Penstemon* sp.), and Cat's eye (*Oreocarya* sp.).

Two globally imperiled (G2) plant species, Rocky Mountain bladderpod (*Lesquerella calcicola*) and round-leaf four-o'clock (*Oxybaphus rotundifolius*), occupy the toe of a hill cut by historic construction of Route 96, on both sides of the road.

Biodiversity Comments: This PCA contains a good (B-ranked) example of a globally rare plant, round-leaf four-o'clock (*Oxybaphus rotundifolius*), which grows only in the Smoky Hill member of the Niobrara Formation in the Arkansas Valley of Colorado. An occurrence of Rocky Mountain bladderpod has also been documented here, though the condition of the occurrence was not noted (E-ranked).

Natural Heritage element occurrences at the Ritchie Gulch Upland PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plants								
<i>Oxybaphus rotundifolius</i>	Round-leaf four-o'clock	G2	S2				B	1996-07-31
<i>Oxybaphus rotundifolius</i>	Round-leaf four-o'clock	G2	S2				E	1998-06-03
<i>Lesquerella calcicola</i>	Rocky Mountain bladderpod	G2	S2				E	1998-06-03

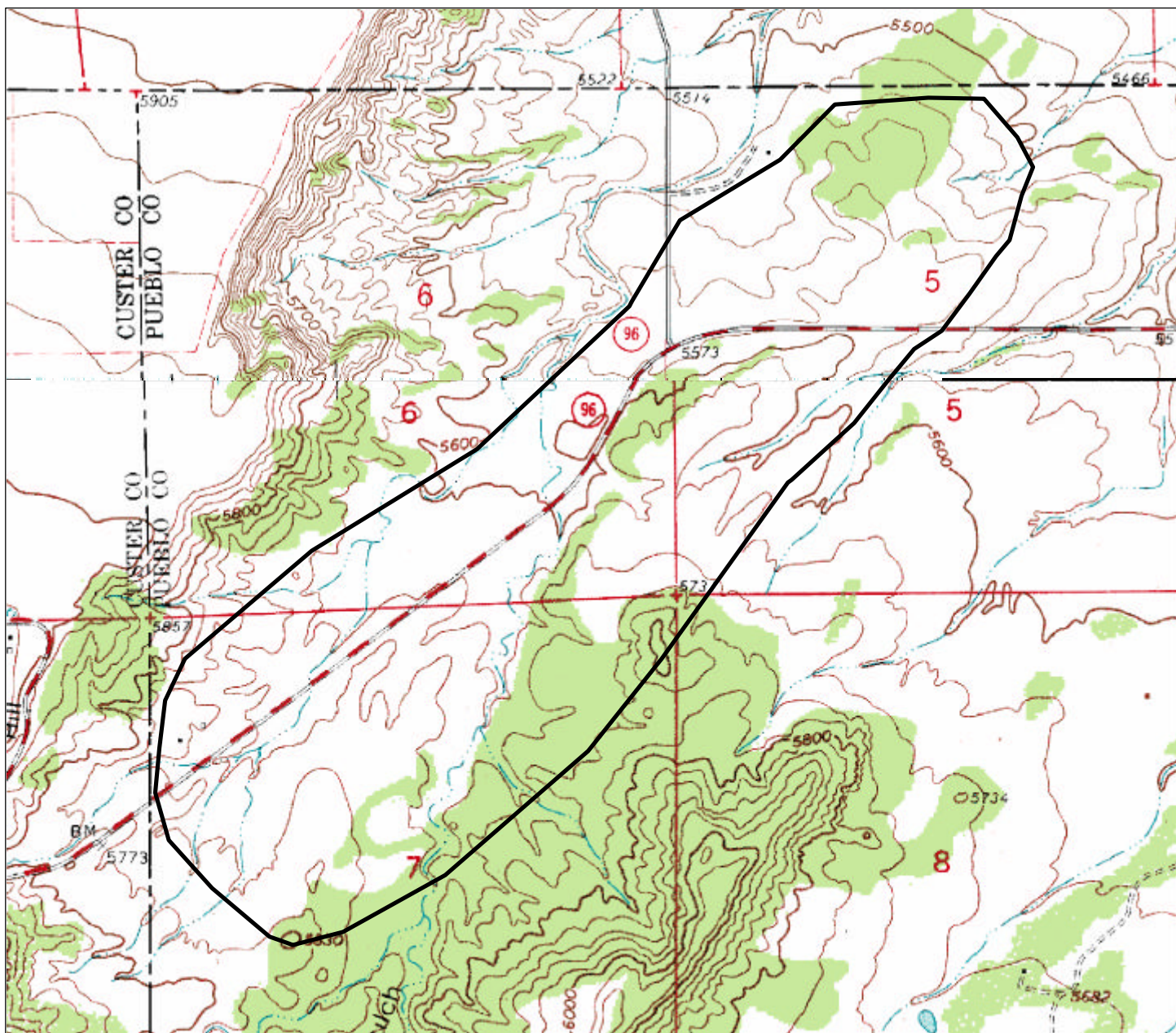
*EO = Element Occurrence

Note: Element occurrence responsible for the B-rank is shown in bold typeface.

Boundary Justification: The boundary encompasses the element occurrences, plus unsurveyed, apparently suitable habitat in the vicinity of the occurrences. In general, PCA boundaries are drawn to represent our best estimate of the primary area needed for the survival of the occurrences. This area is sufficiently large to protect intact (or at least allow simulation of) most of the natural ecological processes necessary for survival of the species, including reproductive ecology and hydrology. The boundaries also include the mosaic of local community types on which the species may rely.

Protection Comments: Work with the Colorado Department of Transportation to ensure that the roadside habitat of this species is not disturbed.

Management Comments: Drought stress was noted in 1996 and 2002. Further inventory and monitoring of the rare plant species would improve our knowledge of these species at this location.



0.5 0 0.5 Miles

Coordinate System: UTM, Zone13, NAD27

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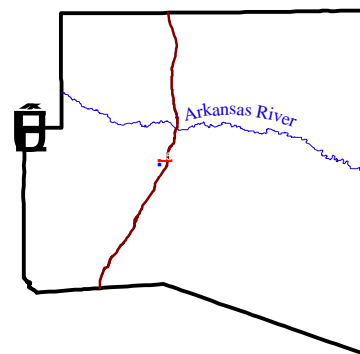
LEGEND

PCA Boundary

Wetmore, 38105-B1
Florence SE, 38105-C1
7.5 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



Signal Rock Sandhills Potential Conservation Area

Biodiversity Rank: B2 (Very high significance)

This PCA contains one of the best (A-ranked) occurrences of the globally-vulnerable (G3? S2) sandsage prairie community (*Artemisia filifolia/Andropogon hallii*) in Colorado. Also within the PCA are excellent (A-ranked) and good (B-ranked) occurrences of two globally-vulnerable (G3) plant species, sandhill goosefoot (*Chenopodium cycloides*), and plains ambrosia (*Ambrosia linearis*). A fair (C-ranked) occurrence of a globally-vulnerable (G3 S2) Great Plains mixed-grass prairie community (*Schizachyrium scoparium-Bouteloua curtipendula*) also occurs within the PCA.

Protection Urgency Rank: P3 (Moderate urgency)

Protection actions are needed to secure long-term conservation. Currently, most of the land within the PCA is owned by the State Land Board and managed with conservation in mind. Most of the state land is leased by The Nature Conservancy (Bohart Ranch) or Chico Basin Ranch or is part of the Transportation Test Track. Some private and BLM lands occur in the southeast portion of the PCA. The Department of Defense Pueblo Chemical Depot occupies the southernmost portion of the PCA.

Management Urgency Rank: M4 (Low urgency)

Current management appears adequate for maintenance of the element occurrences. Management programs for control of weeds and simulation of large-scale natural processes, such as fire and herbivory, are implemented within portions of the PCA.

Location: Pueblo and El Paso counties, approximately 20 miles east of Colorado Springs and 10 miles east of Pueblo. The boundary of the site begins four miles south of Ellicott and extends south into the Pueblo Chemical Depot.

Legal Description: U.S.G.S. 7.5' quadrangles: Ellicott, Edison School, Hanover SE, Hanover NE, Hanover NW, North Avondale, North Avondale NE, Truckton, Boone Hill, Highlands Church, Yoder, Big Springs Ranch, and Devine.

T14S R61W, T14S R62W, T15S R61W, T15S R62W, T15S R63W, T16S R61W, T16S R62W, T16S R63W, T17S R61W, T17S R62W, T18S R61W, T18S R62W, T19S R61W, T19S R62W, T20S R61W, T20S R62W.

Size: 132,365 acres (53,566 hectares)

Elevation: 4550 to 6100 feet (1390 to 1860 meters)

General Description: The site is characterized by slightly rolling sandhills and interdunal swales. The majority of the site is dominated by sandsage prairie with sandsage (*Artemisia filifolia*) as the dominant species. On large areas of the site, yucca (*Yucca glauca*) is co-dominant or more dominant than the sandsage. The understory is dominated by blue grama (*Bouteloua gracilis*) and sand dropseed (*Sporobolus*

cryptandrus) with scattered patches of sand bluestem (*Andropogon hallii*) and prairie sandreed (*Calamovilfa longifolia*).

The northern end of the site is flatter and dominated by blue grama, sand dropseed, and needle-and-thread (*Stipa comata*) graminoids. At the southern end of the site the sandsage prairie is dominant.

Steep bluffs and outcrops east of Black Squirrel Creek (called the Crows Roost) support a community characterized by sparse yucca with little bluestem (*Schizachyrium scoparium*) and sideoats grama (*Bouteloua curtipendula*). This community is classified as the *Schizachyrium scoparium-Bouteloua curtipendula* plant association (Great Plains mixed-grass prairie), although sideoats grama is not always conspicuous and sand bluestem and prairie sandreed are commonly interspersed. This may be the result of the small size of the outcrops or bluffs and the sharp environmental gradient to the sandhills prairie. Small stands of coyote willow (*Salix exigua*) are present along Black Squirrel Creek, as are some cottonwoods.

A small black-tailed prairie dog (*Cynomys ludovicianus*) town is located on the north western side of the site near the Bohart Ranch entrance. It is located on soils probably derived from alluvial sediments, but still with significant sand and small coarse material. Burrowing Owls, Mountain Plovers, and swift foxes have been seen using the habitat provided by the presence of the prairie dog town. Additionally, a Golden Eagle nest is located on the bluffs east of Black Squirrel Creek.

Biodiversity Comments: The site contains one of the best known (A-ranked) occurrences of the globally-vulnerable (G3 S2) sandsage prairie (*Artemisia filifolia/Andropogon hallii*) in Colorado. The occurrence is very large and portions are in excellent condition. Many of the sandhills communities within the site have been managed so that the natural communities appear to be in good to excellent condition. This plant community may change undergo a change in its rarity rank in the future; however, the rarity rank of closely-related communities is similar. Similar-sized patches of this plant community are known to occur in Kansas and in Oklahoma, but in a wide variety of conditions.

Within this site is a good occurrence of the globally-vulnerable (G3 S2) Great Plains mixed-grass prairie (*Schizachyrium scoparium-Bouteloua curtipendula*). This site also supports excellent to fair occurrences of two globally-vulnerable (G3) plant species, the sandhill goosefoot (*Chenopodium cycloides*), and plains ambrosia (*Ambrosia linearis*). The size of the site would permit most natural processes to occur or at least be simulated, although some species (e.g., pronghorn antelope) would not be supported on the site alone.

Boundary Justification: The boundary encompasses the highest quality sandsage communities in the area. The boundary is drawn to exclude lands more impacted by residential development (to the north-northwest) and agricultural activities (north, east, and west) and encompasses mainly the sandhills in the area. Shortgrass prairie in

somewhat natural condition (not converted to cropland) exist in the area and there appears to be sufficient size and distribution of these parcels, and corridors available for viable populations of most plant and animal species. This site is considered large enough to protect intact (or at least allow simulation of) most of the natural ecological processes necessary for survival of the elements including fire, herbivory, and geomorphology (allowing for shifting sand dunes).

Natural Heritage element occurrences at the Signal Rock Sandhills PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plants								
<i>Ambrosia linearis</i>	Plains ambrosia	G3	S3				B	2000-09-06
<i>Chenopodium cycloides</i>	Sandhill goosefoot	G3	S1				A	2001-09-09
<i>Chenopodium cycloides</i>	Sandhill goosefoot	G3	S1				C	2000-09-29
Plant Communities								
<i>Artemisia filifolia</i> / <i>Andropogon hallii</i>	Northern sandhill prairie	G3?	S2				A	2000-09-27
<i>Artemisia filifolia</i> / <i>Andropogon hallii</i>	Northern sandhill prairie	G3?	S2				B	1997-08-29
<i>Schizachyrium scoparium</i> - <i>Bouteloua curtipendula</i>	Great Plains mixed-grass prairie	G3	S2				C	2000-09-27

*EO = Element Occurrence

Note: Element occurrences responsible for the B-rank are shown in bold typeface.

Protection Comments: There are definable threats, but none expected to be critical in the next five years. The land is a mix of privately owned parcels, State Land Board land, and Bureau of Land Management land. Nature Conservancy currently holds a 25-year lease on most of the northern portion of the site with Chico Basin Ranch and the Transportation Test Center leasing most of the southern half. The primary land use in the region is livestock grazing although some irrigated croplands occur nearby.

A longer-term protection concern is the possibility of the State Land Board selling the property to maximize their return on the land. Increases in land value resulting from the growth of Colorado Springs may cause this to be a major concern in the future. Increasing numbers of people are moving into the area, often putting pre-fabricated houses or mobile homes on subdivided parcels of 35 acres. Adjacent land use to the east includes areas of severely degraded sandhills habitat.

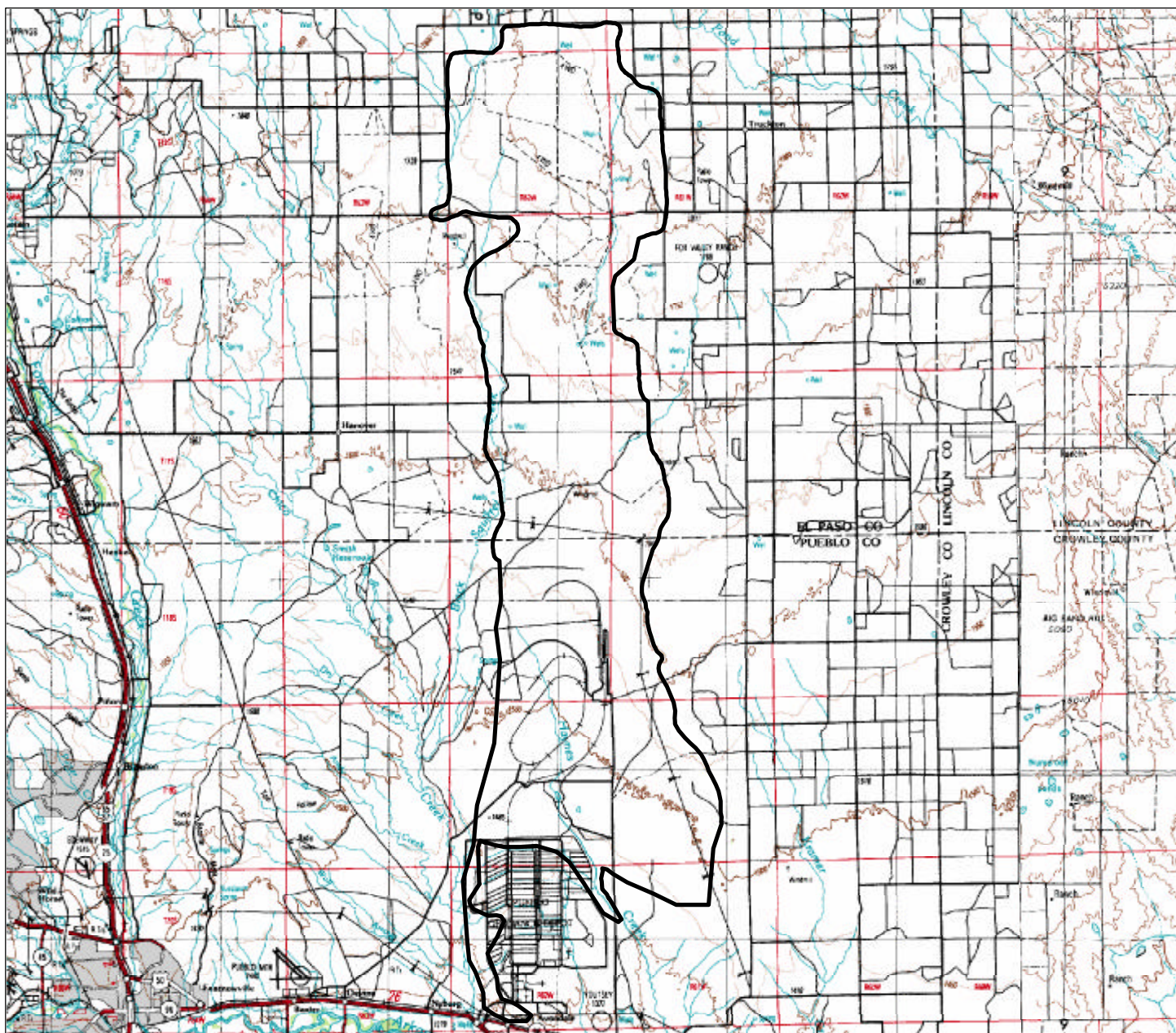
Management Comments: Current management appears to be excellent over much of the site. The majority of the area is operated as working cattle ranches. Management

plans for the site include active weed management, fire programs, and compatible levels of cattle grazing.



Photograph taken at the Signal
Rock Sandhills PCA (above)

Sandhill goosefoot
(*Chenopodium cycloides*) (left)



4 0 4 8 Miles

Coordinate System: UTM, Zone13, NAD27

Colorado Natural Heritage Program

Colorado State University
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map created 14 April 2003

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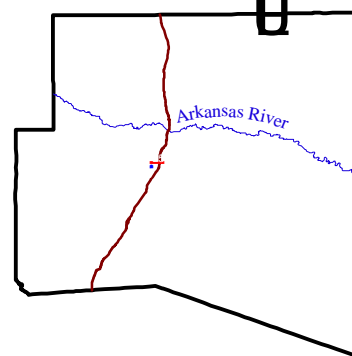
LEGEND

PCA Boundary

Pueblo, 38104-A1
Lamar, 38102-A1
1 x 2 Degree Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



Greenhorn Creek Potential Conservation Area

Biodiversity Rank: B2 (Very high significance)

This site contains a good (B-ranked) occurrence of a globally imperiled (G2 S2) montane riparian forest community, white fir with blue spruce, narrowleaf cottonwood, and rocky mountain maple (*Abies concolor*-*Picea pungens*-*Populus angustifolia*/*Acer glabrum*). Additionally, a fair (C-ranked) occurrence of greenback cutthroat trout (*Oncorhynchus clarki stomias*) (G4T2T3 S2) occurs in Greenhorn Creek.

Protection Urgency Rank: P4 (Low urgency)

All but the lowermost mile of the PCA are part of the San Isabel National Forest. The lowermost mile is either privately owned or part of Rye Mountain Park. The southern half of the PCA is within the USFS Greenhorn Mountain Wilderness Area.

Management Urgency Rank: M3 (Moderate urgency)

Timber sales on USFS property have the potential to affect the greenback cutthroat trout population. The current management appears appropriate for maintaining the riparian occurrences.

Location: The Greenhorn Creek PCA is located in southwestern Pueblo County, upstream from the town of Rye, and includes the southern tip of Custer County.

Legal Description: U.S.G.S. 7.5' quadrangles: San Isabel and Rye. T24S R68W Sections 29-36; T24S R69W Sections 24, 25, 36; T25S R68W Sections 2-10.

Size: 6426 acres (2601 hectares)

Elevation: 7200 to 12,237 feet. (2195 to 3730 meters)

General Description: Greenhorn Creek begins in the Wet Mountains in Custer County and flows east into Pueblo County and eventually to the Saint Charles and Arkansas rivers. The Greenhorn Creek PCA encompasses the headwaters of the creek and about six miles downstream to Rye Mountain Park. The lower two miles of the site support good examples of two montane riparian forest communities: white fir with narrowleaf cottonwood and Rocky Mountain maple (*Abies concolor*-*Picea pungens*-*Populus angustifolia*/*Acer glabrum*) (G2 S2) and narrowleaf cottonwood with alder (*Populus angustifolia*/*Alnus incana*) (G3 S3). The diversity of plant species is high within the communities and includes willows (*Salix monticola*, *S. irrorata*, *S. bebbiana*), chokecherry (*Padus virginiana*), red raspberry (*Rubus ideaus*), bush honeysuckle (*Lonicera involucrata*), river birch (*Betula occidentalis*), and beaked hazelnut (*Corylus cornuta*).

Greenhorn Creek is a steep gradient, perennial stream with a rocky/bouldery bed and abundant woody debris. The woody debris provides habitat for a variety of aquatic

insects including stoneflies, mayflies, and caddisflies. Groundwater seepage in side channels and in the main channel creates marshy areas with dense vegetation.

The Colorado Division of Wildlife reintroduced Greenback cutthroat trout (*Oncorhynchus clarki stomias*) (G4T2T3 S2) to the upper reach of Greenhorn Creek in 1988 (U.S. Fish and Wildlife Service 1998). The natural reproduction rates are currently being monitored by CDOW; the population was not considered stable in 1999 but may become stable in the future (Poliky et al. 1999).

The surrounding mountains in the lower reaches are forested with ponderosa pine and Douglas fir with patches of aspen. The mountains in the higher reaches support spruce fir forests.

There is little evidence of human-caused alteration of the hydrological processes upstream of the occurrence and within the watershed. The stream undergoes flooding as is evidenced by debris in the riparian vegetation. The upstream watershed is forested and managed by the U.S. Forest Service. The southern half of the PCA is included within the 22,040-acre Greenhorn Mountain Wilderness Area, so designated in 1993. The wilderness area includes Greenhorn Mountain, the highest peak in the Wet Mountains (12,347 feet).

Downstream from the PCA, the majority of flow in Greenhorn Creek is diverted to Lake Beckwith to supply the water needs of the town of Colorado City. The diversion occurs near the confluence with Cold Spring Creek (about two miles east of Rye). Lake Beckwith was built in the 1950's and there are currently plans to expand the reservoir (D. Crawford, pers. comm., CDOW).

Biodiversity Comments: This site contains a good (B-ranked) example of a globally imperiled (G2 S2) montane riparian forest: white fir with blue spruce, narrowleaf cottonwood, and Rocky Mountain maple (*Abies concolor*-*Picea pungens*-*Populus angustifolia*/*Acer glabrum*). The plant association is known from about ten documented occurrences in Colorado and occurs in New Mexico. The site also contains a good (B-ranked) example of a globally vulnerable (G3 S3) montane riparian woodland, narrowleaf cottonwood/thinleaf alder (*Populus angustifolia*/*Alnus incana*). The plant association is known from Colorado and New Mexico, and is expected to occur throughout the range of narrowleaf cottonwood in the Southern Rocky Mountains ecoregion. There are about 40 documented occurrences in Colorado.

Greenback cutthroat trout (*Oncorhynchus clarki stomias*) (G4T2T3 S2) were reintroduced to the upper reach of Greenhorn Creek in 1988 (U.S. Fish and Wildlife Service 1998). The natural reproduction rates are currently being monitored by CDOW; the population was not considered stable in 1999 but may become stable in the future (Poliky et al. 1999).

Natural Heritage element occurrences at the Greenhorn Creek PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Fish								
<i>Oncorhynchus clarki stomias</i>	Greenback cutthroat trout	G4T2T3	S2	LT	T		C	1998-09-05
Plant Communities								
<i>Abies concolor-Picea pungens - Populus angustifolia/Acer glabrum</i>	Montane riparian forest	G2	S2				B	2000-08-17
<i>Populus angustifolia/Alnus incana</i>	Montane riparian forest	G3	S3				B	2000-08-17

*EO = Element Occurrence

Note: Element occurrence responsible for the B-rank is shown in bold typeface.

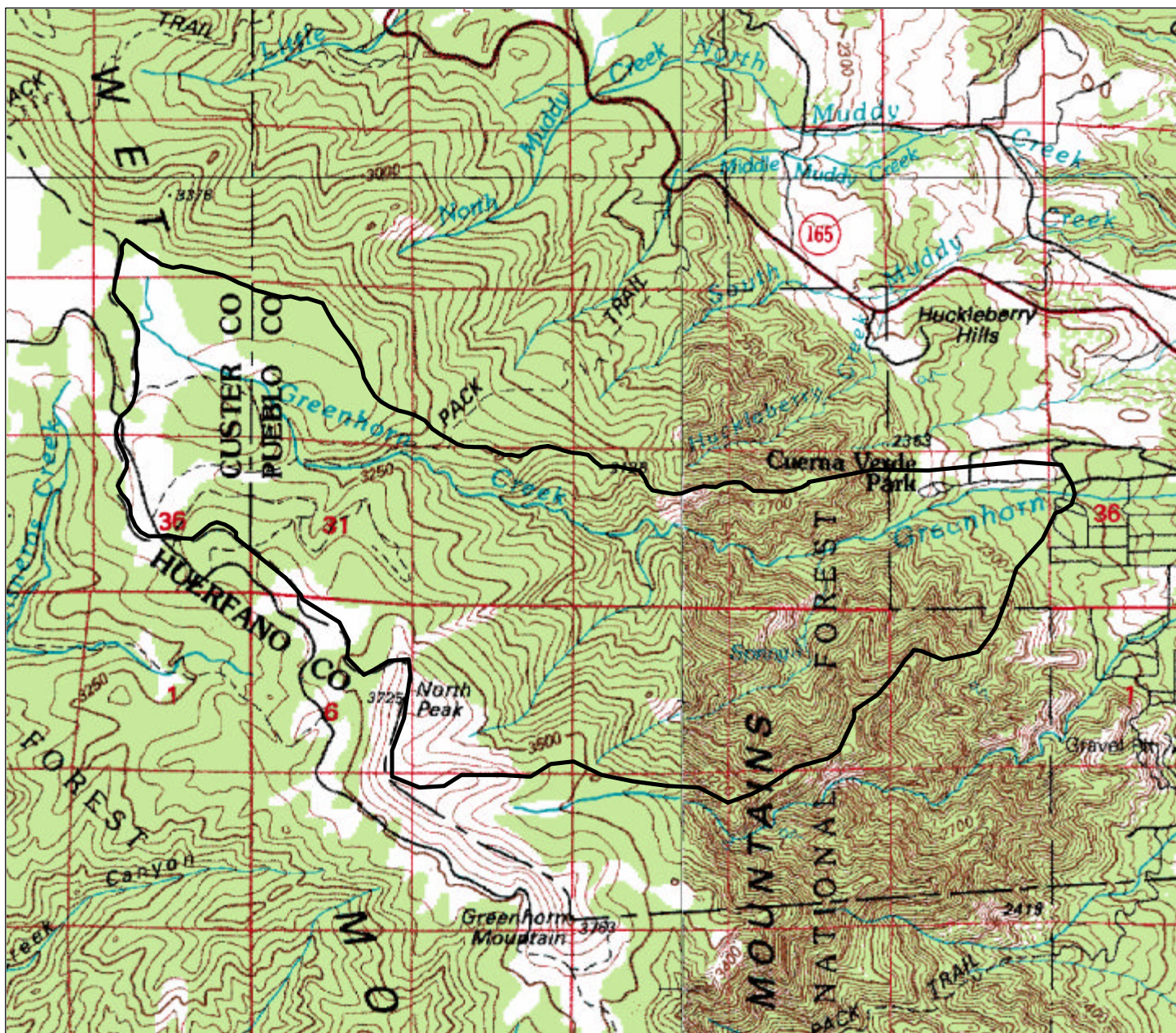
Boundary Justification: The boundary includes the riparian community and the upstream watershed to encompass the headwaters of the stream and the known extent of the greenback cutthroat trout population. The upstream watershed is included to account for continued surface flow and periodic flooding that are necessary for the maintaining the ecological functions and the viability of the occurrences. The boundary was designated using the hydrologic unit GIS coverage (Natural Resources Conservation Service 2000) and the 1:100,000 scale USGS topographic map. The entire upstream watershed of Greenhorn Creek needs to be considered when developing a plan for the long-term viability of this site.

Protection Comments: The majority of the land within the PCA is owned and managed by the USFS. A portion is included within the Greenhorn Mountain Wilderness Area.

Management Comments: The current management appears appropriate for maintaining the element occurrences. A timber sale within the watershed in 1998 resulted in skid trails on the upper reaches of the North Fork of Greenhorn Creek (Melby 1998). USFS personnel reacted quickly to stop the sale and work to repair the damage, but it is unknown whether or not there will be any long-term damage to the greenback cutthroat trout population (Melby 1998). Maintenance of the element occurrences depends on appropriate management in the upper watershed to maintain the natural flooding regime and ecological processes. A small amount of leafy spurge (*Euphorbia esula* ssp. *uralensis*) was noted in Rye Mountain Park campground, and weed management efforts are strongly recommended.



Photograph taken at the Greenhorn Creek PCA



1 0 1 Miles

▲ Coordinate System: UTM, Zone13, NAD27

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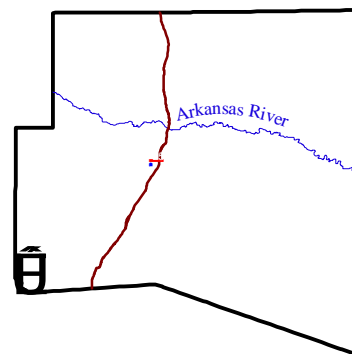
LEGEND

□ PCA Boundary

Walsenburg, 37104-E1
Blanca Peak, 37105-E1
30 x 60 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



Madden Canyon Potential Conservation Area

Biodiversity Rank: B2 (Very high significance)

The Madden Canyon PCA supports a good (B-ranked) occurrence of the globally imperiled (G2Q S2) triploid checkered whiptail (*Cnemidophorus neotesselatus*).

Protection Urgency Rank: P4 (Low urgency)

No threat is known or anticipated for the foreseeable future at this PCA. The occurrence is located on private property, but it is very isolated and not easy to access. Special designation of this area would ensure that future managers are cognizant of the conservation value of this PCA.

Management Urgency Rank: M4 (Low urgency)

No management needs are known or anticipated at this PCA. Grazing occurs at this PCA, however, the areas grazed by livestock will not include the steep and shrubby side slopes of the canyon, which provide the suitable habitat for nesting and hibernacula of the whiptail. A survey and monitoring program would assist in identifying the extent, size, and health of the triploid checkered whiptail population at this PCA.

Location: The Madden Canyon PCA is located in southeastern Pueblo County near the Las Animas and Huerfano county lines. This is a difficult location to find. The landowner guided us to the site, which is due east of the Red Top Road, approximately 2.5 miles north of its junction with Highway 10. Part of the PCA is on BLM property. There is a convoluted series of ranch roads that require navigation to access this PCA.

Legal Description: U.S.G.S. 7.5' quadrangles: Meyers Canyon and North Rattlesnake Butte. T25S R62W Sections 13-17, 19-24, 27-30, 32, 33; T26S R62W Section 5.

Size: 3098 acres (1254 hectares)

Elevation: 4980 to 5800 feet (1518 to 1768 meters)

General Description: The Madden Canyon PCA is located in southeastern Pueblo County in picturesque canyonland carved by tributaries of the Apishapa River. The PCA includes the canyon rims, steep slopes and bottomlands of the three main tributaries of Mustang Creek including Robin's, Madden, and Lone Jack canyons. These three majestic high walled canyons define the rough topography of the PCA. In addition, some of the grasslands dominated by blue grama (*Bouteloua gracilis*) occupying the flat terrain at the tops of and between the canyons are included within the PCA.

Pinyon-juniper woodland covers from 10-45% of the area and is found along the canyon sides, ravines, and extending for short distances into the grasslands located at tops of the canyon. Mountain mahogany (*Cercocarpus montanus*) and skunkbush (*Rhus trilobata*) are both present along the canyon slopes comprising from 20-30% of the understory cover. The grasslands at the canyon tops varies considerably, with some places in areas

distant from the canyon rims containing up to a 70% cover of blue grama and a 20% cover of shrubs including cholla (*Cylindropuntia imbricata*), yucca (*Yucca glauca*), and snakeweed (*Gutierrezia sarothrae*). Close to the canyon rims lies a transition zone where trees and larger shrubs are prominent and blue grama is reduced to a cover of between 10 to 30%. In all, shortgrass prairie covers only 20 to 30% of the entire PCA.

The elevation drop along the canyons varies from 125 to 200 feet, and the many rock outcroppings along the steep canyon sides create very suitable habitat for the triploid checkered whiptail. The area's remoteness, isolation and rough terrain have left it free of human impacts, and aside from grazing by cattle, the PCA is without disturbance. The whiptails occupy the rocks exposed along the sides of the canyon and at the rims of the canyon sides where the cattle do not graze, leaving them insulated from any affects associated with the grazing.

Biodiversity Comments: This PCA contains a good (B-ranked) occurrence of the globally imperiled (G2Q) triploid checkered whiptail. This whiptail is endemic to Colorado; at present its known worldwide distribution consists of Pueblo, Otero, Fremont, and Las Animas counties in southeastern Colorado. The whiptail record at this PCA represents one of the two best known records in the state of Colorado.

Natural Heritage element occurrences at the Madden Canyon PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Reptiles								
<i>Cnemidophorus neotesselatus</i>	Triploid checkered whiptail	G2Q	S2				B	2002-06-10

*EO = Element Occurrence

Boundary Justification: The boundary was developed to primarily include the canyonlands and their associated rock outcroppings and shrubby areas that provide nesting habitat and hibernacula for the whiptail. The design is intended to contain the extent of the habitat that is suitable for the whiptail. Management considerations are not reflected in the boundary, but any projects directly disturbing the canyon slopes and rims have the potential to affect the vegetation and ground structure maintaining the whiptail at the PCA.

Protection Comments: No threat is known or anticipated for the foreseeable future at this PCA. Most of this PCA is on private land, with the remainder occupying State of Colorado Land Board property and Bureau of Land Management property. The isolated and remote location of the PCA and difficulty in accessing it protect it from projects or recreational activities that could potentially affect the viability of the triploid checkered whiptails.

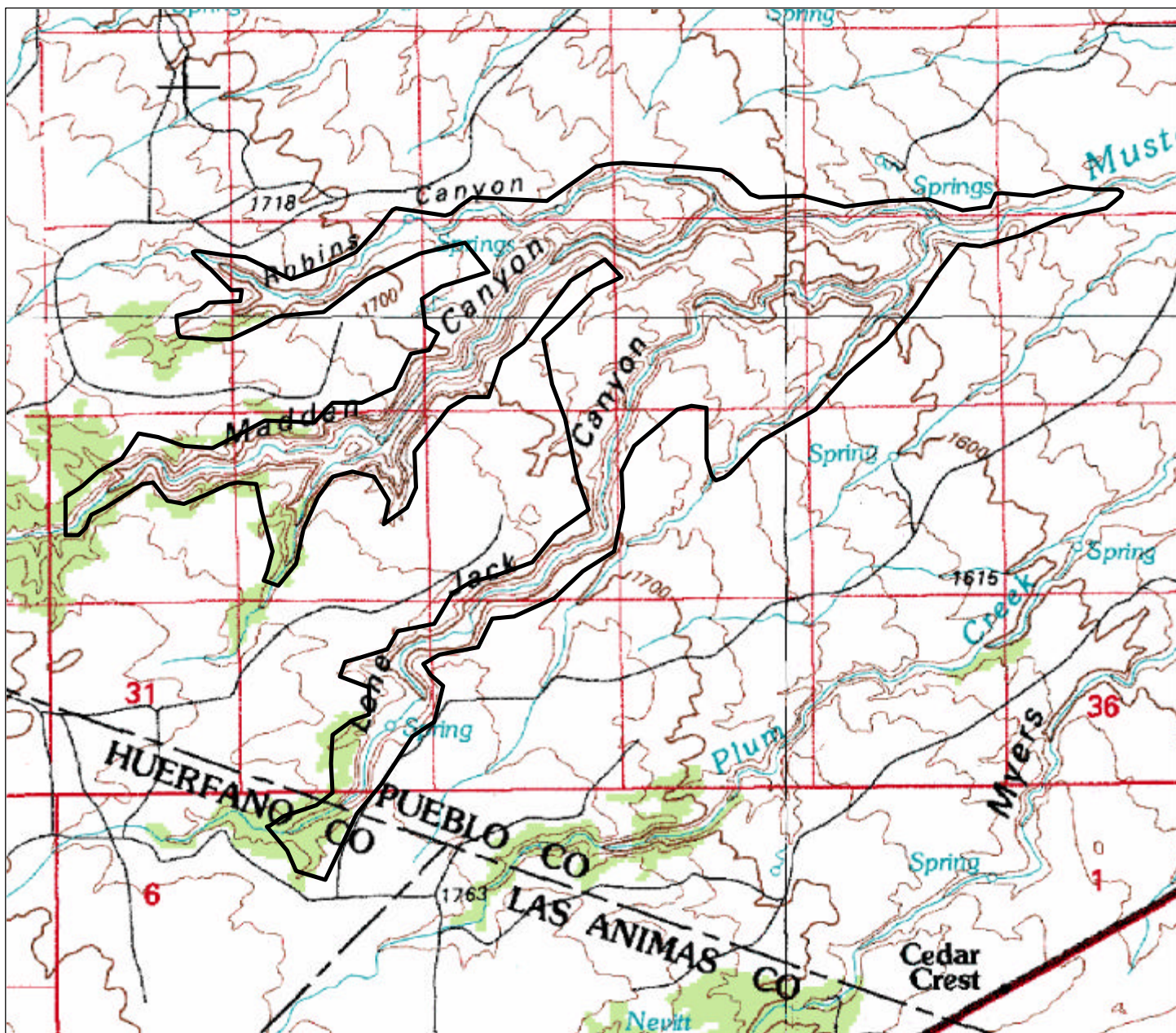
Management Comments: No management needs are known or anticipated at this PCA. Grazing occurs at this PCA, but the areas grazed by livestock will not include the steep and shrubby side slopes of the canyon, which provide the suitable nesting habitat and

hibernacula for the whiptail. Given the secluded and remote location of this PCA, no management needs are anticipated. Information on the whiptails at this site should be brought to the attention of the BLM. Special designation of this area would ensure that future managers are cognizant of the conservation value of this PCA.

A survey and monitoring program would assist in identifying the extent, size and health of the triploid checkered whiptail population at this PCA. Only one triploid checkered whiptail was observed during a one day visit to this PCA, but the habitat is very suitable for whiptails and the area probably supports a large population. Without further survey work, however, this supposition cannot be stated with certainty.



Triploid checkered whiptail (*Cnemidophorus neotesselatus*) habitat at the Madden Canyon PCA.



1 0 1 Miles

Coordinate System: UTM, Zone13, NAD27

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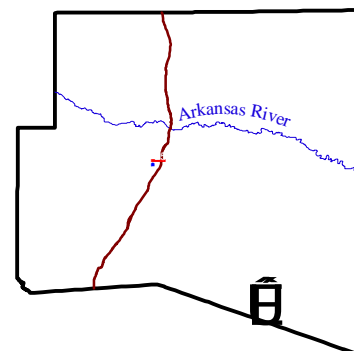
LEGEND

PCA Boundary

Walsenburg, 37104-E1
30 x 60 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



Buffalo Arroyo

Potential Conservation Area

Biodiversity Rank: B2 (Very high significance)

The Buffalo Arroyo PCA supports one good (B-ranked) occurrence of the globally-imperiled (G2Q S2) triploid checkered whiptail (*Cnemidophorus neotesselatus*).

Protection Urgency Rank: P4 (Low urgency)

No threat is known or anticipated for the foreseeable future at this PCA. Ownership of the surrounding land is a checkerboard of state lease and BLM lands, but most of the land is privately owned.

Management Urgency Rank: M4 (Low urgency)

No serious management needs are known or anticipated at this PCA.

Location: The Buffalo Arroyo site is located in southeastern Pueblo County near the Las Animas county line about nine miles southwest of Whiterock.

Legal Description: U.S.G.S. 7.5' quadrangle: Sanford Hills. T26S R61W Sections 13, 14, 23, 24.

Size: 204 acres (83 hectares)

Elevation: 4960 to 5060 feet (1509 to 1042 meters)

General Description: The Buffalo Arroyo PCA is located in southeastern Pueblo County in the rocky terrain of the arroyo for which it is named. The PCA includes the arroyo, its steep slopes and the associated bottomlands. A 30% cover of juniper woodland with much exposed bedrock and an understory of 15% skunkbush (*Rhus trilobata*) dominate the lip and steep slopes of the arroyo. This is ideal habitat for the triploid checkered whiptail (*Cnemidophorus neotesselatus*), a whiptail that is endemic to southwestern Colorado. Outside the arroyo, the vegetation is dominated by shortgrass prairie with a 50% cover of blue grama (*Bouteloua gracilis*) with Indian ricegrass (*Oryzopsis hymenoides*) and purple three-awn (*Aristida purpurea*). Shrubs making up about 15% of the cover within the shortgrass prairie include cholla (*Cylindropuntia imbricata*) and snakeweed (*Gutierrezia sarothrae*). In all, shortgrass prairie covers only 10% of the entire PCA. There is approximately a 10% cover of juniper encroaching upon the grassland from the arroyo.

The PCA has steep slopes of up to 45% along the arroyo with level terrain in the grassland areas and fine sandy-loam soil. There is a corral and cattle tank just off the PCA and surrounding grassland is intensely grazed with about 20% bare ground. Ownership of the surrounding land is a checkerboard of state lease and some BLM land, but most land is privately owned.

The elevation of the PCA drops approximately 60 feet along the sides of the arroyo, and the many rock outcroppings along the steeper sides create very suitable habitat for the triploid checkered whiptail. The PCA is remote, isolated, and occupies private land that is relatively free of human impacts. Aside from grazing by cattle, the PCA is without disturbance. The whiptails occupy the rocks exposed along the sides of the arroyo and at the arroyo's rims where the cattle do not graze. Consequently the whiptails are apparently not affected by grazing.

Biodiversity Rank Justification: This PCA contains a good occurrence of the extremely rare triploid checkered whiptail. This whiptail is endemic to Colorado. At present, its known worldwide distribution consists of Pueblo, Otero, Fremont, and Las Animas counties in southeastern Colorado. The whiptail record at this PCA represents one of the two best known records in the state of Colorado. The whiptail was observed in a healthy arroyo ecosystem with adjacent suitable habitat, but only one individual was observed. Future monitoring is needed to determine the extent and size of this whiptail population. In addition, this area is relatively free of human impacts because it is in an isolated location and on private property. Although the area is intensely grazed, the arroyo and arroyo top where the whiptails occur is not adversely impacted because these areas are not preferred by the cattle.

Natural Heritage element occurrences at the Buffalo Arroyo PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Reptiles								
<i>Cnemidophorus neotesselatus</i>	Triploid checkered whiptail	G2Q	S2				B	2002-06-28

*EO = Element Occurrence

Boundary Justification: The boundary was developed to primarily include the arroyo and its associated rock outcroppings and shrubby areas that provide nesting habitat and hibernacula for the whiptail. The design is intended to contain the extent of the habitat that is suitable for habitation by the whiptail. Management considerations are not reflected in the boundary, but any projects directly disturbing the slopes and rims of the canyons has the potential to affect the vegetation and ground structure maintaining the whiptails at the PCA.

Protection Comments: No threat is known or anticipated for the foreseeable future. Most of this PCA is on private land with the remainder occupying State of Colorado Land Board property and Bureau of Land Management property. The isolated and remote location of the PCA and its inaccessibility protect it from projects or recreational activities that could potentially affect the viability of the triploid checkered whiptails.

Management Comments: No serious management needs are known or anticipated at this PCA. Grazing occurs, but the areas grazed by livestock will not include the steep and shrubby side slopes of the canyon, which provide the suitable nesting habitat and hibernacula for the whiptail. Given the secluded nature of this PCA, no management

needs are anticipated aside from educating the landowners of the whiptail population and the value of this PCA for conservation of the species.

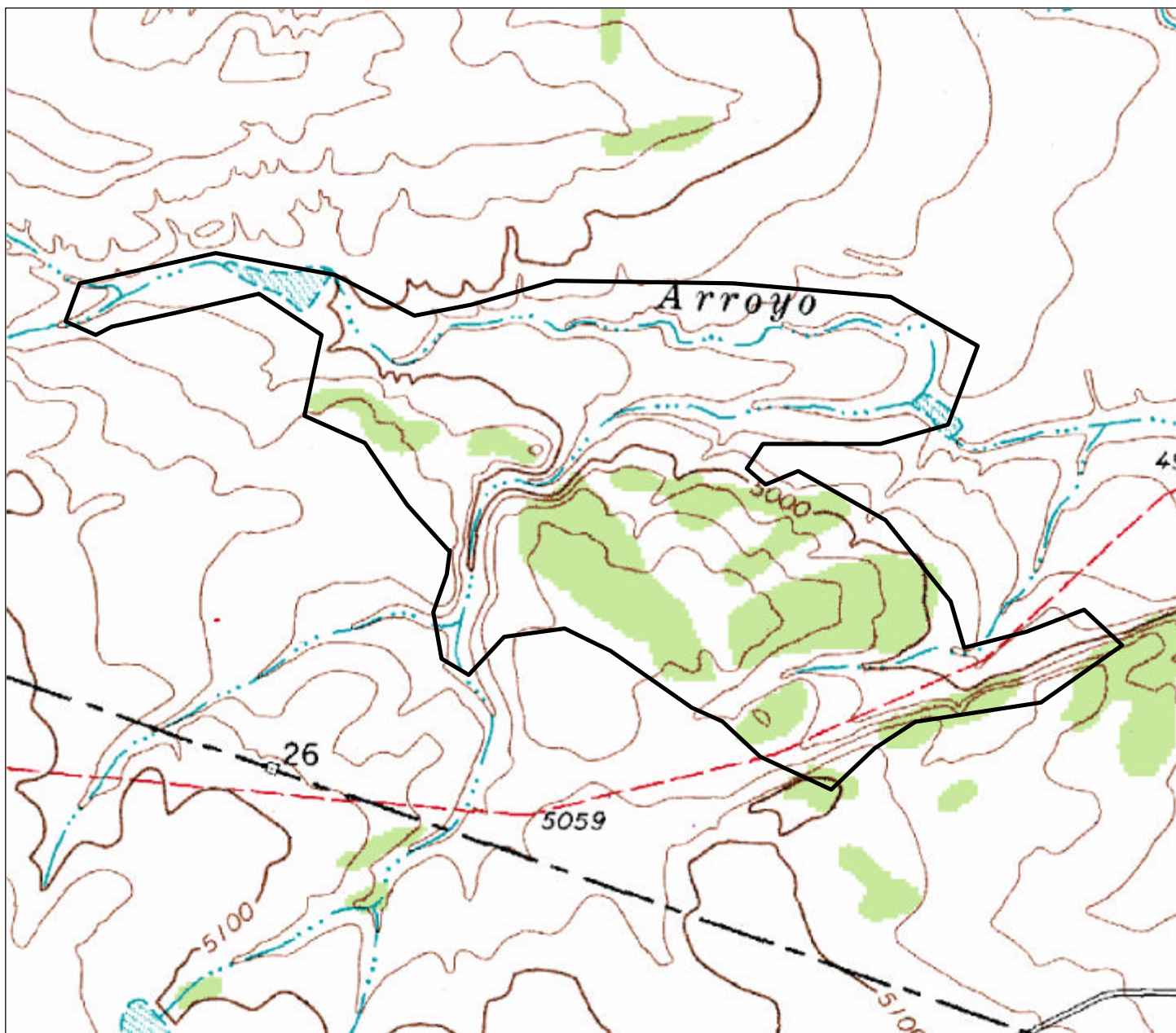
A monitoring program would assist in determining the extent and size of the whiptail population and help define the conservation values of this occurrence of the rare endemic whiptail.



Triploid checkered whiptail (*Cnemidophorus neotesselatus*) at the Buffalo Arroyo PCA (left)

Whiptail habitat at the Buffalo Arroyo PCA (below)





0.25 0 0.25 Miles

Coordinate System: UTM, Zone13, NAD27

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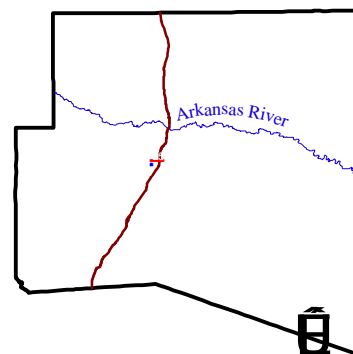
LEGEND

PCA Boundary

Sanford Hills, 37104-G2
7.5 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



B2: Buffalo Arroyo

B3 Potential Conservation Areas

Greenhorn Creek at I-25 Potential Conservation Area

Biodiversity Rank: B3 (High significance)

This PCA contains an unranked (E-ranked) occurrence of a globally imperiled (G2 S2) plant species, Rocky Mountain bladderpod (*Lesquerella calcicola*).

Protection Urgency Rank: P2 (High urgency)

This PCA includes private and state lands along the Interstate 25 corridor. Working with the Colorado Department of Transportation, private landowners, and the State Land Board could identify ways to ensure protection of this site.

Management Urgency: M3 (Moderate urgency)

Invasive weeds and other disturbances along Interstate 25 could pose a threat to the rare plant population.

Location: Pueblo County. Along Interstate 25 between Burnt Mill Road and Colorado City. From exit 83 on I-25 take the Frontage Road south 1.7 miles to an old rest area.

Legal Description: U.S.G.S. 7.5' quadrangle: Verde School. T23S R66W Sections 11, 12, 13, 14, 24.

Size: 991 acres (401 hectares)

Elevation: 5340 to 5700 feet (1630 to 1740 meters).

General Description: Adjacent to an abandoned rest area along I-25, this PCA consists of sedimentary bluffs in shortgrass prairie vegetation with scattered juniper. The rock outcrops support the rare Rocky Mountain bladderpod (*Lesquerella calcicola*), as well as blazing star (*Nuttallia decapetala*) and prickly poppy (*Argemone* sp.). The shortgrass prairie includes blue grama (*Bouteloua gracilis*), three-awn grass (*Aristida purpurea*), needle-and-thread grass (*Stipa comata*), Indian ricegrass (*Oryzopsis hymenoides*), rabbitbrush (*Chrysothamnus* sp.), yucca (*Yucca glauca*), and cholla (*Cylindropuntia imbricata*). A couple of rough dirt roads cross the area, and some intermittent streams drain toward the east. The site has good views of the Wet Mountains.

Biodiversity Comments: This PCA contains an unranked (E-ranked) occurrence of a G2 S2 plant species, Rocky Mountain bladderpod (*Lesquerella calcicola*). The Rocky Mountain bladderpod occurs in shale outcrops and chalky or sandy soils. It is found only in El Paso, Fremont, Huerfano, Las Animas, Conejos, and Pueblo counties in Colorado, and in northeastern New Mexico. It was first observed in Colorado in 1878. Little is known about this species.

Natural Heritage element occurrences at the Greenhorn Creek at I-25 PCA.

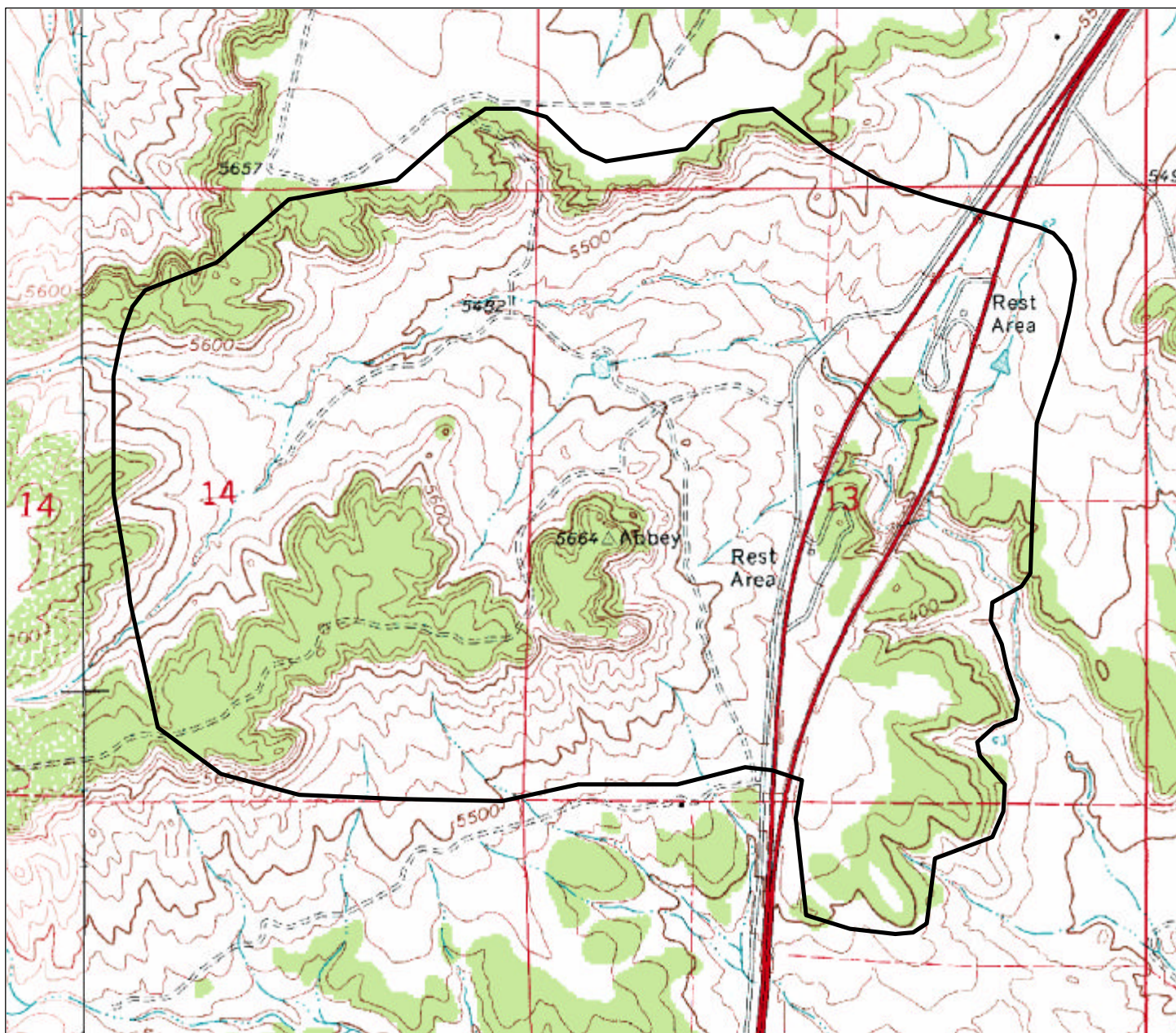
Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plants								
<i>Lesquerella calcicola</i>	Rocky Mountain bladderpod	G2	S2				E	1998-06-19

*EO = Element Occurrence

Boundary Justification: The boundary encompasses the element occurrence, plus unsurveyed, apparently suitable habitat in the vicinity of the occurrence. In general, PCA boundaries are drawn to represent our best estimate of the primary area needed for the survival of the occurrence. This area is estimated to be sufficiently large to protect intact (or at least allow simulation of) most of the natural ecological processes necessary for survival of the species, including reproduction ecology, and hydrology. The boundaries also include the mosaic of community types on which the species may rely (knowledge of this species is incomplete).

Protection Comments: This PCA includes private and state lands along the Interstate 25 corridor. Working with the Colorado Department of Transportation, private landowners, and the State Land Board could identify ways to ensure protection of this site.

Management Comments: Additional surveying for this plant is warranted, but the current data suggest that it is extremely rare. Russian thistle (*Salsola australis*), cheatgrass (*Bromus tectorum*), and field bindweed (*Convolvulus arvensis*) are non-native weeds that were noted along this stretch of I-25 within the PCA. Further inventory and monitoring of the weeds and the rare plants would inform management needs.



0.25 0 0.25 Miles

Coordinate System: UTM, Zone13, NAD27

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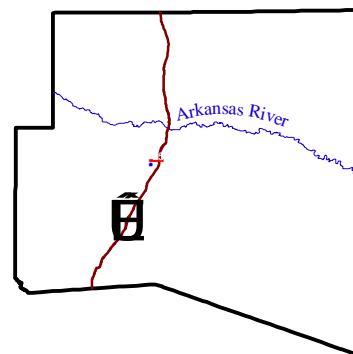
LEGEND

PCA Boundary

Verde School, 38104-A6
7.5 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



Boggs Creek Potential Conservation Area

Biodiversity Rank: B3 (High significance)

This PCA includes a good (B-ranked) occurrence of a globally vulnerable (G3? S1S2) plant species, and a good (B-ranked) occurrence of a globally vulnerable (G3 S3?) plant community.

Protection Urgency Rank: P3 (Moderate urgency)

Work with State of Colorado, Division of Wildlife and Division of Parks and Recreation to protect occurrences in the Lake Pueblo State Recreation Area. The primary threat is recreational use, which could result in inadvertent destruction of the rare plants and degradation of the rare plant community in this area.

Management Urgency: M2 (High urgency)

Hiking trails bisect both of the occurrences. Monitoring recreational use is needed to protect the plants and plant community. Weed management is needed to prevent degradation of the occurrences.

Location: West central Pueblo County. South of Pueblo Reservoir.

Legal Description: U.S.G.S. 7.5' quadrangles: Southwest Pueblo and Northwest Pueblo. T21S R66W Sections 1, 2.

Size: 725 acres (293 hectares)

Elevation: 5000 to 5150 feet (1520 to 1570 meters)

General Description: This PCA contains sedimentary bluffs and rolling hills in shortgrass prairie vegetation with scattered juniper and patches of sagebrush shrublands. Dwarf milkweed (*Asclepias uncialis*), a globally vulnerable plant species, is found in the shortgrass prairie, often in gravelly or rocky soils. Beautiful sandstone mesas support scattered pinyon and juniper trees (*Pinus edulis* and *Juniperus monosperma*), especially along the steep slopes. The bases of slopes give way to shrub-dominated communities with four-winged saltbush (*Atriplex canescens*) or rabbitbrush (*Chrysothamnus* sp.). Toe slopes support yucca (*Yucca glauca*), needle and thread grass (*Stipa comata*), blue grama (*Bouteloua gracilis*), cholla (*Cylindropuntia imbricata*), prickly pear cactus (*Opuntia* sp.), snakeweed (*Gutierrezia sarothrae*), wild buckwheat (*Eriogonum* sp.), and beardtongue (*Penstemon* sp.). Pinyon-juniper woodlands also contain yucca, blue grama, little bluestem (*Schizachyrium scoparium*), and three-awn grass (*Aristida purpurea*). Mesa tops support a globally rare plant community dominated by Bigelow sage (*Artemisia bigelovii*) and Indian ricegrass (*Oryzopsis hymenoides*), as well as small patches of New Mexico feathergrass (*Stipa neomexicana*).

Currently this area is used for recreation, and provides views to the Wet Mountains and Pikes Peak.

Biodiversity Comments: This PCA contains a good (B-ranked) occurrence of a globally vulnerable (G3 S1S2) plant species, *Asclepias uncialis*, or dwarf milkweed. This species was probably more common 100 years ago, as many botanists collected this species in the late 1800s, presumably without specifically searching for it. Many botanists in the region today have been unable to locate dwarf milkweed, even with considerable effort. A likely cause of this species' decline is human modification of its shortgrass prairie habitat for agriculture, livestock operations, and residential development.

A good (B-ranked) occurrence of a globally vulnerable (G3 S3?) plant community, plains escarpment prairie, is also found here.

Natural Heritage element occurrences at the Boggs Creek PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plants								
<i>Asclepias uncialis</i>	Dwarf milkweed	G3?	S1S2			FS, BLM	B	1995-05-06
Plant Communities								
<i>Artemisia bigelovii</i> / <i>Oryzopsis hymenoides</i>	Plains escarpment prairie	G3	S3?				B	2002-08-09

*EO = Element Occurrence

Note: Element occurrence responsible for the B-rank is shown in bold typeface.

Boundary Justification: The boundary encompasses the element occurrences, plus unsurveyed, apparently suitable habitat in the vicinity of the occurrences. In general, PCA boundaries are drawn to represent our best estimate of the primary area needed for the survival of the occurrences. This area is sufficiently large to protect intact (or at least allow simulation of) most of the natural ecological processes necessary for survival of the species and communities, including fire, herbivory, and hydrology. The boundaries also include the mosaic of local community types on which the species may rely.

Protection Comments: This PCA is located primarily on lands that are publicly owned and managed by Colorado State Parks and Colorado Division of Wildlife. However, no specific protection is afforded the rare plants or plant community.

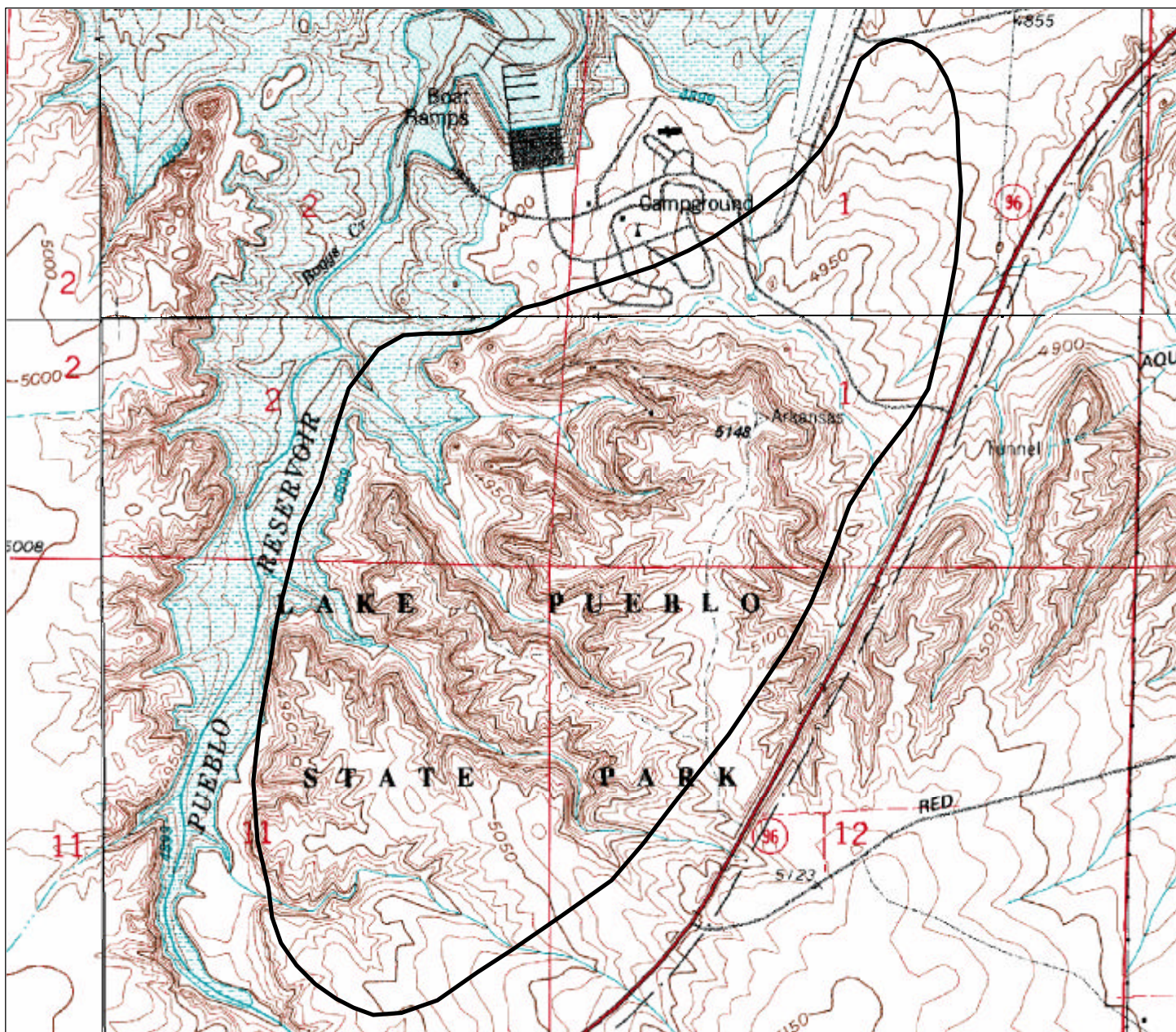
Management Comments: This PCA is adjacent to Pueblo Reservoir Campground. Russian thistle (*Salsola australis*) is spreading in the area and the development of additional campsites and trails could impact the plants. Further inventory work for the dwarf milkweed, especially during a non-drought year, as well as monitoring for changes in population size and condition, would benefit our ability to manage for this species. Additional study is needed to fully understand the phenology and pollination ecology of dwarf milkweed. Further inventory of the plant communities in this PCA is also warranted during a non-drought year.



Dwarf milkweed (*Asclepias uncialis*) (above)

Photograph taken at the Boggs Creek PCA (below)





0.25 0 0.25 0.5 Miles

▲ Coordinate System: UTM, Zone13, NAD27

Colorado Natural Heritage Program

Colorado State University
8002 Campus Delivery
Fort Collins, CO 80523-8002

map created 14 April 2003

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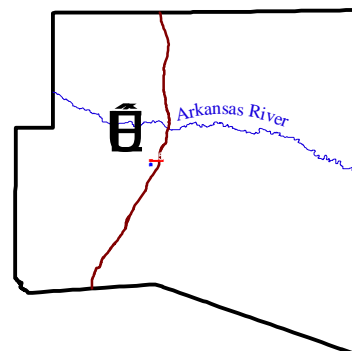
LEGEND

□ PCA Boundary

Southwest Pueblo, 38104-B6
Northwest Pueblo, 38104-C6
7.5 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



Chico Creek Potential Conservation Area

Biodiversity Rank: B3 (High significance)

This PCA contains a good (B-ranked) occurrence of the globally vulnerable (G3) Arkansas darter (*Etheostoma cragini*), good (B-ranked) occurrences of three globally vulnerable (G3) wetland communities, and fair (C-ranked) occurrences of two globally imperiled (G2) cottonwood riparian woodlands. The large acreage and wide range of wetland communities present in the PCA are unusual for the central shortgrass prairie.

Protection Urgency Rank: P3 (Moderate urgency)

Protection actions are needed to secure long-term conservation. Currently, most of the land within the PCA is owned by the State Land Board and managed with conservation in mind.

Management Urgency Rank: M3 (Moderate urgency)

Current management appears appropriate for maintaining the element occurrences; however, various management options could improve their quality. Chico Basin Ranch is working with the Colorado Division of Wildlife to develop a small fishes management plan. Land managers are considering management of non-native species including tamarisk on Chico Creek. Of larger-scale concern is maintenance of the hydrologic regime necessary to support the wetland communities and Arkansas darter.

Location: Chico Creek PCA is located in north central Pueblo County and extends into El Paso County on Black Squirrel Creek. The PCA extends south along Chico Creek onto the Pueblo Chemical Depot.

Legal Description: U.S.G.S. 7.5' quadrangles: Hanover, Hanover SE, Bar JH Ranch, North Avondale NE, Devine, and North Avondale.
T17S R62W Sections 28, 29, 31, 32; T18S R62W Sections 5-8, 17-20, 29-32; T18S R63W Sections 3-5, 8-10, 13-17, 21-27, 33-36; T19S R62W Sections 5-7, 18, 19, 29-32; T19S R63W Sections 1-4, 10-14, 23-25, 36; T20S R62W Sections 5-7, 18, 19; T20S R63W Sections 1, 12, 13.

Size: 21,580 acres (8733 hectares)

Elevation: 4580 to 5200 feet (1396 to 1585 meters).

General Description: The Chico Creek watershed reaches from the Black Forest to the Arkansas River, encompassing over 580 square miles in El Paso and Pueblo counties. Chico Creek and its tributary, Black Squirrel Creek, are ephemeral throughout most of their length, and surface flow reaches the Arkansas River only after heavy precipitation events. In the southern portion of the watershed, various seeps and springs create an extensive Great Plains wetland and riparian complex with perennially ponded portions. Surface water is extremely rare in the basin, and the wetlands formed by these seeps and

springs are the most significant hydrologic feature of the entire basin (Romero 1992). The Chico Creek PCA encompasses these wetlands and riparian areas.

The range of wetland and riparian plant communities supported by the seeps and springs is extensive. The largest wetland complex covers about 2,700 acres in the Black Squirrel Creek basin. Within the surrounding community of greasewood with alkali sacaton (*Sarcobatus vermiculatus*/*Sporobolus airoides*) (G3? S2) occur wetter portions vegetated with a mosaic of wetland communities including Nebraska sedge (*Carex nebrascensis*) (G4 S3), spikerush (*Eleocharis palustris*) (G5 S4), softstem bulrush and hardstem bulrush (*Scirpus tabernaemontani*–*Scirpus acutus*) (G3 S2S3), clustered sedge (*Carex praegracilis*) (G3G4 S2), and prairie cordgrass (*Spartina pectinata*) (G3? S3).

Another interesting wetland complex occurs as a broken band of seeps along bluffs above the eastern bank of Chico Creek. The vegetation on the seeps varies considerably but generally includes common threesquare (*Scirpus pungens*) (G3G4 S3) at up to about 20 percent cover. Other portions of the seeps support a community of alkali sacaton (*Sporobolus airoides*) (G3Q S3). Other plants present on the seeps include mixed sedges (*Carex nebrascensis*, *C. praegracilis*, *C. lanuginosa*, *C. hystericina*), spikerush (*Eleocharis palustris*, *E. acicularis*, *E. quinqueflora*), rushes (*Juncus balticus*), cattail (*Typha latifolia*), bulrush (*Schoenoplectus acutus*), and western wheatgrass (*Panicum virgatum*). Certain small areas of the seeps have unstable histic soil horizons floating on discharging groundwater that gives the wetlands a spongy feel. Two species of lobelia not previously known from Pueblo County (*Lobelia cardinalis* ssp. *graminea* and *L. siphilitica* var. *ludoviciana*) were common on the southern seeps during the 2000 field season. In some areas, the bluff top above the seeps has a white crust of alkaline salts with sparse cover of saltgrass (*Distichlis spicata*).

Portions of Chico Creek support cottonwood riparian woodlands. Unfortunately, tamarisk (*Tamarix ramosissima*), an exotic invasive shrub, has colonized much of Chico Creek crowding out native species. However, many native species are still present, including coyote willow (*Salix exigua*), alkali sacaton (*Sporobolus airoides*), western wheatgrass (*Pascopyrum smithii*), and vine mesquite (*Panicum obtusum*). The riparian plant community can be characterized as cottonwood/alkali sacaton (*Populus deltoides*/*Sporobolus airoides*) (G2Q S2) with patches of cottonwood/western wheatgrass-vine mesquite (*Populus deltoides*/*Pascopyrum smithii*-*Panicum obtusum*) (G2 S2). Control of tamarisk would greatly improve the quality of these occurrences and is being considered by the land managers. The creek undergoes natural flooding regimes as evidenced by the presence of cottonwood saplings and flood debris suspended in the riparian vegetation. A large flood in April/May 1999 resulted in scouring of the channel and subsequent sprouting of cottonwood seedlings. On the Pueblo Chemical Depot, the April/May 1999 flood resulted in widening of the Chico Creek stream channel by three times (M. Canestorp, pers. comm., PCD).

Spring-fed pools in Black Squirrel Creek and a spring-fed tributary to Chico Creek support Arkansas darter (*Etheostoma cragini*) (G3 S2), a small plains fish listed as threatened in the state of Colorado (Colorado Division of Wildlife 2001a). These

populations were discovered by Colorado Division of Wildlife in 1998 (Colorado Division of Wildlife 2001a). Arkansas darters are native to small clear streams tributary to the Arkansas River, and can survive in scattered pools that undergo evaporative concentration, high temperatures, and low dissolved oxygen concentrations (Nesler et al. 1999). The fish likely distribute between perennial portions of the creeks during high flow events (G. Dowler, pers. comm., CDOW). Therefore, it is likely that all the perennial reaches and pools are potential habitat for this fish. Other native fishes present in the creeks include white sucker (*Catostomus commersoni*), fathead minnow (*Pimephales promelas*), red shiner (*Cyprinella lutrensis*), sand shiner (*Notropis stramineus*), plains killifish (*Fundulus zebrinus*), and stoneroller (*Campostoma anomalum*) (Melby 1998).

Some tributaries to Chico Creek in the northern portion of the PCA have surface impoundments for irrigation and recreational use. The population of Arkansas darter on Chico Creek occurs above an impoundment on a tributary (Melby 1998). The ponds likely result in a decrease of native fishes in the drainage by decreasing the amount of available water in the creek (evaporation and agricultural use) and reducing the native fish habitat (Melby 1998). Non-native fishes introduced to the Chico Creek ponds for recreational fishing include large-mouth bass (*Micropterus salmoides*), and bluegill (*Lepomis macrochirus*), both potential predators on native fish populations. Large-mouth bass have also been collected downstream on the Pueblo Chemical Depot portion of Chico Creek (M. Canestorp, pers. comm., PCD).

Other wildlife observed within Black Squirrel and Chico Creek wetlands include plains leopard frogs (*Rana blairi*) (G5 S3), northern leopard frogs (*Rana pipiens*) (G5 S3), Red-winged Blackbirds, and Common Snipe. The pools also support a wide range of aquatic invertebrates. Sampling of pools on Black Squirrel Creek and the adjacent Burnt Creek resulted in collection of over 45 species of aquatic insects, including 26 species of aquatic beetles (Durfee and Kondratieff 2000).

Wildlife noted using Chico Creek riparian area include pronghorn antelope, white-tailed deer, mule deer, coyote, desert cottontail, jackrabbit, American Kestrel, Horned Lark, Lark Bunting, Lark Sparrow, Sage Thrasher, Great Horned Owl, western rattlesnake, and Woodhouse's toad. Also noted were big brown bat, common porcupine, northern leopard frog, Red-tailed and Swainson's Hawks, Northern Flicker, Western Kingbird, and Tree Swallow (Gionfriddo 2001). Small mammal trapping on Chico Creek revealed white-footed mice (*Peromyscus leucopus*), deer mice (*P. maniculatus*), Ord's kangaroo rat (*Dipodomys ordii*), western harvest mice (*Reithrodontomys megalotis*), silky pocket mice (*Perognathus flavus*), hispid cotton rat (*Sigmodon hispidus*), woodrat (*Neotoma* sp.), and voles (*Microtus* sp.) (Schorr 1999, Gionfriddo 2001). Two beaver (*Castor canadensis*) were relocated to the PCD portion of Chico Creek in 1997. Non-native bullfrogs (*Rana catesbeiana*) have been present on the PCD portion of Chico Creek (M. Canestorp, pers. comm., PCD).

Hydrologic investigations by Romero (1992) indicate that the water discharging from the seeps and springs and supporting the perennial pools in the creeks is shallow alluvial

groundwater recharged by precipitation over the entire watershed. According to water balance calculations, about 90 percent of precipitation falling on the basin evaporates or is transpired by plants, and the remaining 10 percent infiltrates and becomes shallow alluvial groundwater (Romero 1992). The groundwater moves southward toward the Arkansas River and discharges as a broken band of seeps along about five miles of the bluff above the east bank of Chico Creek, and as seeps and springs within Chico and Black Squirrel Creeks. The groundwater discharges where the creek has removed the alluvium and the underlying impermeable Pierre Shale bedrock is exposed. Similar seeps that are part of the same system but not included in this PCA occur along Boone Creek on the Pueblo Chemical Depot and south of Pueblo Chemical Depot on bluffs east of the town of North Avondale.

The wetlands and creeks are surrounded by large expanses of relatively natural lands. Upland vegetative communities include sandsage prairie (*Artemisia filifolia/Andropogon hallii*) and blue grama shortgrass prairie (*Bouteloua gracilis-Hilaria jamesii*) (see Signal Rock Sandhills, Chico Basin Shortgrass Prairie, and Midway Prairie PCAs). Bird surveys by Rocky Mountain Bird Observatory tally over 200 species on the 86,000-acre Chico Basin Ranch (S. York, pers. comm., Chico Basin Ranch). Mountain Plover, a shortgrass prairie species that is proposed for federal listing as a threatened species, is known on and around the Chico Creek PCA, generally associated with black-tailed prairie dog colonies. The size and context of the natural landscape suggest that species assemblages are relatively complete and natural ecological processes are intact or restorable.

An area of over 300 square miles—reaching from the northern boundary of the Bohart Ranch in El Paso County to the southern boundary of Pueblo Chemical Depot and including the Chico Creek PCA—is managed by just five parties. These units include the 86,000 acre Chico Basin Ranch, 48,000 acre Bohart Ranch, 33,000 acre Transportation Technology Center, 23,000 acre Pueblo Chemical Depot, and one privately-owned ranch. The Chico Basin Ranch is leased from the State Land Board by Duke Phillips and operated as a cattle ranch. Similarly, the Bohart Ranch is leased from the State Land Board by The Nature Conservancy and operated as a cattle ranch. The Transportation Technology Center is leased from the State Land Board and operated as a railroad technology development and test facility. Pueblo Chemical Depot is a Department of Defense facility built in 1942 for storage of ammunition and general supplies.

The area has historically been used primarily for livestock grazing. The Chico Basin Ranch, Bohart Ranch, and private ranch are actively grazed. Portions of the 23,000 acre Pueblo Chemical Depot have not been grazed by cattle since the land was purchased in 1942 with grazing continuing on 7,700 acres through June 1998. Limited grazing occurs on portions of Chico Creek located on PCD and the private ranch (M. Canestorp, pers. comm., PCD). The Transportation Technology Center (TTC) has not been grazed by cattle since the facility began operation in the early 1970's (G. Spons, pers. comm., TTC).

The hydrological processes of the basin appear to be relatively unaltered. The most important process is recharge to the shallow alluvial aquifer. Recharge supporting the wetlands and riparian areas occurs in both Pueblo and El Paso counties. Processes that might result in decreased infiltration (e.g., increase in hard surfaces/paving), or increased water consumption within the basin (more pumping for domestic and agricultural uses), could decrease the amount of water discharging from the seeps and springs. Additionally, factors that might decrease water quality, such as increased use of septic systems and non-point source pollution from roads and other sources, could result in a degradation of water quality discharging from the seeps and springs.

Biodiversity Comments: This site contains a good example of Arkansas darter (*Etheostoma cragini*), a globally vulnerable eastern plains fish native to small streams in the Arkansas River drainage. The site also includes fair (C-ranked) occurrences of globally imperiled (G2) cottonwood riparian woodland and good (B-ranked) occurrences of three wetland communities.

Natural Heritage element occurrences at the Chico Creek PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Fish								
<i>Etheostoma cragini</i>	Arkansas darter	G3	S2	C	T	FS	B	2000-05-20
<i>Etheostoma cragini</i>	Arkansas darter	G3	S2	C	T	FS	E	1998
Amphibians								
<i>Rana blairi</i>	Plains leopard frog	G5	S3		SC	BLM	E	2000-07-26
Plant Communities								
<i>Populus deltoides</i> / <i>Pascopyrum smithii</i> – <i>Panicum obtusum</i>	Plains cottonwood/ western wheatgrass-vine mesquite	G2	S2				C	2000-07-13
<i>Carex praeegracilis</i>	Clustered sedge wetland	G3G4	S2				B	2000-08-28
<i>Carex praeegracilis</i>	Clustered sedge wetland	G3G4	S2				C	2000-07-26
<i>Scirpus tabernaemontani</i> - <i>Scirpus acutus</i>	Great Plains marsh	G3	S2S3				B	2000-08-28
<i>Populus deltoides</i> / <i>Sporobolus airoides</i>	Plains cottonwood/ alkali sacaton	G2Q	S2				C	2000-07-26
<i>Sarcobatus vermiculatus</i> / <i>Sporobolus airoides</i>	Saline bottom shrubland	G3?	S2				C	1997-04-03

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
<i>Spartina pectinata</i>	Prairie slough grass	G3?	S3				B	2000-08-28
<i>Spartina pectinata</i>	Prairie slough grass	G3?	S3				C	2000-07-26
<i>Scirpus pungens</i>	Bulrush	G3G4	S3				C	2000-09-09
<i>Sporobolus airoides</i>	Great Plains salt meadow	G3Q	S3				C	1997-04-03
<i>Carex nebrascensis</i>	Wet meadow	G4	S3				B	2000-08-28
<i>Phragmites australis</i>	Marsh	G5	S3				C	1997-04-03
<i>Eleocharis palustris</i>	Emergent wetland	G5	S4				B	2000-08-28

*EO = Element Occurrence

Note: Element occurrences responsible for the B-rank are shown in bold typeface.

Boundary Justification: The boundary encompasses the northerly extent of the Black Squirrel Creek Arkansas darter population documented by the Colorado Division of Wildlife (2001b) and the wetland and riparian communities supported by the seeps and springs. Although this PCA boundary incorporates the element occurrences, management at the watershed scale is important for their persistence. Conservation attention could include a greater proportion of the groundwater recharge area believed necessary to maintain the seeps and springs supporting the Arkansas darter population and the wetland and riparian plant communities.

Protection Comments: There are definable threats, but none expected to be critical in the next five years. Small lots to the north (near Colorado Springs) are being sold for residential development, and continued suburban expansion may threaten the likelihood that large-scale ecological processes such as fire, herbivory, flooding, and groundwater recharge will function naturally. Additionally, development of water supplies for housing subdivisions (e.g., groundwater) could alter the hydrologic regime supporting the wetlands and fishes.

Over 98 percent of the land contained within the PCA is owned by the State Land Board and the Department of Defense. Chico Basin Ranch signed a 25-year lease with the State Land Board in 1999. A longer-term issue is the possibility of the State Land Board selling the property to maximize their return on the land. Increases in land value resulting from growth of Colorado Springs may cause this to be a real concern in the future.

At the Pueblo Chemical Depot, all missions except storage of chemical munitions were terminated in 1994, and environmental restoration of the installation is one of the depot's highest priorities. Pueblo Chemical Depot is studying various options for transferring the property to a new owner, potentially a conservation agency or organization willing to manage for native ecosystem values

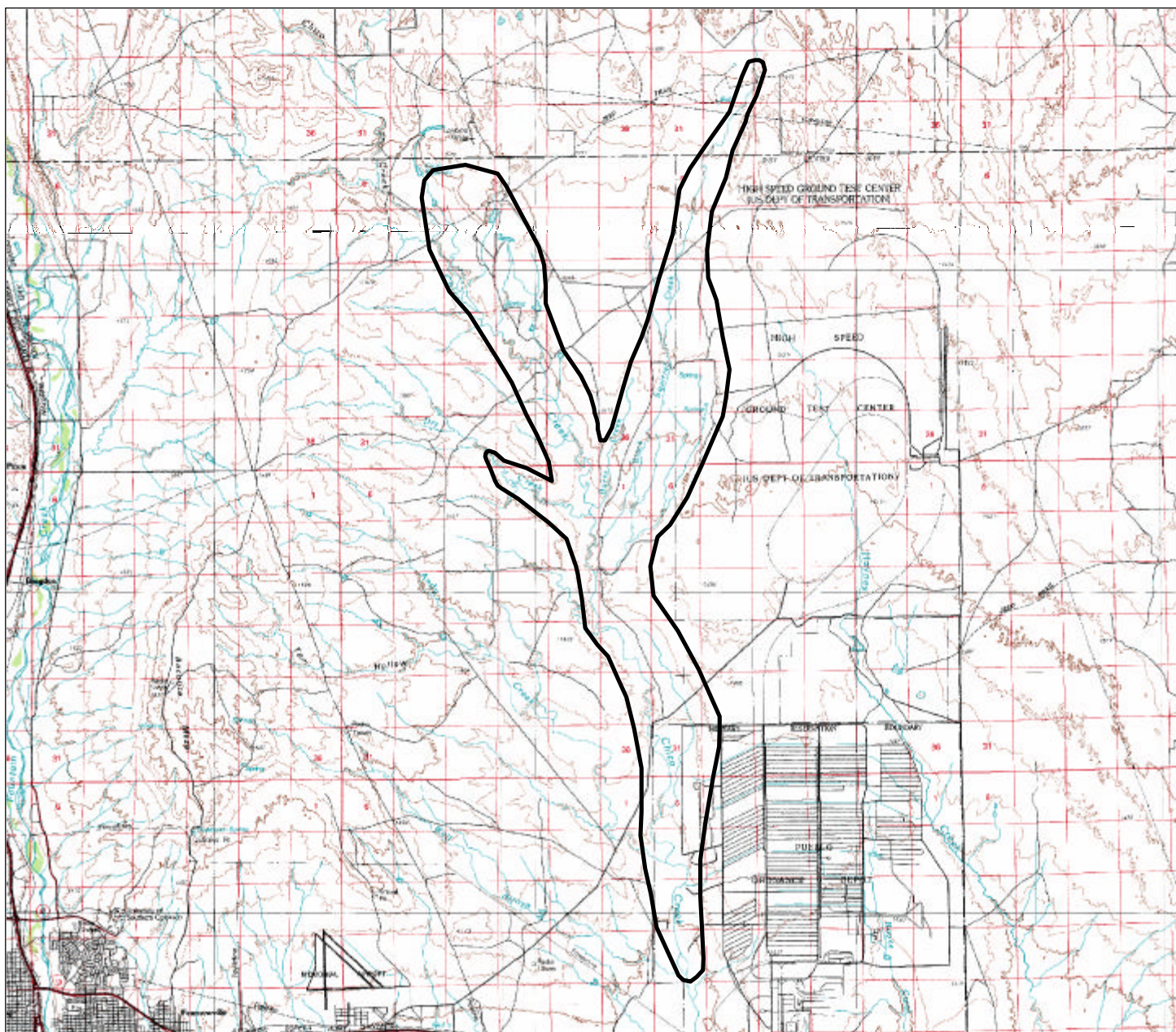
Management Comments: From the perspective of natural heritage elements on the PCA, current management appears appropriate for maintaining the element occurrences. Management actions being considered that could improve the quality of the element

occurrences include improvement of native small fishes habitat, non-native species management, and grazing management. Chico Basin Ranch land managers will be working with Colorado Division of Wildlife to develop a small fishes management plan (Melby 2000). Control of tamarisk on Chico Creek has the potential to greatly improve the quality of the riparian element occurrences and is being considered by the land managers. Chico Basin Ranch is considering altering the grazing regime in the Chico Creek riparian area. Black Squirrel Creek wetlands on the Transportation Technology Center include large patches of Canada thistle (*Breca arvensis*) and other potentially noxious weeds and could benefit from weed control efforts.



Black Squirrel
Creek wetlands
in the Chico
Creek PCA
(above)

Chico Creek
(left)



2 0 2 4 Miles

Coordinate System: UTM, Zone13, NAD27

Colorado Natural Heritage Program

Colorado State University
8002 Campus Delivery
Fort Collins, CO 80523-8002

map created 14 April 2003

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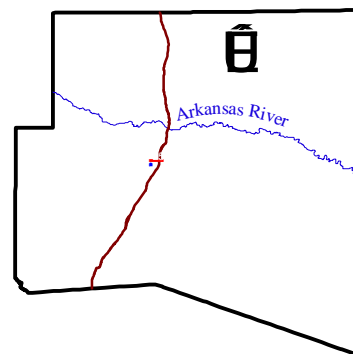
LEGEND

 PCA Boundary

Pueblo, 38104-A1
 Colorado Springs, 38104-E1
 30 x 60 Minute Series

Digital Raster Graphics produced by the U.S.
 Geological Survey, 1996

Location in Study Area



Haynes Creek Potential Conservation Area

Biodiversity Rank: B3 (High significance)

This PCA contains a good (B-ranked) occurrence of a globally vulnerable (G3G4 S3) riparian community (*Scirpus pungens*) on a small plains stream. The non-weedy and non-entrenched condition is unusual for the plains.

Protection Urgency Rank: P3 (Moderate urgency)

The PCA is located on Department of Defense property and private property owned by one landowner. The Department of Defense is considering options for transferring their property to another entity, potentially with conservation intentions.

Management Urgency Rank: M3 (Moderate urgency)

Current management appears adequate to maintain the element occurrences. However, elimination of the tamarisk on Haynes Creek is recommended immediately because the species has not yet established itself and eradication would be relatively easy.

Location: Haynes Creek PCA is located in north central Pueblo County on the eastern boundary of the Department of Defense Pueblo Chemical Depot. The PCA extends upstream and downstream onto private property.

Legal Description: U.S.G.S. 7.5' quadrangles: North Avondale and North Avondale NE. T19S R62W Sections 14, 15, 22, 23, 26, 27, 35, 36; T20S R62W Sections 1, 2, 12, 13; T20S R61W Sections 7, 18.

Size: 2599 acres (1052 hectares)

Elevation: 4600 to 4850 feet (1400 to 1480 meters)

General Description: Haynes Creek is a small, meandering, ephemeral, Great Plains stream occurring within a mosaic of shortgrass prairie, sandsage prairie, and greasewood shrubland. The landscape context of the creek is relatively intact. The creek originates at springs on the Transportation Technology Center and private property, and flows through the eastern undeveloped portion of Pueblo Chemical Depot (PCD) then back to private property and towards the Arkansas River. The PCA encompasses the Haynes Creek springs, the PCD reach of the creek, and the reach downstream from PCD for about a mile.

On the Pueblo Chemical Depot, the width of the creek supporting riparian vegetation ranges from about 5 to 50 feet. The vegetation is a mosaic of threesquare bulrush (*Scirpus pungens*) (G3G4 S3) and saltgrass (*Distichlis spicata*) (G5 S3) communities. Along two miles of the occurrence, the creek has no entrenchment, is completely vegetated, and is relatively free of non-native species. Saltgrass is the dominant species in this reach, with some patches of common spikerush (*Eleocharis palustris*) in the wider

areas. Near the IL Road crossing, the channel is entrenched and the vegetation is mainly threesquare bulrush with small patches of common spikerush, Baltic rush (*Juncus balticus*), and alkali bulrush (*Bolboschoenus maritimus*). In this lower reach, saltgrass is the dominant plant in the floodplain. Weedy species in the channel include curlycup gumweed (*Xanthium strumarium*), dock (*Rumex* sp.), and a few scattered tamarisk (*Tamarix ramosissima*).

Terrestrial insects abundant in Haynes Creek and surrounding uplands are robber flies, grasshoppers, and wasps. Aquatic insects collected from a temporary pond on the creek include predaceous diving beetles (*Agabus disintegratus* and *Hygrotus nubilis*), water boatmen (*Corisella tarsalis* and *Sigara alternata*), and midge larvae (*Chironomus* sp. and *Procladius* sp.) (Kondratieff and Durfee 1999). Birds observed in the vicinity include Killdeer, Western Kingbird, Lark Bunting, Western Meadowlark, Northern Harrier, and Ferruginous Hawk. Mountain Plover use the adjacent shortgrass uplands.

Small mammal trapping in the shortgrass prairie surrounding Haynes Creek resulted in the following species: deer mouse (*Peromyscus maniculatus*), kangaroo rat (*Dipodomys ordii*), western harvest mouse (*Reithrodontomys megalotis*), silky pocket mouse (*Perognathus flavus*), northern grasshopper mouse (*Onychomys leucogaster*), hispid pocket mouse (*Chaetodipus hispidus*), and spotted ground squirrel (*Spermophilus spilosoma*) (Colorado Natural Heritage Program 2001).

Hydrologic investigations by Romero (1992) indicate that Haynes Creek is part of the larger Chico Creek/Black Squirrel Creek system. Creek discharge is from shallow groundwater recharged by precipitation over the entire watershed (Pueblo and El Paso counties). The hydrologic regime of the creek appears to be nearly intact. The springs at the headwaters are developed and a small retention dam was built to supply a privately owned ranch residence and headquarters. The retention pond likely alters the hydrologic regime by moderating flows and increasing evaporative losses. Only two roads cross the creek within the PCA, the Department of Transportation (DOT) Road near the headwaters and the IL Road along the eastern boundary of PCD.

The land history of the depot property is complex. From at least the early 1900's to 1941, the depot property was a mixture of private and state owned parcels with ranching as the primary use. In 1941, the Department of Defense acquired the land and by 1942 had built a munitions storage facility. In 1994, all but a small portion of the munitions were removed. Though bunkers and other buildings were constructed over most of the depot, the Haynes Creek portion was never developed and remains in relatively intact condition.

Grazing has been excluded from the PCD portion of the PCA since 1998 (M. Canestorp, pers. comm., PCD) and fire is suppressed throughout the region.

Biodiversity Comments: This site contains a good example (B-ranked) of a globally vulnerable/apparently secure (G3G4 S3) threesquare bulrush (*Scirpus pungens*) plant

community on a small, intact Great Plains stream. The vegetation is a mosaic of threesquare bulrush and saltgrass (*Distichlis spicata*) (G5 S3) communities.

Natural Heritage element occurrences at the Haynes Creek PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank*	Last Observed
Plant Communities								
<i>Scirpus pungens</i>	Bulrush	G3G4	S3				B	2000-09-09
<i>Distichlis spicata</i>	Salt meadow	G5	S3				B	2000-09-09

*EO = Element Occurrence

Note: Element occurrence responsible for the B-rank is shown in bold typeface.

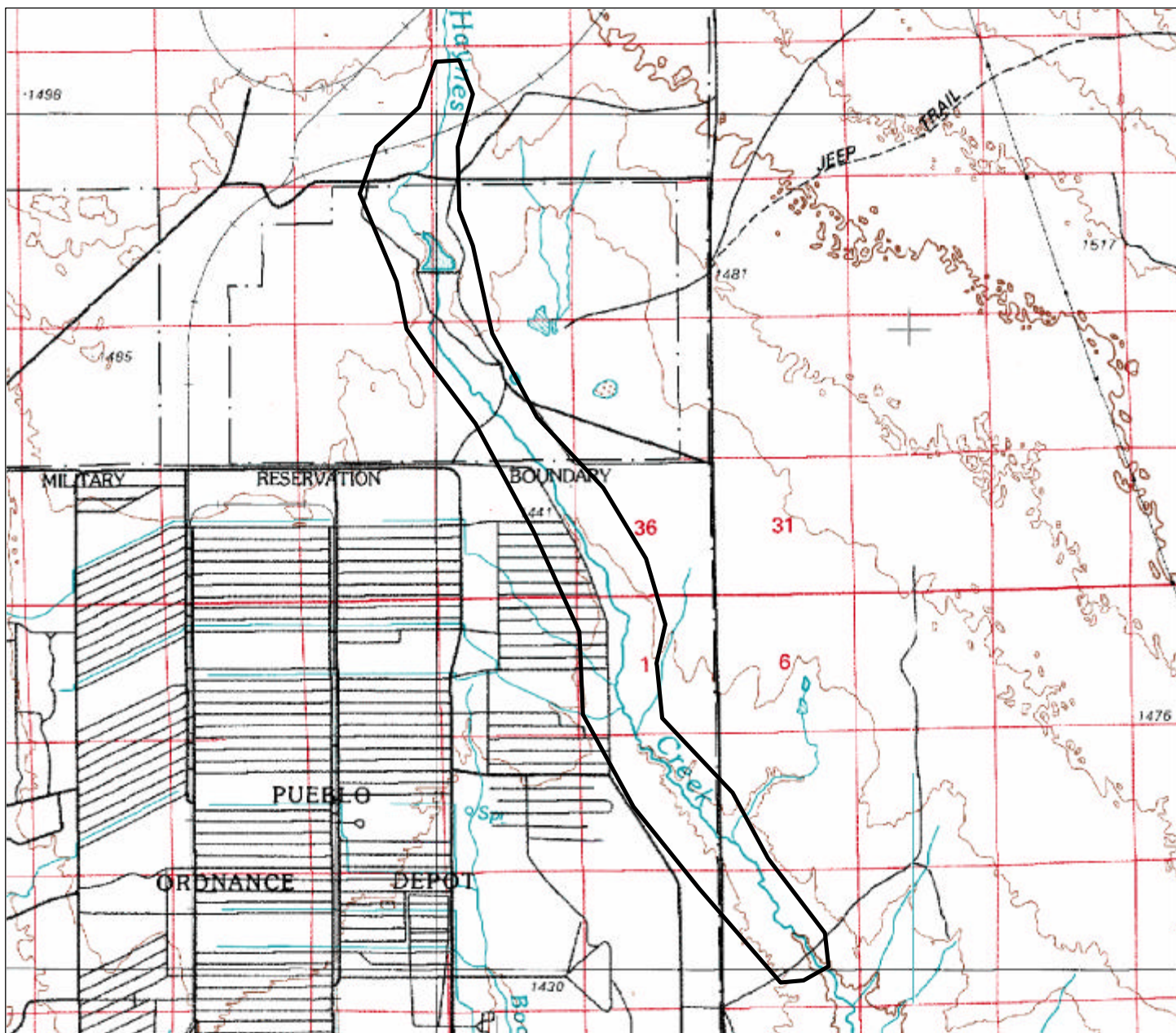
Boundary Justification: The boundary encompasses the springs at the headwaters of the creek and a portion of the surrounding uplands. The PCA does not include the groundwater recharge area necessary to maintain the springs and seeps that support the riparian plant communities along Haynes Creek.

Protection Comments: The Pueblo Chemical Depot is scheduled for closure in future years. The Department of Defense is studying various options for transferring the property to a new owner, potentially one with conservation intentions. The ranch to the north has been operating for decades, and ranch practices appear compatible with maintenance of the good condition of the element occurrences.

Management Comments: From the perspective of natural heritage elements on the PCA, current management appears appropriate for maintaining the element occurrences. Elimination of tamarisk on Haynes Creek is recommended because the species currently forms less than one percent cover and would be relatively easy to eradicate. The potential for reestablishment of naturally-occurring large scale ecological processes such as fire and herbivory should be considered in management plans.



Photograph taken at the Haynes Creek PCA



1 0 1 2 Miles

▲ Coordinate System: UTM, Zone13, NAD27

Colorado Natural Heritage Program

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map created 14 April 2003

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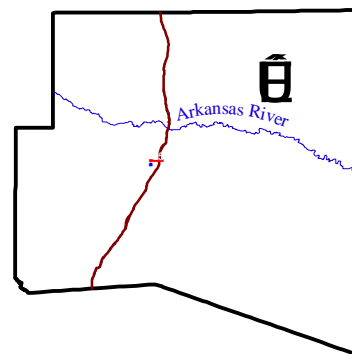
LEGEND

□ PCA Boundary

Pueblo, 38104-A1
30 x 60 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



***Vigil and St. Vrain
Potential Conservation Area***

Biodiversity Rank: B3 (High significance)

This PCA contains a good (B-ranked) occurrence of a plant community that is vulnerable on a global scale (G3G4). Assessments include two drive-throughs and a very short "rapid biological assessment" during the fall. While the known condition of much of the site is probably accurate, there are doubtless some communities, plant, and animal species that have not been detected. In addition, while the observed condition is readily assessed through our current efforts, the ecological integrity of some natural communities relative to other sites in the plains of Colorado is poorly known.

Protection Urgency Rank: P3 (Moderate urgency)

This PCA is located about 20 miles southeast of Pueblo and therefore is conceivably within the range of suburban expansion over the long term. Large ranches in the vicinity of this PCA have been sold to development firms.

Management Urgency: M3 (Moderate urgency)

Management needs vary considerably across the PCA. Parts of the PCA support well-managed cattle operations. The shortgrass prairie and juniper woodlands are dominated by native species and ecological processes appear to be intact. Some restoration or special management actions are needed in the riparian areas to return the plant communities to more natural condition.

Location: Southern Pueblo County.

Legal Description: U.S.G.S. 7.5' quadrangles: Hog Ranch Canyon, North Rattlesnake Bu, Chicos Well, Doyle Bridge, Goat Butte, Red Top Ranch, Cedarwood, Graneros Flats, Myers Canyon, Capps Springs, Lascar, and Cucharas Reservoir.

T23S R62W, T23S R63W, T23S R64W, T23S R65W, T24S R61W, T24S R62W, T24S R3W, T24S R4W, T24S R65W, T25S R61W, T15S R62W, T25S R63W, T25S R64W, T25S R65W, T25S R66W, T26S R62W, T26S R63W, T26S R64W, T26S R65W, T26S R66W, T27S R64W.

Size: 209,435 acres (84,755 hectares)

Elevation: 4800 to 5800 feet (1460 to 1770 meters)

General Description: This PCA consists of about 150,000 acres of shortgrass prairie and juniper woodlands dissected by canyons formed by the Huerfano and Cucharas Rivers and other smaller streams. Swales or arroyos start on the more level prairie and eventually cut down to bedrock to form canyons several hundred feet deep. Blue grama (*Bouteloua gracilis*) is the dominant prairie grass species, with galleta grass (*Hilaria jamesii*) also frequently found in abundance. Sand dropseed (*Sporobolus cryptandrus*) and ring muhly (*Muhlenbergia torreyi*) are present in variable quantities. Cholla (*Cylindropuntia imbricata*) and yucca (*Yucca glauca*) generally occur in low to moderate

abundance across the grasslands, but are occasionally abundant. Two major limestone ridges occur east of the Huerfano River, and several major sandstone ridges (e.g., The Beardsley and Turkey Ridge) are found within the PCA. One-seeded juniper (*Juniperus monosperma*) woodlands, occasionally co-dominated by pinyon pine (*Pinus edulis*), are found across many of these ridges, with an understory generally dominated by sideoats grama (*Bouteloua curtipendula*), blue grama, galleta grass, and hairy grama (*Bouteloua hirsuta*). Ponderosa pine (*Pinus ponderosa*) is scattered around some of the canyons and outcrops at higher elevations. Elevations in the PCA range from approximately 4800 feet at the northern end to 5800 feet at the southern end. The fauna of the area is typical of the southern shortgrass prairie, but with the addition of some montane elements. Swift fox (*Vulpes velox*) and the rare endemic triploid checkered whiptail lizard (*Cnemidophorus neotesselatus*) have been documented within the PCA. Atypically for a system east of the Rocky Mountains, the PCA supports populations of elk, both whitetail and mule deer, pronghorn, swift and red fox, and coyotes. Both mountain lion and bear signs have been seen within the PCA. Only a few small prairie dog towns are known.

Riparian and wetland areas consist of small canyons with intermittent streams, splash pools, some permanent pools associated with springs, and ephemeral shallow ponds (playa lakes). The riparian and wetland areas receive heavy cattle use. In the canyons, riparian and wetland vegetation consists of non-native weeds (e.g., tamarisk (*Tamarix ramosissima*), kochia (*Bassia sieversiana*), and Russian thistle (*Salsola australis*)), non-native grass species (e.g., Kentucky bluegrass (*Poa pratensis*) and redtop (*Agrostis stolonifera*)), or native species strongly resistant to grazing (e.g., alkali muhly (*Muhlenbergia asperifolia*) and threesquare (*Scirpus pungens*)). The portion of the Huerfano River at the north end of the PCA contains plains cottonwood (*Populus deltoides*) plant communities that probably resemble their native state, however non-native species, especially tamarisk but also Russian olive (*Elaeagnus angustifolia*), are still common to abundant, and the native herbaceous vegetation tends to be composed of increasers (e.g., saltgrass (*Distichlis spicata*)). Cottonwood regeneration is abundant on this part of the river.

This region of southeast of Colorado has a rich history that extends from inhabitation by indigenous peoples through the earliest settlements of Europeans, to the current ranching culture adjacent a growing urban center, the city of Pueblo. This region of the Great Plains was known to be inhabited by large herds of bison, therefore also the Indian tribes. Trappers, explorers, and settlers mentioned the Huerfano River and its canyon as prominent landmarks and waters. This PCA includes part of the original Vigil St. Vrain Spanish Land Grant.

Biodiversity Comments: This PCA contains a good occurrence of a plant community, which is vulnerable on a global scale (G3G4). Additionally, swift fox (*Vulpes velox*), a declining shortgrass prairie species (G3 S3), and triploid checkered whiptail (*Cnemidophorus neotesselatus*) (G2Q S2), a lizard known only from southeastern Colorado, have been documented within the PCA. Assessments include two drive-throughs and a very short "rapid biological assessment" during the fall. While the known condition of much of the site is probably accurate, there are doubtless some communities,

plant, and animal species that have not been detected. In addition, while the observed condition is readily assessed through our current efforts, the ecological integrity of some natural communities relative to other sites in the plains of Colorado is poorly known.

Natural Heritage element occurrences at the Vigil and St Vrain PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plant Communities								
<i>Juniperus monosperma/Bouteloua curtipendula</i>	Foothills pinyon-juniper woodland	G5	S3S4				B	1996-10-30
<i>Juniperus monosperma/Bouteloua gracilis</i>	Foothills pinyon-juniper woodland	G5	S3S4				B	1996-10-30
<i>Bouteloua gracilis-Hilaria jamesii</i>	Shortgrass prairie	G3G4	S3				B	1996-10-30
<i>Opuntia imbricata/Hilaria jamesii</i>	Shortgrass prairie	GU	S3				B	1996-10-30
Plants								
<i>Cheilanthes eatonii</i>	Eaton's lip fern	G5?	S2				B	1996-10-30
Mammals								
<i>Vulpes velox</i>	Swift fox	G3	S3	P	SC	FS	E	1996-07-03
Reptiles								
<i>Cnemidophorus neotesselatus</i>	Triploid checkered whiptail	G2Q	S2				H	1988-09-06
Invertebrates								
<i>Amblyscirtes simius</i>	Simius roadside skipper	G4	S3				C	1994-06-05

*EO = Element Occurrence

Note: Element occurrence responsible for the B-rank is shown in bold typeface.

Boundary Justification: The boundaries for this PCA were generated from maps and aerial photos from the Pueblo and Huerfano county soils surveys. The boundary includes 80,000 acres that were field surveyed and an additional 100,000 acres that are similar habitat. Lands to the south and north of the site boundaries show evidence of alteration for agricultural purposes. The eastern boundary is a natural break in the dissected nature of the landscape (assumed to be somewhat of a barrier for the elk). The western boundary generally follows the Huerfano River but the ecological boundaries may still extend to the west.

Protection Comments: It would probably not be necessary to protect the entire PCA to protect viable occurrences of the natural communities alone. Protection of these natural communities, the ecological processes that control them, and the far ranging large ungulates may require more acres.

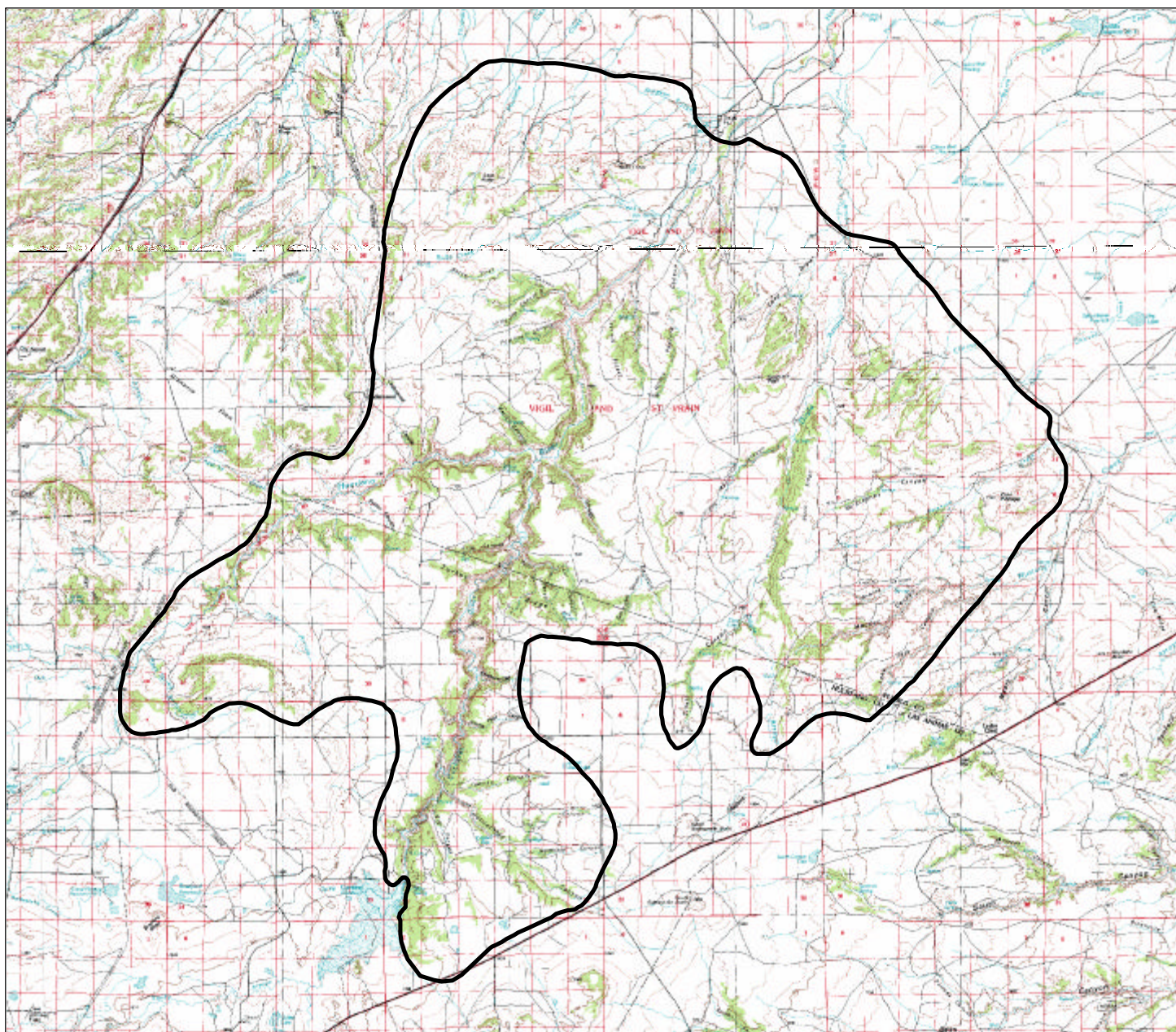
Management Comments: Management needs vary considerably across the PCA. Parts of the PCA support well-managed cattle operations. The shortgrass prairie and juniper woodlands are dominated by native species and ecological processes appear to be intact.

Management that permits prairie dog expansion is desirable to maintain the full suite of prairie species that are known or expected to occur in this area. Some restoration or special management actions are needed in the riparian areas to return the plant communities to more natural condition. These communities are currently dominated by non-native species. Lack of management in the riparian zone may result in further deterioration of native plant communities. The Huerfano River riparian zone needs extensive management to improve the condition of vegetation. Uplands are in good to excellent condition and could be easily maintained through expert livestock grazing or through reintroduction of bison.



Photograph taken at
the Vigil St. Vrain
PCA (above)

Eaton's lip fern
(*Cheilanthes eatonii*)
(left)



3 0 3 6 Miles

▲ Coordinate System: UTM, Zone13, NAD27

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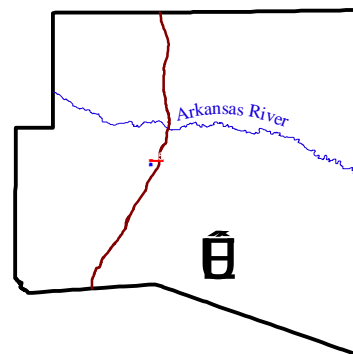
LEGEND

□ PCA Boundary

Walsenburg, 37104-E1
Pueblo, 38104-A1
30 x 60 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



St. Charles River at 3R
Potential Conservation Area

Biodiversity Rank: B3 (High significance)

This site contains a good (B-ranked) occurrence of a vulnerable (G3 S3) montane riparian forest plant community, narrowleaf cottonwood/alder (*Populus angustifolia/Alnus incana*).

Protection Urgency Rank: P3 (Moderate urgency)

The land is privately owned and its primary use is cattle grazing. Due to its proximity to Pueblo, this area could attract increased development.

Management Urgency Rank: M5 (Low urgency)

The current management appears appropriate for maintaining the element occurrence.

Location: St. Charles River at 3R is located about 20 miles southwest of Pueblo, south of Highway 78 on the Three R Road.

Legal Description: U.S.G.S. 7.5' quadrangle: Beulah. T23S R67W Sections 18, 19; T23S R68W Sections 13, 14, 22-26.

Size: 810 acres (328 hectares)

Elevation: 6060 to 7100 feet (1847 to 2164 meters)

General Description: The St. Charles River begins in the Wet Mountains and flows northeast toward Pueblo and the Arkansas River. The site encompasses the riparian area in the lower montane zone. In the lower portion of the site, the river cuts a narrow canyon through some 100 feet of Dakota sandstone creating impressive towering cliffs. The stream is perennial and the bed is coarse alluvium with large boulders. The plant community in this lower montane portion of the canyon is primarily narrowleaf cottonwood (*Populus angustifolia*) with alder (*Alnus incana*) and coyote willow (*Salix exigua*). In the narrower portions of the canyon, narrowleaf cottonwood is absent and alder and coyote willow dominate. Other tree and shrub species within the riparian zone in the canyon include Rocky Mountain juniper (*Juniperus scopulorum*), one-seeded juniper (*J. monosperma*), ponderosa pine (*Pinus ponderosa*), peach-leaf willow (*Salix amygdaloides*), Gambel's oak (*Quercus gambelii*), lead plant (*Amorpha fruticosa*), bluestem willow (*Salix irrorata*), and snowberry (*Symphoricarpos* sp.). The grass and forb understory is a mixture of native and pasture species. Native species include field horsetail (*Equisetum arvense*), scouring-rush (*Hippochaete* sp.), various rushes (*Juncus* spp.) and sedges (including *Carex lanuginosa* and *C. simulata*). Pasture species include orchardgrass (*Dactylis glomerata*), Kentucky bluegrass (*Poa pratensis*), redtop (*Agrostis gigantea*), timothy (*Phleum pratense*), clover (*Trifolium* spp.), and alfalfa (*Medicago sativa*).

The stream has overhanging vegetation in many reaches, and duckweed (*Lemna minor*) and speedwell (*Veronica* sp.) are common on gravel bars in the channel. Small fishes are present in ponded areas. Aquatic insects noted include mayfly and caddisfly larvae, water striders, and water boatmen. Songbirds including Cliff Swallow and Canyon Wrens are abundant in the canyon and raptors soar overhead. Large mammals using the canyon include mountain lion, black bear, and deer.

The canyon walls are vegetated primarily with one-seeded juniper, ponderosa pine, Gambel's oak, mountain mahogany (*Cercocarpus montanus*), and blue grama (*Bouteloua gracilis*). The benches above the canyon walls are irrigated pasture used for haying and cattle grazing on the south bench and primarily non-irrigated grazing on the north bench.

The land use in the area is primarily agricultural and cattle grazing. The ranch owners on the south bench practice "holistic resource management" where the entire herd is kept as a unit and pastures are grazed intensively but for a very short period. For example, the riparian area and canyon bottom are grazed once or twice a year for a few days each (B. Brown, pers. comm., landowner).

There is little evidence of human-caused alteration of the hydrological processes upstream of the occurrence and within the watershed. The stream undergoes flooding as is evidenced by debris in the riparian vegetation and a wide range of age classes for narrowleaf cottonwood. Most of the upstream watershed is forested and is managed by the U.S. Forest Service. Lake Isabel occurs near the headwaters at an elevation of 8474 feet. An irrigation ditch conveying water to the 3R Ranch diverts a portion of the flow at the 3R Road.

Upstream from the PCA, breeding Mexican spotted owl (*Strix occidentalis lucida*) occur on U.S. Forest Service property in forests of Engelmann spruce (*Picea engelmannii*), white fir (*Abies concolor*), Douglas fir (*Pseudotsuga menziesii*), and quaking aspen (*Populus tremuloides*) (Johnson 1977). Mexican spotted owls are classified as a federally threatened species and are generally found in steep canyons with old growth conifers.

Biodiversity Comments: This site contains a good (B-ranked) example of a globally vulnerable (G3 S3) lower montane riparian woodland, narrowleaf cottonwood/thinleaf alder (*Populus angustifolia*/*Alnus incana*). The plant association is known from Colorado and New Mexico, and is expected to occur throughout the range of narrowleaf cottonwood in the Southern Rocky Mountains ecoregion. There are about 40 documented occurrences in Colorado.

Natural Heritage element occurrences at the St. Charles River at 3R 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>Alnus incana</i>	Montane riparian forest	G3	S3				B	2000-09-08

*EO = Element Occurrence

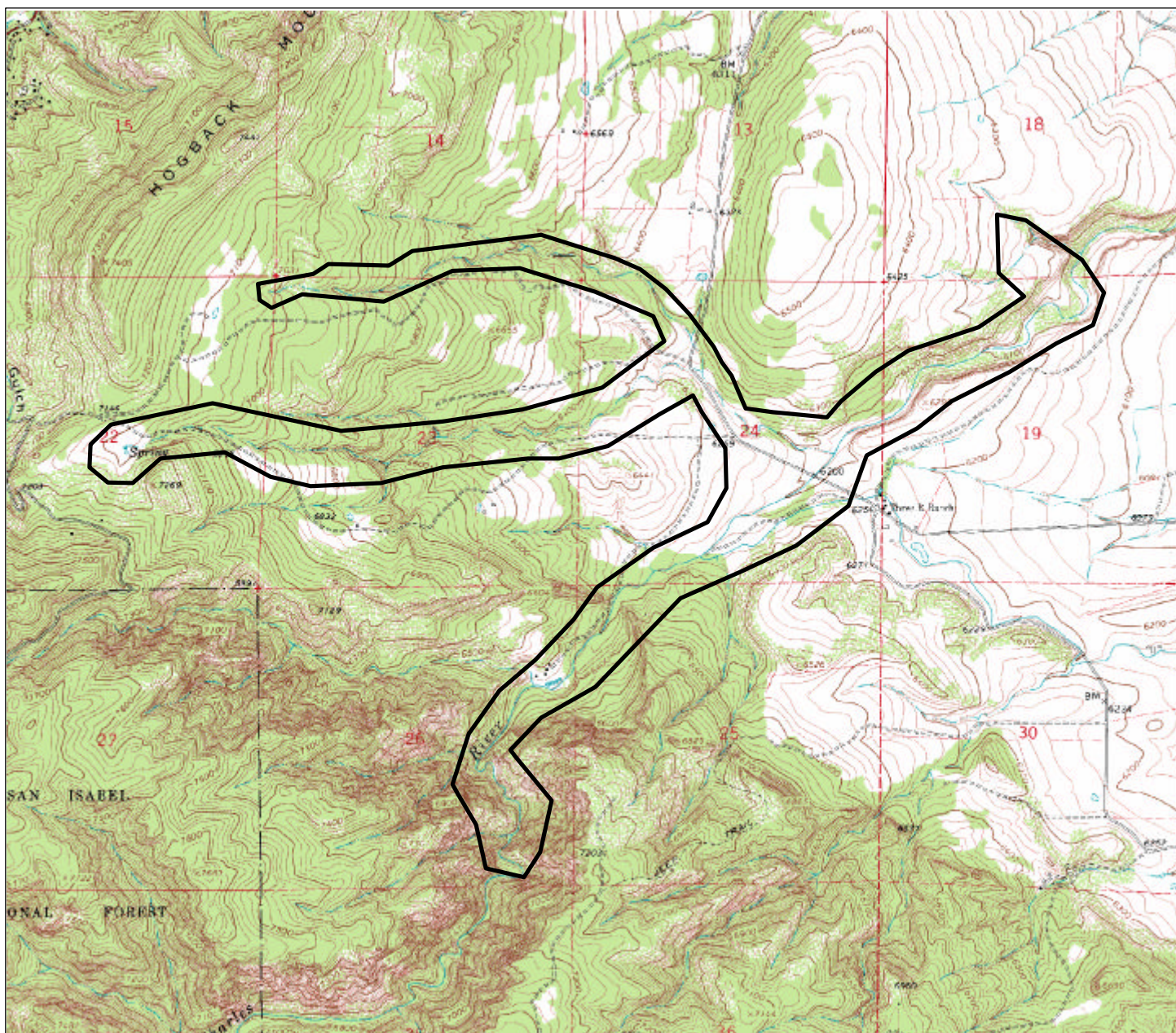
Boundary Justification: The boundary encompasses the riparian community and adjacent benches in the lower end and a portion of the upstream watershed to account for continued surface flow and periodic flooding. These processes are necessary for the viability of the occurrence and maintenance of ecological functions. A much larger area that includes the full upstream watershed of St. Charles River needs to be considered when developing a plan for the long-term viability of this site.

Protection Comments: The land is privately owned and most of it is part of one large cattle ranch. Public lands (BLM and USFS) occur upstream from the PCA and continue to the continental divide. The primary land use in the lower portion of the stream is cattle grazing with haying and rotational grazing on the bench tops. There are homes scattered along the Three R Road. This area could attract increased residential development.

Management Comments: The current management appears appropriate for maintaining the element occurrence. The riparian area is grazed by cattle only once or twice a year for a few days each. Portions of the creek not included in the element occurrence experience year-round grazing and support lower plant species diversity. Although the PCA does not include the entire watershed, maintenance of the element occurrence depends on appropriate management in the upper watershed to maintain the natural flooding regime.



Photograph taken at the St. Charles River at 3R PCA



0.5 0 0.5 1 Miles

Coordinate System: UTM, Zone13, NAD27

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map created 14 April 2003

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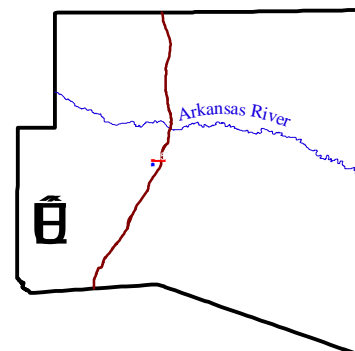
LEGEND

PCA Boundary

Beulah, 38104-A8
 7.5 Minute Series

Digital Raster Graphics produced by the U.S.
 Geological Survey, 1996

Location in Study Area



Rock Creek Hill *Potential Conservation Area*

Biodiversity Rank: B3 (High significance)

This PCA supports an unranked occurrence of a globally imperiled (G2 S2) plant species.

Protection Urgency Rank: P4 (Low urgency)

This PCA is located on private lands. A portion of the area is managed as an educational outreach center for local citizens.

Management Urgency Rank: M4 (Low urgency)

Current management appears to be adequate. Additional inventory work is warranted in a non-drought year.

Location: Southwestern Pueblo County. Both sides of Highway 78, about 10 miles west of Pueblo Blvd.

Legal Description: U.S.G.S. 7.5' quadrangle: Beulah NE. T22S R66W Sections 7, 18.

Size: 203 acres (82 hectares)

Elevation: 5400 to 5626 feet (1645 to 1715 meters)

General Description: This small PCA includes the west-facing slopes of the Rock Creek drainage, on both sides of Highway 78. The PCA is characterized by light-colored outcrops of shale and sandstone, and open pinyon-juniper woodlands (*Pinus edulis* and *Juniperus monosperma*). Some other common plant species noted include mountain mahogany (*Cercocarpus montanus*), skunkbush (*Rhus trilobata*), Indian ricegrass (*Oryzopsis hymenoides*), blue grama (*Bouteloua gracilis*), sand dropseed (*Sporobolus cryptandrus*), yucca (*Yucca glauca*), prickly pear cactus (*Opuntia* spp.) and beardtongue (*Penstemon* sp.). The portion of the site that is north of Highway 78 is managed as an environmental outreach center for local citizens.

Biodiversity Comments: This PCA includes an unranked occurrence of the Rocky Mountain bladderpod (*Lesquerella calcicola*). This plant occurs in shale outcrops and chalky or sandy soils. It is known from less than 20 locations worldwide, and is found only in El Paso, Fremont, Huerfano, Las Animas, Conejos, and Pueblo counties in Colorado, and in northeastern New Mexico. Little is known about this species.

Natural Heritage element occurrences at the Rock Creek Hill PCA.

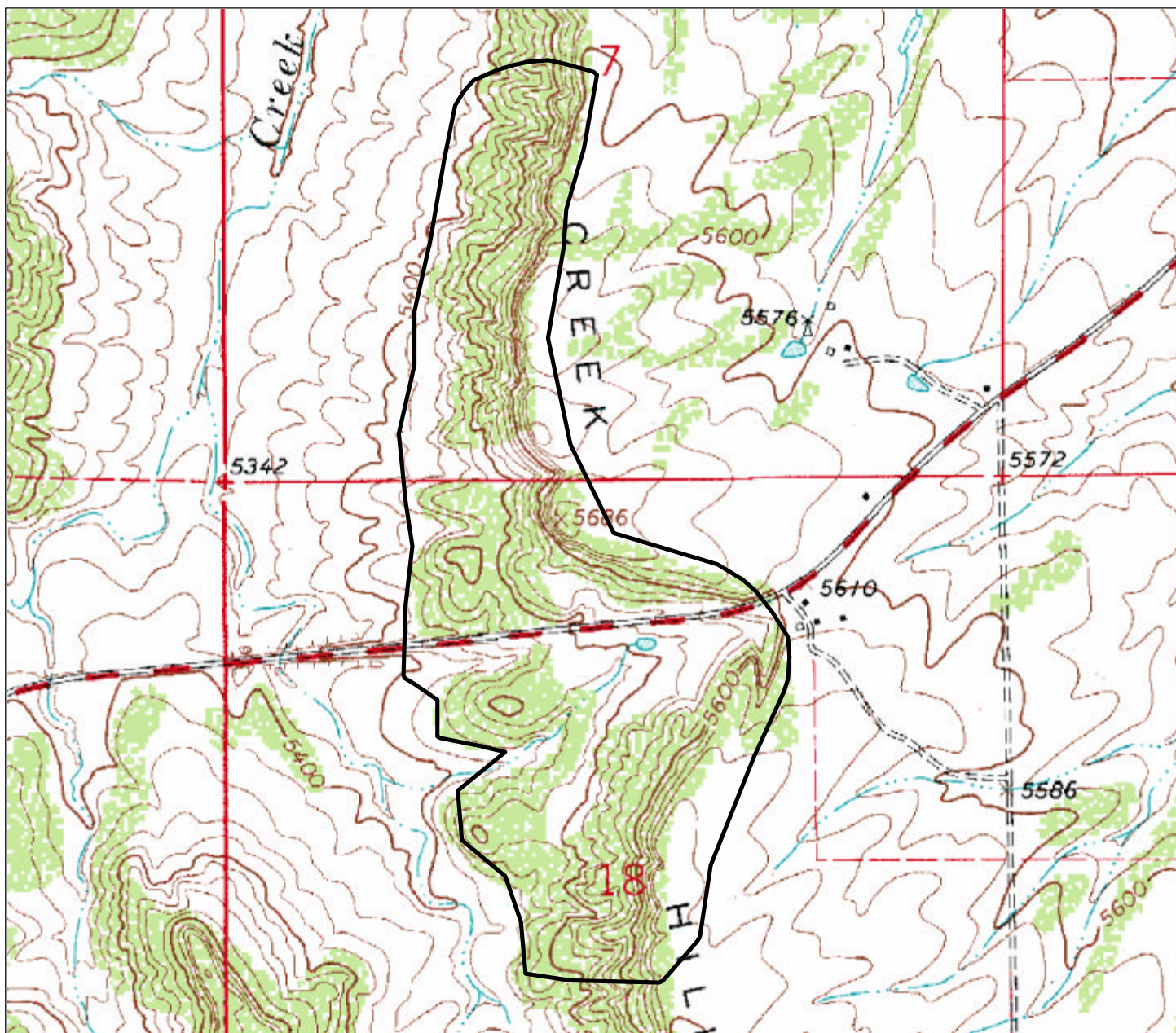
Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plants								
<i>Lesquerella calcicola</i>	Rocky Mountain bladderpod	G2	S2				E	2002-06-03

*EO = Element Occurrence

Boundary Justification: The boundary encompasses the element occurrence and the mosaic of community types found in the immediate vicinity of the occurrence. The boundary includes some unsurveyed, potentially suitable habitat for the globally rare plant species.

Protection Comments: This PCA is located on private lands. The portion of the site that is north of Highway 78 is managed as an environmental outreach center. Plans for the area south of the highway are unknown. Additional inventory work may identify plants that would benefit from protection within the highway right of way.

Management Comments: Further inventory for Rocky Mountain bladderpod as well as other shale barren endemic plants is warranted, especially during a non-drought year. The habitat appeared to have potential for several rare plant species such as round-leaf four-o'clock (*Oxybaphus rotundifolius*) and Colorado gumweed (*Grindelia inornata*). Russian thistle (*Salsola australis*) and field bindweed (*Convolvulus arvensis*) are two invasive weeds that were noted along Rock Creek. These and other weeds could become problematic, although the shale outcrops do not tend to support large weed populations.



0.25 0 0.25 Miles

Coordinate System: UTM, Zone13, NAD27

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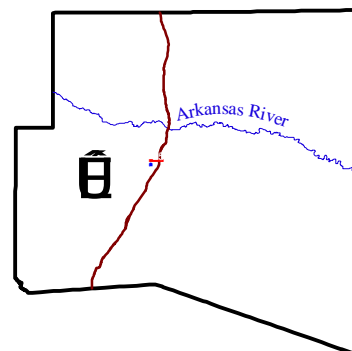
LEGEND

PCA Boundary

Beulah NE, 38104-B7
7.5 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



B3: Rock Hill Creek

B4 Potential Conservation Areas

Sixmile Creek Potential Conservation Area

Biodiversity Rank: B4 (Moderate significance)

This PCA contains an extant (E-ranked) population of Arkansas darter (*Etheostoma cragini*), a globally vulnerable (G3) state imperiled (S2) fish species.

Protection Urgency Rank: P1 (Very high urgency)

A sand and gravel mining operation has recently been proposed within a mile of Sixmile Creek. The mining operation could potentially alter the hydrologic regime supporting the fish population and contribute additional sediment load to the creek. The land within the PCA is privately owned and within the belt of irrigated agricultural land along the Arkansas River.

Management Urgency Rank: M3 (Moderate urgency)

Current management appears to be adequate to maintain the element occurrence; however, the population is not well understood and perhaps management actions could benefit the population.

Location: Sixmile Creek PCA is south of the Arkansas River between the towns of Vineland and Avondale.

Legal Description: U.S.G.S. 7.5' quadrangle: Vineland. T21S R63W Sections 1, 11-14, 22-27, 34, 35

Size: 1671 acres (675 hectares).

Elevation: 4520 to 4700 feet (1380 to 1430 meters).

General Description: Sixmile Creek is a tributary to the Arkansas River located between the towns of Vineland and Avondale. The creek has been documented by the Colorado Division of Wildlife to support Arkansas darter (*Etheostoma cragini*) (G3 S2), a globally imperiled small plains fish (Colorado Division of Wildlife 2001b). The Arkansas darter is a small eastern plains fish native to streams in the Arkansas River basin. This species inhabits small, shallow, clear streams that are often spring-fed and have sandy substrates, slow current, cooler water, and aquatic vegetation (Nesler et al. 1999).

The Arkansas darter has been documented in about a six-mile reach of the creek from the confluence with the Arkansas River upstream to approximately where Bessemer Ditch crosses the creek. Bessemer Ditch is an irrigation canal that transports Arkansas River water from the base of Pueblo Reservoir to the Huerfano River and supplying farmers along the south bank of the Arkansas River.

The source of the water in the creek is not well understood. Springs may discharge to Sixmile Creek creating the wetland habitat and ponds, or the water may be leakage from Bessemer Ditch. In addition, the status of the Arkansas darter population is also not well understood with few individuals located on multiple sampling events.

Vegetation within a marsh just below the Bessemer Ditch crossing includes threesquare bulrush (*Scirpus pungens*), cattail (*Typha* sp.), Baltic rush (*Juncus balticus*), and mixed grasses. Non-native plants within the marsh include Canada thistle (*Breea arvensis*) and Russian olive (*Elaeagnus angustifolia*).

Biodiversity Comments: This site contains an extant (E-ranked) population of a globally vulnerable (G3 S2) fish, the Arkansas darter (*Etheostoma cragini*).

Natural Heritage element occurrences at the Sixmile Creek PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Fish								
<i>Etheostoma cragini</i>	Arkansas darter	G3	S2	C	T	FS	E	1994-06-02

*EO = Element Occurrence

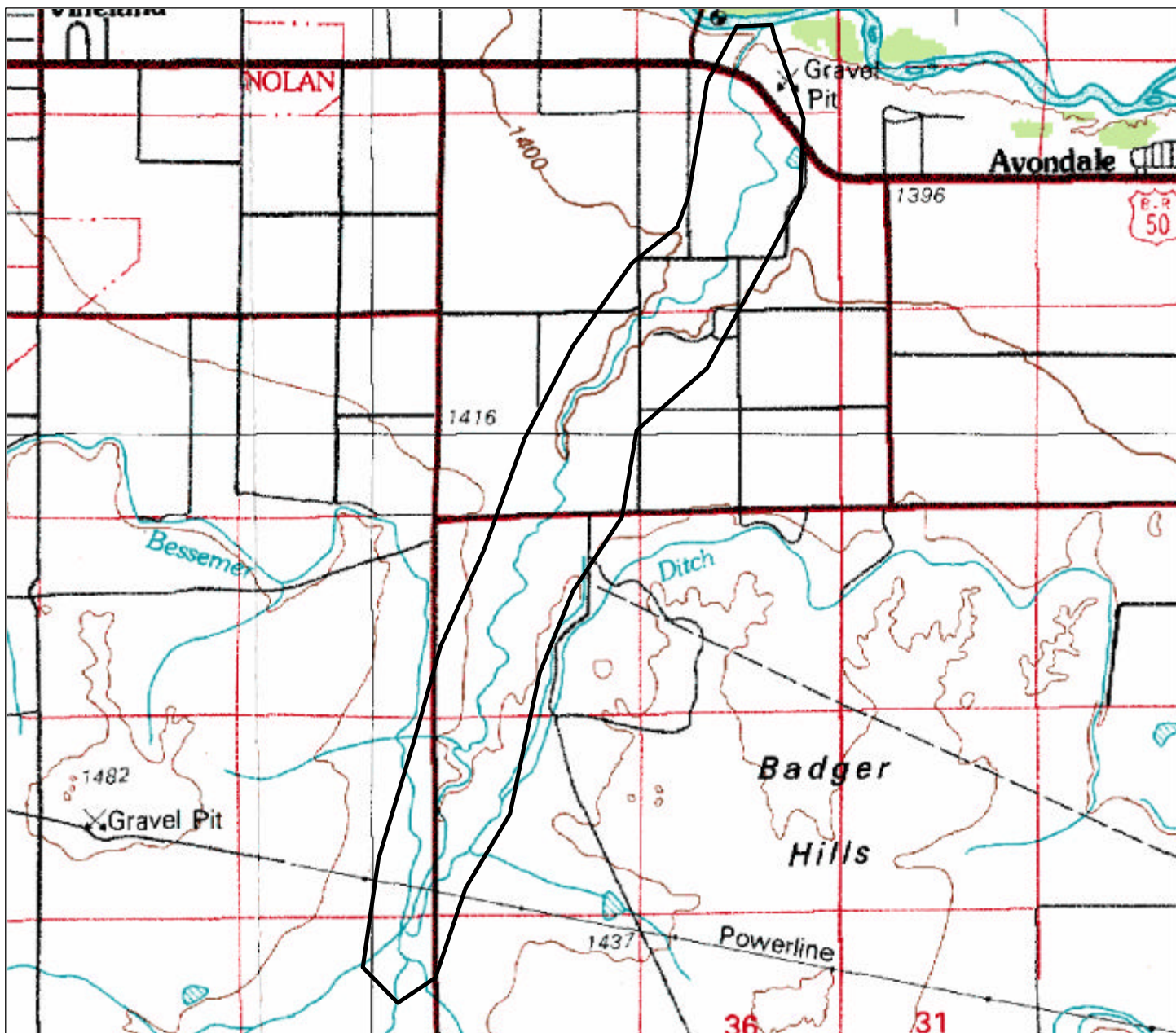
Boundary Justification: The boundary encompasses the reach of Sixmile Creek considered occupied Arkansas darter habitat by the Colorado Division of Wildlife (Colorado Division of Wildlife 2001b). The PCA could be expanded to include a greater proportion of the watershed to ensure maintenance of the ecological and hydrological processes necessary to support the Arkansas darter population.

Protection Comments: A sand and gravel mining operation has recently been proposed within a mile of Sixmile Creek. The mining operation could potentially alter the hydrologic regime supporting the fish population and contribute additional sediment load to the creek. The land within the PCA is privately owned and used for irrigated agriculture.

Management Comments: The fish population and source of the water supplying Sixmile Creek are not well understood. Additional information on this fish population is needed to devise management options. Operation of the proposed sand and gravel mine would suggest additional management needs.





Photograph taken at the Sixmile Creek PCA



0.5 0 0.5 Miles

▲ Coordinate System: UTM, Zone13, NAD27

<p>Colorado Natural Heritage Program</p> <p>Colorado State University 8002 Campus Delivery Fort Collins, CO 80523-8002</p> <p>map created 14 April 2003</p>	<p>LEGEND</p> <p> PCA Boundary</p> <p>Pueblo, 38104-A1 30 x 60 Minute Series</p> <p>Digital Raster Graphics produced by the U.S. Geological Survey, 1996</p>	<p>Location in Study Area</p> 
<p>Disclaimer</p> <p><i>The data contained herein are provided on an as-is, as-available basis without warranties of any kind, expressed or implied, including (but not limited to) warranties of merchantability, fitness for a particular purpose, and non-infringement. CNHP, Colorado State University and the State of Colorado further expressly disclaim any warranty that the data are error-free or current as of the date supplied.</i></p>		

Fountain Creek Springs at Pinon Potential Conservation Area

Biodiversity Rank: B4 (Moderate significance)

This PCA contains a fair (C-ranked) example of a globally vulnerable (G3 S2S3) Great Plains bulrush marsh community (*Scirpus tabernaemontani* – *Scirpus acutus*).

Protection Urgency Rank: P2 (High urgency)

The wetlands are privately owned and the landowner is currently considering different management options.

Management Urgency Rank: M3 (Moderate urgency)

The marsh is relatively self-sustaining. Modifications of the wetlands and introduction of non-native plant and fish species should be discouraged.

Location: Fountain Creek Springs at Pinon PCA is located on the west bank of Fountain Creek near the Pinon Rest Stop on Interstate 25.

Legal Description: U.S.G.S. 7.5' quadrangle: Pinon. T18S R64W Sections 7, 18; T18S R65W Sections 12, 13.

Size: 207 acres (84 hectares)

Elevation: 5100 to 5120 feet (1550 to 1560 meters)

General Description: A spring-fed marsh on the west bank of Fountain Creek supports about 25 acres of Nebraska sedge (*Carex nebrascensis*) (G4 S3) and 5 acres of bulrush (*Scirpus tabernaemontani* – *Scirpus acutus*) (G3 S2S3). The bulrush occurs in the wettest area and surrounds small open water ponds. The ponds support small fishes and frogs. Birds observed within the wetland include Mallard, American Avocet, Green Heron, and Red-winged Blackbird. The marsh has been drained in the past to provide pasture for grazing; however, the native community returns despite the attempts at alteration.

The bulrush portion of the wetland also supports cattail (*Typha angustifolia*), spikerush (*Eleocharis* sp.), duckweed (*Lemna minor*), speedwell (*Veronica* sp.), water parsnip (*Berula erecta*). Watercress (*Nasturtium officinale*), generally considered a Eurasian species, also grows in the ponds. The sedge meadow portion of the wetland also supports threesquare bulrush (*Scirpus pungens*), Baltic rush (*Juncus balticus*), spikerush (*Eleocharis* sp.), saltgrass (*Distichlis spicata*), western wheatgrass (*Pascopyrum smithii*), and foxtail barley (*Hordeum jubatum*). The sedge meadow has been seeded in the past to increase the forage value, and clover (*Trifolium pratense*) makes up about 5 percent cover in the drier portions of the meadow.

Fountain Creek supports a broken band of plains cottonwood with coyote willow (*Populus deltoides* –(*Salix amygdaloides*)/*Salix exigua*) heavily invaded by tamarisk and Russian olive, two non-native species. Flooding within the creek has changed the riparian vegetation lately, removing some of the cottonwood forest and widening and downcutting the banks. Irrigated agriculture occurs along the creek within about a mile band. Privately operated and maintained ditches divert the creek to the irrigated fields.

Biodiversity Comments: This site contains a fair (C-ranked) occurrence of a globally vulnerable (G3 S2S3) bulrush wetland (*Scirpus tabernaemontani*-*Scirpus acutus*).

Natural Heritage element occurrences at the Fountain Creek Springs at Pinon PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plant Communities								
<i>Scirpus tabernaemontani</i> - <i>Scirpus acutus</i>	Great Plains marsh	G3	S2S3				C	2000-07-14
<i>Carex nebrascensis</i>	Wet meadow	G4	S3				C	2000-07-14

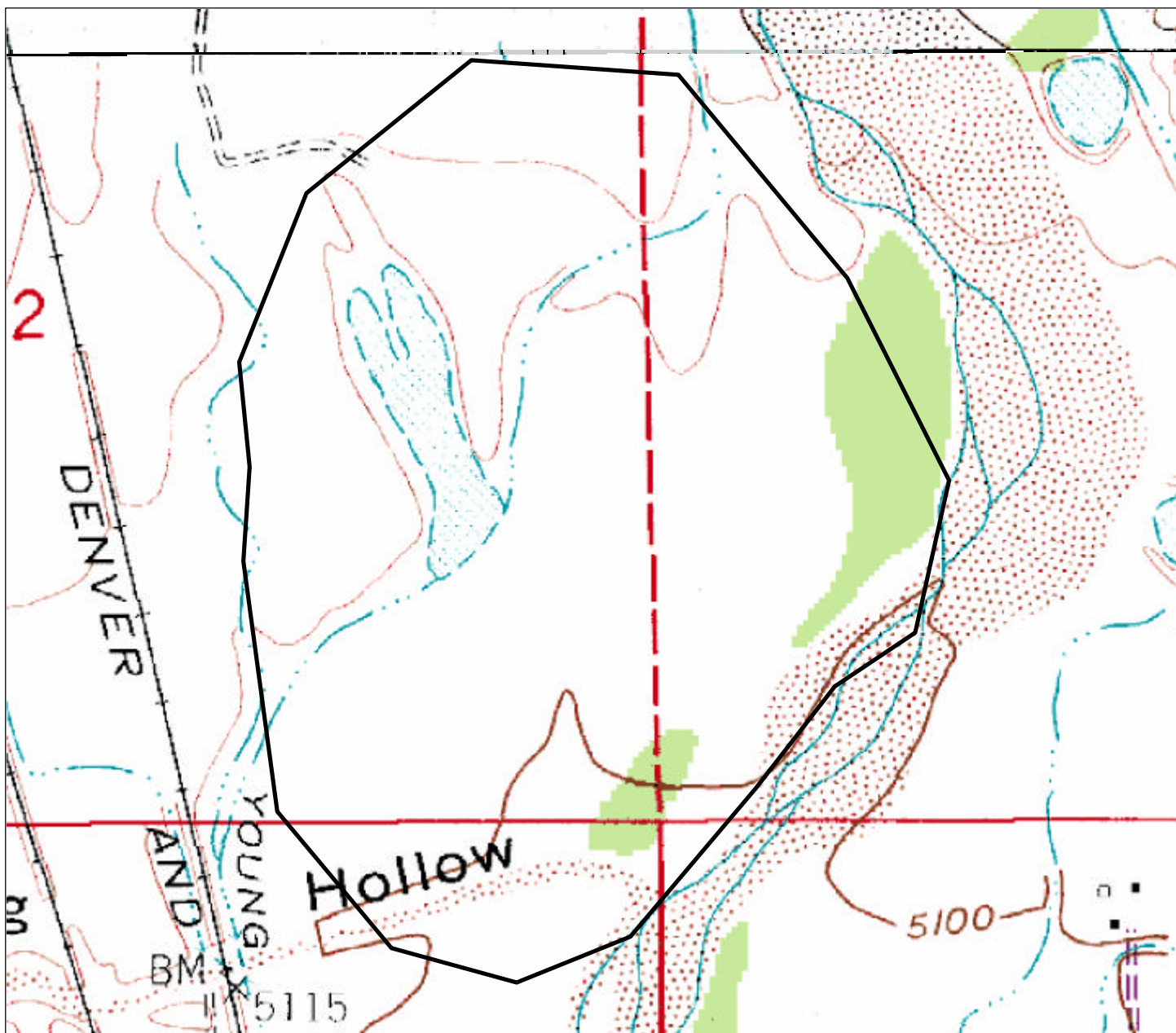
*EO = Element Occurrence

Note: Element occurrence responsible for the B-rank is shown in bold typeface.

Boundary Justification: The boundary encompasses the wetland and a small amount of the surrounding uplands on the west bank of Fountain Creek. The groundwater recharge area for the creek probably includes the Fountain Creek floodplain and may include Youngs Hollow to the west. The recharge area for the springs is not included within the PCA.

Protection Comments: The land is privately owned by one primary owner.

Management Comments: The landowner runs a small farm/ranch and needs to devise a way to earn income from the wetland. Options under consideration include harvesting wetland plant seed and enhancing the wetland for duck hunting. Funding associated with conservation may be an option considered by the landowner.



0.2 0 0.2 Miles

Coordinate System: UTM, Zone13, NAD27

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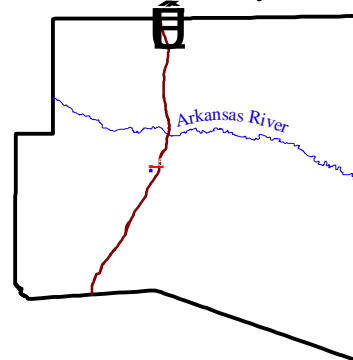
LEGEND

PCA Boundary

Pinon, 38104-D5
7.5 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



Boone Creek Potential Conservation Area

Biodiversity Rank: B4 (Moderate significance)

This PCA contains a fair (C-ranked) occurrence of a globally vulnerable (G3? S2) greasewood flats community (*Sarcobatus vermiculatus*–*Sporobolus airoides*).

Protection Urgency Rank: P3 (Moderate urgency)

The PCA is located on Department of Defense property. The Department of Defense is considering options for turning their property over to another entity.

Management Urgency Rank: M3 (Moderate urgency)

Decommissioning activities on Pueblo Chemical Depot should consider maintaining existing intact portions of the greasewood occurrence in their current condition.

Location: Boone Creek PCA is located in north central Pueblo County within the Department of Defense's Pueblo Chemical Depot.

Legal Description: U.S.G.S. 7.5' quadrangle: North Avondale. T20S R62W Sections 2, 3, 10, 11, 14, 15, 22-27.

Size: 3706 acres (1500 hectares)

Elevation: 4600 to 4770 feet (1400 to 1455 meters)

General Description: The Boone Creek PCA contains over 1,550 acres (627 ha) of greasewood–alkali sacaton shrubland (*Sarcobatus vermiculatus*/*Sporobolus airoides*) occurring within a mosaic of shortgrass and sandsage prairie. The greasewood–alkali sacaton occurrence is a linear system occupying a wide shallow drainage associated with Boone Creek. Surface water is only present after heavy rains; an alkaline salt crust occurs on the soil surface where water ponds after floods. Other vegetation occurring within the shrubland include rabbitbrush (*Chrysothamnus nauseosus*), cholla (*Cylindropuntia imbricata*), blue grama (*Bouteloua gracilis*), and galleta grass (*Hilaria jamesii*). On average, there is about 25 percent bare ground.

Small mammal trapping in the greasewood shrublands at Boone Creek resulted in the following species: deer mouse (*Peromyscus maniculatus*), kangaroo rat (*Dipodomys ordii*), western harvest mouse (*Reithrodontomys megalotis*), northern grasshopper mouse (*Onychomys leucogaster*), hispid cotton rat (*Sigmodon hispidus*), and woodrat (*Neotoma* sp.) (Colorado Natural Heritage Program 2001). Four globally common species of tiger beetles present in the alkaline flats include *Cicindela circumpecta johnsonii*, *C. fulgida*, *C. nigrocoerulea*, and *C. punctulata* (P. Pineda, pers. comm., NPS).

Another significant ecological feature within the PCA is a bermed spring pond adjacent to Boone Creek. Vegetation around the pond includes cattail (*Typha* sp.) and bulrush (*Scirpus acutus*), surrounded by salt flats with saltgrass (*Distichlis spicata*), Baltic rush

(*Juncus balticus*), and foxtail barley (*Hordeum jubatum*). The spring and surrounding area has been invaded by non-native plant species including tamarisk (*Tamarix ramosissima*) and kochia (*Bassia sieversiana*). Wildlife using the spring includes native species (e.g., tiger salamander (*Ambystoma tigrinum*), painted turtle (*Chrysemys picta*), plains garter snake (*Thamnophis radix*), Red-winged Blackbird, Killdeer, damselflies and dragonflies) and non-native (e.g., bullfrogs (*Rana catesbeiana*)) (J. Gionfriddo, pers. comm. CNHP).

The land history of the depot property is complex. From at least the early 1900's to 1941, the depot property was a mixture of private and state owned parcels with ranching as the primary use. In 1941, the Department of Defense acquired the land and by 1942 had built a munition storage facility. In 1994, all but a small portion of the munitions was removed. Ammunition storage bunkers and a network of roads have been constructed through about half of the greasewood occurrence. The bunkers alter the composition and more weeds occur within this portion of the occurrence.

Grazing has been excluded from the bunker portion of the occurrence since 1942 and grazing was excluded from the remainder of the occurrence in 1998.

Biodiversity Comments: This site contains a fair example (C-ranked) of a globally vulnerable (G3? S2) greasewood – alkali sacaton community (*Sarcobatus vermiculatus*–*Sporobolus airoides*).

Natural Heritage element occurrences at the Boone Creek PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plant Communities								
<i>Sarcobatus vermiculatus</i> – <i>Sporobolus airoides</i>	Saline bottom shrubland	G3?	S2				C	2000-08-26

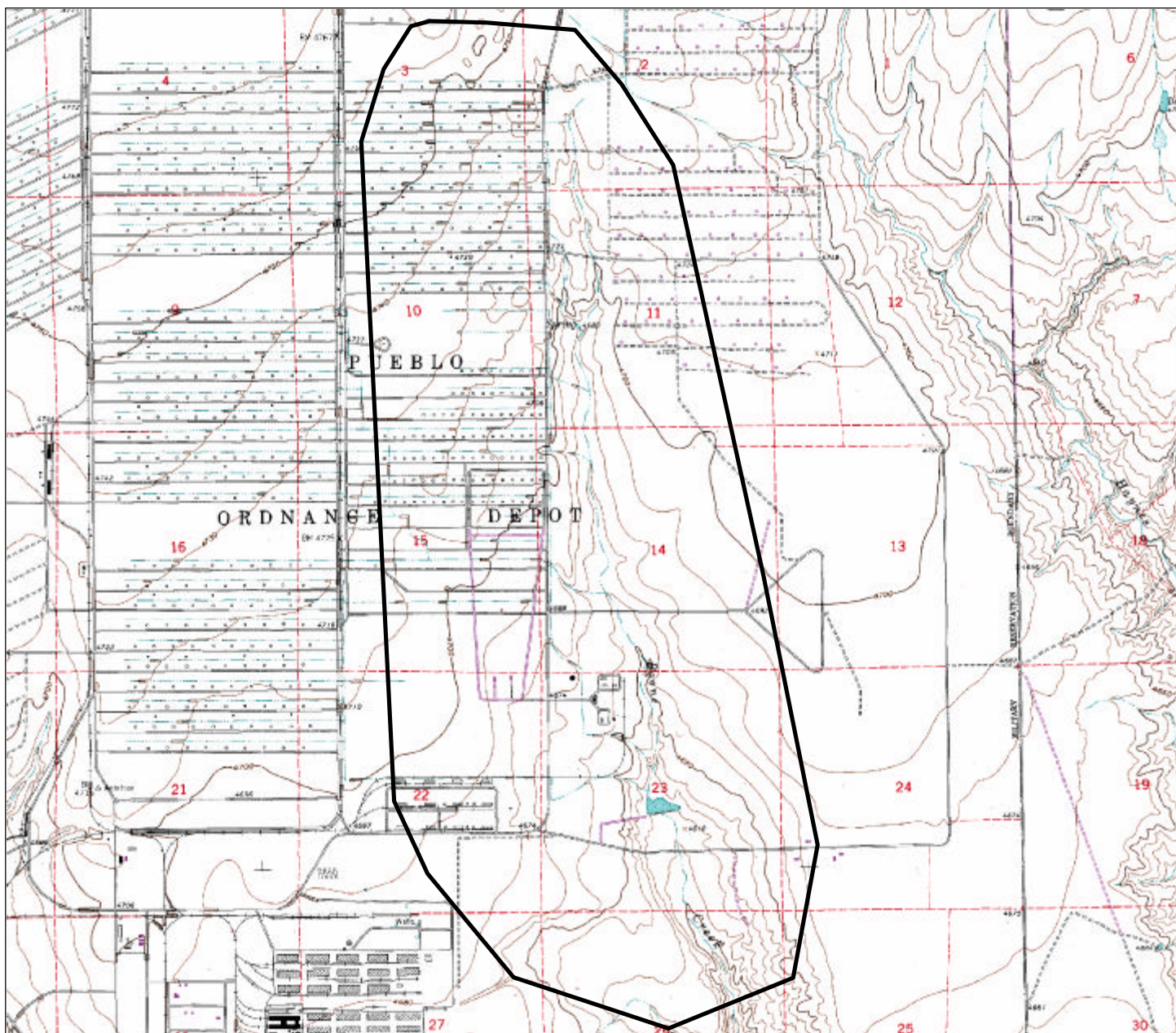
*EO = Element Occurrence

Boundary Justification: The boundary encompasses most of the greasewood occurrence and a portion of the surrounding shortgrass and sandsage prairie. The northern boundary of the PCA is the G-Block on PCD, where chemical munitions are stored.

Protection Comments: All but a very small portion of Pueblo Chemical Depot is being decommissioned. The Department of Defense is studying various options for transferring the property to a new owner, potentially a conservation agency or organization willing to manage for native ecosystem values.

Management Comments: Significant portions of the greasewood shrublands remain in relatively intact condition. The decommissioning activities of Pueblo Chemical Depot should take into consideration the maintenance of these portions in their intact condition. The potential for reestablishment of naturally-occurring large scale ecological processes such as fire and herbivory should be considered in management plans. A proposed plant

to destroy the chemical munitions is planned for the area east of G-block. Construction and maintenance of the plant may impact the Boone Creek PCA.



0.5 0 0.5 Miles

▲ Coordinate System: UTM, Zone13, NAD27

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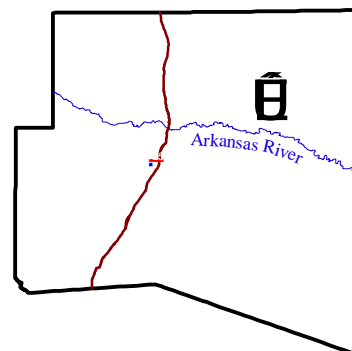
LEGEND

□ PCA Boundary

North Avondale, 38104-C3
 7.5 Minute Series

Digital Raster Graphics produced by the U.S.
 Geological Survey, 1996

Location in Study Area



B4: Boone Creek

Huerfano River at Cedarwood Potential Conservation Area

Biodiversity Rank: B4 (Moderate significance)

This PCA contains a good (B-ranked) example of a globally vulnerable (G3G4 S3) plains cottonwood riparian woodland (*Populus deltoides* – (*Salix amygdaloides*)/*Salix exigua*). This is the best Pueblo County occurrence of this riparian community observed during the 2000 field season.

Protection Urgency Rank: P3 (Moderate urgency)

No threat known for foreseeable future; however, no conservation strategy is in place and development is occurring on adjacent lands.

Management Urgency Rank: M3 (Moderate urgency)

Current management appears adequate for maintenance of the element occurrence. Issues include maintenance of the upstream hydrology (maintain natural flooding regime) and non-native invasive plant species within the river canyon, specifically tamarisk. The density of tamarisk is currently low within the element occurrence and may increase without management.

Location: Huerfano River at Cedarwood PCA is located about 20 miles south of Pueblo near the Huerfano County line.

Legal Description: U.S.G.S. 7.5' quadrangles: Cedarwood and Graneros Flats. T24S R65W Section 36; T25S R65W Sections 1-3; and unsurveyed Township Range.

Size: 1850 acres (749 hectares)

Elevation: 5100 to 5470 feet (1554 to 1667 meters)

General Description: The Huerfano River at Cedarwood PCA encompasses about six miles of the Huerfano River and the surrounding canyon walls near the Huerfano/Pueblo County line. In this reach, the Huerfano is an ephemeral plains stream winding through a canyon cut through about 600 feet of desert varnished Dakota Sandstone. The sandy/gravelly stream channel varies in width from about 15 to 30 feet and the canyon bottom up to 600 feet. Plains cottonwood and coyote willow (*Populus deltoides*-(*Salix amygdaloides*)/*Salix exigua*) (G3G4 S3) grow in scattered bands along the stream with a rather continuous band of threesquare bulrush (*Scirpus pungens*) immediately adjacent to the channel. The plains cottonwood rarely forms dense cover and a variety of age classes are represented. In some areas, there is a shrubby band of American licorice (*Glycyrrhiza lepidota*) on the banks. Tamarisk (*Tamarix ramosissima*) and Russian olive (*Elaeagnus angustifolia*), invasive non-native species, are present within the channel but only in small amounts and rarely form dense cover. Side canyons contain interesting spring-fed pools, some over five feet deep with thick aquatic plants and cattails (*Typha* sp.) on the banks.

In September, the streambed was dry in most sections, with some sections of moist sand and some with flowing water emerging and resubmerging further downstream. Flowing water sections and pools contained many small fishes, garter snakes (*Thamnophis radix*), and aquatic insects including mayfly nymphs, dragonfly nymphs, water striders, and toad bugs.

Some of the stream banks are heavily grazed and have thick cover of rabbitbrush (*Chrysothamnus nauseosus*). In other places, shrubs within the riparian zone include skunkbush (*Rhus trilobata*), golden currant (*Ribes aureum*), snowberry (*Symphoricarpos* sp.), wild grape (*Vitis riparia*), chokecherry (*Padus virginiana*), and mountain mahogany (*Cercocarpus montanus*).

Further downstream, the cover of Russian olive and tamarisk increase as well as other non-native plant species.

The canyon walls are vegetated with one-seeded juniper (*Juniperus monosperma*), pinyon pine (*Pinus edulis*), and mountain mahogany, with ponderosa pine (*Pinus ponderosa*) on the north-facing slope. The mesas atop the canyon walls are a mixture of shortgrass prairie and juniper woodlands.

The PCA is within the 150,000-acre Vigil and St. Vrain PCA, which encompasses several good occurrences of juniper woodlands and shortgrass prairie within a relatively intact landscape. The Huerfano at Cedarwood PCA contains a portion of the Hatchett Ranch, a large ranch that has recently been subdivided into 35-acre ranchettes.

Upstream from the PCA, near Interstate 25, the Huerfano River is used for irrigated agriculture and thick stands of Russian olive and tamarisk occur with the cottonwood. Downstream from the PCA, the cover of Russian olive and tamarisk increase. There are no major dams on the stream.

Biodiversity Comments: The site contains a good (B-ranked) example of globally vulnerable (G3G4 S3) plains cottonwood riparian woodland, plains cottonwood with peachleaf willow and coyote willow (*Populus deltoides*-(*Salix amygdaloides*)/*Salix exigua*). Good examples of this plant community are rarely encountered.

Natural Heritage element occurrences at the Huerfano River at Cedarwood PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plant Communities								
<i>Populus deltoides</i> ssp. <i>monilifera</i> -(<i>Salix amygdaloides</i>)/ <i>Salix exigua</i>	Plains cottonwood riparian woodland	G3G4	S3				B	2000-09-10

*EO = Element Occurrence

Boundary Justification: The boundary encompasses the community occurrence and a portion of the river and riparian area upstream and downstream from the occurrence. The

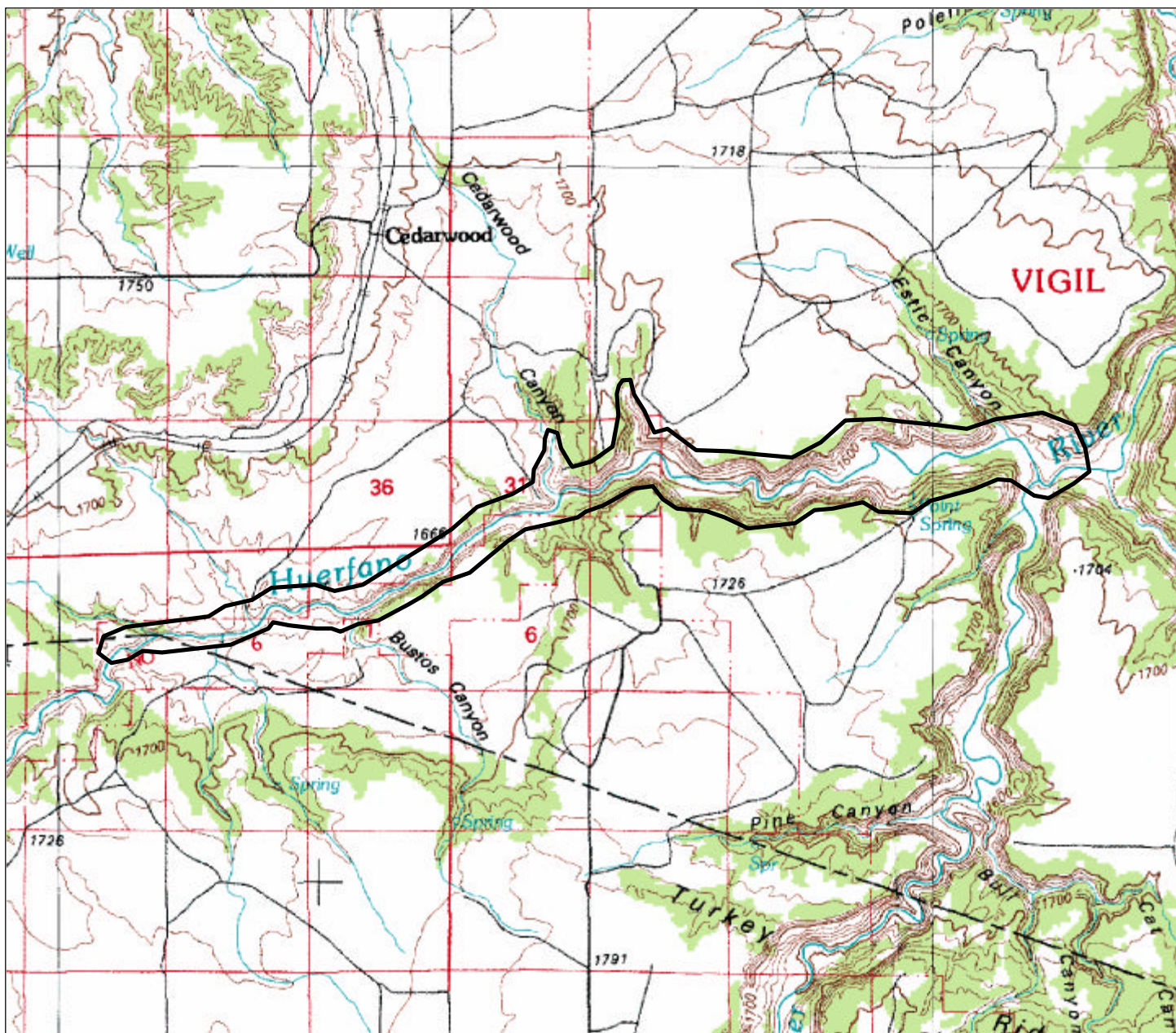
boundary could be extended farther downstream; however, the incidence of non-native invasive plants (e.g., tamarisk and Russian olive) increase downstream. The PCA could be expanded to include a greater proportion of the upstream watershed to ensure maintenance of the ecological and hydrological processes, including periodic flooding.

Protection Comments: The land within the PCA is privately owned and is primarily used as cattle ranches. Immediately to the west is part of the Hatchett Ranch and has been subdivided and sold as ranchettes. Given the proximity to the Hatchett Ranch, this area could attract increased subdivision and development.

Management Comments: The riparian area and canyon are grazed by cattle. Grazing management within the canyon could benefit the community element occurrence. Management of tamarisk and Russian olive would improve the riparian plant community from a natural heritage perspective.



Photograph taken at the Huerfano River at Cedarwood PCA



1 0 1 Miles

Coordinate System: UTM, Zone13, NAD27

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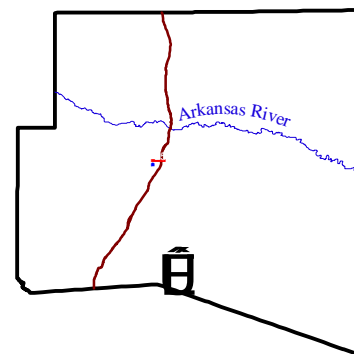
LEGEND

PCA Boundary

Walsenburg, 37104-E1
30 x 60 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



Midway Prairie Potential Conservation Area

Biodiversity Rank: B4 (Moderate significance)

This PCA contains a fair (C-ranked) occurrence of a globally vulnerable (G3G4 S3) grassland (*Bouteloua gracilis*-*Hilaria jamesii*).

Protection Urgency Rank: P3 (Moderate urgency)

Protection actions are needed to secure long-term conservation. Currently, most of the land within the PCA is owned by the State Land Board and managed with conservation in mind.

Management Urgency Rank: M4 (Moderate urgency)

Current management appears appropriate for maintaining the element occurrence.

Location: Approximately twelve miles north-northeast of Pueblo. This PCA is located on the western portion of the Chico Basin Ranch.

Legal Description: U.S.G.S. 7.5' quadrangles: Bar JH Ranch and Pinon. T18S R63W Section 18,19; T18S R64W Sections 13,14; T19S R63W Sections 5, 6.

Size: 7862 acres (3182 hectares)

Elevation: 5000 to 5250 feet (1520 to 1600 meters)

General Description: This flat to gently rolling site contains a large (5000+ acre) example of a shortgrass prairie community (*Bouteloua gracilis*- *Hilaria jamesii*) that is in fair to good condition. The PCA contains the upper reaches of Dry Creek and the western tributaries to Chico Creek. This grassland is co-dominated by blue grama (*Bouteloua gracilis*) and galleta grass (*Hilaria jamesii*), with patches of alkali sacaton (*Sporobolus airoides*). Cholla (*Cylindropuntia imbricata*) is also common but scattered (<5% cover) across the area. Some rather barren highlands provide habitat for James' seaheath (*Frankenia jamesii*) and shadscale saltbush (*Atriplex confertifolia*). In these areas, grass cover is very low.

The Midway Prairie PCA occurs primarily on deep to shallow, well-drained silt clays, silty clay loams, clay loams, and clays that formed in materials weathered from shale (Limon-Razor-Midway association).

The site has been grazed by cattle for over 100 years. Grazing intensity is variable across the site.

Biodiversity Comments: This PCA contains a fair (C-ranked) occurrence of a globally vulnerable (G3G4 S3) grassland (*Bouteloua gracilis*-*Hilaria jamesii*).

Natural Heritage element occurrences at the Midway Prairie PCA.

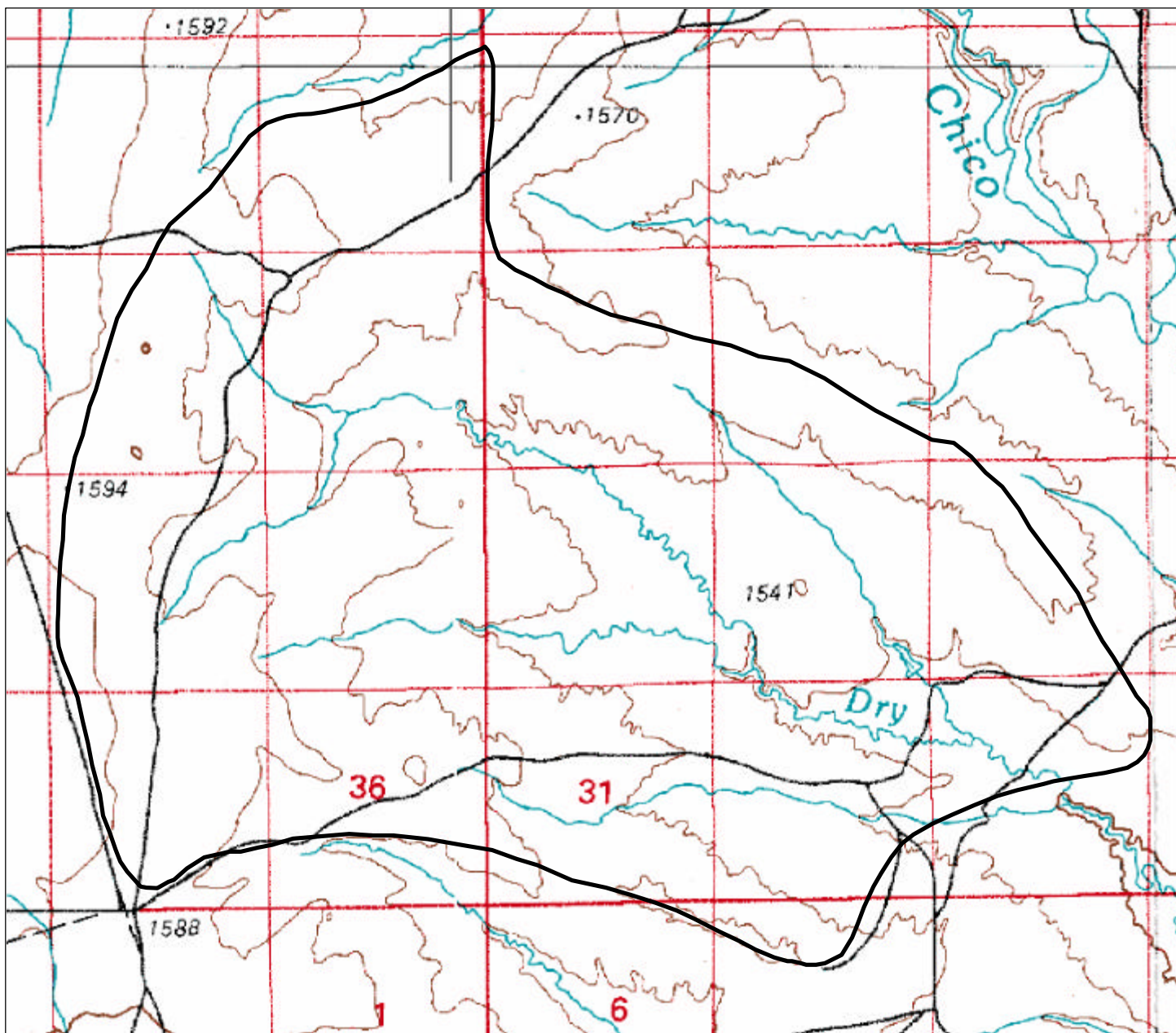
Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plant Communities								
<i>Bouteloua gracilis-Hilaria jamesii</i>	Shortgrass prairie	G3G4	S3				B	2000-09-10

*EO = Element Occurrence

Boundary Justification: The boundary roughly includes a small watershed incorporating the best condition area on the prairie. This boundary would provide an area large enough to buffer the occurrence from direct impacts from tilling, mining, etc. Ecological processes necessary for long-term protection of this site are not incorporated within the site boundaries.

Protection Comments: This PCA is located primarily on state lands that are managed by the Colorado State Land Board. The Chico Basin Ranch signed a 25-year lease with the State Land Board in 1999. A longer-term protection issue is the possibility of the State Land Board selling the property to maximize their return on the land. Increases in land value resulting from growth of Colorado Springs and Pueblo may cause this to be a real concern in the future.

Management Comments: Landscape level processes are important for the protection of the grassland community but are not included in the site boundaries. These processes include fire, herbivory, and possibly others. Monitoring the condition of the grassland community over time would improve our understanding of the management needs at this PCA.



0.5 0 0.5 Miles

Coordinate System: UTM, Zone13, NAD27

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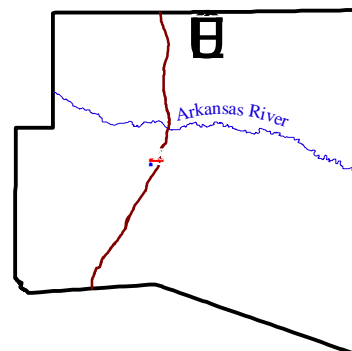
LEGEND

 PCA Boundary

Pueblo, 38104-A1
 30 x 60 Minute Series

Digital Raster Graphics produced by the U.S.
 Geological Survey, 1996

Location in Study Area



Highland Road Potential Conservation Area

Biodiversity Rank: B4 (Moderate significance)

This PCA is drawn for a good (B-ranked) occurrence of the globally secure, state vulnerable (G4 S3B) Ferruginous Hawk (*Buteo regalis*). The PCA contains a large and intact shortgrass prairie landscape that supports a large and healthy prairie dog (*Cynomys ludovicianus*) complex, an important prey species for the nesting hawk. The PCA also contains an excellent (A-ranked) occurrence of a state imperiled (G5 S2B) bird species, the Long-billed Curlew (*Numenius americanus*).

Protection Urgency Rank: P4 (Low urgency)

This PCA is located on private lands as well as lands managed by the Colorado State Land Board. There is no threat known for this site, nor is one anticipated in the foreseeable future.

Management Urgency Rank: M3 (Moderate urgency)

There is a definable threat, but it is not expected to impact this PCA in the next five years. Actions of the current landowner must continue or the prairie dog complex could be lost or irretrievably degraded, which could lead to the loss of the hawk and owl populations at the PCA.

Location: The Highland Road PCA is located in northeastern Pueblo County about 13 miles north of the town of Boone.

Legal Description: U.S.G.S. 7.5' quadrangle: Highlands Church. T18S R60W Sections. 19, 30; T18S R61W Sections 13-17; T19S R60W Section 6; T19S R61W Sections 1, 3, 4.

Size: 12,283 acres (4970 hectares)

Elevation: 5080 to 5340 feet (1548 to 1628 meters)

General Description: The Highland Road PCA is a shortgrass prairie site located in northeastern Pueblo County. The site is characterized by rolling hills and gentle slopes that drain into numerous, mostly ephemeral streams and swales. The area has historically been privately owned rangeland utilized for livestock grazing. Numerous stock ponds have been excavated along many of the streams, and several playas exist within the site. The vegetation is dominated by alkaline meadows and shortgrass prairie on the higher divides between the drainages. Soils are generally fine-textured and alkaline to some extent.

The site contains a large black-tailed prairie dog (*Cynomys ludovicianus*) complex, and nesting Long-billed Curlews (*Numenius americanus*) use the site. There is also a Ferruginous Hawk (*Buteo regalis*) nesting within the site that probably utilizes the

resident prairie dog population as an important food resource. A nesting population of Burrowing Owls (*Athene cunicularia*) also occupies the site.

In the northern part of the site between the many low rolling hills of shortgrass prairie, are small flat-bottomed depressions. Rainfall and runoff collect in these basins forming ephemeral wetlands. It is not clear whether these depressions are wind-deflated playas (Bolen et al. 1989) or remnants of buffalo wallows (Uno 1989), both of which develop clay bottoms and collect runoff after heavy rainstorms. We have chosen to refer to these depressions as playas, fully acknowledging that their origin is not well understood. There are 12 playas within this part of the site. The playas are generally circular to oval-shaped, oriented roughly north south, and range in size from about 0.5 to 10 acres (0.2 to 5 ha). These basins remain dry throughout most of the year and collect water only after heavy rains. The vegetation in the playas is shorter than the surrounding blue grama (*Bouteloua gracilis*) shortgrass prairie and consists of different species. The dominant species in the playas is the perennial warm-season grass buffalograss (*Buchloe dactyloides*). Some other plants that can occur with buffalograss in the playas include a dryland sedge (*Carex eleocharis* ssp. *stenophylla*), prostrate vervain (*Verbena bracteata*), frog-fruit (*Phyla cuneifolia*), spreading yellow cress (*Rorripa sinuata*), greenthread (*Thelesperma megapotamicum*, *T. filifolium*), curly cup gumweed (*Grindelia squarossa*), and Russian thistle (*Salsola australis*).

The grazing activity of prairie dogs and the playas provide heterogeneity within the shortgrass prairie, which is important biologically to provide for the needs of a wide range of species (Knopf 1996a, Hoagland and Collins 1997). Other factors affecting grassland environmental and compositional heterogeneity include fire, soils, and grazing. Because fire and grazing are heavily managed, prairie dogs and playas may serve as the primary source of heterogeneity in the area. Mountain Plover (*Charadrius montanus*), a declining shortgrass prairie species that is proposed for listing as a threatened species by the United States Fish and Wildlife Service, are known to nest in the area. Mountain Plover are known to inhabit areas with low vegetation and a high percentage of bare ground such as prairie dog towns and heavily grazed shortgrass prairie (Knopf 1996b).

Historically, much of the site was covered with vegetation typical of the native shortgrass prairie. Although large patches of this vegetation remain, about 10% of the site was converted to agricultural croplands during the past 100 years. The cultivation of some of these areas was subsequently abandoned, producing "old-field" (weedy, early-successional) habitats. Other fields within the site remain under cultivation. Grazing of domestic livestock occurred historically and continues today.

Biodiversity Comments: This PCA is drawn for a good (B-ranked) occurrence of the globally secure (G4) Ferruginous Hawk (*Buteo regalis*). The site contains a large and intact shortgrass prairie landscape that supports a large and healthy prairie dog (*Cynomys ludovicianus*) complex, an important prey species for the nesting hawk. In addition, there is a pair of nesting Long-billed Curlews (*Numenius americanus*) at the site, a species that is imperiled (S2B) in Colorado. Of the eight known (non-historic) nesting locations of this bird in Colorado, this is the best quality occurrence.

Natural Heritage element occurrences at the Highland Road PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Birds								
<i>Buteo regalis</i>	Ferruginous Hawk	G4	S3B, S4N		SC	BLM, FS	B	2002-05-31
<i>Numenius americanus</i>	Long-billed Curlew	G5	S2B, SZN		SC	BLM, FS	A	2002-05-31
Mammals								
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4				B	2002-05-31

*EO = Element Occurrence

Note: Element occurrence responsible for the B-rank is shown in bold typeface.

Boundary Justification: The PCA boundary is drawn to include the entire extent of the prairie dog complex that is critical to the success of the Ferruginous Hawk nesting on the site, and for creating the short vegetation structure of the grassland that is suitable for habitation by nesting Mountain Plovers. The Ferruginous Hawk will range over a much greater distance while foraging, but to draw a PCA encompassing such a large area would prove impractical for planning purposes. Any activities causing decline of the prairie dogs would have deleterious effects on the nesting hawks, which depend upon diurnally active small mammals as a food resource. Much the same can be stated for the Burrowing Owl population inhabiting this site. The owls will forage over great areas, but often use prairie dog burrows for nesting burrows. Any projects that would eradicate prairie dogs from the landscape would have deleterious effects over time as burrow systems would eventually deteriorate and fill in, effectively reducing nesting sites available to the owls.

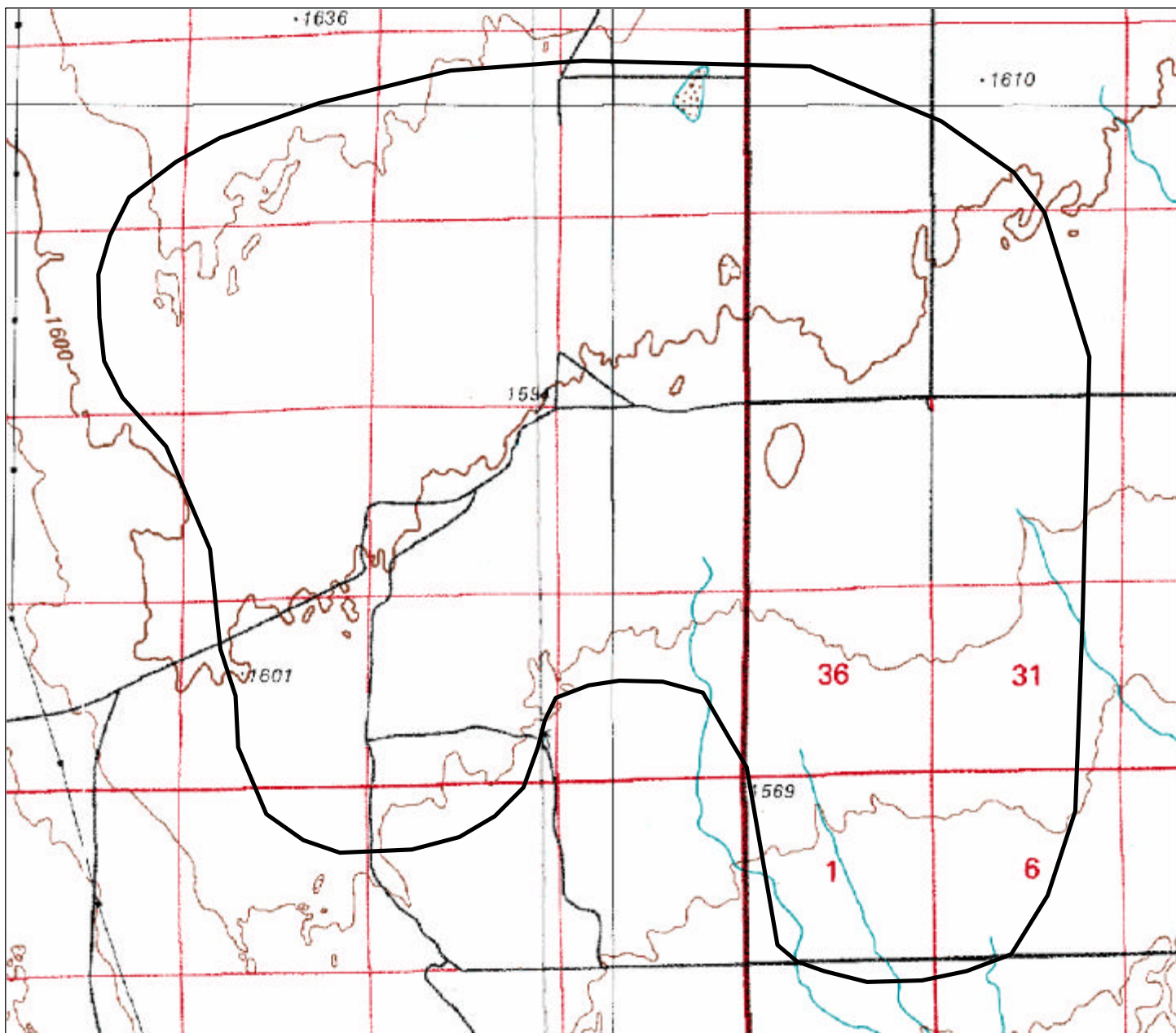
Protection Comments: There is no threat known for this site in the foreseeable future. The site is on private land. Any activities that would eradicate the prairie dogs from the landscape would have immediate and deleterious effects, but the current landowner is friendly towards the prairie dogs and it is not anticipated that the landowner will pursue such an action.

Management Comments: There is a definable threat, but it is not expected to impact this site in the next five years. Actions of the current landowner must continue or the prairie dog complex could be lost or irretrievably degraded, which could lead to the loss of the hawk and owl population at the site. 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. The 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). The extent of grazing at present is moderate and is not impacting the health of the animal populations, and is probably beneficial to Mountain Plover.

Monitoring of the prairie dog population could elucidate the dynamics of the plague and prairie dog association in the area, and assist in defining its importance to Mountain Plover and Long-billed Curlews.



Nesting Ferruginous Hawk (*Buteo regalis*) at the Highland Road PCA.



1 0 1 Miles

▲ Coordinate System: UTM, Zone13, NAD27

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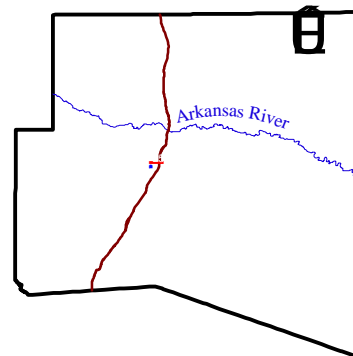
LEGEND

□ PCA Boundary

Pueblo, 38104-A1
30 x 60 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



North Peak Potential Conservation Area

Biodiversity Rank: B4 (Moderate significance)

This PCA contains an unranked (E-ranked) occurrence of a plant species that is globally vulnerable (G3 S3), and an unranked occurrence of a plant species that is imperiled in Colorado (G4? S2).

Protection Urgency Rank: P4 (Low urgency)

This PCA is located on public lands managed by the San Isabel National Forest. The current level of protection provided the plants at this location is probably adequate.

Management Urgency Rank: M4 (Low urgency)

Management needs are unknown. Additional inventory work in this area would improve our understanding of management needs.

Location: Southwestern corner of Pueblo County, on North Peak.

Legal Description: U.S.G.S. 7.5' quadrangle: San Isabel. T25S R68W Sections 5-8.

Size: 571 acres (231 hectares)

Elevation: 11,000 to 12,237 feet (3350 to 3730 meters)

General Description: This PCA is located in the Wet Mountains on North Peak, at the headwaters of Greenhorn Creek, on San Isabel National Forest. Very little is known about this PCA. The rare plant locations were documented by a graduate student at the University of Wyoming. Specimens documenting the rare plant occurrences are deposited at the Rocky Mountain Herbarium in Laramie, Wyoming.

Natural Heritage element occurrences at the North Peak PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plants								
<i>Draba crassa</i>	Thick-leaf whitlow-grass	G3	S3				E	1998-07-01
<i>Stellaria irrigua</i>	Altai chickweed	G4?	S2				E	1999-07-08

*EO = Element Occurrence

Note: Element occurrence responsible for the B-rank is shown in bold typeface.

Boundary Justification: The boundary is drawn to consider the following: 1) protection of the occurrences from direct impacts such as trampling or other surface disturbances; 2) suitable habitat where additional individuals can become established over time; and 3) representation from each of the local alpine plant communities that may support a pollinator for the rare plant species. The boundary was delineated using the USGS San Isabel 7.5 minute quadrangle.

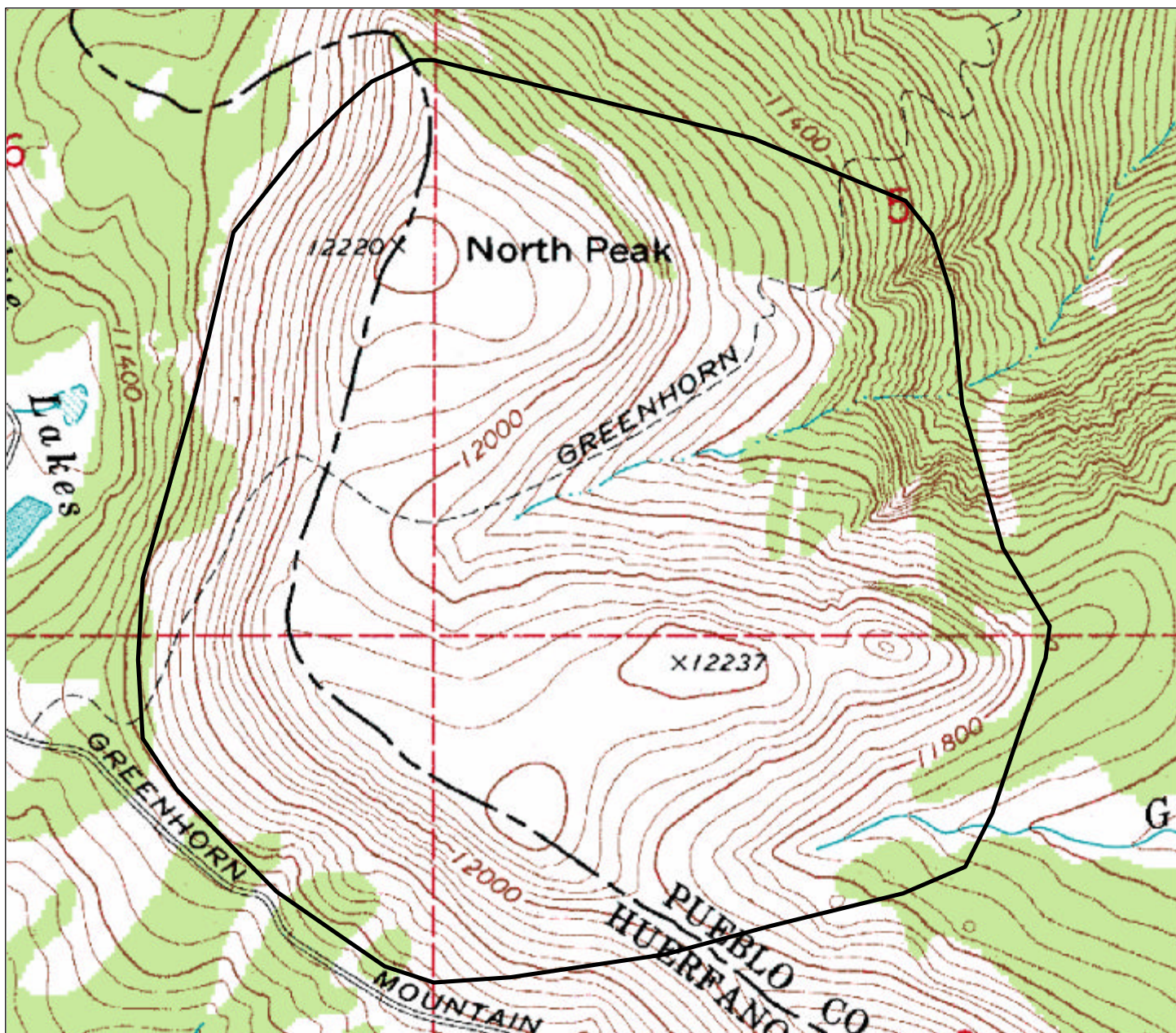
Protection Comments: The current level of protection is probably adequate, but should be monitored in the future to ensure long-term survival of the rare plants.

Management Comments: Management needs are unknown. Additional inventory work in this area would improve our understanding of management needs.



Thick-leaf whitlow grass (*Draba crassa*) (above and below)





0.25 0 0.25 Miles

Coordinate System: UTM, Zone13, NAD27

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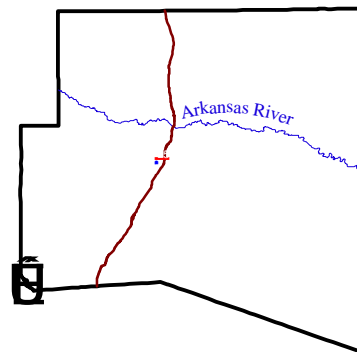
LEGEND

PCA Boundary

San Isabel, 37105-H1
7.5 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



B5 Potential Conservation Areas

Arkansas River at Nepesta Potential Conservation Area

Biodiversity Rank: B5 (General significance)

This PCA contains a good (B-ranked) example of a globally secure (G5 S4) cattail marsh community (*Typha angustifolia* – *Typha latifolia*). This is the best known occurrence of this common wetland community in Pueblo County.

Protection Urgency Rank: P2 (High urgency)

The wetlands are privately owned.

Management Urgency Rank: M3 (Moderate urgency)

The presence of mosquitofish at the Nepesta wetland could be investigated and control measures attempted if they are present. Removal of pumps from the other cattail stand may help restore natural ecological functions.

Location: Arkansas River at Nepesta PCA is located in eastern Pueblo County. The site includes two separate wetlands within the Arkansas River floodplain.

Legal Description: U.S.G.S. 7.5' quadrangle: Nepesta. T21S R61W Sections 22, 23, 26, 27; T21S R60W Sections unsurveyed.

Size: 830 acres (336 hectares)

Elevation: 4360 to 4460 feet. (1330 to 1360 meters)

General Description: This PCA contains two good examples of cattail wetlands (*Typha angustifolia* – *Typha latifolia*) (G5 S4) within meander bends of the Arkansas River. One is located on the north bank of the river near the mouth of Kramer Creek at Nepesta. The other is located about three miles upstream on the south bank of the river.

The cattail marsh near Nepesta is the larger of the two, covering about 150 acres (61 ha). Typical of a cattail stand, the vegetation within the stand is very homogeneous. The uplands north of the stand are greasewood shrublands intermixed with shortgrass prairie. Mosquitofish (*Gambusia affinis*) were introduced to the marsh in an attempt to control mosquito larvae (J. Dillon, pers. comm., landowner). Mosquitofish are native to southeastern U.S. and have been introduced worldwide. Almost everywhere introductions have been made, mosquitofish have gradually eliminated or reduced populations of small native fishes (Minkley and Deacon 1968).

The other cattail marsh occupies about 70 acres (28 ha). It has been drained via pumping of wells in the past to allow haying of the cattails. The pumps have been inactivated due to water agreements with Kansas concerning flow in the Arkansas River. The cattail

stand has small patches of bulrush (*Scirpus acutus*) within and a few scattered peach-leaf willow (*Salix amygdaloides*). Birds including Green Heron and Great Blue Heron were observed perching in the trees. Northern leopard frogs (*Rana pipiens*) were also observed in the wetland. The uplands are rolling hills of shortgrass prairie with rabbitbrush (*Chrysothamnus nauseosus*), cholla (*Cylindropuntia imbricata*), and scattered sandsage (*Artemisia filifolia*).

Natural Heritage element occurrences at the Arkansas River at Nepesta PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plant Communities								
<i>Typha angustifolia</i> - <i>Typha latifolia</i>	Cattail marsh	G5	S4				B	2000-09-26
<i>Typha angustifolia</i> - <i>Typha latifolia</i>	Cattail marsh	G5	S4				B	2000-09-26

*EO = Element Occurrence

Note: Element occurrences responsible for the B-rank are shown in bold typeface.

Biodiversity comments: This site contains a good (B-ranked) occurrence of a globally common (G5 S4) cattail wetland (*Typha angustifolia* – *Typha latifolia*). These cattail marshes are unusually large.

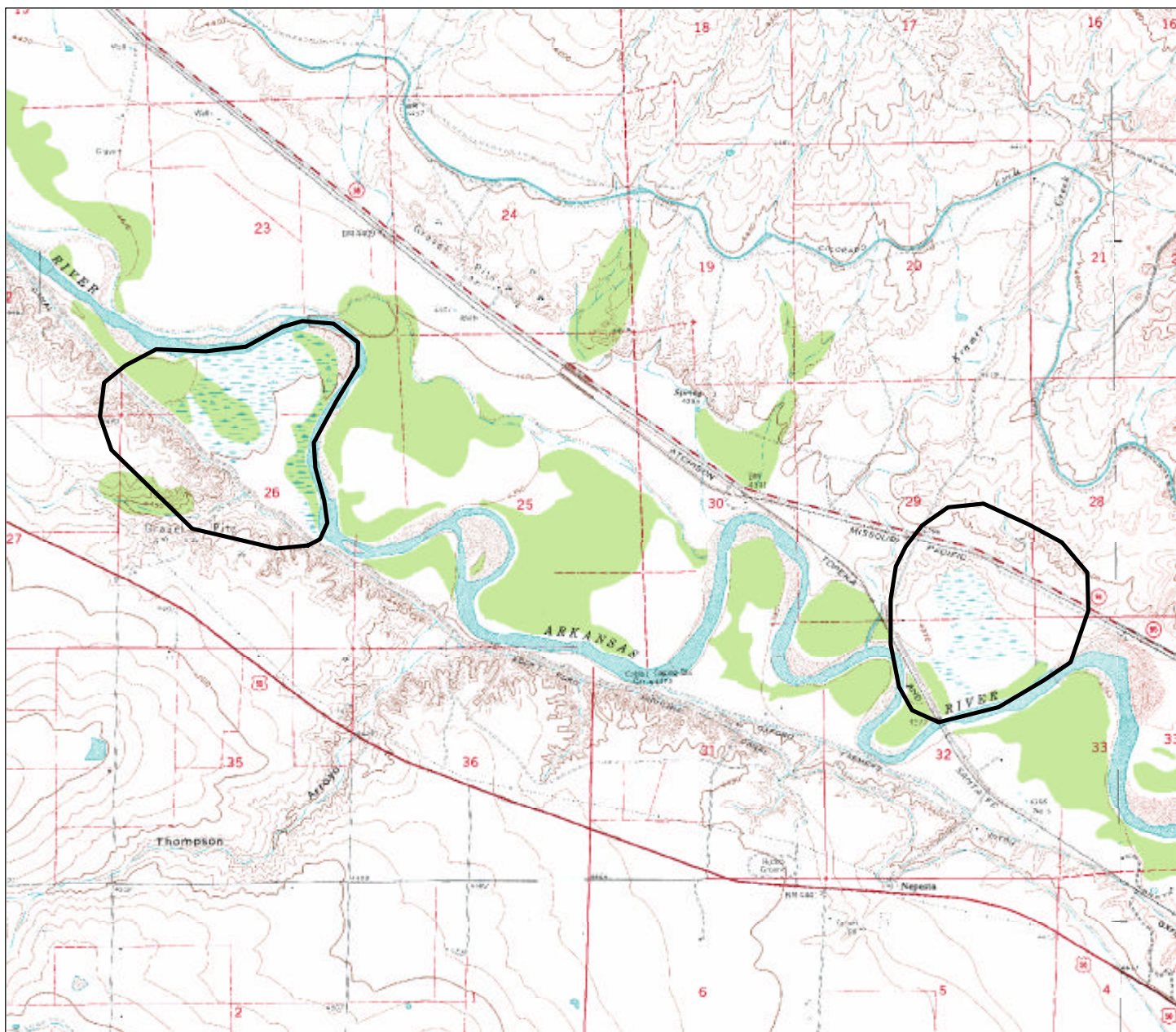
Boundary Justification: The boundary encompasses the wetland and a small amount of the surrounding uplands. The groundwater recharge areas for the wetlands are not encompassed within the PCA. Recharge areas probably include the entire Arkansas River drainage and the adjacent uplands draining toward the Arkansas River.

Protection Comments: The lands are privately owned.

Management Comments: The presence of mosquitofish at the Nepesta wetland could be investigated and control measures attempted if they are present. The pumps designed to drain the more western cattail stand could be removed to ensure long-term maintenance of the local natural hydrologic regime.



Photograph taken at the Arkansas River at Nepesta PCA



0.5 0 0.5 Miles

▲ Coordinate System: UTM, Zone13, NAD27

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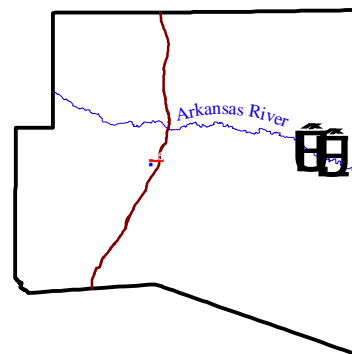
LEGEND

□ PCA Boundary

Nepesta, 38104-B2
7.5 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



Goodpasture Potential Conservation Area

Biodiversity Rank: B5 (General significance)

The Goodpasture PCA supports an excellent (A-ranked) occurrence of the globally secure (G4 S4), but declining, black-tailed prairie dog (*Cynomys ludovicianus*).

Protection Urgency Rank: P3 (Moderate urgency)

There is a definable threat to this population of prairie dogs that may affect it within five years. The occurrence is located on private property and any changes in management relating to control of the population could have immediate and deleterious effects on the population.

Management Urgency Rank: M1 (Very high urgency)

Actions of the current landowner must continue or the prairie dog complex could be lost or irretrievably degraded within one year.

Location: The Goodpasture PCA is located in west-central Pueblo County. Take Highway 78 west of Pueblo for approximately 19 miles to Siloam Road. Go north on Siloam approximately one-quarter mile and the prairie dog complex is on both sides of the road.

Legal Description: U.S.G.S. 7.5' quadrangles: Beulah and Owl Canyon. T22S R67W Sections 20, 21, 28-32

Size: 1562 acres (632 hectares)

Elevation: 5850 to 6275 feet (1783 to 1913 meters)

General Description: The Goodpasture PCA is located in west-central Pueblo County and lies completely on private ranchland. The site was drawn to include a large, reproducing and healthy black-tailed prairie dog complex that occupies low lying shortgrass prairie. The site varies in elevation from around 5850 feet at the east boundary, and gradually rises to 6275 feet to its west edge. The site consists of rolling terrain with a 65% cover of grasses dominated by blue grama (*Bouteloua gracilis*), with some purple three-awn (*Aristida purpurea*). The soil is a rich loam, well drained and has a deep organic layer. The site is situated between two distinctly different landscapes. To the east lie Galbeth Creek and Wales Canyon, which run through the site from east to west, and become steep outside the east edge of the site where the terrain is unsuitable for prairie dogs; to the west and north the site is restricted by juniper woodlands that are also unsuitable to prairie dogs. Cattle grazing throughout the site has reduced the cover, density, and biomass of blue grama. This modification of the rangeland appears not to have affected the prairie dogs, which generally occur in association with grazing cattle (Licht and Sanchez 1993).

Biodiversity Comments: The PCA is of general biodiversity significance and contains one excellent (A-ranked) occurrence of the globally secure (G4) black-tailed prairie dog (*Cynomys ludovicianus*). This particular population of prairie dogs occupies a highly suitable site with soils exhibiting a deep organic horizon. The population appears to be in good health, with over 250 prairie dogs observed at the colony, including many young pups. Although there had been a plague epizootic in 1999 that caused massive die-offs in many prairie dog complexes in Pueblo County, this particular complex appears unaffected by the epizootic. The distant location of this complex from other active prairie dog populations may protect it from outbreaks of plague, and it may offer a unique opportunity for conserving a native prairie dog population free of plague. To verify this would require collecting blood samples from the population and testing for the presence of plague antibodies.

Natural Heritage Element Occurrences at the Goodpasture PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Mammals								
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4	C			A	2002-06-09

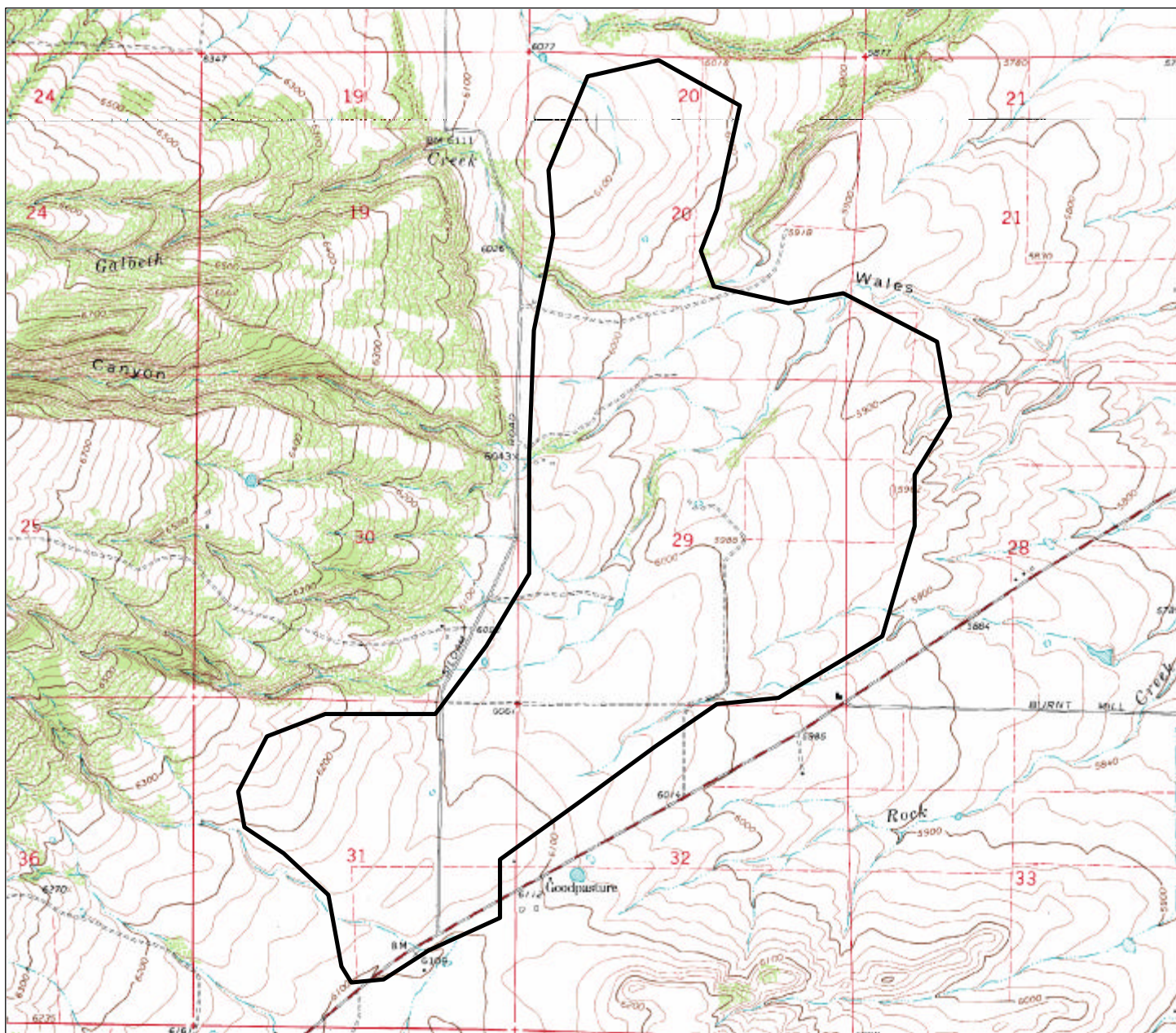
*EO = Element Occurrence

Boundary Justification: The PCA boundary includes the entire extent of the black-tailed prairie dog complex, including the suitable grasslands interspersed among the separate colonies that form the complex. The boundary is intended to represent the area needed for long-term survival of the prairie dog population, and to allow for suitable areas into which the population can expand.

Protection Comments: There is a definable threat facing this prairie dog population that may affect the population within five years. This population of prairie dogs occupies private rangeland, and although it appears the landowner tolerates the prairie dogs, presence the complexes survival depends on the landowners future actions.

Management Comments: Actions of the current landowner must continue or the prairie dog complex could be lost or irretrievably degraded within one year. 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. The 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 to identify whether this population of prairie dogs has been exposed to plague would assist in understanding the conservation value of this population of prairie dogs.



0.5 0 0.5 Miles

Coordinate System: UTM, Zone13, NAD27

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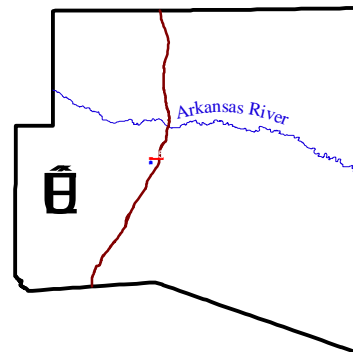
LEGEND

PCA Boundary

Beulah, 38104-A8
Owl Canyon, 38104-B8
7.5 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



North Creek Potential Conservation Area

Biodiversity Rank: B5 (General significance)

This PCA contains an unranked (E-ranked) occurrence of a globally common, state critically imperiled (G4G5 S1) plant species, and a historical (H-ranked) occurrence of a state imperiled (G5 S2) plant species.

Protection Urgency Rank: P3 (Moderate urgency)

This PCA includes a mix of private and public lands managed by the U.S. Forest Service. North Creek Road crosses through the site. The primary threats are probably noxious weed invasions, recreational use, and road maintenance activities.

Management Urgency: M3 (Moderate urgency)

Further inventory for the rare plant species, especially during a non-drought year, is recommended. Monitoring this area for impacts to the rare plant occurrences resulting from noxious weeds and recreational uses would inform management needs.

Location: Pueblo and Custer counties. From downtown Beulah, follow North Creek Road 6 miles up river to old camping and picnic area on right.

Legal Description: U.S.G.S. 7.5' quadrangle: Saint Charles Peak. T22S R68W Sections 19-21, 28-30; T22S R69W Sections 23-26.

Size: 2000 acres (809 hectares)

Elevation: 6640 to 7800 feet (2020 to 2380 meters)

General Description: The riparian area long North Creek is dominated by narrowleaf cottonwood (*Populus angustifolia*), coyote willow (*Salix exigua*), and native and non-native herbs. Upland areas are dominated by ponderosa pine (*Pinus ponderosa*), white fir (*Abies concolor*), and Gambel's oak (*Quercus gambelii*). North Creek Road follows close to the creek through the PCA.

Biodiversity Comments: This PCA includes an unranked occurrence of a state critically imperiled (G4G5 S1) plant species, Peck sedge (*Carex peckii*). The PCA also includes a historical occurrence of a state imperiled (G5 S2) plant species, prairie violet (*Viola pedatifida*).

Natural Heritage element occurrences at the North Creek PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plants								
<i>Carex peckii</i>	Peck sedge	G4G5	S1				E	1998-06-10
<i>Viola pedatifida</i>	Prairie violet	G5	S2				H	1982-04-25

*EO = Element Occurrence

Note: Element occurrence responsible for the B-rank is shown in bold typeface.

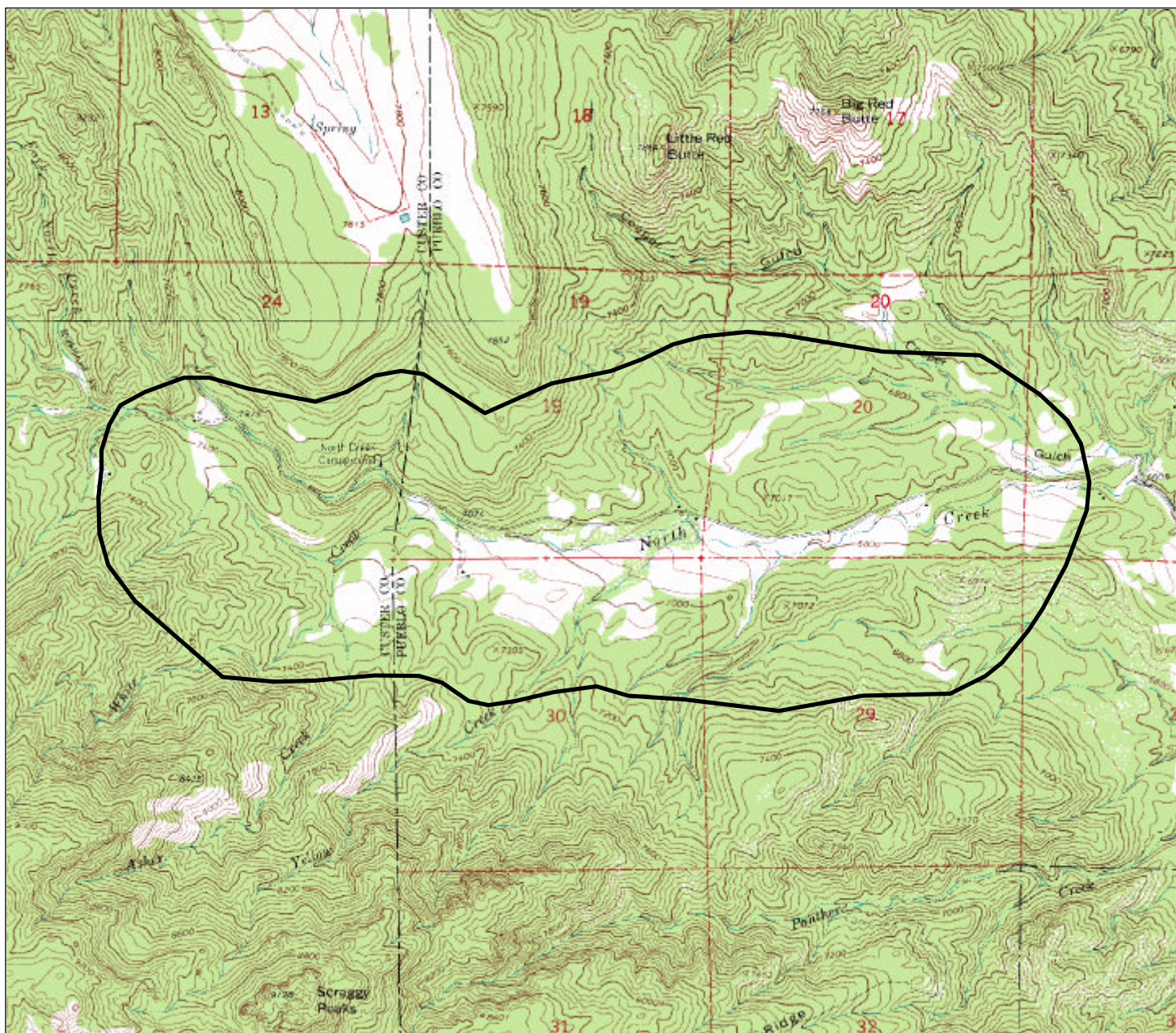
Boundary Justification: The boundary encompasses the riparian corridor that contains the element occurrences, plus unsurveyed, apparently suitable habitat in the vicinity of the occurrences. In general, PCA boundaries are drawn to represent our best estimate of the primary area needed for the survival of the occurrences. The boundaries include the mosaic of community types on which the species may rely. The boundary does not include the entire watershed that may be important to the viability of the elements of concern.

Protection Comments: This PCA includes a mix of private and public lands managed by the U.S. Forest Service. North Creek Road crosses through the site. The primary threats are probably noxious weed invasions, recreational use, and road maintenance activities.

Management Comments: Several noxious and non-native weeds were noted within the PCA, including Canada thistle (*Breca arvensis*), hound's tongue (*Cynoglossum officinale*), musk thistle (*Carduus nutans*), and smooth brome (*Bromus inermis*). Further inventory for the rare plants, especially during a non-drought year, is warranted.



Prairie violet (*Viola pedatifida*)



0.5 0 0.5 Miles

Coordinate System: UTM, Zone13, NAD27

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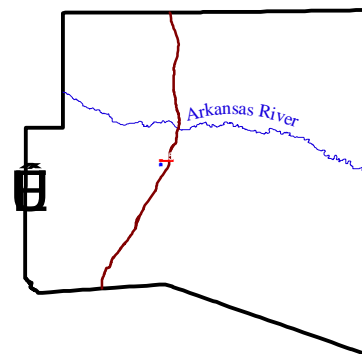
LEGEND

PCA Boundary

Saint Charles Peak, 38105-A1
7.5 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



Edison Road Potential Conservation Area

Biodiversity Rank: B5 (General significance)

The Edison Road PCA supports at least eight (two excellent, five fair, and one poor) occurrences of the apparently secure (G4 S4) black-tailed prairie dog (*Cynomys ludovicianus*).

Protection Urgency Rank: P3 (Moderate urgency)

Most of the land is privately owned and several portions of this site are threatened by residential development.

Management Urgency Rank: M5 (Low urgency)

No management needs are known or anticipated on this site.

Location: El Paso and Pueblo counties. This PCA includes much of the land that lies to the south of Neely Road, to the north of North County Line Road (at the El Paso County/Pueblo County border), to the east of Boone Road, and to the west of Whittemore Road.

Legal Description: U.S.G.S. 7.5' quadrangles: Truckton, Edison School and Truckton SE. T16S R60W Sections 30, 31; T16S R61W Sections 25, 35, 36; T17S R60W Sections 4-10, 15-23, 26-31; T17S R61W Sections 1, 2, 11-14, 23-27, 34-36; T18S R61W Sections 2, 3.

Size: 18,274 acres (7395 hectares)

Elevation: 5390 to 5700 feet (1643 to 1737 meters)

General Description: The Edison Road site includes much of the land that lies to the south of Neely Road, to the north of North County Line Road (at the El Paso County/Pueblo County border), to the east of Boone Road, and to the west of Whittemore Road. The site is irregularly shaped and it extends beyond each of these four roads, at least in some locations. No major drainages lie within or cross the site.

The Edison Road site is characterized by a mixture of open, flat areas and gently rolling terrain, and it is covered by a mosaic of soil types (Larsen 1981). All but one of the observed prairie dog towns, however, occurred on a single soil type: Olney sandy loam. This deep, well-drained soil is characterized by moderate permeability, moderate available water capacity, and slow surface runoff. The hazards of erosion and soil blowing generally are moderate, and the effective rooting depth for plants is 60 inches (150 centimeters) or more (Larsen 1981).

Historically, much of the site was covered with vegetation typical of the native shortgrass prairie. Although large patches of this vegetation remain, portions of the site were converted to agricultural croplands during the past 100 years. The cultivation of some of

these fields was subsequently abandoned, producing "old field" (weedy, early successional) habitats. Other fields within the site remain under cultivation. Grazing of domestic livestock occurred historically throughout the site, and today grazing continues on most of the site.

Other shortgrass prairie species noted within the PCA include Mountain Plover (*Charadrius montanus*), Burrowing Owl (*Athene cunicularia*), Ferruginous Hawk (*Buteo regalis*), and massasauga rattlesnake (*Sistrurus catenatus*) (see the Chico Basin Shortgrass PCA). Mountain Plovers (G2 S2B, SZN) are a declining shortgrass prairie species proposed for federal listing as a threatened species. Burrowing Owls (G4 S2), listed as threatened in the state of Colorado, are known to use abandoned prairie dog burrows for nesting. Ferruginous Hawks are apparently secure globally (G4) but also are seasonally, locally vulnerable (S3B) and are classified as sensitive (BLM, Forest Service) and as a species of special concern (State of Colorado). Finally, massasaugas are imperiled in Colorado (S2) and are classified as sensitive (BLM) and as a species of special concern (State of Colorado).

Biodiversity Rank Justification: At least eight occurrences (colonies or towns) of the apparently secure (G4 S4) black-tailed prairie dog are known within the Edison Road site (two excellent, five fair, and one poor occurrence). In addition, five (two excellent and three fair) occurrences of the apparently secure (G4 S4B) but sensitive (Forest Service) and threatened (State of Colorado) Burrowing Owl are known on the site.

Natural Heritage element occurrences at the Edison Road PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Mammals								
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4				A	2000-07-17
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4				A	2001-04-09
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4				C	2000-07-17
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4				C	2000-08-25
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4				C	2000-07-17
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4				C	2000-08-22
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4				C	2000-08-22
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4				D	2000-08-22

*EO = Element occurrence

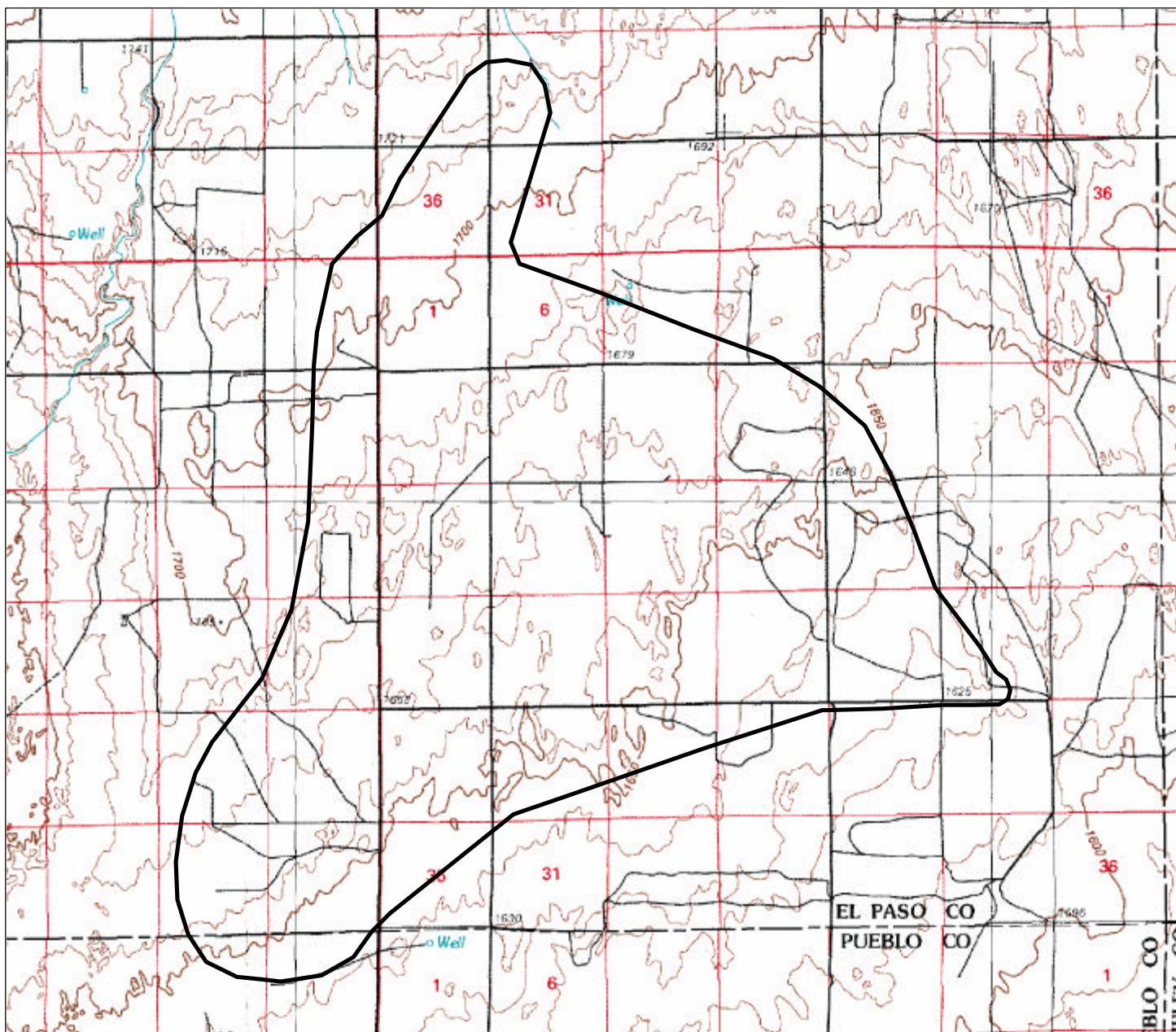
Note: Element occurrences responsible for the B-rank are shown in bold typeface.

Boundary Justification: The boundary encompasses the eight known prairie dog colonies and the (mostly) unoccupied space among these colonies. Scattered within the unoccupied areas are several small clusters of occupied prairie dog mounds.

Protection Comments: Most of the land on this site is privately owned. Low-density residential development of land has already occurred within the site, but it is very limited. A school, an abandoned church, and widely scattered ranches and other residences are present within the Edison Road site. Residential development pressures appear to be increasing.

Any projects that would eradicate prairie dogs from the landscape would have deleterious effects over time.

Management Comments: No management needs are known or anticipated. Most of the land is grazed by domestic livestock. Continuation of current land management practices is unlikely to preclude continued occupancy of the site by prairie dogs.



1 0 1 2 Miles

▲ Coordinate System: UTM, Zone13, NAD27

Colorado Natural Heritage Program

Colorado State University
8002 Campus Delivery
Fort Collins, CO 80523-8002

map created 14 April 2003

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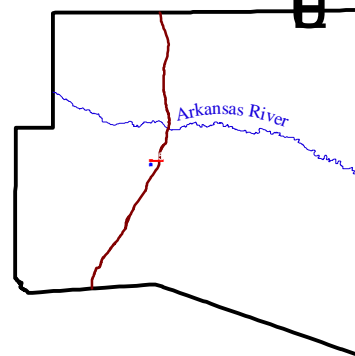
LEGEND

□ PCA Boundary

Colorado Springs, 38104-E1
30 x 60 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



Pueblo Mountain Park Potential Conservation Area

Biodiversity Rank: B5 (General significance)

This PCA supports an unranked occurrence of a state imperiled (G4G5 S1) plant species, lavender hyssop (*Agastache foeniculum*). A state rare plant species, prairie violet (*Viola pedatifida*) (G5 S2), has also been documented in this area.

Protection Urgency Rank: P4 (Low urgency)

The primary threat to this PCA is probably recreational use. Notifying the land managers at Pueblo Mountain Park regarding the location of the rare plants could help ensure their protection.

Management Urgency: M3 (Moderate urgency)

Monitoring recreation use and the distribution of noxious weeds in the vicinity of the rare plant occurrences would help identify management issues. Further inventory work to identify the distribution of the rare plants would also inform management needs.

Location: Pueblo County. From downtown Beulah follow Route 78 to Pueblo Mountain Park.

Legal Description: U.S.G.S. 7.5' quadrangle: Saint Charles Peak. T23S R68W Sections 16, 17, 20, 21.

Size: 881 acres (356 hectares)

Elevation: 6700 to 7800 feet (2042 to 2380 meters)

General Description: This PCA includes a riparian area dominated by willows (*Salix* sp.), and uplands dominated by ponderosa pine (*Pinus ponderosa*) and Gambel's oak (*Quercus gambelii*). Very little is known about this site. Colorado Natural Heritage Program biologists were unable to access this site during the summer and fall of 2002 because the Park was closed due to the drought conditions.

Biodiversity Comments: This PCA supports an unranked occurrence of the state imperiled lavender hyssop (*Agastache foeniculum*), and a historic occurrence of the state imperiled prairie violet (*Viola pedatifida*).

Natural Heritage element occurrences at the Pueblo Mountain Park PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plants								
<i>Agastache foeniculum</i>	Lavender hyssop	G4G5	S1				E	2001-08-27
<i>Viola pedatifida</i>	Prairie violet	G5	S2				H	1967-05-08

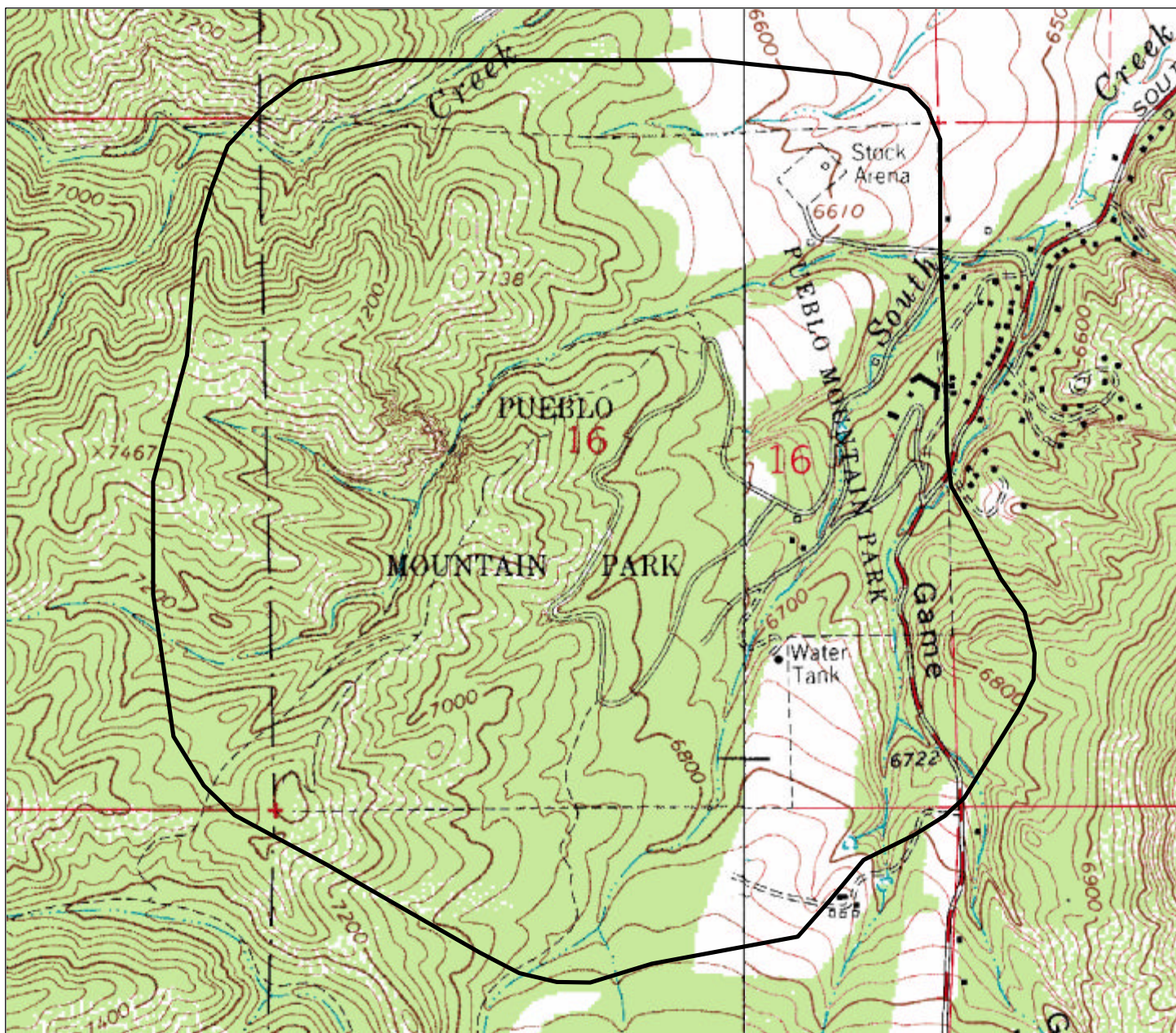
*EO = Element Occurrence

Note: Element occurrence responsible for the B-rank is shown in bold typeface.

Boundary Justification: The boundary encompasses the element occurrences, plus unsurveyed, apparently suitable habitat in the vicinity of the occurrences. In general, PCA boundaries are drawn to represent our best estimate of the primary area needed for the survival of the occurrences. The boundaries include the mosaic of community types on which the species may rely.

Protection Comments: Notify the land managers of Pueblo Mountain Park about the location and management concerns of the rare plant species.

Management Comments: Smooth brome (*Bromus inermis*) and Kentucky bluegrass (*Poa pratensis*) are two non-native plant species that were noted in this PCA. Further inventory for the rare plant species, especially in a non-drought year, is warranted. Monitoring recreational use in the vicinity of the occurrences would help inform management needs.



0.25 0 0.25 Miles

Coordinate System: UTM, Zone13, NAD27

Colorado Natural Heritage Program

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map created 14 April 2003

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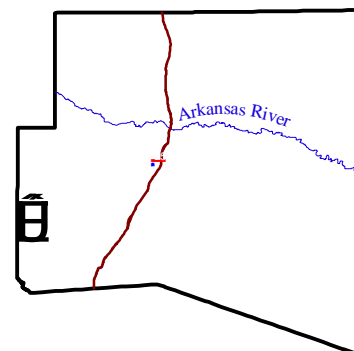
LEGEND

PCA Boundary

Beulah, 38104-A8
Saint Charles Peak, 38105-A1
7.5 Minute Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



Flying A Road Potential Conservation Area

Biodiversity Rank: B5 (General significance)

This PCA is drawn for a good (B-ranked) occurrence of a globally common (G4Q S4) shortgrass prairie plant community and excellent occurrences of the globally common (G4 S4) black-tailed prairie dog.

Protection Urgency Rank: P4 (Low urgency)

This PCA is found on private lands and state lands managed by the Colorado State Land Board. Plans of the private landowners are unknown. Notifying the Land Board about the significance of this site may assist with long-term protection needs.

Management Urgency Rank: M4 (Low urgency)

Current management appears to be adequate. Monitoring noxious weeds would improve our understanding of the management needs for this PCA.

Location: Southeastern Pueblo County and also including some area in Otero County. South of Route 50, along both sides of Flying A Road.

Legal description: U.S.G.S. 7.5' quadrangles: Hardesty Reservoir, Chicos Well, Flying A Ranch, Apishapa Bridge, Snowden Lake, Yellowbank Creek, Red Top Ranch, Fowler, Avondale, Nepesta, and Sanford Hills. T22S R60W Sections 1-36, T22S R61W Sections 1-4, 8-17, 20-30.

Size: 140,348 acres (56,797 hectares)

Elevation: 4320 to 5250 feet (1320 to 1600 meters)

General Description: This PCA includes an extensive shortgrass prairie with few alterations to the natural landscape. There are a few ranches and dirt roads, but the landscape is largely unfragmented. Cattle grazing is the primary land use. The grassland is dominated largely by blue grama (*Bouteloua gracilis*), and also includes galleta grass (*Hilaria jamesii*), sand drop seed (*Sporobolus cryptandrus*), and three-awn grass (*Aristida purpurea*). Other species noted in the grasslands include cholla (*Cylindropuntia imbricata*), yucca (*Yucca glauca*), snakeweed (*Gutierrezia sarothrae*) and prickly pear cactus (*Opuntia* sp.). Small patches of shrublands dominated by four-winged salt bush (*Atriplex canescens*) were also scattered through the PCA in areas that were a bit more mesic. Some of the animals noted include Burrowing Owl, Ferruginous Hawk, Prairie Falcon, Horned Lark, pronghorn antelope, and ground squirrel.

Biodiversity comments: This PCA includes a good occurrence of a globally common shortgrass prairie plant community and excellent occurrences of the globally common black-tailed prairie dog. Black-tailed prairie dogs have declined across their range, and

are considered to be an important “keystone” species that support numerous other species including the swift fox, Burrowing Owl, Ferruginous Hawk, and Mountain Plover.

Natural Heritage element occurrences at the Flying A Road PCA.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO* Rank	Last Observed
Plant Communities								
<i>Bouteloua gracilis</i> herbaceous vegetation	Blue grama shortgrass prairie	G4Q	S4				B	2002-08-07
Mammals								
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4	C			A	2002-06-11
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4	C			A	2002-06-11
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4	C			A	2002-06-29
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4	C			B	2002-06-11
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4	C			B	2002-06-26
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4	C			D	2002-06-11
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G4	S4	C			D	2002-06-26

*EO = Element Occurrence

Note: Element occurrence responsible for the B-rank is shown in bold typeface.

Boundary justification: The boundary is drawn to encompass the good condition shortgrass prairie and associated black-tailed prairie dog towns. The boundary is drawn to exclude lands more impacted by agricultural development (to the north) and encompasses mainly the high quality grasslands in the area. The site is considered large enough to protect intact (or at least allow simulation of) most of the natural ecological processes necessary for survival of the elements, including fire and herbivory.

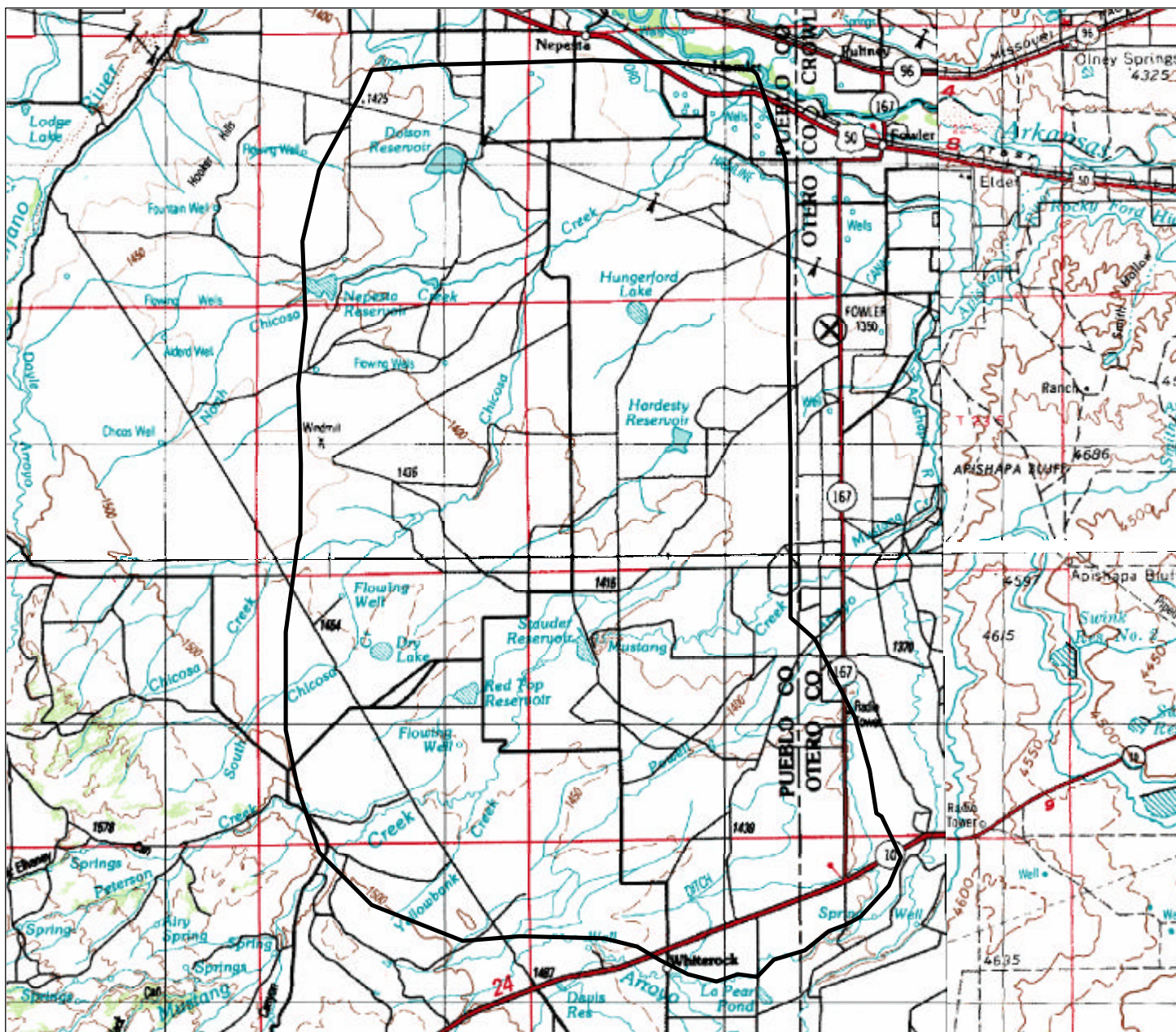
Protection Comments: This PCA is found on private lands and state lands managed by the Colorado State Land Board.

Management Comments: Management needs likely vary across this large PCA. Further observations to document the combination and condition of plant communities found in this PCA during a non-drought year are warranted. Russian thistle (*Salsola australis*) and buffalo bur (*Solanum rostratum*) are two non-native species that were noted in low cover along the roadsides. Monitoring for the spread of non-native plants would improve our understanding of management needs.



Photographs taken at the Flying A Road PCA (above and below)





4 0 4 Miles

▲ Coordinate System: UTM, Zone13, NAD27

Colorado Natural Heritage Program

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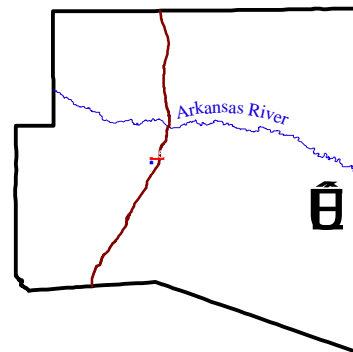
LEGEND

□ PCA Boundary

Trinidad, 37104-A1
Pueblo, 38104-A1
1 x 2 Degree Series

Digital Raster Graphics produced by the U.S.
Geological Survey, 1996

Location in Study Area



NATURAL HISTORY INFORMATION FOR SELECTED RARE AND IMPERILED ANIMALS

Amphibians and Reptiles

Triploid Colorado Checkered Whiptail (*Cnemidophorus neotesselatus*)

Taxonomy

Class: Reptilia

Order: Squamata

Family: Teiidae

Genus: *Cnemidophorus*

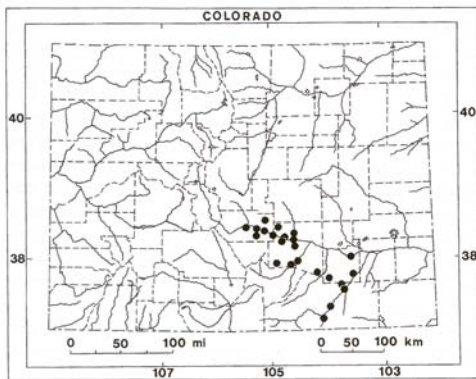
Taxonomic Comments: This species formerly was included in *Cnemidophorus tessellatus* but was recognized as a distinct species in 1997 (Walker *et al.* 1997a). *Cnemidophorus neotesselatus* sometimes hybridizes with *C. sexlineatus* (Walker *et al.* 1997b). Species recently renamed *Aspidoscelis neotesselatus*.

CNHP Ranking: G2Q S2

State/Federal Status: None.



Photo by G. Hammerson



*Triploid Colorado Checkered
Whiptail distribution in Colorado
(from Hammerson 1999)*

Habitat Comments: *Cnemidophorus neotesselatus* occupies arid grasslands, rocky canyons, rocky hillsides, shrubby areas, and open savannahs associated with the Arkansas, Huerfano, Apishapa, and Purgatoire rivers and their tributaries (Walker *et al.* 1997a,b).

Distribution: *Cnemidophorus neotesselatus* occurs only in southeastern Colorado, where it is patchily distributed in Fremont, Pueblo, Otero, and Las Animas counties (Hammerson 1999). Several sites near Higbee, Colorado (Otero County) constitute the only area where coexistence between diploid and triploid stages in any complex of parthenogenetic *Cnemidophorus* is known to occur (Walker *et al.* 1995, Walker and Cordes 1998).

Important Life History Characteristics: This species consists entirely of females and is parthenogenetic (Maslin 1966, 1971). In parthenogenetic species, reproduction is asexual, with egg cells developing without having been fertilized by male gametes; females raised in total isolation from the egg stage to sexual maturity produce eggs that develop into fertile female offspring (Uzzell 1970). The species originated through hybridization between a female *Cnemidophorus marmoratus* and a male *Cnemidophorus septemvittatus*, followed by hybridization between one of these hybrids and a male *Cnemidophorus sexlineatus* (Wright 1993, Walker *et al.* 1995, Walker *et al.* 1997a). Because members of a parthenogenetic population are genetically identical, they would be expected to tolerate and cooperate with each other to a greater extent than would be expected in a non-parthenogenetic population (Hamilton 1964a,b). Indeed, in outdoor enclosure experiments, parthenogenetic whiptails tended to share burrows

much more often (and interacted aggressively much less often) than non-parthenogenetic whiptails, suggesting a greater degree of intraspecific tolerance (Leuck 1982, 1985). Similar experiments with mixed groups of parthenogenetic and non-parthenogenetic whiptails also found that levels of aggression among lizards were correlated with degree of genetic relatedness (Leuck 1993). The diet of *Cnemidophorus neotesselatus* consists of invertebrates, including grasshoppers, beetles, caterpillars, termites, spiders, and moths (Paulissen *et al.* 1993). Whiptails dig burrows in which they spend the night; these burrows are defended against conspecifics and are used night after night (Knopf 1966). *Cnemidophorus neotesselatus* enters hibernation between late August and mid-October and emerges in April (Knopf 1966). A very fast runner, this whiptail typically runs a considerable distance to a sheltered site beneath a bush when threatened (Smith 1946). In general, however, the species is relatively unwary and may be approached quite closely (Price 1992, Hammerson 1999).

Known Threats and Management Issues: Habitat loss has caused the extirpation of *Cnemidophorus neotesselatus* from several sites where it formerly occurred (Walker *et al.* 1996, Walker *et al.* 1997b) and it continues to threaten the survival of populations of this species (Walker *et al.* 1997b, Walker and Cordes 1998).

Massasauga (*Sistrurus catenatus*)

Taxonomy
Class: Reptilia
Order: Squamata
Family: Viperidae
Genus: *Sistrurus*

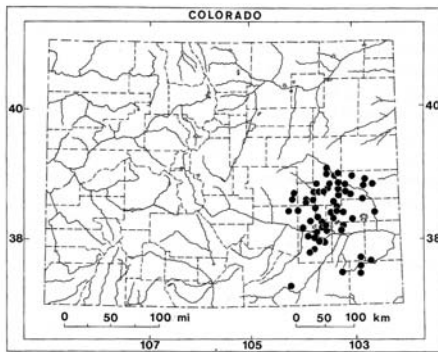
Taxonomic Comments: The eastern massasauga (also known as the pigmy rattlesnake) is a distinct species, *Sistrurus miliarius*.

CNHP Ranking: G3G4 S2

State/Federal Status: BLM sensitive; species of special concern (Colorado).



Photo by G. Hammerson



Massasauga distribution in Colorado (from Hammerson 1999)

Habitat Comments: Over much of its range, *Sistrurus catenatus* inhabits moist habitats such as swamps, marshes, wet meadows, bogs, and associated wetlands (Wright and Wright 1957, Ernst 1992). In the drier, southwestern portions of its range, this small rattlesnake occupies river bottoms, dry grasslands, and shortgrass prairies with sandy soil (Gloyd 1955, Degenhardt *et al.* 1996, Hobert 1997, Hammerson 1999). Use of relatively cool, moist rodent burrows for shelter enables massasaugas to exploit these arid habitats without excessive loss of moisture (Ernst 1992).

Distribution: Extirpated over most of its historical range in the United States (Mackessy 1998), the massasauga now occurs in disjunct populations that extend obliquely to the southwest from the Great Lakes region of southern Ontario and New York through the central and Great Plains states to Texas,

southern New Mexico, southeastern Arizona, and Mexico (Minton 1983). Over most of its range the species occurs below 5,000 ft (1,542 m) in elevation (Minton 1983). In Colorado, the species occurs at elevations below 5,500 ft (1,696 m) in the southeastern quarter of the state (Maslin 1965, Hammerson 1999). The greatest concentration of these snakes is found in southern Lincoln County (Hobert 1997, Mackessy 1998).

Important Life History Characteristics: Massasaugas hibernate (singly) in rock crevices, rodent or crayfish burrows, hollow logs, and other protected sites ("hibernacula") from October or November through March or April (Degenhardt *et al.* 1996, Mackessy 1998). Although they can withstand a freezing body temperature for a short time, massasaugas select hibernacula below the frost line (Maple and Orr 1968, Klauber 1972). Evidence of seasonal migrations between winter and summer habitats has been found in Colorado (Hobert 1997) and in other states (Reinert and Kodrich 1982, Seigel 1986). In spring and fall the snakes are active diurnally (basking and foraging in the sunlight), but during the summer they avoid the extreme daytime heat by shifting their activities to the crepuscular and nocturnal (twilight and night) hours (Seigel 1986, Collins 1993, Hobert 1997, Hammerson 1999). Like many snakes, massasaugas are capable swimmers (Ernst 1992). Massasaugas mate between March and November (Wright 1941, Chiszar *et al.* 1976, Reinert 1981) and they are ovoviviparous (fully formed eggs are retained and hatched inside the maternal body, with the release of live offspring). Young are born from late July to late September (Ernst 1992). In some cases, sperm are stored over winter in the female's reproductive tract and fertilization occurs the next spring (Ernst 1992). Massasaugas use their heat-sensitive facial pits (one pit is located between each eye and its corresponding nostril) to locate endothermic ("warm-blooded") prey, but they also use sight and scent to detect prey (Chiszar *et al.* 1976, Chiszar *et al.* 1979, Chiszar *et al.* 1981). Young massasaugas wave their yellow-tipped tails back and forth over their heads to lure frogs, toads, and lizards

that often feed on brightly-colored, moving insects (Schuett *et al.* 1984). Prey generally are consumed only after death by envenomation, but massasaugas sometimes eat carrion (including roadkills) or live prey (e.g., frogs) (Greene and Oliver 1965, Ernst 1992). Common prey include small mammals, amphibians, reptiles, and birds (Greene and Oliver 1965, Klauber 1972, Hobert 1997). Bites of massasaugas occasionally are fatal to humans (Lyon and Bishop 1936, Stebbins 1954) but usually they are not (Degenhardt *et al.* 1996, Hammerson 1999).

Known Threats and Management Issues: Over much of the species' range, habitat loss has destroyed most colonies of this species (e.g., Bushey 1985, Seigel 1986). Because of their habit of resting on warm, paved roads at night, many massasaugas are killed by motor vehicles (Lowe *et al.* 1986, Degenhardt *et al.* 1996, Mackessy 1998). Like other rattlesnakes, massasaugas are often willfully destroyed because they are venomous, and many are taken by collectors (Klauber 1972, Breisch 1984, Lowe *et al.* 1986).

Plains Leopard Frog (*Rana blairi*)

Taxonomy
Class: Amphibia
Order: Anura
Family: Ranidae
Genus: *Rana*

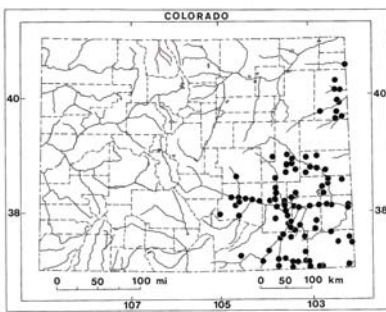
Taxonomic Comments: Formerly considered part of the *Rana pipiens* species complex; hybridizes with *Rana pipiens* and *Rana sphenoccephala*. No subspecies are recognized.

CNHP Ranking: G5 S3

State/Federal Status: Species of special concern (Colorado).



Photo by G. Hammerson



Plains leopard frog distribution in Colorado (Hammerson 1999)

Habitat Comments: Plains 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). They are often found great distances from water and for that reason they sometimes are known as "meadow frogs" (Wright and Wright 1949). Mass movements away from breeding ponds are sometimes undertaken by adults and young after summer rains (Fitch 1958). *Rana blairi* is better adapted to dry conditions than the closely-related *Rana pipiens* (Gillis 1975, 1979) and often uses shallow, muddy waters (Scott and Jennings 1985, Stebbins 1985).

Distribution: *Rana blairi* ranges westward from Indiana to southern South Dakota and eastern Colorado, and southward to Texas; isolated populations occur in southern Illinois, New Mexico, and Arizona (Stebbins 1985, Brown 1992, Conant and Collins 1998). In Colorado, the range of the plains leopard frog generally is complementary to that of the northern leopard frog (*Rana pipiens*) (Hammerson 1999). *Rana blairi* is found at elevations below 6,000 ft (1,850 m) in the Arkansas River drainage in southeastern Colorado and in the Republican River drainage of northeastern Colorado (Hammerson 1999).

Important Life History Characteristics: *Rana blairi* breeds from February through October (Pace 1974), with peak breeding activity occurring after heavy rains (Gillis 1975, Lynch 1985). Eggs, which hatch into tadpoles within three weeks, are laid in large clusters attached to submerged vegetation in shallow water (Degenhardt *et al.* 1996). Depending upon the timing (month) of egg deposition, the tadpoles may metamorphose into frogs or they may overwinter and then transform during the next spring (Gillis 1975, Scott and Jennings 1985). In the autumn, the adults dig into the mud and debris on the bottoms of streams and ponds to overwinter (Collins 1993). The adults feed mainly on non-aquatic insects (Hartman 1906, Hammerson 1999). To escape predators, they tend to leap away from water rather than toward it, in contrast to the responses of many other species of frogs (Degenhardt *et al.* 1996, Hammerson 1999). When captured by predators, these frogs emit characteristic, explosive distress calls (Hammerson 1999). Dispersal distances of eight km have been recorded for the species (Gillis 1975).

Known Threats and Management Issues: *Rana blairi* has become scarce or absent at some locations where non-native bullfrogs have been introduced (Hammerson 1982). *Rana blairi* eggs and young are readily eaten by bullfrog larvae (Ehrlich 1979), and large bullfrog larvae that have overwintered could greatly reduce the reproductive success of plains leopard frogs (Hammerson 1999). Moreover, adult bullfrogs consume adult plains leopard frogs (Mackessy 1998).

Birds

Burrowing Owl (*Athene cunicularia*)

Taxonomy
Class: Aves
Order: Strigiformes
Family: Strigidae
Genus: *Athene*

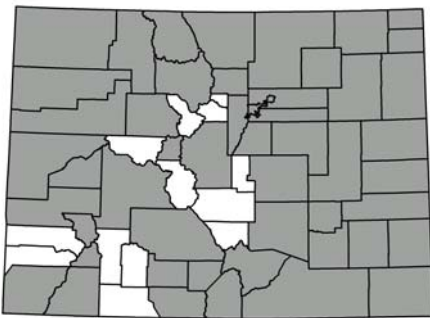
Taxonomic Comments: Formerly known as *Speotyto cunicularia*. As many as 18 subspecies are recognized.

CNHP Ranking: G4 S4B (CNHP watchlist)

State/Federal Status: Forest Service sensitive; listed as threatened in Colorado.



Photo © by Don Baccus
dhogaza@pacifier.com



Burrowing Owl breeding distribution in Colorado (adapted from Andrews and Righter 1992)

Habitat Comments: Burrowing Owls occupy dry, open, treeless grasslands where they typically nest in burrows of prairie dogs or ground squirrels (Butts and Lewis 1982, Haug *et al.* 1993, Kingery 1998). Burrows of badgers, tortoises, and other animals also are sometimes used (Johnsgard 1979) and the owls occasionally excavate their own nesting holes in sandy soil (Ryser 1985, Millsap 1996). Burrowing Owls prefer sites with very low vegetation (as are found in prairie dog towns and heavily-grazed grasslands (Johnsgard 1979)) and they abandon areas where plague or poisoning has eliminated most burrowing rodents and the vegetation has grown more than a few inches tall (MacCracken *et al.* 1985, Plumpton and Lutz 1993). In urban and suburban settings, Burrowing Owls

sometimes nest in open areas such as golf courses, airports, cemeteries, street rights-of-way, and vacant lots (Haug *et al.* 1993).

Distribution: Burrowing Owls nest in suitable habitat throughout most of western North America, in central and southern Florida, in Mexico and in much of central and South America, and on islands to the southwest and southeast of North America (Haug *et al.* 1993). Historically the species probably ranged farther eastward in North America; reductions in the numbers and distributions of prairie dogs and ground squirrels have caused range contractions and decreased abundance of Burrowing Owls throughout the Great Plains (Johnsgard 1979). Winter range includes the southern portions of the breeding range; in winter, most owls seem to vacate the northern parts of the Great Plains and Great Basin (Haug *et al.* 1993). Most Burrowing Owls in North America are migratory, but some local populations are year-round residents (Haug *et al.* 1993). In Colorado, Burrowing Owls are declining in abundance and distribution, and they have been extirpated from some areas (Andrews and Righter 1992). On the eastern plains of Colorado, the species remains a locally uncommon to fairly common summer resident and a casual winter resident; in Colorado's western valleys and mountain parks it is now rare to uncommon (Andrews and Righter 1992).

Important Life History Characteristics: Burrowing Owls often collect dried manure, shred it, and then use it to line the floor of the tunnel, the nest chamber, and the burrow entrance, presumably to reduce the likelihood of predation by masking the scent of the birds (Bent 1938, Martin 1973a, Millsap 1996). If manure is removed from the burrow entrance or the tunnel, the owls will replace it within a day (Martin 1973a). Most Burrowing Owls in non-migratory populations maintain and use the burrow throughout the year and show nest site fidelity (they breed on the same territory in successive years) (Millsap and Bear

1988, Haug *et al.* 1993). Even in migratory populations, some nest site fidelity is evident (Martin 1973a, Wedgwood 1976, Haug *et al.* 1993, Desmond *et al.* 1995). During the breeding season, both male and female Burrowing Owls defend (intrasexually) the nest burrow and the area immediately surrounding it against intrusions by other Burrowing Owls (Haug *et al.* 1993). Burrowing Owls feed primarily on nocturnal rodents such as voles and kangaroo rats as well as nocturnal insects (see refs. in Haug *et al.* 1993). Opportunistic feeders, Burrowing Owls forage mostly during crepuscular hours but also hunt during all other times of the day and night (Grant 1965, Coulombe 1971, Marti 1974). Hunting behavior includes walking, running, or hopping on the ground, flying to the ground from perches, hovering, and aerial flycatching (Grant 1965, Thomsen 1971, Marti 1974). Food is cached both inside (Agersborg 1885, Haug 1985) and outside (Grant 1965) the burrows. When disturbed in the burrow, young Burrowing Owls produce a rasp-like vocalization that mimics the rattling of a disturbed rattlesnake and probably deters predators from entering nesting burrows (Martin 1973b, Rowe *et al.* 1986). Burrowing Owls have the curious habit of following moving animals (e.g., dogs, horses), perhaps to capture small prey items flushed by the animals (Bent 1938).

Known Threats and Management Issues: Burrowing Owls in North America continue to experience mild to relatively severe population declines (Holroyd and Wellicome 1997, Sheffield 1997). Habitat fragmentation and loss (Bent 1938, Haug 1985, Sheffield 1997, Warnock and James 1997), pesticide use for insect control (James and Fox 1987, Fox *et al.* 1989), poisoning of rodent colonies (Bent 1938, Sheffield 1997, Desmond *et al.* 2000:1073), plague outbreaks in rodent colonies (Sheffield 1997), shooting (Butts 1973, Wedgwood 1978), and collisions with vehicles (Bent 1938, Haug and Oliphant 1987, Millsap and Bear 1988) have reduced North American Burrowing Owl populations. Human disturbance at nest and roost sites may significantly reduce Burrowing Owls' reproductive success (Thomsen 1971, Millsap and Bear 1988).

Ferruginous Hawk (*Buteo regalis*)

Taxonomy

Class: Aves

Order: Falconiformes

Family: Accipitridae

Genus: *Buteo*

Taxonomic Comments: There are no subspecies documented for this species.

CNHP Rank: G4 S3B,S4N

Habitat Comments: The Ferruginous Hawk prefers open grasslands, shrublands and deserts (Bechard and Schmutz 1995). Before the elimination of bison (*Bison bison*) in the west, its nests were often partially constructed of bison bones and wool (Bechard and Schmutz 1995). Breeding pairs nest in isolated trees, on rock outcrops, structures such as windmills and power poles, or on the ground. Winter populations concentrate around prairie dog towns (Andrews and Righter 1992).

Distribution: Global range: This species winters in the southern United States and the northern interior parts of Mexico (Bechard and Schmutz 1995). State range: About 1,200 birds winter in Colorado (Johnsgard 1990), comprising about twenty percent of the total winter population in the United States (Andrews and Righter 1992). Fairly common winter resident but a rare to uncommon summer resident on eastern plains (Andrews and Righter 1992).

Known Treats and Management Issues: Local population declines are attributed to the effects of cultivation, grazing, poisoning small mammals, mining and fire in nesting habitats (Bechard and Schmutz 1995). Colorado's breeding population is considered vulnerable (S3B) based on human reduction of the primary winter prey base (prairie dog colonies), small population size, and human encroachment into available habitat .

McCown's Longspur (*Calcarius mccownii*)

Taxonomy

Class: Aves

Order: Passeriformes

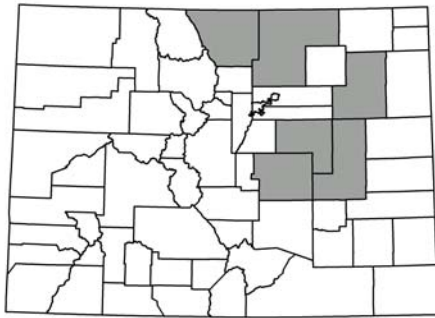
Family: Emberizidae

Genus: *Calcarius*

Taxonomic Comments: No subspecies described.

CNHP Ranking: G5 S2B,SZN (Note: not documented in Pueblo County but in El Paso County just north of the Pueblo County line)

State/Federal Status: None.



McCown's Longspur breeding distribution in Colorado (adapted from Andrews and Righter 1992, Kingery 1998, and CNHP data)

Habitat Comments: McCown's Longspurs breed on open, flat, semi-arid expanses of shortgrass prairie or structurally similar habitats such as heavily grazed or other sparsely-vegetated grasslands (Byers *et al.* 1995, With 1994). These birds tend to be more numerous on breeding grounds in dry years than in wet years (Krause 1968). Wintering grounds also tend to be sparsely-vegetated areas, including shortgrass prairie, overgrazed grasslands, plowed agricultural fields, and dry lake beds (With 1994).

Distribution: The summer breeding range for McCown's Longspurs extends southward from southern Canada to Colorado (Bailey and Niedrach 1965, Andrews and Righter 1992, With 1994, Price *et al.* 1995). Primary breeding areas are in Montana and in southern Alberta and Saskatchewan

(Byers *et al.* 1995). Substantial reductions of the species' breeding range have occurred historically (Krause 1968). In Colorado, the center of breeding activity for McCown's Longspurs is located in northern Weld County but recent observations indicate that the species also breeds in areas farther to the south, including Washington, Elbert, Lincoln, and Kit Carson counties (Kingery 1998). The winter range extends southwestward from western Oklahoma through Texas, and into Mexico; it includes parts of extreme southern Arizona and New Mexico (With 1994).

Important Life History Characteristics: McCown's Longspurs forage diurnally while walking or running (not hopping) on the ground where they consume mainly weed seeds, grasshoppers, and other insects (Terres 1980, With 1994, Byers *et al.* 1995). The male establishes and maintains a discrete breeding territory that he vigorously defends against intrusions by other males of the species (With 1994). Characteristic behaviors (an aerial display and flight song) are used by the male to proclaim territorial ownership and to attract a female (Mickey 1943). The male flies upward, holding both wings outstretched and pulled back to reveal his bright, white wing linings; then he spreads his tail and floats to the ground while singing (Mickey 1943, With 1994). Another courtship display used by the male consists of walking in a tight circle around the female with one of his wings raised to display the white lining (DuBois 1937, Mickey 1943, With 1994). During the breeding season, male and female McCown's Longspurs show an unusual attachment for each other, remaining close together and usually walking side by side (Ludlow 1875, Terres 1980). The female constructs a nest of dried weed stems and grasses in a hollow scraped in the ground, often beneath a shrub or clump of grass (Terres 1980, Byers *et al.* 1995). Eggs are incubated by the female but both parents feed the young (Terres 1980). McCown's Longspurs form flocks by early August and leave the breeding grounds by September (Byers *et al.* 1995). Usually they return to breeding areas in April (Byers *et al.* 1995).

Known Threats and Management Issues: Habitat loss constitutes the greatest threat to this species. Breeding habitat is especially vulnerable to agricultural and urban development and was substantially reduced during the twentieth century (see refs. in With 1994; Byers *et al.* 1995). McCown's Longspurs are vulnerable to direct mortality from pesticides (McEwan and Ells 1975). Although some McCown's Longspurs are relatively tolerant of human disturbance (With 1994), others may abandon active nests if disturbed (Felske 1971, Strong 1971).

Mountain Plover (*Charadrius montanus*)

Taxonomy

Class: Aves

Order: Charadriiformes

Family: Charadriidae

Genus: *Charadrius*

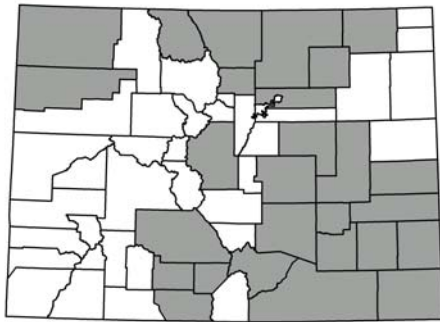
Taxonomic Comments: Formerly known as *Eupoda montana*.

CNHP Ranking: G2 S2B, SZN

State/Federal Status: Forest Service sensitive; BLM sensitive; proposed for federal listing as threatened/endangered; species of special concern (Colorado).



Photo by M. B. Wunder



Mountain Plover breeding distribution in Colorado (adapted from Andrews and Righter 1992)

Habitat Comments: Breeding Mountain Plovers occupy open habitats with low-growing vegetation, especially shortgrass prairie characterized by the presence of blue grama grass and buffalo grass (Graul 1975, Graul and Webster 1976, Knopf and Miller 1994). In grasslands where vegetation grows taller than approximately three inches in height, Mountain Plovers use intensively grazed areas (Graul and Webster 1976, Knopf 1996c), prairie dog towns (Knowles *et al.* 1982; Knowles and Knowles 1984, Olson and Edge 1985, Shackford 1991), and fallow or recently plowed agricultural fields (Shackford 1991, Shackford *et al.* 1999). On their wintering grounds in California, Mountain Plovers use plowed or burned agricultural fields and heavily grazed annual grasslands (Knopf and Rupert 1995). In Texas, wintering Mountain Plovers use coastal prairies, alkaline flats, plowed fields, and Bermuda grass fields (Oberholser 1974).

Distribution: Mountain Plovers breed in parts of Montana, Wyoming, Colorado, New Mexico, and in adjacent portions of Utah, Oklahoma, and Texas (Knopf 1996b). An isolated breeding population occurs in the Davis Mountains of western Texas (Knopf 1996b). In late summer, birds form flocks and disperse widely across the western and southern Great Plains before migrating to their wintering range (Knopf 1996b). Mountain Plovers winter in California, southern Arizona, southern Texas, and Mexico (see refs. in Knopf 1996b). In Colorado, the greatest numbers of breeding Mountain Plovers occur in Weld County (Graul and Webster 1976). The breeding range of this species has undergone a dramatic long-term contraction, both in Colorado (Andrews and Righter 1992) and throughout the western Great Plains (Graul and Webster 1976).

Important Life History Characteristics: Mainly a bird of the high plains and semi-desert regions of western North America, the Mountain Plover is one of the few "shorebirds" that lives away from water in arid regions (Terres 1980). Mountain Plovers arrive on their breeding areas in Colorado in late March (Graul 1975, Knopf and Rupert 1996), when males often return to the same territories they occupied the previous year (Graul 1973). Displays of territorial males include a "falling leaf" display (the male rocks back and forth with his wings held in a sharp "V" as he drops to the ground from 15-30 feet in the air), a slow "butterfly flight" (with slow, deep wingbeats) and ritualized scraping of the ground (a courtship display in which the male presses his chest against the ground and scrapes soil with one foot at a time as he cocks his fanned tail), which produces potential nest sites throughout the territory (Graul 1973). After mating occurs and eggs are laid in a rudimentary nest located in a scrape on the ground, some females leave their mates to

incubate the clutch while they begin a second clutch with a new male (Graul 1973). When this occurs, the female typically incubates the second clutch (Graul 1973, 1975, 1976). This uncommon form of polygamy, in which a female mates successively with more than one male is called successive (Krebs and Davies 1993) or sequential (Reynolds 1987) polyandry. Mountain Plover nests often are situated very close to dried cow manure piles, perhaps to provide disruptive coloration and thereby reduce the probability of nest predation, or perhaps to help the birds more easily relocate their nests (Graul 1975, Knopf and Miller 1994). An incubating Mountain Plover may fly up into the face of a cow to distract the animal and prevent trampling of the nest; this behavior apparently evolved during the long association between grazing bison and breeding Mountain Plovers (Walker 1955; Graul 1973, 1975; McCaffery *et al.* 1984). Mountain Plovers feed on the ground, consuming insects such as grasshoppers, crickets, beetles, and flies (Baldwin 1971, Knopf 1998). Most activities are restricted to the crepuscular hours to avoid the heat of the day (Graul 1975). Mountain Plovers begin to leave their breeding territories and form flocks shortly after the chicks fledge, which occurs in early July in Colorado (Knopf and Rupert 1996). They arrive on the California wintering areas in September and October (Small 1994, Knopf and Rupert 1995).

Known Threats and Management Issues: Breeding Bird Survey data indicate a decline of two-thirds in the continental population during the period 1966-1993 (Knopf 1996c). Once widely distributed in eastern Colorado (Sclater 1912, Bailey and Niedrach 1965), Mountain Plovers underwent a dramatic range reduction due to loss of habitat as native prairie was converted to cropland (see refs. in Andrews and Righter 1992). Habitat loss to agricultural activities also has severely reduced the species' breeding range outside Colorado (Samson and Knopf 1994). Mountain Plovers no longer breed in the Dakotas or in Kansas, for example, probably because of this factor (Graul and Webster 1976). Additional threats to Mountain Plovers and their habitat include gas, oil, and mineral extraction activities, livestock grazing and spring plowing (the timing and extent), collisions with motor vehicles, and recreational activities (Underwood 1994). Human disturbance at nest sites may cause nest abandonment (Graul 1975, Miller and Knopf 1993). Prior to 1900, Mountain Plovers were an important game bird for market hunters (Grinnell *et al.* 1918, Sandoz 1954).

Long-billed Curlew (*Numenius americanus*)

Taxonomy

Class: Aves

Order: Charadriiformes

Family: Scolopacidae

Genus: *Numenius*

Taxonomic Comments: May constitute a superspecies with the Eurasian Curlew (*N. arquata*) (AOU 1988).

CNHP Ranking: G5 S2B, SZN

State/Federal Status: Forest Service sensitive; BLM sensitive; species of special concern (Colorado).

Habitat Comments: Breeding Long-billed Curlews are most often associated with shortgrass prairie, grazed mixed grass prairie, or combinations of short grasses, sage, and cactus, often on gently rolling terrain (Johnsgard 1978). They are considered an indicator species for healthy native grasslands (Kingery 1998). Favored nest sites are damp, grassy hollows in prairie vegetation or long slopes near lakes or streams (Johnsgard 1978). Nests are frequently located near ponds, playas, or lakes (Kingery 1998). The presence of water may influence initiation of nesting the first year and site fidelity may induce them to return even if the nearby water has dried up (Kingery 1998). The nest is simply a slight hollow lined with a varying amount of grasses or weeds (Johnsgard 1978). At times the birds nest in loose colonies, and the frequently place their nests beside dried cow dung, presumably for better concealment (Johnsgard 1978). Long-billed Curlews sometimes nest in wheat fields or fallow fields (Andrews and Righter 1992).

Distribution: The current range of the Long-billed Curlew has contracted from historic times (Kingery 1998). The historical range extended from Canada to Illinois, northern California, and northern Texas (Kingery 1998). The current breeding range includes southwest North Dakota, western South Dakota, western Nebraska (the sandhills area), eastern Colorado, and southwestern Kansas, northwestern Oklahoma, the western panhandle of Texas, and eastern New Mexico (Johnsgard 1978). In Colorado, the heaviest concentration extends from Baca County west in Las Animas County to the Purgatoire River. A second population breeds north of the Arkansas River from eastern El Paso and Pueblo counties to Kansas. A small contingent apparently nests on the Western Slope (Kingery 1998).

Important Life History Characteristics: Curlews raise only one brood per year, and nesting fits into a compact time period (Kingery 1998). Adults arrive on the breeding grounds in April; most clutches are laid in May, and hatch from early to mid June (Kingery 1998). Most of the precocial young can fly by the first of July (Kingery 1998). Long-billed Curlews' diet consists primarily of insects, worms, burrow-dwelling crustaceans, mollusks, toads, eggs and nestlings of other birds, and few berries (Ehrlich et al. 1988). Long-billed Curlews winter south along beaches and mudflats in Mexico and Southern California (Ehrlich et al. 1988; Gilhan et al. 2001).

Known Threats and Management Issues: Declines in range and population have led to concern about the Long-billed Curlew's status (Kingery 1998). Long-billed Curlews share an unfortunate bond with other shortgrass prairie specialists because of threats to remaining shortgrass habitat. Almost all species, including songbirds, raptors, and shorebirds, are declining. Conversion of prairies to agriculture caused much of the decline of this species (Kingery 1998; Ehrlich et al. 1988). In the early 1900s, Long-billed Curlews size and taste made them a popular main dish (Kingery 1998).

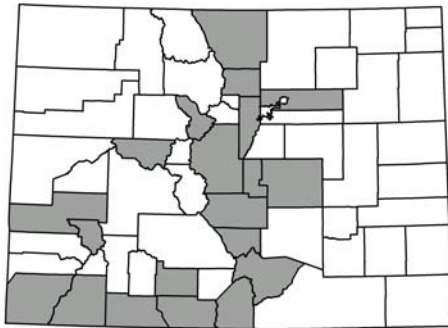
Mexican Spotted Owl (*Strix occidentalis lucida*)

Taxonomy
Class: Aves
Order: Strigiformes
Family: Strigidae
Genus: *Strix*

Taxonomic Comments: Three subspecies of Spotted Owl are recognized: the Northern Spotted Owl (*Strix occidentalis caurina*) the California Spotted Owl (*S. o. occidentalis*), and the Mexican Spotted Owl (*S. o. lucida*). Only the Mexican Spotted Owl (the smallest in body size of the three subspecies) occurs in Colorado.

CNHP Ranking: G3T3 S1B, SUN

State/Federal Status: Listed as federally threatened; listed as threatened in Colorado.



Mexican Spotted Owl distribution (all seasons) in Colorado (adapted from Andrews and Righter 1992)

Habitat Comments: Breeding habitat for the Mexican Spotted Owl consists of mixed coniferous forests dominated by Douglas fir, pine, or true fir, and pine-oak forests (Ganey and Balda 1989a, 1994, Seamans and Gutiérrez 1995, U.S. Fish and Wildlife Service 1995). Old-growth forests (Ganey and Balda 1989a, 1994, Zwank *et al.* 1994) and other closed-canopy forests (Seamans and Gutiérrez 1995, Grubb *et al.* 1997, Young *et al.* 1998) are strongly preferred. The owls also nest in steep, narrow canyons that have perennial water and (usually) coniferous or riparian trees (Kertell 1977, Wagner *et al.* 1982, Rinkevich and Gutierrez 1996). Roost sites used in summer tend to be located in cool microhabitats such as those found on north-facing slopes and/or under closed canopies (Barrows 1981). Winter habitat includes lower-elevation pinyon-juniper woodlands (Ganey *et al.* 1992, U.S. Fish and Wildlife Service 1995), open mountain-shrub habitats, and higher-elevation coniferous forests (Willey 1993).

Distribution: The Mexican Spotted Owl occurs in the forested mountain ranges and deeply-cut canyons of central Utah and Colorado, southward through Arizona, New Mexico, and western Texas into central Mexico (Ganey *et al.* 1988, McDonald *et al.* 1991, Enriquez-Rocha *et al.* 1993). Summer and winter ranges are the same, although in some areas altitudinal migration may occur as owls move to lower (or higher) elevations in winter (Ganey *et al.* 1992, U.S. Fish and Wildlife Service 1995). Although some Mexican Spotted Owls migrate up to 50 km, many individuals spend the winter in the vicinity of their breeding territories but show seasonal shifts in the use of habitats or areas (Ganey and Balda 1989b).

Important Life History Characteristics: Mexican Spotted Owls feed primarily on rodents and other small mammals (Barrows 1981, 1987). Woodrats (*Neotoma* spp.) tend to make up the largest percentage of the diet by weight, but mice (*Peromyscus* spp.), cottontail rabbits, voles, and bats also are important at certain locations and times (Kertell 1977, Ganey 1992, U.S. Fish and Wildlife Service 1995, Young *et al.* 1997). Surplus prey items are sometimes cached for later consumption (Forsman *et al.* 1984). Mexican Spotted Owls do not build their own nests, but instead they rely on the presence of a suitable structure (e.g., dwarf mistletoe brooms, broken tree tops, natural cavities caused by heart rot or broken limbs, platform nests built by other avian species, or ledges on cliffs) (Seamans and Gutierrez 1995, U.S. Fish and Wildlife Service 1995). Although territorial disputes between neighboring Spotted Owls are rare (Forsman *et al.* 1984), the



Photo by F. R. Gehlbach

species is probably highly territorial; breeding individuals defend an area around the nest against intrusions by other Spotted Owls (Gutiérrez *et al.* 1995). Long-term pair bonds generally form between mated Spotted Owls as the two birds typically share a home range throughout the year (Forsman *et al.* 1984). Spotted Owls show a strong tendency to use a traditional nest area or nest location for many years (Forsman *et al.* 1984). A traditional nest site may be occupied for many successive years by a mated pair of Spotted Owls or by different pairs (Bent 1938, Gutiérrez *et al.* 1995). If one member of a mated pair of owls dies, the survivor may remain on the same territory and find a new mate (Forsman *et al.* 1984). Only the female incubates the eggs and broods the newly-hatched chicks; the male feeds the female during this period (she gives some of the food to the young) (Gutiérrez *et al.* 1995). The young are independent by late summer and they disperse from natal areas in September or October (Hodgson and Stacey 1996, Ganey *et al.* 1998).

Known Threats and Management Issues: The primary threats to the survival of the Mexican Spotted Owl are habitat loss and habitat degradation due to forest management practices (e.g., clearcutting, even-aged stand management, mineral extraction) (Ganey and Balda 1989a,b, U.S. Fish and Wildlife Service 1993, Gutiérrez 1994, Gutiérrez *et al.* 1995). The importance of mortality factors such as direct killing by humans and accidental deaths (e.g., collisions with cars, tree limbs, etc.) is unknown.

Fish

Arkansas Darter (*Etheostoma cragini*)

Taxonomy
Class: Osteichthyes
Order: Perciformes
Family: Percidae
Genus: *Etheostoma*



Taxonomic Comments: *Etheostoma* is the largest (most speciose = contains the most species) genus of North American fishes.

Illustration © copyright by W. D. Lewis, Colorado Division of Wildlife distributive information.

CNHP Ranking: G3 S2

State/Federal Status: Forest Service sensitive; candidate for federal listing as threatened/endangered; threatened in Colorado.



Habitat Comments: Arkansas darters inhabit small, shallow, clear, slowly-flowing streams that are partially overgrown with rooted aquatic vegetation such as watercress; they often are found in pools with substrates of sand, fine gravel, or organic detritus (Miller and Robinson 1973, Cross and Collins 1975, Lee *et al.* 1980). They are able to tolerate moderately suboptimal conditions such as water turbidity (Miller 1984), high water temperature and low dissolved oxygen availability (Labbe and Fausch 1997).

Arkansas darter distribution in Colorado (from Colorado Division of Wildlife 2001b)

Distribution: Although the historical distribution of Arkansas darters is unknown because of the paucity of historical records (e.g., three pre-1979 records exist for Colorado), it is generally agreed that the distribution and abundance of the Arkansas darter have declined

substantially due to loss of riparian habitats and reductions in groundwater aquifers that support spring-fed habitats in the region (Colorado Division of Wildlife 2001a). Today, localized populations of Arkansas darters inhabit portions of the Arkansas River drainage in eastern Colorado, southern Kansas, northeastern Oklahoma, and southwestern Missouri (Lee *et al.* 1980, Colorado Division of Wildlife 2001a). In Colorado, Arkansas darters are known to occur in Elbert, El Paso, Lincoln, Pueblo, Kiowa, and Prowers counties (Woodling 1985, Colorado Division of Wildlife 2001a).

Important Life History Characteristics: Arkansas darters are small fishes (up to 2.5 inches or 10 centimeters in length) that breed in the early spring and deposit their eggs in open areas where organic ooze occurs as a thin layer over sandy substrates (Moss 1981). Young Arkansas darters tend to occupy areas that are relatively open, whereas adults use areas with more aquatic vegetation (Moss 1981, Woodling 1985). Although mayflies are the primary food for Arkansas darters, many other items also are consumed, including dragonflies, caddisflies, dipterans, fish eggs, and small leaves and seeds (Moss 1981). Like most darters, Arkansas darters often sit motionless on the substrate; the name "darter" is based on their habit of occasionally darting about on the bottoms of streams as they forage (Page and Burr 1991).

Known Threats and Management Issues: Several factors have contributed to the declines in distribution and abundance of the Arkansas darter. Since the late 1800s, extensive water diversion and impoundment for irrigating croplands, degradation of stream banks and shallow wetlands due to livestock grazing and human activities, and pollution of streams have probably substantially reduced the availability of habitat suitable for Arkansas darters (Colorado Division of Wildlife 2001a). The major obstacle to the recovery and future persistence of the Arkansas darter is the availability of adequate amounts of suitable habitat. The quality and quantity of freshwater habitats will become increasingly difficult to maintain as the

demand for water for human usage (e.g., domestic, agricultural, industrial) continues to increase (Colorado Division of Wildlife 2001a).

Greenback Cutthroat Trout (*Oncorhynchus clarki stomias*)

Taxonomy

Class: Osteichthyes

Order: Salmoniformes

Family: Salmonidae

Genus: *Oncorhynchus*

Taxonomic Comments: Greenback cutthroat trout are closely related to Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*). Greenback 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).



Photograph by J. Woodling

CNHP Ranking: G4T2T3 S2

State/Federal Status: Listed as federally threatened.



Historical and current greenback cutthroat trout distributions (from U.S. Fish and Wildlife Service 1998)

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: The exact historical distribution of the greenback cutthroat trout is uncertain because the species declined so rapidly during the 1800s. The species is native to the headwaters of the South Platte and Arkansas river drainages in Colorado and to a short portion of the South Platte drainage in Wyoming (U.S. Fish and Wildlife Service 1998). By the early 1900s, greenback cutthroat trout were thought to be extinct (Greene 1937). Since then, ten native populations of greenback cutthroat trout have been discovered in the South Platte drainage (seven populations) and in the Arkansas River watershed (three populations); two of the three populations in the Arkansas River drainage

are considered stable (Severy Creek in El Paso County and South Apache Creek in Huerfano County) (U.S. Fish and Wildlife Service 1998, Policky *et al.* 1999). The Colorado Division of Wildlife has reintroduced greenback cutthroat trout at many sites in the South Platte and Arkansas River drainages, and 25 areas in the Arkansas river watershed are managed for the species (Policky *et al.* 1999). Twenty (six historical and 14 reintroduced) populations of greenback cutthroat trout are currently thought to be stable and self-sustaining (U.S. Fish and Wildlife Service 1998).

Important Life History Characteristics: Greenback cutthroat trout spawn in gravel-bottomed areas in running water during the spring when water temperatures reach 5-8°C (41-46°F); the timing of spawning varies with elevation and the age of the fish (U.S. Fish and Wildlife Service 1998). Although female greenbacks in hatcheries produce eggs when two years old, females in small alpine streams in Colorado typically reach sexual maturity at three or four years of age (U.S. Fish and Wildlife Service 1998). An opportunistic feeder, the greenback cutthroat trout consumes a wide range of prey but focuses mainly on invertebrates (Trotter 1987, U.S. Fish and Wildlife Service 1998). Vertebrates such as salamanders and small fishes also are consumed (U.S. Fish and Wildlife Service 1998).

Known Threats and Management Issues: The decline in greenback 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 the South Platte and Arkansas river drainages (U.S. Fish and Wildlife Service 1998). Rainbow trout and various cutthroat subspecies readily hybridize with greenback 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 greenback 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 greenback cutthroat populations, particularly in waters where non-native species were present with greenbacks (U.S. Fish and Wildlife Service 1998).

Other factors that contributed to the decline of greenback cutthroat trout populations also were associated with the human settlement and development of the Front Range. Exploitation of land, water, minerals, timber resources, and fisheries adversely affected greenback 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 greenback cutthroat trout.

Preliminary experiments indicated that greenback cutthroat trout were susceptible to whirling disease (caused by microscopic, water-borne parasite *Myxobolus cerebralis*) and that mortalities among infected greenbacks were higher than those among infected rainbow trout despite the fact that greenbacks showed no overt signs of infection (no skeletal deformities or tail-chasing behavior) (U.S. Fish and Wildlife Service 1998).

Mammals

Black-tailed Prairie Dog (*Cynomys ludovicianus*)

Taxonomy

Class: Mammalia

Order: Rodentia

Family: Sciuridae

Genus: *Cynomys*

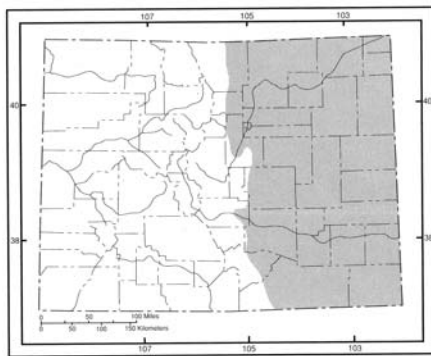
Taxonomic Comments: Of the two recognized subspecies, only one occurs in Colorado (*Cynomys ludovicianus ludovicianus*).

CNHP Ranking: G4 S4

State/Federal Status: None.



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desertusa.com



Black-tailed prairie dog distribution in Colorado (from Fitzgerald et al. 1994)

Habitat

Comments: *Cynomys ludovicianus* occupies shortgrass and mixed-grass prairie habitats with well-drained, friable soils that permit the construction of complex burrow systems. The shrubs and herbaceous vegetation within colonies of black-tailed prairie dogs tend to be shorter than those located within colonies of Gunnison's and white-tailed prairie dogs because black-tailed prairie dogs clip tall plants (without eating them) to increase the detectability of approaching aerial and terrestrial predators (King 1955, Pizzimenti 1975, Fitzgerald et al. 1994, Hoogland 1995).

Distribution: Of the five species of prairie dogs in North America, *Cynomys ludovicianus* is the most widely distributed (Hoogland 1996). Today the species occurs in isolated patches throughout its historical range, which included much of the

Great Plains from southern Saskatchewan (Canada) to northern Mexico (Hoogland 1996). In Colorado, black-tailed prairie dogs occupy suitable included in the eastern 40 percent of the state, inhabiting shortgrass prairie and other areas of low-growing vegetation (Fitzgerald et al. 1994). Throughout its range, the species occurs in much lower densities and in smaller colonies than it did historically (Fitzgerald et al. 1994, Hoogland 1996).

Important Life History Characteristics: Black-tailed prairie dogs are diurnal, burrowing, colonially-dwelling, herbivorous rodents that are active above-ground throughout the year. Unlike the Gunnison's, Utah, and white-tailed prairie dogs, they do not hibernate (Hoogland 1996). Within a colony, black-tailed prairie dogs live in territorial family groups called coteries, which include an adult male, usually two or three adult females, and several non-breeding yearlings and juveniles (Hoogland 1996). Males tend to disperse (leave the natal coterie) before they mature sexually; this behavior reduces inbreeding and may result in colonization of new areas (Hoogland 1982, Garrett and Franklin 1988). Rather than dispersing, females tend to remain in the natal coterie throughout their lives; for this reason, females within a coterie usually are closely related (Hoogland 1995). Through their foraging behavior and their clipping of tall plants, black-tailed prairie dogs have dramatically changed the composition of plant communities throughout their range (Hoogland 1996). In addition, the presence of prairie dog towns greatly increases the zoological diversity of prairie ecosystems by attracting predators and many other animals (e.g., Tyler 1970, Campbell and Clark 1981, Clark et al. 1982, Hoogland 1995).

Known Threats and Management Issues: Black-tailed prairie dogs have been subjected to extermination programs (public and private) for more than 100 years (Hoogland 1995). Outbreaks of plague (caused by the bacillus *Yersinia pestis* and transmitted by fleas) continue to reduce or even eliminate some colonies (Barnes 1982, Ebasco Serv., Inc. 1989). As in the past, however, the greatest threats to black-tailed prairie dogs come from humans due to conflicts with agricultural and other economic interests.

Townsend's Big-eared Bat (*Plecotus townsendii pallescens*)

Taxonomy

Class: Mammalia

Order: Chiroptera

Family: Vespertilionidae

Genus: *Corynorhinus*

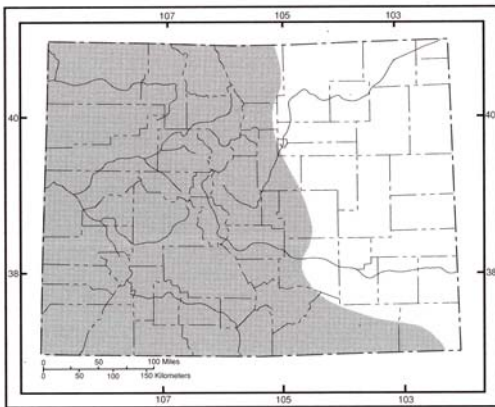
Taxonomic Comments: The generic name was recently changed from *Plecotus* to *Corynorhinus*.

CNHP Ranking: G4T4 S2

State/Federal Status: BLM sensitive; USFS sensitive; state species of undetermined status (Colorado).



Photo by J. Siemers



Townsend's big-eared bat distribution in Colorado (from Fitzgerald *et al.* 1994)

Habitat Comments: Townsend's big-eared bats occur in a wide range of habitats including semi-desert shrublands, pinyon-juniper woodlands, and dry coniferous forest (Fitzgerald *et al.* 1994). Because they naturally roost (and hibernate) in caves, their presence is strongly correlated with the availability of caves or cave-like roosting sites (Pierson *et al.* 1999).

Population densities are highest in areas with substantial surface exposures of cavity-forming rock (e.g., limestone, sandstone, gypsum, or volcanic) and in old mining areas (Pierson *et al.* 1999). Hibernacula generally are characterized by stable low temperatures and moderate airflow (Colorado Division of Wildlife 1984) and they are thought to be a population limiting factor for Townsend's big-eared bats (Fitzgerald *et al.* 1994).

Distribution: The two western subspecies of *C. townsendii* are widely distributed throughout western North America; in several northwestern states there are extensive zones of intergradation of the two subspecies (Pierson *et al.* 1999). *C. t. pallescens* occurs throughout Colorado except on the eastern plains, and is found in mines, caves, and human-made, cave-like structures at elevations up to 9,500 ft (2,930 m) (Colorado Division of Wildlife 1984). Only 11 maternity roosts and 30 hibernacula have been documented in Colorado (Pierson *et al.* 1999). Almost all known colonies in Colorado are very small (< 30 bats); known historical records of big-eared bats in Colorado include only about 350 individuals (Pierson *et al.* 1999). Available evidence suggests that dramatic declines in the sizes of Colorado colonies of big-eared bats may have occurred historically (Pierson *et al.* 1999).

Important Life History Characteristics: Big-eared bats emerge from their daytime roosts after dark and feed on insects (especially moths) which they capture in flight or glean from foliage (Colorado Division of Wildlife 1984, Nowak 1999). Much of their feeding occurs over water or sagebrush, or along the edges of patches of vegetation (Fitzgerald *et al.* 1994). After the young are born in May or June (only one offspring per female) the females congregate in nursery colonies where they share metabolic heat; warm nursery sites are critical for the survival of the young (Humphrey and Kunz 1976). No long-distance migrations have been reported for *C. townsendii* (Barbour and Davis 1969, Clark and Stromberg 1987, Fitzgerald *et al.* 1994). Site fidelity is high: individual bats tend to return each year to the same hibernation (Humphrey and Kunz 1976) and nursery (Pearson *et al.* 1952) roosts. Nonetheless, during hibernation there is much movement of bats within a cave and among caves as environmental conditions fluctuate and the animals

seek more favorable microclimatic conditions (Bee *et al.* 1981, Schwartz and Schwartz 1981, Fitzgerald *et al.* 1994).

Known Threats and Management Issues: Townsend's big-eared bats have very specific habitat requirements with regard to temperature and humidity levels at roosting sites; relatively few sites offer conditions appropriate for roosting by these bats (see refs. cited by Pierson *et al.* 1999). Moreover, *C. townsendii* is highly vulnerable to human disturbance (Colorado Division of Wildlife 1984, Clark and Stromberg 1987, Nowak 1999). Unlike many other species of bats, Townsend's big-eared bats do not seek shelter in protected crevices when roosting, but instead they cluster in highly visible locations (e.g., cave ceilings) where they are easily disturbed (Handley 1959, Barbour and Davis 1969). In Colorado, human visitation and disturbance rates at nursery and hibernation caves are very high (Pierson *et al.* 1999). In addition to human disturbance, other factors that threaten *C. townsendii* include the closure of abandoned mines (loss of roosting habitat), the impoundment of toxic materials (direct mortality), pesticide spraying (reduction of insect prey base), vegetation conversion and livestock grazing (loss of foraging habitat), and timber harvesting (loss of foraging and roosting habitats) (Pierson *et al.* 1999).

Swift Fox (*Vulpes velox*)

Taxonomy

Class: Mammalia

Order: Carnivora

Family: Canidae

Genus: *Vulpes*

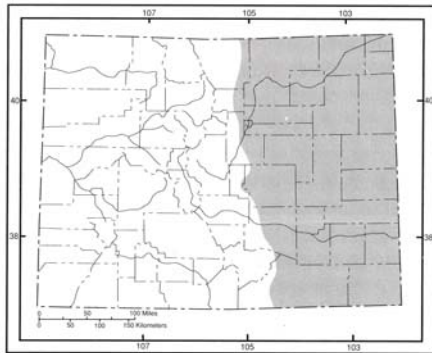
Taxonomic Comments: Some taxonomists consider swift foxes and kit foxes (*Vulpes macrotis*) to be distinct subspecies within a single species which they designate *Vulpes velox*. We follow the more common classification in which these two foxes are regarded as distinct species.

CNHP Ranking: G3 S3

State/Federal Status: Forest Service sensitive; species of special concern (Colorado).



Photo by J. P. Gionfriddo



Swift fox distribution in Colorado
(from Fitzgerald *et al.* 1994)

Habitat Comments: Swift foxes inhabit shortgrass, midgrass, and mixed-grass prairies, where they prefer well-drained, friable soils (Bee *et al.* 1981, Nowak 1999). Dens are excavated on slopes, ridges, or flat areas that afford good views of surrounding lands (Fitzgerald *et al.* 1994).

Distribution: Swift foxes formerly occurred throughout the Great Plains from Canada to Texas. Populations were severely depleted from the 1830s through the 1950s. Swift fox numbers remain very low throughout the northern portion of the species' former range. In Colorado, swift foxes inhabit the eastern third of the state, where they live in low densities on areas of native shortgrass prairie (Fitzgerald *et al.* 1994).

Important Life History Characteristics: The basic social unit in swift foxes consists of the mated pair (which remain together year-round and may mate for life) and their young (Nowak 1999). Occasionally a male may mate and live with two adult females. Young swift foxes are born in March or early April and remain with their parents at den sites through late August. This strong, protracted family group association at the den is unique among canids (Kilgore 1969, Hillman and Sharps 1978). Swift foxes use dens throughout the year (Egoscue 1979) and have been characterized as the most subterranean (burrow dependent) of native North American foxes (Seton 1929). Swift fox dens are important ecological features that provide refuges, breeding sites, and sources of food for a variety of vertebrates and invertebrates (Kilgore 1969).

Known Threats and Management Issues: Swift foxes occupy only 10 percent of their former range (Smeeton 1993, Allardyce 1995). Factors responsible for the reductions in their distribution and population sizes include trapping, hunting, predator and rodent control programs, attacks by unleashed dogs, collisions with automobiles, and habitat loss (Bailey 1926, Kilgore 1969, Hillman and Sharps 1978). Swift foxes are not as cautious as many other canids and so they are trapped and poisoned relatively easily (Egoscue 1979). In southeastern Colorado, predation by coyotes is a major source of mortality of swift foxes (Andersen *et al.* 1998).

Insects

Simius Roadside Skipper (*Amblyscirtes simius*)

Taxonomy

Class: Insecta

Order: Lepidoptera

Family: HesperIIDae

Genus: *Amblyscirtes*

Taxonomic Comments: No subspecies reported for this species (Miller and Brown 1981). May belong in a separate genus because of mating habits and genitalic differences uncharacteristic for the genus *Amblyscirtes* (Scott 1986).

CNHP Ranking: G4 S3

Habitat Comments: Shortgrass and mixed-grass prairie and open pinyon-juniper woodland (Scott 1986). This species occurs in hilly prairie, and there seems to be a correlation with shaley substrates (Stanford pers. comm.). Occurs in shortgrass prairie up to 9,000 feet (2,800m) (Scott 1986, Ferris and Brown 1981).

Distribution: Global range: In shortgrass prairie, ranges from southern Saskatchewan south to Sonora, Mexico, through Montana, Wyoming, Colorado, Arizona, New Mexico, and Texas (Scott 1986, Ferris and Brown 1981). State range: Known from 10 counties in Colorado: Baca, Custer, El Paso, Fremont, Huerfano, Larimer, Otero, Pueblo, Rio Grande, Saguache (Stanford and Opler 1993).

Phenology: In the Rocky Mountain region, the flight period begins in mid-May and continues through July, depending on elevation and latitude (Scott 1986, Ferris and Brown 1981). It is usually uncommon, but may swarm briefly in wetter years (Ferris and Brown 1981). Adults sip nectar of many flowers, including blue beardtongue (*Penstemon* spp.) (Scott 1986). Males are usually active very early and late in the day. In sunny, calm weather, males perch on hilltops and small prairie prominences to await females (Ferris and Brown 1981).

Larval Hostplant: Blue grama (*Bouteloua gracilis*) (Scott 1986).

Known Threats and Management Issues: Existing threats include conversion of habitat for housing developments, mismanagement of grazing regimes, or agricultural use resulting in habitat fragmentation and reduction in good cover of hostplant.

Dusted Skipper (*Atrytonopsis hianna turneri*)

Taxonomy:

Class: Insecta

Order: Lepidoptera

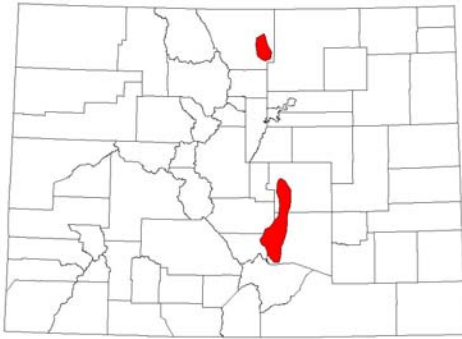
Family: Hesperiidae

Genus: *Atrytonopsis*

Taxonomic Comments: Two subspecies are recognized in North America: *turneri* and *hianna* (Miller and Brown 1981). Subspecies *turneri* occurs in Colorado (Ferris and Brown 1981). Subspecies *hianna* has few or no under-hindwing spots when compared with subspecies *turneri* (Scott 1986).

CNHP Ranking: G4G5 S2

State/Federal Status: None



Statewide distribution of *Atrytonopsis hianna*.

Source: Stanford and Opler 1993

Distribution: Global range: Frequents northeastern North America from Saskatchewan and New England south to Florida and the Ozark Plateau. Several disjunct western populations comprise the Rocky Mountain subspecies. New Mexico records require confirmation (Ferris and Brown 1981). State range: Found in the foothills of the Arkansas headwaters, and in Larimer County (Stanford and Opler 1993). Larimer County populations are apparently peripheral to eastern populations, while Arkansas drainage populations are believed to be disjunct (Scott 1986, Ferris and Brown 1981). Known from five Colorado counties: Custer, El Paso, Fremont, Larimer, Pueblo.

Habitat Comments: Inhabits Transition zone open dry fields, open woodland, and prairie gulches (Scott 1986).

This skipper is found in bluestem grasslands, and often on acid pine or pine-oak barrens or prairies (Pyle 1981). Inhabits relatively undisturbed canyons and open pine woodlands from 5,300 to 7,200 ft (1,615 to 2,195 m). These habitats are subject to fire, and the skipper must either survive burning or be a good colonist (Opler and Krizek 1984, Pyle 1981).

Phenology: In Colorado, it has one brood, with adults flying from May to mid-June. Males perch in flat clearings or gullies, usually on the ground to await females. Adults will nectar on beardtongue (*Penstemon*) species, and on blackberry, strawberry, and clover (Scott 1986).

Larval Hostplants: Big bluestem (*Andropogon gerardii*) and little bluestem (*Schizachyrium scoparium*).

Known Threats and Management Issues: Given its lower Front Range distribution, it may be threatened by increasing development. Fire suppression is changing the character of its Front Range habitat reducing the open shrublands and woodlands preferred by this species.

Colorado Blue (*Euphilotes rita coloradensis*)

Taxonomy

Class: Insecta

Order: Lepidoptera

Family: Lycaenidae

Genus: *Euphilotes*

Taxonomic Comments: There are four recognized subspecies in North America: *rita*, *coloradensis*, *spaldingi*, and *mattoni* (Miller and Brown 1981).

CNHP Ranking: G3G4T2T3 S2

Habitat Comments: This subspecies is encountered in Upper Sonoran Desert and plateau country and in undisturbed prairies from 5,000 to 7,000 feet in elevation (1,524 to 2,133 m) (Ferris and Brown 1981). Found in undisturbed prairie sites where the food plant, bushy eriogonum, (*Eriogonum effusum*) grows abundantly (Stanford pers. comm.). Habitats require light to moderate grazing by wildlife or cattle.

Distribution: Global range: The buckwheat blue, *Euphilotes rita* is distributed exclusively in the southwestern United States, from the Mojave Desert of southern California to New Mexico and northward from Nevada to Utah, northern New Mexico, and southern Wyoming. State range: Subspecies *coloradensis* distributed from eastern Colorado (east of the divide) north to south-central Wyoming (Scott 1986). Known from 21 counties in Colorado: Adams, Alamosa, Arapahoe, Chaffee, Cheyenne, Costilla, Custer, Denver, Douglas, El Paso, Elbert, Fremont, Kit Carson, Larimer, Lincoln, Morgan, Prowers, Rio Grande, Saguache, Washington, Weld (Stanford and Opler 1993).

Phenology: One flight, mostly August (Scott 1986). Brood coincides with blooming of hostplant. Adults nectar exclusively on larval hostplant and are most easily encountered there (Stanford pers. comm.).

Larval Hostplant: Bushy eriogonum (*Eriogonum effusum*).

Known Threats and Management Issues: Threats to habitat include cropland conversion of prairie habitat, removal of grazing regimes, weedy invasions, and suburban development, all resulting in habitat fragmentation. Grazing levels need to be determined to maintain habitat quality.

Rhesus skipper (*Polites rhesus*)

Taxonomy:

Class: Insecta

Order: Lepidoptera

Family: HesperIIDae

Genus: *Polites*

Taxonomic Comments: No subspecies reported (Brown and Miller 1981). Examination of genitalic characteristics indicate that this species, and its sister species *P. carus*, should be included in the genus *Polites*. This moves both species of the genus *Yvretta* to *Polites*, thus creating the *Yvretta* group within the genus *Polites* (Burns 1994).

CNHP Ranking: G4S2S3

Habitat Comments: Upper Sonoran to lower Canadian zone shortgrass and mixed-grass prairie habitats (Scott 1986); records from 3,800 to 9,300 feet (1,150 to 2,850 m) (Ferris and Brown 1981).

Distribution: Global range: In shortgrass prairie, this species ranges from southern Canada (Saskatchewan and Alberta) in a fairly narrow strip through the western Great Plains and southern Rocky Mountains of the United States (Stanford and Opler 1993), to the high mountains of Central Mexico (Burns 1994). State Range: Known from 20 counties in Colorado: Alamosa, Arapahoe, Baca, Chaffee, Custer, Denver, Douglas, El Paso, Elbert, Fremont, Huerfano, Jefferson, Larimer, Las Animas, Morgan, Park, Pueblo, Saguache, Weld, Yuma (Stanford and Opler 1993).

Phenology: One flight, mostly May, and late-May to mid-June at higher altitudes (Scott 1986); mid-June in South Park (Ferris and Brown 1981). Rare in most years, but in wet seasons it may swarm over prairies and congregate on blossoms of prostrate milk vetch (*Astragalus* spp.) species (Ferris and Brown 1981). Males will perch during sunny warm mornings on hilltops to await females. Adults will sip nectar of flowers, especially Drummond's milkvetch (*A. drummondii*) (Scott 1986).

Larval Hostplant: Blue grama (*Bouteloua gracilis*).

Known Threats and Management Issues: Existing threats are: fragmentation of habitat by conversion to agricultural use, or by mismanagement of grazing regimes, possibly reducing cover of hostplant.

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