



**Survey of Critical Biological Resources: a resurvey and update
of Potential Conservation Areas in
Garfield County, Colorado**

2016



**WARNER COLLEGE OF
Natural Resources**



Colorado State University

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Prepared for:

Garfield County Board of County Commissioners

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Cover photo: Habitat for *DeBeque milkvetch*, west of Rifle, Garfield County; by Delia G. Malone.

EXECUTIVE SUMMARY

In 2015, Garfield County contracted with Colorado State University and the Colorado Natural Heritage Program (CNHP) to update previous biological surveys that had been conducted by CNHP in Garfield County with funding provided by Garfield County.

Our goal was to resurvey and update a subset of previously delineated Potential Conservation Areas (PCAs). Those sites selected for resurvey were targeted by biological significance (presence of rare species) or by the value of ecosystem services that the PCA provided to wildlife and human culture (water storage and cleansing by stream and riparian habitat), or by the potential of the site to be inundated with noxious weed species.

Our objective was to provide county decision makers and managers with the most up to date information regarding the condition of some of the most valuable natural biological resources in Garfield County, and the stressors that may be diminishing their value. This report provides Garfield County additional tools with which to prioritize management and guide sustainable development in the county.

Results of these recent surveys present a varied picture of the condition of the county's natural resources. While the ecological condition of some sites is functional, other sites have been subjected to increasing stresses such as noxious weed invasion or incompatible livestock grazing and are undergoing ecological decline. Restoration of ecosystem processes and functions will enable both the maintenance of Garfield County's wealth of natural resources, including those rare plant and animal species that are unique to Garfield County, and the ecosystem services that sustain the county's human population.

Recent work by CNHP and others to develop Best Management Practices (BMPs) that protect native plant and animal species while enabling essential development-related activities to continue are important in maintaining sustainable populations of native plants and animals. Examples include BMPs to Reduce the Impacts of Road Maintenance Activities to Plants of Concern (Panjabi and Smith 2014) and BMPs for Managing Noxious Weeds on Sites with Rare Plants (Mui and Panjabi 2016). Results of this survey can be used to prioritize sites for protection, restoration or management and, with BMPs, develop a management plan that protects natural resources while enabling human development.

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This project was conceived by Steve Anthony of Garfield County and enabled by Amy Greenwell and Michael Menefee at the CNHP, with whose efforts the knowledge and conservation of our natural heritage is greatly enhanced. This project would not have been successful without the help of many dedicated individuals at CNHP, including Sierra Crumbaker, who processed and reviewed data and provided their knowledge and expertise. Thank you.

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COLORADO'S NATURAL HERITAGE PROGRAM

The Colorado Natural Heritage Program's mission is to preserve the natural diversity of life by contributing the essential scientific foundation that leads to lasting conservation of Colorado's biological wealth. The Colorado Natural Heritage Program is the state's primary comprehensive biological diversity data center, gathering information and field observations to help develop statewide conservation priorities – priorities to enable the long-term sustainability of the natural systems upon which human culture depends.

INTRODUCTION

In 2015-2016, the Colorado Natural Heritage Program (CNHP) conducted surveys of both critical biological resources, defined as rare plants and animals and plant communities tracked by CNHP, and noxious weeds in Garfield County. Previous biological surveys were conducted in 2001 (Lyon et al. 2001). However, since that time many new development pressures have arisen from both energy and exurban growth. These types of development can foster the introduction and spread of noxious weeds, initiating a desire to resurvey many areas of the county and to survey for the first time sites which were not previously visited.

Surveys conducted in 2015-2016 assessed the current condition and threats to rare plant and animal species and natural communities within the county, and documented new species and plant community occurrences of global, statewide or local conservation significance that were not previously observed. Additionally, noxious weed species that were encroaching into rare plant or animal habitat or into riparian habitat were documented, mapped and prioritized for treatment.

From the saltbush desert shrublands in the west to the subalpine peaks in the Flattops and the shale cliffs and mesas of the Plateau region, Garfield County's diverse topography provides the setting for a rich and abundant variety of native plants and animals. These native plant and animal species provide humans with important ecosystem services from pollination to water purification and carbon sequestration. Protecting or restoring the county's natural communities with their full suite of species in their natural richness and abundance is essential in sustaining the ecosystem services and aesthetics upon which humans depend.

This resurvey and update of Critical Biological Resources in Garfield County provides land managers a valuable, up to date tool for land use planning that enables a proactive approach to development and conservation.

PROJECT BACKGROUND

Garfield County encompasses two biomes, the Colorado Plateau biome in the western half of the county and the Southern Rocky Mountain biome in the eastern half of the county. The complex geology, steep elevational gradient and variable topography that characterize these two biomes create a landscape template that provides for the development of a rich array of plant communities and consequent high diversity of plant and animal communities.

Plant community type is determined by two primary factors: soil and climate. Because both soils and climate are highly variable and complex in Garfield County, the pattern and diversity of plant communities on the landscape are equally as diverse and complex. Ten general upland vegetation types occur in Garfield County. In order of ascending elevation, they include: salt desert shrublands, shale barrens, sagebrush shrublands, pinyon-juniper woodlands, mixed mountain shrublands, mountain and foothill grasslands, aspen forests, Douglas-fir forests, spruce-fir forests, and alpine tundra. Riparian (streamside) vegetation occurs at all elevation but varies with regard to species composition. Additionally, natural vegetation has been converted into agricultural fields for both dryland and irrigated farming use.

Table 1. Conservation status of Colorado's rredominate habitats.

System Name	Conservation Status
Alpine Tundra	Effectively conserved
Aspen	Moderately conserved
Foothill Shrubland	Weakly conserved
Grasslands	Weakly conserved
Greasewood	Under conserved
Juniper	Weakly conserved
Lodgepole Pine	Moderately conserved
Mixed Conifer	Moderately conserved
Oak & Mixed Mtn Shrub	Weakly conserved
Pinyon Juniper - CO PL	Weakly conserved
Pinyon Juniper - SRM	Moderately conserved
Ponderosa Pine	Weakly conserved
Sagebrush	Weakly conserved
Salt Shrub	Weakly conserved
Sand Sage	Under conserved
Shortgrass Prairie	Under conserved
Shrub-Steppe	Moderately conserved
Spruce Fir	Effectively conserved

An analysis of the status of Colorado's ecological systems, at risk animals and rare plants showed that while Colorado's dominant ecological systems are still largely intact, many of them are threatened and/or not well protected (Rondeau et al. 2011). Table 1 from the assessment summarizes the results regarding the status of Colorado ecosystems that were analyzed. Ten of these ecosystems occur in Garfield County: alpine tundra, aspen, foothill shrublands, mixed conifer, oak and mixed mountain shrublands, pinyon juniper, sagebrush, salt shrublands and spruce-fir. Of these, two are effectively conserved. The analysis indicates both great risks but also great opportunities for conserving functioning landscapes in Garfield County.

POTENTIAL CONSERVATION AREAS IN GARFIELD COUNTY, COLORADO

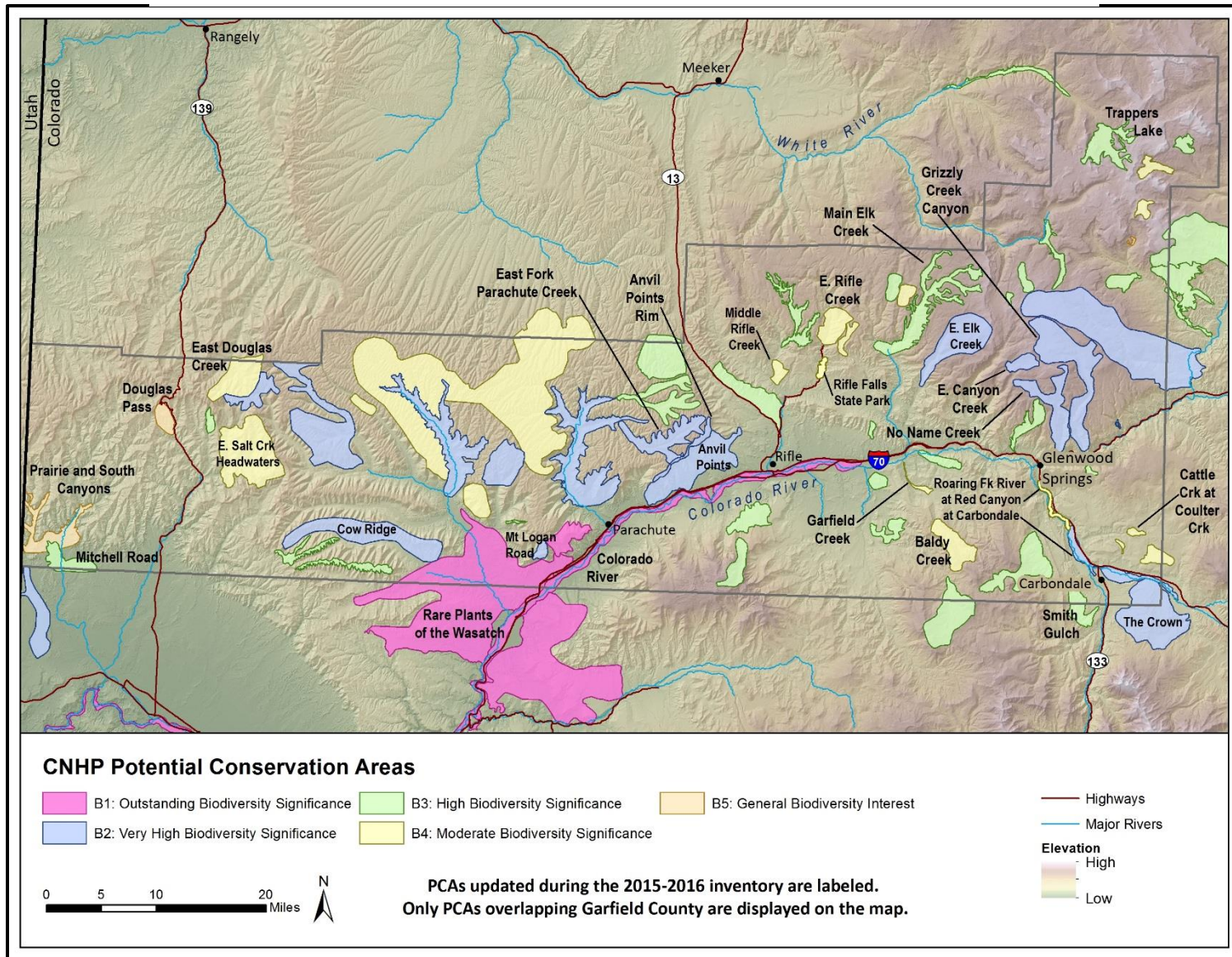


Figure 1: Potential Conservation Areas (PCAs) delineated from the biological surveys conducted in 2000-2001. In 2015-2016 re-surveys were conducted at the labeled PCAs. Each PCA is assigned a rank according to its biodiversity significance.

CONSERVATION ASSESSMENT

THE VALUE OF BIOLOGICAL DIVERSITY

Protecting biological diversity has become an important management issue for many natural resource professionals. Biological diversity at its most basic level includes the full range of species on earth, from unicellular bacteria and protists through multicellular plants, animals, and fungi. At finer levels of organization, biological diversity includes the genetic variation within species, both among geographically separated populations and among individuals within a single population. On a wider scale, diversity includes variations in the biological communities in which species live, the ecosystems in which communities exist, and the interactions among these levels. All levels are necessary for the continued survival of species and plant communities, and all are important for the well-being of humans.

Life's diversity of plants, animals and natural ecosystems in Colorado provides humans with both aesthetic and utilitarian value. Each of the more than 400 species of plants and animals that are found in Garfield County is bestowed with the intrinsic beauty and value of life. When these species are interacting to create functioning ecosystems they also provide humans with essential services that we, even with our technological intelligence, cannot create.

Biological diversity at the genetic level enables species to respond to environmental change, thereby ensuring their long-term survival. Garfield County contains several extremely rare plant species – examples of the power of genetic diversity to create the evolution of traits that allow a species to survive and even thrive in environmentally extreme conditions.

POTENTIAL THREATS TO BIOLOGICAL DIVERSITY IN GARFIELD COUNTY

General threats that may affect biodiversity on a large, landscape-level scale in Garfield County are summarized below. We understand that the issues discussed below are often important parts of a healthy economy and contribute to the well-being of our society. We mention these general “impacts to biodiversity” with the hope that good planning can minimize the impacts where both intact and critical habitat resides and restore those sites where ecosystem function or diversity have been diminished.

Climate change

Data from the Intergovernmental Panel on Climate Change (IPCC) (Ray et al. 2008) clearly show that Colorado's climate will not be the same as it has been in the past. The IPCC primary conclusions are: temperatures are increasing and will continue to increase; there is uncertainty with regard to precipitation projections; even with no change in precipitation, temperature increases alone will lead to a decline in runoff for most of Colorado's river basins by the mid-21st century; and a warming climate increases the risk to Colorado's water supply even if precipitation remains at historical levels.

Annual average temperatures across Colorado have increased by 2.0°F over the past 30 years. Warmer temperatures are evident for all seasons, and daily high and low temperatures have also increased (Lucas et al. 2014). In contrast, over the period of record, there are no comparable trends in average annual precipitation in Colorado, although snowpack levels have been generally below average since 2000. The decrease in snowpack, along with warming spring temperatures and the effects of increased dust-on-snow have combined to shift the timing of snowmelt and peak runoff from 1-4 weeks earlier (Lucas et al. 2014). Flowering dates for some plant species are over a month earlier than they were a century ago (Munson and Sher 2015). Drought conditions as measured by the Palmer Drought Severity Index also reflect warming temperatures and the recent period of below average precipitation. Reconstructions of droughts in western North America show a number of droughts prior to the instrumental record that were more severe and longer lasting than the worst droughts of the past century (Woodhouse 2004, Stahle et al. 2007, Routson et al. 2011), which illustrates the relatively narrow view of variability provided by the historical record. Both historic and pre-instrumental record droughts have had notable effects on vegetation patterns, and have severely impacted patterns of human habitation and social interaction (Woodhouse 2004, Benson et al. 2007). The possibility of future droughts that greatly exceed the most severe droughts of the past millennia cannot be excluded (Cook et al. 2015).

Impacts of a warming climate on Garfield County's natural resources and consequently human culture will likely be substantial. Developing management plans that respond to impending climate changes by restoring ecosystem resiliency will help ameliorate negative impacts of a warming climate. Understanding vulnerabilities of natural resources to climate change can help prioritize effective responses thereby improving potential for sustaining both natural resources and ecosystem functions.

In Garfield County, ecological systems and species element occurrences were ranked according to an analysis conducted for the Bureau of Land Management by the Colorado Natural Heritage Program. The report, "Climate Change Vulnerability Assessment for Colorado Bureau of Land Management," ranks the vulnerability to climate change of Colorado's ecosystems and plant and animal species (CNHP 2015). The following is excerpted from the Climate Change Vulnerability Analysis for Colorado: "Prolonged drought has been a periodic influence in the western United States, including Colorado. Ecosystems of lower elevations are generally drought tolerant, although species composition within an ecosystem is likely to shift with changing climate patterns. The species that characterize Colorado's ecosystems have varying tolerance to drought, however, it is likely that all species are less resistant to the effects of herbivory, pests, and pathogens when under drought stress. Widespread prevalence of drought stressed trees may provide enhanced conditions for stand-replacing events such as fire or insect outbreak. Ecosystems of higher, wetter elevations have generally been 'climate-limited,' with high fuel loads, but rarely having dry climate conditions suitable for fire spread. Lower, more mesic ecosystems have been characterized as 'fuel-limited,' with conditions frequently suitable for fire, but low fuel loads unless prior years have been wet. With warmer temperatures and more frequent drought, higher elevation forests with abundant fuels may

have increased fire frequency, while lower elevation grassland and shrubland ecosystems become more fuel-limited with reduced biomass production.”

The combined effects of human actions that fragment landscapes, alter natural processes, reduce biodiversity, and degrade environmental quality are likely to reduce the resilience of complex adaptive ecosystems to regime shifts under changing climate conditions (CNHP 2015). The cumulative effects of anthropogenic disturbance in Colorado are due to habitat fragmentation and conversion from agricultural use as well as industrial, residential, resource, and recreational development activities. Restoring ecosystem resilience and mitigating the consequent negative impacts of a warming climate is possible with restoration of system processes, including abiotic processes such as hydrology and biotic processes such as plant productivity and soil development. Prioritizing ecosystem restoration and species protection can be directed by an understanding of the vulnerability of those natural communities and species to climate change. The Climate Change Vulnerability Analysis for Colorado assesses the impact of a warming climate on natural ecosystems and animal and plant species. Vulnerability ranks for rare plant and animal species that occur in Garfield County are provided in Tables 7 and 8 and in summary Table 12.

Ecological system vulnerability

The following climate change vulnerability scoring assumes that ecosystems with higher levels of anthropogenic disturbance are likely to be less resilient to disturbance of any kind under future climate conditions (Decker and Fink 2015). Ecosystem vulnerability to climate change was ranked according to the following criteria. Resulting scores are intended to give a relative, not absolute, indication of the potential impact of future climate conditions on an ecosystem. That is, a “Low” score does not mean that an ecosystem is not vulnerable to climate change, but that the analysis indicates that it may be less vulnerable than those ecosystems with scores of Moderate, High, or Very High. Furthermore, under the scoring system used, “Moderate” is a broad category, and all ecosystems with a Moderate vulnerability rank are not necessarily equally vulnerable) (CNHP 2015).

Very High: Ecosystems have high vulnerability to climate change when exposure and sensitivity are high, and adaptive capacity and resilience are low. Under these circumstances, transformation of the ecosystem is most likely to occur in upcoming decades.

High: High vulnerability to climate change results from combining either high or moderate exposure-sensitivity with low or medium adaptive capacity-resilience. Under either combination, climate change is likely to have noticeable impact.

Moderate: Moderate vulnerability to climate change results from a variety of combinations for exposure-sensitivity and adaptive capacity-resilience. The scoring matrix is slightly weighted toward increased vulnerability in the number of possible combinations which produce a moderate vulnerability ranking. Under circumstances where the two factors are essentially balanced, vulnerability is thought to be reduced, but still of concern.

Low: Low vulnerability to climate change occurs when an ecosystem is expected to experience low exposure and sensitivity in combination with high or moderate adaptive capacity and resilience. For these ecosystems climate change stress and its effects are expected to be least severe or absent.

Plant and animal species' vulnerability

In accordance with well-established practices the NatureServe Climate Change Vulnerability Index divides vulnerability into two components: **exposure** to climate change within the assessment area (e.g., a highly sensitive species will not suffer if the climate where it occurs remains stable); and **sensitivity** of the species to climate change (e.g., an adaptable species will not decline even in the face of significant changes in temperature and/or precipitation). Exposure to climate change is measured by examining the magnitude of predicted temperature and moisture change across the species' distribution within the study area. Sensitivity is assessed using 20 factors divided into two categories: 1) indirect exposure to climate change; and 2) species specific factors (including dispersal ability, temperature and precipitation sensitivity, physical habitat specificity, interspecific interactions, and genetic factors) (CNHP 2015). The six possible scores are:

Extremely Vulnerable: Abundance and/or range extent within geographical area assessed extremely likely to substantially decrease or disappear by 2050.

Highly Vulnerable: Abundance and/or range extent within geographical area assessed likely to decrease significantly by 2050.

Moderately Vulnerable: Abundance and/or range extent within geographical area assessed likely to decrease by 2050.

Not Vulnerable/Presumed Stable: Available evidence does not suggest that abundance and/or range extent within the geographical area assessed will change (increase/decrease) substantially by 2050. Actual range boundaries may change.

Not Vulnerable/Increase Likely: Available evidence suggests that abundance and/or range extent within geographical area assessed is likely to increase by 2050.

Insufficient Evidence: Available information about a species' vulnerability is inadequate to calculate an Index score.

Oil and gas development

Oil and gas development is a major threat to biological diversity in Garfield County, especially the rare plant occurrences. Direct impacts from energy related development activities have resulted in habitat modification and destruction. Direct impacts include loss of surface vegetation, soil damage and loss, due to the removal of soil and vegetation that occurs with the construction of roads, well pads, evaporation ponds, disposal pits and pipelines. These activities result in the direct loss of plants and reduced plant population size with consequent loss of genetic diversity, increased vulnerability to stochastic events and diminished capacity to respond to global climate change.

Indirect impacts that have resulted from oil development activities include: habitat fragmentation, which can also lead to decreased population size and isolation, as well as

reduced migration and colonization (NatureServe 2016); increased dust pollution due to road traffic, which can clog plant pores and interfere with photosynthesis; invasion of noxious weeds such as cheatgrass, which invades areas in response to disturbance, outcompetes native plants and increases the potential for catastrophic fire; and loss of pollinator habitat with resulting reduction in pollinator diversity and reduced pollination which can then reduce plant reproductive success and genetic variability (USFWS 2013).

Livestock grazing

Domestic livestock grazing is a traditional livelihood in Garfield County that has left a broad and often negative impact on the landscape. For some natural communities, properly managed grazing can be a compatible activity. However, in others, livestock grazing can adversely affect the area's biological resources. Many riparian areas in Garfield County are included in rangeland and grazing allotments, especially at lower elevations in the county. Livestock tend to congregate near wetland and riparian areas for shade, lush browse, and access to water. Long-term livestock use of wetland and riparian areas can potentially erode stream banks, cause streams to downcut or spread out of an established channel causing additional erosion, 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 and introduction of non-native forage species). Inappropriate livestock grazing is also detrimental to sage grouse by reducing nesting cover and decreasing the insect food source for chicks. However, appropriately managed livestock grazing can be compatible with the region's biodiversity.

Hydrologic alteration

River impoundment in the form of lakes, reservoirs, irrigation ditches or canals can affect aquatic dependent plants and animals (Chien 1985). Annual flooding is a natural ecological process that has been severely altered by the construction of dams, reservoirs, and other water diversions. These actions have altered the normal high peak flows that were once a part of the natural hydrological regime of many large tributaries of the Colorado River and many of their smaller tributaries. These natural flows are necessary for continued viability of most riparian vegetation. For example, many plants, such as cottonwood trees, can only reproduce with flooding events (Rood & J.M. Mahoney 1993). As plant composition changes in response to alterations in the flooding regime, the composition of the aquatic and terrestrial fauna may also change.

In addition to river impoundment, rivers have been altered by stream bank stabilization projects (i.e., channelization) (Rosgen 1996). 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 (e.g., point bars are required for cottonwood and 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 has 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. The growth of irrigated agriculture in Garfield County inadvertently created many new wetlands in areas where wetlands never existed. For example, seepage from hundreds of miles of unlined canals and earthen ditches and much of the water applied in irrigation contributes to groundwater and surface water runoff. As a result, many areas have developed wetland characteristics where none existed prior to irrigation. Conversely, many historical wetlands, such as seeps and springs, have been lost or altered due to water “development” projects, such as water diversions and impoundments, to create stock ponds. Thus, as the quality and extent of historical wetlands diminished, some of the habitat loss was offset by irrigation-induced wetlands. It is debatable whether the biological diversity significance of an integrated network of river bottom wetlands, sinuous marshy streams, and extensive saline meadows and shrublands can be equated to the dispersed pattern of irrigation-induced wetlands across an agricultural landscape. However, in addition to providing valuable wildlife habitat, irrigation-induced wetlands may be acting to remove nitrate, pesticides, and sediments from agricultural tail waters before entering major rivers and local aquifers.

Gravel Mining

Gravel mining along the Colorado River has become a big industry in Garfield County and generally occurs in one of the most critical and sensitive habitats: the riparian habitat near urban areas. Gravel is a fluvial deposit, therefore most gravel occurs in the floodplains of rivers and streams and must be mined where it occurs. Consequently, the gravel mining operation destroys whatever biological integrity the river bottom has at that location (Heifner no date).

Impacts to both terrestrial and aquatic wildlife from gravel mining is severe. When a given number of acres of terrestrial habitat to which existing communities are fairly well adapted are converted to aquatic habitat, a loss to adapted communities occurs. The gain in aquatic habitat hardly offsets the loss of terrestrial habitat. Locally, very severe displacements occur to terrestrial species. These displacements place stress on adjacent lands. It may be conceivable that the opening of new gravel pits should be done at a time when such displacements are at a minimum. If this were done when migratory species were not nesting, the disruption might be somewhat mitigated (Heifner no date).

Recreation

Recreation, once very local and perhaps even unnoticeable, is increasing and becoming a threat to natural ecosystems in Garfield County. Different types of recreation (e.g., motorized versus non-motorized activities) typically have different effects on ecosystem processes. ATVs can disrupt migration and breeding patterns, and fragment habitat for native resident species. This

activity can also threaten rare plants found in forested and non-forested areas. ATVs have also been identified as a vector for the invasion of non-native plant species and a cause of soil erosion with resulting smothering of vegetation and excessive stream sedimentation.

Non-motorized recreation, mostly hiking but also some horseback riding, mountain biking and rock climbing, presents a different set of issues (Knight and Cole 1991; Miller et al. 1998). Wildlife behavior can be significantly altered by repeat visits of hikers, horseback riders, or bicyclists. Trail placement should consider the range of potential impacts on the ecosystem. Considerations include minimizing fragmentation by leaving large undisturbed areas of wildlife habitat where possible (CDNR 1998). Miller et al. (1998) found lower nest survival for ground-nesting birds adjacent to trails; they also found that ground-nesting birds were more likely to nest away from trails with a zone of influence approximating 250 feet (75 meters). Alpine areas, mountain lakes, and riparian zones are routes and destinations for many established trails; impacts to native vegetation (mainly trampling) in these areas can be high.

Residential development

Residential development is a localized but increasing threat in Garfield County, especially along the I-70 corridor and along the Roaring Fork River between Carbondale and Glenwood Springs. Development creates a number of stresses, including habitat loss and fragmentation, introduction of non-native species, fire suppression, and domestic animals (dogs and cats) (Oxley et al. 1974; Coleman and Temple 1994). Habitat alteration to residential development is generally irreversible and should therefore be directed to areas with less biological significance. Development often tends to occur adjacent to watercourses, wetland and riparian habitats, which are highly susceptible to development impacts. Establishing riparian setbacks that maintain native vegetation and riparian functions is important to maintaining stream habitat and water quality and quantity.

Fragmentation and edge effects

Edges are simply the outer boundary of an ecosystem that abruptly grades into another type of habitat, such as the edge of a Gambel oak shrubland adjacent to grassland. Edges are often created by naturally occurring processes such as floods, fires, and wind. Edges can also be created by human activities such as roads, trails, 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 in areas that may have had few “natural” edges. 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 birds).

Non-native species

Invasion of non-native and aggressive species and their displacement of native species is one of the biggest threats to Garfield County's natural diversity. Non-native plants or animals can have wide-ranging impacts. Non-native plants can increase dramatically under the right conditions and dominate a previously natural area (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 (James 1993; D'Antonio and Vitousek 1992). Although complete eradication of non-native aggressive species is not possible, some control efforts can pay off. Regarding non-native invasive plant species, one important guideline is that when a plant is removed, something will take its place; that is, "ecological voids do not exist" (Young 1981). Simply killing aggressive non-native plant species, unless there is a seed source for desirable replacements, will result in more unwanted species, perhaps even more noxious than those removed. Seeding of desirable, native plant species is usually necessary. When seeding, it is important to consider seedbed characteristics including rock cover, and the potential of the soil to support the planted species. A first step is to assess the current vegetation, in relation to the potential of the site. One approach is to experiment on a small scale to determine the potential success of a weed control/seeding project, using native plant species. Ideally, seed should be harvested locally. A mixture of native grasses and forbs is desirable, so that each species may succeed in the microhabitat for which it is best suited. In general, lower elevations of the county are more affected by non-native and aggressive plant species than higher elevations, and level valley bottoms more than steep slopes.

METHODS

A priority targeted survey list was compiled in collaboration with Garfield County, Bureau of Land Management and United States Forest Service staff, and private groups and citizens. CNHP records and databases of Garfield County were consulted, including existing records of element occurrences (EOs) and Potential Conservation Areas (PCAs). Areas likely to harbor new occurrences were identified prior to surveys using topographic maps, aerial imagery, and geologic maps. Maps were then developed to guide on-the-ground surveys. The following summarizes survey and assessment methods.

- 1. Collected Available Information:** CNHP databases were updated with information regarding the known locations of species and significant plant associations within Garfield County. Additional information was gathered from knowledgeable sources, including BLM and USFS biologists, to help locate additional occurrences of Natural Heritage Elements.
- 2. Identify Targeted Inventory Areas:** Using available information, survey sites were chosen based on 1) their historic CNHP ranking and known element occurrence locations, 2) potential of harboring rare or imperiled species or significant plant communities, 3) potential for high natural values, and 4) potential for noxious weed invasion.

3. **Known locations were prioritized:** Biological urgency (the most rare or imperiled) and potential population viability of the elements (degree of threat) were primary parameters used to prioritize surveys.
4. **Landowner Contacts:** Once survey sites were chosen, land ownership of these areas was determined. Landowners were then contacted either by phone, mail or in person. If landowners could not be contacted, or if permission to access the property was denied, this was recorded and the site was not visited. Under no circumstances were properties surveyed without landowner permission.
5. **Conduct Field Surveys and Gather Data:** Field surveys were conducted in the spring and summer of 2015 and 2016 at time periods that corresponded to the flowering phenology of rare plant species or as dictated by the phenology or breeding season of animal species. It is essential that surveys take place during a time when the targeted elements are detectable. For instance, breeding birds cannot be surveyed outside of the breeding season and plants are often not identifiable without flowers or fruit which are only present during certain times of the season. Many of the plants in the western parts of Garfield County have extremely short flowering seasons and all but disappear by mid-summer. May and June are the prime survey times for most of these species. The methods used in the surveys vary according to the elements that are targeted. In most cases, the appropriate habitats were visually searched in a systematic fashion that attempted to cover the area as thoroughly as possible in the given time. Some classes of organisms require special techniques to document their presence. These techniques are summarized below:
 - **Plant communities:** visual, collect qualitative or quantitative composition data.
 - **Amphibians:** visual or with aquatic nets.
 - **Birds:** visual or by song/call, evidence of breeding sought.
 - **Insects:** aerial net, pit fall traps, moth lighting.
 - **Fishes:** electroshocking, seining, barbless fly-fishing, observation.
 - **Wetland plant communities:** visual, collect qualitative or quantitative composition, soil, and hydrological function and value data. Specific wetland fen survey protocol is detailed below.

ELEMENT OCCURRENCE DISCOVERY

When a rare species or significant plant community was discovered, its precise location and extent was recorded with a global positioning system (GPS) unit. Other data recorded at each occurrence include numbers observed, breeding status, habitat description, disturbance features, observable threats, and potential protection and management needs. The overall significance of each occurrence, relative to others of the same element, was estimated by rating the size of the population or community, the condition or naturalness of the habitat, and the landscape context (its connectivity and its ease or difficulty of protecting) of the occurrence. These factors are combined into an element occurrence rank, useful in refining conservation priorities. See the following section on Natural Heritage Program Methodology for more about element occurrence ranking.

WETLAND FEN SURVEY PROTOCOL

Previous biological surveys in Garfield County did not include surveys of fen wetlands, however because fens have high natural values, time was allotted for surveying potential fen sites. The following methods were used to prioritize and survey fens in Garfield County:

- 1) Potential fens in Garfield County were identified by analysis of digital aerial photography and topographic maps (Malone et al. 2011). Wetlands described as “Palustrine Emergent Saturated” (PEMB) and “Palustrine Scrub-Shrub Saturated” (PSSB) with a confidence level of 3-5 (Malone et al. 2011) were targeted.
- 2) Field surveys of potential fen sites were conducted using the following protocol:
 - a. Potential fen sites were mapped and located with GPS.
 - b. A tile soil probe was used to evaluate depth to mineral/soil/rock interface at several points in the wetland.
 - c. A soil pit was dug at a representative probe depth using a sharpshooter shovel; the pit was dug to the depth of peat or the depth of the shovel—whichever was reached first.
 - d. At each soil pit:
 - i. Depth of peat in the pit was measured.
 - ii. If peat depth was >40cm the site was initially determined to be a fen and the following actions were undertaken:
 - After a minimum “resting period” of one hour, water quality measurements of pour water were collected which included pH, electrical conductivity and temperature.
 - Soil was classified using the Von Post scale of humification.
 - Photograph and UTM location with a GPS of the pit were taken.
 - Fen perimeter was delineated using GPS.
 - Plant communities/species and animal species within the fen perimeter and in surrounding landscape were identified.
 - General environmental information was collected including: slope, aspect, topographic position, hydrology source and flow characteristics, disturbance type, intensity and extent.
 - Fen type was categorized according to hydrologic characteristics.

NATURAL HERITAGE ASSESSMENT

On-site assessment of species’ or community viability and current threats were determined at each occurrence. Element occurrence forms were completed and occurrences were ranked according to the NatureServe system that integrates data on size, condition, and landscape context (NatureServe 2006). The results of the surveys were incorporated into the CNHP BIOTICS database in 2016.

EXOTIC INVASIVE SPECIES ASSESSMENT

Exotic plant invasion is an increasingly serious problem in Colorado. Whenever non-native invasive plant species were encountered their precise location and extent were mapped with a GPS unit and prioritized according to their potential threat to rare plant species or riparian habitat. Prioritization was determined according to whether the weed was encroaching into a

plant, animal, or plant community element occurrence or into riparian habitat (regardless of whether a “tracked” element occurrence was present). Priority ranking was based on the element’s rarity as determined by CNHP state rarity ranking. Thus a weed management priority of “1” indicates that the element being encroached upon has a state rarity rank of “1” and was assigned the highest weed management priority etc. However, weed occurrences that were encroaching into the habitat of a federally listed plant or animal species were designated as priority “1,” regardless of their CNHP State tracking rank.

NATURAL HERITAGE METHODOLOGY

To determine the status of species within Colorado, CNHP gathers information on plants, animals and plant communities. Each of these elements of natural diversity is assigned a rank that indicates its relative degree of imperilment on a five-point scale (for example, 1 = extremely rare/imperiled, 5 = abundant/secure). The primary criterion for ranking elements is the number of occurrences (in other words, the number of known distinct localities or populations). This factor is weighted more heavily than other factors because an element found in one place is more imperiled than something found in twenty-one places. Also of importance are the size of the geographic range, the number of individuals, the trends in both population and distribution, identifiable threats, and the number of protected occurrences. Element imperilment ranks are assigned both in terms of the element's degree of imperilment within Colorado (its State-rank or S-rank) and the element's imperilment over its entire range (its Global-rank or G-rank). Taken together, these two ranks indicate the degree of imperilment of an element. CNHP actively collects, maps, and electronically processes specific occurrence information for animal and plant species considered extremely imperiled to vulnerable in the state (S1 - S3). Several factors, such as rarity, evolutionary distinctiveness and endemism (specificity of habitat requirements), contribute to the conservation priority of each species. Certain species are “watchlisted,” meaning that specific occurrence data are collected and periodically analyzed to determine whether more active tracking is warranted. A complete description of each of the Natural Heritage ranks is provided in Table 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 2, ranks followed by a “B,” for example S1B, indicate that the rank applies only to the status of breeding occurrences. Similarly, ranks followed by an “N,” for example S4N, refer to non-breeding status, typically during migration and winter. Elements without this notation are believed to be year-round residents within the state.

Table 2: Definition of Natural Heritage Imperilment Ranks.

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 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 actual rank of the element falls within that range

LEGAL DESIGNATIONS FOR RARE SPECIES

Natural Heritage imperilment ranks should not be interpreted as legal designations. Although most species protected under state or federal endangered species laws are extremely rare, not all rare species receive legal protection. Legal status is designated by both the U.S. Fish and Wildlife Service under the Endangered Species Act or by the Colorado Division of Wildlife under Colorado Statutes 33-2-105 Article 2. In addition, the U.S. Forest Service recognizes some species as “Sensitive,” as does the Bureau of Land Management. Table 3 defines the special status assigned by these agencies and provides a key to abbreviations used by CNHP.

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

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.

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.

PDL Proposed for delisting.

XN Nonessential experimental population.

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:

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.

4. State Status: The Colorado Division of Wildlife has developed categories of imperilment for non-game species (refer to the Colorado Division of Wildlife's Chapter 10 – Nongame Wildlife of the Wildlife Commission's regulations). The categories being used and the associated CNHP codes are provided below.

E Endangered: those species or subspecies of native wildlife whose prospects for survival or recruitment within this state are in jeopardy, as determined by the Commission.

T Threatened: those species or subspecies of native wildlife which, as determined by the Commission, are not in immediate jeopardy of extinction but are vulnerable because they exist in such small numbers, are so extremely restricted in their range or are experiencing such low recruitment or survival that they may become extinct.

SC Special Concern: those species or subspecies of native wildlife that have been removed from the state threatened or endangered list within the last five years; are proposed for federal listing (or are a federal listing "candidate species") and are not already state listed; have experienced, based on the best available data, a downward trend in numbers or distribution lasting at least five years that may lead to an endangered or threatened status; or are otherwise determined to be vulnerable in Colorado.

ELEMENT OCCURRENCES AND THEIR RANKING

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

Size – a measure of the area or abundance of the element’s occurrence. 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). This factor for an occurrence is evaluated relative to other known and/or presumed viable, examples.

Condition/Quality – an integrated measure of the composition, structure and biotic interactions that characterize the occurrence. This includes measures such as reproduction, age structure, biological composition (such as the presence of exotic versus native species), structure (such as 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 rank and D representing a poor rank. These ranks for each factor are then averaged to determine an appropriate EO rank for the occurrence. If not enough information is available to rank an element occurrence, an EO rank of E is assigned. EO ranks and their definitions are summarized in Table 4.

Table 4. Element Occurrence Ranks and their Definitions.

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).

POTENTIAL CONSERVATION AREAS

In order to successfully protect populations or occurrences CNHP designs 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. PCAs may include a single occurrence of a rare element, or a suite of rare element occurrences or significant features. The PCA is designed 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; and
- 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 any activity. Rather, the boundaries designate ecologically significant areas in which land managers may wish to consider how specific activities or land use changes within or near the PCA affect the natural heritage resources and sensitive species on which the PCA is based. Please note that these boundaries are based on our best estimate of the primary area supporting the long-term survival of targeted species and plant communities. A thorough analysis of the human context and potential stresses has not been conducted. However, CNHP's conservation planning staff is available to assist with these types of analyses where conservation priority and local interest warrant additional research.

Ranking of Potential Conservation Areas

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

Table 5. Colorado 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 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 A- or B-ranked occurrence of a G4 or G5 S1 species (or at least C-ranked if it is the only state, provincial, national, or ecoregional occurrence) Concentration of A- or B-ranked occurrences of G4 or G5 N1-N2, S1-S2 elements (four or more) D-ranked occurrence of a G2 element At least C-ranked occurrence of a disjunct G4 or G5 element Concentration of excellent or good occurrences (A- or B-ranked) of G4 S1 or G5 S1 elements (four or more)
B5	General or State-wide Biological Diversity Significance: Good or marginal occurrence of common community types and globally secure S1 or S2 species.

PROTECTION URGENCY RANKS

Protection urgency ranks (P ranks) refer to the timeframe in which it is recommended that conservation protection occur. In most cases, this rank refers to the need for a major change of protective status (for example agency special area designations or ownership). The urgency for protection rating reflects the need to take legal, political, or other administrative measures to protect the area. Table 6 summarizes the P ranks and their definitions. A protection action involves increasing the current level of protection accorded one or more tracts within a potential conservation area. It may also include activities such as educational or public relations campaigns, or collaborative planning efforts with public or private entities, to minimize adverse impacts to element occurrences at a site. It does not include management actions. Situations that may require a protection action may include the following:

- 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.

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

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

MANAGEMENT URGENCY RANKS

Management urgency ranks (M ranks) indicate the timeframe in which it is recommended that a change occur in management of the 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 PCA. A management action may include biological management (prescribed burning, removal of exotics, mowing, etc.) or people and site management (building barriers, re-routing trails, patrolling for collectors, hunters, or trespassers, etc.). Management action does not include legal, political, or administrative measures taken to protect a PCA. Table 7 summarizes M ranks and their definitions.

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

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

RESULTS

In 2001, biological surveys of Garfield County conducted by CNHP confirmed that Garfield County contains areas with high biological significance (Lyon et al. 2001). These surveys documented the presence of a total of 677 total element occurrences in 73 Potential Conservation Areas. These element occurrences included extremely rare plants and animals that survive only in Garfield County as well as the presence of numerous rare natural communities.

In 2015-2016, CNHP conducted resurveys of 27 of the PCAs that were delineated in 2001. These biological surveys resulted in the delineation of *three new PCAs* and the discovery of 76 new element occurrences. New element occurrences included 18 plant community occurrences, nine vascular plant and 15 animal element occurrences. Table 10 provides a summary of the updates to those PCAs that were resurveyed and rank changes and threats to those PCAs. Appendix 1 lists all of the element occurrences that were surveyed in 2015-2016 as well as new occurrences that were identified during those surveys. A synopsis of updated results for each resurveyed PCA and new PCA are provided below. Full text of updates and new PCA results are provided in Appendix 2.

Several element occurrences not previously known from Garfield County were discovered during these resurveys including both plant and animal species occurrences. Plant species newly documented in Garfield County included Sego cisco lily, good-neighbor bladderpod, mud sedge, and least moonwort. Animal species newly documented in Garfield County included Western yellow-billed cuckoo and northern pygmy owl. Table 8 provides a list of rare plants in Garfield County including those newly documented in the county, and Table 9 provides a list of rare animal species in Garfield County including those newly documented in the county along with their climate change vulnerability rank.

Table 8. Rare plants of Garfield County. Their global and state rank, agency status, and climate change vulnerability rating. Rating of ND = no data available for Garfield County.

ELEMENT	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL/ STATE STATUS	CLIMATE CHANGE VULNERABILITY RATING
<i>Allium nevadense</i>	Nevada onion	G4	S2		ND
<i>Argilochloa dasyclada</i>	Utah fescue	G3	S3		ND
<i>Asplenium trichomanes-ramosum</i>	Green spleenwort	G4	S1S2		ND
<i>Astragalus argophyllus</i> var. <i>martinii</i>	Meadow milkvetch	G5T4	S1		ND
<i>Astragalus debequaeus</i>	Debeque milkvetch	G2	S2	BLM	Extremely vulnerable
<i>Astragalus naturitensis</i>	Naturita milkvetch	G3	S3		Extremely vulnerable
<i>Astragalus wetherillii</i>	Wetherill milkvetch	G3	S3		ND
<i>Carex diandra</i>	Lesser panicled sedge	G5	S1		ND
<i>Ceanothus martinii</i>	Utah mountain lilac	G4	S1		ND
<i>Cypripedium calceolus</i> ssp. <i>parviflorum</i>	Yellow lady's-slipper	G5	S2		ND
<i>Draba spectabilis</i>	Draba	G3?T3Q	S3		ND
<i>Eriogonum contortum</i>	Grand buckwheat	G3	S2	BLM	Extremely vulnerable
<i>Iliamna grandiflora</i>	Large-flower globe- mallow	G3?Q	S1		ND
<i>Lesquerella parviflora</i>	Piceance bladderpod	G2G3	S2S3		Extremely vulnerable
<i>Limnorchis ensifolia</i>	Canyon bog-orchid	G4G5T3?	S3		ND
<i>Listera borealis</i>	Northern twayblade	G4	S2	BLM	ND
<i>Monardella odoratissima</i>	Mountain wild mint	G4G5	S2		ND
<i>Nuttallia rhizomata</i>	Roan-cliffs blazing star	G2	S2		Extremely vulnerable
<i>Oreocarya cana</i>	Mountain cat's-eye	G5	S2		ND
<i>Oreocarya mensana</i>	Carbon cryptanth	G3	S1		ND
<i>Pellaea atropurpurea</i>	Purple cliff-brake	G5	S2S3		ND
<i>Pellaea breweri</i>	Brewer's cliff-brake	G5	S2		ND
<i>Pellaea suksdorfiana</i>	Smooth cliff-brake	G5T4?	S2		ND
<i>Penstemon debilis</i>	Parachute penstemon	G1	S1	C	Extremely vulnerable
<i>Penstemon harringtonii</i>	Harrington beardtongue	G3	S3	FS/BLM	Extremely vulnerable
<i>Phacelia submutica</i>	DeBeque phacelia	G4T2	S2	C/FS/BLM	Extremely vulnerable
<i>Sclerocactus glaucus</i>	Uinta basin hookless cactus	G3	S3	LT	Extremely vulnerable
<i>Sullivantia hapemanii</i> var. <i>purpusii</i>	Hanging garden sullivantia	G3T3	S3	FS	ND

ELEMENT	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL/ STATE STATUS	CLIMATE CHANGE VULNERABILITY RATING
<i>Thalictrum heliophilum</i>	Sun-loving meadowrue	G3	S3		Extremely vulnerable
RARE PLANT SPECIES NEWLY DOCUMENTED IN GARFIELD COUNTY 2015					
<i>Calochortus ciscoensis</i>	Sego cisco lily	G2	S1		ND
<i>Physaria vicina</i>	Good-neighbor bladderpod	G2	S2		Extremely vulnerable
<i>Carex limosa</i>	Mud sedge	G5	S2		ND
<i>Botrychium simplex</i>	Least moonwort	G5	S2		ND

FS = U.S. Forest Service sensitive; BLM = Bureau of Land Management sensitive species; LT = Threatened U.S. Fish and Wildlife Service; LE = Endangered USFWS; C = Candidate for Federal Listing USFWS.

Table 9. Rare animals of Garfield County. Their global and state rank, agency status, and climate change vulnerability rating. Rating of ND = no data available for Garfield County.

ELEMENT	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL/STATE STATUS	CLIMATE CHANGE VULNERABILITY
<i>Accipiter gentilis</i>	Northern Goshawk	G5	S3B,SZN		Moderately vulnerable
<i>Aegolius funereus</i>	Boreal Owl	G5	S2		ND
<i>Amphispiza belli</i>	Sage Sparrow	G5	S3B,SZN	(PS)	ND
<i>Bucephala islandica</i>	Barrow's Goldeneye	G5	S2B,SZN		ND
<i>Buteo regalis</i>	Ferruginous Hawk	G4	S3B,S4N		ND
<i>Centrocercus urophasianus</i>	Sage Grouse	G5	S4	BLM/CO- SC	Highly vulnerable
<i>Cypseloides niger</i>	Black Swift	G4	S3B		Presumed stable
<i>Falco peregrinus anatum</i>	American Peregrine Falcon	G4T3	S2B,SZN	LE-PDL	Presumed stable
<i>Grus canadensis tabida</i>	Greater Sandhill Crane	G5T4	S2B,S4N		ND
<i>Haliaeetus leucocephalus</i>	Bald Eagle	G4T?Q	S1B,S3N	LT	ND
<i>Plegadis chihi</i>	White-Faced Ibis	G5	S2B,SZN		Moderately vulnerable
<i>Tympanuchus phasianellus columbianus</i>	Columbian Sharp- Tailed Grouse	G4T3	S2		ND
<i>Vireo vicinior</i>	Gray Vireo	G4	S2B,SZN		ND
RARE BIRD SPECIES NEWLY DOCUMENTED IN GARFIELD COUNTY IN 2015					
Western yellow-	<i>Coccyzus americanus</i>	G5T3Q	S1B	Threatened	Moderately

ELEMENT	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL/STATE STATUS	CLIMATE CHANGE VULNERABILITY
bellied cuckoo	<i>occidentalis</i>				vulnerable
Northern pygmy owl	<i>Glaucidium gnoma</i>	G4G5	S3B		ND
FISH					
<i>Catostomus latipinnis</i>	Flannelmouth sucker	G3G4	S3	BLM	ND
<i>Gila robusta</i>	Roundtail chub	G2G3	S2		Highly vulnerable
<i>Oncorhynchus clarki pleuriticus</i>	Colorado River cutthroat trout	G4T3	S3		Extremely vulnerable
<i>Prosopium williamsoni</i>	Mountain whitefish	G5	S3		ND
<i>Xyrauchen texanus</i>	Razorback sucker	G1	S1	LE/CO-E	Highly vulnerable
REPTILES AND AMPHIBIANS					
<i>Bufo boreas pop 1</i>	Boreal toad (Southern Rocky Mountain population)	G4T1Q	S1	C/CO-E	Highly vulnerable
<i>Cnemidophorus velox</i>	Plateau striped whiptail	G5	S4		ND
<i>Coluber constrictor mormon</i>	Western yellowbelly racer	G5T5	S3		ND
<i>Gambelia wislizenii</i>	Longnose Leopard Lizard	G5	S1		Presumed stable
<i>Crotalus viridis concolor</i>	Midget faded rattlesnake	G5T4	S3?		Highly vulnerable
<i>Rana pipiens</i>	Northern leopard frog	G5	S3		Moderately vulnerable
<i>Spea intermontana</i>	Great Basin spadefoot	G5	S3		Presumed stable
<i>Urosaurus ornatus</i>	Tree lizard	G5	S4		ND
MAMMALS					
<i>Cynomys leucurus</i>	White-tailed prairie dog	G4	S4		Presumed stable
<i>Euderma maculata</i>	Spotted bat	G4	S2	FS, BLM	ND
<i>Gulo gulo</i>	Wolverine	G4	S1		ND
<i>Lynx canadensis</i>	Lynx G5 S1	G5	S1	(PS)	ND
<i>Corynorhinus townsendii pallescens</i>	Pale lump -nose bat subsp	G4T4	S2		Presumed stable
<i>Vulpes macrotis</i>	Kit fox	G4	S1	CO-E	ND
INVERTEBRATES					
<i>Erebia theano</i>	Theano Alpine	G4	S3		ND

Table 10. Summary of ranking and threat update from resurveys of 28 PCAS selected for resurvey and three new PCAs.

POTENTIAL CONSERVATION AREA RANKS and ASSOCIATED ECOSYSTEMS					THREATS								
POTENTIAL CONSERVATION AREA	B-RANK: Previous (P) Current (C)	P-RANK: Previous (P) Current (C)	M-RANK: Previous (P) Current (C)	ECOSYSTEM(S) ASSOCIATED WITH PCA	CLIMATE CHANGE VULNERABILITY	Hydrologic Modification	Residential Development	Oil and Gas Development	Incompatible Grazing	Recreation	Roads	Exotic Plant Species	Agricultural Habitat Conversion
						Infiltration alteration Dams/Diversions			Vegetation Alteration Soil Degradation		Fragmentation , Erosion Hydrologic Modification		
Anvil Points Rim	P - B2	P - P2	P - M2	Sage shrubland;	Low					X	X		
	C - B2	C - P2	C - M2	Montane grassland.	Moderate								
Anvil Points	P - B2	P - P2	P - M2	P-J woodlands	High	X		X	X			X	
	C - B2	C - P2	C - M2	Desert shrub	Moderate								
Barrel Spring Point	P - B2	P - P3	P - M3	Sage shrubland	Low			X	X		X	X	
	C - B2	C - P2	C - M2	Desert shrub.	Moderate								
Cattle Creek at Coulter Creek	P - B4	P - P2	P - M1	Riparian Woodland	Low	X	X				X	X	
	C - B4	C - P2	C - M1	(Mountain)									
Colorado River	P - B1	P - P2	P - M2	Riparian Forest	Very high	X	X		X		X	X	X
	C - B1	C - P2	C - M2	(Western)									
Cow Ridge	P - B2	P - P3	P - M4	Sage shrubland;	Low	X			X			X	
	C - B2	C - P3	C - M3	Desert shrub	Moderate								
Douglas Pass	P - B4	P - P3	P - M3	Mixed Conifer Forest	Moderate	X			X		X	X	
	C - B5	C - P1	C - M1	Oak Shrubland	Low								

POTENTIAL CONSERVATION AREA RANKS and ASSOCIATED ECOSYSTEMS					THREATS								
POTENTIAL CONSERVATION AREA	B-RANK: Previous (P) Current (C)	P-RANK: Previous (P) Current (C)	M-RANK: Previous (P) Current (C)	ECOSYSTEM(S) ASSOCIATED WITH PCA	CLIMATE CHANGE VULNERABILITY	Hydrologic Modification	Residential Development	Oil and Gas Development	Incompatible Grazing	Recreation	Roads	Exotic Plant Species	Agricultural Habitat Conversion
						Infiltration alteration Dams/Diversions			Vegetation Alteration Soil Degradation		Fragmentation , Erosion Hydrologic Modification		
East Divide Creek	P – B3	P – P4	P – M4	P-J woodland	High	X		X	X		X	X	
	C – B3	C – P2	C - M3	Oak shrubland	Low								
East Douglas Creek	P – B3	P – P4	P– M2	Riparian woodland	Very high	X			X			X	
	C – B4	C – P2	C – M2	(Western)									
East Elk Creek	P – B3	P – P3	P – M3	Riparian woodland	Low	X				X			
	C – B2	C – P3	C – M3	(Mountain)									
East Fork Parachute Creek	P – B2	P – P1	P – M2	Riparian shrubland	Very high	X		X	X		X	X	
	C – B2	C – P1	C – M2	(Western)									
East Rifle Creek	P – B3	P – P3	P – M2	Riparian woodland	Very high	X				X	X	X	
	C – B4	C – P2	C – M2	(western)									
East Salt Creek Headwaters	P – B3	P – P3	P – M3	Riparian woodland	Very high	X			X			X	X
	C – B4	C – P3	C – M3	Oak shrubland									
Garfield Creek	P – B3	P – P2	P – M2	Riparian woodland (western)	Very high	X		X	X	X	X	X	X
	C – B4	C – P2	C – M2										
Grizzly Creek Canyon	P – B3	P– P4	P – M4	Mountain wetland	Moderate	X			X	X	X	X	
	C – B2	C – P3	C – M3	Riparian woodland (Mountain)	Low								
Main Elk Creek	P – B3	P – P3	P – M3	Riparian woodland (Mountain)	Low							X	
	C – B3	C – P3	C – M3										
Middle Rifle Creek	P – B3	P – P4	P – M4	Pinyon-Juniper woodland	High				X			X	
	C – B3	C – P2	C – M3										
Mitchell Road	P – B3	P – P3	P – M3	Desert shrubland	Moderate	X			X			X	
	C – B3	C – P2	C – M3	Semi-desert grassland	Low								
Mt. Logan Road	P – B2	P – P2	P – M2	Desert shrubland	Moderate			X			X	X	
	C – B2	C – P2	C – M2										

POTENTIAL CONSERVATION AREA RANKS and ASSOCIATED ECOSYSTEMS					THREATS								
POTENTIAL CONSERVATION AREA	B-RANK: Previous (P) Current (C)	P-RANK: Previous (P) Current (C)	M-RANK: Previous (P) Current (C)	ECOSYSTEM(S) ASSOCIATED WITH PCA	CLIMATE CHANGE VULNERABILITY	Hydrologic Modification	Residential Development	Oil and Gas Development	Incompatible Grazing	Recreation	Roads Fragmentation , Erosion Hydrologic Modification	Exotic Plant Species	Agricultural Habitat Conversion
						Infiltration alteration Dams/Diversion			Vegetation Alteration Soil Degradation				
No Name Creek	P – B2 C – B2	P – P4 C – P4	P – M3 C – M3	Riparian woodland (Mountain)	Low	X				X		X	
Prairie and South Canyon	P – B5 C – B5	P – P4 C – P2	P – M4 C – M2	Desert shrubland	Moderate	X			X	X		X	
Rare Plants of the Wasatch	P – B1 C – B1	P – P2 C – P2	P – M2 C – M2	Desert shrubland	Moderate	X		X	X		X	X	
Rifle Falls State Park	P – B4 C – B4	P – P4 C – P3	P – M2 C – M2	Riparian woodland (Mountain)	Low	X				X		X	
Roaring Fork River at Carbondale	P – B2 C – B2	P – P3 C – P3	P – M2 C – M2	Riparian woodland (Mountain)	Low	X	X			X	X	X	
Smith Gulch	P – B3 C – B3	P – P3 C – P3	P – M3 C – M3	Sage shrubland Oak Shrubland	Low	X			X		X	X	X
The Crown	P – B2 C – B2	P – P4 C – P2	P – M3 C – M2	Sage shrubland Oak shrubland	Low					X	X	X	
Trappers Lake	P – B3 C – B3	P – P4 C – P4	P – M3 C – M3	Spruce-fir forest Wetlands (mountain)	Moderate				X	X			
NEW POTENTIAL CONSERVATION AREAS													
Canyon Creek	C – B2	C – P2	C – M3	Wetlands (mountain)	Moderate	X			X	X	X		
Baldy Creek	C – B4	C – P2	C – M3	Riparian woodlands (Mountain)	Low	X		X	X		X	X	X
Roaring Fork at El Jebel	C – B4	C – P3	C – M2	Riparian woodlands (Mountain)	Low	X	X			X	X	X	

P = previous rank; C = current rank.

Biological diversity Rank (CNHP). **B1** Outstanding Significance, **B2** Very High Significance, **B3** High Significance, **B4** Moderate or Regional Significance, **B5** General or Statewide Biological diversity Significance.

Protection urgency ranks. P ranks refer to the time frame in which conservation protection should occur in order to prevent the loss of the element. **P1** May be immediately threatened, **P2** Threat expected within 5 years, **P3** Definable threat but not in the next 5 years, **P4** No threat known for foreseeable future, **P5** Land protection complete.

Management urgency ranks. M ranks indicate the time frame in which a change in management of the element or site must occur in order to ensure the element's future existence. **M1** Management action may be required immediately, **M2** New management action may be needed within 5 years to prevent the loss of element occurrences. **M3** New management action may be needed within 5 years to maintain current quality of element occurrences. **M4** Although the element is not currently threatened, management may be needed in the future to maintain the current quality of element occurrences. **M5** No serious management needs known or anticipated at the site.

Climate Change Vulnerability Ranks (CNHP 2015): Very High: Ecosystems have high vulnerability to climate change when exposure and sensitivity are high, and adaptive capacity and resilience are low. Under these circumstances, transformation of the ecosystem is most likely to occur in upcoming decades.

High: High vulnerability to climate change results from combining either high or moderate exposure-sensitivity with low or medium adaptive capacity-resilience. Under either combination, climate change is likely to have noticeable impact.

Moderate: Moderate vulnerability to climate change results from a variety of combinations for exposure-sensitivity and adaptive capacity-resilience. The scoring matrix is slightly weighted toward increased vulnerability in the number of possible combinations which produce a moderate vulnerability ranking. Under circumstances where the two factors are essentially balanced, vulnerability is thought to be reduced, but still of concern.

Low: Low vulnerability to climate change occurs when an ecosystem is expected to experience low exposure and sensitivity in combination with high or moderate adaptive capacity and resilience. For these ecosystems climate change stress and its effects are expected to be least severe or absent.

SUMMARY RESULTS of 2015-2016 RESURVEYS of SELECTED POTENTIAL CONSERVATION AREAS

Following we provide a synopsis of updated Potential Conservation Area (PCA) reports for each PCA that was resurveyed. Table 10 provides a summary of updated ranking results and threats identified for each resurveyed PCA. Full PCA reports are available in Appendix 2.

ANVIL POINTS RIM

Ranks: B2/P2M2; Ranks were determined to be unchanged.

Biodiversity values: The Anvil Points Rim site is located at the southeastern limit of the Roan Plateau and the Piceance Basin.

Prior to the 2015-16 surveys occurrences associated with this PCA included: Utah fescue (G3 S3), Parachute penstemon (G1 S1), American Peregrine Falcon (G4T4 S2B), Roan Cliffs blazing star (G2 S2), Western Slope Grasslands Herbaceous Vegetation (G2 S2), Columbian Sharp-tailed Grouse (G4T3 S2), Montane Grasslands Herbaceous Vegetation (G4? S1). **Newly documented occurrences include:** new occurrences of Hanging Garden Sullivantia (G3T3S3), Piceance bladderpod (G2S2), Mountain wild mint (G4G5S2). The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Bluebunch wheatgrass herbaceous vegetation	<i>Pseudoroegneria spicata</i> Herbaceous Vegetation	G2S2	B (EOID 7184)	C	Moderate
Parachute penstemon	<i>Penstemon debilis</i>	G1S1	B (EOID 9727)	B	Extremely vulnerable
Utah fescue	<i>Argillochloa dasyclada</i>	G3S3	H (EOID 938)	C	No data
Hanging Garden Sullivantia	<i>Sullivantia hapemanii</i> var. <i>purpusii</i>	G3T3S3	NA	C	No data
Piceance bladderpod	<i>Physaria parviflora</i>	G2S2	NA	C	Extremely vulnerable
Mountain wild mint	<i>Monardella odoratissima</i>	G4G5S2	NA	B	No data

Threats: Domestic livestock grazing, with an allowed 4,525 sheep, occurs across the Anvil Points Rim PCA (allotment # CO18908) (BLM 2016a). The allotment is categorized by the BLM as “improve” which broadly describes BLM’s management objective for this allotment and indicates that the “present ecological condition is unsatisfactory.”

The mine access road to Anvil Points has provided a route for the invasion of non-native plants which now threaten the viability of three rare plant species which occur at or near the mine site including Parachute penstemon, Roan cliffs blazing star and Piceance bladderpod. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the “Weed Site ID.”

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_025	<i>P.debilis</i>	Houndstongue	<i>Cynoglossum officinale</i>	B
Garfield_weeds_127	<i>P.debilis</i>	Canada thistle	<i>Cirsium arvense</i>	B
Garfield_weeds_114	<i>M. odoratissima</i>	Houndstongue	<i>Cynoglossum officinale</i>	B
Garfield_weeds_018	<i>P.debilis</i>	Common mullein	<i>Verbascum thapsus</i>	C

Management recommendations:

1) Restore rangeland health by reducing duration and intensity of grazing or eliminating grazing entirely from the site to rest the range and enable achievement of BLM’s rangeland health standards (Batchelor et al. 2015, BLM 2016b).

2) Manage and eradicate weeds from the Anvil Points road and mine site. Implementing “Recommended Best Management Practices for Managing Noxious Weeds on Sites with Rare Plants” (Mui and Spackman 2016) would improve long-term viability potential of the rare plants associated with this site.

In 2016 the BLM produced a resource management plan for the Roan Plateau. The plan “Final Supplemental Environmental Impact Statement for the Roan Plateau Resource Management Plan Amendment” was recently released for a 30-day protest period ending Aug. 1, 2016 (BLM 2016c). This plan primarily addresses oil and gas development without addressing livestock impacts. This plan also would designate four ACECs (24,890 acres) that would be managed for “important resources.” The Parachute Creek Watershed Management Area would also be designated. However, all rivers eligible for management under the Wild and Scenic Rivers Act would be determined not suitable for designation and released from interim management protections.



Figure 2: Parachute penstemon at Anvil Points Rim.



Figure 5: Mountain wild mint on Anvil Points Rim.

ANVIL POINTS

Ranks: B2/P2M2: Ranks were determined to be unchanged.

Biodiversity values: The Anvil Points site is located on the south and southeast-facing sides of the Roan Plateau between the rim and the alluvial flats of the Colorado River. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** Roan Cliffs blazing star (G2 S2), Wetherill's milkvetch (G3 S3), mountain wild mint (G4G5 S2), and Utah fescue (G3 S3) plant species. **Newly documented occurrences include:** new occurrences of Barneby's thistle (G3G4S3), DeBeque milkvetch (G2S2), and long-flower cat's-eye (G3S3). The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
DeBeque milkvetch	<i>Astragalus debequaeus</i>	G2S2	A (EOID 6210)	C	Extremely vulnerable
DeBeque milkvetch	<i>Astragalus debequaeus</i>	G2S2	A (EOID 9785)	B	Extremely vulnerable
Roan cliffs blazing star	<i>Astragalus debequaeus</i>	G2S2	A (EOID 4788)	B	Extremely vulnerable
Barneby's thistle	<i>Cirsium barnebyi</i>	Watchlisted	NA	C	No data
DeBeque milkvetch	<i>Astragalus debequaeus</i>	G2S2	NA	C	Extremely vulnerable
Long-flower cat's-eye	<i>Oreocarya longiflora</i>	G3S3	NA	C	No data

Threats: Road, well-pad and pipeline development have eliminated potential habitat for rare plant species. These alterations contribute to degradation of soil and hydrologic processes. Grazing has converted once lush grasslands and sage shrublands into cheatgrass-dominated deserts and thus diminished the value of the range for wildlife and livestock. They have also altered precipitation infiltration and disturbance (fire) processes and thereby decreased resiliency of the habitat to climate change. These allotments are categorized by the BLM as

“custodial” indicating that, among other things, “there may be limited conflicts between livestock grazing and other resources” (BLM 2016a).

Invasive weeds are common throughout this PCA and threaten both the viability of the rare plant species and ecosystem function. Non-native invasive species dominate grazing allotments and include cheatgrass (*Bromus tectorum*) and Alyssum (*Alyssum simplex*) on upland sites and Tamarisk (*Tamarix ramosissima*) in washes and gullies. Weed invasion, especially by yellow sweetclover (*Melilotus officinale*), cheatgrass (*Bromus tectorum*) and smooth brome (*Bromus inermis*) along the road that accesses Anvil Points mine, threatens long-term viability of Roan Cliff’s blazing star. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the “Weed Site ID.”

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_008	<i>A. debequaeus</i>	Musk Thistle	<i>Carduus nutans</i>	B
Garfield_weeds_009	<i>A. debequaeus</i>	Musk Thistle	<i>Carduus nutans</i>	B
Garfield_weeds_010	<i>A. debequaeus</i>	Salt Cedar	<i>Tamarisk spp.</i>	B
Garfield_weeds_011	<i>A. debequaeus</i>	Musk Thistle	<i>Carduus nutans</i>	B
Garfield_weeds_017	<i>N. rhizomata</i>	Canada thistle	<i>Cirsium arvense</i>	B
Garfield_weeds_012	<i>A. debequaeus</i>	Redstem Filaree	<i>Erodium cicutarium</i>	C
Garfield_weeds_016	<i>N. rhizomata</i>	Field bindweed	<i>Convolvulus arvensis</i>	C
Garfield_weeds_015	<i>N. rhizomata</i>	Yellow sweet clover	<i>Melilotus officinalis</i>	NA
Garfield_weeds_013	None	Musk Thistle	<i>Carduus nutans</i>	B
Garfield_weeds_014	None	Western Salsify	<i>Tragopogon dubius</i>	NA

Management recommendations:

- 1) Restore landscape integrity and prevent further fragmentation from roads or drill pads; reconnect fragmented landscapes by “ripping” unused roads to enable natural revegetation. We recommend a minimum 1/4 mile setback from DeBeque milkvetch habitat for all anthropogenic development.
- 2) DeBeque milkvetch is a short-lived species. Protecting large areas around known populations is essential to providing habitat that enables population dispersal via seed dispersal and also to provide habitat and vegetation diversity that promotes pollinator viability.
- 3) Implementing “Recommended Best Management Practices for Managing Noxious Weeds on Sites with Rare Plants” (Mui and Spackman 2016) would improve the long-term viability potential for the rare plant species and ecosystem functions in this PCA.
- 4) Restore rangeland health by reducing duration and intensity of grazing or eliminating grazing entirely from the site to rest the range and enable achievement of BLM’s rangeland health standards (Batchelor et al. 2015, BLM 2016b).

BARREL SPRING POINT

Ranks: Previous B2/P3M3; current B2/P2M2. The P and M ranks were changed due to diminished landscape conditions that have resulted from weed invasion along roads, inappropriate livestock grazing and habitat alteration related to oil and gas development, all of which have degraded community and hydrologic processes that function to sustain natural communities and species.

Biodiversity values: The Barrel Spring Point site occupies a high ridge along the divide separating the Colorado River (Roan Creek and East Salt Creek) and White River drainages, east of Douglas Pass. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** Piceance bladderpod G2 S2. **Newly documented occurrences include:** new occurrences of Sullivantia Hanging Gardens community (G2S2), large-flower globe-mallow (G3?QS1S2), and Barneby's thistle (G3G4S3) plant species. The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Sullivantia hanging gardens	<i>Sullivantia hapemanii</i> - (<i>Aquilegia barnebyi</i>) Herbaceous Vegetation	G2S2	H (EOID 10100)	C	No data
Sullivantia hanging gardens	<i>Sullivantia hapemanii</i> - (<i>Aquilegia barnebyi</i>) Herbaceous Vegetation	G2S2	NA	B	No data
Piceance bladderpod	<i>Physaria parviflora</i>	G2S2	A (EOID 623)	B	Extremely vulnerable
Large-flower globe-mallow	<i>Lilium grandiflora</i>	G3?QS1S2	NA	D	No data
Barneby's thistle	<i>Cirsium barnebyi</i>	Watchlisted	NA	B	No data
Brewer's sparrow	<i>Spizella breweri</i>	USFS sensitive	NA	E	Presumed stable

Threats: Weed invasion threatens the occurrence of Piceance bladderpod. Incompatible livestock grazing has altered system hydrology which threatens the Sullivantia Hanging Gardens community. Oil and gas infrastructure development has contributed to habitat fragmentation. Cumulative impacts from these development activities have decreased system resiliency to climate change. Immediate consequences include excessive soil drying as evidenced by aspen woodland die off. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the "Weed Site ID."

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_080	<i>P. parviflora</i>	Common Mullein	<i>Verbascum thapsus</i>	C

Management recommendations:

- 1) Restoring ecosystem hydrology and resiliency in the surrounding upland landscape is essential to long-term system sustainability and the viability of the Hanging Garden community occurrences. Reduce the duration and intensity of grazing regime to enable range recovery (BLM 2016b).
- 2) Weed eradication is essential to maintaining the condition of the PCA. Implement BMPs for managing weeds on sites with rare plants (Mui and Panjabi 2016).

CATTLE CREEK AT COULTER CREEK

Ranks: B4/P2M1. Ranks were determined to be unchanged.

Biodiversity values: This PCA occurs in lower montane habitat and includes the sub-watershed at the confluence of Cattle and Coulter Creek downstream. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** Mixed mountain shrubland (G3S3) on south-facing slopes. **Surveys conducted in 2015-2016:** New occurrences of Blue spruce/Red-osier dogwood (G4S2) in the Cattle Creek riparian corridor. The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Blue spruce/Red-osier dogwood	<i>Picea pungens/ Cornus sericea woodland</i>	G4S2	NA	B	Low
Olive-sided flycatcher	<i>Contopus cooperi</i>	USFS sensitive	NA	E	No data

Threats: A road parallels Cattle Creek causing erosion and runoff sediments to be deposited in the riparian area. The road is also acting as a conduit for weed invasion. Numerous diversions and wells alter natural hydrology in both Cattle and Coulter Creeks. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the “Weed Site ID.”

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_105	<i>Picea pungens/ Cornus sericea</i>	Common Tansy	<i>Tanacetum vulgare</i>	B
Garfield_weeds_105.1	<i>Picea pungens/ Cornus sericea</i>	Absinthe wormwood	<i>Artemisia absinthium</i>	B
Garfield_weeds_106	Riparian habitats	Plumeless thistle	<i>Carduus acanthoides</i>	B
Garfield_weeds_128	<i>Picea pungens/ Cornus sericea</i>	Reed canarygrass	<i>Phalaris arundinacea</i>	NA

Management recommendations:

- 1) Manage and eradicate riparian weeds by implementing an integrated weed management strategy with a focus on non-chemical strategies (Bennett no date).

2) To sustain the quality of both the riparian community and stream water quality and quantity; and restore and maintain natural hydrologic regime replete with out-of-bank springtime flooding flows of natural duration and amplitude.

3) Modify road maintenance activities, which currently results in excessive amounts of gravel and road-based pollutants moving into the stream, to prevent road gravel and pollutants from being transported into the stream channel.

COLORADO RIVER MEGASITE

Ranks: B1/P2M2. Ranks were determined to be unchanged.

Biodiversity values: This site includes the stretch of the Colorado River that extends from Rifle to the Utah border. **Prior to the 2015-16 surveys occurrences associated with this PCA**

included: Fish species including Humpback Chub (G1S1), Roundtail Chub (G3S2), Colorado Pikeminnow (G1S1), Bonytail Chub (G1SX) and Razorback Sucker (G1S1); bird species including Bald Eagle (G5S1B,S3N), American Peregrine Falcon (G4T4 S2B), Greater Sandhill Crane (G5T4 S2B,S4N); and Fremont's cottonwood riparian forest (G3S3). **Newly documented occurrences**

include: Bald Eagle (new nest site with young in nest), White-faced Ibis (G5 S2B), northern leopard frog (G3S3), and Silver buffaloberry riparian shrubland (G3G4 S2). The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Silver buffaloberry	<i>Shepherdia argentea</i> Shrubland	G3G4S1	NA	C/D	Low vulnerability
Bald Eagle	<i>Haliaeetus leucocephalus</i>	G5/S1BS3N	NA	E	No data
White-faced Ibis	<i>Plegadis chihi</i>	G5/S2B	NA	E	Moderately vulnerable
Northern leopard frog	<i>Rana pipiens</i>	G5/S3	NA	E	Moderately vulnerable

Threats: Development of the floodplain with agricultural conversion, ranching, urbanization, industrialization and the consequent invasion of non-native species such as tamarisk (*Tamarix ramosissima*), Russian olive (*Elaeagnus angustifolia*), and Russian knapweed (*Acroptilon repens*) has greatly reduced the quality and extent of native riparian vegetation. More recently extensive gravel mining operations in the river floodplain up and downstream of the City of Rifle has further contributed to the loss of cottonwood gallery forests and commensurate riparian and stream values that these forests provide. Nearly all the existing stands of Rio Grande cottonwood are considered to be in decline due to altered hydrology from upstream impoundments and the long-term effects of livestock grazing (NatureServe 2015). Cottonwood regeneration is poor throughout this PCA and bodes ill for the future of the riverine ecosystem. Ecological consequences of the loss of riparian vegetation, channelization and flow alteration include impaired riparian and stream ecosystem functions including water cleansing and storage functions and provisioning of wildlife habitat.

A natural flooding regime and channel morphology are necessary for cottonwood regeneration and the creation of wildlife habitat including fish spawning habitat and eagle nesting habitat. However, natural processes have been disabled and are no longer functioning due to development of both water and floodplains which has resulted in river channelization and prevented natural flooding processes to occur. Loss of cottonwood woodlands has further intensified channel downcutting, which has impaired the out-of-bank flows that recharge the aquifer and sustain riparian vegetation. These alterations have reduced the availability of nest sites for birds (including eagles, great blue herons and Neotropical migrant songbirds), intensified flooding flows, reduced fish spawning habitat, and the consequent drying of floodplain soil has enabled the invasion of tamarisk and other exotic plant species. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the “Weed Site ID.”

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_001	Riparian habitats	Salt Cedar	<i>Tamarisk spp.</i>	B
	Riparian habitats	Russian olive	<i>Elaeagnus angustifolia</i>	B
	Riparian habitats	Plumeless thistle	<i>Carduus acanthoides</i>	B
	Riparian habitats	Bull thistle	<i>Cirsium vulgare</i>	B
Garfield_weeds_105	<i>Populus deltoides</i> ssp. <i>wislizeni</i> / <i>Rhus trilobata</i> Woodland	Russian olive	<i>Elaeagnus angustifolia</i>	B
Garfield_weeds_119	None	Kochia	<i>Kochia scoparia</i>	NR
Garfield_weeds_119.1	Riparian habitats	Scotch thistle	<i>Onopordum acanthium</i>	B
Garfield_weeds_119.2	Riparian habitats	Russian knapweed	<i>Acroptilon repens</i>	B
Garfield_weeds_120	<i>Populus deltoides</i> ssp. <i>wislizeni</i> / <i>Rhus trilobata</i> Woodland	Russian olive	<i>Elaeagnus angustifolia</i>	B
Garfield_weeds_121	<i>Populus deltoides</i> ssp. <i>wislizeni</i> / <i>Rhus trilobata</i> Woodland	Common Tansy	<i>Tanacetum vulgare</i>	B
Garfield_weeds_121.1	<i>Populus deltoides</i> ssp. <i>wislizeni</i> / <i>Rhus trilobata</i> Woodland	Salt Cedar	<i>Tamarisk spp.</i>	B
Garfield_weeds_121.2	<i>Populus deltoides</i> ssp. <i>wislizeni</i> / <i>Rhus trilobata</i> Woodland	Siberian elm	<i>Ulmus pumila</i>	NR
Garfield_weeds_122	<i>Populus deltoides</i> ssp. <i>wislizeni</i> / <i>Rhus trilobata</i>	Kochia	<i>Kochia scoparia</i>	NR

	Woodland			
Garfield_weeds_122.1	<i>Populus deltoides</i> ssp. <i>wislizeni</i> / <i>Rhus trilobata</i> Woodland	Russian knapweed	<i>Acroptilon repens</i>	B
Garfield_weeds_123	<i>Populus deltoides</i> ssp. <i>wislizeni</i> / <i>Rhus trilobata</i> Woodland	Salt Cedar	<i>Tamarisk spp.</i>	B
Garfield_weeds_124	<i>Populus deltoides</i> ssp. <i>wislizeni</i> / <i>Rhus trilobata</i> Woodland	Russian knapweed	<i>Acroptilon repens</i>	B

Management Recommendations: Riparian habitat restoration with simultaneous restoration of a natural flow regime and channel morphology is essential to protect and conserve the river resource.

- 1) Work with Colorado River Water managers to manage river flows that mimic historic natural hydrologic regime and simultaneously.
- 2) Restore natural stream channel morphology.
- 3) Replant native riparian plant species.
- 4) Implement riparian development and grazing setbacks to protect riparian vegetation and riparian-dependent wildlife.
- 5) Promote and protect the active restoration of beaver to historic levels of abundance and distribution.
- 6) Eradicate exotic plant species, especially tamarisk, Russian olive and knapweed, by implementing integrated weed management with a focus on non-chemical strategies (Bennett no date).
- 7) Reclaim gravel mine pits to provide wildlife habitat.



Figure 4: Great blue herons on the Colorado River.

COW RIDGE

Ranks: Previous B2/P3M4; Current B2P3M3. The M rank was modified due to incompatible livestock grazing in the eastern half of this PCA which is diminishing rangeland health.

Biodiversity values: The Cow Ridge PCA is located on the uplands between two east-flowing drainages, the North Dry Fork and Kimball Creek which both flow into Roan Creek. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** Piceance bladderpod (G2S2) and Utah fescue (G3S3). **Newly documented occurrences include:** a new population of Piceance bladderpod, and Barneby's thistle (G3G4S3). The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Piceance bladderpod	<i>Physaria parviflora</i>	G2S2	A(EOID 10850)	A	Extremely vulnerable
Piceance bladderpod	<i>Physaria parviflora</i>	G2S2	NA	A	Extremely vulnerable
Barneby's thistle	<i>Cirsium barnebyi</i>	Watchlisted	NA	B	No data

Threats: Anthropogenic threats to this PCA are related to livestock grazing. While the western half of this site meet BLM rangeland health standards, the eastern half does not meet BLM range health standards due to livestock grazing (PEER 2012). Although direct impacts to Piceance bladderpod from cattle are relatively minor since cattle do not typically graze on the steep slopes of the Green River Formation, indirect impacts are substantial and result in vegetation and soil degradation of adjacent mesas which impacts system hydrology and soil erosion processes thus impacting the element occurrences.

Management recommendations:

- 1) On the western half of the PCA maintain the current livestock grazing management regime.
- 2) On the eastern half of the PCA rest the area from livestock grazing until the range improves and BLM's Rangeland Standards are met (BLM 2016b).



Figure 5: Piceance bladderpod on Cow Ridge.

DOUGLAS PASS

Rank: Previous B4/P3M3; Current B5/P1M1. The B, P and M ranks were modified due to habitat deterioration that has diminished the condition of the previously documented Douglas-fir/Mountain maple community occurrence and the near loss, and consequent down-ranking, of the large-flower globe-mallow occurrence. The large-flower globe-mallow occurrence (EOID 7868) rank was downgraded from good (B rank) to poor (D rank). Additionally, as a consequence of habitat deterioration, the Douglas fir-mountain maple forest occurrence was determined to be in fair condition and was downgraded from good (B rank) to fair (C rank).

Biodiversity values: The Douglas Pass PCA encompasses an area east of Highway 139 and south of Douglas Pass. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** large-flower globe-mallow (G3?Q S1S2) and Douglas-fir/mountain maple lower Montane Forests (G4? S2). **Newly documented occurrences include:** new occurrences of Gambel oak-Utah serviceberry mountain shrubland (G3G5S2). The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Large-flower globe-mallow	<i>Lilamna grandiflora</i>	G3?QS1S2	B (EOID 7868)	D	No data
Douglas fir/Mountain maple	<i>Pseudotsuga menziesii</i> / <i>Acer glabrum</i> Forest	G4S2	B (EOID 9379)	C	Moderate
Gambel oak-Utah serviceberry	<i>Quercus gambelii</i> / <i>Amelanchier utahensis</i> Shrubland	G3G5S2	NA	C	Low

Threats: Habitat deterioration from incompatible grazing, roadside maintenance and weed invasion has taken a toll on the natural values of this PCA. Surveys in 2001 identified one of the largest known populations of the globally vulnerable large-flowered globemallow—as of 2015 the population of large-flowered globemallow had been reduced to a single individual. Further,

all but one of the ponds observed in 2001 had free water and stream channels were dry. Consequently, the Douglas fir/mountain maple community occurrence, which is associated with moist environments was downgraded from good (B rank) to fair (C rank). Additionally, exotic plant species, which in 2001 were limited to the heavily grazed areas around the stock ponds, are common throughout the PCA.

Lands in and surrounding this PCA do not meet BLM Rangeland Health Standards due to livestock (PEER 2012). Inappropriate livestock grazing has altered vegetation structure and degraded soils, thereby altering the hydrologic regime, enabling weed invasion and disconnecting ecosystem processes. Invasion of exotic plant species has contributed to the loss or displacement of the large-flowered globe-mallow and has degraded ecosystem processes and services throughout the PCA. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the “Weed Site ID.”

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_073.1	<i>I.grandiflora</i>	Canada thistle	<i>Cirsium arvense</i>	B
Garfield_weeds_073.2	<i>I.grandiflora</i>	Houndstongue	<i>Cynoglossum officinale</i>	B
Garfield_weeds_073.5	<i>I.grandiflora</i>	Salt Cedar	<i>Tamarisk spp.</i>	B
Garfield_weeds_073.5.1	<i>I.grandiflora</i>	Bull thistle	<i>Cirsium vulgare</i>	B
Garfield_weeds_073.8	<i>I.grandiflora</i>	Canada thistle	<i>Cirsium arvense</i>	B
Garfield_weeds_073.9	<i>I.grandiflora</i>	Salt Cedar	<i>Tamarisk spp.</i>	B
Garfield_weeds_073.3	<i>I.grandiflora</i>	Field bindweed	<i>Convolvulus arvensis</i>	C
Garfield_weeds_073	<i>I.grandiflora</i>	Yellow Sweet clover	<i>Melilotus officinalis</i>	NA
Garfield_weeds_073.4	<i>I.grandiflora</i>	Yellow Sweet clover	<i>Melilotus officinalis</i>	NA
Garfield_weeds_073.6	<i>I.grandiflora</i>	Yellow Sweet clover	<i>Melilotus officinalis</i>	NA
Garfield_weeds_073.7	<i>I.grandiflora</i>	Yellow Sweet clover	<i>Melilotus officinalis</i>	NA

Management recommendations:

1) Rest the area from livestock grazing until the range improves and BLM’s Rangeland Standards are met (BLM 2016b).

2) Eradicate and control weed invasion by implementing BMPs for Managing Noxious Weeds on Sites with Rare Plants (Mui and Panjabi 2016); and BMPs for Conserving Roadside Populations of Colorado’s Globally Imperiled Plants (Panjabi and Smith 2014).



Figure 6: Large-flower globe-mallow.

EAST DIVIDE CREEK

Rank: Previous B3/P4M4; Current B3/P2M3. The P and M ranks were modified due to impacts of livestock grazing and energy development infrastructure which have altered and fragmented the landscape, enabled the invasion of exotic plant species which dominate grazed sites, and cumulatively has reduced system resiliency.

Biodiversity values. The East Divide Creek PCA occupies the tops of mesas and steep, rocky, south, southwest and west-facing hillsides. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** Wetherill milkvetch (G3S3) plant species which is found in dry washes and on barren naturally eroded slopes. **Newly documented occurrences include:** new populations of Wetherill milkvetch and Gambel Oak-Utah serviceberry shrubland communities (G3G5S2) which are found on steep, rugged slopes that are generally inaccessible to livestock. The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Gambel oak-Utah serviceberry	<i>Quercus gambelii</i> / <i>Amelanchier utahensis</i> Shrubland	G3G5S2	NA	C	Low vulnerability
Wetherill's milkvetch	<i>Astragalus wetherillii</i>	G3S3	A (EOID 8818)	B/C	No data

Threats: Alteration, conversion and fragmentation of habitat as a consequence of incompatible livestock grazing and oil and gas development have diminished soil and hydrologic processes and altered vegetation cover and composition, thereby degrading ecosystem functions and diminishing system resiliency. Both BLM and private lands have been leased for oil and gas development and directional and horizontal wells densely cover the landscape (Fractracker Alliance 2016). Further, exotic plant species have invaded along roadways, dominate those excessively grazed sites and have moved into drainages. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the “Weed Site ID.”

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_091.1	<i>A. wetherllii</i>	Houndstongue	<i>Cynoglossum officinale</i>	B
Garfield_weeds_091.2	<i>A. wetherllii</i>	Musk thistle	<i>Carduus nutans</i>	B
Garfield_weeds_092	<i>A. wetherllii</i>	Musk thistle	<i>Carduus nutans</i>	B
Garfield_weeds_092.1	<i>A. wetherllii</i>	Houndstongue	<i>Cynoglossum officinale</i>	B
Garfield_weeds_098	<i>A. wetherllii</i>	Musk Thistle	<i>Carduus nutans</i>	B
Garfield_weeds_098.1	<i>A. wetherllii</i>	Houndstongue	<i>Cynoglossum officinale</i>	B
Garfield_weeds_099	Riparian habitat	Salt Cedar	<i>Tamarisk spp.</i>	B
Garfield_weeds_099.1	Riparian habitat	Musk thistle	<i>Carduus nutans</i>	B
Garfield_weeds_091	<i>A. wetherllii</i>	Common Mullein	<i>Verbascum thapsus</i>	C
Garfield_weeds_099.2	Riparian habitat	Siberian elm	<i>Ulmus pumila</i>	NA

Management recommendations: Although Wetherill’s milkvetch is typically restricted to sedimentary rock ledges and to steeper slopes on the banks of washes, soils are unconsolidated, highly erodible and susceptible to disturbance, and therefore alteration of adjacent habitat readily impacts this species’ habitat.

- 1) Restoration of energy infrastructure-induced disturbance (roads, well-pads, injection pits etc.) is essential to restoring landscape health and sustainability.
- 2) Reducing grazing intensity and duration is essential to restoring native plant communities and with it system resiliency (BLM 2016b).
- 3) Eradicate and control weed invasion by implementing BMPs for Managing Noxious Weeds on Sites with Rare Plants (Mui and Panjabi 2016); and BMPs for Conserving Roadside Populations of Colorado’s Globally Imperiled Plants (Panjabi and Smith 2014).

EAST DOUGLAS CREEK

Rank: Previous B3/P4M2; Current B4/P2M2. The B and P ranks were modified due to the alteration and consequent loss of the Colorado blue spruce/River birch woodland community. Although the return of beaver (*Castor canadensis*) to the site bodes well for the restoration of

stream functions, inappropriate livestock grazing destabilizes and undermines the benefits that beaver bring and thus the sustainability of this PCA continues to be threatened.

Biodiversity values: This site encompasses the headwaters of East Douglas Creek, including Bear Park Creek and East Park Creek and numerous seeps and springs. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** Colorado blue spruce/River birch woodland community (the 2015 survey documented that this site no longer supports this community). **Newly documented occurrences include:** new occurrences of Colorado River cutthroat trout (G4T3S3), Autumn willow (G4S1) shrubland community and large-flower globe-mallow (G3?Q S1S2) plant species. The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Blue spruce/River birch	<i>Picea pungens/Betula occidentalis woodland</i>	G2S2	C (EOID 8827)	X	Low
Autumn willow	<i>Salix serissima</i>	G4S1	NA	C	No data
Large-flower globe-mallow	<i>Iliamna grandiflora</i>	G3?QS1S2	NA	C	No data
Colorado River Cutthroat trout	<i>Oncorhynchus clarki pleuriticus</i>	G4T3S3	NA	E	Extremely vulnerable

Threats: Much of the lower elevation streams of the White River Basin, such as East Douglas Creek, were heavily grazed from the 1930s into the early 1960s (Kittel et al. 1999). Riparian habitat along East Douglas Creek was heavily impacted from these activities through excessive bank erosion, channel downcutting and invasion of non-native plant species. Riparian zones provide key services for all ecosystems, but are especially important in dry regions, where they provide the main source of moisture for plants and wildlife and the main source of water for downstream plant, animal, and human communities; these services are highly dependent on streambanks and flood plains being in a vegetated and relatively undisturbed state (Belsky et al. 1999). Although the stream channel is downcut, beaver have recently recolonized the drainage. A new channel is developing within the old downcut channel and stream flows are recovering and riparian functions are returning. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the “Weed Site ID.”

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_082	Riparian habitat	Yellow Sweet clover	<i>Melilotus officinalis</i>	NA
Garfield_weeds_082.1	Riparian habitat	Yellow Sweet clover	<i>Melilotus officinalis</i>	NA

Management recommendations: Important to the continued recovery of the riparian and stream habitat is the return of beaver. Their dam-building activity is enabling water storage functions to this sub-watershed which is responsible for restoring sustainable stream flows and

riparian habitat functions, including enabling revegetation by species such as autumn willow. The recent documentation of cutthroat trout inhabiting the stream indicates recovery of natural stream habitat and flow. Protecting and encouraging beaver activity along this stream reach is the single most effective strategy that can be used to restore and maintain environmentally sustainable stream flows by enabling water storage.

Simultaneously, managing grazing with riparian grazing BMPs to protect stream and riparian habitat from livestock use is essential to ensure continued stream and riparian recovery. The grazing allotment surrounding this site (allotment # 06349) is categorized by the BLM as “improve” (BLMa 2016) which broadly describes BLM’s management objective for this allotment and indicates that the “present ecological condition is unsatisfactory.”

- 1) Increase water storage and stream functions by protecting and encouraging beaver activity.
- 2) Restore range health by removing livestock from riparian habitat and implementing BLM’s Rangeland Health Standards on surrounding upland habitat (BLMb 2016).

EAST ELK CREEK

Rank: Previous B3/P3M3; Current B2/P3M3. The B rank was modified due to the discovery of an excellent (A ranked) occurrence of the Hanging garden Sullivantia-Barneby columbine hanging garden community. This community occupies a north-facing cliff wall above East Elk Creek and below a steep gully where abundant surface water discharge supports this lush hanging garden.

Biodiversity values: East Elk Creek flows through a steep narrow canyon in the Leadville limestone formation and is one of the major creek basins that drains the southwestern portion of the Flat Tops - an uplifted plateau with gently rolling terrain and vast open grasslands and sage shrublands interspersed with islands of subalpine fir forest and aspen woodlands. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** Narrowleaf cottonwood/river birch montane riparian forest (G3/S2) and river birch/mesic graminoid lower montane shrubland (G3/S2). **Newly documented occurrences include:** Sullivantia Hanging Gardens (G2S2). The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Narrowleaf cottonwood/River birch	<i>Populus angustifolia/Betula occidentalis woodland</i>	G3S3	A (EOID 8969)	B	Low
Hanging garden sullivantia-Oil shale columbine	<i>Sullivantia hapemanii - Aquilegia barnebyi Herbaceous Vegetation</i>	G2S2	NA	A	No data

Threats: This PCA encompasses public lands managed by the USFS as Gap Status – 3, meaning that the lands are managed for multiple uses, subject to extractive (e.g. mining or logging) or OHV use. Although extractive, motorized or grazing uses are unlikely to occur in the East Elk

Creek canyon. A recreational trail and dirt road diminish stream sustainability and function by causing excessive erosion in numerous sites along the creek. Additionally, the headwaters of East Elk Creek, which are located in the White River plateau, receive heavy anthropogenic use which includes livestock grazing, a network of 4wd roads and culverts and several dams, all of which impact the hydrologic regime.

Because canyon hydrology is intimately connected to and dependent on the hydrologic regime on the top of the plateau, anthropogenic alteration to the hydrologic regime from incompatible livestock grazing, roads, dams and climate change threaten the sustainability of natural communities and stream habitat in the canyon. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the “Weed Site ID.”

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed Rank
Garfield_weeds_113	None	Musk thistle	<i>Carduus nutans</i>	B
Garfield_weeds_112	None	Yellow Toadflax	<i>Linaria vulgaris</i>	B

Management recommendations: East Elk Creek is hydrologically connected with the uplifted plateau, and thus maintaining plateau habitat is essential to sustaining flows in East Elk Creek.

- 1) Relocate the recreational trail outside of the riparian corridor, or if that is not possible, stabilize and revegetate streambanks in eroded sites.
- 2) Manage livestock grazing on the plateau to protect riparian and wetland habitat by excluding livestock from these habitats.

EAST FORK PARACHUTE CREEK

Rank: B2/P1M2. Ranks were determined to be unchanged.

Biodiversity values: The East Fork of Parachute Creek originates near the eastern rim of the Roan Cliffs and flows southwest-west before plunging 200 feet into a narrow box canyon. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** natural communities including quaking aspen/bracken fern wetland forest (G4 S3S4), quaking aspen/mountain maple woodland (G2S2), narrowleaf cottonwood/red-osier dogwood riparian forest (G4 S3), quaking Aspen/tall forbs forest (G5 S5), basin wild rye Western slope grasslands (G2G3Q S1), heartleaf bittercress- tall fringed bluebells wetlands (G4 S4), Colorado blue spruce/red-osier dogwood montane riparian forest (G4 S2), box elder-narrowleaf cottonwood/red-osier dogwood forest (G2 S2), Subalpine fir/Drummond’s willow Montane Riparian Forest (G5 S4), mountain willow/mesic forbs shrubland (G4 S3) and Drummonds willow/Mesic Forb shrubland (G4 S4); plant species including Utah fescue (G3 S3), Large-flower globe-mallow (G3?Q S1S2), Hanging Garden sullivantia (G3T3 S3) and Roan Cliffs blazing star (G2 S2); and animal species including Boreal Owl (G5 S2) and Colorado River Cutthroat Trout (G4T3 S3). **Surveys conducted in 2015-2016:** increased the number and extent of the previously documented hanging garden

sullivantia occurrence. The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Mountain willow/Mesic forbs	<i>Salix planifolia/mesic forbs shrubland</i>	G4S4	C (EOID 8448)	B	Low
Hanging garden sullivantia	<i>Sullivantia hapemanii</i> var. <i>purpusii</i>	G3T3S3	A (EOID 1539)	B	No data
Olive-sided flycatcher	<i>Contopus cooperi</i>	USFS sensitive	NA	E	No data
Brewer's sparrow	<i>Spizella breweri</i>	USFS sensitive	NA	E	Presumed stable

Threats: Road-induced habitat fragmentation and incompatible livestock use threaten the water resource and associated element occurrences. Incompatible livestock grazing, both in the surrounding uplands and in canyon riparian habitat, has altered the local hydrologic regime, thus threatening stream and seep functions and consequently the viability of plant, community and animal occurrences. For instance, the hanging garden communities in this PCA, which are dominated by Hanging Garden Sullivantia, depend on abundant and consistent surface water flows which are being diminished by current incompatible land uses.

Threats to Cutthroat trout include replacement by introduced brook trout, rainbow trout, and brown trout; habitat alteration/fragmentation from overgrazing by livestock, logging, toxic effluents from mining, and water diversion for irrigation (NatureServe 2016). In 1996 Colorado Plants and Wildlife (CPW) found that brook trout in the East Fork of Parachute Creek greatly outnumbered Cutthroat trout and predicted that the brook trout population would totally replace the cutthroat trout in the next few years. Since then CPW has installed a fish barrier downstream from the confluence with Third Water Gulch to enable cutthroat trout recovery. However, other threats remain. Inappropriate livestock grazing in the riparian habitat along this stream threaten cutthroat trout viability by degrading cutthroat habitat requirements. Cutthroat trout require cool, clear water and well-vegetated streambanks for cover and bank stability; instream cover in the form of deep pools and boulders and logs; and clean gravel for spawning (NatureServe 2016). The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the "Weed Site ID."

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_020	<i>S. Hapemanii</i>	Scotch thistle	<i>Onopordum acanthium</i>	B
Garfield_weeds_062	None	Common mullein	<i>Verbascum thapsus</i>	C
Garfield_weeds_061	Riparian habitats	Houndstongue	<i>Cynoglossum officinale</i>	B
Garfield_weeds_110	<i>Salix monticola</i> mesic forbs	Canada thistle	<i>Cirsium arvense</i>	B

Management recommendations: These riparian canyon communities are dependent on abundant and consistent shallow groundwater discharge from surrounding hillslopes to maintain the hanging garden and riparian communities in this PCA. The concentration of rare natural communities and plant and animal species speaks to the high biological significance of this site. Management to sustain these element occurrences will also help enable sustainable stream flows, which in turn will help maintain riparian vegetation and aquatic and terrestrial wildlife.

- 1) Designate this PCA as an ACEC (Area of Critical Environmental Concern) to facilitate sustainable riparian and stream management.
- 2) Protect and encourage beaver and their dam-building activity. Beaver have re-colonized the valley, and their dam-building activity, which stores and cleanses water, provides nursery habitat for fish, recharging the local aquifer and contributing greatly to the restoration of riparian habitat.
- 3) Close extraneous spur roads to prevent further erosion, reduce habitat fragmentation and decrease avenues for weed invasion.
- 4) Eliminate and manage noxious weeds invasion in riparian habitat by implementing Best Management Practices for Managing Noxious weed in Riparian Habitat with a focus on non-chemical strategies (Bennett no date).
- 5) To ensure the long-term viability of the water and biotic resources, livestock should be excluded from riparian habitat in this PCA. Livestock use of riparian habitat diminishes system resiliency by degrading water quality, soil condition and riparian vegetation, and by enabling weed invasion.



Figure 7: Hanging garden sullivantia at East Fork of Parachute Creek.

EAST RIFLE CREEK

Ranks: Previous B3/P3M2; Current B4/P2M2. The B and P ranks were modified due to the deterioration of the quality of the box elder/red-osier dogwood riparian community occurrence from “good” to “fair.” Quality and viability of this community is threatened by hydrologic alteration and unmanaged recreation.

Biodiversity values: East Rifle Creek flows through a narrow, steep-walled canyon of vertical limestone cliffs. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** Box elder/red-osier dogwood Montane Riparian Deciduous Forest (G3?S1) and Hanging garden sullivantia (G3T3 S3). **Surveys conducted in 2015-2016:** no new occurrences were observed, but the box elder/red-osier dogwood occurrence was down ranked from a good (B rank) to a fair (C rank) occurrence due to hydrologic alteration and anthropogenic disturbance which has diminished the quality of the occurrence. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the “Weed Site ID.”

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Box elder/Red-osier dogwood	<i>Acer negundo / Cornus sericea Forest</i>	G3?S1	B (EOID 1043)	C	Low vulnerability

Threats: Exotic plant species are common along the road that parallels East Rifle Creek. Additionally, the local hydrologic regime is modified by the road that parallels the stream which eliminates at least 50% of the riparian habitat. Although native plant species dominate community composition, vegetation structure is modified by anthropogenic disturbance with plant species richness and cover consequently diminished. Vegetation alteration is primarily a consequence of recreational disturbance which has crushed herbaceous vegetation and diminished recruitment of box elder and red-osier dogwood. Reportedly at one time, a large colony of Black Swifts occupied the canyon, as did a nesting pair of Bald Eagles and Peregrine Falcons. However, disturbance from recreational climbers purportedly led to the abandonment of the swift colony and subsequent departure of both the Bald Eagle and Peregrine Falcon.

Numerous springs discharge along this stretch of East Rifle Creek from the Leadville limestone, an aquifer that is recharged from precipitation, snowmelt, and stream-flow and has a general subsurface flow toward the south, west, and northwest away from the White River Uplift. The Colorado Parks and Wildlife has developed a few of these stream-level springs to supply the Rifle State Fish Hatchery, which is located just downstream from this site. As a result, many of the springs are currently dry or are discharging less water than prior to development. In these disturbed sites and partly as a consequence of hydrologic alteration, exotic plant species dominate habitat throughout the Rifle State Fish Hatchery. Additional hydrologic alteration occurs due to livestock grazing in the surrounding landscape and to water diversion through the Grass Valley Canal that collects and diverts water. The table below lists weeds species at

surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the “Weed Site ID.”

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_023	None	Yellow toadflax	<i>Linaria vulgaris</i>	B
Garfield_weeds_024	None	Oxeye daisy	<i>Chrysanthemum leucanthemum</i>	B
Garfield_weeds_024.1	None	Reed canarygrass	<i>Phalaris arundinacea</i>	NA
Garfield_weeds_021	None	Common burdock	<i>Arctium minus</i>	C

Management recommendations:

- 1) Regulating and restricting recreation to defined use areas and trails is essential to maintaining the riparian plant occurrences.
- 2) Sustainability potential of this PCA would be greatly improved by eliminating and managing exotic weed invasions by implementing Best Management Practices for Managing Noxious weed in Riparian Habitat with a focus on non-chemical strategies (Bennett no date).

EAST SALT CREEK HEADWATERS

Ranks: Previous B3/P3M3; Current B4/P3M3. The B rank was modified to B4 because the PCA was originally designed for Piceance bladderpod, which is now considered historical and is no longer the element driving the rank. Instead, the narrowleaf cottonwood/three-leaf sumac community is the element occurrence that is determining the PCA B rank.

Biodiversity values: The East Salt Creek Headwaters site occupies the ridge separating the East Salt Creek drainage to the west and the Roan Creek drainage to the east, along with the riparian zone of Corral Canyon, a tributary of East Salt Creek. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** narrowleaf cottonwood/skunkbrush riparian woodland (G3S3), balsam poplar woodland (GUS2) and a historical occurrence of Piceance bladderpod (G2S2). **Newly documented occurrences include:** new occurrences of Gambel oak-mountain mahogany shrubland (G3S3), American peregrine falcon (G4T4S2B), and an increase in the distribution of the Narrowleaf cottonwood/skunkbush riparian woodland occurrence. The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Narrowleaf cottonwood/ Three-leaf sumac	<i>Populus angustifolia/Rhus trilobata</i> woodland	G3S3	C (EOID 1922)	C	Low vulnerability
Gambel oak-Mountain Mahogany	<i>Quercus gambelii - Cercocarpus montanus / (Carex geyeri)</i> Shrubland	G3S3	NA	C	Low vulnerability
Peregrine falcon	<i>Falco peregrinus anatum</i>	G4T4/S2B	NA	E	No data

Threats: Heavy and excessive livestock grazing has degraded and altered vegetation throughout both upland and riparian habitat. Sustained inappropriate livestock use will continue the decline of the riparian community occurrence. Currently the narrowleaf cottonwood tree canopy is dominated by mature and decadent cottonwood with little sign or potential for recruitment to replace dying individuals. Further, inappropriate livestock grazing in the surrounding uplands has removed excessive amounts of vegetation resulting in soil erosion and invasion of exotic plant species. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the “Weed Site ID.”

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_006	<i>E. traillii:</i>	Salt cedar	<i>Tamarisk spp.</i>	B
Garfield_weeds_006.1	<i>E. traillii:</i>	Russian olive	<i>Elaeagnus angustifolia</i>	B
Garfield_weeds_007.1	None	Hoary Cress	<i>Cardaria draba</i>	B
Garfield_weeds_007.2	None	Hoary Cress	<i>Cardaria draba</i>	B
Garfield_weeds_007.3	None	Hoary Cress	<i>Cardaria draba</i>	B
Garfield_weeds_007.4	None	Hoary Cress	<i>Cardaria draba</i>	B
Garfield_weeds_007.5	None	Hoary Cress	<i>Cardaria draba</i>	B
Garfield_weeds_007.6	None	Hoary Cress	<i>Cardaria draba</i>	B

Management recommendations: Resting the area from livestock grazing would improve habitat health and help restore system resiliency.

- 1) To restore riparian and stream functions exclude livestock grazing from riparian habitat.
- 2) Restore rangeland health by reducing grazing duration and intensity on upland sites as recommended by BLM’s rangeland health standards.

GARFIELD CREEK

Ranks: Previous B3/P2M2; Current B4/P2M2. The B rank was modified due to the loss of the narrowleaf cottonwood/river hawthorn community.

Biodiversity values: Throughout this PCA Garfield Creek is a medium sized C class stream that meanders through a moderately wide valley. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** community Narrowleaf cottonwood/river hawthorn (G2?S2) changed in 2015 from C to X because the community is no longer present. **Newly documented occurrences include:** narrowleaf cottonwood/mountain willow riparian woodland (G3S2), Lewis’s woodpecker (*Melanerpes lewis*) (G4S4) and Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) (G5T3QS1B), a bird species which is now federally listed as

“Threatened” and afforded the protection of the Endangered Species Act. The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Narrowleaf cottonwood/river hawthorn	<i>Populus angustifolia/Crataegus rivularis</i>	G2?S2	C	X	Low vulnerability
Narrowleaf cottonwood/Mountain willow	<i>Populus angustifolia/Salix monticola</i>	G3S2	NA	C	Low vulnerability
Lewis's woodpecker	<i>Melanerpes lewis</i>	G4/S4	NA	E	No data
Western yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>	G5T3Q/S1B	NA	E	Moderately vulnerable

Threats: Surrounding uplands are heavily developed and fragmented by agriculture and extractive energy-related development. The natural hydrologic regime is extensively altered by upstream diversions, livestock grazing, agricultural conversion of surrounding adjacent habitat and road- and development-induced fragmentation. These stresses will likely reduce the viability of the elements in the PCA. However, there is opportunity to mitigate or eliminate the threats if action is taken within 5 years.

As evidence of the impact of inappropriate livestock use, the community for which this PCA was initially designated is no longer functionally present and has been replaced by a few scattered box elder with an understory of noxious weeds. Channel downcutting, which has resulted from inappropriate livestock grazing, has resulted in abandonment and drying of the historic stream bench and consequent dying and loss of riparian vegetation. Channel downcutting has also inhibited the development of the stream habitat necessary for the recruitment of narrowleaf cottonwood. Consequently, the tree canopy in this stream reach is now dominated by mature and decadent cottonwood. Box elder (*Acer negundo*) appears to be establishing and may soon replace dominant cottonwood tree species, and non-native exotic plant species are invading.

Additionally, although records indicate that northern leopard frogs were commonly present, none were observed during this survey. The absence of leopard frogs may be due to an abundance of crawfish, a non-native species which has been implicated as major contributors to amphibian population declines, and in some instances local extinction (Kats and Ferrer 2003). The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the “Weed Site ID.”

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_038	None	Scotch thistle	<i>Onopordum acanthium</i>	B
Garfield_weeds_039	None	Hoary Cress	<i>Cardaria draba</i>	B
Garfield_weeds_040	None	Scotch thistle	<i>Onopordum</i>	B

			<i>acanthium</i>	
Garfield_weeds_041	None	Oxeye daisy	<i>Chrysanthemum leucanthemum</i>	B
Garfield_weeds_041.1	None	Canada thistle	<i>Cirsium arvense</i>	B
Garfield_weeds_045	None	Scotch thistle	<i>Onopordum acanthium</i>	B
Garfield_weeds_037.1	None	Common burdock	<i>Arctium minus</i>	C
Garfield_weeds_101	<i>Populus augustifolia/Salix monticola</i>	Canada thistle	<i>Cirsium arvense</i>	B
Garfield_weeds_102.1	<i>Populus augustifolia/Salix monticola</i>	Bull thistle	<i>Cirsium vulgare</i>	B
Garfield_weeds_102.2	<i>Populus augustifolia/Salix monticola</i>	Oxeye daisy	<i>Chrysanthemum leucanthemum</i>	B
Garfield_weeds_103	Riparian habitats	Poison hemlock	<i>Conium maculatum</i>	C
Garfield_weeds_103.1	Riparian habitats	Common mullein	<i>Verbascum thapsus</i>	C
Garfield_weeds_104	Riparian habitats	Musk thistle	<i>Carduus nutans</i>	B

Management recommendations: Management concerns derive from stream diversions, upland development-induced vegetation and hydrologic alteration, and inappropriate livestock grazing. Restoring a natural hydrologic regime and eliminating noxious plant species are priority management actions. Preventing livestock from accessing riparian habitat would enable vegetation and stream channel recovery over time. Protecting and encouraging beaver activity is likely the single most beneficial action that can be taken to restore stream and riparian habitat function.

- 1) Restore sustainable stream flows by bringing back riparian habitat functions with a focus on restoring riparian soils and native vegetation.
- 2) Exclude livestock from the riparian stream corridor.
- 3) Eliminate and manage noxious weed invasion by implementing Best Management Practices for Managing Noxious weed in Riparian Habitat with a focus on non-chemical strategies (Bennett no date).

GRIZZLY CREEK CANYON

PCA Ranks: Previous B3/P4M4; Current B2/P3M3. The biodiversity rank was modified from B3 to B2 to account for new occurrences of natural communities, plants and animals found on the top of the plateau and in Grizzly Creek Canyon. Protection and management urgency ranks were modified to account for the impact of incompatible livestock grazing on wetland communities at the top of the Plateau and to hydrologic alteration in Grizzly Canyon.

Biodiversity values: Grizzly Creek drains the White River plateau, an expansive uplifted highland with gently rolling terrain, vast open grasslands and sage shrublands interspersed with patches of spruce-fir forest. Habitat on the plateau is a mosaic of uplands and wetlands. Upland habitats include spruce-fir forests, sage shrublands and grasslands. Wetland types include riverine (riparian), lacustrine, slope and depressional wetlands with fens often occurring in all

wetland types except in riparian wetlands. Fen habitats are an irreplaceable, ancient class of wetland that depends on a sufficient water supply and quantity to maintain the vegetation which reciprocally maintains the water resource. Alteration of either results in the loss of this wetland type. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** Drummond's willow/beaked sedge montane willow carr (G4S2), mountain willow/mesic forbs montane willow carr (G4S3), Douglas-fir/mountain-lover lower montane forest (G2G3 S2), Gambel oak/mountain-lover mixed mountain shrubland (GU S1), Idaho fescue-Thurber's fescue montane grasslands and a historical occurrence of meadow milkvetch (G5T4 S1). **Newly documented occurrences include:** mud sedge herbaceous vegetation community (G2/S1S2), Sheep sedge herbaceous vegetation community (GUQ/S1), mud sedge (G5/S2) plant species, lesser panicled sedge (G5/S1) plant species and northern leopard frog(G5/S3) all found on top of the plateau; and in the canyon, narrowleaf cottonwood-box elder/red-osier dogwood woodlands (G2 S2). The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Sheep sedge herbaceous vegetation	<i>Carex illota herbaceous vegetation</i>	GUQS2	NA	C	Moderate
Mud sedge herbaceous vegetation	<i>Carex limosa herbaceous vegetation</i>	G2S1S2	NA	B	Moderate
Douglas fir/Mountain lover	<i>Pseudotsuga menziesii/Paxistima myrsinites forest</i>	G2G3 S2S3	NA	B	Moderate
Box elder-Narrowleaf cottonwood/Red-osier dogwood	<i>Acer negundo-Populus angustifolia/Cornus sericea woodland</i>	G2S2	NA	B	Low
Lesser panicled sedge	<i>Carex diandra</i>	G5S1	NA	B	No data
Mud sedge	<i>Carex limosa</i>	G5S2	NA	B	No data
Least moonwort	<i>Botrychium simplex</i>	G5T3T4S2	NA	D	No data
Northern leopard frog	<i>Rana pipiens</i>	G5S3	NA	E	Moderately vulnerable

Threats: This area of the White River plateau is intensively grazed by domestic livestock and is designated by the USFS as a Recreation Management Area to be managed for multiple uses including extractive (e.g. mining or logging) and motorized OHV use. Wetland resources, especially fen wetlands, on the plateau are threatened by the cumulative impacts of direct and indirect anthropogenic hydrologic alteration. Numerous dams and diversions are present across this landscape which together with livestock and motorized recreational uses alters the natural hydrologic regime. Throughout this region livestock grazing has impacted upland vegetation and soils, and consequently the hydrologic regime that contributes to the maintenance of wetlands on the plateau. Additionally a web of roads alters shallow groundwater flow to fens and culverts often drain these wetland fens. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the "Weed Site ID."

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_107	None	Common Mullein	<i>Verbascum thapsus</i>	C
Garfield_weeds_108	Riparian habitats	Common burdock	<i>Arctium minus</i>	C
Garfield_weeds_109	None	Common burdock	<i>Arctium minus</i>	C

Management recommendations: Impacts that result from livestock grazing on the plateau include vegetation alteration, modification of the natural hydrologic regime and soil degradation. Reducing livestock grazing intensity and adjusting the grazing regime to consider the life cycle needs of native plants and animals would improve vegetation condition, help restore a natural hydrologic regime and contribute to the maintenance of viable native animal populations. For instance, Northern leopard frogs require a mosaic of habitats to meet the requirements of all of their life stages including summer habitat (feeding by adults in upland areas), tadpole habitat (up to three months spent as tadpoles in shallow breeding ponds) and winter habitat (overwintering in lakes, streams, and ponds). Their complicated movement patterns during the year should also be considered and include habitat used for reproduction, summer feeding ranges, fall migrations, and overwintering.

In canyon habitat, a recreational trail that is located along streambanks, together with hydrologic alteration that results from an aqueduct that transfers streamflows from Grizzly Creek to No Name Creek, are modifying vegetation communities and altering the processes that maintain riparian vegetation. Restoration of a natural hydrologic regime would help restore and maintain the cottonwood gallery forest by enabling cottonwood recruitment. Non-native weedy species are invading along the recreational trail that parallels the stream and in numerous areas social trails that access the stream have resulted in vegetation trampling and more weed invasion. Weed management is essential to prevent further spread of invasive weeds and consequent deterioration of the occurrence.

- 1) On the plateau, reduce livestock grazing intensity and duration on upland habitats; exclude livestock from wetland and fen habitat; and adjust the grazing regime to accommodate the phenology of Northern leopard frogs.
- 2) On the plateau, reconnect wetland and upland habitats by removing extraneous roads.
- 3) In canyon habitat restore a natural hydrologic regime to enable cottonwood regeneration.
- 4) Eliminate and manage noxious weed invasions along recreational trails by implementing Best Management Practices for Managing Noxious weed in Riparian Habitat with a focus on non-chemical strategies (Bennett no date).

MAIN ELK CREEK

Ranks: Previous B3/P3 M3. Ranks were determined to be unchanged.

Biodiversity values: Main Elk Creek is one of the major creek basins that drains the southwestern portion of the Flat Tops - an uplifted plateau with gently rolling terrain, and vast open grasslands and sage shrublands interspersed with islands of subalpine fir forest and aspen

woodlands. Riparian habitat is a narrow band of lush blue spruce and cottonwood forests and willow shrublands. Stream habitat condition is somewhat diminished. Stream structure is simplified which provides less than ideal habitat for native fish with structure dominated by riffle and run habitat with low frequency of pool habitat. Stream banks are stable and well vegetated. However, embeddedness is high and excessive deposition indicates either excessive erosion and/or lack of flushing flows. The presence of two American dipper pairs with young in this short stream reach however indicates good water quality. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** Drummond's willow/Mesic forb shrubland (G4 S4), Colorado blue spruce/red-osier dogwood woodland montane riparian forest (G4 S2), Colorado River cutthroat trout (G4T3 S3), and River birch/star Solomon plume foothills riparian shrubland (G4? S3). **Surveys conducted in 2015-2016:** modification to the rank of the blue spruce/Red-osier dogwood community. The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Blue spruce/Red-osier dogwood	<i>Picea pungens</i> / <i>Cornus sericea</i> woodland	G4S2	A (EOID 6602)	B	Low

Threats: Surveys conducted in 2015 documented that two exotic plant species, common mullein and musk thistle, have infested several sites in the riparian corridor along this stream reach. Consequently, the blue spruce/red-osier dogwood community occurrence was down-graded from “excellent” to “good.” The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the “Weed Site ID.”

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_130	<i>Picea pungens</i> / <i>Cornus sericea</i> woodland	Common mullein	<i>Verbascum thapsus</i>	C
Garfield_weeds_111	<i>Picea pungens</i> / <i>Cornus sericea</i> woodland	Common mullein	<i>Verbascum thapsus</i>	C
Garfield_weeds_111.1	<i>Picea pungens</i> / <i>Cornus sericea</i> woodland	Musk thistle	<i>Carduus nutans</i>	B

Management recommendations: Common mullein (*Verbascum thapsus*) and musk thistle (*Carduus nutans*) infest several sites along this stream reach and threaten the natural values associated this occurrence.

1) Immediate weed management is essential to prevent the spread of invasive weeds and maintain the quality of the occurrence. Follow Best Management Practices for Managing Noxious weed in Riparian Habitat with a focus on non-chemical strategies (Bennett no date).

MIDDLE RIFLE CREEK

Ranks: Previous B3/P4M4; Current; B3/P2M3. The P and M ranks were modified due to inappropriate livestock use and weed invasion which has decreased viability and increased the urgency for management action that restores and maintains system health.

Biodiversity values: This PCA is characterized by steep washes of sandstone draining to Middle Rifle Creek. **Prior to the 2015-16 surveys occurrences associated with this PCA included:**

Wetherill's milkvetch (G3 S3), Gray Vireo (G4 S2B) and Western Yellowbelly Racer (G5T5 S3).

Surveys conducted in 2015-2016: the Wetherill's milkvetch occurrence was revisited and down ranked to C due to habitat degradation. The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Wetherill's milkvetch	<i>Astragalus wetherillii</i>	G3S3	B (EOID 4828)	C	No data

Threats: Although habitat is characterized by native pinyon-juniper woodlands, the condition of the woodlands is diminished by an altered disturbance regime, weed invasion and inappropriate livestock use. Livestock have trampled plants and soils throughout the site and noxious weeds, especially cheatgrass (*Bromus tectorum*), pose a threat to the imperiled element occurrence. A warming climate, in combination with livestock-induced habitat degradation and an altered disturbance regime, diminish system resiliency and render the occurrence vulnerable to extirpation. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the "Weed Site ID."

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Throughout PCA	<i>A. wetherillii</i>	Cheatgrass	<i>Bromus tectorum</i>	NA

Management recommendations:

- 1) Reduce grazing intensity.
- 2) Special designation for the known location of the plant would ensure long-term viability of the occurrence.
- 3) Establish a monitoring program to aid in identifying the impacts of disturbance on Wetherill's milkvetch population.



Figure 83: Wetherill's milkvetch (*Astragalus wetherillii*).

MITCHELL ROAD

Ranks: Previous B3/P3M3; Current B3/P2M3. The P rank was modified due to livestock-induced range degradation which has decreased the resiliency of the landscape to environmental perturbations such as drought. Diminished system resiliency in combination with a changing climate has increased vulnerability to loss of species and diminished system function.

Biodiversity values. This PCA lies within the saltbush fans and flats characteristic of areas south of the Bookcliffs. Public lands in this PCA are managed by the BLM as GAP Status Code 3 indicating that they are managed for multiple uses and subject to extractive (e.g. mining or logging) or OHV use. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** grand buckwheat (G3S2), long-nosed leopard lizard (G5S1), White-tailed Prairie Dog (G4S4), and Cold Desert Shrublands (G3G5 SU). **Newly documented occurrences include:** Cisco sego lily (G2S1), southwestern cat's-eye (G3S1) and long-nosed leopard lizard. The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Cisco sego lily	<i>Calochortus ciscoensis</i>	G2S1	NA	C	No data
Southwestern cat's-eye	<i>Oreocarya mensana</i>	G3S1	NA	C	No data
Long-nosed leopard lizard	<i>Gambelia wislizenii</i>	G5/S1	NA	E	Presumed stable

Threats: Incompatible livestock grazing has resulted in BLM's rangeland health standards not being met in this PCA or in the surrounding landscape (<http://www.peer.org/campaigns/public-lands/public-lands-grazing-reform/blm-grazing-data-interactive-map.html>). Exotic plant species, especially cheatgrass (*Bromus tectorum*), dominate herbaceous cover. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the "Weed Site ID."

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_004	None	Salt cedar	<i>Tamarisk spp.</i>	B
Throughout PCA	All	Cheatgrass	<i>Bromus tectorum</i>	NA

Management recommendations:

- 1) Actions that increase ecosystem resilience and enhance the adaptive capacity of the range ecosystem will reduce species' vulnerability to changing climate conditions, and should be a primary focus of management efforts (CNHP 2015).
- 2) Restore rangeland health by reducing the duration and intensity of grazing or eliminating grazing entirely from the site so that BLM's rangeland health standards are met (Batchelor et al. 2015, BLM 2016).
- 3) Given the suite of rare species that occur in this PCA this site would make a good addition to the Badger Wash State Natural, a BLM Area of Critical Environmental Concern located just to the south of this PCA in Mesa County.



Figure 9: Long-nosed leopard lizard at Mitchell Road PCA.

MOUNT LOGAN ROAD

Ranks: Previous B2/P2M2. Ranks were determined to be unchanged. However, surveys conducted in 2015-2016 documented changes in the abundance of several of the populations of rare plant species that had been documented in 1996 with some species increasing in abundance and distribution while others have decreased. Roan cliffs blazing star (G2S2) has increased while Utah mountain lilac (G4S1) abundance and distribution has decreased. Additionally, Utah fescue (G3S3) which was previously ranked "historical" was observed at Logan Wash mine site access road and Barneby's thistle (G3G4S3) is now distributed throughout this PCA.

Importantly, the mine access road to the Logan Wash mine is now closed to most vehicle traffic but for occasional maintenance visits by management personnel. Since the 2009 surveys which documented Parachute penstemon (G1S1) at this PCA, the road closure and the resulting cessation of disturbance have enabled colonization of the road by several rare native plant species including Parachute penstemon, Roan cliff's blazing star, Utah fescue and Barneby's thistle.

Biodiversity value: This site includes the roadside of a narrow dirt road which switchbacks up Mt. Logan. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** Parachute penstemon (G1S1), Roan Cliffs blazing star (G2S2), Utah fescue (G3S3), and Utah mountain lilac (G4S1). **Newly documented occurrences include:** Barneby's thistle (G3G4S3). The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Parachute penstemon	<i>Penstemon debilis</i>	G1S1	C	C	Extremely vulnerable
Festuca dasyclada	<i>Argilochloa dasyclada</i>	G3S3	H	C	No data
Roan cliffs blazing star	<i>Nuttallia rhizomata</i>	G2S2	C (EOID 1219)	B	Extremely vulnerable
Utah mountain lilac	<i>Ceanothus martinii</i>	G4S1	E (EOID 11004)	C	No data
Barneby's thistle	<i>Cirsium barnebyi</i>	Watchlisted	NA-new	C	No data

Threats: Historic energy development has altered the landscape in this PCA. Landscape fragmentation is high and connectivity reduced due to a web of roads that service energy development infrastructure. Surrounding landscape and ecosystem processes, especially hydrologic, soil and vegetation processes, are also altered, and ecosystem processes are compromised by oil and gas-related infrastructure and development. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the "Weed Site ID."

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_067	<i>N. rhizomata</i>	Musk thistle	<i>Carduus nutans</i>	B
Throughout PCA	<i>P. debilis</i>	Cheatgrass	<i>Bromus tectorum</i>	NA
Throughout PCA	<i>P. debilis</i>	Yellow sweetclover	<i>Melilotus officinale</i>	NA

Management recommendations:

- 1) To reduce impacts from any future energy development consult and implement "Recommended Best Management Practices for Plants of Concern" (Elliot et al. 2011).
- 2) Reducing fragmentation and reconnecting natural processes by closing extraneous roads will help restore some ecosystem function.

3) Natural revegetation of closed roads, well pads and disturbed sites with simultaneous weed monitoring and management is recommended. For best weed management strategies consult “Recommended Best Management Practices for Managing Noxious Weeds on Sites with Rare Plants” (Mui and Panjabi 2016) and “Conserving Roadside Populations of Colorado’s Globally Imperiled Plants, A Pilot Project” (Panjabi and Smith 2014).

4) Livestock grazing occurs on adjacent mesa tops. Although direct impacts from cattle to the rare plants that occur in this PCA are probably infrequent and minor due to their location on steep shale slopes, indirect impacts to underlying ecosystem processes are substantial. Thus grazing should be permitted only with appropriate management.

5) Element occurrences and threat impacts should be monitored annually to ensure successful adaptive management strategies.

Reclamation and revegetation using current standards that include bringing in topsoil and using seed from off-site sources is NOT recommended. These reclamation techniques would diminish habitat suitability for Parachute penstemon, introduce plants unsuitable to the site and increase competition for scarce resources, thereby diminishing viability potential of rare plant species.



Figure 10: Roan-cliffs blazing star at Logan Wash.

NO NAME CREEK

Ranks: Previous B2/P4M3. Ranks were determined to be unchanged.

Biodiversity values: No Name Creek drains high elevation plateaus of the Flat Tops cascading down through steep, narrow cliffs and canyons, ultimately having its confluence with the Colorado River. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** Drummonds willow/mesic forb shrubland (G4 S4), narrowleaf cottonwood/red-osier dogwood riparian forest (G4 S3), quaking aspen/sticky laurel forest (G2S1) and hanging garden sullivantia (G3T3 S3). **Newly documented occurrences include:** Narrowleaf cottonwood/river birch riparian woodland (G3 S3), Canyon bog orchid (G4G5T4?S3), extending the distribution of the

narrowleaf cottonwood/red-osier dogwood riparian forest (G4S3), and changing the rank of the hanging garden sullivantia occurrence from “poor” (D) to “failed to find” (F rank). The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Narrowleaf cottonwood/Red-osier dogwood	<i>Populus angustifolia</i> / <i>Cornus sericea</i> woodland	G4S3	B (EOID 5791)	B	Low
Narrowleaf cottonwood/River birch	<i>Populus angustifolia</i> / <i>Betula occidentalis</i>	G3S2	NA- new	B	Low
Hanging Garden Sullivantia	<i>Sullivantia hapanii</i> var. <i>purpusii</i>	G3T3S3	D (EOID 5374)	F	No data
Canyon bog orchid	<i>Limnorchis ensifolia</i>	G4G5T4?S3	NA- new	B	No data

Threats: A recreational trail that receives heavy use parallels the stream along the lower reaches of the creek. Noxious weeds have invaded along the trail and are abundant. Social trails that branch off of the main trail and encroach into riparian habitat resulting in vegetation trampling are also common. Indirect impacts to the sustainability of No Name Creek arise from alteration to headwater wetlands on the Plateau from livestock grazing, dams, and roads – maintenance of these wetland is essential to maintenance of streamflows in No Name Creek. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the “Weed Site ID.”

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_052	None	Common mullein	<i>Verbascum thapsus</i>	C

Management recommendations:

- 1) Maintain the natural hydrologic regime. Small, first order streams that drain steep east- and west-facing talus slopes in this canyon often support narrowleaf cottonwood-river birch woodland communities. Stream flow and maintenance of riparian communities is dependent on functioning wetlands on the Flattops plateau to support a natural hydrologic regime.
- 2) Within the lower reaches of No Name Creek eradication of noxious weeds and management of invasion with a focus on non-chemical strategies is important to the maintenance of the quality of this PCA.
- 3) Eliminate social trails and simultaneously, to dissuade new social trails, provide hardened trails that enable directed access to the stream.
- 4) On the plateau, reduce livestock grazing intensity and duration on upland habitats and exclude grazing in wetland habitat.

PRAIRIE AND SOUTH CANYON

Rank: Previous **B5/P4 M4**; Current **B5/P2 M2**. The “P” and “M” ranks were modified due to the immediate need for range management that restores rangeland health and increases potential for wildlife viability.

Site description. Vegetation is a mosaic of communities that vary with topography and soil. Riparian habitat is characterized by shrublands that are dominated by big sagebrush, hillslopes are characterized by pinyon-juniper woodlands, and salt flats are a mosaic of sage shrublands, salt bush shrublands and grasslands.

Biodiversity values. This PCA includes the riparian habitats of South and Prairie Canyons within the West Salt Creek drainage. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** kit fox (G4 S1). **Surveys conducted in 2015-2016:** verified the presence of the Ferron's milkvetch (G3S1) which was previously ranked as “H” (Historically known, but not verified for an extended period). The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Ferron's milkvetch	<i>Astragalus musiniensis</i>	G3S1	H (EOID 5759)	D	No data

Threats: Inappropriate livestock grazing has degraded ecosystem processes and diminished resiliency, function and sustainability of this landscape thereby diminishing viability potential for native plant and animal species and reducing the capacity of the range to support livestock grazing. Throughout the shrublands and grasslands herbaceous cover is dominated by exotic plant species, especially cheatgrass. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the “Weed Site ID.”

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Throughout PCA	All	Cheatgrass	<i>Bromus tectorum</i>	NA

Management recommendations: BLM’s rangeland health standards are not met in this PCA or in the vast surrounding landscape.

- 1) Restore rangeland function by implementing BLM’s rangeland health standards; resting the public allotments from livestock use for a minimum of 15 to 20 years may enable restoration of some range habitat function.
- 2) Restoration of the range with native graminoids and eliminating cheatgrass is essential to restoring system function. New cheatgrass elimination and management strategies using biocontrol are proving effective in eliminating cheatgrass.
- 3) Conduct surveys for kit fox in this PCA. Kit foxes have been on Colorado’s endangered species list since 1998. Work by Beck (1999, 2000) strongly suggested the already small kit fox

population in Colorado had declined sharply and that the species was close to extirpation from the state.

- a. Restrict trapping or hunting kit foxes;
- b. To discourage indirect and direct killing and poisoning, disseminate information to ranchers about kit fox food habits (primarily jackrabbits but also kangaroo rats, ground squirrels, ground-nesting birds, reptiles, and insects);
- c. Prohibit ATV use in potential and previously documented kit fox habitat; ATV use near kit fox habitat may disturb the foxes (McGrew 1979).

RARE PLANTS OF THE WASATCH

Rank: Previous B1/P2 M2. Ranks were determined to be unchanged.

Biodiversity values: This site is a botanical hotspot. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** DeBeque milkvetch (G2 S2), DeBeque phacelia (G2 S2), Naturita milkvetch (G2G3 S2S3), Adobe Hills thistle (G2G3 S2S3), Wetherill's milkvetch (G3 S3), long-flower cat's-eye (G3 S3), Colorado hookless cactus (G2G3 S2S3) and (juniper tumble mustard (G2 S2); natural communities including Utah juniper/Utah greasebush woodland(GUS2), Western Slope grasslands (G2G4 S1), Mesic Western Slope Pinyon-Juniper Woodlands (G5 S4), and Mesic Western Slope pinyon-juniper woodlands (G3S2). **Surveys conducted in 2015-2016:** added new occurrences of DeBeque milkvetch, Colorado hookless cactus, long-flower cat's eye, Adobe hills thistle and Sage sparrow (G5S3B) but failed to find a historic occurrence of Juniper tumble mustard (G2S2). The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Juniper tumble mustard	<i>Thelypodopsis juniperorum</i>	G2S2	H(EOID 22878)	F	No data
Adobe hills thistle	<i>Cirsium perplexans</i>	G2G3 S2S3	NA	C	No data
Colorado hookless cactus	<i>Sclerocactus glaucus</i>	G2G3 S2S3	NA	C	Extremely vulnerable
Sage Sparrow	<i>Amphispiza belli</i>	G5/S3B	NA	E	No data
Brewer's sparrow	<i>Spizella breweri</i>	USFS sensitive	NA	E	Presumed stable

Threats: Public lands in this PCA are managed with emphasis on oil and gas development and livestock grazing. Direct and indirect anthropogenic development activities threaten the long-term viability of populations of rare plants in this PCA. Road, well-pad, evaporation and pipeline development have directly eliminated potential habitat and indirectly contributed to alteration of soil and hydrologic processes. Grazing in the surrounding landscape has directly converted once lush grasslands and sage shrublands into cheatgrass-dominated deserts which has indirectly altered precipitation infiltration, soil processes and diminished habitat resiliency to our changing climate.

As a consequence of incompatible livestock grazing, BLM's rangeland health standards are not met on lower gradient habitats of this PCA. Both indirect and direct livestock-induced impacts

reduce potential long-term viability of native plant and animal species. Direct impacts result from vegetation trampling to which both Colorado hookless cactus and DeBeque phacelia are susceptible. Indirect impacts result from excessive vegetation removal and the consequent invasion of non-native species, such as cheatgrass (*Bromus tectorum*), and soil compaction which then influences natural hydrologic and disturbance (fire) regimes.

Diminished rangeland health reduces resiliency to environmental perturbations such as climate change. Predicted climate change in Colorado threatens DeBeque milkvetch, DeBeque phacelia, Naturita milkvetch, and Colorado hookless cactus, which are all considered to be extremely vulnerable to impacts of climate change (CNHP 2015).

Excessive livestock grazing also threatens viability potential for sage sparrows. Sage Sparrows are vulnerable to loss and fragmentation of sagebrush habitat and may require sagebrush parks in access of 100 acres. Range improvement programs removing sagebrush and invasion by cheatgrass have the potential to destroy this Sage Sparrow population.

Non-native exotic plant species, including cheatgrass and others, are ubiquitous in the surrounding landscape. Cheatgrass alters the natural fire regime by increasing the frequency, intensity, and size of range fires. Fire kills sagebrush and where non-native grasses dominate, the landscape can be converted to annual grassland as the fire cycle escalates, removing habitat for Sage Sparrow. Sage Sparrows can however persist with moderate grazing and other land management activities that maintain sagebrush cover and the integrity of native vegetation, but respond negatively to heavy grazing. Recovery of native grasses, management of fire to prevent loss of sagebrush cover and implementing a moderate grazing regime would improve viability potential for Sage Sparrows in this PCA. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the “Weed Site ID.”

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_064	C. perplexans	Salt Cedar	<i>Tamarisk spp.</i>	B
Garfield_weeds_065	Riparian habitat	Salt Cedar	<i>Tamarisk spp.</i>	B
Garfield_weeds_066	Riparian habitat	Salt Cedar	<i>Tamarisk spp.</i>	B
Throughout PCA	All	Cheatgrass	<i>Bromus tectorum</i>	NA

Management recommendations:

- 1) Resting or retiring grazing allotments in this PCA are essential to restoring range health and rare plant long-term viability.
- 2) Prohibiting further surface disturbance and reconnecting the landscape by closing extraneous roads would help to restore system resiliency by enabling reproductive success and species’ migration ability, thereby improving the potential for long-term survivability of the rare plant and animal species documented in this PCA.
- 3) Eliminating exotic weedy plant species, especially cheatgrass, is essential to restoring rangeland health and viability potential of rare plant and animal species. New cheatgrass

elimination and management strategies using biocontrol are proving effective in eliminating cheatgrass.

4. Designating ACECs with large buffers to provide habitat for rare plant species, as well as providing habitat for seed dispersal and migration, would ensure that environmental conditions necessary to maintain rare plant populations are protected for the long term.



Figure 4: Colorado hookless cactus.



Figure 52: DeBeque milkvetch at Anvil Points.

RIFLE FALLS STATE PARK

Rank: Previous B4/P4 M2; Current B4/P3 M2. The P rank for this PCA was modified due to the heavily diverted stream flows which, in combination with climate change-induced drying, threaten stream flows which are essential to Black Swift habitat.

Biodiversity values. Topography in this PCA is characterized by high rolling hills drained by narrow gullies and wide valleys. Rifle Creek flows through the main valley creating a spectacular waterfall which provides habitat for Black Swifts. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** Black swift (G4T4 S2) and Townsend's big-eared bat (G3G4T3T4 S2). **Surveys conducted in 2015-2016:** added a new occurrence of box elder/chokecherry riparian woodland (G3S2) and verified the continued presence of the Black Swift colony. The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Box elder/Chokecherry	<i>Acer negundo/Prunus virginiana</i>	G3S2	NA-new	C	Low
Black Swift	<i>Cypseloides niger</i>	G4T4 S2	C	C	Presumed stable

Threats: Waterfalls are an uncommon feature on the landscape and because climate-changed induced habitat drying is altering stream flows, therefore any waterfalls that support breeding populations of Black Swifts are important to protect. Additionally, the falls at Rifle Falls State Park are a popular tourist attraction. Access to the mine in the PCA that provides habitat for the bats is currently unrestricted, however bats are sensitive to human disturbance and would benefit from restricted access.

From the headwaters of Rifle Creek to the confluence with the Colorado River, as well as on the majority of tributaries to Rifle Creek, streamflows are heavily diverted. Landscape use surrounding this PCA is dominated by livestock grazing. Further, adjacent lower elevation habitat within the watershed is fragmented by anthropogenic alteration and by the Grass Valley Canal that collects and diverts water. The cumulative impacts of these anthropogenic alterations threaten the sustainability of the rare bird, mammal, and plant community occurrences in this PCA. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the "Weed Site ID."

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_024	Riparian habitat	Oxyeye daisy	<i>Chrysanthemum leucanthemum</i>	B
Garfield_weeds_024	Riparian habitat	Reed Canarygrass	<i>Phalaris arundinacea</i>	NA

Management: Protecting stream flows and the present physical state of the falls from alteration is essential to sustaining the natural resources at Rifle Falls State Park.

- 1) Managing recreation to prevent disturbance to wildlife and to prevent vegetation trampling is critical to viability of the element occurrences.
- 2) Limiting direct access to the falls through trail design would ensure continued nesting by the Black Swifts.
- 3) Maintain natural stream flows. Stream diversions that result in reduced flows at the falls could cause Black Swifts to abandon the nest site.
- 4) Townsends big-eared bats do not tolerate human disturbance. Construction of a bat gate to restrict human access, but allow continued use by the bats would help ensure that the population is conserved.
- 5) Implementing a monitoring program would aid in better defining the size and productivity of the elements, and would assist in developing an adaptive management plan.



Figure 63: Rifle Falls State Park.

ROARING FORK RIVER AT CARBONDALE

Rank: Previous B2/P3 M2. Ranks were determined to be unchanged.

Biodiversity values: Historically this river valley habitat was characterized by widely meandering river with broad riparian wetlands dominated by a mosaic of wetland communities including cottonwood gallery woodlands, willow shrublands and wet meadows. Currently, as a consequence of anthropogenic habitat conversion only narrow, fragmented remnants of these wetlands remain. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** Ute ladies'- tresses orchid (G2G3/S2 and Federally protected by the ESA with Threatened listing status), American yellow lady's-slipper orchid (G5 S2), narrowleaf cottonwood/thinleaf alder riparian plant community (G3/S3) and Bald Eagle (G5S1BS3N). **Surveys conducted in 2015-**

2016: verified the continuing presence and nesting of the Bald Eagles, downgraded two occurrences of American yellow lady's –slipper orchid due to weed invasion and eliminated the narrowleaf cottonwood/thinleaf alder riparian woodland due to a fire in 2008 which destroyed the community. Surveys conducted by CNHP with the USFWS and BLM in 2013 documented that stream channel point bar habitat from Rock Bottom Ranch down to the lower reaches of this PCA below Cattle Creek support good occurrences of the Ute ladies tresses orchid. This occurrence supports as many as 700 individuals in 11 sub-populations. Adjacent riparian habitat, both up and downstream provides some potential for dispersal. The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Narrowleaf cottonwood/Thinleaf alder	<i>Populus angustifolia/Alnus incana</i>	G3S3	C	X	Low
Ute ladies'-tresses	<i>Spiranthes diluvialis</i>	G2G3 S2	B (EOID 15421)	B	No data
American yellow lady's slipper	<i>Cypripedium calceolus ssp. parviflorum</i>	G5S2	B (EOID 5919)	D	No data
American yellow lady's slipper	<i>Cypripedium calceolus ssp. parviflorum</i>	G5S2	B (EOID 15188)	C	
Bald Eagle	<i>Haliaeetus leucocephalus</i>	G5S1BS3N	E (EOID 6596)	E	No data

Threats: Anthropogenic modification to habitat and stream hydrology have resulted in stream channelization and loss of riparian plant communities over much of this PCA. Alteration to the natural hydrologic regime has resulted in changes to vegetation community composition and structure, which threatens the long-term viability of plant, community and animal occurrences in this PCA.

Consequences of habitat and hydrologic alteration include stream channelization, which in combination with flow alteration has diminished the creation of early seral riparian habitat essential for Ute ladies'-tresses reproductive success; reduced point bar formation essential for cottonwood seedling establishment; and diminished overbanking flows which recharge the aquifer that supports riparian vegetation.

Exotic plant species are ubiquitous and threaten the persistence of the element occurrences in this PCA. Additional threats to the plant, animal and plantcommunity elements in this PCA arise from: livestock grazing in riparian habitat that has resulted in direct trampling damage to orchids, and elimination of cottonwood recruits that are essential to replace the decadent cottonwood stands; and recreational activity, particularly fishing along stream reaches where Ute ladies'-tresses orchids are located, disturbs streambanks and has resulted in vegetation trampling.

Ute ladies'-tresses orchids have a complex life history that is dependent on mycorrhizal infection, specialized pollination biology and a natural flooding regime that maintains the

frequently disturbed (flooding) early seral habitat conditions upon which this species relies for reproduction. Anthropogenic alteration of both surrounding riparian habitat and hydrological processes renders local populations vulnerable to extirpation. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the “Weed Site ID.”

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_027	<i>C. parviflorum</i>	Common Tansy	<i>Tanacetum vulgare</i>	B
Garfield_weeds_028	<i>C. parviflorum</i>	Canada thistle	<i>Cirsium arvense</i>	B
Garfield_weeds_029.1	<i>C. parviflorum</i>	Canada thistle	<i>Cirsium arvense</i>	B
Garfield_weeds_029.2	<i>C. parviflorum</i>	Common Tansy	<i>Tanacetum vulgare</i>	B
Garfield_weeds_030	<i>C. parviflorum</i>	Common Tansy	<i>Tanacetum vulgare</i>	B
Garfield_weeds_131	<i>C. parviflorum</i>	Canada thistle	<i>Cirsium arvense</i>	B
Garfield_weeds_131	<i>C. parviflorum</i>	Common tansy Canada thistle	<i>Tanacetum vulgare</i> <i>Cirsium arvense</i>	B
Garfield_weeds_115	<i>S. diluvialis</i>	Scotch thistle	<i>Onopordum acanthium</i>	B
Garfield_weeds_116	<i>S. diluvialis</i>	Common Tansy	<i>Tanacetum vulgare</i>	B
Garfield_weeds_116.1	<i>S. diluvialis</i>	Scotch thistle	<i>Onopordum acanthium</i>	B
Garfield_weeds_116.2	<i>S. diluvialis</i>	Plumeless thistle	<i>Carduus acanthoides</i>	B
Garfield_weeds_117	<i>S. diluvialis</i>	Common Tansy	<i>Tanacetum vulgare</i>	B
Garfield_weeds_118	<i>S. diluvialis</i>	Plumeless thistle	<i>Carduus acanthoides</i>	B

Management recommendations:

- 1) Restoring a natural hydrologic cycle replete with timing, duration and magnitude of spring flooding flows is essential to maintaining the processes that create the habitat upon which all of element occurrences in this PCA rely.
- 2) Sustainability potential of this PCA would be greatly improved by eliminating and managing exotic weed invasions by implementing Best Management Practices for Managing Noxious weed in Riparian Habitat with a focus on non-chemical strategies (Bennett no date).
- 3) Develop and Implement a management plan that protects Ute ladies'-tresses and American yellow ladies'-slippers orchids from livestock grazing and recreational trampling disturbance.
 - a. Eliminate recreational-induced trampling by identifying occurrences and routing fisherman access around, rather than through those sites;
 - b. Exclude livestock grazing from riparian habitat especially during late spring and summer when plants are growing and when birds are breeding; manage stocking rates and timing to encourage riparian shrub growth and vigor; use exclosures to protect sensitive areas from browsing and soil compaction (NatureServe 2016).
 - c. Because Ute ladies'-tresses orchid populations are often dynamic and “move” within a watershed as disturbances create new habitat or succession eliminates old habitat,

protecting currently unoccupied sites both up- and downstream of known populations is important to enable long-term population viability.

4) Establish a riparian development setback of at least 100 feet that conserves native vegetation along streambanks. Such a setback would help enhance and protect all of the natural values documented in this PCA.

5) Ensure protection of Bald Eagle nesting sites: For Bald Eagles implement appropriate measures as recommended by the National Bald Eagle Management Guidelines (<https://www.fws.gov/northeast/ecologicalservices/eaglenationalguide.html>)



Figure 74: Yellow ladies-slipper orchid.

SMITH GULCH

Rank: B3/P3 M3. Although the Garfield County sub-population of Harrington's beardtongue was lost, ranks were determined to be unchanged due to the presence of the sub-populations in Pitkin County.

Biodiversity values: This PCA spans both Garfield and Pitkin counties and encompasses Smith Gulch and the adjacent Edgerton Creek, and Barbers Gulch which are intermittent drainages that flow to the Crystal River just above its confluence with the Roaring Fork River. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** Harrington's beardtongue, a globally-vulnerable plant species which is restricted to Colorado and is found almost exclusively in sagebrush habitat. All locations are centered around Edwards in Eagle County with satellite populations in Garfield, Pitkin, Grand, Eagle, and Routt counties. Recent genetic information from the University of Northern Colorado suggests that the "mother" population originated in Pitkin County (pers. comm. M. McGlaughlin 2016). **Surveys conducted in 2015-2016:** verified the loss of Harrington's beardtongue from this site. The table below represents all occurrences that were documented in 2015/16. Surveys conducted in 2015-2016:

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Harrington's beardtongue	<i>Penstemon harringtonii</i>	G3S3	C (EOID 6340)	X	Extremely vulnerable

Threats: General threats to the persistence of Harrington's beardtongue include residential and agricultural development, off-road vehicle use, exotic plant species invasion, over-grazing by domestic and wild ungulates, oil and gas development, and climate change (Panjabi and Anderson 2006). In this PCA threats include agricultural habitat conversion, off-road vehicle use, exotic plant species invasion, over-grazing by domestic and wild ungulates, and climate change. The Garfield County sub-population has been extirpated due to the conversion of habitat to a horse pasture. Further, the entire area surrounding the occurrence experiences heavy livestock grazing. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the "Weed Site ID."

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_072	<i>P. harringtonii</i> extirpated at site	Musk Thistle	<i>Carduus nutans</i>	B

Management recommendations:

- 1) Implement BMPs for "Conserving Roadside Populations of Colorado's Globally Imperiled Plants" (Smith and Panjabi 2014) for those populations located near roads and pipelines.
- 2) Exotic plant species are ubiquitous. Eliminate and manage exotic plant invasions by implementing "Recommended Best Management Practices for Managing Noxious Weeds on Sites with Rare Plants" (Mui and Panjabi 2016).
- 3) Manage livestock grazing to restore sage shrublands (Pyke et al. 2015; Blaisdell et al. 1982) and be compatible with the survival of rare plants. Patches of sagebrush that are heavily grazed do not contain Harrington's beardtongue whereas sites that are grazed less heavily contain robust populations of Harrington's beardtongue.
- 4) Annual monitoring and protecting known populations from disturbance with large buffer areas to enable seed dispersal and migration will contribute to long-term population viability. Harrington's beardtongue populations are known to fluctuate in population numbers from year to year. Therefore, this specific location may be a higher priority than the current information reflects and monitoring should continue.

THE CROWN

Rank: Previous B2/P4 M3; Current B2/P2 M2. Modification of the P and M ranks are due to the dramatic and ubiquitous increase in mechanized and motorized recreational use of The Crown and the ensuing habitat alteration. Trail-induced habitat fragmentation and commensurate high levels of human disturbance has reduced the habitat's carrying capacity, threatens wildlife values and alters ecosystem processes including hydrologic, soil and vegetation processes.

Biodiversity values: The Crown PCA is bound by Prince Creek to the west, West Sopris Creek to the east, and the Roaring Fork River to the north. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** Harrington's beardtongue (G3/S3) is endemic to Colorado in a very narrow range and is found almost exclusively in sagebrush habitat. **Surveys conducted in 2015-2016:** verified the continued presence of Harrington's beardtongue and documented new occurrences of Brewer's Sparrow (USFS and BLM sensitive). The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Harrington's beardtongue	<i>Penstemon harringtonii</i>	G3S3	A (EOID 5517)	B	Extremely vulnerable
Brewer's sparrow	<i>Spizella breweri</i>	USFS sensitive	NA-new	E	Presumed stable
Brewer's sparrow	<i>Spizella breweri</i>	USFS sensitive	NA-new	E	Presumed stable

Threats: Harrington's beardtongue are highly threatened due to habitat loss and alteration by residential and recreational development, off-road vehicle use, exotic plant species' invasion, over-grazing by domestic and wild ungulates, oil and gas development and climate change. These threats in combination with its restricted range, create an urgency for protection (Panjabi and Anderson 2006). In this PCA Harrington's beardtongue is especially threatened by mechanized and motorized vehicle use.

Since the time of the previous surveys an extensive and ubiquitous network of recreational trails, dominated by both mechanized and motorized recreational users, has fragmented, disturbed and altered native habitat. The Crown has become one of the most popular trail networks for mountain bikers in the last decade. According to the BLM, The Crown and nearby Red Hill attract the highest number of mountain bike users per year on BLM lands in the Roaring Fork Valley. Ensuing habitat alterations has diminished the carrying capacity of the landscape, degraded wildlife value and diminished ecosystem functions throughout the PCA. Weeds are ubiquitous and soils are eroding along the numerous roads and trails that crisscross the landscape.

Additionally, much of the sage shrubland habitat is characterized by decadent shrub stands with herbaceous cover dominated by cheatgrass further degrading wildlife value and threatening to alter the natural fire regime. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the "Weed Site ID."

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Throughout PCA	<i>P. harringtonii</i>	Cheatgrass	<i>Bromus tectorum</i>	NA

Management recommendations:

- 1) Expand the PCA by acquiring conservation easements to enhance long-term survivability potential of Harrington's beardtongue by enabling population dispersal and migration.
- 2) Identifying and closing potential Harrington's beardtongue habitat to anthropogenic use would enable long-term population recovery and survivability by protecting habitat into which this species might disperse. Harrington's beardtongue populations are known to fluctuate in population numbers from year to year. Providing the potential for increased numbers of sub-populations would protect the entire population. Ensuring that sub-populations are connected to potential habitat and to each other, and that roads and trails that act as barriers to dispersal are removed, would further enable population sustainability.
- 3) Restore sage shrubland habitat (Pyke et al. 2015). Harrington's beardtongue primarily occupy sage shrublands. Age classes of these shrublands are dominated by decadent age class individuals with minimal recruitment. Herbaceous cover in sage habitat is often dominated by cheatgrass and *Poa bulbosa*, non-native species which are fire-prone and provide little to no wildlife value.

TRAPPER'S LAKE

Rank: Previous B3/P4 M3: ranks were determined to be unchanged.

Biodiversity values: Trappers Lake forms the headwaters of the North Fork White River. **Prior to the 2015-16 surveys occurrences associated with this PCA included:** Colorado River cutthroat (G4T3), Barrow's Goldeneye (G5S2B), Boreal Owl (G5S2), boreal toad (G4T1Q/S1) Theano alpine butterfly (G5 S3), planeleaf willow/marsh marigold willow carr (G4 S4), subalpine fir/fringed bluebells riparian forest (G5 S5), wolf willow/water sedge willow carr (G4 S3), beaked sedge wet meadow (G5 S4), short-fruit willow/mesic forbs shrubland (G4S4) and tufted hairgrass alpine meadow. **Surveys conducted in 2015-2016:** confirmed the continued presence of cutthroat trout. The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Cut-throat Trout	<i>Oncorhynchus clarkii pleuriticus</i>	G4T3/S3	NA	E	Extremely vulnerable

Threats: "Outfitter" camps occupy nearly every drainage, a high level of recreational activity occurs around the lake and throughout the PCA and domestic sheep grazing occurs in the area. Without appropriate management these activities threaten Wilderness values.

Management recommendations. The entire Frazer Creek drainage is within a designated Wilderness area and is without reservoirs, impoundments, livestock grazing, or surface disturbance of any kind. However, anthropogenic activity has altered ecosystem processes and wilderness values.

- 1) Improve long-term sustainability and resiliency of ecosystem processes and Wilderness values with management that protects hydrologic, soil, vegetation and biological processes:

- a) Exclude livestock from grazing in wetlands;
 - b) Encourage retirement of grazing allotments.
 - c) Regulate recreational use to maintain Wilderness-appropriate levels of human recreation.
 - d) To avert the loss of this Colorado River cutthroat trout population maintain the current hydrologic regime and prevent disturbance of both the surrounding landscape and streamside vegetation to prevent excessive erosion and sedimentation while maintaining hydrologic integrity.
- 2) To ensure the maintenance of ecosystem services expand the Flattops Wilderness area to include the entire ecoregion.

NEWLY DOCUMENTED POTENTIAL CONSERVATION AREAS

EAST CANYON CREEK

Rank: B2/ P2 M3.

Biodiversity values: This PCA is located on the Flat Tops which are a vast, uplifted, highland plateau. **Surveys conducted in 2015-2016:** documented a wetland fen that supports the globally imperiled mud sedge herbaceous vegetation community (G2 S1S2). Plant species characterizing this site indicate that the community should be assigned a C-value of “9.” The “C” value (coefficient of conservatism) of a community or plant represents the estimated probability that a species occurs in a landscape that is either pristine or is disturbed; C-values of 7 or higher are assigned to species that are obligate to high-quality natural areas and sensitive to sudden alterations to natural ecological processes and disturbances (Culver and Lemly 2013).

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Mud sedge herbaceous vegetation	<i>Carex limosa herbaceous vegetation</i>	G2S1S2	NA	B	Moderate

Threats: This area is designated by the USFS as Gap Status “3” which designates management for multiple uses including extractive uses (e.g. mining or logging) or OHV use and grazing. Livestock (sheep) grazing is ubiquitous and has altered vegetation composition and cover. Consequences include hydrologic alteration and diminished resiliency to environmental perturbations especially those impacts associated with a warming and drying climate in the southwest. No weed species were observed in this PCA.

Management recommendations: Conserving the natural hydrologic regime that controls these ancient fen wetlands is essential to the maintenance of both the fen plant community and the fen itself. Because fens are fed by shallow groundwater flow from surrounding uplands, protecting upland vegetation and soils is important to the sustainability of these fens.

- 1) Reducing livestock grazing intensity and duration would benefit upland vegetation and fen sustainability by promoting soil restoration and resiliency to drought by enhancing precipitation infiltration and storage.
- 2) Exclude livestock from wetland habitat.
- 3) Adjust the grazing regime to accommodate the phenology of amphibians present in this area.
- 4) Maintain and route roads to have minimal impact on groundwater flow.



Figure 85: Northern leopard frog.



Figure 96: Wetland fens on the Flattops.

BALDY CREEK

Rank: B4/P2M3.

Biodiversity values: Baldy Creek drains montane zone steep forested hillslopes. **Element occurrences associated with this PCA include:** Colorado blue spruce/thinleaf alder woodland community (G3S3) and Northern goshawk bird species (G5S3B) with nestlings. The table below represents all occurrences that were documented in 2015/16.

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Blue spruce/Thinleaf alder woodlands	<i>Picea pungens/</i> <i>Alnus incana</i>	G3S3	NA	B	Low

Threats: A combination of factors, including livestock grazing, hydrologic alteration and extractive energy development, contribute to diminished function and condition of this riparian community. Although trees and shrub cover is composed of native species, herbaceous cover commonly includes a high cover of non-native species. Road-induced stream channelization in combination with inappropriate livestock grazing has negatively impacted streambanks and riparian vegetation and enabled weed invasion. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the “Weed Site ID.”

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed Rank
Garfield_weeds_047.1	<i>Picea pungens/</i> <i>Alnus incana</i>	Houndstongue	<i>Cynoglossum officinale</i>	B
Garfield_weeds_047.2	PICPUN_ALNINC <i>Picea pungens/</i> <i>Alnus incana</i>	Canada thistle	<i>Cirsium arvense</i>	B
Garfield_weeds_047	<i>Picea pungens/</i> <i>Alnus incana</i>	Poison Hemlock	<i>Conium maculatum</i>	C

Management recommendations:

- 1) Exclude livestock from riparian habitat.
- 2) Eliminate and managing exotic weed invasions by implementing Best Management Practices for Managing Noxious weed in Riparian Habitat with a focus on non-chemical strategies (Bennett no date).

ROARING FORK AT RED CANYON

Rank: B4/P3M2

Biodiversity Values: Historically this river valley habitat was characterized by widely meandering river with broad riparian wetlands dominated by a mosaic of wetland communities including cottonwood gallery woodlands, willow shrublands and wet meadows. Currently, as a consequence of anthropogenic habitat conversion only narrow, fragmented remnants of these

wetlands remain. **2015-16 surveys also documented new occurrences of the following:** American yellow lady's-slipper (G5S2), narrowleaf cottonwood/river birch riparian forest (G3S3), Willow Flycatcher (G5S4), Lewis's Woodpecker with nestlings (G4S4) and a Bald Eagle pair with nestlings (G5S1BS3N).

ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
American yellow lady's-slipper	<i>Cypripedium calceolus ssp. parviflorum</i>	G5S2	NA	C	No data
Narrowleaf cottonwood/River birch	<i>Populus angustifolia/Betula occidentalis</i>	G3S3	NA	B/C	Low
Willow flycatcher	<i>Empidonax traillii</i>	G5/S4	NA	E	No data
Lewis's woodpecker	<i>Melanerpes lewis</i>	G4/S4	NA	E	No data
Willow flycatcher	<i>Empidonax traillii</i>	G4/S4	NA	E	No data
Lewis's woodpecker	<i>Melanerpes lewis</i>	G4/S4	NA	E	No data
Bald Eagle	<i>Haliaeetus leucocephalus</i>	G5/S1BS3N	NA	E	No data
Lewis's woodpecker	<i>Melanerpes lewis</i>	G4/S4	NA	E	No data

Threats: Anthropogenic modification to habitat and stream hydrology have resulted in stream channelization and loss of natural communities over much of this PCA. Alteration to the natural hydrologic regime has resulted in changes to vegetation community composition and structure, which threatens the long-term viability of plant, plant community and animal occurrences in this PCA. For instance, habitat loss and alteration is thought to be the principle cause of decline of the Willow Flycatcher and Lewis's Woodpecker (NatureServe 2016). Riparian habitats, particularly cottonwood and willow communities, have been dramatically reduced and degraded by urban development, roads, off-road vehicle use, recreation, livestock grazing, agriculture, water development projects, channelization, willow control, and encroachment by non-native species (NatureServe 2016).

Exotic plant species are ubiquitous and threaten the persistence of the element occurrences in this PCA. Exotics commonly present include hay grasses, houndstongue, cheatgrass, sweetclover, oxeye-daisy, plumeless and Canada thistle, Russian olive and tansy which is one of the most aggressive exotics in the PCA. The table below lists weeds species at surveyed sites in 2015-16, their status on the state noxious weed list, and can be cross-referenced to provided GIS files by using the "Weed Site ID."

Weed Site ID	Element Threatened	Weed Species Common Name	Weed Species Scientific Name	State Weed List
Garfield_weeds_053	<i>S. diluvialis</i>	Oxeye daisy	<i>Chrysanthemum leucanthemum</i>	B
Garfield_weeds_054	<i>S. diluvialis</i>	Oxeye daisy	<i>Chrysanthemum leucanthemum</i>	B
Garfield_weeds_055	<i>E. traillii</i>	Russian olive	<i>Elaeagnus angustifolia</i>	B

Garfield_weeds_056	<i>E. traillii</i>	Common Tansy	<i>Tanacetum vulgare</i>	B
Garfield_weeds_058	None	Oxeye daisy	<i>Chrysanthemum leucanthemum</i>	B
Garfield_weeds_058.1	<i>E. traillii</i>	Common tansy	<i>Tanacetum vulgare</i>	B
Garfield_weeds_057	None	Canada thistle	<i>Cirsium arvense</i>	B

Management recommendations:

- 1) Restore a natural hydrologic cycle replete with timing, duration and magnitude of spring flooding flows is essential to restoring the processes that create the habitat upon which all of element occurrences in this PCA rely.
- 2) Eliminate and managing exotic weed invasions by implementing Best Management Practices for Managing Noxious weed in Riparian Habitat with a focus on non-chemical strategies (Bennett no date).
- 3) Establish a riparian development setback of at least 100 feet that conserves native vegetation along streambanks. Such a setback would help enhance and protect all of the natural values documented in this PCA.
- 5) Ensure protection of Bald Eagle nesting sites: for Bald Eagles implement appropriate measures as recommended by the National Bald Eagle Management Guidelines (<https://www.fws.gov/northeast/ecologicalservices/eaglenationalguide.html>)



Figure 107: Bald Eagle mated pair at the Ranch at Roaring Fork.

FEN WETLAND SURVEY RESULTS

The diverse geography of Garfield County creates a template for an equally diverse set of wetlands. Fens are “ancient wetlands” that provide valuable ecosystem services and often harbor rare plant and animal species. The Flattops in Garfield County are a potential wealth of fen wetlands. In 2015 23 potential fen sites in Garfield County were surveyed. Of those sites 16 qualified as a fen wetland. Table 11 provides a list of surveyed sites that qualified as fens with defining environmental conditions. These surveys evaluated only a small percentage of potential fen habitat. Further surveys are likely to discover additional fen wetlands.

Table 11. Fens identified from 2016-16 Garfield County wetland survey, and their associated environmental factors.

Fen ID	Fen Yes/no	Fen Type	Disturbance Y/N	Peat Depth cm	Von Post Scale	pH	EC	C°
30798	Yes	PEM	ROAD	70	H3	8.23	518	12.7
47771	Yes	PEM	Sheep, Headcut	57	H4	7.5	253	12.1
47772	Yes	PEM	None	40-48	H5	7.6	436	13
				40	H5	7.6	436	13
47773	Yes	PEM	None	45-100	H8	8.2	283	11.3
				45	H7	7.5	585	13
47757	Yes	PEM	Road	56-115	H4	7.87	163	13.4
47777	Yes	PEMB	Sheep	56	H5	7.99	209	13.54
29609	Yes	PEMB	Sheep	56	H5			
47754	Yes	PEMB	Sheep	50	H3	7.56	85	12.7
47771	YES	PEMB	Sheep,road	55-130	H4	7.8	139	14.1
47740	YES	PEMB	Sheep, road	48	H5	7.19	141	12.1
	YES	PEMB	Sheep, road	48	H5			
47764	YES	PEMB	45		H3	3214	233	17.9
47763	YES	PEMB	45		H4		181	14.6
47759	YES	PEMB	None					
47762	YES	PEMB	Roads	>55	H4	10.5	272	16.1
47808	YES	PEMB	Sheep	>59	H5	5.42	261	8.1

NOXIOUS WEED OCCURRENCES

A total of 24 noxious weed species at 187 sites in Garfield County were documented and mapped. Of these 24 weed species, 15 are on the State's "B" list, five are on the "C" list and four of the species are not ranked and are on neither the State's nor Garfield County's weed list. Of the 24 species documented in 2015, 12 are on Garfield County's weed list and four are on the County's proposed noxious-weed list.

Of the 187 weed occurrence sites documented in 2015, 138 of these sites have been invaded by State "B" list weed species, 32 sites by "C" list weed species; and 17 sites by weed species that are not ranked (Table 11). No "A" list species were observed during these surveys. Of the 187 weed sites, ten have been assigned a priority "1" for management, 42 sites have been assigned a priority "2," 63 sites have been assigned a priority "3," 30 sites have been assigned a priority "4" and 42 sites a priority "5." A weed management priority of "1" indicates that the Element being encroached upon has a State rarity rank of "1" and is assigned the highest weed management priority. However, weed occurrences that are encroaching into the habitat of a federally listed plant or animal species were also designated as priority "1", regardless of their CNHP State tracking rank. Weeds that were encroaching into riparian habitat were designated a minimum priority rank of "3" if there were no other higher ranked occurrences present; if other higher ranked occurrences were present then the site was given that priority rank.

Weed species documented during 2015 surveys included: absinth wormwood, bull thistle, Canada thistle, common mullein, common tansy, field bindweed, hoary cress, houndstongue, kochia, musk thistle, oxeye daisy, plumeless thistle, poison hemlock, redstem filaree, reed canarygrass, Russian knapweed, Russian olive, salt cedar, Scotch thistle, Siberian elm, Western salsify, yellow sweet clover, yellow toadflax, and common burdock. Table 11 provides a list of weed species encountered during surveys.

Several noxious weed species are so widespread and well established that, with current strategies and technologies, investing time and resources in control may be considered futile and Garfield County does not include these species on their weed list. These species include cheatgrass, Kentucky bluegrass and dandelion. Cheatgrass is especially problematic and ubiquitous. However, recent scientific technologies using native soil bacteria to control and eventually eradicate cheatgrass are proving successful in cheatgrass management (Kennedy et al. 2016) thereby helping to restoring range health.

A rapidly emerging problem is that of secondary invasion — an increase in abundance of non-target exotics following treatment of targeted invasive plants (Pearson et al. 2015). Several sites identified in these surveys found secondary invasion of invasive weeds after treatment for a different invasive species. Colorado's Department of Agriculture Noxious Weed Program has worked with the Colorado Natural Heritage Program to

develop “Recommended Best Management Practices for Managing Noxious Weeds on Sites with Rare Plants”. Implementation of these BMPs for rare plant species would help to conserve Garfield County’s diverse natural heritage. A list of these BMPs is found in Table 13.

Table 12. Noxious weeds documented within Potential Conservation Areas in Garfield County in 2015, prioritized by threat level.

Priority	PCA Name	Site ID	Threatens Element: Yes/No: Species/community threatened	Weed Species: Common Name	Weed Species: Scientific Name	State Weed Rank
1	Anvil Points Rim	Garfield_weeds_025	YES: <i>P. debilis</i>	Houndstongue	<i>Cynoglossum officinale</i>	B
		Garfield_weeds_127	YES: <i>P. debilis</i>	Canada thistle	<i>Cirsium arvense</i>	B
		Garfield_weeds_114	YES: <i>M. odoratissima</i>	Houndstongue	<i>Cynoglossum officinale</i>	B
		Garfield_weeds_018	YES: <i>P. debilis</i>	Common mullein	<i>Verbascum thapsus</i>	C
1	Mt. Logan Road	Garfield_weeds_067	Yes: <i>N. rhizomata</i>	Musk thistle	<i>Carduus nutans</i>	B
		Throughout PCA	YES: <i>P. debilis</i>	Cheatgrass	<i>Bromus tectorum</i>	NR
		Throughout PCA	YES: <i>P. debilis</i>	Yellow sweetclover	<i>Melilotus officinale</i>	NR
1	Roaring Fork River at Carbondale	Garfield_weeds_029	YES: <i>S. diluvialis</i>	Oxeye daisy	<i>Chrysanthemum leucanthemum</i>	B
		Garfield_weeds_030.1	YES: <i>S. diluvialis</i>	Oxeye daisy	<i>Chrysanthemum leucanthemum</i>	B
		Garfield_weeds_115	YES: <i>S. diluvialis</i>	Scotch thistle	<i>Onopordum acanthium</i>	B
		Garfield_weeds_116	YES: <i>S. diluvialis</i>	Common Tansy	<i>Tanacetum vulgare</i>	B
		Garfield_weeds_116.1	YES: <i>S. diluvialis</i>	Scotch thistle	<i>Onopordum acanthium</i>	B
		Garfield_weeds_116.2	YES: <i>S. diluvialis</i>	Plumeless thistle	<i>Carduus acanthoides</i>	B
		Garfield_weeds_117	YES: <i>S. diluvialis</i>	Common Tansy	<i>Tanacetum vulgare</i>	B
		Garfield_weeds_118	YES: <i>S. diluvialis</i>	Plumeless thistle	<i>Carduus acanthoides</i>	B
1	Roaring Fork River at El Jebel	Garfield_weeds_053	YES: <i>S. diluvialis</i>	Oxeye daisy	<i>Chrysanthemum leucanthemum</i>	B
		Garfield_weeds_054	YES: <i>S. diluvialis</i>	Oxeye daisy	<i>Chrysanthemum leucanthemum</i>	B
2	Anvil Points	Garfield_weeds_008	YES: <i>A. debequaeus</i>	Musk Thistle	<i>Carduus nutans</i>	B
		Garfield_weeds_009	YES: <i>A. debequaeus</i>	Musk Thistle	<i>Carduus nutans</i>	B
		Garfield_weeds_010	YES: <i>A. debequaeus</i>	Salt Cedar	<i>Tamarisk spp.</i>	B
		Garfield_weeds_011	YES: <i>A. debequaeus</i>	Musk Thistle	<i>Carduus nutans</i>	B
		Garfield_weeds_017	YES: <i>N. rhizomata</i>	Canada thistle	<i>Cirsium arvense</i>	B
		Garfield_weeds_012	YES: <i>A. debequaeus</i>	Redstem Filaree	<i>Erodium cicutarium</i>	C
		Garfield_weeds_016	YES: <i>N. rhizomata</i>	Field bindweed	<i>Convolvulus arvensis</i>	C
		Garfield_weeds_015	YES: <i>N. rhizomata</i>	Yellow sweet clover	<i>Melilotus officinalis</i>	NR
2	Barrel Spring Point	Garfield_weeds_080	YES: <i>P. parviflora</i>	Common Mullein	<i>Verbascum thapsus</i>	C
2	Cattle Creek	Garfield_weeds_105	YES: <i>Picea pungens</i> / <i>Cornus sericea</i>	Common Tansy	<i>Tanacetum vulgare</i>	B

Priority	PCA Name	Site ID	Threatens Element: Yes/No: Species/community threatened	Weed Species: Common Name	Weed Species: Scientific Name	State Weed Rank
	at Coulter Creek	Garfield_weeds_105.1	YES: <i>Picea pungens</i> / <i>Cornus sericea</i>	Absinthe wormwood	<i>Artemisia absinthium</i>	B
		Garfield_weeds_128	YES: <i>Picea pungens</i> / <i>Cornus sericea</i>	Reed canarygrass	<i>Phalaris arundinacea</i>	NR
		Garfield_weeds_106	YES: Riparian	Plumeless thistle	<i>Carduus acanthoides</i>	B
2	Douglas Pass	Garfield_weeds_073.1	YES: <i>I. grandiflora</i>	Canada thistle	<i>Cirsium arvense</i>	B
		Garfield_weeds_073.2	YES: <i>I. grandiflora</i>	Houndstongue	<i>Cynoglossum officinale</i>	B
		Garfield_weeds_073.5	YES: <i>I. grandiflora</i>	Salt Cedar	<i>Tamarisk spp.</i>	B
		Garfield_weeds_073.5.1	YES: <i>I. grandiflora</i>	Bull thistle	<i>Cirsium vulgare</i>	B
		Garfield_weeds_073.8	YES: <i>I. grandiflora</i>	Canada thistle	<i>Cirsium arvense</i>	B
		Garfield_weeds_073.9	YES: <i>I. grandiflora</i>	Salt Cedar	<i>Tamarisk spp.</i>	B
		Garfield_weeds_073.3	YES: <i>I. grandiflora</i>	Field bindweed	<i>Convolvulus arvensis</i>	C
		Garfield_weeds_073	YES: <i>I. grandiflora</i>	Yellow Sweet clover	<i>Melilotus officinalis</i>	NR
		Garfield_weeds_073.4	YES: <i>I. grandiflora</i>	Yellow Sweet clover	<i>Melilotus officinalis</i>	NR
		Garfield_weeds_073.6	YES: <i>I. grandiflora</i>	Yellow Sweet clover	<i>Melilotus officinalis</i>	NR
		Garfield_weeds_073.7	YES: <i>I. grandiflora</i>	Yellow Sweet clover	<i>Melilotus officinalis</i>	NR
2	Garfield Creek	Garfield_weeds_102	YES: <i>Populus angustifolia</i> / <i>Salix monticola</i>	Canada thistle	<i>Cirsium arvense</i>	B
		Garfield_weeds_102.1	YES: <i>Populus angustifolia</i> / <i>Salix monticola</i>	Bull thistle	<i>Cirsium vulgare</i>	B
		Garfield_weeds_102.2	YES: <i>Populus angustifolia</i> / <i>Salix monticola</i>	Oxeye daisy	<i>Chrysanthemum leucanthemum</i>	B
2	Main Elk Creek	Garfield_weeds_111.1	YES: <i>Picea pungens</i> / <i>Cornus sericea</i>	Musk thistle	<i>Carduus nutans</i>	B
		Garfield_weeds_111	YES: <i>Picea pungens</i> / <i>Cornus sericea</i>	Common mullein	<i>Verbascum thapsus</i>	C
2	Rare Plants of the Wasatch	Garfield_weeds_064	YES: <i>C. perplexans</i>	Salt Cedar	<i>Tamarisk spp.</i>	B
		Garfield_weeds_065	YES: riparian	Salt Cedar	<i>Tamarisk spp.</i>	B
		Garfield_weeds_066	YES: riparian	Salt Cedar	<i>Tamarisk spp.</i>	B
		Throughout PCA	YES: All elements	Cheatgrass	<i>Bromus tectorum</i>	NR
2	Roaring Fork River at Carbondale	Garfield_weeds_131	YES: <i>C. parviflorum</i>	Canada thistle	<i>Cirsium arvense</i>	B
		Garfield_weeds_131	YES: <i>C. parviflorum</i>	Common tansy Canada thistle	<i>Tanacetum vulgare</i> <i>Cirsium arvense</i>	B
		Garfield_weeds_027	YES: <i>C. parviflorum</i>	Common Tansy	<i>Tanacetum vulgare</i>	B
		Garfield_weeds_028	YES: <i>C. parviflorum</i>	Canada thistle	<i>Cirsium arvense</i>	B
		Garfield_weeds_029.1	YES: <i>C. parviflorum</i>	Canada thistle	<i>Cirsium arvense</i>	B

Priority	PCA Name	Site ID	Threatens Element: Yes/No: Species/community threatened	Weed Species: Common Name	Weed Species: Scientific Name	State Weed Rank
		Garfield_weeds_029.2	YES: <i>C. parviflorum</i>	Common Tansy	<i>Tanacetum vulgare</i>	B
		Garfield_weeds_030	YES: <i>C. parviflorum</i>	Common Tansy	<i>Tanacetum vulgare</i>	B
3	Anvil Points Rim:	Garfield_weeds_019	YES: <i>F. dasyclada</i>	Common mullein	<i>Verbascum thapsus</i>	C
3	Baldy Creek	Garfield_weeds_047.1	YES: <i>Picea pungens/ Alnus incana</i>	Houndstongue	<i>Cynoglossum officinale</i>	B
		Garfield_weeds_047.2	YES: <i>Picea pungens/ Alnus incana</i>	Canada thistle	<i>Cirsium arvense</i>	B
		Garfield_weeds_047	YES: <i>Picea pungens/ Alnus incana</i>	Poison Hemlock	<i>Conium maculatum</i>	C
3	Colorado River Megasite	Garfield_weeds_001	YES: Riparian	Salt Cedar	<i>Tamarisk spp.</i>	B
			YES: Riparian	Russian olive	<i>Elaeagnus angustifolia</i>	B
			YES: Riparian	Plumeless thistle	<i>Carduus acanthoides</i>	B
			YES: Riparian	Bull thistle	<i>Cirsium vulgare</i>	B
		Garfield_weeds_105	YES: <i>Populus deltoides/ Rhus trilobata</i>	Russian olive	<i>Elaeagnus angustifolia</i>	B
		Garfield_weeds_119	NO	Kochia	<i>Kochia scoparia</i>	NR
		Garfield_weeds_119.1	YES: Riparian	Scotch thistle	<i>Onopordum acanthium</i>	B
		Garfield_weeds_119.2	YES: Riparian	Russian knapweed	<i>Acroptilon repens</i>	B
		Garfield_weeds_120	YES: <i>Populus deltoides/ Rhus trilobata</i>	Russian olive	<i>Elaeagnus angustifolia</i>	B
		Garfield_weeds_121	YES: <i>Populus deltoides/ Rhus trilobata</i>	Common Tansy	<i>Tanacetum vulgare</i>	B
		Garfield_weeds_121.1	YES: <i>Populus deltoides/ Rhus trilobata</i>	Salt Cedar	<i>Tamarisk spp.</i>	B
		Garfield_weeds_121.2	YES: <i>Populus deltoides/ Rhus trilobata</i>	Siberian elm	<i>Ulmus pumila</i>	NR
		Garfield_weeds_122	YES: <i>Populus deltoides/ Rhus trilobata</i>	Kochia	<i>Kochia scoparia</i>	NR
		Garfield_weeds_122.1	YES: <i>Populus deltoides/ Rhus trilobata</i>	Russian knapweed	<i>Acroptilon repens</i>	B
		Garfield_weeds_123	YES: <i>Populus deltoides/ Rhus trilobata</i>	Salt Cedar	<i>Tamarisk spp.</i>	B
		Garfield_weeds_124	YES: <i>Populus deltoides/ Rhus trilobata</i>	Russian knapweed	<i>Acroptilon repens</i>	B
3	Deep Creek	Garfield_weeds_125	NO	Yellow Toadflax	<i>Linaria vulgaris</i>	B
		Garfield_weeds_126	NO	Canada thistle	<i>Cirsium arvense</i>	B
		Garfield_weeds_087.1	YES: Riparian	Salt Cedar	<i>Tamarisk spp.</i>	B

Priority	PCA Name	Site ID	Threatens Element: Yes/No: Species/community threatened	Weed Species: Common Name	Weed Species: Scientific Name	State Weed Rank
		Garfield_weeds_088	YES: Riparian	Salt Cedar	<i>Tamarisk spp.</i>	B
3	Divide Creek	Garfield_weeds_087	YES: Riparian	Russian olive	<i>Elaeagnus angustifolia</i>	B
3	East Divide Creek	Garfield_weeds_091.1	YES: <i>A. wetherillii</i>	Houndstongue	<i>Cynoglossum officinale</i>	B
		Garfield_weeds_091.2	YES: <i>A. wetherillii</i>	Musk thistle	<i>Carduus nutans</i>	B
		Garfield_weeds_092	YES: <i>A. wetherillii</i>	Musk thistle	<i>Carduus nutans</i>	B
		Garfield_weeds_092.1	YES: <i>A. wetherillii</i>	Houndstongue	<i>Cynoglossum officinale</i>	B
		Garfield_weeds_098	YES: <i>A. wetherillii</i>	Musk Thistle	<i>Carduus nutans</i>	B
		Garfield_weeds_098.1	YES: <i>A. wetherillii</i>	Houndstongue	<i>Cynoglossum officinale</i>	B
		Garfield_weeds_099	YES: Riparian	Salt Cedar	<i>Tamarisk spp.</i>	B
		Garfield_weeds_099.1	YES: Riparian	Musk thistle	<i>Carduus nutans</i>	B
		Garfield_weeds_091	YES: <i>A. wetherillii</i>	Common Mullein	<i>Verbascum thapsus</i>	C
		Garfield_weeds_099.2	YES: Riparian	Siberian elm	<i>Ulmus pumila</i>	NR
3	East Douglas Creek	Garfield_weeds_082	YES: Riparian	Yellow Sweet clover	<i>Melilotus officinalis</i>	NR
		Garfield_weeds_082.1	YES: Riparian	Yellow Sweet clover	<i>Melilotus officinalis</i>	NR
3	East Elk Creek	Garfield_weeds_113	NO	Musk thistle	<i>Carduus nutans</i>	B
		Garfield_weeds_112	NO	Yellow Toadflax	<i>Linaria vulgaris</i>	B
3	East Fork Parachute Creek	Garfield_weeds_020	YES: <i>S. Hapemanii</i>	Scotch thistle	<i>Onopordum acanthium</i>	B
		Garfield_weeds_020.1	YES: <i>S. Hapemanii</i>	Houndstongue	<i>Cynoglossum officinale</i>	B
		Garfield_weeds_061	YES: Riparian	Houndstongue	<i>Cynoglossum officinale</i>	B
		Garfield_weeds_110	YES: <i>Salix monticola</i>	Canada thistle	<i>Cirsium arvense</i>	B
3	Garfield Creek	Garfield_weeds_104	YES: Riparian	Musk thistle	<i>Carduus nutans</i>	B
		Garfield_weeds_103	YES: Riparian	Poison hemlock	<i>Conium maculatum</i>	C
		Garfield_weeds_103.1	YES: Riparian	Common mullein	<i>Verbascum thapsus</i>	C
3	Grizzly Creek Canyon	Garfield_weeds_108	YES: Riparian	Common burdock	<i>Arctium minus</i>	C
3	Main Elk Creek	Garfield_weeds_130	YES: <i>Picea pungens</i> / <i>Cornus sericea</i>	Common mullein	<i>Verbascum thapsus</i>	C
3	Smith Gulch	Garfield_weeds_072	NO: <i>P. harringtonii</i> extirpated	Musk Thistle	<i>Carduus nutans</i>	B
3	The Crown	Throughout PCA	YES: <i>P. harringtonii</i>	Cheatgrass	<i>Bromus tectorum</i>	NR
3	Rifle Falls State Park	Garfield_weeds_024	Y: Riparian	Oxeye daisy Reed canarygrass	<i>Chrysanthemum leucanthemum</i>	B
					<i>Phalaris arundinacea</i>	NR
4	Roaring Fork River at El	Garfield_weeds_055	YES: <i>E. traillii</i>	Russian olive	<i>Elaeagnus angustifolia</i>	B
4	Jebel	Garfield_weeds_056	YES: <i>E. traillii</i>	Common Tansy	<i>Tanacetum vulgare</i>	B

Priority	PCA Name	Site ID	Threatens Element: Yes/No: Species/community threatened	Weed Species: Common Name	Weed Species: Scientific Name	State Weed Rank
4		Garfield_weeds_058	No	Oxeye daisy	<i>Chrysanthemum leucanthemum</i>	B
4		Garfield_weeds_058.1	YES: <i>E. traillii</i>	Common tansy	<i>Tanacetum vulgare</i>	B
4		Garfield_weeds_057	No	Canada thistle	<i>Cirsium arvense</i>	B
5	Anvil Points	Garfield_weeds_013	NO	Musk Thistle	<i>Carduus nutans</i>	B
		Garfield_weeds_014	NO	Western Salsify	<i>Tragopogon dubius</i>	NR
5	East Fork Parachute Creek	Garfield_weeds_062	NO	Common mullein	<i>Verbascum thapsus</i>	C
5	Grizzly Creek Canyon	Garfield_weeds_109	NO	Common burdock	<i>Arctium minus</i>	C
5	No Name	Garfield_weeds_052	NO	Common mullein	<i>Verbascum thapsus</i>	C
5	Prairie and South Canyon	Throughout PCA	All	Cheatgrass	<i>Bromus tectorum</i>	NR

Priority ranking is based on Element rarity as determined by CNHP State rarity ranking: a weed management priority of “1” indicates that the Element being encroached upon has a State rarity rank of “1” and is assigned the highest weed management priority etc. However, weed occurrences that are encroaching into the habitat of a federally listed plant or animal species were designated as priority “1”, regardless of their CNHP State tracking rank. Weeds that were encroaching into riparian habitat were designated a minimum priority rank of “3” if there were no other higher ranked occurrences present; if other higher ranked occurrences were present then the site was given that priority rank.

Table 13. Noxious weeds documented outside of Potential Conservation Areas in Garfield County in 2015, prioritized by threat level.

Priority	Site Name	Weed Site ID	Threatens EO: Y/N:	Weed Species: Common Name	Weed Species: Scientific Name	State Weed Rank
2	Douglas Pass Road	Garfield_weeds_005	Y: <i>E. contortum</i>	Hoary Cress	<i>Cardaria draba</i>	B
2	Garfield Creek	Garfield_weeds_101	YES: <i>Populus angustifolia</i> / <i>Salix monticola</i>	Canada thistle	<i>Cirsium arvense</i>	B
3	Colorado River at Silt	Garfield_weeds_096	Y: Riparian	Musk thistle	<i>Carduus nutans</i>	B
		Garfield_weeds_097	Y: Riparian	Russian knapweed	<i>Acroptilon repens</i>	B
3	Douglas Pass	Garfield_weeds_081.1	Y: <i>P. parviflora</i>	Yellow sweetclover	<i>Melilotus officinalis</i>	NR
3	East Salt Creek	Garfield_weeds_006	Y: <i>E. traillii</i>	Salt cedar	<i>Tamarisk spp.</i>	B
		Garfield_weeds_006.1	Y: <i>E. traillii</i>	Russian olive	<i>Elaeagnus angustifolia</i>	B
3	Hubbard Gulch	Garfield_weeds_060	Y: Riparian	Salt cedar	<i>Tamarisk spp.</i>	B
3	Logan Wash	Garfield_weeds_068	Y: Riparian	Salt cedar	<i>Tamarisk spp.</i>	B
		Garfield_weeds_069	Y: Riparian	Musk thistle	<i>Carduus nutans</i>	B
3	Middle Rifle Creek	Throughout PCA	Y: <i>A. wetherillii</i>	Cheatgrass	<i>Bromus tectorum</i>	NR
3	Roan Creek	Garfield_weeds_044	Y: riparian	Salt cedar	<i>Tamarisk spp.</i>	B
4	Baldy Creek	Garfield_weeds_046	NO	Hoary Cress	<i>Cardaria draba</i>	B
		Garfield_weeds_048.1	NO	Canada thistle	<i>Cirsium arvense</i>	B
		Garfield_weeds_049	NO	Hoary Cress	<i>Cardaria draba</i>	B
		Garfield_weeds_050	NO	Hoary Cress	<i>Cardaria draba</i>	B
		Garfield_weeds_051	NO	Hoary Cress	<i>Cardaria draba</i>	B
		Garfield_weeds_026	NO	Poison Hemlock	<i>Conium maculatum</i>	C
		Garfield_weeds_026.1	NO	Field Bindweed	<i>Convolvulus arvensis</i>	C
		Garfield_weeds_048	NO	Poison Hemlock	<i>Conium maculatum</i>	C
4	Crystal Fish Hatchery	Garfield_weeds_132	NO	Canada thistle	<i>Cirsium arvense</i>	B
4	East Rifle Creek	Garfield_weeds_023	NO	Yellow toadflax	<i>Linaria vulgaris</i>	B
		Garfield_weeds_024	NO	Oxeye daisy	<i>Chrysanthemum leucanthemum</i>	B
		Garfield_weeds_022	NO	Common mullein	<i>Verbascum thapsus</i>	C
		Garfield_weeds_021	NO	Common burdock	<i>Arctium minus</i>	C

Priority	Site Name	Weed Site ID	Threatens EO: Y/N:	Weed Species: Common Name	Weed Species: Scientific Name	State Weed Rank
		Garfield_weeds_024.1	NO	Reed canarygrass	<i>Phalaris arundinacea</i>	NR
4	East Salt Creek	Garfield_weeds_007.1	NO	Hoary Cress	<i>Cardaria draba</i>	B
		Garfield_weeds_007.2	NO	Hoary Cress	<i>Cardaria draba</i>	B
		Garfield_weeds_007.3	NO	Hoary Cress	<i>Cardaria draba</i>	B
		Garfield_weeds_007.4	NO	Hoary Cress	<i>Cardaria draba</i>	B
		Garfield_weeds_007.5	NO	Hoary Cress	<i>Cardaria draba</i>	B
		Garfield_weeds_007.6	NO	Hoary Cress	<i>Cardaria draba</i>	B
4	Garfield Creek	Garfield_weeds_037	NO	Bull thistle	<i>Cirsium vulgare</i>	B
		Garfield_weeds_038	NO	Scotch thistle	<i>Onopordum acanthium</i>	B
		Garfield_weeds_039	NO	Hoary Cress	<i>Cardaria draba</i>	B
		Garfield_weeds_040	NO	Scotch thistle	<i>Onopordum acanthium</i>	B
		Garfield_weeds_041	NO	Oxeye daisy	<i>Chrysanthemum leucanthemum</i>	B
		Garfield_weeds_041.1	NO	Canada thistle	<i>Cirsium arvense</i>	B
		Garfield_weeds_045	NO	Scotch thistle	<i>Onopordum acanthium</i>	B
		Garfield_weeds_037.1	NO	Common burdock	<i>Arctium minus</i>	C
5	Douglas Pass	Garfield_weeds_081	NO	Yellow Sweet clover	<i>Melilotus officinalis</i>	NR
		Garfield_weeds_081.1	NO	Yellow Sweet clover	<i>Melilotus officinalis</i>	NR
5	East Divide Creek	Garfield_weeds_090.1	NO	Houndstongue	<i>Cynoglossum officinale</i>	B
		Garfield_weeds_090.2	NO	Musk thistle	<i>Carduus nutans</i>	B
		Garfield_weeds_093	NO	Musk thistle	<i>Carduus nutans</i>	B
		Garfield_weeds_093.1	NO	Houndstongue	<i>Cynoglossum officinale</i>	B
		Garfield_weeds_094	NO	Musk thistle	<i>Carduus nutans</i>	B
		Garfield_weeds_090	NO	Common Mullein	<i>Verbascum thapsus</i>	C
5	Gibson gulch	Garfield_weeds_100	NO	Bull thistle	<i>Cirsium vulgare</i>	B
		Garfield_weeds_089	NO	Common Mullein	<i>Verbascum thapsus</i>	C
5	Glenwood ditch	Garfield_weeds_031	NO	Scotch thistle	<i>Onopordum acanthium</i>	B
		Garfield_weeds_032	NO	Musk thistle	<i>Carduus nutans</i>	B
		Garfield_weeds_033	NO	Common Tansy	<i>Tanacetum vulgare</i>	B
		Garfield_weeds_033.2	NO	Canada thistle	<i>Cirsium arvense</i>	B
		Garfield_weeds_034	NO	Scotch thistle	<i>Onopordum acanthium</i>	B

Priority	Site Name	Weed Site ID	Threatens EO: Y/N:	Weed Species: Common Name	Weed Species: Scientific Name	State Weed Rank
		Gaefield_weeds_034.1	NO	Common Tansy	<i>Tanacetum vulgare</i>	B
		Garfield_weeds_035	NO	Common Tansy	<i>Tanacetum vulgare</i>	B
		Garfield_weeds_036	NO	Musk thistle	<i>Carduus nutans</i>	B
		Garfield_weeds_036.2	NO	Houndstongue	<i>Cynoglossum officinale</i>	B
		Garfield_weeds_033.1	NO	Common Mullein	<i>Verbascum thapsus</i>	C
		Garfield_weeds_034.2	NO	Common Mullein	<i>Verbascum thapsus</i>	C
		Garfield_weeds_036.1	NO	Common mullein	<i>Verbascum thapsus</i>	C
5	Grizzly Creek Canyon	Garfield_weeds_107	NO	Common Mullein	<i>Verbascum thapsus</i>	C
5	Howard Canyon	Garfield_weeds_002	NO	Redstem filaree	<i>Erodium cicutarium</i>	C
5	Hubbard Gulch	Garfield_weeds_059	NO	Canada thistle	<i>Cirsium arvense</i>	B
5	JQS Trail	Garfield_weeds_063	NO	Bull thistle	<i>Cirsium vulgare</i>	B
5	Kimball Creek	Garfield_weeds_043	NO	Common Mullein	<i>Verbascum thapsus</i>	C
5	Mitchell Road	Garfield_weeds_004	NO	Salt cedar	<i>Tamarisk spp.</i>	B
		Throughout PCA	All elements	Cheatgrass	<i>Bromus tectorum</i>	NR
5	New Castle	Garfield_weeds_042	NO	Scotch thistle	<i>Onopordum acanthium</i>	B
5	Rifle Gap Reservoir	Garfield_weeds_070	NO	Musk thistle	<i>Carduus nutans</i>	B
		Garfield_weeds_071	NO	Field Bindweed	<i>Convolvulus arvensis</i>	C
5	Spring Valley	Garfield_weeds_084	NO	Musk thistle	<i>Carduus nutans</i>	B
		Garfield_weeds_084.1	NO	Canada thistle	<i>Cirsium arvense</i>	B
		Garfield_weeds_086	NO	Canada thistle	<i>Cirsium arvense</i>	B
		Garfield_weeds_085	NO	Common mullein	<i>Verbascum thapsus</i>	C
5	Ward and Reynolds Ditch	Garfield_weeds_095	NO	Scotch thistle	<i>Onopordum acanthium</i>	B
5	West Salt Creek	Garfield_weeds_003	NO	Salt cedar	<i>Tamarisk spp.</i>	B

Priority ranking is based on Element rarity as determined by CNHP State rarity ranking: a weed management priority of "1" indicates that the Element being encroached upon has a State rarity rank of "1" and is assigned the highest weed management priority etc. However, weed occurrences that are encroaching into the habitat of a federally listed plant or animal species were designated as priority "1", regardless of their CNHP State tracking rank. Weeds that were encroaching into riparian habitat were designated a minimum priority rank of "3" if there were no other higher ranked occurrences present; if other higher ranked occurrences were present then the site was given that priority rank.

DISCUSSION

The Essential Role of Biological Diversity: Protecting biological diversity has become an important management issue for many natural resource professionals. Biological diversity at its most basic level includes the full range of species on earth, from unicellular bacteria and protists through multicellular plants, animals, and fungi. At finer levels of organization, biological diversity includes the genetic variation within species, both among geographically separated populations and among individuals within a single population. On a wider scale, diversity includes variations in the biological communities in which species live, the ecosystems in which communities exist, and the interactions among these levels. All levels are necessary for the continued survival of species and plant communities, and contribute to the well-being of human society.

OBSERVED THREATS to BIODIVERSITY and MANAGEMENT PRESCRIPTIONS

Climate Change: All ecosystems are likely to be affected to some extent by climate change. Ecosystems with low exposure and high resilience could be the beneficiaries of future conditions, while those with high exposure and low resilience are likely to experience range contractions and/or significant changes in species composition and overall condition (CNHP 2015). Restoring ecosystem resiliency will be key to sustainably managing the impacts of climate change.

Oil and Gas Development: Seventeen globally imperiled plants found in oil and gas development areas in Colorado are in danger of extinction (Elliot et al. 2011). Seven of these species occur in Garfield County including DeBeque milkvetch (*Astragalus debequaeus*), Piceance bladderpod (*Physaria parviflora*), Roan-cliffs blazing star (*Mentzelia rhizomata*), Parachute penstemon (*Penstemon debilis*), DeBeque phacelia (*Phacelia submutica*), Colorado hookless cactus (*Sclerocactus glaucus*) and sun-loving meadow rue (*Thalictrum heliophilum*). One of the biggest conservation issues for Colorado native plants is the lack of awareness of the existence and status of these rare plant species. Increasing this awareness, especially during development activities that may impact rare plants, will reduce the likelihood of future listings under the Endangered Species Act. Avoiding or minimizing impacts to these species during oil and gas development activities may help to effectively conserve their habitat and is unlikely to confer substantial impacts on oil and gas development projects (Elliot et al. 2011). To reduce the impacts of oil and gas development activities to plants of concern we recommend consulting “Recommended Best Management Practices for Plants of Concern (Elliot et al. 2011).

Incompatible livestock grazing: Together with livestock grazing, overabundance of native ungulates (e.g., deer and elk) and feral burros or horses can alter vegetation, soils, hydrology, and native wildlife species composition and abundances (CNHP 2015). Further, these alterations intensify the effects of climate change on these resources (Beschta et al. 2013). For terrestrial ecosystems, the projected combination of increasing drought, higher temperatures, earlier snowmelt, and precipitation variability interacting with the effects of (domestic and

wild) ungulate use can result in decreased biodiversity, reduced soil moisture, accelerated soil and nutrient loss, and increased sedimentation (Beschta et al. 2013).

Manage livestock grazing to maintain ecosystem health as recommended by BLM's rangeland health standards (BLM 2016b) and by maintenance of natural communities including strategies that promotes ecosystem health by providing:

- Livestock management that sustains a full suite of native plant and animal species.
- Periodic rest or deferment from grazing during critical growth periods.
- Adequate recovery and regrowth periods.
- Opportunity for seed dissemination and seedling establishment.
- Maintenance of sufficient vegetation on both upland and riparian sites to protect soil from wind and water erosion.
- In riparian areas, vegetation type and cover is sufficient to dissipate energy, capture sediment, recharge ground water, and contribute to stream stability.
- Where reseeding is required use native plant species.
- Range improvement projects are designed to be consistent with overall ecological functions and processes with minimum adverse impacts to other resources or uses of riparian/wetland and upland sites.
- Grazing management will occur in a manner that does not encourage the establishment or spread of noxious weeds.
- Natural occurrences such as fire, drought, flooding, and prescribed land treatments should be combined with livestock management practices to move toward the sustainability of biological diversity across the landscape, including the maintenance, restoration, or enhancement of habitat to promote and assist the recovery and conservation of threatened, endangered, or other special status species, by helping to provide natural vegetation patterns, a mosaic of successional stages, and vegetation corridors, and thus minimizing habitat fragmentation.

Hydrologic Modification of Rivers, Streams and Wetlands:

- 1. River and stream modification:** To maintain stream and wetland function, development should be managed to avoid surface disturbance near wetlands that could increase stream sedimentation or the potential of toxic chemicals running off into the wetlands. To protect aquatic wildlife species we recommend implementing Colorado Parks and Wildlife oil and gas BMPs for aquatic species and amphibians including:
 - Avoid changes to water quality and quantity.
 - Collect water samples to monitor water quality before, during and after surface occupation and document data and changes.
 - No surface disturbance within 300 feet of any designated Gold Medal water.
 - Design stream crossings to minimize the total number of crossings and so that crossings are at or as near to 90 degrees to the direction of stream flow.
 - Construct stream crossings "in the dry" and avoid impacts to trout during spawning and hatching periods.

- Restrict trucks from crossing streams and utilize appropriate and effective culverts that don't preclude upstream movement of fish.
- Avoid using low water crossings.
- Control erosion and sedimentation, and manage storm water runoff; reclaim sites as quickly as possible to restore vegetation.
- Control weeds along riparian corridors and manage livestock grazing to maintain riparian corridor health.
- Consider fencing riparian areas.
- Repair incised channels where excessive erosion and sedimentation is occurring.
- Consider directional boring of pipeline crossings of perennial streams.
- Replace non-native riparian vegetation such as tamarisk and Russian olive with appropriate native plantings such as cottonwood or willow.
- Protect groundwater, riparian areas and wetlands by installing impermeable barriers beneath fluid pits. When working in designated Gold Medal waters, disinfect heavy equipment, hand tools, boots and any other equipment that was previously used in a river, stream, lake, pond, or wetland prior to moving the equipment to another water body.

2. **Stream and riparian habitat alteration:** Restoring beaver (*Castor canadensis*) to streams in Garfield County may be the best and most effective strategy to increase water storage and stream health. Surveys indicate that stream and riparian function is impaired in many streams in Garfield County due to the cumulative impacts of aquatic and terrestrial alteration.

According to The Lands Council (Spokane, WA 2010, in their study conducted in Eastern Washington State on water storage by the beaver, an estimated 10 acre-feet (ca. 3.26 million gallons) of water storage can be attributed to a single beaver due to its dam-building prowess which is a conservative estimate of the amount of surface water and groundwater held back by the average beaver. Studies reveal that beavers offer tremendous ecosystem benefits—increased natural water storage and improved watershed health. Historic beaver populations and their workings, such as beaver dams, ponds and beaver meadows, stored massive amounts of water and carbon (Wohl 2013).

3. **Gravel mining:** Reclamation of gravel mine sites can partially mitigate the impacts of the mining operation. In most cases the essence of reclamation is revegetation, and use of native species in the reclamation effort is essential to achieve maximum reclamation success since native plants are the most likely to survive during extremes of environmental factor change (Heifner no date). Essential to minimizing gravel mining effects is the management of cumulative impacts: construction designs that produce maximum space and strength with minimum material; using a regional planning approach that restricts dispersion as much as possible and insists on reclamation to the highest quality (Heifner no date).

Bald Eagles with nests are present near several of these gravel mining operations. Protecting eagles and their breeding habitat from disturbance during breeding season is essential to their continued recovery and is required by law. Maintaining appropriate disturbance setbacks as recommended and required by the Bald and Golden Eagle Protection Act and by the Migratory Bird Treaty Act (U.S.FWS 2016) is essential to the ongoing recovery of this magnificent bird.

- 4. Wetland fen alteration:** Wetland fens are an irreplaceable resource. The Rocky Mountain Region (R2) of the U.S. Forest Service considers fens a sensitive plant habitat that should be managed for conservation and restoration (USFS 2011). Fens are defined as groundwater-fed wetlands with organic soils that typically support sedges and low stature shrubs (Mitch & Gosselink 2007). The strict definition of an organic soil (peat) is one with 40 cm (16 in) or more of organic soil material in the upper 80 cm (31 in) of the soil profile (Soil Survey Staff 2014). Accumulation of organic material to this depth requires constant soil saturation and cold temperatures, which create anaerobic conditions that slow the decomposition of organic matter. By storing organic matter deep in their soils, fens act as a carbon sink. In the arid west, peat accumulation occurs very slowly; estimates are 20 cm (8 in) per 1,000 years in Colorado (Chimner 2000; Chimner and Cooper 2002).

- Long-term maintenance of fen wetlands requires maintenance of both the hydrology and the plant species that interact to create and maintain the peat that defines and enables fen function. Thus management that conserves these environmental and ecological features will contribute to long-term sustainability of this vital resource.

Road impacts: At least 22 globally imperiled plants found along roadside areas in Colorado are at risk of extinction (Panjabi and Smith 2014). One of the biggest conservation issues for Colorado rare native plants is the lack of awareness of their existence and status. Increasing awareness of these species, especially during development and maintenance activities that may impact rare plants, will reduce the likelihood of future listings under the Endangered Species Act. Avoiding or minimizing impacts to these species during road maintenance activities may help to effectively conserve their habitat and is unlikely to confer substantial impacts on road maintenance goals and projects. Species-specific Best Management Practices (BMPs) for these 22 imperiled plants have been developed (Panjabi and Smith 2014). We recommend implementation of these BMPs by county personnel involved in road maintenance activities.

Exotic plant species invasions: Exotic plant invasions present a global threat to ecosystems and impact both agriculture and native plant communities. Exotic invasive plant species with the potential to alter ecosystem functioning that are regionally widespread in Colorado include cheatgrass (*Bromus tectorum*), knapweed (*Acroptilon* and *Centaurea* spp.), Russian olive (*Elaeagnus angustifolia*), leafy spurge (*Euphorbia esula*), and tamarisk (*Tamarix ramosissima*). Canada thistle (*Cirsium arvense*) and musk thistle (*Carduus natans*) are also widespread, and other, less prevalent problem species include oxeye daisy (*Leucanthemum vulgare*) and yellow toadflax (*Linaria vulgaris*). Mountain grasslands, low elevation shrubland, and riparian/wetland

ecosystems are most affected (CNHP 2015). To control and eradicate weeds the following strategies are recommended:

- Prevent the introduction and/or sale of non-native species that are known to significantly impact natural areas, including species such as tamarisk, Russian olive, purple loosestrife, wild chamomile, and non-native fish species.
- Encourage natural area managers, public agencies, and private landowners to remove these species from their properties. On sites with rare plants implement “Best Management Practices for Managing Noxious Weeds on Sites with Rare Plants” (Mui and Spackman 2016).
- Secondary invasion — an increase in abundance of non-target exotics following treatment of targeted invasive plants — is increasingly a problem for land managers. Revegetation is a critical tool for inhibiting secondary invasions of exotic plant species. Secondary invaders respond to conditions of decreased competition and increased resource availability resulting from suppression of targeted invaders. Given that the hole created by suppression of the target invader appears to be a primary factor linked to secondary invasion, revegetation is a critical tool for inhibiting secondary invasion and reinvasion by the target species to achieve overall restoration and biodiversity goals (Pearson et al. 2016).
- Encourage the use of native species for revegetation and landscaping efforts. Seed for revegetation 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 best species to be used for revegetation (<https://cpw.state.co.us/Documents/CNAP/RevegetationGuide.pdf>).
- Cheatgrass is ubiquitous and eradication efforts are often viewed as futile. However, new research shows promise for cheatgrass control by using naturally occurring soil bacteria (Kennedy et al 2016). Because cheatgrass dramatically diminishes ecosystem services strategies to restore native grasses are warranted. Cheatgrass provides little value for native or domestic ungulates. Cheatgrass alters the natural fire regime by increasing the frequency, intensity, and size of range fires. Fire kills sagebrush and where non-native grasses dominate, the landscape can be converted to annual grassland as the fire cycle escalates, removing habitat for native wildlife species. Recovery of native grasses and management of fire to prevent loss of sagebrush cover would benefit landscape sustainability.

Table 13. Management resources to ameliorate or remediate threats to element occurrences.

MANAGEMENT RESOURCES	
STRESSOR	RESOURCE GUIDE TO MANAGEMENT OR RESTORATION
Climate Change	1. Climate Change Vulnerability Assessment for Colorado Bureau of Land Management (Colorado Natural Heritage Program (2015.)
Stream Restoration	1. The Beaver Restoration Guidebook: Working with Beaver to Restore Streams, Wetlands, and Floodplains. Version 1.0. United States Fish and Wildlife Service, Portland, Oregon. 189 pp.(Pollock et al. 2015) Online at: http://www.fws.gov/oregonfwo/ToolsForLandowners/RiverScience/Beaver.asp 2. Let the Water Do the Work: Induced Meandering, an Evolving Method for Restoring Incised Channels (Zeedyk and Clothier 2014).
Oil and Gas Development	1. Recommended Best Management Practices for Plants of Concern. Practices developed to reduce the impacts of oil and gas development activities to plants of concern (Elliott et al. 2011).
Livestock Grazing Management	1. BLM and USFS rangeland health standards to restore range health: available online: http://www.blm.gov/co/st/en/BLM_Programs/grazing/rm_stds_guidelines.html 2. Restoring livestock-damaged riparian habitat: Passive restoration by removing cattle (Batchelor and Ripple 2015). 3. Restoration handbook for sagebrush steppe ecosystems with emphasis on greater sage-grouse habitat—Part 1. Concepts for understanding and applying restoration: U.S. Geological Survey Circular 1416, 44 p. (Pyke et al. 2015) http://dx.doi.org/10.3133/cir1416 . 3. Managing Intermountain rangelands--sagebrush-grass ranges. Gen. Tech. Rep. INT-134. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 41 p. (Blaisdell et al. 1982). 4. Fire and Restoration of Sagebrush Ecosystems (Baker 2006) http://www.colorado.edu/geography/class_homepages/geog_4430_f10/Baker_SagebrushFireRestoration_WildSocBull06.pdf 5. Exclusionary Fences & Riparian Pastures (Harper no date).
Noxious Weed Management	1. Recommended Best Management Practices for Managing Noxious Weeds on Sites with Rare Plants (Mui and Panjabi 2016). 2. Bennett, M. Weed Management in Riparian Areas With a focus on non-chemical strategies. No date. Oregon State University Extension Service.

	Available online at: http://extension.oregonstate.edu/sorec/sites/default/files/bennett_weed_management_in_riparian_areas.pdf. 3. Native Plant Revegetation Guide for Colorado https://cpw.state.co.us/Documents/CNAP/RevegetationGuide.pdf 4. Control of Tamarix in the Western United States: Implications for Water Salvage, Wildlife Use, and Riparian Restoration. Recommended Best Management Practices for Managing Noxious weed in Riparian Habitat. 2005. 5. Secondary invasion: The bane of weed management (Pearson et al. 2016). 6. Microbial Control of Cheatgrass, Jointed Goatgrass and Medusahead (Kennedy et al. 2016). 7. Guidelines for Safe & Effective Herbicide Use Near Water (Noble, no date).
Road Impact Mitigation	1. Panjabi, S.S. and G. Smith. 2014. <i>Conserving Roadside Populations of Colorado's Globally Imperiled Plants, a Pilot Project</i>. Colorado Natural Heritage Program, Colorado State University, Fort Collins, Colorado. 2. Panjabi, S.S. and G. Smith, 2014. Recommended best management practices for DeBeque milkvetch (<i>Astragalus debequaeus</i>): practices developed to reduce the impacts of road maintenance activities to plants of concern. Colorado Natural Heritage Program, Colorado State University, Fort Collins, Colorado. 3. Panjabi, S.S. and G. Smith, 2014. Recommended best management practices for Good-neighbor bladderpod (<i>Physaria vicina</i>): practices developed to reduce the impacts of road maintenance activities to plants of concern. Colorado Natural Heritage Program, Colorado State University, Fort Collins, Colorado
Bald and Golden Eagle Protection	1. National Bald Eagle Management Guidelines. Available online: https://www.fws.gov/northeast/ecologicalservices/eaglenationalguide.html 2. Recommended buffer zones and seasonal restrictions for colorado raptors. https://cpw.state.co.us/Documents/WildlifeSpecies/LivingWithWildlife/RaptorBufferGuidelines2008.pdf



Figure 118. Garfield County Badlands.

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APPENDIX 1.

. Summary results of all PCAs and occurrences as well as new PCAs documented during 2015-2016. Climate Change Vulnerability scores are from CNHP 2015.

PCA NAME	ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
Anvil Points Rim	Bluebunch wheatgrass herbaceous vegetation	<i>Pseudoroegneria spicata</i> Herbaceous Vegetation	G2S2	B (EOID 7184)	C	Moderate
	Parachute penstemon	<i>Penstemon debilis</i>	G1S1	B (EOID 9727)	B	Extremely vulnerable
	Utah fescue	<i>Argillochloa dasyclada</i>	G3S3	H (EOID 938)	C	ND
	Hanging Garden Sullivantia	<i>Sullivantia hapemanii</i> var. <i>purpusii</i>	G3T3S3	NA – new	C	ND
	Piceance bladderpod	<i>Physaria parviflora</i>	G2S2	NA – new	C	Extremely vulnerable
	Mountain wild mint	<i>Monardella odoratissima</i>	G4G5S2	NA - new	B	ND
Anvil Points	DeBeque milkvetch	<i>Astragalus debequaeus</i>	G2S2	A (EOID 6210)	C	Extremely vulnerable
	DeBeque milkvetch	<i>Astragalus debequaeus</i>	G2S2	A (EOID 9785)	B	
	Roan cliffs blazing star	<i>Astragalus debequaeus</i>	G2S2	A (EOID 4788)	B	
	Barneby's thistle	<i>Cirsium barnebyi</i>	G3G4S3	NA -new	C	ND
	DeBeque milkvetch	<i>Astragalus debequaeus</i>	G2S2	NA - new	C	Extremely vulnerable
	Long-flower cat's-eye	<i>Oreocarya longiflora</i>	G3S3	NA -- new	C	No data
Barrel Spring Point	Hanging garden sullivantia- Oil shale columbine	<i>Sullivantia hapemanii</i> - (<i>Aquilegia barnebyi</i>) Herbaceous Vegetation	G2S2	H (EOID 10100)	C	No data
	Hanging garden sullivantia- Oil shale columbine	<i>Sullivantia hapemanii</i> - (<i>Aquilegia barnebyi</i>)	G2S2	NA - new	B	No data

PCA NAME	ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
		<i>Herbaceous Vegetation</i>				
	Piceance bladderpod	<i>Physaria parviflora</i>	G2S2	A (EOID 623)	B	Extremely vulnerable
	Large-flower globe-mallow	<i>Iliamna grandiflora</i>	G3?QS1S2	NA –new	D	No data
	Barneby's thistle	<i>Cirsium barnebyi</i>	G3G4S3	NA –new	B	No data
	Brewer's sparrow	<i>Spizella breweri</i>	USFS sensitive	NA - new	E	Presumed stable
Cattle Creek at Coulter	Blue spruce/Red-osier dogwood	<i>Picea pungens/Cornus sericea woodland</i>	G4S2	NA –new	B	Low
	Olive-sided flycatcher	<i>Contopus cooperi</i>	USFS sensitive	NA – new	E	No data
Colorado River	Silver buffaloberry	<i>Shepherdia argentea Shrubland</i>	G3G4S1	NA – new	C/D	Low
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	G5/S1BS3N	NA – new	E	No data
	White-faced Ibis	<i>Plegadis chihi</i>	G5/S2B	NA – new	E	Moderately vulnerable
	Northern leopard frog	<i>Rana pipiens</i>	G5/S3	NA - new	E	Moderately vulnerable
Cow Ridge	Piceance bladderpod	<i>Physaria parviflora</i>	G2S2	A(EOID 10850)	A	Extremely vulnerable
	Piceance bladderpod	<i>Physaria parviflora</i>	G2S2	NA – new	A	
	Barneby's thistle	<i>Cirsium barnebyi</i>	G3G4S3	NA –new	B	No data
Douglas Pass	Douglas fir/Mountain maple	<i>Pseudotsuga menziesii / Acer glabrum Forest</i>	G4S2	B (EOID 9379)	C	Moderate
	Gambel oak-Utah serviceberry	<i>Quercus gambelii / Amelanchier utahensis Shrubland</i>	G3G5S2	NA – new	C	Low
	Large-flower globe-mallow	<i>Iliamna grandiflora</i>	G3?QS1S2	B (EOID 7868)	D	No data
East Divide Creek	Gambel oak-Utah serviceberry	<i>Quercus gambelii / Amelanchier utahensis Shrubland</i>	G3G5S2	NA- new	C	Low
	Wetherill's milkvetch	<i>Astragalus wetherillii</i>	G3S3	A (EOID 8818)	B/C	No data
East Douglas Creek	Blue spruce/River birch	<i>Picea pungens/Betula</i>	G2S2	C (EOID 8827)	X	Low

PCA NAME	ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
		<i>occidentalis woodland</i>				
	<i>Oncorhynchus clarki pleuriticus</i>	G4T3S3	NA -new	NA	Extremely vulnerable	Colorado River Cutthroat trout
	Autumn willow	<i>Salix serissima</i>	G4S1	NA –new	C	No data
	Large-flower globe-mallow	<i>Iliamna grandiflora</i>	G3?QS1S2	NA – new	C	No data
East Elk Creek	Narrowleaf cottonwood/River birch	<i>Populus angustifolia/Betula occidentalis woodland</i>	G3S3	A (EOID 8969)	B	Low
	Hanging garden sullivantia-Oil shale columbine	<i>Sullivantia hapemanii - (Aquilegia barnebyi) Herbaceous Vegetation</i>	G2S2	NA – new	A	No data
East Fork Parachute Creek	Mountain willow/Mesic forbs	<i>Salix planifolia/mesic forbs shrubland</i>	G4S4	C (EOID 8448)	B	Low
	Hanging garden sullivantia	<i>Sullivantia hapemanii var. purpusii</i>	G3T3S3	A (EOID 1539)	B	No data
	Olive-sided flycatcher	<i>Contopus cooperi</i>	USFS sensitive	NA – new	E	No data
	Brewer's sparrow	<i>Spizella breweri</i>	USFS sensitive	NA – new	E	Presumed stable
East Rifle Creek	Box elder/Red-osier dogwood	<i>Acer negundo / Cornus sericea Forest</i>	G3?S1	B (EOID 1043)	C	Low
East Salt Creek Headwaters	Narrowleaf cottonwood/ Three-leaf sumac	<i>Populus angustifolia/Rhus trilobata woodland</i>	G3S3	C(EOID 1922)	C	Low
	Gambel oak-Mountain Mahogany	<i>Quercus gambelii - Cercocarpus montanus / (Carex geyeri) Shrubland</i>	G3S3	NA – new	C	Low
	Peregrine falcon	<i>Falco peregrinus anatum</i>	G4T4/S2B	NA – new	E	No data
Garfield Creek	Narrowleaf cottonwood/river hawthorn	<i>Populus angustifolia/ Crataegus rivularis</i>	G2?S2	C	X	Low

PCA NAME	ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
	Narrowleaf cottonwood/Mountain willow	<i>Populus angustifolia/Salix monticola</i>	G3S2	NA – new	C	Low
	Lewis's woodpecker	<i>Melanerpes lewis</i>	G4/S4	NA - new	E	No data
	Western yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>	G5T3Q/S1B	NA – new	E	Moderately vulnerable
Grizzly Creek Canyon	Sheep sedge herbaceous vegetation	<i>Carex illota herbaceous vegetation</i>	GUQS2	NA – new	C	Moderate
	Mud sedge herbaceous vegetation	<i>Carex limosa herbaceous vegetation</i>	G2S1S2	NA – new	B	Moderate
	Douglas fir/Mountain lover	<i>Pseudotsuga menziesii/Paxistima myrsinites forest</i>	G2G3 S2S3	NA – new	B	Moderate
	Box elder-Narrowleaf cottonwood/Red-osier dogwood	<i>Acer negundo-Populus angustifolia/Cornus sericea woodland</i>	G2S2	NA – new	B	Low
	Lesser panicled sedge	<i>Carex diandra</i>	G5S1	NA – new	B	No data
	Mud sedge	<i>Carex limosa</i>	G5S2	NA – new	B	No data
	Least moonwort	<i>Botrychium simplex</i>	G5T3T4S2	NA – new	D	No data
	Northern leopard frog	<i>Rana pipiens</i>	G5/S3	NA – new	E	Moderately vulnerable
Main Elk Creek	Blue spruce/Red-osier dogwood	<i>Picea pungens/Cornus sericea woodland</i>	G4S2	A (EOID 6602)	B	Low
Middle Rifle Creek	Wetherill's milkvetch	<i>Astragalus wetherillii</i>	G3S3	B (EOID 4828)	C	No data
Mitchell Road	Cisco sego lily	<i>Calochortus ciscoensis</i>	G2S1	NA – new	C	No data
	Southwestern cat's-eye	<i>Oreocarya mensana</i>	G3S1	NA – new	C	No data
	Long-nosed leopard lizard	<i>Gambelia wislizenii</i>	G5/S1	NA – new	E	Presumed stable
Mt. Logan Road	Parachute penstemon	<i>Penstemon debilis</i>	G1S1	C	C	Extremely vulnerable
	Festuca dasyclada	<i>Argillochloa dasyclada</i>	G3S3	H	C	

PCA NAME	ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
	Roan cliffs blazing star	<i>Mentzelia rhizomata</i>	G2S2	C (EOID 1219)	B	Extremely vulnerable
	Utah mountain lilac	<i>Ceanothus martinii</i>	G4S1	ND (EOID 11004)	C	No data
	Barneby's thistle	<i>Cirsium barnebyi</i>	G3G4S3	NA – new	C	No data
No Name Creek	Narrowleaf cottonwood/Red-osier dogwood	<i>Populus angustifolia</i> / <i>Cornus sericea</i> woodland	G4S3	B (EOID 5791)	B	Low
	Narrowleaf cottonwood/River birch	<i>Populus angustifolia</i> / <i>Betula occidentalis</i>	G3S2	NA – new	B	Low
	Hanging Garden Sullivantia	<i>Sullivantia hapemania</i> var. <i>purpusii</i>	G3T3S3	D (EOID 5374)	F	No data
	Canyon bog orchid	<i>Limnorchis ensifolia</i>	G4G5T4?S3	NA - new	B	No data
Prairie and South Canyon	Ferron's milkvetch	<i>Astragalus musiniensis</i>	G3S1	H (EOID 5759)	D	No data
Rare Plants of the Wasatch	Juniper tumble mustard	<i>Thelypodopsis juniperorum</i>	G2S2	H(EOID 22878)	F	No data
	Adobe hills thistle	<i>Cirsium perplexans</i>	G2G3 S2S3	NA – new	C	No data
	Colorado hookless cactus	<i>Sclerocactus glaucus</i>	G2G3 S2S3	NA – new	C	Extremely vulnerable
	Sage Sparrow	<i>Amphispiza belli</i>	G5/S3B	NA – new	E	No data
	Sage Sparrow	<i>Amphispiza belli</i>	G5/S3B	NA – new	E	No data
	Brewer's sparrow	<i>Spizella breweri</i>	USFS sensitive	NA – new	E	Presumed stable
Rifle Falls State Park	Box elder/Chokecherry	<i>Acer negundo</i> / <i>Prunus virginiana</i>	G3S2	NA – new	C	Low
	Black Swift	<i>Cypseloides niger</i>	G4T4 S2	C	C	Presumed stable
Roaring Fork River at Carbondale	Narrowleaf cottonwood/Thinleaf alder	<i>Populus angustifolia</i> / <i>Alnus incana</i>	G3S3	C	X	Low
	Ute ladie's-tresses	<i>Spiranthes diluvialis</i>	G2G3 S2	B (EOID 15421)	B	No data
	American yellow lady's-slipper	<i>Cypripedium calceolus</i> ssp. <i>parviflorum</i>	G5S2	B (EOID 5919)	D	No data
	American yellow lady's-slipper	<i>Cypripedium calceolus</i> ssp.	G5S2	B(EOID 15188)	C	

PCA NAME	ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
		<i>parviflorum</i>				
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	G5S1BS3N	E (EOID 6596)	S	No data
Smith Gulch	Harrington's penstemon	<i>Penstemon harringtonii</i>	G3S3	C (EOID 6340)	X	Extremely vulnerable
The Crown	Harrington's penstemon	<i>Penstemon harringtonii</i>	G3S3	A (EOID 5517)	B	Extremely vulnerable
	Brewer's sparrow	<i>Spizella breweri</i>	USFS sensitive	NA – new	E	Presumed stable
	Brewer's sparrow	<i>Spizella breweri</i>	USFS sensitive	NA – new	E	Presumed stable
Trappers Lake	Cut-throat Trout	<i>Oncorhynchus clarkii pleuriticus</i>	G4T3/S3	NA – new	E	Extremely vulnerable
Baldy Creek (New)	Blue spruce/Thinleaf alder	<i>Picea pungens/Alnus incana</i>	G3S3	NA – new	B	Low
Canyon Creek (New)	Mud sedge herbaceous vegetation	<i>Carex limosa herbaceous vegetation</i>	G2S1S2	NA – new	B	Moderate
Roaring Fork River at Red Canyon (New)	American yellow lady's-slipper	<i>Cypripedium calceolus ssp. parviflorum</i>	G5S2	NA - new	C	No data
	Narrowleaf cottonwood/River birch	<i>Populus angustifolia/Betula occidentalis</i>	G3S3	NA - new	B/C	Low
	Willow flycatcher	<i>Empidonax traillii</i>	G5/S4	NA - new	E	No data
	Lewis's woodpecker	<i>Melanerpes lewis</i>	G4/S4	NA - new	E	No data
	Willow flycatcher	<i>Empidonax traillii</i>	G4/S4	NA - new	E	No data
	Lewis's woodpecker	<i>Melanerpes lewis</i>	G5/S1BS3N	NA - new	E	No data
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	G5/S1BS3N	NA - new	E	No data
	Lewis's woodpecker	<i>Melanerpes lewis</i>	G4/S4	NA - new	E	No data
East Salt Creek	Gambel oak-Mountain mahogany	<i>Quercus gambelii - Cercocarpus montanus / (Carex geyeri) Shrubland</i>	G3S3	NA - new	C	Low
Goodrich Park	Gambel oak-Mountain mahogany	<i>Quercus gambelii - Cercocarpus</i>	G3S3	NA - new	B	Low

PCA NAME	ELEMENT COMMON NAME	ELEMENT SCIENTIFIC NAME	GLOBAL/ STATE RANK	HISTORIC EO RANK/EOID	CURRENT EO RANK	CLIMATE CHANGE VULNERABILITY
		<i>montanus / (Carex geyeri) Shrubland</i>				
Howard Canyon	Southwestern cat's-eye	<i>Oreocarya mensana</i>	G3S1	NA - new	D	No data
West Salt Creek	Southwestern cat's-eye	<i>Oreocarya mensana</i>	G3S1	NA - new	C	
Mitchell Road	Southwestern cat's-eye	<i>Oreocarya mensana</i>	G3S1	NA - new		No data
South Dry Fork	Barneby's thistle	<i>Cirsium barnebyi</i>	G3G4S3	NA - new	C	No data
Kimball Mountain	Barneby's thistle	<i>Cirsium barnebyi</i>	G3G4S3	NA - new	A	
	Utah mountain lilac	<i>Ceanothus martinii</i>	G4S1	NA - new	B	No data
	Piceance bladderpod	<i>Physaria parviflora</i>	G2S2	NA - new	A	Extremely vulnerable
Spring Valley	Good-neighbor bladderpod	<i>Physaria vicina</i>	G2S2	NA - new	C	Extremely vulnerable
Four A Ridge Road	Large-flower globe-mallow	<i>Iliamna grandiflora</i>	G3?QS1S2	NA - new	D	No data
Baldy Creek	Northern Goshawk	<i>Accipiter gentilis</i>	G5/S3B	NA - new	E	Moderately vulnerable
Battlement Mesa	Cut-throat Trout	<i>Oncorhynchus clarkii pleuriticus</i>	G4T3/S3	NA - new	E	Extremely vulnerable
Crystal River at Fish Hatchery	Lewis's woodpecker	<i>Melanerpes lewis</i>	G4/S4	NA - new	E	No data
East Salt Creek at Ashford Canyon	Willow flycatcher	<i>Empidonax traillii</i>	G5/S4	NA - new	E	No data
Howard Canyon	Gray Vireo	<i>Vireo vicinior</i>	G4/S2B	NA - new	E	No data
Hubbard Gulch	Brewer's Sparrow	<i>Spizella breweri</i>	USFS sensitive	NA - new	E	Presumed stable
Kimball Mountain	Brewer's Sparrow	<i>Spizella breweri</i>	USFS sensitive	NA - new	E	Presumed stable
Demaree Canyon	White-tailed Prairie Dog	<i>Cynomys leucurus</i>	G4/S4	NA - new	E	Presumed stable
Marion Mine Gulch	Northern pygmy owl	<i>Glaucidium gnoma</i>	G4G5/S3B	NA - new	E	No data
Spring Park	Brewer's Sparrow	<i>Spizella breweri</i>	USFS sensitive	NA - new	E	Presumed Stable
Spring Park	Sage Sparrow	<i>Amphispiza belli</i>	G5/S3B	NA - new	E	No data
Deep Creek	Olive-sided flycatcher	<i>Contopus cooperi</i>	USFS sensitive	NA - new	E	No data

APPENDIX 2.

POTENTIAL CONSERVATION AREAS DOCUMENTED IN 2015-2016

Colorado River

Biodiversity Rank - B1: Outstanding Biodiversity Significance

Protection Urgency Rank - P2: Threat/Opportunity within 5 Years

Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss

U.S.G.S. 7.5-minute quadrangles: Rifle, Red Pinnacle, Rulison, North Mamm Peak, Fruita, Wagon Track Ridge, Mesa, Clifton, Grand Valley, Colorado National Monument, Grand Junction, Palisade, Silt, Ruby Canyon, Anvil Points, De Beque, Bitter Creek Well, Cameo, Westwater, Mack

Size: 40,653 acres (16,452 ha)

Elevation: 4,440 - 5,689 ft. (1,353 - 1,734 m)

General Description: This site includes the stretch of the Colorado River that extends from Rifle to the Utah border. The Colorado River riparian corridor is the most heavily developed area in Mesa County. The floodplains near the river were historically dominated by stands of Rio Grande cottonwood (*Populus deltoides* ssp. *wislizeni*) with an understory of skunkbrush (*Rhus trilobata*). However, development of the floodplain, agriculture, and most notably, the invasion of non-native species such as tamarisk (*Tamarix ramosissima*), Russian olive (*Elaeagnus angustifolia*), and Russian knapweed (*Acroptilon repens*) have greatly reduced the amount of native riparian vegetation within this site. Extensive gravel mining operations in the river floodplain up and downstream of the City of Rifle has included the removal of cottonwood gallery forests and commensurate riparian and stream values that these forests provide. Along the immediate banks of the river and around wetlands in the floodplain, coyote willow (*Salix exigua*), cocklebur (*Xanthium strumarium*), barnyard grass (*Echinochloa crus-galli*), reedcanary grass (*Phalaris arundinacea*), common reed (*Phragmites australis*), cattail (*Typha latifolia*), hardstem bulrush (*Schoenoplectus acutus*), threesquare bulrush (*S. pungens*), alkali bulrush (*S. maritimus*), and redroot flatsedge (*Cyperus erythrorhizos*) are typically dominant. This site provides critically important habitat for endangered fish such as the razorback sucker (*Xyrauchen texanus*), Colorado pikeminnow (*Ptychocheilus lucius*), and humpback chub (*Gila cypha*). The river reach from New Castle into De Beque Canyon supports populations of roundtail chub (*Gila robusta*) and flannelmouth sucker (*Catostomus latipinnis*). In addition, a recovery program for razorback suckers (*Xyrauchen texanus*) stocked a total of 29,377 juvenile and adult razorback suckers into the Upper Colorado River near Parachute from October 1999 to November 2000; an additional 14,322 suckers have been released into the Gunnison River between April 1994 and November 2000 (Pfeifer and Burdick 2000). In 1999, 174 of these fish were recaptured during electroshocking surveys. Fish disbursement from stocking has been predominately downstream of release sites (Pfeifer and Burdick 2000). There are also records of Bald Eagles (*Haliaeetus leucocephalus*) attempting to nest here in the early 1980s and recent observations of feeding Peregrine Falcons (*Falco peregrinus anatum*) and Sandhill Cranes (*Grus canadensis tabida*). The cottonwood associations found within this site have the potential to support nesting Bald Eagles, and in time eagles could repopulate this site as populations continue to expand after the DDT induced declines of the 1970s and 80s. Reestablishment of the Bald Eagles is dependent on maintaining or improving the current quality of the area. This area historically contained numerous wetlands and extensive riparian forests, but the I-70 corridor, Rio

Grande-Southern Pacific Railroad, and agriculture practices have modified and/or destroyed many of these areas. Irrigated pastures are interspersed along the river's floodplain with cottonwood galleries composed of narrowleaf cottonwood (*Populus angustifolia*), Rio Grande cottonwood, skunkbrush (*Rhus trilobata*), tamarisk, and Russian olive. Small patches of the globally imperiled Rio Grande cottonwood riparian forest (*Populus deltoides* ssp. *wislizeni* / *Rhus trilobata*) dot the islands and portions of the floodplain. Sporadic marshes dominated by cattail (*Typha* sp.) and hardstem bulrush (*Schoenoplectus acutus*) and alkaline meadows dominated by Baltic rush (*Juncus balticus*), common threesquare, and saltgrass (*Distichlis spicata*) are scattered throughout the floodplain. Most patches of the Rio Grande cottonwood forest are only in fair condition due to the influx of non-native shrubs such as tamarisk and Russian olive and improper grazing. Although small, the most intact stands of this community in Mesa County occur on an island within the Bureau of Reclamation's De Beque Wildlife Area and on private land in the Cameo area. The narrow De Beque Canyon portion of the river is historical habitat for at least two of the river's endangered fish. However, recent surveys conducted by Colorado Parks and Wildlife (CPW) and United States Fish and Wildlife Service (USFWS) did not locate any Colorado pikeminnow (Osmundson 2001). A proposed fish ladder would enable the natural migration of the fish to take place. If it is built, the fish could be returned to the canyon within a few years. Other species of concern in De Beque Canyon include Peregrine Falcons, Bald Eagles, Great Blue Herons, and the northern leopard frog (*Lithobates pipiens*). The Grand Valley portion of the river is highly developed and heavily used for agriculture. Nonetheless, it is the most important stretch of the river in Mesa County for the endangered fish due to the amount of historical and current backwater areas, sloughs, and ponds which provide critical habitat for these fish. Most of the cottonwood galleries have been heavily infested with tamarisk, Russian olive, and Russian knapweed but still provide valuable wildlife habitat and perform important ecological functions in an otherwise arid, urbanizing landscape. The stretch of river through Horseshoe and Ruby Canyon does not contain extensive stands of riparian vegetation but does contain important areas for the endangered fishes. Difficulties encountered in the recovery efforts for the razorback sucker and Colorado pikeminnow are not unrelated to other conservation issues in the area. Natural flows of the river have been altered by upstream water diversions, dams, and levees, resulting in a lack of floodplain dynamics that are critical to wetland habitat creation, regeneration of cottonwoods, and maintenance of aquatic habitat for native fishes. Floods, which created the areas that the fish historically used for spawning, and which are also necessary for the normal regeneration of cottonwood and willow, are no longer viable options because of the water development in the area and development within the floodplain. The lack of natural flooding has increased tamarisk invasion, which, in turn, reduces flows via very high transpiration rates and increased sedimentation (The Nature Conservancy 1998). Decreased flows and the absence of flushing results in a concentration of elements such as selenium, which move up the food chain, affecting the survival of the fish. The area near Grand Junction is an important area for open space and recreation. Grand Junction's Riverfront Project includes a system of trails and protected areas and the Western Colorado Botanic Garden. State protected areas include the Walker State Wildlife Area, and Connected Lakes Park. The U. S. Fish and Wildlife Service's Colorado River Recovery Program uses the area as an experimental spawning ground for endangered fish. It encompasses several standard sites, including Ruby Canyon, the Colorado River at Grand Junction, and Debeque Canyon in Mesa County. Soils are derived from alluvium and vary in texture depending on geomorphic position. Organic matter accumulation is minimal except

around wetlands and near the banks of sloughs where small O- and thick A-horizons may form. The substratum along the Rifle Stretch consists of unconsolidated surficial deposits of Quaternary gravel and alluvium in the valley bottom. The soils within floodplain consist of a mosaic of Torrifluvents, Halaquepts, and Wann series. The Torrifluvents formed in alluvium and are located closest to the current river channel. The Wann series is found on slightly higher portions of the floodplain or in areas where soil development has had time to occur. The Wann series is classified as a coarse-loamy, mixed, mesic Fluvaquentic Haplustolls. These soils are deep, somewhat poorly drained soils formed in alluvium derived from sandstone and shale. These soils are calcareous and moderately alkaline (USDA Soil Conservation Service 1978). Halaquepts are a broadly defined soil type that consists of deep, somewhat poorly drained to poorly drained, level, salt-affected soils on low terraces (USDA Soil Conservation Service 1978). Texture in these soils is highly variable with the upper 24 inches ranging from loam to clay, and the underlying layers generally gravelly. Halaquepts are commonly gleyed from the surface down (USDA Soil Conservation Service 1978). Soils within De Beque Canyon are not mapped by the Natural Resources Conservation Service (NRCS), but given the narrow nature of the canyon and subsequent lack of extensive floodplains, most soils likely consist of various textures of alluvium. Backwater areas and soils under cottonwood canopies likely have organic rich A-horizons. Soils along the river within the Grand Valley are not mapped by the NRCS, but given what is mapped along the river in Ruby Canyon and along the Gunnison River, a likely common soil type in the area may be the Youngston Series. The Youngston is classified as a fine-loamy, mixed, (calcareous), mesic Typic Torrifluvents. The Youngston consists of deep, well-drained soils that have been formed in alluvium on floodplains and alluvial fans (USDA Soil Conservation Service 1978). It is mapped as occurring along the Gunnison River and in Ruby Canyon.

Climate Description: The climate of the area is characterized as arid semi-desert. The average maximum summer daytime temperature is 93 (deg F) and nighttime minimums of 57 (deg F). Summer maxima may be as high as 110 (deg F). Average winter daytime and nighttime temperature extremes are 38 (deg F) and 12 (deg F), respectively. Precipitation averages less than 8.64 inches per year and primarily occurs in the late summer and fall as rain. (WRCC 2004)

Land Use History: Dams and diversion for irrigation. There has been much alteration of plant associations within the floodplain of the Colorado River that stem from altered hydrology and past land use.

Biodiversity Significance Rank Comments (B1): The site includes multiple occurrences of three of the endangered fish of the Colorado River, the razorback sucker (*Xyrauchen texanus*), Colorado pikeminnow (*Ptychocheilus lucius*), and humpback chub (*Gila cypha*). All three species are considered globally critically imperiled (G1). The USFWS and Colorado Division of Wildlife list the razorback sucker as endangered. Fewer than seventy specimens of razorback sucker have been collected since 1979, and these have all been adult fish, which may live for thirty years (Woodling 1985). This suggests that reproductive failure is the cause of their decline. Lack of recruitment of young into the population has been attributed to predation by non-native species including catfish and carp. Dams may block access to spawning habitats, change suitable juvenile habitat, block upstream migration, and lower water temperatures. There are confirmed spawning areas in Mesa County at Clifton, and the

Colorado River between Grand Junction and Clifton is one of the main concentration areas of the fish. Backwaters, eddies, and impoundments are critical habitat for the fish. The fish are often associated with sand, mud and rock substrates in areas with sparse aquatic vegetation and moderate to warm temperatures (Sigler and Miller 1963). The Colorado River has been stocked with razorback suckers along the Rifle stretch. The USFWS and Colorado Division of Wildlife list the Colorado pikeminnow as endangered. The Colorado pikeminnow was once an important commercial fish throughout the Colorado River drainage in mainstream channels, including the Green, Yampa, White, Colorado, Gunnison, Dolores, and Animas rivers. Its current distribution is restricted to the lower reaches of these rivers, except the Dolores and Animas (Woodling 1985). The decline of the fish is not fully understood. It is thought that dams have restricted spawning migrations, and that lowered water temperatures resulting from cold-water releases prevent the development of fertilized eggs. Biotic interactions with other introduced fish species may also have impacted their decline (Woodling 1985). Young pikeminnows prefer small, quiet backwaters. Adults use various habitats, including deep, turbid, strongly flowing water, eddies, runs, flooded bottoms, or backwaters (especially during high flow). Lowlands inundated during spring high flow appear to be important habitats (Tyus and McAda 1984). Efforts for the recovery of the pikeminnow include reintroduction and the construction of fish ladders to facilitate their natural migration (R. Anderson, CDOW, personal communication.). The USFWS and Colorado Division of Wildlife list the humpback chub as endangered. The humpback chub was historically widely distributed throughout the Colorado River Basin to which it is endemic. Its habitat has been altered by the construction of dams, and today it is found in widely separated river areas in the upper and lower Colorado Basin. The species is also threatened by hybridization with the roundtail chub (*Gila robusta*). Reduced river flows allow the round tail chub to successfully inhabit some deep water areas during low water periods where humpback chubs were previously isolated, resulting in competition and hybridization. Intermediates between the species occur in altered river systems, but not in unaltered rivers, emphasizing the importance of natural riverine environments for the recovery of the species (Tyus and Karp 1989). This site also supports multiple occurrences of the globally imperiled (G2) Rio Grande cottonwood/skunkbrush (*Populus deltoides* ssp. *wislizeni* / *Rhus trilobata*) riparian forest. This association has only been documented from river floodplains of the lower Colorado, Yampa, and San Miguel rivers in extreme western Colorado (Keammerer 1974, Kittel and Lederer 1993). Nearly all the existing stands are considered to be in decline due to altered hydrology from upstream impoundments and the long-term effects of livestock grazing. Sexual regeneration of cottonwoods is poor at all sites, and tamarisk is invading stands of this type on many of the aforementioned rivers. Historically, only two to three pairs of Bald Eagles nested along the Colorado River, but the nesting pairs have increased steadily since the 1980s to 38 confirmed nests in 1995 (Winternitz 1998). There were active nests along the Colorado River in the mid-1990's but they have not been successful since the early 1980s (Lyon et. al 2001). However, recently an active and successful nest was discovered on one of the large islands near Rhone (Soker, D. USFWS, personal communication, 2002). Colorado is a very popular wintering area for Bald Eagles. The annual midwinter count shows a stable population of 600 to 800 eagles. Although now in recovery, populations of Bald Eagles declined during the 1980s because of high pesticide use, poisoning, and poaching (feathers are valuable on the black market). Several Peregrine Falcon records, one in good condition (B-ranked), are also within this site. Though there are more than 70 known Peregrine Falcon pairs breeding in Colorado, there

are fewer than 300 individuals estimated as breeding in Colorado. Human disturbance of nests by recreational rock climbers, illegal capture by falconers, and uncertain breeding status across the state are factors considered important in the conservation of this species which is vulnerable through its range (G4T3). A portion of this site has also been designated an Important Bird Area (Grand Valley Riparian Corridor) by the Audubon Society due to the fact that nearly 300 bird species have used the lowland riparian vegetation in the Grand Valley over the last 15 years. This includes nearly 70 breeding species and over 70 wintering species (National Audubon Society 2000).

Natural Heritage element occurrences at the Colorado River PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Birds	Falco peregrinus anatum	American Peregrine Falcon	G4T4	S2B		SC	BLM/US FS	C	1998-06-23
Birds	Falco peregrinus anatum	American Peregrine Falcon	G4T4	S2B		SC	BLM/US FS	B	2003-05-31
Birds	Falco peregrinus anatum	American Peregrine Falcon	G4T4	S2B		SC	BLM/US FS	C	1998-07-03
Birds	Falco peregrinus anatum	American Peregrine Falcon	G4T4	S2B		SC	BLM/US FS		1997-06-12
Birds	Haliaeetus leucocephalus	Bald Eagle	G5	S1B,S3 N		ST	BLM/US FS	H	1981-03-99
Birds	Haliaeetus leucocephalus	Bald Eagle	G5	S1B,S3 N		ST	BLM/US FS	D	1998-12-29
Birds	Haliaeetus leucocephalus	Bald Eagle	G5	S1B,S3 N		ST	BLM/US FS	E	2015-05-18
Birds	Haliaeetus leucocephalus	Bald Eagle	G5	S1B,S3 N		ST	BLM/US FS	E	1995-99-99
Birds	Haliaeetus leucocephalus	Bald Eagle	G5	S1B,S3 N		ST	BLM/US FS	E	1994-05-05
Birds	Haliaeetus leucocephalus	Bald Eagle	G5	S1B,S3 N		ST	BLM/US FS	H	1979-99-99
Birds	Haliaeetus leucocephalus	Bald Eagle	G5	S1B,S3 N		ST	BLM/US FS	H	1981-02-99
Birds	Grus canadensis tabida	Greater Sandhill Crane	G5T5	S2B,S4 N		SC			1997-06-12
Fish	Gila cypha	Humpback Chub	G1	S1	LE	ST		H	1983-99-99
Fish	Gila cypha	Humpback Chub	G1	S1	LE	ST		H	1979-04-99
Fish	Gila cypha	Humpback Chub	G1	S1	LE	ST		C	2000-10-99
Fish	Gila cypha	Humpback Chub	G1	S1	LE	ST		H	1979-08-99
Fish	Gila cypha	Humpback Chub	G1	S1	LE	ST		H	1978-08-99
Fish	Gila elegans	Bonytail Chub	G1	SX	LE	SE		X	1984-07-17
Fish	Ptychocheilus lucius	Colorado Pikeminnow	G1	S1	LE, XN	ST		H	1979-11-99
Fish	Ptychocheilus lucius	Colorado Pikeminnow	G1	S1	LE, XN	ST		H	1979-04-99

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Fish	Ptychocheilus lucius	Colorado Pikeminnow	G1	S1	LE, XN	ST		H	1979-08-99
Fish	Ptychocheilus lucius	Colorado Pikeminnow	G1	S1	LE, XN	ST		H	1979-09-99
Fish	Xyrauchen texanus	Razorback Sucker	G1	S1	LE	SE		H	1981-07-15
Fish	Xyrauchen texanus	Razorback Sucker	G1	S1	LE	SE		H	1980-03-99
Fish	Xyrauchen texanus	Razorback Sucker	G1	S1	LE	SE		H	1979-99-99
Fish	Xyrauchen texanus	Razorback Sucker	G1	S1	LE	SE		H	1972-04-19
Fish	Xyrauchen texanus	Razorback Sucker	G1	S1	LE	SE		H	1979-09-99
Fish	Xyrauchen texanus	Razorback Sucker	G1	S1	LE	SE		H	1980-06-99
Fish	Xyrauchen texanus	Razorback Sucker	G1	S1	LE	SE		E	1996-99-99
Fish	Xyrauchen texanus	Razorback Sucker	G1	S1	LE	SE		H	1974-99-99
Fish	Gila robusta	Roundtail Chub	G3	S2		SC	BLM/US FS	H	1980-07-18
Fish	Gila robusta	Roundtail Chub	G3	S2		SC	BLM/US FS	H	1980-04-22
Fish	Gila robusta	Roundtail Chub	G3	S2		SC	BLM/US FS	H	1983-99-99
Fish	Gila robusta	Roundtail Chub	G3	S2		SC	BLM/US FS	H	1985-02-08
Fish	Gila robusta	Roundtail Chub	G3	S2		SC	BLM/US FS	H	1964-10-09
Fish	Gila robusta	Roundtail Chub	G3	S2		SC	BLM/US FS	H	1985-05-99
Fish	Gila robusta	Roundtail Chub	G3	S2		SC	BLM/US FS	H	1979-99-99
Fish	Gila robusta	Roundtail Chub	G3	S2		SC	BLM/US FS	H	1988-06-08
Natural Communities	Populus deltoides ssp. wislizeni / Rhus trilobata Woodland	Fremont's Cottonwood Riparian Forests	G2	S3				C	1984-05-16
Natural Communities	Populus deltoides ssp. wislizeni / Rhus trilobata Woodland	Fremont's Cottonwood Riparian Forests	G2	S3				C	2000-09-10

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Natural Communities	Populus deltoides ssp. wislizeni / Rhus trilobata Woodland	Fremont's Cottonwood Riparian Forests	G2	S3				D	2001-09-24
Natural Communities	Populus deltoides ssp. wislizeni / Rhus trilobata Woodland	Fremont's Cottonwood Riparian Forests	G2	S3				C	2001-09-10
Natural Communities	Populus deltoides ssp. wislizeni / Rhus trilobata Woodland	Fremont's Cottonwood Riparian Forests	G2	S3				BC	2001-09-10
Natural Communities	Populus deltoides ssp. wislizeni / Rhus trilobata Woodland	Fremont's Cottonwood Riparian Forests	G2	S3				C	1984-06-08
Natural Communities	Populus deltoides ssp. wislizeni / Rhus trilobata Woodland	Fremont's Cottonwood Riparian Forests	G2	S3					1984-05-17
Natural Communities	Populus deltoides ssp. wislizeni / Rhus trilobata Woodland	Fremont's Cottonwood Riparian Forests	G2	S3				B	2001-09-10
Natural Communities	Populus deltoides ssp. wislizeni / Rhus trilobata Woodland	Fremont's Cottonwood Riparian Forests	G2	S3				C	2001-09-24
Natural Communities	Populus deltoides ssp. wislizeni / Rhus trilobata Woodland	Fremont's Cottonwood Riparian Forests	G2	S3				C	2001-09-27
Natural Communities	Populus deltoides ssp. wislizeni / Rhus trilobata Woodland	Fremont's Cottonwood Riparian Forests	G2	S3				C	2000-07-16
Natural Communities	Populus deltoides ssp. wislizeni / Rhus trilobata Woodland	Fremont's Cottonwood Riparian Forests	G2	S3				C	1984-05-15
Natural Communities	Populus deltoides ssp. wislizeni / Rhus trilobata Woodland	Fremont's Cottonwood Riparian Forests	G2	S3				D	1974-99-99
Natural Communities	Populus deltoides ssp. wislizeni / Rhus trilobata Woodland	Fremont's Cottonwood Riparian Forests	G2	S3				BC	2001-09-27
Natural Communities	Populus deltoides ssp. wislizeni / Rhus trilobata Woodland	Fremont's Cottonwood Riparian Forests	G2	S3				C	2000-06-27

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: Numerous occurrences of the state rare (G5/S3) northern leopard frog were documented throughout this site.

Boundary Justification: The site boundary encompasses the mainstem of the Colorado

River and its floodplain, including the adjacent highway and railroad, which are unavoidably parts of this site. The boundaries incorporate an area that will allow natural hydrological processes such as seasonal flooding, sediment deposition, and new channel formation to maintain viable populations of the elements. The boundaries also provide a small buffer from nearby agriculture fields, roads, and houses where surface runoff may contribute excess nutrients, sediment, and herbicides/pesticides. The site contains areas where old oxbows, sloughs, and ponds could provide a source of recruitment for native wetland and riparian plant species and provide critical fish habitat. It should be noted that the hydrological processes necessary to the elements are not fully contained by the site boundaries. Given that the elements are dependent on natural hydrological processes associated with the Colorado River, any upstream activities along the Colorado River and its tributaries such as water diversions, impoundments, and development could potentially be detrimental to the elements. This boundary indicates the minimum area that should be considered for any conservation management plan.

Protection Urgency Rank Comments (P2): This site includes mixed land ownership: state, federal, city, county, and private. There are many ongoing efforts by federal, state and local entities to protect and restore elements of this site. Efforts are underway to acquire properties or easements, which will enable the development of a continuous greenbelt and trail system from Fruita to Palisade. This use would be consistent with protecting the natural values of the river corridor, whereas further industrial and commercial development, such as gravel mining, will negatively impact riparian and wetland habitat. Most of the site along the Rifle Stretch is privately owned except for a few patches of BLM land. The aesthetic qualities of the area may encourage increased development as human population expands in the Rifle area. Because the land along the Colorado River here is privately owned, realization of this threat is highly probable. The majority of the site within De Beque Canyon is owned and managed by the BLM with no formal protection. Small parts are managed by the Bureau of Reclamation and Colorado State Parks (Island Acres State Recreation Area). In Ruby Canyon, the BLM land on the south side of the river has been designated as part of the Colorado Canyons National Conservation Area. Most of Ruby Canyon is under BLM ownership, with a few very small parcels of private land. The state and federal government under the Endangered Species Act provide protection for the Peregrine Falcon, Bald Eagle, razorback sucker, Colorado pikeminnow, and humpback chub. Various parts of the river corridor are currently protected by a variety of designations. Ruby Canyon and Debeque Canyon carry no surface occupancy stipulations for oil and gas development. Four thousand acres on the north side of Ruby Canyon are closed to mineral location to protect the recreational setting (USDI 1987). This protection is warranted for the entire site. Managing activity surrounding known Bald Eagle nest sites in accordance with USFWS and CPW guidelines is essential to continued recovery of eagles. Guidelines from CPW are as follows: (1) no surface occupancy (beyond that which historically occurred) within a 0.25-mile buffer zone around active Bald Eagle nests; and (2) seasonal restrictions to human encroachment within 0.5-miles of active nests from October 31 to July 31 each year (Colorado State Parks and Wildlife 2008).

Management Urgency Rank Comments (M2): Reclaiming the gravel mine pit sites for wildlife habitat could provide important future habitat for Bald Eagles, as well as the fish, mammals and songbirds that rely on the Colorado River corridor for foraging, reproduction,

and migration. Removal of tamarisk and restoration of native vegetation should be a priority. Stream and habitat alteration with consequent loss of native riparian woodlands and natural flow regimes has greatly diminished watershed functions. Terrestrial habitat restoration and simultaneous restoration of a natural flow regime is essential to protect and conserve the water resource. Manage weeds and simultaneously replant native riparian species, restore the natural hydrologic regime and promote, protect and restore beaver. Tamarisk removal is underway along portions of the Colorado River. Revegetation projects should use only native plants. The BLM estimates that the Ruby Canyon section of the river receives 7,000 visitor days of use per year. BLM management plans for Ruby Canyon emphasize recreation. The plan calls for managing wildlife habitat primarily for endangered and riparian species, with a focus on improving the chance of survival, and increasing the area of cottonwood stands. Woody riparian habitat is to be maintained "to favor the tallest plant species native to each site, while promoting diversity in plant heights and species" (USDI 1987). In order to accomplish this, tamarisk control will be necessary. Habitat for Peregrine Falcons and Bald Eagles is actively managed and protected from surface-disturbing activities. A further management objective is to provide suitable habitat for the four endemic Colorado River fish in cooperation with the CDOW and USFWS. Surface disturbance is to be prohibited in riparian areas. ORV use is limited to existing roads on the north side of the river. The south side is closed to vehicles because of the wilderness recommendation (USDI 1987). Consideration should be given to restricting motorized watercraft in the canyon. In De Beque Canyon, as with other areas along the river, the riparian community has been altered due to the absence of natural flooding. Management for the protection and increase of cottonwood stands, as called for by the BLM management plan for the Ruby Canyon area is also appropriate here. Threats along the Rifle Stretch and Grand Valley include invasion of aggressive non-native species, water control, gravel pits, and encroachment from human population expansion. A majority of the area is irrigated and grazed, and parts are maintained as a hunting preserve, but grazing is allowed on these areas to sustain the agricultural tax status. Exclosures to eliminate grazing in the riparian zone would aid in sustaining the globally rare Rio Grande cottonwood/skunkbush association and the native fish populations. Monitoring these associations would assist in understanding how release from grazing pressures influences regeneration of native plants. With the enduring popularity of waterfront development, loss of nesting habitat may remain the biggest threat to Bald Eagles. Bald Eagles avoid areas with nearby human activity and development (Buehler et al. 1991), so maintaining mature tree stands that are in close proximity to water with limited human presence would benefit this species. BLM management plans for Ruby Canyon call for managing wildlife habitat primarily for endangered and riparian species, with a focus on improving and increasing cottonwood stands. Surface disturbance is to be prohibited in riparian areas. ORV use is prohibited or limited to existing roads. This prescription would be appropriate for the entire river corridor.

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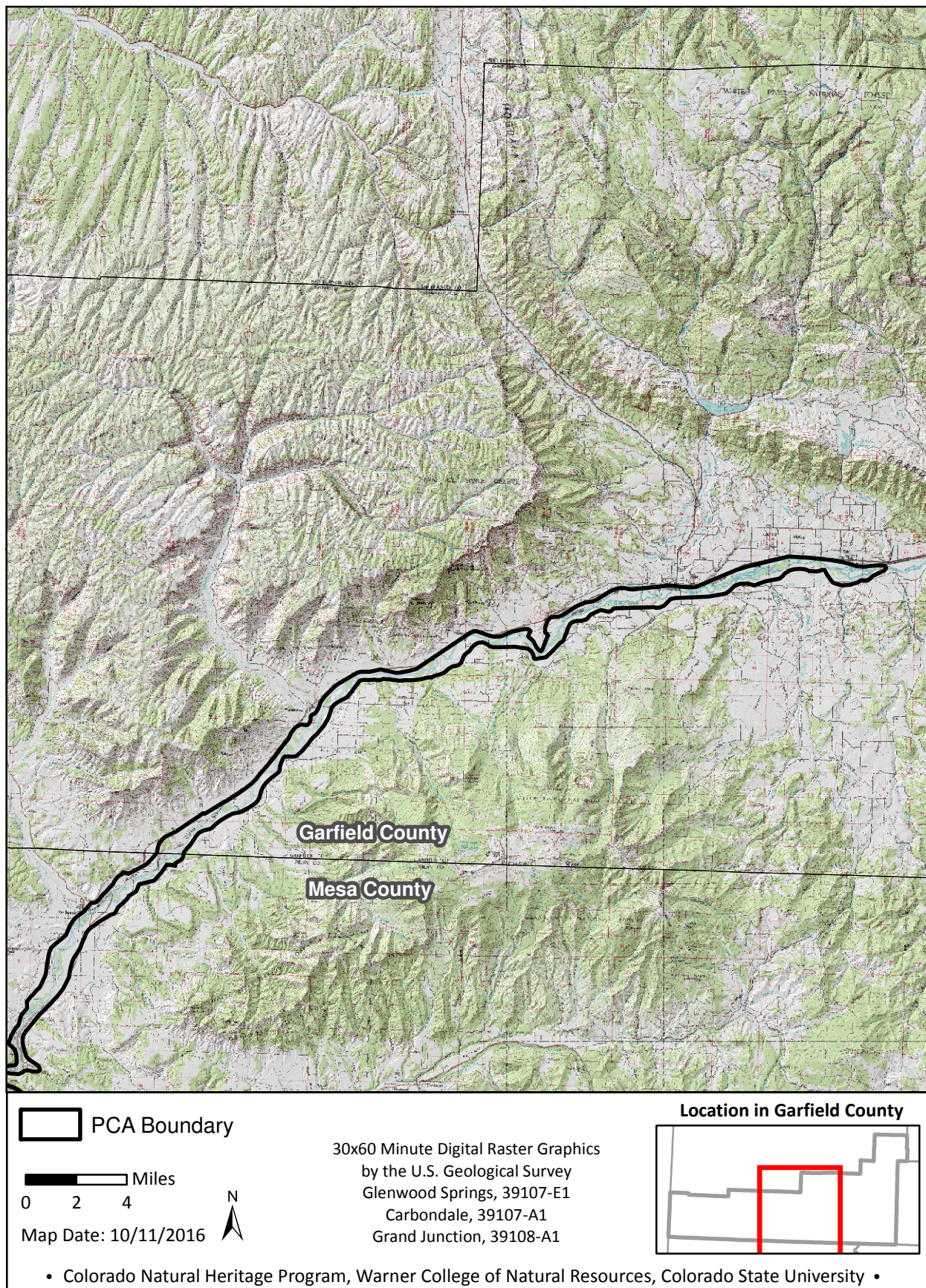
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Version Author: Malone, D.G.

Version Date: 08/13/2016



Colorado River Potential Conservation Area, B1: Outstanding Biodiversity Significance

Mount Callahan

Biodiversity Rank - B1: Outstanding Biodiversity Significance

Protection Urgency Rank - P2: Threat/Opportunity within 5 Years

Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality

U.S.G.S. 7.5-minute quadrangles: Red Pinnacle, Grand Valley

Size: 3,858 acres (1,561 ha)

Elevation: 7,400 - 8,500 ft. (2,256 - 2,591 m)

General Description: The steep shale exposures on the south-facing slopes and cliffs of Mt. Callahan tower 2,500 feet above the Colorado River (I-70) about 15 miles downstream of Rifle, Colorado. These shale exposures provide important habitat for five rare plant species, and support the highest quality known occurrences of the critically imperiled Parachute Penstemon. Surrounding the shale exposures, the more gentle slopes support high quality grasslands and sagebrush shrublands. Douglas-fir is found in north-facing ravines and scattered throughout the grassland. The site has been designated as a State Natural Area.

Biodiversity Significance Rank Comments (B1): This site supports five rare plant species which occur on the shale barrens of the Parachute Creek Member of the Green River Formation. This area shows a high rate of endemism in plants. Of most concern is the Federally listed as threatened, critically imperiled (G1/S1) Parachute penstemon (*Penstemon debilis*), which is known only from Garfield County. This site supports excellent (A-ranked) and good (B-ranked) occurrences of the Parachute penstemon. The site also supports excellent (A ranked) and good (B-ranked) occurrences of the globally imperiled (G2/S2) Roan Cliffs blazing star (*Nuttallia rhizomata*) and a good (B-ranked) occurrence of the globally imperiled (G2/S2) sun-loving meadowrue (*Thalictrum heliophilum*). Two occurrences of the globally vulnerable (G3/S3) Utah fescue (*Argillochloa dasyclada*) are found in the site, including one in good condition (B-ranked). A good (B-ranked) occurrence of the state imperiled (G4G5/S2) Mountain wild mint (*Monardella odoratissima*) has been documented in the site. The Mount Callahan site also supports three good to excellent plant communities adjacent to the rare plant locations on the shale barrens. All of these elements add to the wide range of biodiversity at Mount Callahan.

Natural Heritage element occurrences at the Mount Callahan PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Natural Communities	<i>Pseudoroegneria spicata</i> Herbaceous Vegetation	Western Slope Grasslands	G2	S2				A	1996-99-99
Natural Communities	<i>Artemisia nova</i> / <i>Pseudoroegneria spicata</i> Shrubland	Western Slope Sagebrush Shrublands	G4G5	S2				A	1996-07-08
Natural Communities	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i> / <i>Pseudoroegneria spicata</i> Shrubland	Western Slope Sagebrush Shrublands	G5	S2				B	1996-07-08
Vascular Plants	<i>Penstemon debilis</i>	Parachute penstemon	G1	S1	LT			A	2011-09-23
Vascular Plants	<i>Penstemon debilis</i>	Parachute penstemon	G1	S1	LT			B	2011-09-23
Vascular Plants	<i>Nuttallia rhizomata</i>	Roan Cliffs blazing star	G2	S2			BLM	A	1996-07-08
Vascular Plants	<i>Nuttallia rhizomata</i>	Roan Cliffs blazing star	G2	S2			BLM	B	2015-09-01
Vascular Plants	<i>Thalictrum heliophilum</i>	sun - loving meadowrue	G2	S2			BLM/US FS	B	2011-09-23
Vascular Plants	<i>Argillochloa dasyclada</i>	False ricegrass	G3	S3				B	2000-07-25
Vascular Plants	<i>Argillochloa dasyclada</i>	False ricegrass	G3	S3				H	1986-06-11
Vascular Plants	<i>Monardella odoratissima</i>	mountain wild mint	G4G5	S2				B	1996-07-08

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: The boundary is drawn to include the area that supports the long-term survival of the Parachute penstemon. This site includes all occurrences on the shale barrens and the occurrences on the adjoining grasslands. A buffer is drawn to protect the element occurrences from indirect and direct disturbances and to encourage the long-term integrity of the various plant communities at the site.

Protection Urgency Rank Comments (P2): The site was previously owned by Occidental Oil Company. A new mine company has purchased the site and future use or development of the site is uncertain. Oil shale is not cost effective to extract at this time, but surface mining is a potential threat, and should be prohibited to protect site's natural resources. The site has been designated as a State Natural Area; however, this designation does not confer any legal protection.

Management Urgency Rank Comments (M3): Grazing should be permitted only with intense management. The roadcut that traverses Mt. Logan is an avenue for weed invasion and eliminates natural habitat. Closing the road would enable natural re-vegetation and the recovery of natural ecological processes. Cheatgrass (*Bromus tectorum*) and yellow sweet clover (*Melilotus officinale*) are present in the site.

Land Use Comments: Land uses include grazing and oil and gas development.

Natural Hazard Comments: Steep scree cliffs.

Exotic Species Comments: A few small patches of cheatgrass and yellow sweet clover exist, otherwise the area is essentially weed free.

Information Needs: Continue the monitoring program for the rare plant species at this site.

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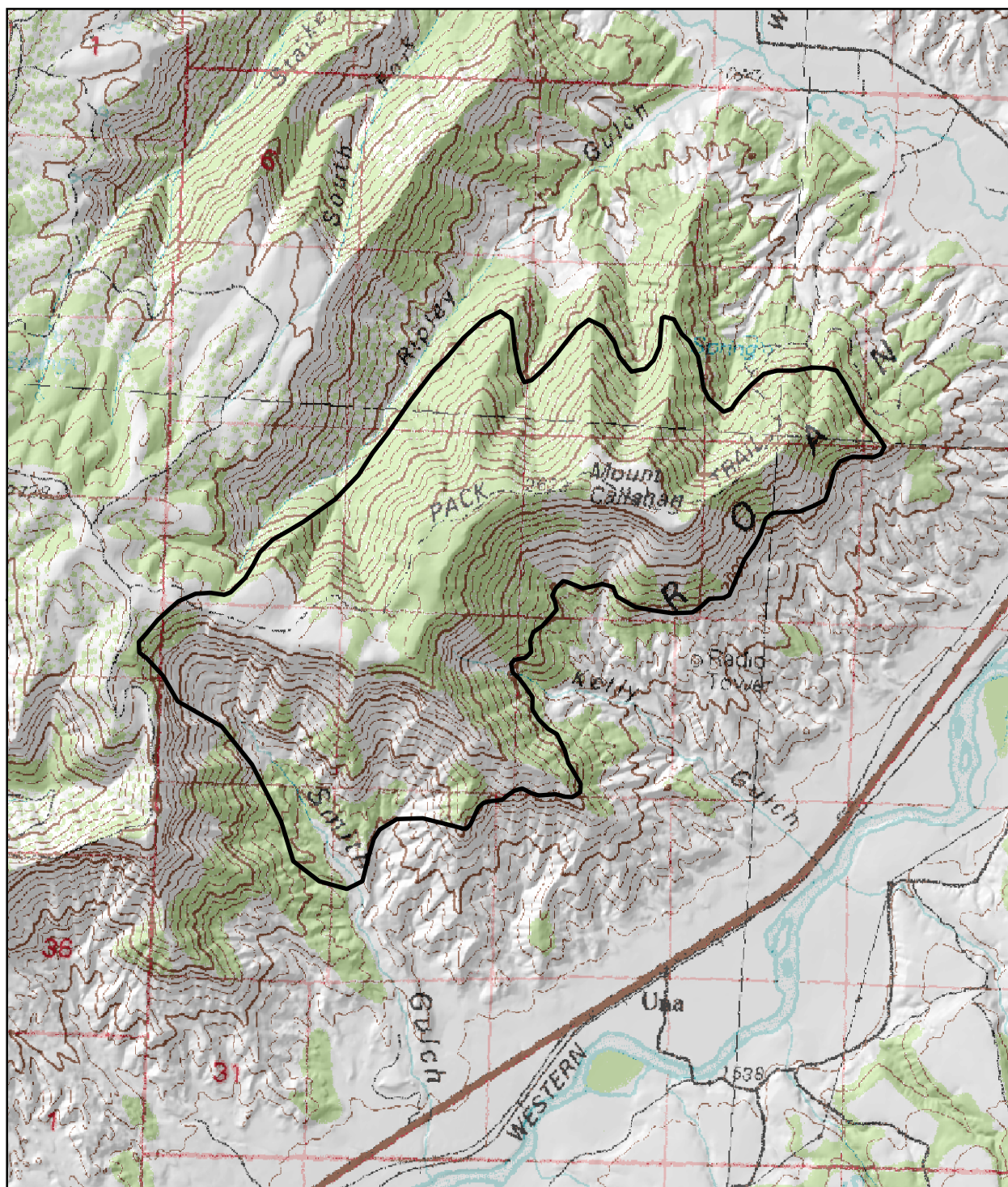
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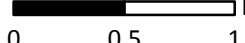
Welsh, S.L., N.D. Atwood, L.C. Higgins and S. Goodrich. 1987. Utah Flora, Great Basin Naturalist Memoirs, No. 9. Brigham Young University, Provo, Utah.

Version Author: Handwerk, J.E., S.C. Spackman and K.K. Fayette

Version Date: 10/16/2016



 PCA Boundary

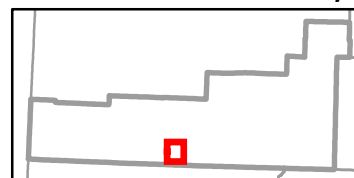
 Miles
0 0.5 1

Map Date: 10/15/2016



30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Grand Junction, 39108-A1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Mount Callahan Potential Conservation Area, B1: Outstanding Biodiversity Significance

Rare Plants of the Wasatch

Biodiversity Rank - B1: Outstanding Biodiversity Significance

Protection Urgency Rank - P2: Threat/Opportunity within 5 Years

Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss

U.S.G.S. 7.5-minute quadrangles: Red Pinnacle, Long Point, Molina, Wagon Track Ridge, Mesa, Grand Valley, Winter Flats, De Beque, Cameo, The Saddle, Housetop Mountain

Size: 117,210 acres (47,433 ha)

Elevation: 5,000 - 5,600 ft. (1,524 - 1,707 m)

General Description: The site consists of rough, rocky hills, composed of the Atwell Gulch and Shire members of the Wasatch Formation and also portions of the Ohio Creek Formation. Eroded purple clay areas on the pinon - juniper covered slopes provide habitat for the annual Debeque phacelia (*Phacelia submutica*), while Debeque milkvetch (*Astragalus debequaeus*) is found in sandy clay soil of the drainage bottoms and on some slopes. The Naturita milkvetch is found scattered on ledges and in crevices of the sandstone rimrock overlooking the Colorado River, while Wetherill milkvetch is found on the sides of dry washes. Uinta Basin hookless cactus is generally found on alluvial terraces above the Colorado River, on steep south-facing clay and rock slopes and knolls, or at the base of the slopes on gravelly soil. Associated species in the area include sagebrush, shadscale, saltbushes, greasewood, snakeweed, spiny horsebrush, Utah juniper, galleta and Indian rice grass. Much of the area is grazed, and exotic species such as cheatgrass, horned buttercup and halogeton have invaded some areas, especially the lower flats. There are several small roads in the area. Many eroded gullies dissect the site and carry seasonal flows to the Colorado River. The condition of the site varies from pristine to degraded. There is oil and gas development throughout much of the area. In some areas, such as Corcoran Wash, sagebrush was chained in 1967, and crested wheat planted. Other areas have been burned, and have regrowth of oak and serviceberry. Grazing on some of the private lands has been heavy, and exotic species such as cheatgrass and sweet clover are abundant. In general, the steeper lands appear to be in better condition. The site includes Pyramid Rock which is an isolated peak that has been recognized as a designated Natural Area by the state, and an ACEC (Area of Critical Environmental Concern) by the BLM. The ACEC contains populations of at least three of the rare plant species and a high quality example of the Utah juniper / Salina wild rye plant association.

Key Environmental Factors: Soil structure must remain intact to preserve species of concern. Over time, more by usage than by research, botanists have gradually refined the habitat description of *Phacelia submutica* and *Astragalus debequaeus*, so that it is now generally believed to be more-or-less confined to soils derived from what Donnell (1969) identified as the Atwell Gulch and Shire members of the Wasatch Formation in western Colorado. These are typically described as brown or gray clay or adobe badlands lying immediately above (Shire) or below (Atwell Gulch) the blueish-gray Molina member of the Wasatch Formation. However, because the geologic substrate at known occurrences has not always been field-verified by trained geologists, surveyors should remain open to the possibility that the species can occur on other, similar substrates (Decker et al. 2005).

Climate Description: Semi-arid western Colorado.

Land Use History: Area has traditionally been used lightly for grazing as the arid climate and barren soils provide little valuable forage for livestock.

Biodiversity Significance Rank Comments (B1): This site is a botanical hotspot and contains almost the entire known population of the globally imperiled (G2/S2) Debeque milkvetch (*Astragalus debequaeus*) and the globally imperiled (G2/S2) Debeque phacelia (*Phacelia submutica*). The only other known locations for these two species are within the Anvil Points site located about 15 miles to the northeast. There are several excellent (A-ranked) and good (B-ranked) occurrences of *Astragalus debequaeus* and *Phacelia submutica*. There are also excellent (A-ranked) and good (B-ranked) occurrences of the globally imperiled (G2G3/S2S3) Adobe Hills thistle (*Cirsium perplexans*), excellent (A-ranked) and good (B-ranked) occurrences of the globally imperiled (G2G3/S2S3) Naturita milkvetch (*Astragalus naturitensis*), and several good (B-ranked) occurrences of the globally imperiled (G2G3/S2S3) Colorado hookless cactus (*Sclerocactus glaucus*), a species federally listed as Threatened. Globally vulnerable (G3/S3) plants documented within the site include Wetherill milkvetch (*Astragalus wetherillii*) and long-flower cat's-eye (*Oreocarya longiflora*). This concentration of globally rare plants is exceptional and therefore warrants the B1 rank.

Natural Heritage element occurrences at the Rare Plants of the Wasatch PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Natural Communities	<i>Pleuraphis jamesii</i> Herbaceous Vegetation	Western Slope Grasslands	G2G4	S1				B	1996-06-22
Natural Communities	<i>Juniperus osteosperma</i> / <i>Leymus salinus</i> spp. salinus Wooded Herbaceous Vegetation	Mesic Western Slope Pinyon - Juniper Woodlands	G3	S2				BC	1996-99-99
Natural Communities	<i>Pinus edulis</i> - <i>Juniperus osteosperma</i> / <i>Cercocarpus montanus</i> - Mixed Shrubs Woodland	Two - needle Pinyon - Utah Juniper / Alderleaf Mountain - mahogany - Mixed Shrubs Woodland	G5	S5				B	1996-06-22
Natural Communities	<i>Juniperus osteosperma</i> / <i>Forsellesia meionandra</i> Woodland	Utah Juniper / Utah Greasebush	GU	S2				B	2000-05-16
Natural Communities	<i>Juniperus osteosperma</i> / <i>Forsellesia meionandra</i> Woodland	Utah Juniper / Utah Greasebush	GU	S2				C	2000-05-17
Natural Communities	<i>Juniperus osteosperma</i> / <i>Forsellesia meionandra</i> Woodland	Utah Juniper / Utah Greasebush	GU	S2				B	2000-05-10
Vascular Plants	<i>Astragalus debequaeus</i>	DeBeque milkvetch	G2	S2			BLM	A	2010-10-20
Vascular Plants	<i>Astragalus debequaeus</i>	DeBeque milkvetch	G2	S2			BLM	AB	1996-05-31
Vascular Plants	<i>Astragalus debequaeus</i>	DeBeque milkvetch	G2	S2			BLM	A	1996-05-22
Vascular Plants	<i>Astragalus debequaeus</i>	DeBeque milkvetch	G2	S2			BLM	C	2012-04-27
Vascular Plants	<i>Astragalus debequaeus</i>	DeBeque milkvetch	G2	S2			BLM	C	2000-05-11
Vascular Plants	<i>Astragalus debequaeus</i>	DeBeque milkvetch	G2	S2			BLM	A	2007-07-03
Vascular Plants	<i>Astragalus debequaeus</i>	DeBeque milkvetch	G2	S2			BLM	A	2010-04-19

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Vascular Plants	Astragalus debequaeus	DeBeque milkvetch	G2	S2			BLM	A	2011-06-10
Vascular Plants	Astragalus debequaeus	DeBeque milkvetch	G2	S2			BLM	D	2011-05-13
Vascular Plants	Astragalus debequaeus	DeBeque milkvetch	G2	S2			BLM	A	2011-07-25
Vascular Plants	Thelypodopsis juniperorum	juniper tumble mustard	G2	S2				H	1983-05-18
Vascular Plants	Astragalus naturitensis	Naturita milkvetch	G2G3	S2S3			BLM	B	2010-05-24
Vascular Plants	Astragalus naturitensis	Naturita milkvetch	G2G3	S2S3			BLM	A	2008-05-22
Vascular Plants	Astragalus naturitensis	Naturita milkvetch	G2G3	S2S3			BLM	A	2011-06-16
Vascular Plants	Astragalus naturitensis	Naturita milkvetch	G2G3	S2S3			BLM	A	2008-05-30
Vascular Plants	Astragalus naturitensis	Naturita milkvetch	G2G3	S2S3			BLM	A	2011-06-10
Vascular Plants	Astragalus naturitensis	Naturita milkvetch	G2G3	S2S3			BLM	CD	2010-05-18
Vascular Plants	Astragalus naturitensis	Naturita milkvetch	G2G3	S2S3			BLM	B	2000-05-10
Vascular Plants	Astragalus naturitensis	Naturita milkvetch	G2G3	S2S3			BLM	B	2000-05-17
Vascular Plants	Astragalus naturitensis	Naturita milkvetch	G2G3	S2S3			BLM	D	2010-10-20
Vascular Plants	Astragalus naturitensis	Naturita milkvetch	G2G3	S2S3			BLM	AB	2012-04-28
Vascular Plants	Astragalus naturitensis	Naturita milkvetch	G2G3	S2S3			BLM	C	2010-04-26
Vascular Plants	Astragalus naturitensis	Naturita milkvetch	G2G3	S2S3			BLM	B	2011-05-08
Vascular Plants	Astragalus naturitensis	Naturita milkvetch	G2G3	S2S3			BLM	B	2012-04-28
Vascular Plants	Astragalus naturitensis	Naturita milkvetch	G2G3	S2S3			BLM	AB	2008-05-22
Vascular Plants	Astragalus naturitensis	Naturita milkvetch	G2G3	S2S3			BLM	C	2011-05-10
Vascular Plants	Cirsium perplexans	Adobe Hills thistle	G2G3	S2S3				A	2009-05-21

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Vascular Plants	Cirsium perplexans	Adobe Hills thistle	G2G3	S2S3				AB	2011-05-07
Vascular Plants	Cirsium perplexans	Adobe Hills thistle	G2G3	S2S3				E	2007-05-15
Vascular Plants	Cirsium perplexans	Adobe Hills thistle	G2G3	S2S3				A	2007-05-21
Vascular Plants	Cirsium perplexans	Adobe Hills thistle	G2G3	S2S3				A	2007-05-24
Vascular Plants	Cirsium perplexans	Adobe Hills thistle	G2G3	S2S3				A	2007-05-17
Vascular Plants	Cirsium perplexans	Adobe Hills thistle	G2G3	S2S3				A	2007-09-11
Vascular Plants	Cirsium perplexans	Adobe Hills thistle	G2G3	S2S3				AB	2011-06-17
Vascular Plants	Cirsium perplexans	Adobe Hills thistle	G2G3	S2S3				A	2008-05-23
Vascular Plants	Cirsium perplexans	Adobe Hills thistle	G2G3	S2S3				B	2011-06-22
Vascular Plants	Cirsium perplexans	Adobe Hills thistle	G2G3	S2S3				C	2008-05-30
Vascular Plants	Cirsium perplexans	Adobe Hills thistle	G2G3	S2S3				B	2007-05-16
Vascular Plants	Cirsium perplexans	Adobe Hills thistle	G2G3	S2S3				A	2008-05-30
Vascular Plants	Cirsium perplexans	Adobe Hills thistle	G2G3	S2S3				B	2016-05-19
Vascular Plants	Cirsium perplexans	Adobe Hills thistle	G2G3	S2S3				A	2000-07-09
Vascular Plants	Sclerocactus glaucus	Colorado hookless cactus	G2G3	S2S3	LT			C	2000-05-11
Vascular Plants	Sclerocactus glaucus	Colorado hookless cactus	G2G3	S2S3	LT			AB	2014-06-03
Vascular Plants	Sclerocactus glaucus	Colorado hookless cactus	G2G3	S2S3	LT			C	2010-06-11
Vascular Plants	Sclerocactus glaucus	Colorado hookless cactus	G2G3	S2S3	LT			C	2007-09-11
Vascular Plants	Sclerocactus glaucus	Colorado hookless cactus	G2G3	S2S3	LT			B	2011-06-17
Vascular Plants	Sclerocactus glaucus	Colorado hookless cactus	G2G3	S2S3	LT			B	2014-05-28
Vascular Plants	Sclerocactus glaucus	Colorado hookless cactus	G2G3	S2S3	LT			C	2010-05-18

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Vascular Plants	<i>Sclerocactus glaucus</i>	Colorado hookless cactus	G2G3	S2S3	LT			D	2011-07-21
Vascular Plants	<i>Sclerocactus glaucus</i>	Colorado hookless cactus	G2G3	S2S3	LT			BC	2013-09-18
Vascular Plants	<i>Sclerocactus glaucus</i>	Colorado hookless cactus	G2G3	S2S3	LT			B	2014-05-26
Vascular Plants	<i>Sclerocactus glaucus</i>	Colorado hookless cactus	G2G3	S2S3	LT			BC	2011-05-12
Vascular Plants	<i>Sclerocactus glaucus</i>	Colorado hookless cactus	G2G3	S2S3	LT			BC	2013-05-02
Vascular Plants	<i>Sclerocactus glaucus</i>	Colorado hookless cactus	G2G3	S2S3	LT			F	1983-05-18
Vascular Plants	<i>Sclerocactus glaucus</i>	Colorado hookless cactus	G2G3	S2S3	LT			B	2014-06-16
Vascular Plants	<i>Sclerocactus glaucus</i>	Colorado hookless cactus	G2G3	S2S3	LT			D	2016-05-19
Vascular Plants	<i>Sclerocactus glaucus</i>	Colorado hookless cactus	G2G3	S2S3	LT			H	1984-05-27
Vascular Plants	<i>Sclerocactus glaucus</i>	Colorado hookless cactus	G2G3	S2S3	LT			AB	2010-05-17
Vascular Plants	<i>Sclerocactus glaucus</i>	Colorado hookless cactus	G2G3	S2S3	LT			C	2010-05-14
Vascular Plants	<i>Sclerocactus glaucus</i>	Colorado hookless cactus	G2G3	S2S3	LT			BC	2010-05-25
Vascular Plants	<i>Sclerocactus glaucus</i>	Colorado hookless cactus	G2G3	S2S3	LT			C	2014-09-10
Vascular Plants	<i>Astragalus wetherillii</i>	Wetherill's milkvetch	G3	S3				E	1997-05-16
Vascular Plants	<i>Astragalus wetherillii</i>	Wetherill's milkvetch	G3	S3				C	2010-04-26
Vascular Plants	<i>Astragalus wetherillii</i>	Wetherill's milkvetch	G3	S3				H	1984-05-16
Vascular Plants	<i>Astragalus wetherillii</i>	Wetherill's milkvetch	G3	S3				H	1991-05-29
Vascular Plants	<i>Astragalus wetherillii</i>	Wetherill's milkvetch	G3	S3				D	1997-05-18
Vascular Plants	<i>Oreocarya longiflora</i>	long - flower cat's - eye	G3	S3				D	1996-05-29
Vascular Plants	<i>Oreocarya longiflora</i>	long - flower cat's - eye	G3	S3				B	2011-05-10

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Vascular Plants	Oreocarya longiflora	long - flower cat's - eye	G3	S3				C	2010-05-25
Vascular Plants	Oreocarya longiflora	long - flower cat's - eye	G3	S3				C	2011-05-08
Vascular Plants	Oreocarya longiflora	long - flower cat's - eye	G3	S3				H	1984-05-16
Vascular Plants	Oreocarya longiflora	long - flower cat's - eye	G3	S3				C	2010-05-17
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			H	1982-05-21
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			AB	2014-04-22
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			AB	2010-05-26
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			H	1986-05-29
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			H	1989-05-17
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			B	1995-05-07
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			H	1986-05-06
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			B	2014-04-22
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			BC	2014-05-20
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			B	2010-05-24
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			H	1986-05-28
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			BC	2014-06-02
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			C	2009-05-20
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			A	2010-05-10
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			C	2004-05-99
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			C	2011-05-26
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			C	1995-06-06

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			D	2009-05-04
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			C	2009-05-29
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			C	2013-05*02
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			B	2016-04-22
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			BC	2014-04-25
Vascular Plants	Phacelia submutica	DeBeque phacelia	G4T2	S2	LT			H	1982-05-13

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: Very large and pristine area with few human impacts and interesting geological features. As of 2015, anthropogenic habitat alteration and fragmentation was ubiquitous due to extractive energy development and inappropriate livestock grazing. Surveys in 2015-2016 documented the presence of the globally demonstrably secure but state vulnerable (G5/S3B) Sage sparrow (*Artemisiospiza nevadensis*).

Boundary Justification: The boundary includes the known occurrences of *Astragalus debequaeus* and *Phacelia submutica* and intervening potential habitat. Predictive modeling indicates additional potential habitat for these species outside of the site boundary (Decker et al. 2005). Environmental data considered in element distribution modeling for these species include geology, soils, vegetation, elevation, slope, aspect, local relief and a variety of climate variables. Much of the site and surrounding area has not been surveyed for these and the other associated rare plants. A large portion of unsuitable habitat, irrigated agricultural lands along the Colorado River, was excluded; however, smaller portions of unsuitable habitat along the Colorado River and Roan Creek are included.

Protection Urgency Rank Comments (P2): Approximately 70% of the land within the site is owned by the BLM, 1% by the USFS, with the remainder privately owned. The public land has no special protection status with the exception of the 550 acre Pyramid Rock BLM ACEC. Most of the rare plants occur on the public lands as the private lands are generally concentrated along the riparian corridor. The principal threat to the plant species of concern at this site is oil and gas development and pipelines in the short term and oil-shale development in the long term. OHV use is another threat. The BLM management plan for the Pyramid Rock ACEC prohibits oil and gas surface occupancy, mineral materials sales and OHV use except on designated roads and trails (USDI 1992). The plan refers to the protection of two plant species, although more rare species are present (USDI 1987). We recommend that a larger area is considered for special designation. The federally Threatened status of the Uinta Basin hookless cactus should ensure that the plants and their habitat are protected on BLM land. The BLM's Oil and Gas EIS (USDI 1999) stipulates no

surface occupancy for locations of Threatened or Endangered species. *Phacelia submutica* is a candidate for federal listing, and *Astragalus debequaeus*, *Astragalus naturitensis*, and *Cirsium perplexans* are considered sensitive species by BLM. BLM policy (USDI 2001) states that "the BLM shall implement management plans that conserve candidate [and BLM sensitive species] and their habitats and shall ensure that actions authorized, funded, or carried out by the BLM do not contribute to the need for the species to become listed." It is understood that protecting the exact location of individual plants will not assure the survival of the rare plant populations as additional adjacent habitat is needed for the establishment of new individuals over time. It is usually possible to make minor adjustments in location of surface features to avoid direct impacts to plants. Careful survey of proposed sites of oil or gas development is critical. Part of the site on Roan Creek was at one time considered for a dam; it has not been built (as of 2006), and it is unknown what the present plans are. If it were built, it would probably destroy at least part of a Uinta Basin hookless cactus population. Although most of the rare plant locations known in the site are on BLM land, adjacent private land also contains suitable habitat and could be subject to development or other potentially incompatible land uses. BLM's rangeland health standards are not met on lower gradient habitats of this site due to inappropriate livestock grazing (<http://www.peer.org/campaigns/public-lands/public-lands-grazing-reform/blm-grazing-data-interactive-map.html>). Diminished rangeland health also reduces resiliency to environmental perturbations such as climate change. Predicted climate change in Colorado threatens *Astragalus debequaeus*, *Astragalus naturitensis*, *Phacelia submutica*, and *Sclerocactus glaucus* which are all considered to be extremely vulnerable to impacts of climate change (CNHP 2015).

Management Urgency Rank Comments (M2): The BLM lands are managed with emphasis on oil and gas development. Surface disturbing activities could pose a threat to the rare and imperiled plants of the area. Known locations of these plants should be protected, as called for in the management plan (USDI 1987), and nearby areas with similar habitat inventoried before new projects are permitted. Inventories, prior to permitting new projects, should take place during the plants' flowering season to ensure that plant populations are not accidentally overlooked. Most of the plant occurrences are in small enough areas that they could be avoided. Monitoring the rare plants to determine trends is recommended. Many areas of this site are rugged and remote in nature making active management unnecessary. However, heavy grazing and the infestation of exotic species could cause problems in the future. Most of the area is grazed in spring-time just after *Astragalus debequaeus* and *Phacelia submutica* flower. The *Astragalus debequaeus* plants accumulate selenium, and are therefore probably avoided by cattle. Plants appear to be abundant and healthy, with no evidence of herbivory. Additionally, cattle tend to stay in the bottoms, rather than on the slopes where most of the rare plants are found. The exception to this is the Uinta Basin hookless cactus, which is usually found at the base of the hills, and is threatened by trampling. The position of many of the cactus plants under shrubs suggests that trampling by livestock may limit their survival in more open sites. BLM has an ongoing monitoring program for the cactus plants in some areas of this site, although the monitoring frequency is limited by available staff time. Some of the flat lands at the base of the hills have been treated to remove sagebrush and planted with crested wheat grass (alien). Cheatgrass (alien) is also moving into this area. The status of a monitoring program for the rare plants, as called for in the ACEC management plan, is unknown as of 2006. Grazing, trampling by

livestock, OHV use, and future sagebrush treatment may impact the plants. Managing this entire area with the same prescription as is given to the Pyramid Rock ACEC would benefit the rare and endangered plant populations. Livestock grazing has diminished ecosystem resiliency to climate change impacts. Both indirect and direct livestock-induced impacts reduce potential long-term viability. Direct impacts result from trampling to which both *Sclerocactus glaucus* and *Phacelia submutica* are susceptible. Indirect impacts result from excessive vegetation removal and the consequent invasion of non-native species, such as cheatgrass (*Bromus tectorum*) and soil compaction which then influences hydrologic and disturbance (fire) regimes. Retiring grazing allotments in this site, prohibiting surface disturbance and reconnecting the landscape would help to both restore system resiliency and enable reproductive success and species' migration thereby improving the potential for long-term survivability of the rare elements documented in this site.

Land Use Comments: Area used for grazing and oil and gas extraction. Potential for oil shale development that would likely severely threaten site, and its associated communities and plants of concern. Recreational use occurs in the area but is not heavy within site.

Natural Hazard Comments: Very steep slopes are potentially hazardous for people climbing them.

Exotic Species Comments: Cheatgrass is invading. Cheatgrass alters the natural fire regime by increasing the frequency, intensity, and size of range fires. Fire kills sagebrush and where non-native grasses dominate, the landscape can be converted to annual grassland as the fire cycle escalates, removing native habitat

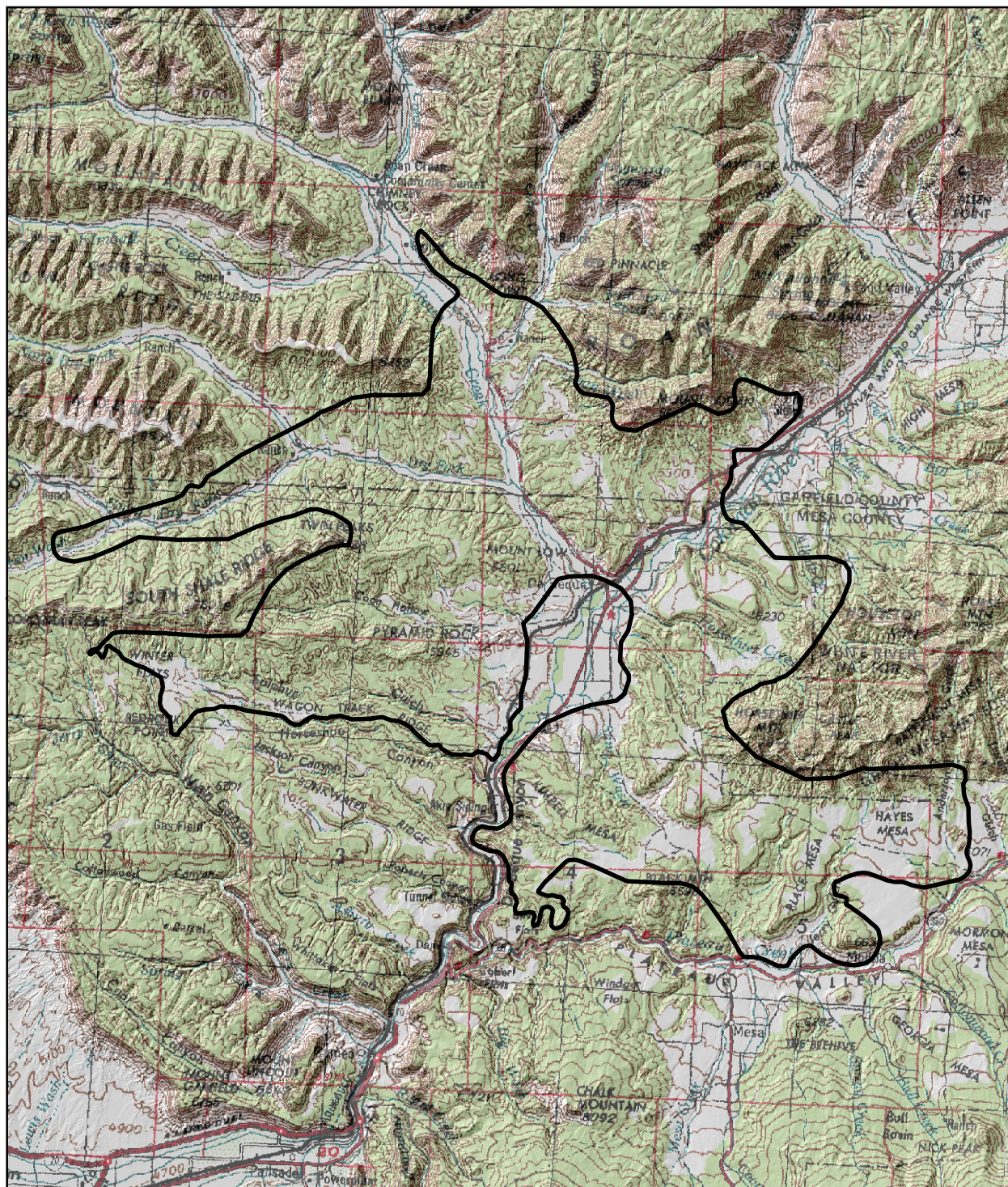
Information Needs: The fact that *Phacelia submutica* is an annual plant that does not necessarily appear every year makes it difficult to confirm presence or absence in a single observation. A survey in an unfavorable year or at the incorrect time of year cannot rule out the possibility that *Phacelia submutica* is actually present at the site in the seed bank. Many occurrences of Naturita milkvetch and long-flower cat's-eye are historical; current surveys are needed.

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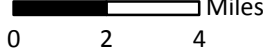
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Version Author: Malone, D.G.

Version Date: 08/13/2016



 PCA Boundary

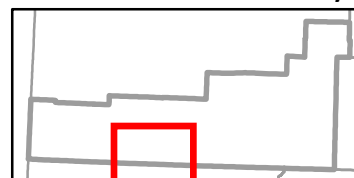
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Map Date: 10/13/2016



1x2 Degree Digital Raster Graphics
by the U.S. Geological Survey
Grand Junction, 39108-A1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Rare Plants of the Wasatch Potential Conservation Area, B1: Outstanding Biodiversity Significance

4A Ridge

Biodiversity Rank - B2: Very High Biodiversity Significance

Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years

Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality

U.S.G.S. 7.5-minute quadrangles: Desert Gulch, Razorback Ridge, Brushy Point, Henderson Ridge

Size: 18,328 acres (7,417 ha)

Elevation: 6,800 - 8,600 ft. (2,073 - 2,621 m)

General Description: The 4A Ridge site occupies the top and steep shale slopes of 4A Ridge, Horse Ridge, Henderson Ridge, Brush Mountain, and Bear Point, along with the riparian area of the Left Fork of Carr Creek. It contains a mosaic of several habitats that form a repeating pattern throughout the Roan Plateau. South-facing slopes with barren scree of the Green River formation support several rare plants that are endemic to this habitat. North-facing slopes, while geologically similar, retain more moisture and support heavier vegetation. The riparian complex includes the stream in the valley bottoms and tributary drainages that often begin at springs.

Biodiversity Significance Rank Comments (B2): This site contains good (B-ranked), and fair (C-ranked) occurrences of the globally imperiled (G2/S2) Piceance bladderpod (*Physaria parviflora*), an excellent (A-ranked) occurrence of the globally imperiled (G2/S2) sun-loving meadowrue (*Thalictrum heliophilum*), and a good (B-ranked) occurrence of the globally imperiled (G2/S2) sullivantia hanging gardens community (*Sullivantia hapemanii* - *Aquilegia barnebyi*). The globally imperiled (G2/S2) Roan Cliffs blazing star (*Nuttallia rhizomata*) is known historically from the site. The site also supports excellent and fair occurrences of two globally vulnerable (G3/S3) plant species Utah fescue (*Argillochloa dasyclada*) and the hanging gardens sullivantia (*Sullivanita hapemanii* var. *purpusii*).

Natural Heritage element occurrences at the 4A Ridge PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Natural Communities	Sullivantia hapemanii - (Aquilegia barnebyi) Herbaceous Vegetation	Sullivantia Hanging Gardens	G2	S2				B	2015-07-01
Natural Communities	Sullivantia hapemanii - (Aquilegia barnebyi) Herbaceous Vegetation	Sullivantia Hanging Gardens	G2	S2				E	1987-07-12
Natural Communities	Populus angustifolia / Rhus trilobata Woodland	Narrowleaf Cottonwood / Skunkbrush	G3	S3				A	1993-06-10
Vascular Plants	Nuttallia rhizomata	Roan Cliffs blazing star	G2	S2			BLM	H	1987-07-13
Vascular Plants	Physaria parviflora	Piceance bladderpod	G2	S2			BLM	C	2000-06-29
Vascular Plants	Physaria parviflora	Piceance bladderpod	G2	S2			BLM	H	1987-07-12
Vascular Plants	Physaria parviflora	Piceance bladderpod	G2	S2			BLM	B	2000-06-29
Vascular Plants	Thalictrum heliophilum	sun - loving meadowrue	G2	S2			BLM/US FS	H	1987-07-12
Vascular Plants	Thalictrum heliophilum	sun - loving meadowrue	G2	S2			BLM/US FS	H	1987-07-13
Vascular Plants	Thalictrum heliophilum	sun - loving meadowrue	G2	S2			BLM/US FS	H	1987-07-15
Vascular Plants	Thalictrum heliophilum	sun - loving meadowrue	G2	S2			BLM/US FS	A	2000-06-29
Vascular Plants	Argillochloa dasyclada	False ricegrass	G3	S3				H	1987-07-13
Vascular Plants	Argillochloa dasyclada	False ricegrass	G3	S3				C	2000-06-29
Vascular Plants	Sullivantia hapemanii var. purpusii	Hanging Garden sullivantia	G3T3	S3				A	2000-06-29
Vascular Plants	Sullivantia hapemanii var. purpusii	Hanging Garden sullivantia	G3T3	S3				H	1987-07-13
Vascular Plants	Sullivantia hapemanii var. purpusii	Hanging Garden sullivantia	G3T3	S3				H	1987-07-12
Vascular Plants	Sullivantia hapemanii var. purpusii	Hanging Garden sullivantia	G3T3	S3				H	1983-08-03

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: The boundary is drawn to include the area that supports the long-term survival of the rare plants that occur on the steep shale slopes of 4A Ridge and Henderson Ridge. Apparently unoccupied but similar habitat between the occurrences is included to allow for movement or expansion of the populations over time as landslides open up new sites, and existing sites become more heavily vegetated. The boundaries also include the Left Fork of Carr Creek. The area important to maintain this high quality riparian area encompasses the springs and small side drainages on the adjacent slopes, and overlaps the habitat of the rare shale endemic plants. This upland area, encompassing a major part of the hydrological input to the creek, is critical to the natural hydrological processes, such as periodic flooding and subsequent dynamic changes in plant community distribution, which are vital to the viability of this riparian system.

Protection Urgency Rank Comments (P3): This site is located on both BLM and private lands. No threats to the rare plants were noted during the survey. However, future activities such as oil shale or natural gas extraction could impact the plants. Development on BLM would require an Environmental Analysis (EA), at which time presence of BLM sensitive species including Piceance bladderpod and Roan Cliffs blazing star would be addressed. Development is restricted by no surface occupancy (NSO) stipulations on steep slopes of over 40%, which would apply to many of the rare plant sites. Modifications to locations of proposed developments can often be made to protect rare plant locations. The private land has no such protection. BLM's long range plans include a public access road in Corral Canyon (USDI 1987), although this does not appear to be imminent. An Environmental Assessment would be required, and should take into account the locations of the riparian plant community and the hanging garden sullivantia.

Management Urgency Rank Comments (M3): The rare plant locations are probably too steep for cattle, and therefore not subject to grazing impacts. Few exotic species are adapted to the rare plant habitat, and none were observed. No current management needs are known. There is a road that traverses its way up Left Fork Carr Creek on the adjacent hillside. No impacts from this road were observed in the riparian area. Potential erosion and spread of non-native species should be monitored along this road corridor. Developed springs have greatly altered the composition and structure of wetland vegetation near these areas. The density and frequency at which cattle use the springs has caused excessive erosion to these areas. Restoration of these springs should be considered. An undocumented report (Lambeth, pers. comm.) of Colorado River cutthroat trout in pools in the upper reaches of Left Fork Carr Creek should be investigated, and if high purity trout are found, measures to protect the cutthroat from contamination by downstream brook trout should be considered.

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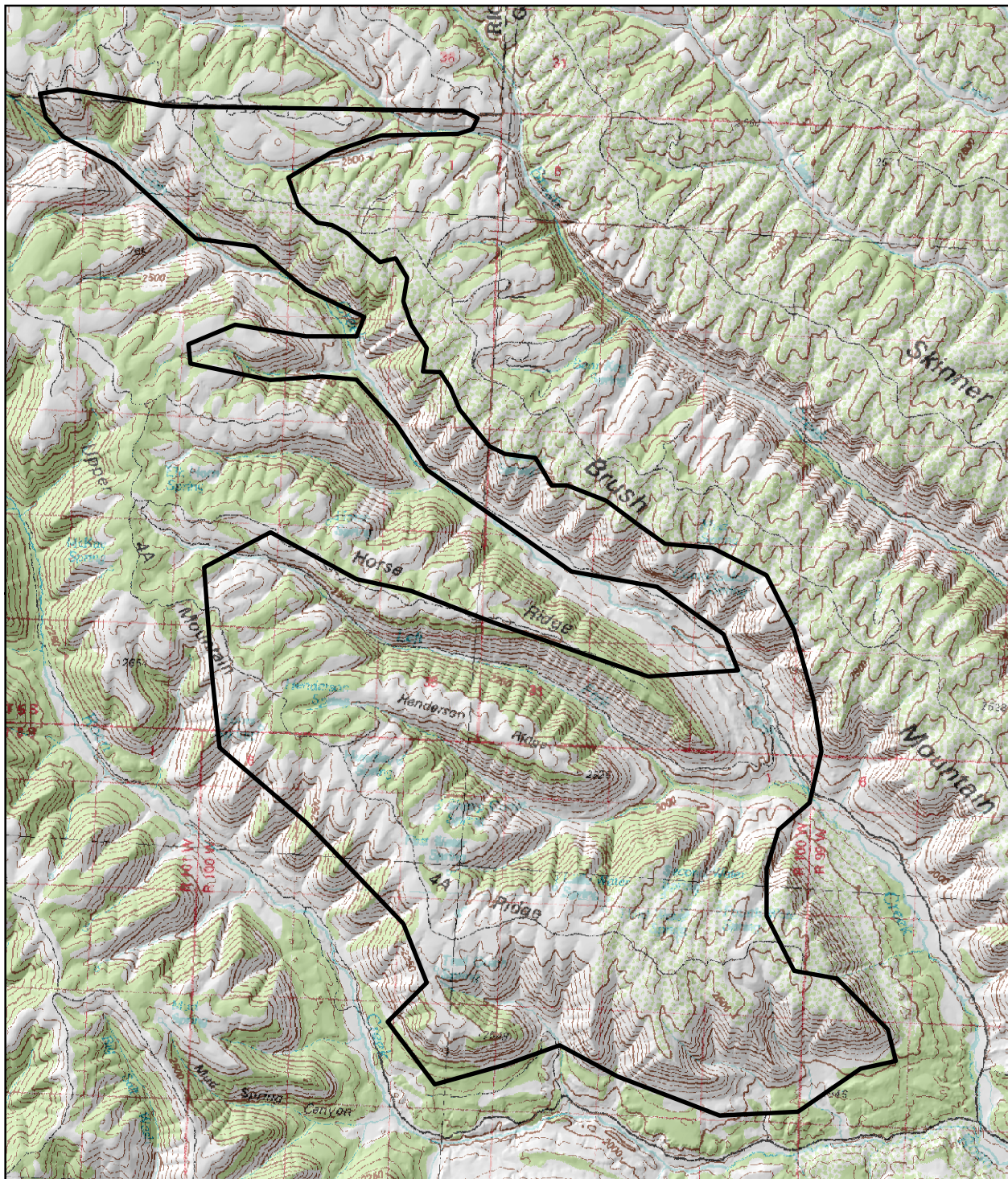
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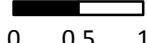
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Version Author: Handwerk, J.E. and M.J. Lyon

Version Date: 10/17/2016



 PCA Boundary

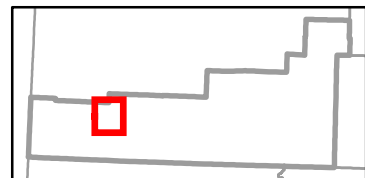
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Map Date: 10/15/2016



30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Douglas Pass, 39108-E1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

4A Ridge Potential Conservation Area, B2: Very High Biodiversity Significance

Anvil Points

Biodiversity Rank - B2: Very High Biodiversity Significance

Protection Urgency Rank - P2: Threat/Opportunity within 5 Years

Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss

U.S.G.S. 7.5-minute quadrangles: Rifle, Rulison, Anvil Points

Size: 14,086 acres (5,700 ha)

Elevation: 5,280 - 9,000 ft. (1,609 - 2,743 m)

General Description: The Anvil Points site consists of south and southeast-facing sides of the Roan Plateau between the rim and the alluvial flats of the Colorado River.

Biodiversity Significance Rank Comments (B2): This site contains excellent (A-ranked) and good (B-ranked) occurrences of the globally imperiled (G2/S2) Roan Cliffs blazing star (*Nuttallia rhizomata*), a good (B-ranked) occurrence of the globally imperiled (G2/S2) DeBeque milkvetch (*Astragalus debequaeus*) and an excellent (A-ranked) occurrence of the globally vulnerable (G3/S3) Wetherill's milkvetch (*Astragalus wetherillii*). It also contains excellent, good and fair occurrences of several plant species which are globally vulnerable. Surveys conducted in 2015-2016 determined that environmental conditions surrounding many of the occurrences of DeBeque milkvetch (*Astragalus debequaeus*) and Roan Cliffs blazing star (*Nuttallia rhizomata*) threaten the viability of the occurrences. Land uses have impacted both DeBeque milkvetch and Roan Cliff's blazing star populations. Energy development infrastructure (roads, well pads, pipelines) and impacts from the Garfield County land fill have altered or spill over into habitat that supports DeBeque milkvetch.

Natural Heritage element occurrences at the Anvil Points PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Vascular Plants	Astragalus debequaeus	DeBeque milkvetch	G2	S2			BLM	B	2006-09-07
Vascular Plants	Astragalus debequaeus	DeBeque milkvetch	G2	S2			BLM	C	2000-04-27
Vascular Plants	Astragalus debequaeus	DeBeque milkvetch	G2	S2			BLM	C	2015-06-25
Vascular Plants	Astragalus debequaeus	DeBeque milkvetch	G2	S2			BLM	BC	2015-06-07
Vascular Plants	Astragalus debequaeus	DeBeque milkvetch	G2	S2			BLM	D	1995-11-21
Vascular Plants	Astragalus debequaeus	DeBeque milkvetch	G2	S2			BLM	A	2006-10-14
Vascular Plants	Astragalus debequaeus	DeBeque milkvetch	G2	S2			BLM	C	1996-05-30
Vascular Plants	Astragalus debequaeus	DeBeque milkvetch	G2	S2			BLM	B	2016-04-13
Vascular Plants	Astragalus debequaeus	DeBeque milkvetch	G2	S2			BLM	AB	2011-06-10
Vascular Plants	Nuttallia rhizomata	Roan Cliffs blazing star	G2	S2			BLM	E	2001-04-30
Vascular Plants	Nuttallia rhizomata	Roan Cliffs blazing star	G2	S2			BLM	B	2015-06-08
Vascular Plants	Nuttallia rhizomata	Roan Cliffs blazing star	G2	S2			BLM	A	1998-07-15
Vascular Plants	Argillochloa dasyclada	False ricegrass	G3	S3				B	1998-07-14
Vascular Plants	Argillochloa dasyclada	False ricegrass	G3	S3				C	1998-07-17
Vascular Plants	Argillochloa dasyclada	False ricegrass	G3	S3				A	1998-07-15
Vascular Plants	Astragalus wetherillii	Wetherill's milkvetch	G3	S3				C	1998-07-16
Vascular Plants	Astragalus wetherillii	Wetherill's milkvetch	G3	S3				D	1998-05-12
Vascular Plants	Astragalus wetherillii	Wetherill's milkvetch	G3	S3				A	1995-10-28
Vascular Plants	Astragalus wetherillii	Wetherill's milkvetch	G3	S3				C	1998-05-13
Vascular Plants	Astragalus wetherillii	Wetherill's milkvetch	G3	S3				D	1998-05-13

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Vascular Plants	Oreocarya longiflora	long - flower cat's - eye	G3	S3				C	2016-04-13
Vascular Plants	Monardella odoratissima	mountain wild mint	G4G5	S2				C	1998-07-15

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: The boundary encompasses the habitat occupied by Debeque milkvetch, Wetherill milkvetch, Debeque phacelia, and Roan Cliffs blazing star on the lower slopes of the Roan Plateau in the vicinity of Anvil Points. The site is located primarily on the Wasatch Formation, and is adjacent to the Anvil Points Rim site, which includes occurrences of a different set of rare plants that grow on the Green River Formation higher up on the cliffs.

Protection Urgency Rank Comments (P2): Oil and gas development are the major threats to the rare plant occurrences. The imperiled status of the milkvetch warrants additional surveys in this area before new wells or roads are developed, and site designs that avoid the areas occupied by the plants. Road, well-pad and pipeline development have directly eliminated potential habitat and indirectly contributes to alteration of soil and hydrologic processes. The invasion of weeds, especially yellow sweetclover (*Melilotus officinale*), cheatgrass (*Bromus tectorum*) and smooth brome (*Bromus inermis*), along the road that accesses Anvil Points mine, threatens long-term population viability Roan Cliff's blazing star even though the population is large and vigorous. Impacts to the condition of the landscape from the Garfield County landfill are both direct and indirect. Direct impacts include a plethora of plastic bags and trash that is blown into the surrounding natural habitat. Grazing in the surrounding landscape has directly converted once lush grasslands and sage shrublands into cheatgrass-dominated deserts and indirectly altered precipitation infiltration, soil and disturbance (fire) processes and diminished habitat resiliency to our changing climate. Grazing allotments on lower gradient landscapes in this site are over-grazed. Inappropriate grazing is evidenced by upland herbaceous cover that is dominated by non-native invasive species including especially cheatgrass (*Bromus tectorum*) and Alyssum (*Alyssum simplex*), sage shrublands are characterized by decadent individuals and tamarisk (*Tamarix ramosissima*) has invaded washes and gullies.

Management Urgency Rank Comments (M2): Although the entire site should be managed for the rare and endemic plants, the High Risk Area that contains the Debeque milkvetch has the most urgent need for restricted management. Within this area the landscape integrity should remain high, with no additional fragmentation due to roads or drill pads. We recommend a minimum 1/4 mile set back on all drilling and drilling related activities from the Debeque milkvetch locations. The 1/4 mile distance is considered a minimum buffer. More ecological research could help refine what activities are compatible with this plant. Because DeBeque milkvetch is a short-lived species, protecting large areas around known populations is essential to provide habitat that enables population expansion via seed

dispersal and also enables pollinator viability. Invasive weeds are common throughout this site and threaten both the viability of the rare plant species and ecosystem function. Implementing “Recommended Best Management Practices for Managing Noxious Weeds on Sites with Rare Plants” (Mui and Spackman 2016) would improve the long-term viability potential for the rare plant species and ecosystem functions in this site.

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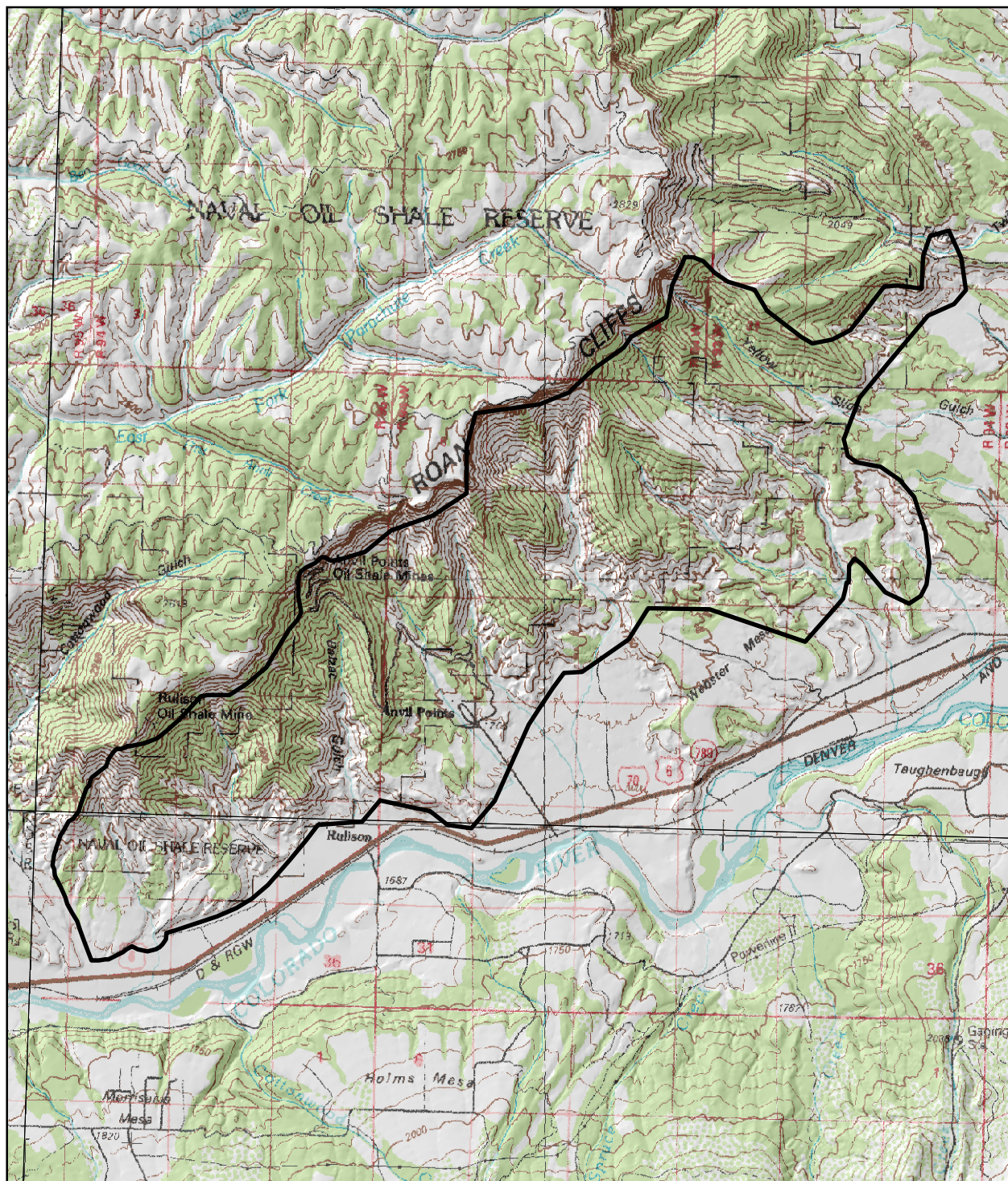
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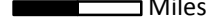
Mui, C. and S. Spackman. 2016. Recommended Best Management Practices for Managing Noxious Weeds on Sites with Rare Plants. Colorado Natural Heritage Program.

Version Author: Malone, D.G.

Version Date: 08/13/2016



 PCA Boundary

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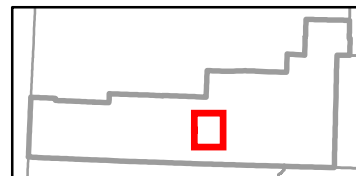
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Map Date: 10/10/2016



30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Carbondale, 39107-A1
Glenwood Springs, 39107-E1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Anvil Points Potential Conservation Area, B2: Very High Biodiversity Significance

Anvil Points Rim

Biodiversity Rank - B2: Very High Biodiversity Significance

Protection Urgency Rank - P2: Threat/Opportunity within 5 Years

Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality

U.S.G.S. 7.5-minute quadrangles: Anvil Points

Size: 1,867 acres (756 ha)

Elevation: 8,600 - 9,300 ft. (2,621 - 2,835 m)

General Description: The Anvil Points Rim site is generally the very southeastern limit of the Roan Plateau and the Piceance Basin. The Rim sits at an elevation of about 9,000 feet atop some three and a half miles of southeast-facing cliffs that plummet 400 feet or more down toward the Colorado River, 4,000 feet below. These dramatic cliffs are home to nesting Peregrine Falcons and Golden Eagles. The rim above the cliffs is a mixture of *Artemisia tridentata vaseyana* and *Symphoricarpus rotundifolius* with scattered blue bunch wheatgrass grassland (*Pseudoroegneria spicata inermis*) dominated hilltops. On a small patch of south-facing shale scree, the globally rare oil-shale endemic *Penstemon debilis* can be found. This occurrence of *Penstemon debilis* is one of few known sites in the world.

Key Environmental Factors: The major key environmental factor driving the botanic life at Anvil Points Rim is the surface oil-shale soil. It harbors many oil-shale endemic plants that are range restricted by the extent of the surfacing of this Green River Oil Shale formation. Other factors involved may include the wind patterns generated not only by the northeast-southwest running Colorado River Valley, but by the strong uplifts caused by the cliffs themselves. This effect may work to determine seed dispersal of some of the oil-shale endemic plants, but that is only speculation. Not much is known of the life histories of many of these oil-shale endemic plants.

Land Use History: The Roan Plateau in general has a long history of 100 years or more of heavy use by livestock, but the Anvil Points Rim site itself is a fair distance from any reliable water source, and therefore may not have experienced any strong impacts from such historical use. Domestic sheep grazing, with an allowed 4,525 sheep occurs throughout the site (allotment # C018908) (<http://www.geocommunicator.gov/GeoComm/>). The allotment is categorized by the BLM as “improve” which broadly describes BLM’s management objective for this allotment and indicates that the “present ecological condition is unsatisfactory”.

Biodiversity Significance Rank Comments (B2): This site contains a good (B-ranked) and a poor (D-ranked) occurrence of Parachute penstemon (*Penstemon debilis*), a globally critically imperiled (G1/S1) plant species. It also contains an excellent (A-ranked) and a good (B-ranked) occurrence of Roan Cliffs blazing star (*Haltallia rhizomata*), a globally imperiled (G2/S2) plant species, a fair (C-ranked) occurrence of a globally imperiled (G2/S2) *Pseudoroegneria spicata* grassland community, a good (B-ranked) occurrence of the globally vulnerable (G4T4/S2B) American Peregrine Falcon (*Falco peregrinus anatum*) and an excellent (A-ranked) occurrence of the globally vulnerable (G4T3/S2) Columbian

Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*), a bird species which is classified in Colorado as a Sensitive Species but is also classified as a game species with hunting allowed. The U.S. Forest Service (USFS) and the Bureau of Land Management (BLM) identify CSTG as a sensitive species wherever it occurs on lands under their jurisdictions but this grouse is not currently protected with ESA listing. Additional species documented in the Anvil Points Rim site include a fair (C-ranked) occurrence of Hanging Garden Sullivantia (*Sullivantia hapemanii* var. *purpusii*) a globally vulnerable (G3T3/S3) plant species, a fair (C-ranked) occurrence of Piceance bladderpod (*Physaria pulvinata*) a globally imperiled (G2/S2) plant species, and a good (B-ranked) occurrence of Mountain wild mint (*Monardella odoratissima*) a state imperiled (G4G5/S2) plant species.

Natural Heritage element occurrences at the Anvil Points Rim PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Birds	<i>Tympanuchus phasianellus columbianus</i>	Columbian Sharp-tailed Grouse	G4T3	S2		SC	BLM/US FS	A	1996-07-10
Birds	<i>Falco peregrinus anatum</i>	American Peregrine Falcon	G4T4	S2B		SC	BLM/US FS	B	2000-07-09
Natural Communities	<i>Pseudoroegneria spicata</i> Herbaceous Vegetation	Western Slope Grasslands	G2	S2				C	2015-07-23
Natural Communities	<i>Pseudoroegneria spicata</i> - <i>Poa secunda</i> Herbaceous Vegetation	Montane Grasslands	G4?	S1				B	1996-07-29
Vascular Plants	<i>Penstemon debilis</i>	Parachute penstemon	G1	S1	LT			B	2015-06-08
Vascular Plants	<i>Penstemon debilis</i>	Parachute penstemon	G1	S1	LT			D	2010-09-16
Vascular Plants	<i>Nuttallia rhizomata</i>	Roan Cliffs blazing star	G2	S2			BLM	B	1996-08-08
Vascular Plants	<i>Nuttallia rhizomata</i>	Roan Cliffs blazing star	G2	S2			BLM	A	1996-07-04
Vascular Plants	<i>Physaria parviflora</i>	Piceance bladderpod	G2	S2			BLM	C	2015-06-08
Vascular Plants	<i>Argillochloa dasyclada</i>	False ricegrass	G3	S3				H	1996-07-04
Vascular Plants	<i>Argillochloa dasyclada</i>	False ricegrass	G3	S3				B	2015-07-23
Vascular Plants	<i>Sullivantia hapemanii</i> var. <i>purpusii</i>	Hanging Garden sullivantia	G3T3	S3				C	2015-06-09
Vascular Plants	<i>Monardella odoratissima</i>	mountain wild mint	G4G5	S2				B	2015-07-23

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: The boundary encompasses all the occurrences of shale endemic plants and grassland communities on the rim, the cliff and adjacent slope. It is intended to capture the ecological processes affecting these elements, primarily precipitation, wind, and herbivory.

Protection Urgency Rank Comments (P2): The site, previously owned by the Department of Energy (DOE) as part of the Naval Oil Shale Reserve, was transferred to the BLM in 1997. The potential for oil shale development exists, but at this time is not an economically viable

option. In any case, the RMP should consider the biological significance of this site, and ensure that the Parachute penstemon and other significant species listed above are adequately protected. Since 2002 the BLM produced a resource management for the Roan Plateau. The "Final Supplemental Environmental Impact Statement for the Roan Plateau Resource Management Plan Amendment" was recently released for a 30-day protest period ending August 1st, 2016. Alternative IV is the Settlement Alternative as well as BLM's proposed RMPA. The basis of Alternative IV is to incorporate the terms of the Settlement Agreement for the Planning Area. Approximately 1,830 acres above the plateau rim and 30,170 acres below the rim would be open to oil and gas leasing and development (32,000 acres). Approximately 34,780 acres of BLM surface would be closed to oil and gas leasing. Leases on lands above the rim that would be made available to oil and gas leasing and development would be subject to the same stipulations as leases issued (per the remanded ROD and RMPA) in 2008, as modified by the terms and conditions detailed in the Settlement Agreement. Four ACECs (25,010 acres) would be designated and managed for important resources under Alternative IV. (http://www.blm.gov/co/st/en/BLM_Programs/land_use_planning/rmp/roan_plateau.html)

Management Urgency Rank Comments (M3): The entire site should be managed for the integrity of the landscape that surrounds the grassland, as it is extremely sensitive to alteration. Due to the flat nature of the grassland, the area is exceptionally vulnerable to road construction. Roads would not only fragment this relatively small site, but also allow noxious weeds and introduced species to infiltrate, and further endanger this unique system. The management plan should also address livestock grazing, although the present low use of the area is sustainable and complementary to this ecosystem. To ensure the continued sustainability of this system we recommend that no new water or improvement projects take place; no new roads be created; and unnecessary spur or duplicate roads be closed. Travel management issues will be covered in the BLM's new Resource Management Plan, expected to be completed in 2002.

Land Use Comments: The issue of potentially threatening land-use by the para-gliding club has been circumvented for a time. The Anvil Points Rim site is currently being used for livestock grazing, but the rim itself is only slightly used due to scarcity of water. There are two recently constructed stock tanks within the boundaries of the site, but they were dry by the end of the season this year, and were located in the very heads of ephemeral streams. A substantially-sized road bisects the entire site, and a few peripheral roads exist. The area experiences heavy use during all hunting seasons, but the critical areas do not appear to be choice sites for hunter camping.

Natural Hazard Comments: There are some phenomenally dramatic cliffs on the site (400+ foot drops) that are in oil-shale soils (which tend to be loose and flaky), so visitors and stewards alike should be cautious in approaches to the edge of the rim. The JQS Trail should not be traveled during a rainstorm, or very soon thereafter, since the clay substrate makes this exposed road extremely slippery and dangerous.

Exotic Species Comments: There are supposedly some released Barbary sheep in the vicinity of the site, but we never encountered them, nor any signs of their existence. Colorado Parks and Wildlife periodically makes helicopter flights over the area in attempts

to shoot any Barbary sheep they encounter, and there is an ever-open hunting season on them in the area. The mine access road to Anvil Points has provided a route for the invasion of non-native plant species (Canada thistle (*Cirsium arvense*), houndstongue (*Cynoglossum officinale*) and common mullein (*Verbascum thapsus*)) which now threaten viability of three rare plant species which occur at or near the mine site, *Penstemon debilis*, *Physaria parviflora* and *Nuttallia rhizomata*.

Off-Site Considerations: The county dump is at the foot of the cliffs below the Anvil Points Rim site, (near the old Anvil Points community). There is extensive oil and gas development on private, BLM, and DOE lands in the immediate vicinity of the site.

Information Needs: Still need information on the status of the site as a lekking ground for Columbian Sharp-tailed Grouse.

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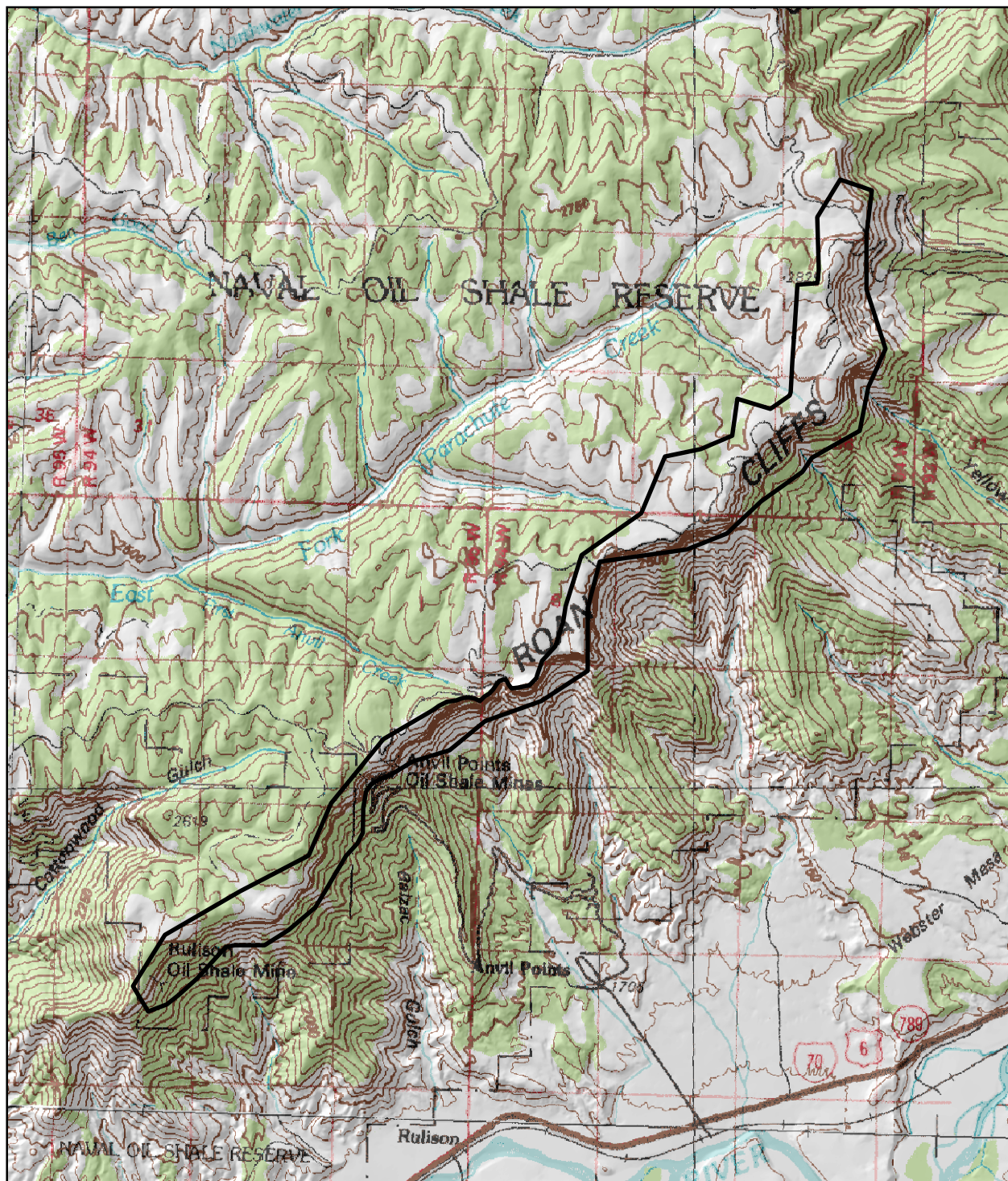
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Mui, C. and S. Spackman. 2016. Recommended Best Management Practices for Managing Noxious Weeds on Sites with Rare Plants. Colorado Natural Heritage Program.

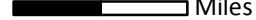
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Version Author: Malone, D.G.

Version Date: 08/13/2016



 PCA Boundary

 Miles

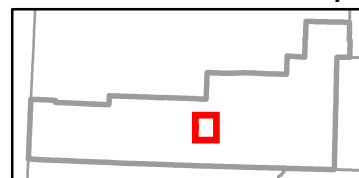
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Map Date: 10/11/2016



30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Glenwood Springs, 39107-E1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Anvil Points Rim Potential Conservation Area, B2: Very High Biodiversity Significance

Bar X Wash

Biodiversity Rank - B2: Very High Biodiversity Significance

Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years

Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss

U.S.G.S. 7.5-minute quadrangles: Badger Wash, Bitter Creek Well, Bar X Wash

Size: 5,970 acres (2,416 ha)

Elevation: 4,900 - 5,400 ft. (1,494 - 1,646 m)

General Description: This site is in the western part of the West Salt Creek drainage, an area of low Mancos shale hills, covered with desert shrub vegetation. Several communities form a mosaic pattern on the hillsides. They represent various combinations of shadscale, mat saltbush and Gardner saltbush, in combination with poison aster, Salina wild rye, galleta, and shale barrens. Other common species on the hillsides are yucca, low rabbitbrush, and the selenium indicator, *Stanleya pinnata*. In gullied washes, three rare plants were found together. Flat bottomlands have greasewood, with a weedy understory of cheatgrass, mustard and horned buttercup. A few Utah junipers are scattered on the higher hills. Native bunchgrasses survive in patches of a few acres on the less heavily grazed slopes. The area contains four significant natural communities and four rare plant species, as well as two birds of concern. The *Lygodesmia doloresensis* was a very small disjunct occurrence of a species found along the Dolores River. Further study of the taxonomy and biogeography of this species is needed. So far, recreational impacts are far lower than in similar areas further east toward Grand Junction. However, as the Grand Valley becomes more populated, ORV use could become a threat. Oil and gas exploration and development have affected the area. Swaths of weedy vegetation demarcate pipeline routes and roadsides, and large areas are dominated by cheatgrass. Prevalence of broom snakeweed (*Gutierrezia sarothrae*) in some areas indicates former heavy grazing impacts. However, the presence of patches of native vegetation provides hope that natural communities can be recovered with time.

Climate Description: The climate of the area is characterized as arid semi-desert. The average maximum summer daytime temperature is 93 (deg F) and nighttime minimums of 57 (deg F). Summer maxima may be as high as 110 (deg F). Average winter daytime and nighttime temperature extremes are 38 (deg F) and 12 (deg F), respectively. Precipitation averages less than 8.64 inches per year and primarily occurs in the late summer and fall as rain. (WRCC 2004)

Land Use History: grazed, oil and gas development and exploration

Biodiversity Significance Rank Comments (B2): This site supports many significant plants and plant communities. Most notable are: a good (B-ranked) occurrence of the globally imperiled (G2/S2) Gardner's mat saltbush shrubland (*Atriplex gardneri* / *Leymus salinus*), a good (B-ranked) occurrence of the globally critically imperiled (G1G2/S1S2) Dolores River skeletonplant (*Lygodesmia doloresensis*), a good (B-ranked) occurrence of the globally vulnerable (G3/S2) cliff dweller's candlestick cateseye (*Oreocarya elata*), and a good (B-ranked) occurrence of the globally vulnerable (G3/S1) Ferron milkvetch (*Astragalus*

musiniensis).

Natural Heritage element occurrences at the Bar X Wash PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Birds	<i>Amphispiza belli</i>	Sage Sparrow	G5	S3B			USFS	H	1982-06-99
Mammals	<i>Vulpes macrotis</i>	Kit Fox	G4	S1		SE	BLM/USFS	H	1983-99-99
Natural Communities	<i>Atriplex gardneri</i> / <i>Leymus salinus</i> Dwarf - shrubland	Gardner's Mat Saltbush Shrublands	G2?	S2				B	1996-06-01
Natural Communities	<i>Atriplex confertifolia</i> / <i>Achnatherum hymenoides</i> Shrubland	Cold Desert Shrublands	G3	S2				BC	1996-06-01
Natural Communities	<i>Juniperus osteosperma</i> / <i>Leymus salinus</i> spp. <i>salinus</i> Wooded Herbaceous Vegetation	Mesic Western Slope Pinyon - Juniper Woodlands	G3	S2				C	1983-06-16
Natural Communities	<i>Atriplex confertifolia</i> / <i>Leymus salinus</i> Shrubland	Cold Desert Shrublands	G3G5	SU				C	1996-06-01
Natural Communities	<i>Atriplex confertifolia</i> / <i>Leymus salinus</i> Shrubland	Cold Desert Shrublands	G3G5	SU				B	1996-06-01
Vascular Plants	<i>Lygodesmia doloresensis</i>	Dolores River skeletonplant	G1G2	S1S2			BLM	B	2010-06-04
Vascular Plants	<i>Astragalus musiniensis</i>	Ferron's milkvetch	G3	S1			BLM	B	1996-06-01
Vascular Plants	<i>Oreocarya elata</i>	cliff dweller's candlestick catseye	G3	S2				B	1996-06-01
Vascular Plants	<i>Oreocarya elata</i>	cliff dweller's candlestick catseye	G3	S2				H	1988-05-03
Vascular Plants	<i>Oreocarya elata</i>	cliff dweller's candlestick catseye	G3	S2				H	1996-06-01

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: Portions of a good (B-ranked) occurrence of the globally vulnerable (G3/S2) grand buckwheat (*Eriogonum contortum*) occur with the site as well as a historical occurrence of the state imperiled (G4/S2) Jones bluestar (*Amsonia jonesii*).

Boundary Justification: The site includes a cluster of occurrences of rare plant communities and rare plants, with potential habitat for the plants between observed locations. Boundaries are drawn to include all element occurrences and a buffer zone.

Protection Urgency Rank Comments (P3): Status of oil and gas development is unknown. A grazing management plan is being formulated now with BLM, the permittee and other interested parties. *Eriogonum contortum* seems to be a fairly tough, resilient shrub. The *Astragalus* and *Cryptantha* may be more susceptible. Most vulnerable is the condition of the natural communities: the ratio of weedy areas to those with native bunchgrasses.

Management Urgency Rank Comments (M2): Grazing exclosures are needed to monitor effects of grazing and potential for recovery of the rare plants and plant communities. Grazing management should be designed to protect the rare plants and communities, and to generally improve the condition of the native vegetation. Planning for NCA is underway.

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Version Author: Handwerk, J.E. and M.J. Lyon

Version Date: 10/17/2016

Bar X Wash Potential Conservation Area, B2: Very High Biodiversity Significance

Barrel Spring Point

Biodiversity Rank - B2: Very High Biodiversity Significance

Protection Urgency Rank - P2: Threat/Opportunity within 5 Years

Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss

U.S.G.S. 7.5-minute quadrangles: Calf Canyon, Brushy Point, Henderson Ridge

Size: 3,753 acres (1,519 ha)

Elevation: 7,600 - 8,922 ft. (2,316 - 2,719 m)

General Description: The Barrel Spring Point site occupies a high ridge along the divide separating the Colorado River (Roan Creek and East Salt Creek) and White River drainages, east of Douglas Pass. A road traverses the ridge along the northern part, following the divide. The level ridge top and vegetated slopes have a mosaic of sagebrush shrublands and aspen forests. The land drops off to the south in steep barren slopes of Green River shale that provide habitat for the Piceance bladderpod.

Biodiversity Significance Rank Comments (B2): This site supports an excellent (A-ranked) occurrence of a globally imperiled (G2/S2) plant, Piceance bladderpod (*Physaria parviflora*), a good (B-ranked) occurrence of the globally imperiled (G2/S2) Sullivantia Hanging Gardens community (*Sullivantia hapemanii* var. *purpusii* – *Aquilegia barnebyi*), and an excellent (A-ranked) occurrence of the globally vulnerable (G3T3/S3) hanging garden sullivantia plant (*Sullivantia hapemanii* var. *purpusii*). Some of the hanging garden sullivantia plants are associated with Barneby's columbine (*Aquilegia barnebyi*) which re-defines them as Sullivantia Hanging Gardens community.

Natural Heritage element occurrences at the Barrel Spring Point PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Natural Communities	Sullivantia hapemanii - (Aquilegia barnebyi) Herbaceous Vegetation	Sullivantia Hanging Gardens	G2	S2				B	2015-07-01
Vascular Plants	Physaria parviflora	Piceance bladderpod	G2	S2			BLM	A	2015-06-15
Vascular Plants	Sullivantia hapemanii var. purpusii	Hanging Garden sullivantia	G3T3	S3				A	2000-06-28

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: There is a good (B-rank) occurrence of the Watchlisted (G3G4/S3) Barneby's thistle (*Cirsium barnebyi*) in this site.

Boundary Justification: The boundary includes an area that supports the long-term survival of the Piceance bladderpod and the hanging garden sullivantia. It includes the

south-facing barren scree slopes and the road cut where the Piceance bladderpod is located, and the springs where the hanging garden sullivantia was found. Adjacent unoccupied steep slopes are included to allow for shifting of the population as new landslides develop and existing sites become more heavily vegetated.

Protection Urgency Rank Comments (P2): Most of this site is on BLM land, with some private land in the northeast portion. The Piceance bladderpod and one of the hanging garden sullivantia occurrences are on BLM land. As long as the primary land use is grazing, there is probably no threat to the rare plants, as cattle seldom venture onto the steep shale slopes. If oil and gas development were to take place, the rare plants could be impacted. Piceance bladderpod is listed as a sensitive species by BLM, and as such will be considered in an Environmental Analysis that would be required before any new developments were approved. In addition, their location on steep slopes, which carry No Surface Occupancy (NSO) stipulations should protect them from direct disturbance (USDI 1987). Although private land does not carry the same restrictions, it is probably not practical to drill on the steep shale slopes. However, roads and pipelines are sometimes built on steep slopes such as these. Weed management is essential to protect the population from displacement. Restoring resiliency in the surrounding landscape by modifying the grazing regime and re-connecting the landscape is essential to long-term system sustainability.

Management Urgency Rank Comments (M2): The spring feeding the hanging sullivantia is being used for domestic water which is trucked to a ranch. This does not appear to be affecting the occurrence; however, further water development or access road improvement could have an impact. The shale barrens where the Piceance bladderpod is found probably requires no management, as it is too steep and there is too little forage for cattle. Plants were growing on an artificially barren scree of a road cut, as well as on the naturally eroding slopes below. The surrounding landscape is only moderately intact due to fragmentation from anthropogenic development with consequent alteration of ecosystem processes due to inappropriate livestock grazing and oil and gas development. These activities have diminished ecosystem processes, particularly soil, community and hydrologic processes, that function to sustain natural communities and alterations have diminished ecosystem resiliency to climate change. Consequences include excessive soil drying as evidenced by aspen woodland die off. Long-term impacts may include loss of those communities that depend on reliable water resources such as the Sullivantia Hanging Garden community.

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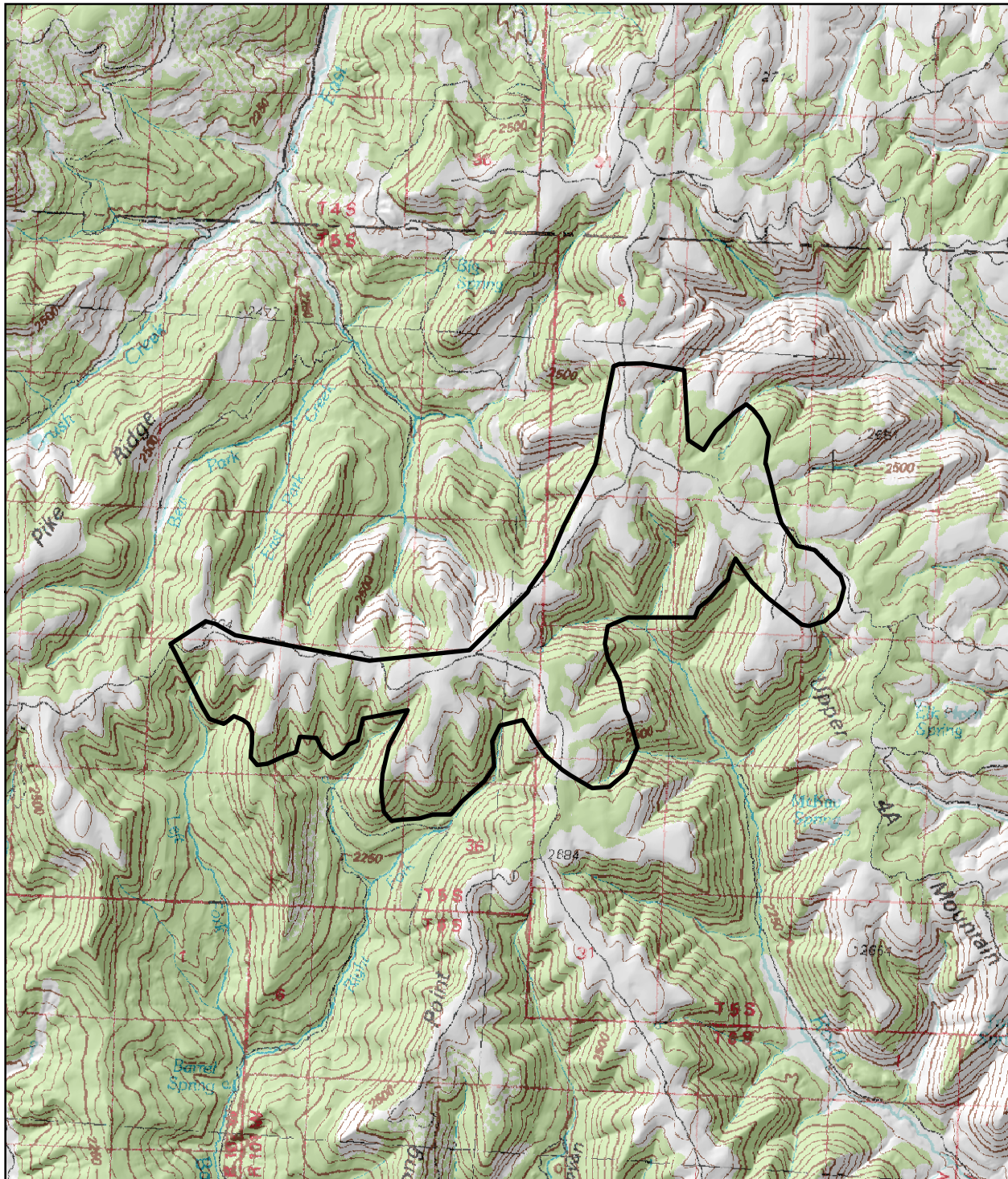
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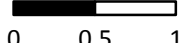
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Version Author: Malone, D.G.

Version Date: 08/13/2016



 PCA Boundary

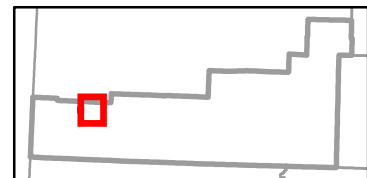
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Map Date: 10/11/2016



30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Douglas Pass, 39108-E1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Barrel Spring Point Potential Conservation Area, B2: Very High Biodiversity Significance

Clear Creek

Biodiversity Rank - B2: Very High Biodiversity Significance

Protection Urgency Rank - P2: Threat/Opportunity within 5 Years

Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future

U.S.G.S. 7.5-minute quadrangles: Mount Blaine, Bull Fork, Long Point, Figure Four Spring, Desert Gulch

Size: 14,174 acres (5,736 ha)

Elevation: 5,513 - 8,000 ft. (1,680 - 2,438 m)

General Description: Clear Creek, a tributary of Roan Creek, is a major drainage of the Roan Plateau, and includes numerous small side drainages. The lower part of the drainage is composed of the Wasatch formation, while the upper part and the steep sides are in the Green River Formation, marlstones below and Parachute Creek Member above. Significant areas within this large site include Red Point, Sheep Gulch, Mud Springs Creek, Camp Gulch, Deer Park Gulch, Scott Gulch, Buck Gulch, Doe Gulch, and Tom's Creek Canyon. The site harbors several narrowly endemic plant species that are restricted to the Green River shale on the steep canyonsides, as well as both rare and common plant communities. The canyonsides are for the most part sparsely vegetated. The area is almost completely privately owned, primarily by large oil companies. There are a few small BLM parcels included.

Biodiversity Significance Rank Comments (B2): This site contains an excellent (A-ranked) occurrence of the sun-loving meadowrue (*Thalictrum heliophilum*), as well as several historical occurrences. The hanging garden sullivanita (*Sullivantia hapemanii* var. *purpusii*) and Utah fescue (*Argillochloa dasyclada*) which are vulnerable on a global scale (G3/S3), and the globally imperiled (G2/S2) Roan Cliffs blazing star (*Nuttallia rhizomata*) are also known historically from the site. The site also contains occurrences of plant communities which are imperiled or vulnerable on a global scale.

Natural Heritage element occurrences at the Clear Creek PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Mammals	<i>Vulpes macrotis</i>	Kit Fox	G4	S1		SE	BLM/US FS	D	1998-99-99
Natural Communities	<i>Atriplex confertifolia</i> / <i>Achnatherum hymenoides</i> Shrubland	Cold Desert Shrublands	G3	S2					1983-99-99
Natural Communities	<i>Atriplex confertifolia</i> / <i>Pseudoroegneria spicata</i> Shrubland	Cold Desert Shrublands	G3	S2					1983-99-99
Natural Communities	<i>Populus angustifolia</i> / <i>Rhus trilobata</i> Woodland	Narrowleaf Cottonwood / Skunkbrush	G3	S3				BC	1993-06-11
Natural Communities	<i>Pseudoroegneria spicata</i> - <i>Achnatherum hymenoides</i> Herbaceous Vegetation	Western Slope Grasslands	G3G4	S1					1983-99-99
Natural Communities	<i>Pinus edulis</i> - <i>Juniperus osteosperma</i> / <i>Cercocarpus montanus</i> - Mixed Shrubs Woodland	Two - needle Pinyon - Utah Juniper / Alderleaf Mountain - mahogany - Mixed Shrubs Woodland	G5	S5					1983-99-99
Natural Communities	<i>Pseudotsuga menziesii</i> / <i>Symphoricarpos oreophilus</i> Forest	Western Slope Douglas Fir Forests	G5	S4					1983-99-99
Natural Communities	<i>Catabrosa aquatica</i> - <i>Mimulus</i> ssp. Spring Wetland	Spring Wetland	GU	S2				C	2000-09-12
Vascular Plants	<i>Nuttallia rhizomata</i>	Roan Cliffs blazing star	G2	S2			BLM	H	1983-06-99
Vascular Plants	<i>Thalictrum heliophilum</i>	sun - loving meadowrue	G2	S2			BLM/US FS	H	1983-06-03
Vascular Plants	<i>Thalictrum heliophilum</i>	sun - loving meadowrue	G2	S2			BLM/US FS	A	1993-06-10
Vascular Plants	<i>Thalictrum heliophilum</i>	sun - loving meadowrue	G2	S2			BLM/US FS	H	1983-06-99
Vascular Plants	<i>Argillochloa dasyclada</i>	False ricegrass	G3	S3				H	1981-99-99
Vascular Plants	<i>Argillochloa dasyclada</i>	False ricegrass	G3	S3				H	1982-07-99

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Vascular Plants	Argillochloa dasyclada	False ricegrass	G3	S3				H	1982-99-99
Vascular Plants	Sullivantia hapemanii var. purpusii	Hanging Garden sullivantia	G3T3	S3				H	1983-06-99
Vascular Plants	Sullivantia hapemanii var. purpusii	Hanging Garden sullivantia	G3T3	S3				H	1981-99-99
Vascular Plants	Sullivantia hapemanii var. purpusii	Hanging Garden sullivantia	G3T3	S3				H	1983-99-99

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: The boundary is drawn to include Clear Creek and its tributaries, with their Green River shale canyonsides, to the rim, but does not include the mesa tops. It includes springs at the head of tributaries that support the hanging garden sullivantia. Some unoccupied habitat for the shale endemic plants is included to allow for movement of the plant populations over time, as landslides open up new sites, and existing sites become too heavily vegetated for the targeted species.

Protection Urgency Rank Comments (P2): The site is almost entirely owned by private oil companies. Although not currently economical, future oil shale extraction could seriously impact this significant site.

Management Urgency Rank Comments (M4): No current management needs are known.

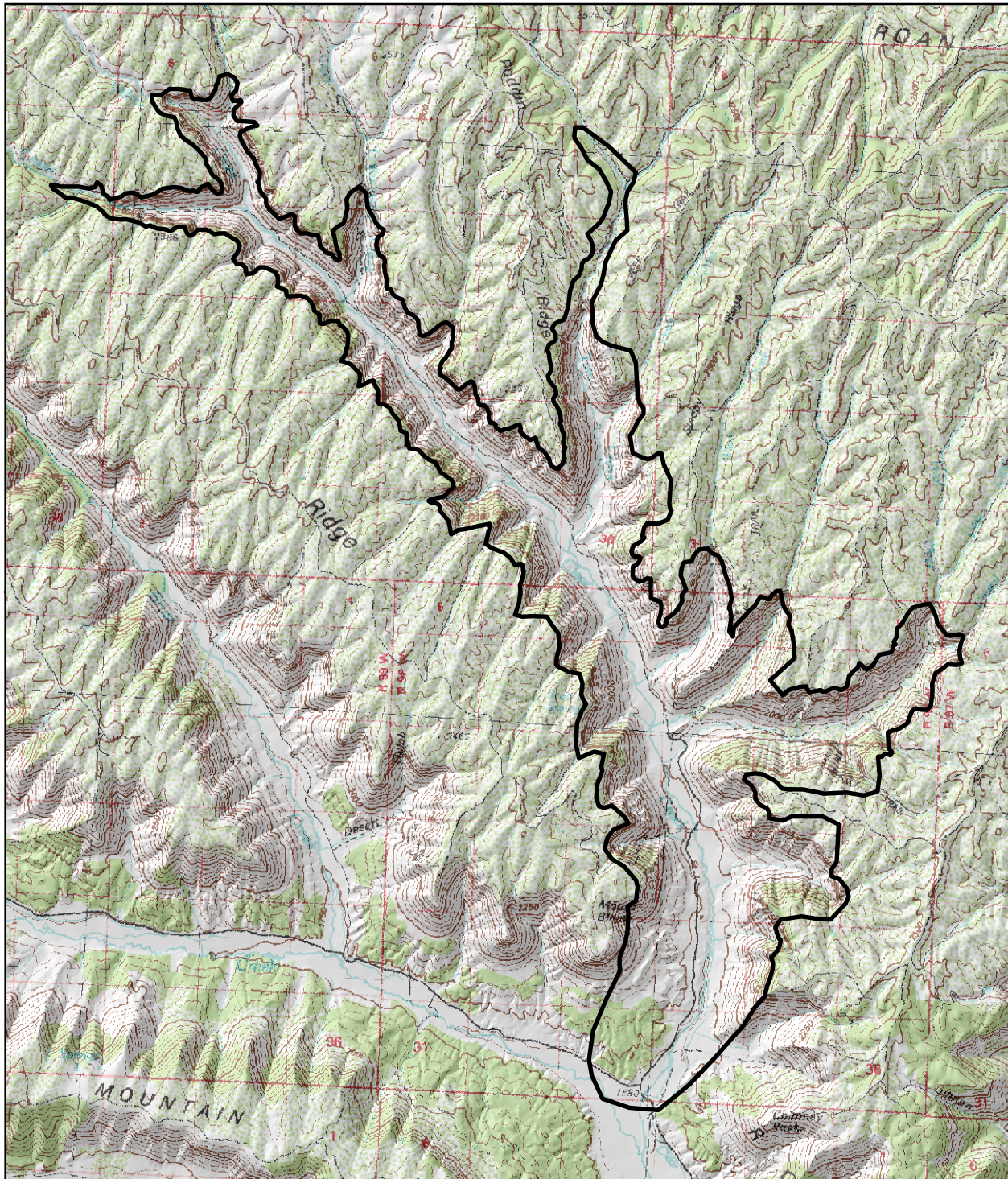
Information Needs: Many occurrences are historical. Need current field survey to verify quality of rare plant populations.

References

Lyon, P., J. Sovell, and J. Rocchio. 2001. Final Report: Survey of Critical Biological Resources, Garfield County, Colorado. Vol. 1. Colorado Natural Heritage Program, Fort Collins, CO.

Version Author: Handwerk, J.E. and M.J. Lyon

Version Date: 10/16/2016



 PCA Boundary

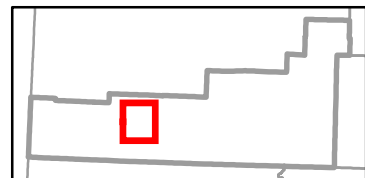
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Map Date: 10/15/2016



30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Douglas Pass, 39108-E1
Grand Junction, 39108-A1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Clear Creek Potential Conservation Area, B2: Very High Biodiversity Significance

Conn Creek

Biodiversity Rank - B2: Very High Biodiversity Significance

Protection Urgency Rank - P2: Threat/Opportunity within 5 Years

Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality

U.S.G.S. 7.5-minute quadrangles: Red Pinnacle, Long Point, Mount Blaine, Circle Dot Gulch

Size: 6,866 acres (2,779 ha)

Elevation: 6,200 - 8,400 ft. (1,890 - 2,560 m)

General Description: Conn Creek cuts through the Green River Formation on the Roan Plateau, forming a small box canyon before joining Roan Creek. Two hundred foot shale cliffs form the walls of the box canyon, and a dramatic waterfall at the head of the canyon plunges more than 100 feet over the Roan Cliffs. Conn Creek is a small perennial stream with a very high gradient (500 feet per mile). The adjacent side slopes are very steep and vegetated with Gambel's oak (*Quercus gambelii*), mountain mahogany (*Cercocarpus montanus*), and Utah serviceberry (*Amelanchier utahensis*) on lower slopes while the upper and northeast-facing slopes near the cliff are forested with Douglas-fir. Occasional landslides provide habitat for rare and endemic shale plants. The riparian zone of Conn Creek supports a unique low elevation community dominated by box elder maple and choke cherry. It has a very dense, and fairly undisturbed understory of Oregon grape (*Mahonia repens*), skunkbrush (*Rhus trilobata*), serviceberry (*Amelanchier utahensis*), snowberry (*Symphoricarpos rotundifolius*), and black twinberry (*Lonicera involucrata*). Three rare plants were found on the shale barrens of the steep side slopes: Roan Cliffs blazing star, sun-loving meadowrue and Utah fescue. All three are oil shale endemics, adapted to the Green River shale. A fourth Colorado endemic, hanging garden sullivantia, was found at a waterfall with a plunge pool and seeping cliffs, associated with oil shale columbine (*Aquilegia barnebyi*).

Biodiversity Significance Rank Comments (B2): This site supports a good occurrence (B-ranked) of the globally imperiled (G2/S2) sun-loving meadowrue (*Thalictrum heliophilum*). The hanging garden sullivantia (*Sullivantia hapemanii* var. *purpusii*) and Utah fescue (*Argillochloa dasyclada*) which are vulnerable on a global scale (G3/S3), and the globally imperiled (G2/S2) Roan Cliffs blazing star (*Nuttallia rhizomata*) are also known historically from the site. The lower elevation riparian areas support a good occurrence of the globally vulnerable (G3/S2) boxelder / chokecherry riparian community (*Acer negundo* / *Prunus virginiana*). Low elevation riparian communities in Colorado are generally in poor condition due to hydrologic changes, heavy grazing, agricultural use, and development.

Natural Heritage element occurrences at the Conn Creek PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Natural Communities	Acer negundo / Prunus virginiana Forest	Montane Riparian Deciduous Forest	G3	S2				B	2000-07-09
Vascular Plants	Nuttallia rhizomata	Roan Cliffs blazing star	G2	S2			BLM	H	1983-06-99
Vascular Plants	Thalictrum heliophilum	sun - loving meadowrue	G2	S2			BLM/US FS	B	1993-06-10
Vascular Plants	Argillochloa dasyclada	False ricegrass	G3	S3				H	1983-06-99
Vascular Plants	Sullivantia hapemanii var. purpusii	Hanging Garden sullivantia	G3T3	S3				H	1983-06-99

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: Sage Sparrows are found within the site.

Boundary Justification: The site boundaries for Conn Creek include the riparian area and its immediate slopes and cliff from the waterfall to its junction with Cascade Canyon. This boundary includes all element occurrences listed. The more significant elements occur on the shale scree slopes and streamsides of the box canyon. In order to protect these elements, especially the riparian zones, a broader, secondary boundary including the entire watershed should be considered. The watershed approach is especially important if mining activity takes place, since oil shale mining can be highly destructive to the drainages. The boundaries are also mapped to include the Sage Sparrow occurrence and over 30 acres of the surrounding big sagebrush habitat. Sage Sparrows require big sagebrush parks of over 30 acres for nesting (Lambeth 1998).

Protection Urgency Rank Comments (P2): No protective status is given to this site. Occidental Oil Company owns both Conn and Cascade Canyons. Few roads or trails are within the Conn Creek Site, although grazing takes place in both the riparian areas and on the slopes. At current oil prices it is not now economical to mine oil shale. If or when the price of oil goes up and technology is improved, the oil companies will probably mine this site.

Management Urgency Rank Comments (M3): This site is generally in pristine condition. The only non-native plant observed was woolly mullein (*Verbascum thapsus*). The only management activity recommended at present is to periodically monitor the site for changes. Sage Sparrows are vulnerable to loss and fragmentation of sagebrush habitat and may require sagebrush parks of 100 acres or more (NatureServe 2000). Range improvement programs removing sagebrush and invasion by cheatgrass (*Bromus tectorum*) have the potential to destroy this Sage Sparrow population. Cheatgrass alters the natural fire regime by increasing the frequency, intensity, and size of range fires. Fire kills sagebrush and where non-native grasses dominate, the landscape can be converted to annual grassland as the fire

cycle escalates, removing habitat for Sage Sparrow (Paige and Ritter 1998). Sage Sparrows can persist with moderate grazing and other land management activities that maintain sagebrush cover and the integrity of native vegetation, but they respond negatively to heavy grazing (Saab et al. 1995). Recovery of native grasses, management of fire to prevent loss of sagebrush cover and implementing moderate grazing practices would benefit Sage Sparrows at this site.

References

Lyon, P., J. Sovell, and J. Rocchio. 2001. Final Report: Survey of Critical Biological Resources, Garfield County, Colorado. Vol. 1. Colorado Natural Heritage Program, Fort Collins, CO.

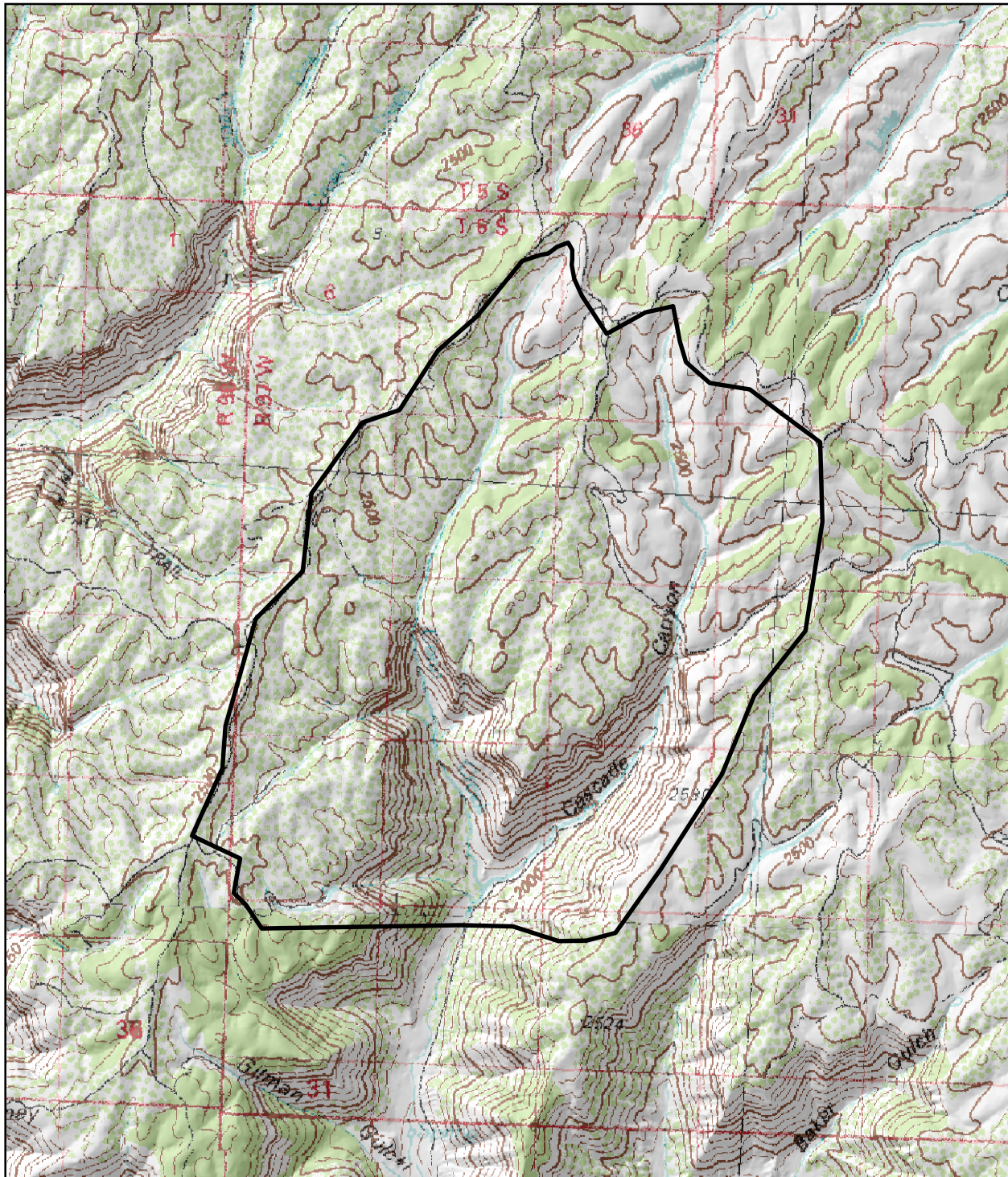
NatureServe. 2000. An online encyclopedia of life [web application]. Version 1.1. Arlington, VA. Available: <http://www.natureserve.org/>.

Paige, C., and S.A. Ritter. 1998. Birds in a sagebrush sea: managing sagebrush habitats for bird communities. Western Working Group of Partners in Flight, Boise, ID.

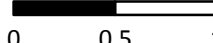
Saab, V.A., C.E. Bock, T.D. Rich, and D.S. Dobkin. 1995. Livestock grazing effects in western North America. Pages 311-353 in T.E. Martin and D.M. Finch, editors. Ecology and management of Neotropical migratory birds. Oxford University Press, New York, NY.

Version Author: Handwerk, J.E. and M.J. Lyon

Version Date: 10/16/2016



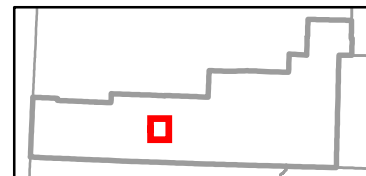
 PCA Boundary

 Miles
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Map Date: 10/15/2016 

30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Douglas Pass, 39108-E1
Grand Junction, 39108-A1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Conn Creek Potential Conservation Area, B2: Very High Biodiversity Significance

Cow Ridge

Biodiversity Rank - B2: Very High Biodiversity Significance

Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years

Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future

U.S.G.S. 7.5-minute quadrangles: Long Point, Middle Dry Fork, The Saddle

Size: 14,606 acres (5,911 ha)

Elevation: 6,000 - 8,428 ft. (1,829 - 2,569 m)

General Description: Cow Ridge is the upland between two east-flowing drainages, the North Dry Fork and Kimball Creek. Both flow into Roan Creek. The site takes in the south-facing slopes of the ridge, above the North Dry Fork. The top of the ridge consists of the Parachute Creek member of the Green River shale. The lower elevations are composed of Green River marlstone, while in the eastern end at lower elevations, the Wasatch and Ohio formations are found. The sparsely vegetated south slopes have much barren exposed shale, and a mixture of pinon, juniper, and mountain shrubs, including Gambel's oak, chokecherry, snowberry, mountain mahogany and serviceberry. There are a few scattered Douglas-fir and ponderosa pine.

Biodiversity Significance Rank Comments (B2): This site contains excellent (A-ranked), good to fair (BC-ranked) and historical occurrences of a globally imperiled (G2/S2) plant, Piceance bladderpod (*Physaria parviflora*). There are also extant occurrences of a globally vulnerable (G3/S3) grass, Utah fescue (*Argillochloa dasyclada*), and the state critically imperiled (G4/S1) Utah mountain lilac (*Ceanothus martinii*). Additionally, surveys conducted in 2015 documented a new (B-ranked) occurrence of the Piceance bladderpod 3 miles to the west of the known occurrences.

Natural Heritage element occurrences at the Cow Ridge PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Vascular Plants	Physaria parviflora	Piceance bladderpod	G2	S2			BLM	A	2015-06-15
Vascular Plants	Physaria parviflora	Piceance bladderpod	G2	S2			BLM	H	1987-07-07
Vascular Plants	Physaria parviflora	Piceance bladderpod	G2	S2			BLM	BC	2015-06-15
Vascular Plants	Physaria parviflora	Piceance bladderpod	G2	S2			BLM	H	1987-07-16
Vascular Plants	Argillochloa dasyclada	False ricegrass	G3	S3				H	1987-07-16
Vascular Plants	Argillochloa dasyclada	False ricegrass	G3	S3				H	1987-07-07
Vascular Plants	Ceanothus martinii	Utah mountain lilac	G4	S1				C	2015-06-15

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: The state rare (G3G4/S3) Barneby's thistle (*Cirsium barnebyi*) occurs in this site.

Boundary Justification: The boundary was revised in 2001 to include the area that supports the long-term survival of the Piceance bladderpod occurrence. It includes the south-facing slopes of Cow Ridge above the North Dry Fork, which support two rare plant species. Some adjacent suitable habitat that is presently unoccupied is included to allow for movement of the plant populations over time, as landslides open up new sites, and existing sites become too heavily vegetated for the targeted species.

Protection Urgency Rank Comments (P3): A narrow strip of private land is located along the bottom of the North Dry Fork, while the uplands are public, managed by the Grand Junction Resource Area of the BLM. Future oil and gas development on BLM would require an Environmental Assessment, at which time the Piceance bladderpod, a BLM sensitive species, should be considered and protected from direct disturbance. There is no such protection for the private land.

Management Urgency Rank Comments (M4): There are no known management needs at present.

References

Bureau of Land Management. 2016b. Standards for Public Land Health. Available online at:

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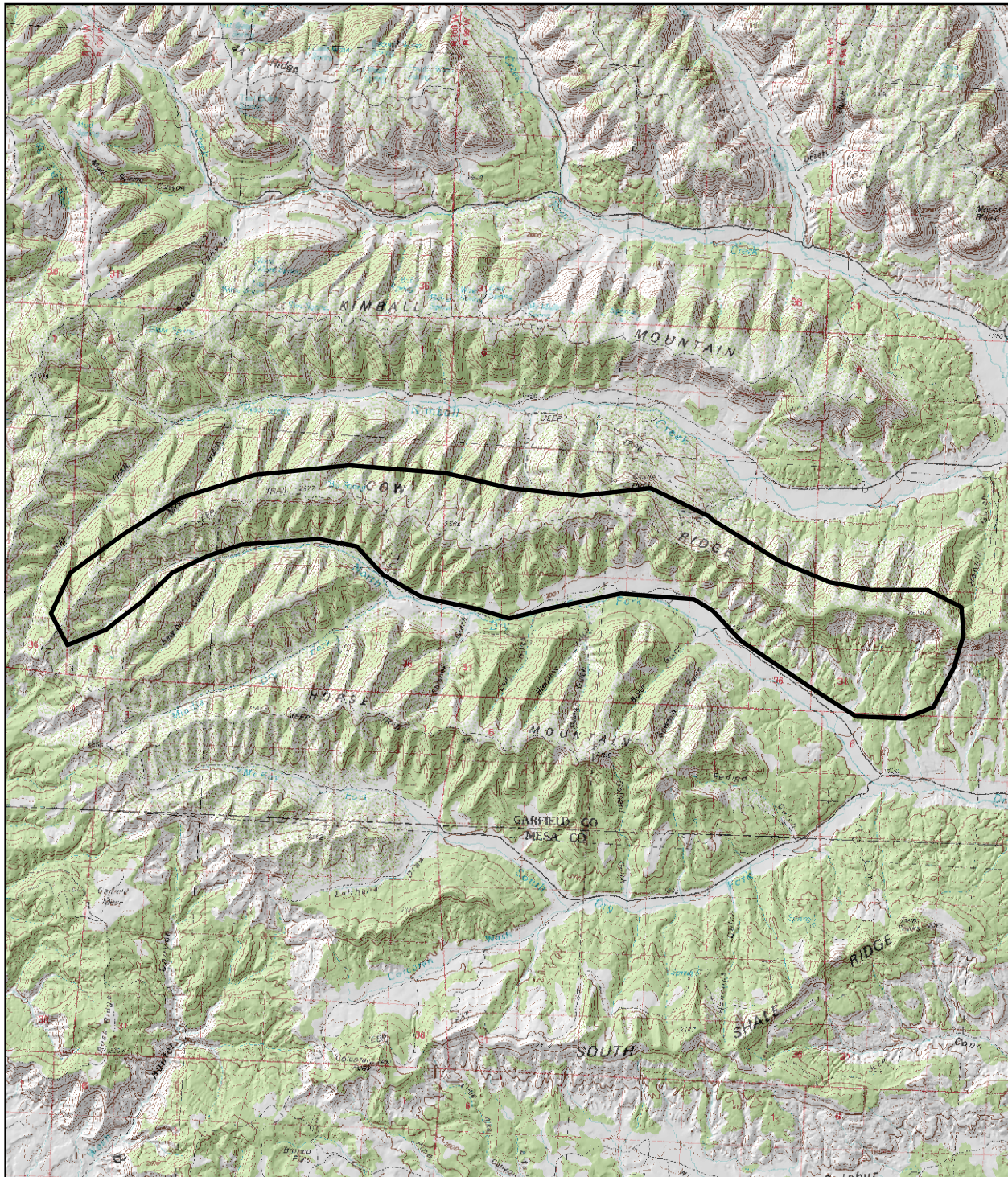
Malone, D. J. Emerick, P. Lyon, and J. Sovell. 2016. CNHP Final Report: Survey of Critical Biological Resources: a resurvey and update of Potential Conservation Areas in Garfield County, Colorado. Colorado Natural Heritage Program, Fort Collins, CO.

Public Employees for Environmental Responsibility (PEER). 2012. BLM Grazing Data Interactive Map. Available online at:

<http://www.peer.org/campaigns/public-lands/public-lands-grazing-reform/blm-grazing-data-interactive-map.html>. Accessed 2016.

Version Author: Malone, D.G.

Version Date: 08/13/2016



 PCA Boundary

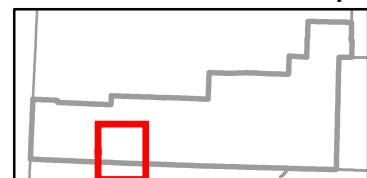
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Map Date: 10/12/2016



30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Grand Junction, 39108-A1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Cow Ridge Potential Conservation Area, B2: Very High Biodiversity Significance

Deep Creek

Biodiversity Rank - B2: Very High Biodiversity Significance

Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years

Management Urgency Rank - M4: Not Needed Now; No Current Threats; May Need in Future

U.S.G.S. 7.5-minute quadrangles: Sweetwater Lake, Deep Lake, Dotsero, Broken Rib Creek, Carbonate

Size: 37,313 acres (15,100 ha)

Elevation: 6,200 - 10,460 ft. (1,890 - 3,188 m)

General Description: Beginning at Deep Lake (10,460 feet) on the White River Plateau, Deep Creek plunges more than 4,500 feet in 15 miles to join the Colorado River near Dotsero (6,200 feet). Approximately 1 mile from Deep Lake, Deep Creek carves a rugged and remote limestone gorge, forming a dramatic pristine canyon over 2,500 feet deep and 13 miles long. The headwaters of Deep Creek are subalpine forests of aspen, spruce - fir, interspersed with meadows and many small lakes. The high elevation riparian areas consist of Drummond's willow (*Salix drummondiana*) and mesic forbs in the wide areas, changing to spruce and mesic forbs as the canyon narrows. As the creek drops closer to its confluence with the Colorado River, the landscape becomes more arid and vegetation turns toward pinon - juniper and sagebrush on the slopes and cottonwood forests in the canyon bottom. The limestone strata have created ideal conditions for the formation of caves. Over forty known caves are within the canyon walls. These include many of the state's most outstanding caves, including Groaning Cave, Colorado's longest at seven miles; Big A, Disappointment Cave, with the largest opening of any in the state; 20 Pound Tick Cave, still being explored and accessible only with scuba gear; and Fixin' to Die Cave, Colorado's second longest at 3 miles (Parris 1973). Deep Creek stands out from neighboring canyons in its ruggedness, remoteness, and pristine condition. Very little human disturbance is within the canyon. Trails are nonexistent and it is only accessible by traversing the creek itself, during low water. Coffee Pot Road, an unpaved forest service road, is atop the plateau and parallels Deep Creek. The road is the major access for Deep, Heart, and Bison lakes in the headwaters of Deep Creek. Recreational use, cattle grazing, and logging are all popular activities on the plateau. All these activities may or may not have an effect on the canyon itself. To our knowledge there is no grazing or logging within the canyon, and very little recreation. Although several nearby drainages, e.g. Grizzly and No Name creeks, have a similar appearance with similar landscape composition, none is as pristine as Deep Creek. The canyon proper has one of the most intact canyon landscapes found in Colorado. Although rare elements can be found in the canyon, Deep Creek is most impressive because of the integrity of the landscape.

Key Environmental Factors: Seasonal flooding

Biodiversity Significance Rank Comments (B2): The Deep Creek site has one of the most intact, pristine canyon landscapes found in Colorado. Although rare elements can be found in the canyon, Deep Creek is most impressive because of the integrity of the landscape. Along with a pristine landscape, several state and globally rare elements are found in Deep

Creek. Most significantly, the site contains a good (B-ranked) occurrence of a globally imperiled (G2/S2) *Sullivantia hapemanii* - (*Aquilegia barnebyi*) plant community and a good (B-ranked) occurrence of a globally imperiled (G2G3/S2) *Pseudotsuga menziesii* / *Paxistima myrsinites* plant community. Many other natural communities and globally rare plants have been identified within the site. It also contains rare bat and rare bird occurrences.

Natural Heritage element occurrences at the Deep Creek PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Birds	Falco peregrinus anatum	American Peregrine Falcon	G4T4	S2B		SC	BLM/US FS	A	1999-07-05
Birds	Haliaeetus leucocephalus	Bald Eagle	G5	S1B,S3 N		ST	BLM/US FS	H	1989-99-99
Fish	Gila robusta	Roundtail Chub	G3	S2		SC	BLM/US FS	H	1981-99-99
Mammals	Corynorhinus townsendii pallescens	Townsend's Big-eared Bat Subsp	G3G4T3T4	S2		SC	BLM/US FS	E	2001-09-20
Mammals	Euderma maculatum	Spotted Bat	G4	S2			BLM/US FS	H	1987-06-99
Natural Communities	Sullivantia hapemanii - (Aquilegia barnebyi) Herbaceous Vegetation	Sullivantia Hanging Gardens	G2	S2				B	1993-07-27
Natural Communities	Sullivantia hapemanii - (Aquilegia barnebyi) Herbaceous Vegetation	Sullivantia Hanging Gardens	G2	S2				E	1995-08-10
Natural Communities	Pseudotsuga menziesii / Paxistima myrsinites Forest	Lower Montane Forests	G2G3	S2				B	1995-07-99
Natural Communities	Picea engelmannii / Cornus sericea Woodland	Montane Riparian Forests	G3	S1					1995-07-99
Natural Communities	Artemisia tridentata ssp. vaseyana / Festuca thurberi Shrubland	Western Slope Sagebrush Shrublands	G3G4	S1S2					1995-07-99
Natural Communities	Festuca idahoensis - Festuca thurberi Herbaceous Vegetation	Montane Grasslands	G3G4	S1				B	1995-07-99
Natural Communities	Picea pungens / Cornus sericea Woodland	Montane Riparian Forest	G4	S2					1995-09-99
Natural Communities	Populus angustifolia / Cornus sericea Woodland	Cottonwood Riparian Forest	G4	S4				B	1993-07-28
Natural Communities	Populus angustifolia / Cornus sericea Woodland	Cottonwood Riparian Forest	G4	S4				B	1993-06-28

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Natural Communities	Pseudotsuga menziesii / Cornus sericea Woodland	Lower Montane Riparian Forests	G4	S2					1995-07-99
Natural Communities	Salix drummondiana / Carex utriculata Shrubland	Montane Willow Carr	G4	S2					1995-07-99
Natural Communities	Salix drummondiana / Mesic Forbs Shrubland	Drummonds Willow / Mesic Forb	G4	S4				BC	1993-07-27
Natural Communities	Salix drummondiana / Mesic Forbs Shrubland	Drummonds Willow / Mesic Forb	G4	S4				B	1993-07-27
Natural Communities	Salix monticola / Mesic Forbs Shrubland	Montane Riparian Willow Carr	G4	S4				B	1995-07-99
Natural Communities	Cornus sericea Shrubland	Foothills Riparian Shrubland	G4Q	S2				A	1993-07-28
Natural Communities	Carex aquatilis Herbaceous Vegetation	Montane Wet Meadows	G5	S5				B	1993-07-28
Natural Communities	Quercus gambelii / Symphoricarpos oreophilus Shrubland	Mixed Mountain Shrublands	G5	S5					1995-09-99
Natural Communities	Phragmites australis Western North America Temperate Ruderal Herbaceous Vegetation	Western Slope Marsh	GNA	S5				C	1993-07-14
Vascular Plants	Nuttallia multicaulis	Many - stem stickleaf	G3	S3				B	1999-08-11
Vascular Plants	Penstemon harringtonii	Harrington beardtongue	G3	S3			BLM/US FS	B	1995-06-10
Vascular Plants	Penstemon harringtonii	Harrington beardtongue	G3	S3			BLM/US FS	B	1993-06-18
Vascular Plants	Penstemon harringtonii	Harrington beardtongue	G3	S3			BLM/US FS	C	1999-06-04
Vascular Plants	Penstemon harringtonii	Harrington beardtongue	G3	S3			BLM/US FS	A	1994-05-31
Vascular Plants	Penstemon harringtonii	Harrington beardtongue	G3	S3			BLM/US FS	A	1999-06-18
Vascular Plants	Penstemon harringtonii	Harrington beardtongue	G3	S3			BLM/US FS	C	1999-06-18
Vascular Plants	Penstemon harringtonii	Harrington beardtongue	G3	S3			BLM/US FS	H	1991-06-20

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Vascular Plants	Sullivantia hapemanii var. purpusii	Hanging Garden sullivantia	G3T3	S3				B	1993-07-27
Vascular Plants	Sullivantia hapemanii var. purpusii	Hanging Garden sullivantia	G3T3	S3					1995-08-10

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: The site boundaries for Deep Creek include the entire watershed of Deep Creek. Although the flat and gentle slope areas are not pristine, they form the necessary buffer to protect the roadless, pristine slopes and valley bottom of Deep Creek. The boundary includes the canyon cliffsides that provide important nesting habitat for Peregrine Falcons. The boundary does not contain the entire feeding area of the pale lump-nosed bat, the extent of which is difficult to define.

Protection Urgency Rank Comments (P3): Most of Deep Creek is federally owned, with the lower part managed by BLM and the upper part by the US Forest Service. The BLM portion is designated an Area of Critical Environmental Concern. The Forest portion has been recommended for designation as a Research Natural Area and for Wild and Scenic River designation. The Wild and Scenic designation is the preferred alternative in the revision to the White River National Forest Plan which is still in progress at this writing.

Management Urgency Rank Comments (M4): Due to its ruggedness, cattle use only the upper and lower stretches of the site. Grazing and logging practices on the plateau should be monitored to assess impacts on the canyon's health. Logging, hunting, grazing, and recreation are the major activities. Nearly all these activities take place on the plateau or gentle slopes. A Forest Service campground is maintained at Deep Lake. Many hunting camps are along Coffee Pot Road and at the small lakes.

Natural Hazard Comments: Steep slopes, cliffs, and caves

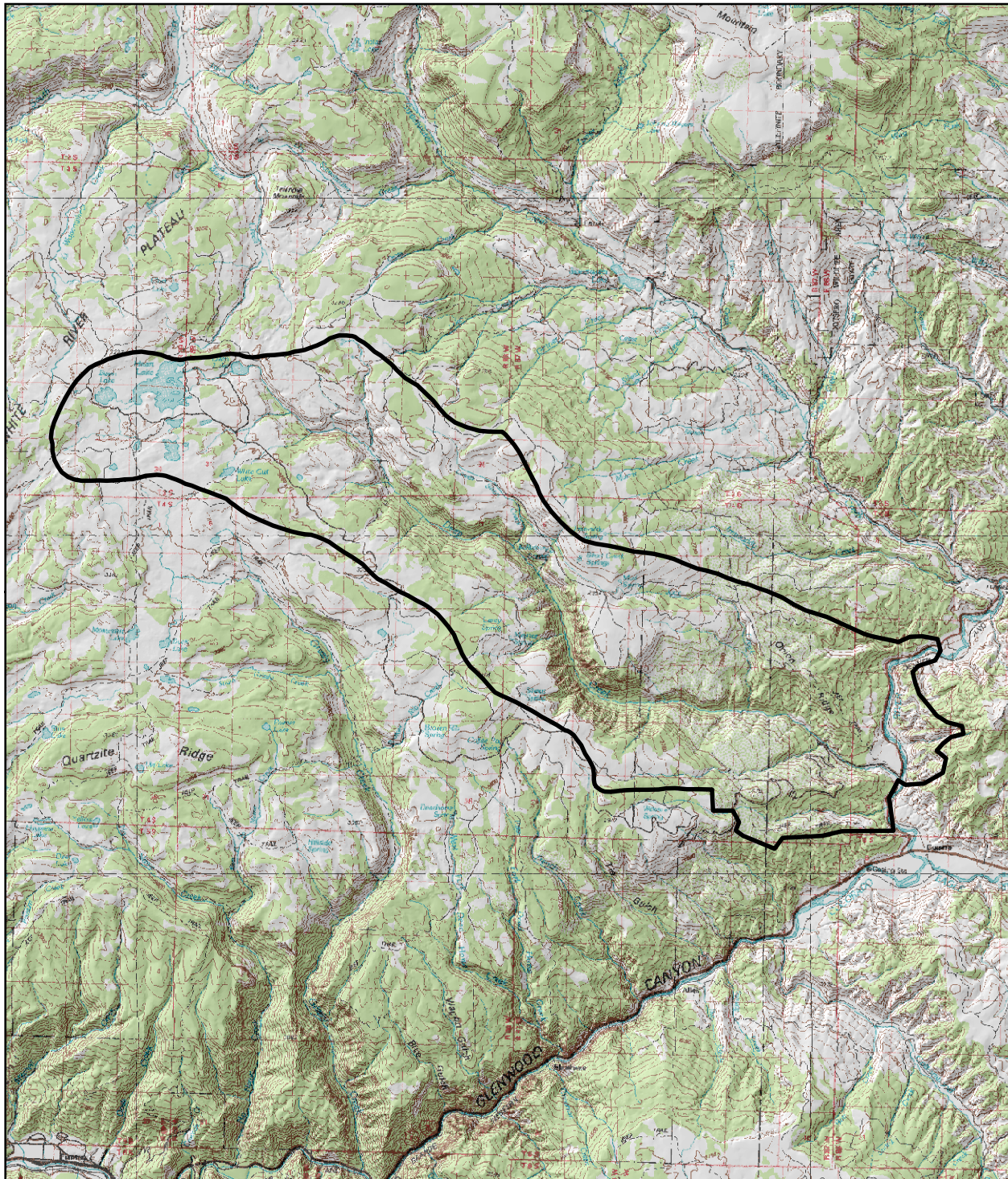
Off-Site Considerations: Hydrological processes origination outside of the planning boundary, including water quality, quantity, and timing, must be managed to maintain population and community viability.

References

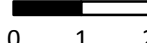
Lyon, P., J. Sovell, and J. Rocchio. 2001. Final Report: Survey of Critical Biological Resources, Garfield County, Colorado. Vol. 1. Colorado Natural Heritage Program, Fort Collins, CO.

Version Author: Lyon, M.J.

Version Date: 12/15/2000



 PCA Boundary

 Miles
0 1 2

Map Date: 10/15/2016



30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Glenwood Springs, 39107-E1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Deep Creek Potential Conservation Area, B2: Very High Biodiversity Significance

East Canyon Creek

Biodiversity Rank - B2: Very High Biodiversity Significance

Protection Urgency Rank - P2: Threat/Opportunity within 5 Years

Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality

U.S.G.S. 7.5-minute quadrangles: Adams Lake, Carbonate

Size: 2,055 acres (832 ha)

Elevation: 10,423 - 10,433 ft. (3,177 - 3,180 m)

General Description: The Flat Tops, are a vast, uplifted, highland plateau. Habitat on top of the plateau is characterized by gently rolling hills with a complex mosaic of sage shrublands, grasslands, islands of spruce - fir forests and aspen woodlands with hundreds of wetlands, open water ponds, lakes and streams. Originating from the lakes and wetlands are several large streams that drain the Plateau, carving deeply down through limestone geology creating steep cliffs and canyons, eventually making their way to the Colorado River. Several of the streams provide the major source of drinking water for cities and towns in this section of the Colorado River watershed.

Key Environmental Factors: Fens only occur where cool, moist conditions persist. Lack of oxygen combined with cold temperatures dramatically slows or inhibits decomposition leading to the accumulation of organic material, or the formation of peat (Mitsch and Gosselink 1993). Thus the maintenance and sustainability of fen wetland ecosystems requires abundant and reliably consistent shallow groundwater flow, cold temperatures and a dense cover of native wetland vegetation.

Climate Description: Climate average from 1951-2006 at this site was as follows: Average temperature from December-February was approximately 20 deg. F and precipitation varied from about 1500 mm-2250 mm; average temperature from March-May was approximately 25 deg. F and precipitation was approximately 1600 mm; average temperature from June-August was approximately 50 deg. F-55 deg. F and precipitation was approximately 800-900 mm; and average temperature from September-November was approximately 35°F and precipitation was approximately 1200 mm-1300 mm (The Nature Conservancy 2016). Changes in climate by the 2050's, using a medium emission scenario and an ensemble average, are predicted to occur in this area of the Flattops as follows: from December – February temperature increase of 2.5 deg. F and precipitation increase of 20%; from March-May temperature increase of 4.5 deg. F and precipitation decrease of 6%-7%; from June-August temperature increase of 5.4 deg. F and precipitation decrease of 4.5%; and from September – November temperature increase of 4.7 deg. F and precipitation increase of 1.7% (The Nature Conservancy 2016).

Land Use History: Historically, clearcut logging was intensive on the Flattops. Recovery is still underway.

Biodiversity Significance Rank Comments (B2): This fen supports a good (B-rank) occurrence of the globally imperiled (G2/S1S2) mud sedge (*Carex limosa*) herbaceous

vegetation community. The “C” value (coefficient of conservatism which represents the estimated probability that a species occurs in a landscape that is either pristine or disturbed) for *Carex limosa* is “9”. C-values of 7 or higher are assigned to species that are obligate to high-quality natural areas and sensitive to sudden alterations to natural ecological processes and disturbances (Culver and Lemly 2013). This *Carex limosa* fen occupies a three-sided southwest-trending basin that is sustained by abundant shallow groundwater flow from southwest- and northwest-facing slopes. This fen is distinguished by north-south trending narrow, low ridges, similar in appearance to solifluction terraces and which have likely developed in response to abundant shallow groundwater flow.

Natural Heritage element occurrences at the East Canyon Creek PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Natural Communities	<i>Carex limosa</i> Herbaceous Vegetation	Montane Wetland	G2	S1S2				B	2015-08-29

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: Fens provide important ecosystem services, especially water storage and carbon sequestration. This fen also provides habitat and resources for amphibians, waterfowl, large ungulates, songbirds, shorebirds and upland game birds. Vegetation on the tops of the ridges are dominated by a community association of tall cottongrass (*Eriophorum angustifolium* - C9), water sedge (*Carex aquatilis* - C6), Northwest territory sedge (*C. utriculata* - C5), elephanthead (*Pedicularis groenlandica* - C8) and felwort (*Swertia perennis* - C8). Low intervening furrows are characterized by a monoculture of mud sedge (*Carex limosa* - C9). Deep pools have developed in the karst geology and are scattered throughout the fen with vegetation here dominated by Northwest territory sedge on the margins and buckbean (*Menyanthes trifoliata* - C9) occupying pond interiors.

Boundary Justification: Boundaries are drawn to include the ecological processes, especially the hydrologic processes essential to the maintenance of the fen and includes several nearby potential fen sites.

Protection Urgency Rank Comments (P2): This area is designated by the USFS as Gap Status: 3 - managed for multiple uses - subject to extractive (e.g. mining or logging) or OHV use. Designation type: Habitat or Species Management Area. Livestock (sheep) grazing is ubiquitous and has altered vegetation composition and cover. Consequences include hydrologic alteration and diminished resiliency to environmental perturbations especially those impacts associated with a warming and drying climate in the southwest.

Management Urgency Rank Comments (M3): Conserving the natural hydrology that controls these ancient wetlands is essential to the maintenance of both the fen plant community and the fen itself. Because fens are fed by shallow groundwater flow from surrounding uplands, protecting upland vegetation and soils is important to the sustainability of these fens. Reducing livestock grazing intensity and duration would benefit upland vegetation and thus fen sustainability by promoting soil restoration and drought

resiliency by enhancing precipitation infiltration and storage. Other anthropogenic development activities that impact these fens, such as water development and roads that alter groundwater flow to the fen, have a high potential of altering these fens and their natural communities. Maintaining and routing roads to have minimal impact on groundwater flow would benefit the long-term sustainability of these fens.

Exotic Species Comments: Non-native species are rare and typically only encountered along roadways.

References

Culver, D. R. and J. M. Lemly. 2013a. Field Guide to Colorado's Wetland Plants. Colorado Natural Heritage Program. Colorado State University. 694 pp.

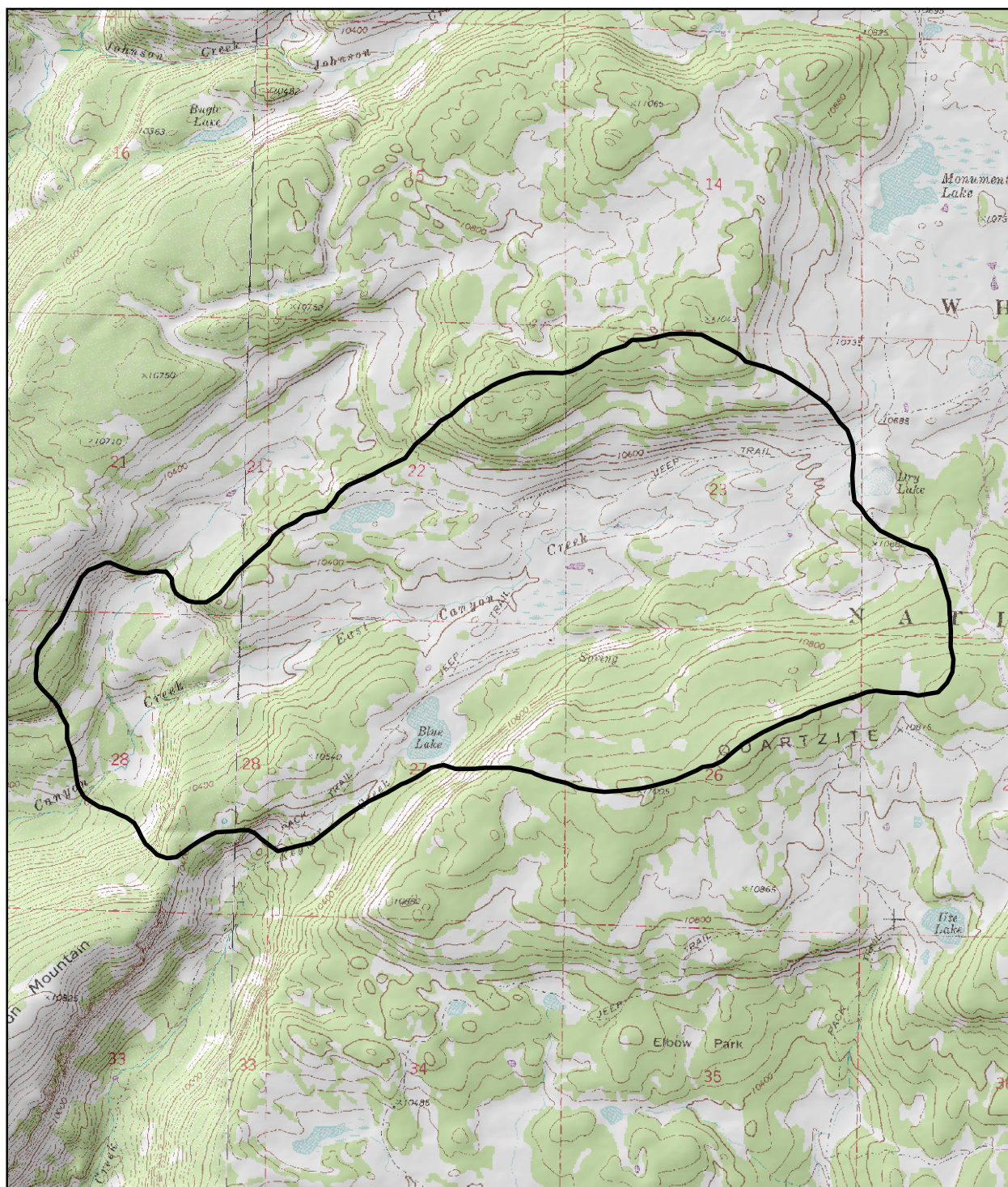
Malone, D. J. Emerick, P. Lyon, and J. Sovell. 2016. CNHP Final Report: Survey of Critical Biological Resources: a resurvey and update of Potential Conservation Areas in Garfield County, Colorado. Colorado Natural Heritage Program, Fort Collins, CO.

Mitsch, W.J. and J.G. Gosselink. 1993. Wetlands, Third edition. John Wiley and Sons, Inc. pub. 920 pp.

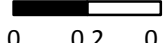
The Nature Conservancy. 2016. ClimateWizard. Available online at <http://www.climatewizard.org/>.

Version Author: Malone, D.G.

Version Date: 08/20/2016



 PCA Boundary

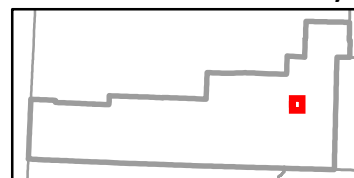
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Map Date: 10/11/2016



7.5 Minute Digital Raster Graphics
by the U.S. Geological Survey
Carbonate, 39107-F3
Adams Lake, 39107-F4

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

East Canyon Creek Potential Conservation Area, B2: Very High Biodiversity Significance

East Elk Creek

Biodiversity Rank - B2: Very High Biodiversity Significance

Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years

Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality

U.S.G.S. 7.5-minute quadrangles: Adams Lake, Deep Creek Point

Size: 10,966 acres (4,438 ha)

Elevation: 6,400 - 9,600 ft. (1,951 - 2,926 m)

General Description: East Elk Creek forms a steep narrow canyon through the Leadville limestone formation. Limestone outcrops are prevalent throughout the area and the canyon is aesthetically similar to Glenwood Canyon. Upland slopes are sparsely vegetated due to the steep limestone outcrops but Gambel's oak (*Quercus gambelii*), Utah serviceberry (*Amelanchier utahensis*), juniper (*Juniperus osteosperma*), aspen (*Populus tremuloides*), and Douglas-fir (*Pseudotsuga menziesii*) were growing in scattered locations. The riparian area is dominated by a mature overstory of narrowleaf cottonwood (*Populus angustifolia*) and river birch (*Betula occidentalis*) along with scattered blue spruce (*Picea pungens*) and a lush and rich understory of herbaceous species. Regeneration of narrowleaf cottonwood appears to be occurring on sporadic point bars. Downstream, the riparian community grades into a community dominated by blue spruce and narrowleaf cottonwood with hay meadows and pastures occupying the floodplain. Flooding still occurs along the creek and hydrological processes have not been altered. Grazing does not occur within this site, however, downstream there is grazing within the floodplain. There is an abandoned mine (Gray Eagle Mine) upstream, but no impacts to the stream were observed. Numerous seeps and springs occur along the adjacent hillsides and occasionally within the floodplain. These springs discharge from the Leadville Limestone, which has been shown to be a major local aquifer (Teller 1983). This aquifer is recharged via precipitation, snowmelt, and stream-flow and has a general subsurface flow toward the south, west, and northwest away from the White River Uplift (Teller 1983). These springs are very important in maintaining the hydrological regime of this site. The water from these springs has a fairly high pH (~8.1) near the source due to a high calcium carbonate content. Floodplain springs support stands of river birch with a diverse understory of forbs and graminoids such as interior sedge (*Carex interior*), beaked sedge (*C. utriculata*), field horsetail (*Equisetum arvense*), scouring rush (*Hippochaete hyemalis*), and wild mint (*Mentha arvense*). Springbrooks (the drainage immediately downstream from spring sources) are dominated by American speedwell (*Veronica americana*), watercress (*Naturtium officinale*), beaked sedge, and the canyon bog orchid (*Limnorchis ensifolia*), which is also found along the streambanks of East Elk Creek throughout the site. Oil shale columbine (*Aquilegia barneybi*) is the dominant plant near many spring sources. One particular spring is quite unique in that precipitate of calcium carbonate has formed a steep, terraced, seep wetland that is completely dominated by oil shale columbine and various moss species. The terrace formed as a result of groundwater, rich in carbon dioxide, discharging to the surface. This results in the release of large quantities of carbon dioxide creating a disequilibrium between carbon dioxide, carbonate ions, and carbonic acid in the groundwater (Wetzel 1983). As a result of this disequilibrium, calcium bicarbonate precipitates from the groundwater and encrusts the substrate near the

spring source. Following many years, the precipitate has formed a large solid wall of calcium carbonate. Along this terrace wall there are small pools which harbor numerous insects. Northern leopard frogs (*Lithobates pipiens*) were also observed using these pools and were seen throughout the site. Overall, this site is in excellent condition. Although this site is not as pristine as Deep Creek, compared to most other creeks of a similar elevation, East Elk Creek supports a relatively intact riparian area. The soils along the creek are mapped as Torrifluvents. These soils formed in alluvium and are highly stratified and vary widely in texture and depth (Soil Conservation Service 1985). Soils were fairly coarse near East Elk Creek. Soils near the springs and along the spring brooks were saturated and accumulating organic matter (they had a dark and fairly deep A horizon forming over a C horizon of alluvium). A functional assessment was also conducted for this site, please see report (Survey of Critical Wetlands and Riparian Areas of Garfield County, Rocchio, J. 2000).

Biodiversity Significance Rank Comments (B2): The upper reaches of East Elk Creek support an excellent (A-ranked) occurrence of the globally imperiled (G2/S2) *Sullivantia hapemanii* var. *purpusii*-*Aquilegia barnebyi* hanging garden association. This community occupies a north-facing cliff wall above East Elk Creek and below a steep gully where abundant surface water discharge supports this lush hanging garden. The site also supports an excellent (A-ranked) occurrence of the globally vulnerable (G3/S2) river birch / mesic graminoid (*Betula occidentalis* / mesic graminoid) lower montane riparian shrubland and a good (B-ranked) occurrence of the globally vulnerable (G3/S3) narrowleaf cottonwood / river birch (*Populus angustifolia* / *Betula occidentalis*) montane riparian forest. The river birch / mixed graminoid community is well documented in several western states, however, improper livestock grazing, stream-flow alterations, and heavy recreational use threaten it. This stand was in excellent condition as there is no grazing in this area. The narrowleaf cottonwood / river birch community is known from fewer than a dozen locations in Colorado and is expected to occur in Nevada, Wyoming, and South Dakota. This stand has an unusually high diversity of shrubs and herbaceous species in the understory compared to most occurrences.

Natural Heritage element occurrences at the East Elk Creek PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Natural Communities	<i>Sullivantia hapemanii</i> - (<i>Aquilegia barnebyi</i>) Herbaceous Vegetation	<i>Sullivantia</i> Hanging Gardens	G2	S2				A	2015-07-22
Natural Communities	<i>Betula occidentalis</i> / Mesic Graminoids Shrubland	Lower Montane Riparian Shrublands	G3	S2				A	2000-07-28
Natural Communities	<i>Populus angustifolia</i> / <i>Betula occidentalis</i> Woodland	Montane Riparian Forest	G3	S3				B	2015-07-22

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: A caddisfly, whose range is unknown at this time, has been documented along East Elk Creek, and is considered a conservation priority for invertebrates by Boris Konradieff, a Professor of Entomology and Curator of the C.P. Gillette Museum of Arthropod Diversity, at Colorado State University. East Elk Creek is one of the most pristine riparian areas in Garfield County at this elevation (approximately 6,500 feet).

Boundary Justification: The boundaries were drawn to ensure that all of the springs and small side drainages were protected to ensure continued surface flow, periodic flooding, and space for the creek's fluvial processes to continually maintain existing riparian communities while also creating additional habitat via flood scouring, lateral flow, and channel meandering.

Protection Urgency Rank Comments (P3): This site mainly occurs on U.S. Forest Service land managed for multiple use and does not seem to receive much use other than occasional fishing and hiking. The Forest Service does not allow camping along the first 3 miles of the creek. Although extractive, motorized or grazing uses are most unlikely to occur in the East Elk Creek canyon, the headwaters of East Elk Creek which are located in the White River Plateau receive heavy anthropogenic use which impacts downstream hydrologic functions.

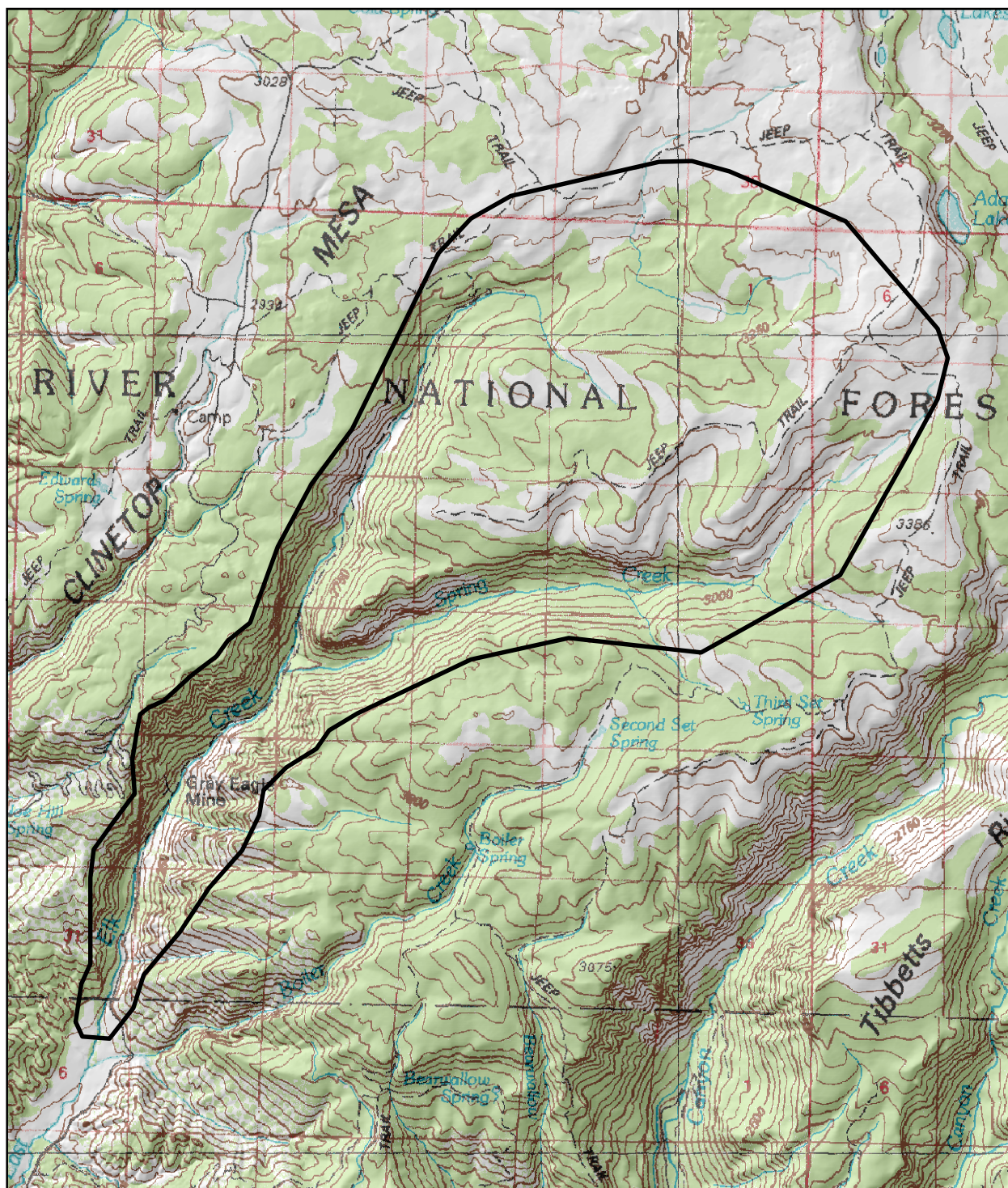
Management Urgency Rank Comments (M3): The area does receive some recreational use, mainly fishing. This activity does not appear to be affecting the elements but use should be monitored. Although development of the springs in the area does not seem likely, such activity would have a major detrimental effect on the ecological integrity of the riparian area. This site is in excellent condition, thus opportunities for restoration activities are minimal. There may be an opportunity to restore the area near Gray Eagle Mine, however CNHP did not visit this portion of the site, consequently specifics regarding potential restoration opportunities in this location cannot be given. The hydrologic regime is generally intact as is the surrounding upland landscape which provides the template for sustainable stream processes. However, direct impacts to the riparian zone from a recreational trail and dirt road diminish stream sustainability and function.

References

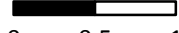
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- Teller, R.W. 1983. Ground-Water Potential of the Leadville Limestone on the White River Uplift in Garfield and Rio Blanco Counties, Colorado. Water-Resources Investigations Report 83-4036, U.S. Geological Survey, Lakewood, CO.

Version Author: Malone, D.G.

Version Date: 08/16/2016



 PCA Boundary

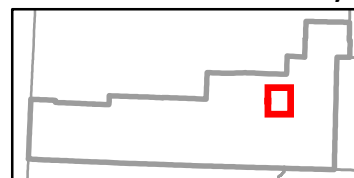
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Map Date: 10/12/2016



30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Glenwood Springs, 39107-E1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

East Elk Creek Potential Conservation Area, B2: Very High Biodiversity Significance

East Fork Parachute Creek

Biodiversity Rank - B2: Very High Biodiversity Significance

Protection Urgency Rank - P1: Immediately Threatened/Outstanding Opportunity

Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss

U.S.G.S. 7.5-minute quadrangles: Forked Gulch, Anvil Points

Size: 7,678 acres (3,107 ha)

Elevation: 6,700 - 9,000 ft. (2,042 - 2,743 m)

General Description: East Fork Parachute Creek originates near the eastern rim of the Roan Cliffs. It bisects the NOSR-1 property as it flows southwest/west before plunging 200 feet in spectacular waterfall fashion into a narrow box canyon that leads off DOE property to the northwest. The shale soils comprising the bed of this drainage contribute to steep slopes on either side of this mostly direct-flowing stream. The shale is highly erosive and steep walls with seeping water are home to Hanging garden sullivantia. Along the stream bed, willow communities persist in some small patches, but most of the drainage has been heavily impacted by grazing over a long period of time. This has resulted in degraded *Carex* and willow communities with high proportions of exotic species. The stream is also home to a Colorado endemic species of cutthroat trout.

Key Environmental Factors: A key factor affecting this site is the oil-shale soils.

Land Use History: The Roan Plateau in general has a long history of 100 years or more of heavy use by livestock. Since the area is fairly arid in general, the major drainages on the property have been the most impacted by this livestock use.

Biodiversity Significance Rank Comments (B2): Most significantly, this site contains excellent (A-ranked) and good (B-ranked) occurrences of plant communities (*Acer negundo* - *Populus angustifolia* / *Cornus sericea* and *Populus tremuloides* / *Acer glabrum* riparian forests) which are imperiled on a global scale (G2/S2) and an excellent (A-ranked) occurrence of the globally imperiled (G2/S2) Roan Cliffs blazing star (*Nuttallia rhizomata*). It also contains several excellent and good occurrences of plant species and plant communities which are globally vulnerable, including hanging garden sullivantia (*Sullivantia hapemanii* var. *purpusii*), and a fair (C-ranked) occurrence of a globally vulnerable (G4T3/S3) fish subspecies, Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*). Surveys conducted in 2015 resulted in the down-ranking of the Hanging garden sullivantia from excellent (A-rank) to good (B-rank). Although the 2015 surveys expanded both the known distribution and number of subpopulations of hanging garden sullivantia, they also documented the livestock-induced degradation of the surrounding landscape. Impacts include alteration to the hydrologic regime as evidenced by drying of stream side-channels and degradation to riparian vegetation along these side channels. Drying and disturbed riparian and uplands soils have often been invaded by non-native species which now dominate many riparian sites along this stream reach. Hanging garden sullivantia depends upon abundant and consistent surface water flows which are being diminished by current inappropriate land use.

Natural Heritage element occurrences at the East Fork Parachute Creek PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Birds	<i>Aegolius funereus</i>	Boreal Owl	G5	S2			USFS	B	1996-09-10
Fish	<i>Oncorhynchus clarkii pleuriticus</i>	Colorado River Cutthroat Trout	G4T3	S3		SC	BLM/US FS	C	1997-99-99
Natural Communities	<i>Populus tremuloides</i> / <i>Acer glabrum</i> Forest	Montane Riparian Forests	G1G2	S2				B	1993-06-16
Natural Communities	<i>Acer negundo</i> - <i>Populus angustifolia</i> / <i>Cornus sericea</i> Forest	Narrowleaf Cottonwood Riparian Forests	G2	S2				A	1996-06-25
Natural Communities	<i>Acer negundo</i> - <i>Populus angustifolia</i> / <i>Cornus sericea</i> Forest	Narrowleaf Cottonwood Riparian Forests	G2	S2				A	1993-06-23
Natural Communities	<i>Leymus cinereus</i> Herbaceous Vegetation	Western Slope Grasslands	G2G3Q	S1				B	1995-09-19
Natural Communities	<i>Cardamine cordifolia</i> - <i>Mertensia ciliata</i> Herbaceous Vegetation	Alpine Wetlands	G4	S4				A	1993-07-23
Natural Communities	<i>Picea pungens</i> / <i>Cornus sericea</i> Woodland	Montane Riparian Forest	G4	S2				B	1996-06-26
Natural Communities	<i>Populus angustifolia</i> / <i>Cornus sericea</i> Woodland	Cottonwood Riparian Forest	G4	S4				A	1993-07-23
Natural Communities	<i>Populus tremuloides</i> / <i>Pteridium aquilinum</i> Forest	Aspen Wetland Forests	G4	S4				C	1996-07-27
Natural Communities	<i>Salix drummondiana</i> / Mesic Forbs Shrubland	Drummonds Willow / Mesic Forb	G4	S4				BC	1996-06-26
Natural Communities	<i>Salix monticola</i> / Mesic Forbs Shrubland	Montane Riparian Willow Carr	G4	S4				B	2015-06-26
Natural Communities	<i>Abies lasiocarpa</i> / <i>Salix drummondiana</i> Forest	Montane Riparian Forest	G5	S4				B	1996-06-26
Natural Communities	<i>Populus tremuloides</i> / Tall Forbs Forest	Montane Aspen Forest	G5	S5				C	1993-06-14
Natural Communities	<i>Populus tremuloides</i> / Tall Forbs Forest	Montane Aspen Forest	G5	S5				C	1993-06-15
Vascular Plants	<i>Nuttallia rhizomata</i>	Roan Cliffs blazing star	G2	S2			BLM	A	1995-09-22

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Vascular Plants	Argillochloa dasyclada	False ricegrass	G3	S3				A	1996-07-27
Vascular Plants	Argillochloa dasyclada	False ricegrass	G3	S3				C	1996-06-20
Vascular Plants	Iliamna grandiflora	large - flower globe - mallow	G3?Q	S1S2				C	1996-07-29
Vascular Plants	Sullivantia hapemanii var. purpusii	Hanging Garden sullivantia	G3T3	S3				A	1996-06-23
Vascular Plants	Sullivantia hapemanii var. purpusii	Hanging Garden sullivantia	G3T3	S3				B	2015-07-20

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: The scenic falls aside, this drainage not only provides one of the most important sources of water for livestock, it provides an important source for wildlife as well. Surveys conducted in 2015 documented the presence of Olive-sided Flycatcher (*Contopus cooperi*) and Brewer's Sparrow (*Spizella breweri*) which are both USFS sensitive species. These riparian willow shrublands and aspen woodlands provide high quality nesting and foraging habitat for numerous raptor, woodpecker and neotropical migrant songbirds including Lincoln's Sparrow, Cordilleran Flycatcher, Red-naped Sapsucker, Swainson's Hawk, and Dusky Grouse.

Boundary Justification: Two primary ecological processes were considered when designing the site boundary: 1) surface water and 2) ground water. Both are critical to the fish and hanging gardens that this site captures. The native cutthroat trout rely on good quality and quantity of surface water. The site boundary captures much of the East Fork Parachute Creek watershed that is so important to maintaining a viable population of fish. The hanging gardens rely on both surface and ground water and therefore this boundary captures a large portion of both.

Protection Urgency Rank Comments (P1): The land was previously (1996) owned by DOE, but they transferred it to the BLM.

Management Urgency Rank Comments (M2): The entire site should be managed for maintaining quantity and quality of the water that is so important for sustaining the elements of biodiversity. Roads, drill pads and other activities can easily alter the water quality and should be kept to a minimum and confined to ridge tops that are flat and less susceptible to high erosion rates. Extraneous spur roads, especially on steep slopes should be closed to prevent further erosion. Excessive livestock grazing has altered the hydrologic regime. Inappropriate livestock grazing has removed riparian vegetation resulting in banks failing and sloughing into the stream. In these sites soils are drying and weeds are invading. Riparian areas are restorable by modifying the grazing regime and excluding cattle from riparian and stream habitat. In addition to managing the surface area, it is also necessary to manage the stream and its fauna. The large population of introduced brook trout competes

with the native Colorado River cutthroat trout. The riparian community also suffers from invasion of non-native plants. We recommend that a management plan be developed that addresses all of these threats. In a positive turn of events, beavers (*Castor canadensis*) have re-colonized the valley. Their dam-building activity has had the effect of storing water which is contributing immensely to restoration of stream and riparian habitat and maintaining streamflows for fish. Protecting and encouraging beaver and their activity will enable stream and habitat sustainability as well as improve water quality and quantity.

Land Use Comments: The current land use patterns allow for overuse of this site by livestock. Future stewards should restrict this use by whatever means available, and will have some restoration work to do. Other uses of this site that merit consideration include fishing. Anglers should be encouraged to return cutthroat trout to the stream and keep only brook trout. There currently exists one information sign encouraging this practice, but no patrol and/or enforcement of this practice exists.

Natural Hazard Comments: Those visiting this site should pay careful attention to topographical maps, as there exist areas where entry to the creek is difficult at best, impossible at worst due to sharp cliffs that line the drainage. The JQS trail should not be travelled during a rainstorm, or very soon thereafter, since the clay substrate makes this exposed road extremely slippery and dangerous.

Exotic Species Comments: Exotic brook trout have been introduced to this stream system. Cattle, sheep, other ungulates, and people have introduced a number of exotic plant species, including houndstongue, to the small floodplain of this drainage.

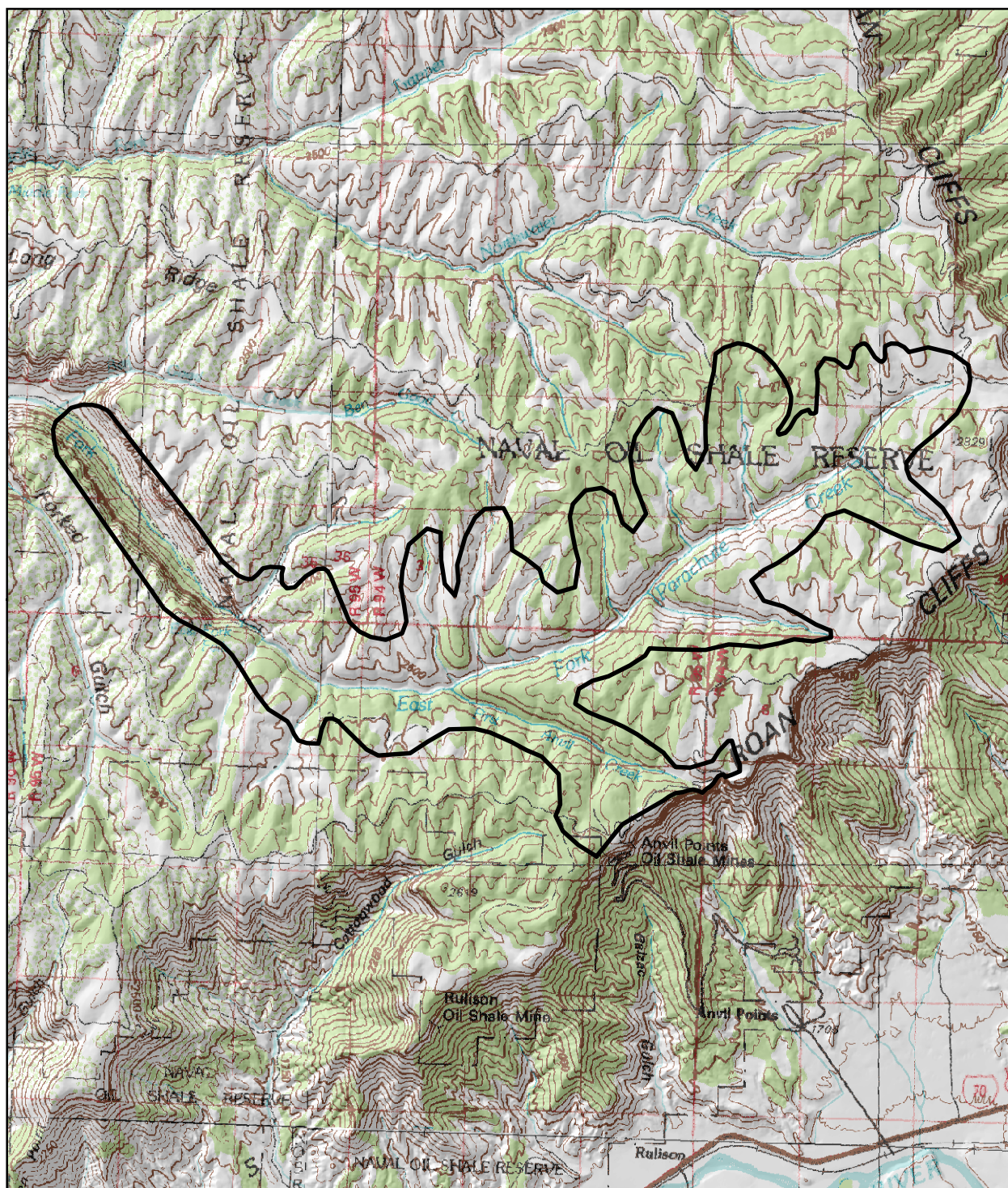
References

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Version Author: Malone, D.G.

Version Date: 08/13/2016



 PCA Boundary

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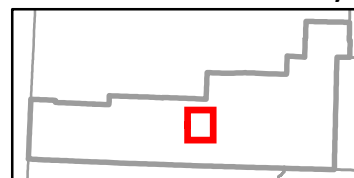
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Map Date: 10/12/2016



30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Douglas Pass, 39108-E1
Glenwood Springs, 39107-E1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

East Fork Parachute Creek Potential Conservation Area, B2: Very High Biodiversity Significance

Grizzly Creek Canyon

Biodiversity Rank - B2: Very High Biodiversity Significance

Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years

Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality

U.S.G.S. 7.5-minute quadrangles: Glenwood Springs, Broken Rib Creek, Shoshone, Carbonate

Size: 16,357 acres (6,619 ha)

Elevation: 6,100 - 10,800 ft. (1,859 - 3,292 m)

General Description: Grizzly Creek drains the White River Plateau, an expansive uplifted highland with gently rolling terrain, vast open grasslands and sage shrublands interspersed with patches of spruce - fir forest. Grizzly Creek carves a deep, steep canyon down through limestone geology before meeting the Colorado River 1,500 feet below. Topographically the White River Plateau is characterized by rolling hills and swales dissected by deep canyons. Habitat on the plateau is a mosaic of uplands and abundant wetlands. Upland habitats include spruce - fir forests, sage shrublands and grasslands. Wetland types include riverine (riparian) lacustrine, slope and depressional wetlands with fens often occurring in all wetland types except in riparian wetlands. Fen habitats are an irreplaceable, ancient class of wetland that depends on a sufficient water supply and quantity to maintain the vegetation which reciprocally maintains the water resource. Alteration of either results in the loss of this wetland type. The Grizzly Creek Canyon is characterized by limestone towers that rise above steep, vegetated slopes with a mosaic of Douglas-fir (*Pseudotsuga menziesii*) forests, and oak (*Quercus gambelii*) and sticky laurel (*Ceanothus velutinus*) shrublands. Riparian habitat is a narrow, linear mosaic band of subalpine to montane riparian woodlands and shrublands.

Biodiversity Significance Rank Comments (B2): Plateau habitat supports several wetland communities including at least one B-ranked occurrence of the globally imperiled (G2/S1S2) *Carex limosa* herbaceous vegetation community, and at least one C-ranked occurrence of the State critically imperiled (GUQ/S1) *Carex illota* herbaceous vegetation community. The wetland type that supports these communities are fens, an ancient wetland type that is considered a Resource Category 1 within the U.S. Fish and Wildlife Service Mitigation Policy and due to their irreplaceability the U.S. forest Service Rocky Mountain Region issued a statement to avoid impacts to fens on National Forest Lands. Good (B-ranked) occurrences of the State imperiled (G5/S2) *Carex limosa*, and the State critically imperiled (G5/S1) *Carex diandra* were documented. There is also an occurrence of the state rare (G5/S3) northern leopard frog (*Lithobates pipiens*). Narrow, riparian canyon habitat also supports several additional communities including a good (B-ranked) occurrence of the globally imperiled (G2/S2) box elder - narrowleaf cottonwood / red-osier dogwood woodlands (*Acer negundo* - *Populus angustifolia* / *Cornus sericea*) woodlands. Steep, west-facing upland slopes support a good (B-ranked) occurrence of the globally imperiled (G2G3/S2) Douglas-fir / mountain lover (*Pseudotsuga menziesii* / *Paxistima myrsinites*) forest.

Natural Heritage element occurrences at the Grizzly Creek Canyon PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Amphibians	Lithobates pipiens	Northern Leopard Frog	G5	S3		SC	BLM/US FS	E	2015-08-22
Natural Communities	Acer negundo - Populus angustifolia / Cornus sericea Forest	Narrowleaf Cottonwood Riparian Forests	G2	S2				B	2015-07-17
Natural Communities	Carex limosa Herbaceous Vegetation	Montane Wetland	G2	S1S2				B	2015-08-29
Natural Communities	Pseudotsuga menziesii / Paxistima myrsinites Forest	Lower Montane Forests	G2G3	S2				B	2015-07-17
Natural Communities	Festuca idahoensis - Festuca thurberi Herbaceous Vegetation	Montane Grasslands	G3G4	S1					1995-07-09
Natural Communities	Salix drummondiana / Carex utriculata Shrubland	Montane Willow Carr	G4	S2					1995-07-99
Natural Communities	Salix monticola / Mesic Forbs Shrubland	Montane Riparian Willow Carr	G4	S4					1995-07-99
Natural Communities	Salix monticola / Mesic Forbs Shrubland	Montane Riparian Willow Carr	G4	S4				B	1993-07-27
Natural Communities	Quercus gambelii / Paxistima myrsinites Shrubland	Mixed Mountain Shrublands	GU	S1					1995-06-99
Natural Communities	Carex illota Herbaceous Vegetation	Alpine Wetlands	GUQ	S1				C	2015-08-28
Vascular Plants	Carex diandra	lesser panicled sedge	G5	S1			USFS	B	2015-08-21
Vascular Plants	Carex limosa	mud sedge	G5	S2				B	2015-08-21

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: Boundary includes occurrences and adjacent habitat. Site boundaries need verification, habitat may extend further than current boundary. Buffer extends further upslope from the edge of the occurrences to approximately 100 meters.

Protection Urgency Rank Comments (P3): The site is currently managed by the White River National Forest and does not have any special protection status. The area has been designated by the USFS a Recreation Management Area to be managed for multiple uses including extractive (e.g. mining or logging) and motorized OHV use, and it currently receives multiple use from logging, grazing, and recreation users. The plateau is intensively grazed by domestic livestock.

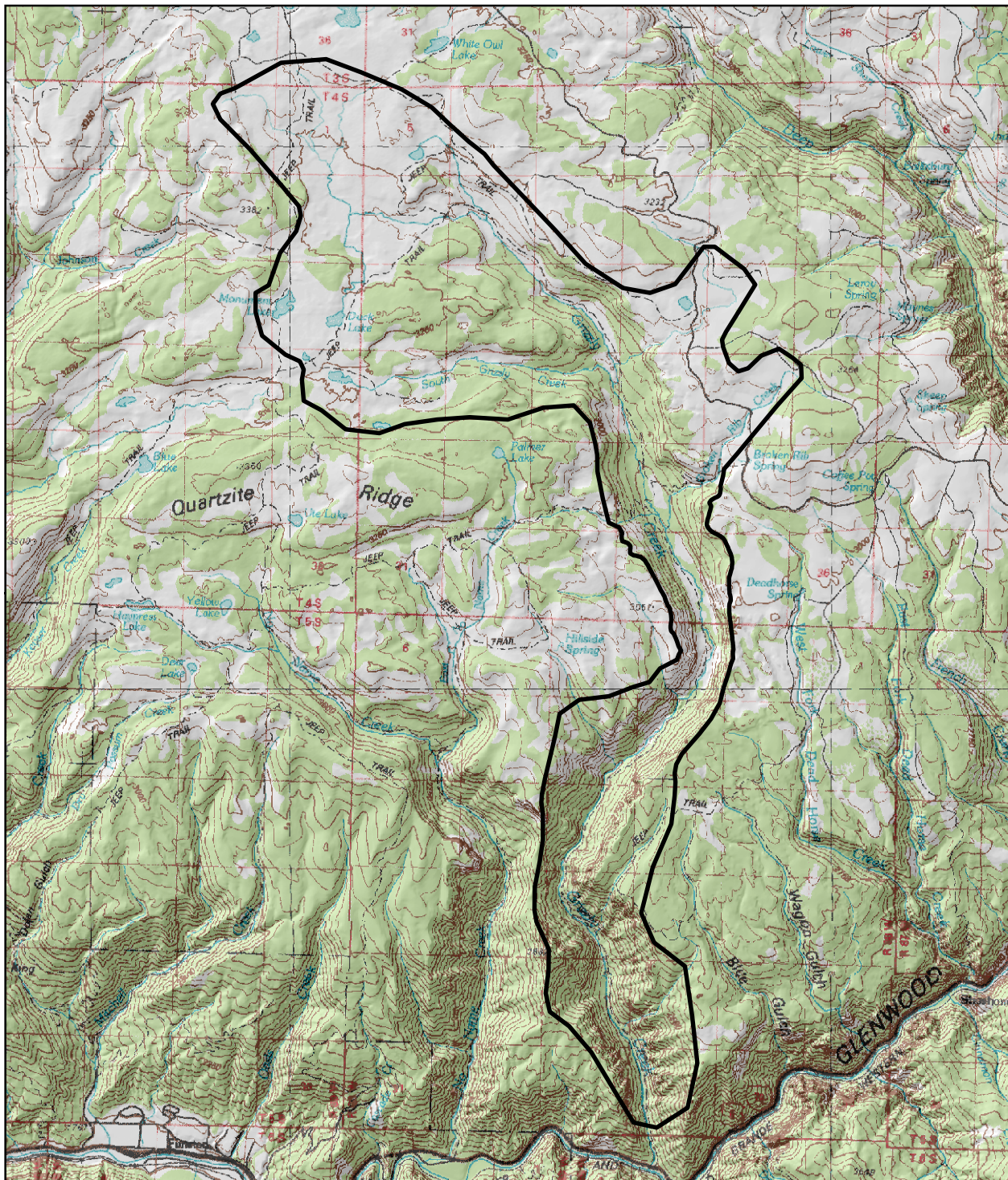
Management Urgency Rank Comments (M3): Numerous dams and diversions are present across this landscape which together with livestock and motorized recreational uses alters the natural hydrologic regime. Throughout this region livestock grazing has impacted upland vegetation, soils and consequently the hydrologic regime that contributes to the maintenance of wetlands on the plateau. Additionally a web of roads alters shallow groundwater flow to many and fens and a culverts often drain these special category wetland fens. Impacts that result from livestock grazing on the plateau include vegetation alteration, modification of the natural hydrologic regime and soil degradation. Reducing livestock grazing intensity and adjusting the grazing regime to consider the life cycle needs of native plants and animals would improve vegetation condition, help restore a natural hydrologic regime and contribute to the maintenance of viable native animal populations. For instance, northern leopard frogs require a mosaic of habitats to meet the requirements of all of their life stages including summer habitat (feeding by adults in upland areas), tadpole habitat (up to three months spent as tadpoles in shallow breeding ponds) and winter habitat (overwintering in lakes, streams, and ponds). Their complicated movement patterns during the year must also be considered and include habitat used for reproduction, summer feeding ranges, fall migrations, and overwintering. In canyon habitat, a recreational trail that often is located on streambanks together with hydrologic alteration that results from an aqueduct that transfers streamflows from Grizzly Creek to No Name Creek, are modifying vegetation communities and altering the processes that maintain riparian vegetation. Restoration of a natural hydrologic regime would help restore and maintain the cottonwood gallery forest by enabling cottonwood recruitment. Non-native weedy species are invading along the recreational trail that parallels the stream and in numerous areas, social trails that access the stream have resulted in vegetation trampling and more weed invasion. Weed management is essential to prevent further spread of invasive weeds and consequent deterioration of the occurrence.

References

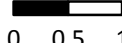
- Lyon, P. 2000. Colorado Natural Heritage Program Biological Assessment of Garfield County.
- Malone, D. J. Emerick, P. Lyon, and J. Sovell. 2016. CNHP Final Report: Survey of Critical Biological Resources: a resurvey and update of Potential Conservation Areas in Garfield County, Colorado. Colorado Natural Heritage Program, Fort Collins, CO.
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Version Author: Malone, D.G.

Version Date: 04/07/2016



 PCA Boundary

 Miles
0 0.5 1

Map Date: 10/13/2016



30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Glenwood Springs, 39107-E1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Grizzly Creek Canyon Potential Conservation Area, B2: Very High Biodiversity Significance

Hanging Lake

Biodiversity Rank - B2: Very High Biodiversity Significance

Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years

Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss

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

Size: 83 acres (33 ha)

Elevation: 6,300 - 6,700 ft. (1,920 - 2,042 m)

General Description: This site encompasses a narrow, steep canyon flanked by 400-600 foot horizontally stratified sandstone and limestone cliffs. Douglas-fir (*Pseudotsuga menziesii*) occurs sporadically on these slopes while also occurring in the riparian area along with box elder (*Acer negundo*), Colorado blue spruce (*Picea pungens*), and red-osier dogwood (*Cornus sericea*). Colluvial deposits are at the base of the cliff faces and often extend to the streambanks. Hanging Lake, which is located along East Fork Deadhorse Creek just above the confluence with West Fork Deadhorse Creek, is a unique environment with lush vegetation and aqua-blue water. Stream flow in East Fork Deadhorse Creek is perennial while flow in West Fork Deadhorse Creek, although indicated on maps as perennial, appears to be intermittent. Downstream of the confluence of these two forks of Deadhorse Creek, stream flow is perennial due to drainage from Hanging Lake. Hanging Lake was formed by a geologic fault, which caused the lake bed to drop away from the valley floor above. The lake receives perennial flow from East Fork Deadhorse Creek via Bridal Veil Falls. The lake edge has built up from dissolved carbonates, which are deposited on the shore and on surrounding slopes as the lake water flows over the edge and makes its way down to the confluence with West Fork Deadhorse Creek. Thus, the lake's edge and the downstream slope are encrusted with a thick deposit of calcium carbonate where species such as Barneby's columbine (*Aquilegia barneybi*) and hanging garden sullivantia (*Sullivantia hapemanii* var. *purpusii*) were fairly common. Small wetlands are located upstream of Bridal Veil Falls (near Spouting Rock), along the edge of Hanging Lake, and on the downstream slope where drainage from Hanging Lake saturates the hillside. These areas are dominated by Barneby's columbine, hanging garden sullivantia (on steep faces), red-osier dogwood, river birch (*Betula occidentalis*), beaked sedge (*Carex utriculata*), Rocky Mountain rush (*Juncus saximontanus*), bog orchid (*Limnorchis* sp.), brookgrass (*Catabrosa aquatica*), redtop (*Agrostis gigantea*), leafy-bracted aster (*Aster foliaceus*) and American speedwell (*Veronica americana*). Hornwort (*Ceratophyllum demersum*) was the dominant aquatic species in these areas. The riparian vegetation near Hanging Lake and Spouting Rock consisted of red-osier dogwood, river birch, box elder, and mock-orange (*Philadelphus microphyllus*). Soils are not mapped by the county soil survey. The U.S. Forest Service in Glenwood Springs may have soil maps for this area. Overall, soils were derived from alluvium except near Hanging Lake, where soil development was often limited due to constant deposition of calcium carbonate. However, those areas that were saturated and on fairly level terrain had accumulated a deep litter layer (O horizon) due to a dense growth of mosses and herbaceous vegetation.

Land Use History: Recreation

Biodiversity Significance Rank Comments (B2): This site supports an excellent (A-ranked) occurrence of a globally (G2/S2) imperiled hanging garden plant community (*Sullivantia hapemanii* - (*Aquilegia barnebyi*)). This site also contains a good (B-ranked) occurrence of a globally vulnerable (G3?/S1) montane box elder / red osier dogwood riparian forest (*Acer negundo* / *Cornus sericea*). This riparian plant community is known from less than 50 occurrences globally and less than 10 occurrences are known in Colorado. This site also contains an historical occurrence of a globally vulnerable plant subspecies, the hanging garden sullivanian (*Sullivantia hapemanii* var. *purpusii*), which is endemic to western Colorado. The Black Swift (*Cypseloides niger*) record represents a traditional nesting colony with five to nine nesting pairs. Estimates suggest that over 200 nesting pairs of Black Swifts occur in Colorado, representing between 10% and 20% of the total nesting population of the species (Boyle 1998). This makes Colorado's population an important component of this bird's total population. In addition, Black Swifts restrict their nesting to areas near or behind waterfalls or to caves with running water, because such habitats are uncommon, any that support breeding swift populations are important to protect. This species' low population size, few occurrences, and lack of local trend data are all reasons for its vulnerable ranking in the state (G4/S3B). This site supports a good (B-ranked) occurrence of Black Swift.

Natural Heritage element occurrences at the Hanging Lake PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Birds	<i>Cypseloides niger</i>	Black Swift	G4	S3B			BLM/US FS	B	2005-08-25
Natural Communities	<i>Sullivantia hapemanii</i> - (<i>Aquilegia barnebyi</i>) Herbaceous Vegetation	Sullivantia Hanging Gardens	G2	S2				A	1991-06-17
Natural Communities	<i>Acer negundo</i> / <i>Cornus sericea</i> Forest	Montane Riparian Deciduous Forest	G3?	S1				B	2000-09-20
Vascular Plants	<i>Sullivantia hapemanii</i> var. <i>purpusii</i>	Hanging Garden sullivanian	G3T3	S3				H	1991-06-17

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: The boundary encompasses the entire riparian area along Deadhorse Creek and a portion of the adjacent slopes. However, upstream reaches of East and West Fork Deadhorse Creek were not included in the site boundaries. A comprehensive management/protection plan needs to consider these areas to adequately protect hydrologic processes necessary for the viability of the wetland and riparian elements. The current boundaries allow fluvial processes along the creek to dynamically maintain riparian and wetland communities. The boundaries, along with the inaccessibility of the Black Swift's particular habitat, prevents direct disturbance to the Black Swift nests.

Protection Urgency Rank Comments (P3): The site is currently managed by the U.S. Forest Service and is a popular hiking destination. Designating this site as a "Special Interest Area" would assist in protecting its unique geologic features and ecological diversity.

Management Urgency Rank Comments (M2): There is heavy recreational use along the creek up to Hanging Lake and Spouting Rock. There are few obvious threats to Black Swifts, except where development, such as trails and boardwalks, alters nesting habitat. Protecting stream flows and the present physical state of the falls at Hanging Lake from alteration and limiting direct access to the falls through the design and placement of trails would ensure continued nesting by the swifts. Diversion of stream water causing reduced flow at the falls could cause swifts to abandon the site and affect the viability of the wetland and riparian plant communities. Heavy recreational use has trampled streamside vegetation in some areas and has resulted in the spread of non-native species such as Kentucky bluegrass (*Poa pratensis*), dandelion (*Taraxacum officinale*), and smooth brome (*Bromus inermis*).

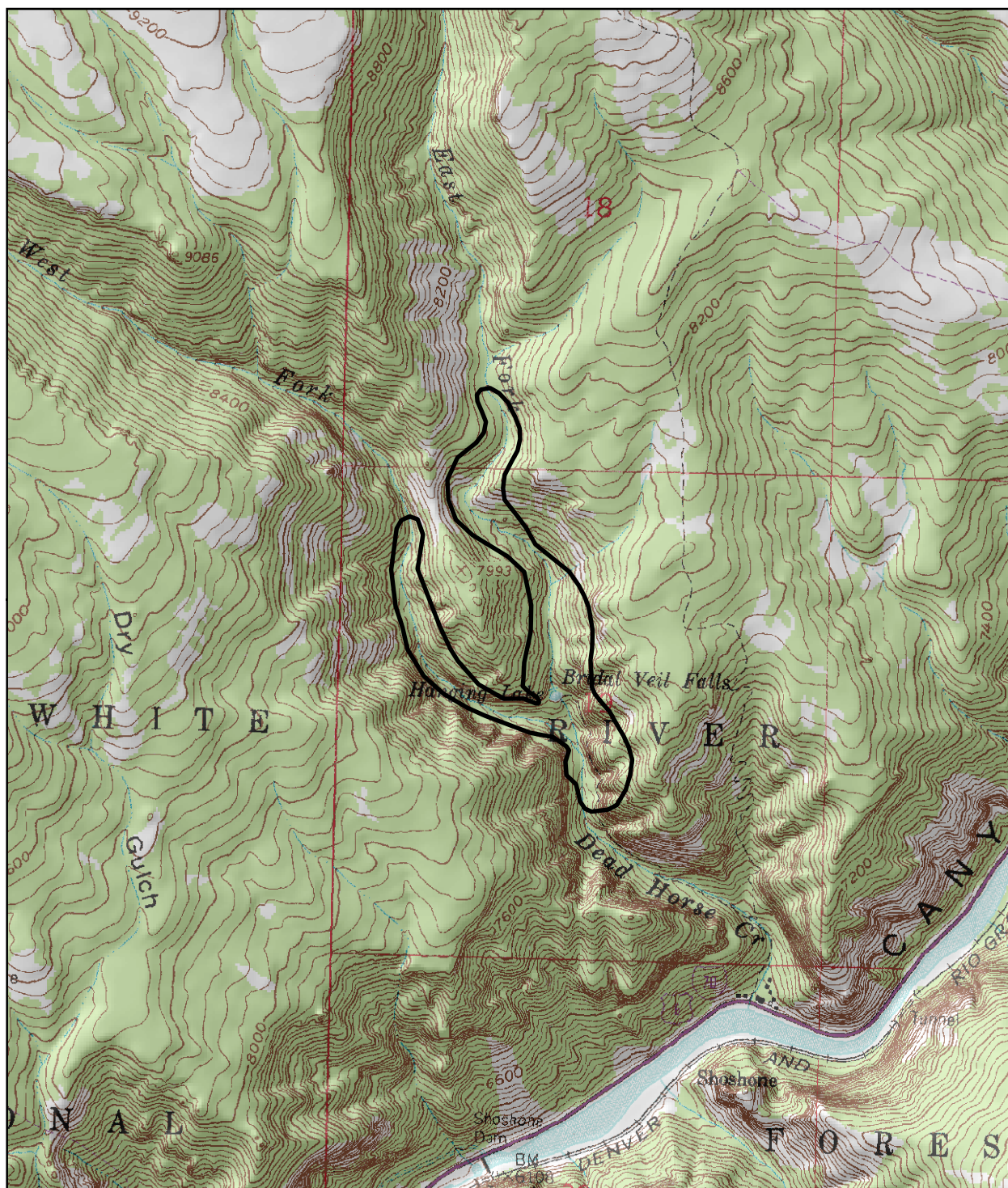
Exotic Species Comments: Heavy recreational use has trampled streamside vegetation in some areas and has resulted in the spread of non-native species such as Kentucky bluegrass (*Poa pratensis*), dandelion (*Taraxacum officinale*), and smooth brome (*Bromus inermis*).

References

Rocchio, J., P. Lyon, and J. Sovell. 2000. Final Report: Survey of Critical Wetlands and Riparian Areas of Garfield County, Colorado. Colorado Natural Heritage Program, College of Natural Resources, Colorado State University, Fort Collins, Colorado.

Version Author: Bell, J.B.

Version Date: 06/27/2003



 PCA Boundary

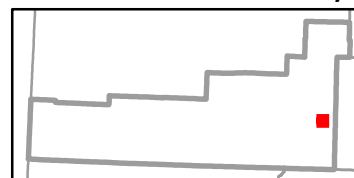
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Map Date: 10/15/2016



7.5 Minute Digital Raster Graphics
by the U.S. Geological Survey
Shoshone, 39107-E2

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Hanging Lake Potential Conservation Area, B2: Very High Biodiversity Significance

Mount Logan Road

Biodiversity Rank - B2: Very High Biodiversity Significance

Protection Urgency Rank - P2: Threat/Opportunity within 5 Years

Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss

U.S.G.S. 7.5-minute quadrangles: Red Pinnacle

Size: 1,023 acres (414 ha)

Elevation: 7,000 - 8,044 ft. (2,134 - 2,452 m)

General Description: This site includes the roadside of a narrow dirt road which switchbacks up Mt. Logan. The site is an unnatural one for the Parachute penstemon, Arapien stickleaf and Utah fescue, which normally grow on steep south-facing slopes. The roadcut exposes the Green River shale on a north-facing slope which, except for the roadcut, is heavily vegetated. The Utah mountain lilac, on the other hand, is at home in the dense growth of shrubs above the roadcut. Over 100 large plants of this species were counted in a small area with a diverse assortment of mountain shrubs including Gambel's oak, serviceberry, snowberry, bitterbrush, mountain mahogany, currant and wild rose.

Biodiversity Significance Rank Comments (B2): This site contains a good (B-ranked) and a poor (D-ranked) occurrence of the globally critically imperiled (G1/S1) Parachute penstemon (*Penstemon debilis*), a good (B-ranked) occurrence of the globally imperiled (G2/S2) Roan Cliffs blazing star (*Mentzelia rhizomata*), a fair (C-ranked) occurrence of the state rare (G4/S1) Utah mountain lilac (*Ceanothus martinii*) and an extant occurrence of the globally vulnerable (G3/S3) Utah fescue (*Argillochloa dasyclada*). Roan cliffs blazing star was previously small in numbers, but was found in 2015 to be relatively abundant and widespread, and the historically known Utah fescue was located in 2015. Conversely, the abundance and vigor of Utah mountain lilac has declined. The Logan Wash mine and access road to the mine is now closed to most vehicle traffic but for occasional maintenance visits by management personnel. Since the 2009 surveys, the road closure and the cessation of disturbance the road closure have enabled road colonization by several rare native plant species.

Natural Heritage element occurrences at the Mount Logan Road PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Vascular Plants	<i>Penstemon debilis</i>	Parachute penstemon	G1	S1	LT			B	2015-09-02
Vascular Plants	<i>Penstemon debilis</i>	Parachute penstemon	G1	S1	LT			D	2010-08-25
Vascular Plants	<i>Nuttallia rhizomata</i>	Roan Cliffs blazing star	G2	S2			BLM	B	2015-09-01
Vascular Plants	<i>Argillochloa dasyclada</i>	False ricegrass	G3	S3				E	2016-06-28
Vascular Plants	<i>Ceanothus martinii</i>	Utah mountain lilac	G4	S1				C	2015-09-01

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: A fair population of the state vulnerable (G3G4/S3) Barneby's thistle (*Cirsium barnebyi*) plant species was documented throughout the site. This species is on CNHP's watchlist.

Boundary Justification: The site includes occurrences of several rare plant species on a roadcut and a small buffer up and downslope of the road. It is intended to provide room for populations to migrate over time.

Protection Urgency Rank Comments (P2): The site was previously owned by Occidental Oil Company and the Logan Wash mine and access road to the mine is now closed to most vehicle traffic. A new mine company has purchased the site and future use or development of the site is uncertain.

Management Urgency Rank Comments (M2): Historic energy development has heavily altered the landscape in this site. Consulting CNHP's "Recommended Best Management Practices for Plants of Concern" would help reduce impacts from any future energy development (Elliot et al. 2009). Landscape fragmentation is high and connectivity reduced due to a web of roads that service energy development infrastructure. Surrounding landscape and ecosystem processes, especially hydrologic, soil and vegetation processes, are also greatly altered and diminished by oil and gas-related infrastructure and development. Reducing fragmentation and reconnecting natural processes by closing some of these roads would help restore some ecosystem function. Natural revegetation of closed roads, well pads and disturbed sites with simultaneous weed monitoring and management is recommended. For best weed management strategies we recommend consulting "Recommended Best Management Practices for Managing Noxious Weeds on Sites with Rare Plants" (Mui and Panjabi 2016) and "Conserving Roadside Populations of Colorado's Globally Imperiled Plants, a Pilot Project" (Panjabi and Smith 2014). Reclamation and revegetation using current standards that include bringing in topsoil and using seed from off-site sources is not recommended. These reclamation techniques would diminish habitat suitability for Parachute penstemon, introduce plants unsuitable to the site and increase

competition for scarce resources thereby diminishing viability potential of rare plant species. Livestock grazing occurs on adjacent mesa tops. Although direct impacts from cattle to the rare plants that occur in this site are probably infrequent and minor due to their location on steep shale slopes, indirect impacts to underlying ecosystem processes are substantial. Thus grazing should be permitted only with intense management and element occurrences and threat impacts should be monitored annually to enable successful adaptive management.

Land Use Comments: Road traffic. Land uses include grazing and extractive energy development.

Natural Hazard Comments: Road is extremely dangerous when wet.

Exotic Species Comments: Cheatgrass (*Bromus tectorum*), smooth brome (*Bromus inermis*), and yellow sweetclover (*Melilotus officinale*) are widely spread along the roadcut. Prickly lettuce (*Lactuca serriola*) and musk thistle (*Carduus nutans*) occur in patches along the roadcut.

References

Elliott, B. A., S. Spackman Panjabi, B. Kurzel, B. Neely, R. Rondeau, M. Ewing. 2009. Recommended Best Management Practices for Plants of Concern. Practices developed to reduce the impacts of oil and gas development activities to plants of concern. Unpublished report prepared by the Rare Plant Conservation Initiative for the National Fish and Wildlife Foundation.

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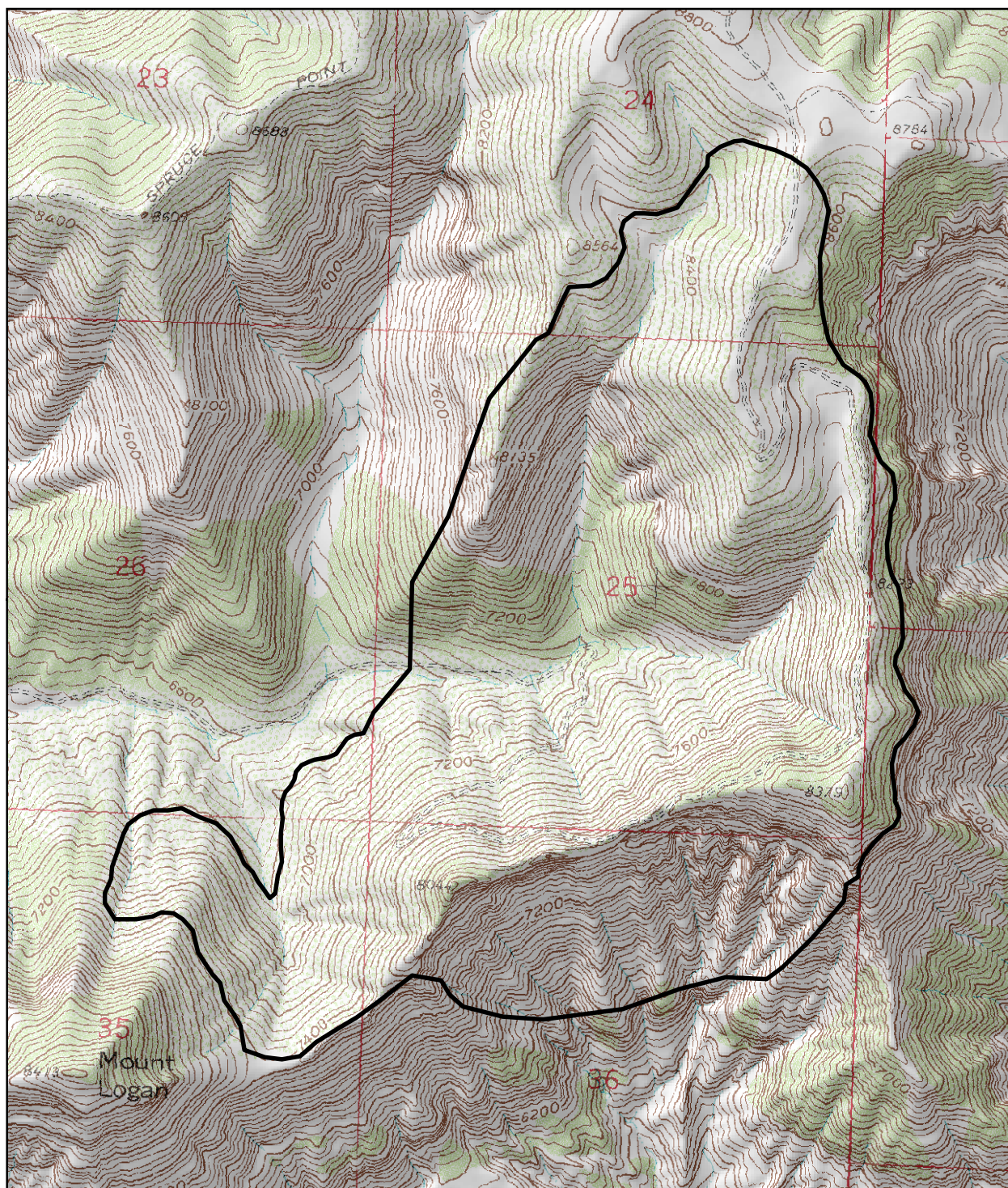
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Panjabi, S.S. and G. Smith 2014. Conserving Roadside Populations of Colorado's Globally Imperiled Plants, a Pilot Project. Colorado Natural Heritage Program, Colorado State University, Fort Collins, Colorado.

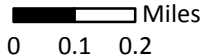
Spackman, S., K. Fayette, K. Carsey and R.J. Rondeau. 1997. Final Report: Field Survey and Protection Recommendations for the Globally Imperiled Parachute Penstemon, *Penstemon debilis* O'Kane and Anderson. Colorado Natural Heritage Program, Fort Collins, CO.

Version Author: Malone, D.G.

Version Date: 08/13/2016



 PCA Boundary

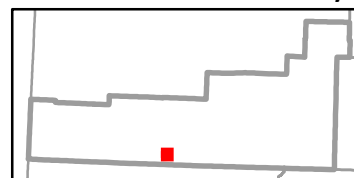
 Miles
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Map Date: 10/13/2016



7.5 Minute Digital Raster Graphics
by the U.S. Geological Survey
Red Pinnacle, 39108-D2

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Mount Logan Road Potential Conservation Area, B2: Very High Biodiversity Significance

No Name Creek

Biodiversity Rank - B2: Very High Biodiversity Significance

Protection Urgency Rank - P4: No Threat or Special Opportunity

Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality

U.S.G.S. 7.5-minute quadrangles: Glenwood Springs, Carbonate

Size: 7,880 acres (3,189 ha)

Elevation: 6,000 - 10,700 ft. (1,829 - 3,261 m)

General Description: This is a very large site that encompasses the entire watershed for No Name Creek, which is used by the City of Glenwood Springs for their city water supply. No Name Creek drains high elevation plateaus of the Flat Tops cascading down through steep, narrow cliffs and canyons, ultimately having its confluence with the Colorado River. Canyon walls are characterized by sheer cliffs and by steep talus slopes with widely scattered *Pseudotsuga menziesii* and patchy but often dense cover of shrubs. Riparian habitat is a narrow, lush band of *Populus angustifolia* woodlands that transitions to a mixed *Populus angustifolia* - *Picea pungens* woodland at higher elevations. Small, first order streams that drain steep east- and west-facing talus slopes often support narrowleaf cottonwood - river birch (*Populus angustifolia* / *Betula occidentalis*) communities. Stream flow and thus maintenance of riparian communities is dependent on functioning wetland on the plateau headwaters to support a natural hydrologic regime. This site contains a long and extensive riparian area with a high cover of woody vegetation plus numerous subalpine meadows and ponds. The diversity of habitats, including scrub-shrub, forested, and emergent wetlands, provide excellent habitat for avian species and large and small mammals.

Biodiversity Significance Rank Comments (B2): This site supports one good (B-ranked) occurrence of the globally imperiled (G2/S2) aspen / sticky-laurel (*Populus tremuloides* / *Ceanothus velutinus*) forest, one good (B-ranked) occurrence of the state rare (G4/S3) narrowleaf cottonwood / red-osier dogwood (*Populus angustifolia* / *Cornus sericea*) riparian forest and two good (B-ranked) occurrences of the common (G4/S4) Drummond's willow / mesic forb (*Salix drummondiana* / mesic forb) deciduous alluvial shrubland. Surveys conducted in 2015 failed to find an occurrence of hanging garden sullivantia (*Sullivantia hapemanii* var. *purpusii*) previously documented at the site.

Natural Heritage element occurrences at the No Name Creek PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Natural Communities	Populus tremuloides / Ceanothus velutinus Forest	Aspen Forests	G2	S1				B	1995-06-99
Natural Communities	Populus angustifolia / Betula occidentalis Woodland	Montane Riparian Forest	G3	S3				B	2015-06-23
Natural Communities	Populus angustifolia / Cornus sericea Woodland	Cottonwood Riparian Forest	G4	S4				B	2015-06-23
Natural Communities	Salix drummondiana / Mesic Forbs Shrubland	Drummonds Willow / Mesic Forb	G4	S4				B	1993-06-27

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: The boundary encompasses the entire No Name Creek watershed and thus, ensures continued hydrological flow and allows natural fluvial processes to dynamically maintain the riparian plant communities.

Protection Urgency Rank Comments (P4): The site is managed by the White River National Forest and is currently managed for the City of Glenwood Springs' water supply.

Management Urgency Rank Comments (M3): There is heavy recreation along the lower reach of the creek, where hiking and horseback riding are prevalent. Non-native weedy species are invading along the recreational trail. Upstream, recreational use such as hunting and camping occurs. Control and eradication of non-native species and minimizing encroachment of recreational trails into adjacent riparian habitat would benefit the site. Maintenance of headwater wetlands is essential to maintenance of streamflows. Plateau wetlands which support this stream are heavily impacted by livestock grazing, dams, diversions and roads. Restoring a natural hydrologic regime would enhance the potential for long-term sustainability of stream flows and riparian habitat.

Exotic Species Comments: Non-native species such as orchard grass (*Dactylis glomerata*) and Kentucky bluegrass (*Poa pratensis*) are fairly abundant.

References

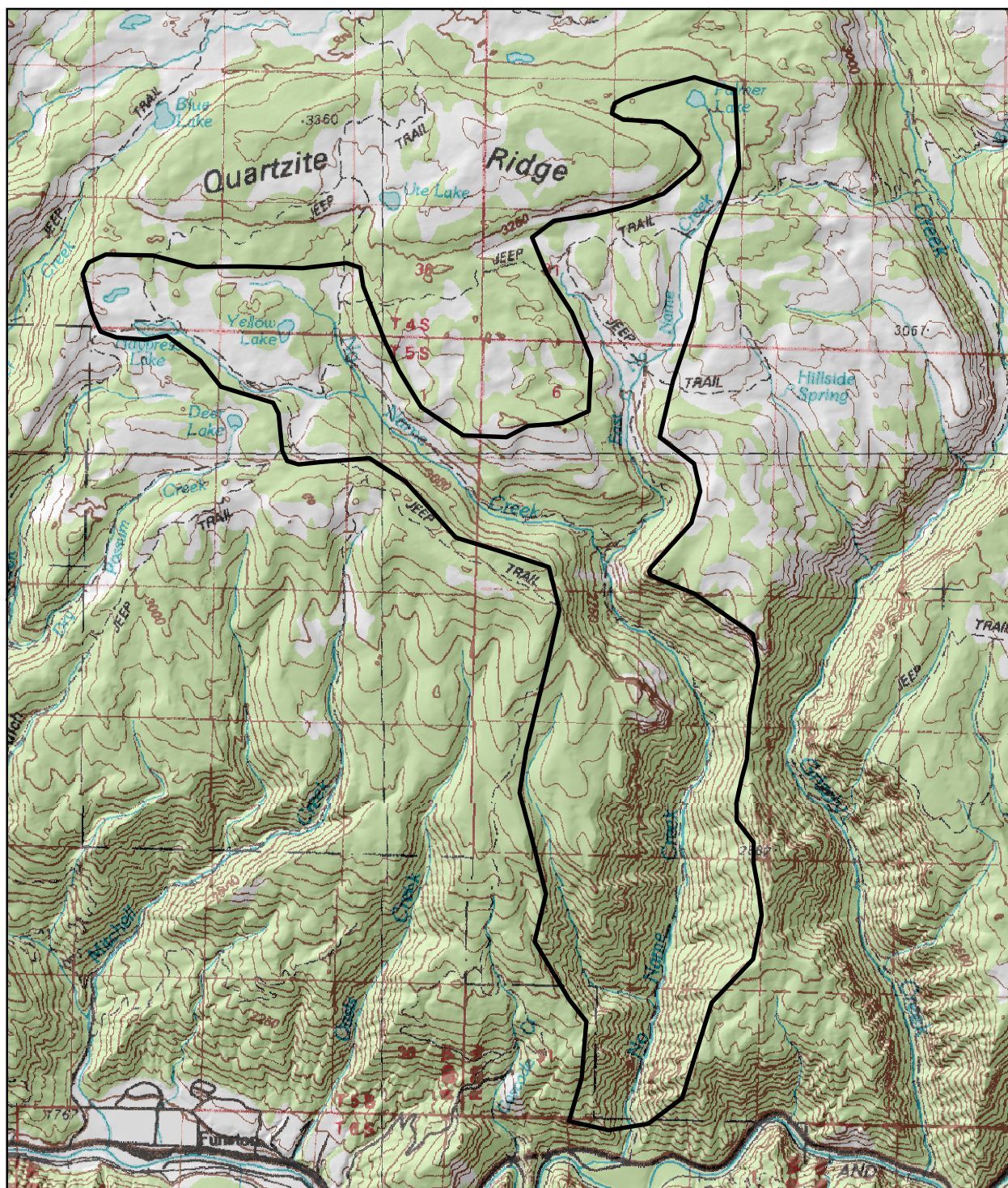
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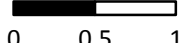
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Version Author: Malone, D.G.

Version Date: 08/13/2016



 PCA Boundary

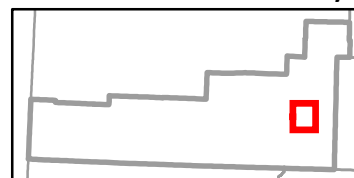
 Miles
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Map Date: 10/13/2016



30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Glenwood Springs, 39107-E1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

No Name Creek Potential Conservation Area, B2: Very High Biodiversity Significance

Parachute Creek

Biodiversity Rank - B2: Very High Biodiversity Significance

Protection Urgency Rank - P2: Threat/Opportunity within 5 Years

Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss

U.S.G.S. 7.5-minute quadrangles: Red Pinnacle, Cutoff Gulch, Grand Valley, Circle Dot Gulch, Forked Gulch, McCarthy Gulch, Anvil Points

Size: 19,513 acres (7,897 ha)

Elevation: 5,305 - 8,415 ft. (1,617 - 2,565 m)

General Description: This site consists of the Parachute Creek drainage which is roughly 144,000 acres in size. It contains the riparian areas of Parachute Creek and its tributaries, and continues upslope ending at the cliff tops of the Roan Plateau. The high quality and diverse assemblage of the plant communities is unique, and supports many rare plant species. Tributaries lying within the site include the East, West, and Middle Forks of Parachute Creek and Garden, Hayes and Wheeler Gulches. Each tributary makes a dramatic plunge off the Roan Plateau over 100 to 200 foot shale cliffs. The gradient remains fairly steep after falling off the plateau, forming a pool-drop creek with steep south and north-facing slopes. Sagebrush (*Artemisia tridentata*), serviceberry (*Amelanchier*), and mountain spray (*Holodiscus dumosus*) dominate the south-facing slopes, while Douglas-fir / spruce - fir (*Pseudotsuga menziesii* - *Picea* spp.) forests dominate the north-facing slopes. There is lush riparian vegetation in the box canyons and the more gentle slopes dropping off the Roan Plateau support high quality grasslands and sagebrush shrublands. Areas directly adjacent to the main stem of Parachute Creek are highly disturbed by irrigated pastures and intense grazing. The high quality riparian habitats support four rare riparian plant communities including cottonwood forests, foothills riparian shrubland, and mountain riparian deciduous forest. The riparian habitats and associated creeks also support four rare animal species including the Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*), Great Basin spadefoot (*Spea intermontana*), western yellowbelly racer (*Coluber constrictor mormon*) and midget faded rattlesnake (*Crotalis viridis concolor*). A rare hanging garden community occurs at East Middle Fork Falls and at higher elevation the south-facing slopes of the shale exposures provide important habitat for four rare plant species. Over 75% of this site is private land with small patches of BLM land spread throughout making up the remainder. Parachute Creek and its tributaries cut through sedimentary rocks of the Tertiary age leaving exposed from cliff tops to the valley bottom a geologic timeline. Found exposed from top to bottom are the lower part and Parachute Creek Member of the Green River Formation; Wasatch Formation claystone, mudstone and sandstone; and finally unconsolidated gravel and alluvial deposits of the Quaternary Age along Parachute Creek.

Biodiversity Significance Rank Comments (B2): This site contains a concentration of excellent and good occurrences of globally imperiled and vulnerable elements. Most significant are excellent (A-ranked) and good (B-ranked) occurrences of the globally imperiled (G2/S2) Roan Cliffs blazing star (*Nuttallia rhizomata*) and the globally imperiled (G2/S2) sun-loving meadowrue (*Thalictrum heliophilum*), which are oil-shale endemic species. This site also contains excellent (A-ranked) occurrences of the globally vulnerable

(G3T3/S3) hanging gardens sullivanian (Sullivanian *hapemanii* var. *purpusii*) and numerous occurrences, including excellent (A-ranked) and good (B-ranked) occurrences, of the globally vulnerable (G3/S3) Utah fescue (*Argillochloa dasyclada*). The area supports a diverse assemblage of high quality, undisturbed rare plant communities including good (B-ranked) occurrences of the globally vulnerable (G3/S2) box elder / chokecherry (*Acer negundo* / *Prunus virginiana*) montane riparian deciduous forest and the globally vulnerable (G3/S3) narrowleaf cottonwood / skunkbrush riparian forest (*Populus angustifolia* / *Rhus trilobata* woodland).

Natural Heritage element occurrences at the Parachute Creek PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Natural Communities	Acer negundo / Prunus virginiana Forest	Montane Riparian Deciduous Forest	G3	S2				C	1993-06-24
Natural Communities	Acer negundo / Prunus virginiana Forest	Montane Riparian Deciduous Forest	G3	S2				B	1993-06-22
Natural Communities	Acer negundo / Prunus virginiana Forest	Montane Riparian Deciduous Forest	G3	S2				BC	1993-06-22
Natural Communities	Acer negundo / Prunus virginiana Forest	Montane Riparian Deciduous Forest	G3	S2				B	1993-06-23
Natural Communities	Populus angustifolia / Rhus trilobata Woodland	Narrowleaf Cottonwood / Skunkbrush	G3	S3				B	1993-06-22
Natural Communities	Populus angustifolia / Cornus sericea Woodland	Cottonwood Riparian Forest	G4	S4				B	1993-06-23
Natural Communities	Populus angustifolia / Cornus sericea Woodland	Cottonwood Riparian Forest	G4	S4				A	1993-06-24
Natural Communities	Cornus sericea Shrubland	Foothills Riparian Shrubland	G4Q	S2				A	1993-06-24
Natural Communities	Pinus edulis - Juniperus osteosperma / Cercocarpus montanus - Mixed Shrubs Woodland	Two - needle Pinyon - Utah Juniper / Alderleaf Mountain - mahogany - Mixed Shrubs Woodland	G5	S5				E	1974-99-99
Natural Communities	Pseudotsuga menziesii / Symphoricarpos oreophilus Forest	Western Slope Douglas Fir Forests	G5	S4				E	1974-99-99
Reptiles	Coluber constrictor mormon	Western Yellowbelly Racer	G5T5	S3				H	1972-06-99
Vascular Plants	Nuttallia rhizomata	Roan Cliffs blazing star	G2	S2			BLM	A	1993-06-24
Vascular Plants	Nuttallia rhizomata	Roan Cliffs blazing star	G2	S2			BLM	A	1996-07-04
Vascular Plants	Nuttallia rhizomata	Roan Cliffs blazing star	G2	S2			BLM	H	1983-99-99
Vascular Plants	Nuttallia rhizomata	Roan Cliffs blazing star	G2	S2			BLM	H	1981-06-20

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Vascular Plants	Nuttallia rhizomata	Roan Cliffs blazing star	G2	S2			BLM	H	1983-07-16
Vascular Plants	Nuttallia rhizomata	Roan Cliffs blazing star	G2	S2			BLM	B	1996-08-20
Vascular Plants	Nuttallia rhizomata	Roan Cliffs blazing star	G2	S2			BLM	A	1996-08-20
Vascular Plants	Nuttallia rhizomata	Roan Cliffs blazing star	G2	S2			BLM	A	1993-06-26
Vascular Plants	Nuttallia rhizomata	Roan Cliffs blazing star	G2	S2			BLM	A	1993-06-22
Vascular Plants	Nuttallia rhizomata	Roan Cliffs blazing star	G2	S2			BLM	B	1996-07-09
Vascular Plants	Thalictrum heliophilum	sun - loving meadowrue	G2	S2			BLM/US FS	B	1996-07-09
Vascular Plants	Thalictrum heliophilum	sun - loving meadowrue	G2	S2			BLM/US FS	A	1996-07-04
Vascular Plants	Thalictrum heliophilum	sun - loving meadowrue	G2	S2			BLM/US FS	A	1993-06-24
Vascular Plants	Thalictrum heliophilum	sun - loving meadowrue	G2	S2			BLM/US FS	H	1983-99-99
Vascular Plants	Thalictrum heliophilum	sun - loving meadowrue	G2	S2			BLM/US FS	C	1993-06-22
Vascular Plants	Thalictrum heliophilum	sun - loving meadowrue	G2	S2			BLM/US FS	A	1996-08-20
Vascular Plants	Thalictrum heliophilum	sun - loving meadowrue	G2	S2			BLM/US FS	H	1984-08-09
Vascular Plants	Argilochloa dasyclada	False ricegrass	G3	S3				B	1996-07-04
Vascular Plants	Argilochloa dasyclada	False ricegrass	G3	S3				H	1983-99-99
Vascular Plants	Argilochloa dasyclada	False ricegrass	G3	S3				B	1993-06-24
Vascular Plants	Argilochloa dasyclada	False ricegrass	G3	S3				A	1996-07-04
Vascular Plants	Argilochloa dasyclada	False ricegrass	G3	S3				C	1996-08-20
Vascular Plants	Argilochloa dasyclada	False ricegrass	G3	S3				E	1993-06-22
Vascular Plants	Sullivantia hapemanii var. purpusii	Hanging Garden sullivantia	G3T3	S3				A	1993-07-22

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Vascular Plants	Sullivantia hapemanii var. purpusii	Hanging Garden sullivantia	G3T3	S3				A	1993-06-23

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: This area has dramatic cliff faces, magnificent waterfalls and visual beauty.

Boundary Justification: The site boundaries for Parachute Creek include most of the creek's watershed, including upland slopes and the major tributaries: West Fork, Middle Fork, East Middle Fork, and East Fork. These boundaries will ensure continued natural surface flow and maintain a natural hydroperiod through Parachute Creek, which will maintain a dynamic distribution of riparian plant communities along the drainage and support fish populations. These boundaries also include all the steep south-facing slopes that are important to the rare, endemic plant occurrences on the shale barrens, with a buffer to protect the occurrences from indirect and direct disturbances. The long-term integrity of the upland plant communities are also encouraged by the site boundaries by allowing natural disturbances, such as fire and insects, to maintain the mosaic of communities found within this site. Additionally, the Roan Cliffs blazing star and the sun-loving meadowrue are early successional plants that commonly occur on relatively recent landslides. As the landslides become vegetated, usually with mountain shrubs, the endemic plants disappear. Therefore, it is necessary to include areas in this site that do not currently have the endemic plants but have the conditions for generating new landslides that these plants can occupy.

Protection Urgency Rank Comments (P2): This site is nearly all private land and the area is currently threatened by oil shale and gas development, haying operations and intense grazing along Parachute Creek.

Management Urgency Rank Comments (M2): Current grazing intensity is degrading some plant community occurrences.

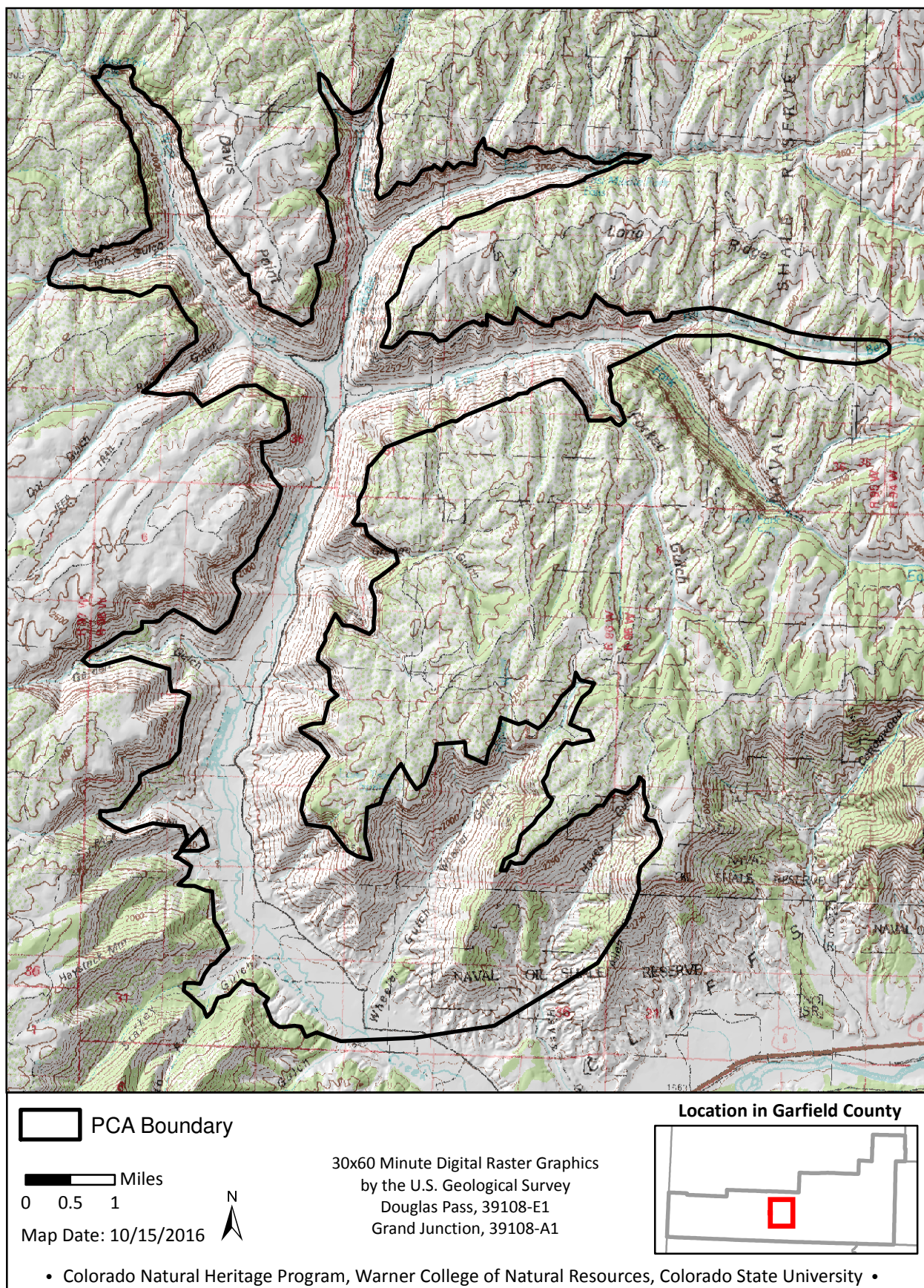
Land Use Comments: Two old mining sites, one on Exxon, one on UNOCAL land, have left large scars easily visible on the aerial photographs. Neither of these sites appear to be recoverable, although the site on East Fork has been reseeded with exotic grasses. Portions of West Fork Parachute Creek, near the confluence of Parachute Creek are used as hay meadows and for cattle grazing. The East and Middle Fork tributaries are not grazed in the canyon sections of the creeks. Due to the currently low prices of oil, mining oil is not economical.

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Version Author: Handwerk, J.E. and J.R. Sovell

Version Date: 10/17/2016



Parachute Creek Potential Conservation Area, B2: Very High Biodiversity Significance

Roaring Fork River at Carbondale

Biodiversity Rank - B2: Very High Biodiversity Significance

Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years

Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss

U.S.G.S. 7.5-minute quadrangles: Leon, Basalt, Carbondale, Cattle Creek

Size: 4,814 acres (1,948 ha)

Elevation: 6,093 - 6,526 ft. (1,857 - 1,989 m)

General Description: Affording spectacular views of Mount Sopris to the south, and including the widest stretch of riparian vegetation, the site is one of the most intact stretches along the lower elevations of the Roaring Fork River. It spans more than twelve miles of the Roaring Fork River floodplain, between 6,000 and 6,500 feet. The riparian vegetation includes a mosaic of narrowleaf cottonwood (*Populus angustifolia*) and coyote willow (*Salix exigua*) and supports a high diversity of species in the shrub layer. In a few small patches, a rare orchid, yellow lady's slipper (*Cypripedium calceolus* ssp. *parviflorum*), is found associated with false Solomon's seal (*Maianthemum stellatum*). Another rare orchid documented in the site is the federally Threatened Ute ladies' tresses (*Spiranthes diluvialis*). It is possible that further research would discover additional orchid occurrences in this site. On the north bank of the river, the riparian vegetation is bisected by multiple two-track roads. A series of ponds in the north and central part of the site support a diverse mix of native bird species, cattail marshes, and patches of sedge and rush-dominated wetlands. On the south side of the river there are private homes scattered within the historic floodplain and natural riparian vegetation. Islands in the river are covered by dense stands of coyote willow (*Salix exigua*). The north section of the site consists of a narrow riparian area located on the west bank of the floodplain of the Crystal River, just upstream from the junction with the Roaring Fork River. The riparian vegetation is limited to a small area because of houses on the west, and the natural narrowing of the floodplain to the south. This area is dominated by narrowleaf cottonwood (*Populus angustifolia*), dense stands of coyote willow, Rocky Mountain willow (*S. monticola*), alder (*Alnus incana*), and honeysuckle (*Lonicera involucrata*) with an understory of field horsetail (*Equisetum arvense*), false Solomon's seal, and rush species (*Juncus* spp). The Ute ladies' slipper orchid is also found in the section in a diverse riparian zone. The south section contains a riparian zone between Crown and Basalt Mountain, southwest of El Jebel. Small fragments of riparian communities exist within developed areas. The river is deeply entrenched for small reaches. Narrowleaf cottonwood with mixed understory dominates both banks of the river along this stretch. The alluvial deposits found along the river banks range from pure sand to large cobbles. The adjacent upland areas rise 200 feet above the floodplain and support pinon - juniper (*Pinus edulis* - *Juniperus osteosperma*) communities and mixed shrublands. The soils along the riparian areas are mapped as Fluvaquents, Atencio series, and Redrob series. Fluvaquents are a broadly defined unit consisting of deep, somewhat poorly drained soils on floodplains and alluvial valley floors (Soil Conservation Service 1992). These soils are typically stratified and widely vary in texture. The water table is typically within 2 feet of the soil surface during spring and summer. Fluvaquents are found immediately adjacent to the river. The Atencio series is classified as a fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiustolls

(Soil Conservation Service 1992). Atencio soils are deep, well drained soils on fans and terraces, which have formed in alluvium. The Redrob series is classified as fine-loamy over sandy or sandy-skeletal, mixed (calcareous), frigid Fluvaquentic Haplaquolls (Soil Conservation Service 1992). Redrob soils are somewhat poorly drained and are found on alluvial valley floors, low terraces, and floodplains along major streams. The Redrob occupies the largest area of the floodplain at this site. A functional assessment was conducted for this site.

Biodiversity Significance Rank Comments (B2): This is one of the largest riparian areas in good condition observed in the lower Roaring Fork Valley. It supports a good and poor (B and D-ranked) occurrence of a globally imperiled (G2G3/S2) and federally listed Threatened plant species, Ute ladies'-tresses orchid (*Spiranthes diluvialis*) and good to fair (B and C-ranked) occurrences of a state rare orchid, American yellow lady's-slipper (*Cypripedium calceolus* ssp. *parviflorum*). The site also supports a fair (C-ranked) example of a globally vulnerable (G3/S3) riparian plant community, *Populus angustifolia* / *Alnus incana*, and a Bald Eagle (*Haliaeetus leucocephalus*) with nestlings in the north section. Surveys conducted during 2015-2016 found that due to weed invasion and the consequent elimination of potential habitat, two of the occurrences of American yellow lady's-slipper orchid warranted down-grading from good (B) to fair (C) estimated viability. Surveys also found that one of the previously documented narrowleaf cottonwood/thinleaf alder (*Populus angustifolia* / *Alnus incana*) riparian woodlands was lost to fire in 2008 which was started by a rancher who was burning his ditch. The great majority of mature and older age class cottonwood as well as the shrub layer was lost to the fire. New occurrences of Lewis's woodpecker (*Melanerpes lewis*) were documented along with a Bald Eagle (*Haliaeetus leucocephalus*) with nestlings.

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

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Birds	Melanerpes lewis	Lewis's Woodpecker	G4	S4			USFS	E	2015-08-15
Birds	Melanerpes lewis	Lewis's Woodpecker	G4	S4			USFS	C	2015-06-24
Birds	Haliaeetus leucocephalus	Bald Eagle	G5	S1B,S3N		ST	BLM/USFS	E	1997-99-99
Natural Communities	Populus angustifolia / Alnus incana Woodland	Montane Riparian Forest	G3	S3				C	1997-07-10
Natural Communities	Populus angustifolia / Alnus incana Woodland	Montane Riparian Forest	G3	S3				X	2015-06-24
Natural Communities	Populus angustifolia / Betula occidentalis Woodland	Montane Riparian Forest	G3	S3				C	2015-06-24
Vascular Plants	Spiranthes diluvialis	Ute ladies' tresses	G2G3	S2	LT			B	2015-08-10
Vascular Plants	Spiranthes diluvialis	Ute ladies' tresses	G2G3	S2	LT			D	2011-08-19
Vascular Plants	Spiranthes diluvialis	Ute ladies' tresses	G2G3	S2	LT			B	2013-08-16
Vascular Plants	Spiranthes diluvialis	Ute ladies' tresses	G2G3	S2	LT			C	2013-08-16
Vascular Plants	Cypripedium calceolus ssp. parviflorum	American yellow lady's - slipper	G5	S2			USFS	B	1998-06-15
Vascular Plants	Cypripedium calceolus ssp. parviflorum	American yellow lady's - slipper	G5	S2			USFS	C	2015-06-24
Vascular Plants	Cypripedium calceolus ssp. parviflorum	American yellow lady's - slipper	G5	S2			USFS	C	2015-06-18
Vascular Plants	Cypripedium calceolus ssp. parviflorum	American yellow lady's - slipper	G5	S2			USFS	CD	2015-06-18

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: Although not drawn for this species, a small rookery of Great Blue Herons (*Ardea herodias*), including approximately four nests, is found within this site. Great Blue Heron rookeries often include several hundred pairs of birds. The mountain whitefish (*Prosopium williamsoni*) is also known to occur in Roaring Fork River from Glenwood Springs to near Woody Creek and unverified occurrences have been reported between

Woody Creek and Aspen. The willow flycatcher (*Empidonax traillii*) was also observed within the site.

Boundary Justification: The boundary encompasses about twelve miles of the Roaring Fork River's floodplain northwest and east of Carbondale. It incorporates an area that will allow natural hydrological processes such as seasonal flooding, sediment deposition, and new channel formation to maintain viable populations of the elements. The boundary also provides a buffer from nearby agriculture fields, roads, and houses where surface runoff may contribute excess nutrients, sediment, and herbicides/pesticides. The site contains old oxbow lakes, sloughs, and ponds that could provide a source of recruitment for native wetland and riparian plant species. It should be noted that the hydrological processes necessary to the elements are not fully contained by the site boundaries. Given that the elements are dependent on natural hydrological processes associated with the Roaring Fork River, any upstream activities such as water diversions, impoundments, and development could potentially be detrimental to the elements. Hydrological processes originating outside of the planning boundary including water quality, quantity, and flooding, should be managed to maintain the population and community viability.

Protection Urgency Rank Comments (P3): The Ranch at the Roaring Fork is a private housing community in the site which has chosen to leave this large stretch of riparian floodplain intact, and to allow low impact recreational uses such as walking and birding. If development for this site is planned in the future, the land should be considered for Open Space acquisition. The area to the north and south are private, some of the landowners are interested in conservation and protection of some of the rare species. Throughout this stream reach, the majority of riparian habitat upon which each of the elements depend has been modified by agricultural, rural and urban development. Consequences include elimination of native communities and stream channelization over much of potential natural habitat. Anthropogenic activities have also resulted in alteration to stream disturbance (flooding) processes which would otherwise maintain early seral habitat which is essential to the viability and persistence of Ute ladies tresses species' as well as to the maintenance and recruitment of riparian woodlands and shrubland element occurrences which are necessary to support the animal species occurrences in this site. Alteration to the natural hydrologic regime has resulted in changes to vegetation community composition and structure, which threaten the persistence of plant, community and animal occurrences in this reach. Hydrologic alteration includes: stream channelization that has diminished the point bar formation essential for cottonwood seedling establishment; diminished overbanking flows which recharge the aquifer that supports riparian vegetation; and dam releases which do not mimic a natural flow regime, often occurring during August, the season of the year that *S. diluvialis* flowers and sets fruit, thereby threatening this species' reproductive success and viability. Additionally, recreational activity, particularly fishing along this stream reach, disturbs streambanks and has resulted in vegetation trampling.

Management Urgency Rank Comments (M2): Horse ranching and coal mining occurred within this site historically. Horse grazing may be the cause of the spread of exotic plant species, including hay grasses, houndstongue (*Cynoglossum officinale*), cheatgrass (*Bromus tectorum*), sweetclover (*Melilotus officinale*), oxeye-daisy (*Leucanthemum vulgare*), and plumeless and Canada thistle (*Carduus acanthoides* and *Cirsium arvense*). Tansy (*Tanacetum*

vulgare) is the most aggressive exotic in the site and should be controlled with care not to disturb soils or impact rare species. Russian olive (*Elaeagnus angustifolia*) extends in a narrow band for about 50 feet along the Roaring Fork River. The hydrology of the site should be maintained, including the human-made ditches and ponds. The elements should be protected from road, ditch, powerline and railroad maintenance activities. Management agreements with the private land owners regarding the rare plants and plant community occurrences should be pursued. Great Blue Herons (*Ardea herodias*) are known to abandon nests and colonies with increased visits by humans and with road building and logging activity. The responses of birds to disturbance greatly depends on the time of breeding season. A buffer of 300 meters minimum where no human activity should take place during courtship and nesting seasons is recommended (Butler 1992). The roads within the site's riparian areas should be closed and maintained as trails. Residential areas in the southern portion include human-made ponds, irrigation ditches, and hayfields, which are contributing to the exotic plant species in the natural riparian areas. Disturbance of this site should be minimized. A trail/rail corridor is proposed for the old railroad tracks which run through this area. A 100 foot wide easement is owned by the Roaring Fork Railroad Holding Authority. This 100 foot area may see a lot of disturbance if this project is funded. The riparian plant communities would be highly threatened. Water quality, quantity, and flooding must not be significantly altered. Hydrologic considerations must extend beyond the site boundaries, especially wherever the watershed is not contained in the proposed site. Current hydrology may be important to the rare orchid occurrences and changes should be considered before construction.

Land Use Comments: Occurrences of *Spiranthes diluvialis* and *Cypripedium calceolus* ssp. *parviflorum* on the upstream, southeast reaches of this site, are threatened with land use changes. This reach of stream is currently owned by the USFS which is considering selling this parcel to Eagle and Pitkin counties for residential and recreational use. Without strict regulations the recreational pressure, which is already high and has already resulted in numerous social trails and vegetation trampling, will increase greatly thereby increasing the threat of loss of these species.

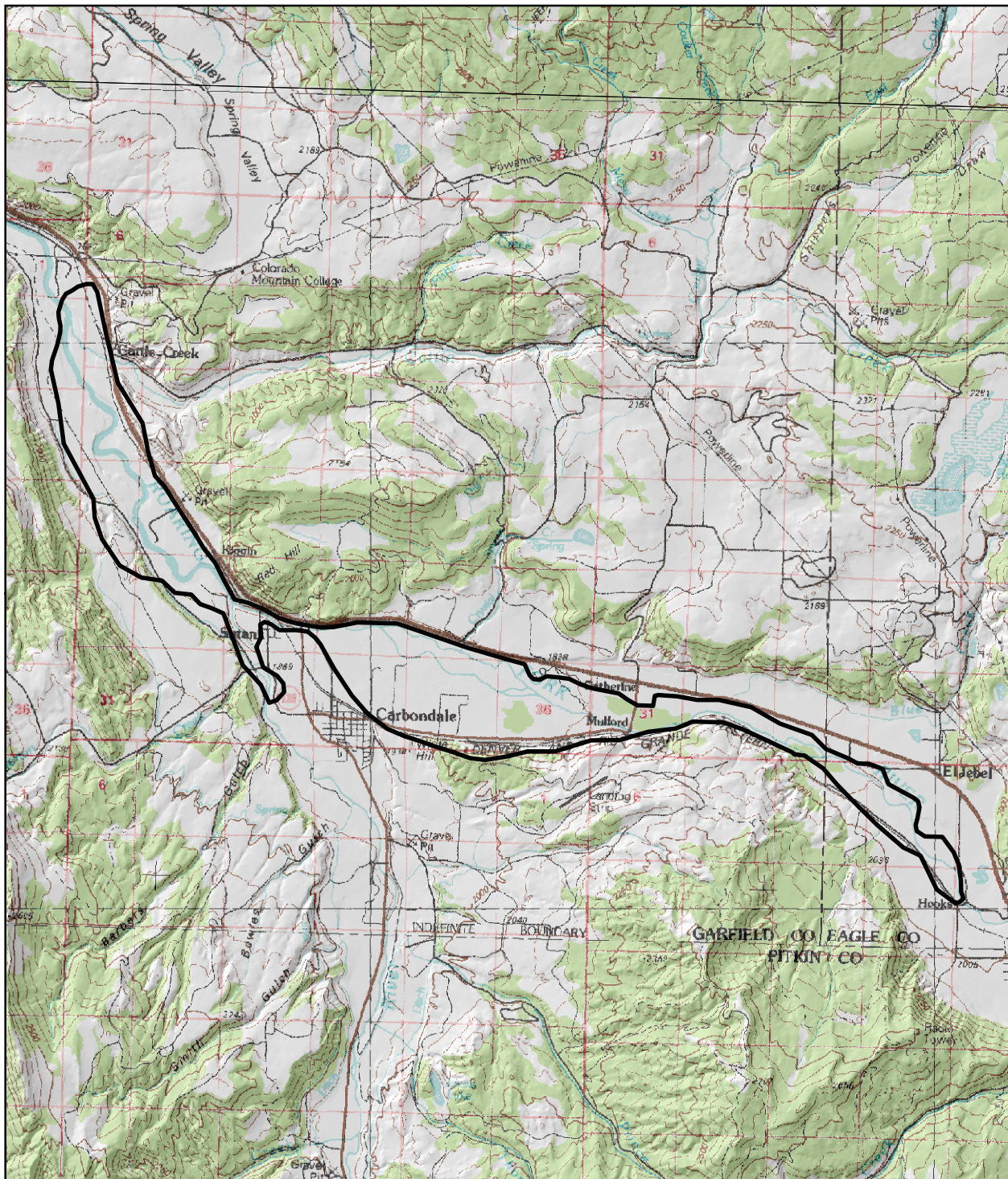
Exotic Species Comments: Exotics include houndstongue (*Cynoglossum officinale*), cheatgrass (*Bromus tectorum*), sweetclover (*Melilotus officinale*), oxeye-daisy (*Leucanthemum vulgare*), plumeless and Canada thistle (*Carduus acanthoides* and *Cirsium arvense*), Tansy (*Tanacetum vulgare*), Russian olive (*Elaeagnus angustifolia*), orchard grass (*Dactylis glomerata*) and Kentucky blue grass (*Poa pratensis*). Tansy (*Tanacetum vulgare*) is the most aggressive exotic in the site and should be controlled with care not to disturb soils or impact rare species.

References

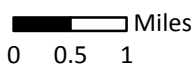
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Version Author: Malone, D.G. and J.E. Handwerk

Version Date: 08/16/2016



 PCA Boundary

 Miles
0 0.5 1

Map Date: 10/13/2016



30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Carbondale, 39107-A1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Roaring Fork River at Carbondale Potential Conservation Area, B2: Very High Biodiversity Significance

The Crown

Biodiversity Rank - B2: Very High Biodiversity Significance

Protection Urgency Rank - P2: Threat/Opportunity within 5 Years

Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss

U.S.G.S. 7.5-minute quadrangles: Leon, Basalt, Carbondale, Mount Sopris

Size: 16,386 acres (6,631 ha)

Elevation: 6,500 - 8,800 ft. (1,981 - 2,682 m)

General Description: The Crown is bound by Prince Creek to the west, West Sopris Creek to the east, and the Roaring Fork River to the north. The site ranges in elevation from about 6,500 feet along the Roaring Fork River, to 8,800 feet at the summit of The Crown. Shadowed by Mount Sopris at 12,953 feet, this site is spectacular. It is characterized by pinon - juniper (*Pinus edulis* - *Juniperus* sp.) woodlands, oak (*Quercus gambelii*), and sagebrush (*Artemisia tridentata*) shrublands. Within the large areas of oak shrublands, there is an area which is dominated by oak and snowberry (*Symphoricarpos oreophilus*), which is an uncommon plant association in Colorado. The sagebrush dominated areas are known to support the globally rare Harrington's beardtongue (*Penstemon harringtonii*), although a low total number of individuals have been documented for this location. The west-facing slopes from The Crown to Prince Creek are steep with intermittent creeks. In contrast, the slopes down to West Sopris Creek and are gentle rolling hills. This large area is in good overall condition, however scattered roads and trails used by recreationists are creating erosion and weed problems. Since 1999, an extensive network of recreational trails, dominated by mechanized and motorized recreational users, has fragmented, disturbed and altered the native habitat. These habitat alterations have diminished the carrying capacity of the landscape and degraded wildlife value and ecosystem functions throughout the site. Weeds are ubiquitous and soils are eroding along the numerous roads and trails that criss-cross the landscape.

Biodiversity Significance Rank Comments (B2): This site contains good (B-ranked) occurrences of a plant species which is vulnerable on a global scale. Harrington's beardtongue (*Penstemon harringtonii*) is a globally rare (G3) plant species that is endemic to Colorado and is found almost exclusively in sagebrush habitat. In general, Harrington's beardtongue and its habitat are highly threatened due to residential and recreational development. These threats, in addition to its restricted range, create an urgency for protection. Harrington's beardtongue populations are known to fluctuate in population numbers from year to year. Although a low total number of individuals have been documented within this site, it may be a higher priority than the current information reflects.

Natural Heritage element occurrences at the The Crown PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Natural Communities	<i>Quercus gambelii</i> - <i>Cercocarpus montanus</i> / (<i>Carex geyeri</i>) Shrubland	Mixed Mountain Shrublands	G3	S3				C	1998-09-03
Natural Communities	<i>Quercus gambelii</i> / <i>Amelanchier utahensis</i> Shrubland	Mixed Mountain Shrubland	G3G5	S2				B	1998-09-03
Natural Communities	<i>Quercus gambelii</i> / <i>Symphoricarpos oreophilus</i> Shrubland	Mixed Mountain Shrublands	G5	S5				A	1997-07-01
Vascular Plants	<i>Penstemon harringtonii</i>	Harrington beardtongue	G3	S3			BLM/US FS	B	2015-06-28
Vascular Plants	<i>Penstemon harringtonii</i>	Harrington beardtongue	G3	S3			BLM/US FS	B	1993-06-23

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: Several uncommon plant communities are found within the site, including *Quercus gambelii* - *Cercocarpus montanus* / (*Carex geyeri*), *Quercus gambelii* / *Symphoricarpos oreophilus*, and *Quercus gambelii* / *Amelanchier utahensis* Mixed Mountain Shrublands.

Boundary Justification: Approximately 7,000 acres are included in this site. The boundary encompasses the mosaic of community types in which the elements of concern are found. The surrounding high quality habitat acts as a buffer to direct disturbances, such as trampling and indirect disturbances, such as unnatural erosion. The site also provides additional suitable habitat for the elements to establish in over time.

Protection Urgency Rank Comments (P2): This site is publicly owned and managed by the Bureau of Land Management, and is largely bounded by lands that have been extensively and increasingly altered by a variety of anthropogenic development activities including agricultural conversion, livestock grazing, residential development and roads. These alterations inhibit the potential for the elements to migrate into more suitable habitat. Acquiring conservation easements would enhance long-term survivability potential by enabling population migration and expansion. The Crown has become one of the most popular trail networks for mountain bikers in the last decade. According to the BLM, The Crown and nearby Red Hill attract the highest number of mountain bike users per year on BLM lands in the Roaring Fork Valley.

Management Urgency Rank Comments (M2): Trail-induced habitat fragmentation and related high and intense level of human disturbance has reduced carrying capacity, threatens wildlife values and alters ecosystem processes including hydrologic, soil and vegetation processes. BLM's management plan specifies that The Crown is to be managed primarily for day-use recreation, with an emphasis on mountain biking and limited

motorized use. BLM's plan recommends constructing "approximately 12-to-15 miles of new single-track mountain bike trails to create loop trails, link existing trails, reduce the amount of biking on roads and create trail connections to new access points. The BLM designated the Crown as a "special recreation" area and did not designate the ridge on the Crown as an area of "critical environmental concern," as requested by Pitkin County. *Penstemon harringtonii* habitat by is characterized by sage shrublands. Age classes of these shrublands are dominated by decadent age class individuals with minimal recruitment. Herbaceous cover in sage habitat is often dominated by *Bromus tectorum* and *Poa bulbosa*, non-native species which are fire-prone and provide little to no wildlife value. Surveys in 2015 of the occurrence of *P. harringtonii* located in the Garfield County portion of this site documented a moderately-sized, reproductively successful population with hundreds of individuals comprised of all age classes. This site occurs along a historic but now closed road. Number of individuals has increased significantly since the 1993 survey.

References

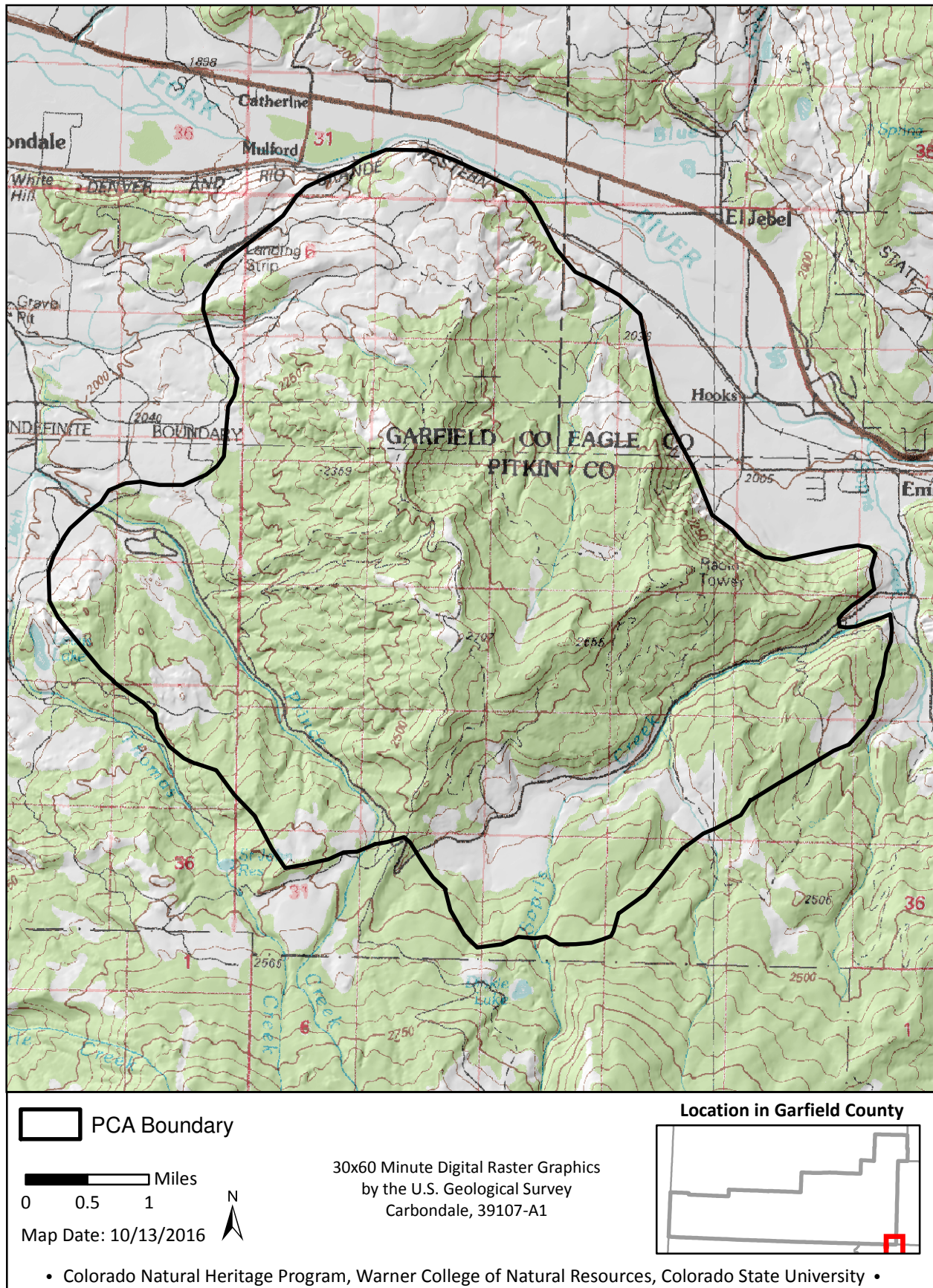
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Version Date: 08/17/2016



The Crown Potential Conservation Area, B2: Very High Biodiversity Significance

East Divide Creek

Biodiversity Rank - B3: High Biodiversity Significance

Protection Urgency Rank - P2: Threat/Opportunity within 5 Years

Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality

U.S.G.S. 7.5-minute quadrangles: Gibson Gulch

Size: 2,250 acres (911 ha)

Elevation: 6,100 - 7,200 ft. (1,859 - 2,195 m)

General Description: The East Divide Creek site occupies a steep, rocky, south and southwest facing hillside with pinyon pine and Utah juniper. There is considerable naturally eroded bare soil derived from the Wasatch formation. Wetherill milkvetch is found in dry washes and on barren eroded areas. Other plants in the site include antelope bitterbrush (*Purshia tridentata*), many-lobed groundsel (*Senecio multilobatus*), and roughseed cat's-eye (*Cryptantha flavoculata*).

Biodiversity Significance Rank Comments (B3): This site contains an excellent to good (AB-ranked) occurrence of a globally vulnerable (G3/S3) Wetherill's milkvetch (*Astragalus wetherillii*). Surveys conducted in 2015 documented two new sub-populations of *A. wetherillii*. This population is comprised of numerous sub-populations which, taken together, comprise a large population. The sub-population structure confers added potential for long-term viability. Also documented during 2015 surveys is a fair (C-ranked) occurrence of the state imperiled (G3G5/S2) Gambel oak-Utah serviceberry (*Quercus gambelii*-*Amelanchier utahensis*) mixed mountain shrubland.

Natural Heritage element occurrences at the East Divide Creek PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Natural Communities	<i>Quercus gambelii</i> / <i>Amelanchier utahensis</i> Shrubland	Mixed Mountain Shrubland	G3G5	S2				C	2015-07-14
Vascular Plants	<i>Astragalus wetherillii</i>	Wetherill's milkvetch	G3	S3				AB	2015-07-10

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: An historical occurrence of northern leopard frog is within the north-eastern portion of the site.

Boundary Justification: The boundary includes both the surveyed location of Wetherill milkvetch, and some additional land to the east with the same aspect, geology and vegetation which was not surveyed, but is expected to also harbor the milkvetch.

Protection Urgency Rank Comments (P2): The site is primarily located on BLM land, with a small amount of private land included in the southwest part of the site above East Divide

Creek. BLM and private lands have been leased for oil and gas development and in 2016 directional and horizontal wells densely cover the landscape (<https://www.fractracker.org/map/us/colorado/>). Grazing intensity and duration on public lands has altered native vegetation, soil condition and consequently system resiliency. Although occurrences of *A. wetherillii* are typically isolated from direct impacts of livestock grazing and energy development, indirect impacts of these development activities on ecosystem processes including on hydrologic, community and soil processes, ultimately diminishes the long-term viability potential of *Astragalus wetherillii*.

Management Urgency Rank Comments (M3): The site is undisturbed except for natural erosion. Mesa tops are excessively grazed and energy development infrastructure has heavily fragmented the landscape (<https://www.fractracker.org/map/us/colorado/>). Although *A. wetherillii* is typically restricted to sandy soils associated with sedimentary rock ledges below mesa rims and to steeper slopes on the banks of washes, the soils are unconsolidated, highly erodible and susceptible to disturbance. Restoration of energy infrastructure-induced disturbance (roads, well-pads, injection pits etc.) is essential to restoring landscape health and sustainability. Reducing grazing intensity and duration is essential to restoring native plant communities and system resiliency.

Exotic Species Comments: Non-native plant species have invaded along roadways, dominate excessively grazed sites, and have moved into drainages. Non-native plant species include bull thistle (*Cirsium vulgare*), musk thistle (*Carduus nutans*), Canada thistle (*Cirsium arvense*), tamarisk (*Tamarix ramosissima*), Russian olive (*Elaeagnus angustifolia*), Siberian elm (*Ulmus pumila*), common mullein (*Verbascum thapsus*), houndstongue (*Cynoglossum officinale*) and cheatgrass (*Bromus tectorum*) which is ubiquitous.

References

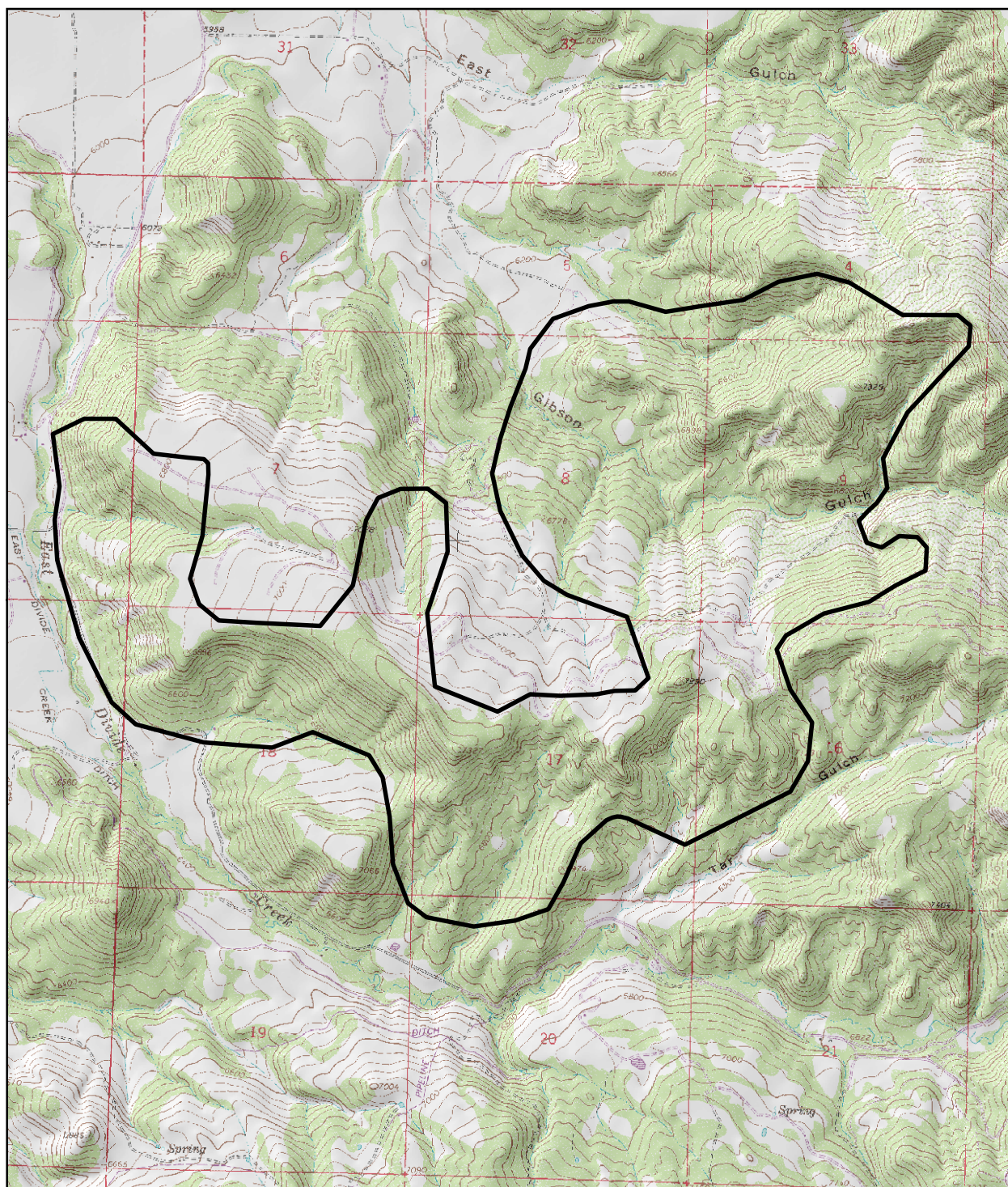
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Version Author: Malone, D.G.

Version Date: 08/13/2016



 PCA Boundary

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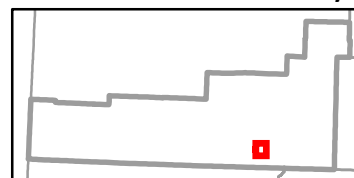
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Map Date: 10/13/2016



7.5 Minute Digital Raster Graphics
by the U.S. Geological Survey
Gibson Gulch, 39107-D5

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

East Divide Creek Potential Conservation Area, B3: High Biodiversity Significance

Main Elk Creek

Biodiversity Rank - B3: High Biodiversity Significance

Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years

Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality

U.S.G.S. 7.5-minute quadrangles: Meadow Creek Lake, Blair Mountain, Deep Creek Point

Size: 11,633 acres (4,708 ha)

Elevation: 6,400 - 10,800 ft. (1,951 - 3,292 m)

General Description: The lower portion of this site occurs in a beautiful steep-sided limestone canyon with a narrow riparian area along the canyon bottom. The surrounding canyon walls are dominated by periodic Utah serviceberry (*Amelanchier utahensis*) and spruce - fir forest, while other upland areas have a prevalence of Douglas-fir (*Pseudotsuga menziesii*), aspen (*Populus tremuloides*), and Gambel's oak (*Quercus gambelii*). The steep limestone walls create a cool, moist, and lush riparian area dominated by narrowleaf cottonwood (*Populus angustifolia*), chokecherry (*Prunus virginiana*), river birch (*Betula occidentalis*), blue spruce (*Picea pungens*), red-osier dogwood (*Cornus sericea*), thinleaf alder (*Alnus incana*), mountain willow (*Salix monticola*), sandbar willow (*S. exigua*), and Drummond's willow (*S. drummondiana*). The understory is composed of a diversity of herbaceous species. Further upstream, various willow species dominate the riparian areas while Engelmann spruce (*Picea engelmannii*), subalpine fir (*Abies lasiocarpa*), and aspen dominate the upland slopes. Main Elk Creek also supports a population of the Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*). Soils at this site are not mapped by the county soil survey. The U.S. Forest Service in Glenwood Springs may have soil maps for this area. Heavy grazing may be altering normal nutrient cycles along the creek by contributing excess carbon/nutrients to the system and by disrupting the soil surface via hoof action, which might increase erosion and the rate of nutrient transformations in the soil. This site contains a long riparian area with a fairly high cover of woody vegetation, thus the capacity of this wetland to perform flood attenuation and bank stabilization may be good. The presence of permanent water within such an arid landscape provides important habitat for numerous birds, mammals, and insects.

Biodiversity Significance Rank Comments (B3): The site contains two occurrences, one in good (B-ranked) condition and one in fair (C-ranked) condition, of a state vulnerable (G4T3/S3) fish subspecies, Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*). Cutthroat trout are a sensitive species that are native to the Colorado River Basin, and have recently been in decline. Remnant populations still remain in Colorado, Wyoming, and Utah. The genetic purity of the cutthroat here is rated B-. There are also several occurrences of communities in good condition. The state rare (G4/S2) blue spruce / red-osier dogwood community occurrence rank was down-graded from excellent (A-rank) to good (B-rank) due to infestations of common mullein and musk thistle.

Natural Heritage element occurrences at the Main Elk Creek PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Fish	<i>Oncorhynchus clarkii pleuriticus</i>	Colorado River Cutthroat Trout	G4T3	S3		SC	BLM/US FS	C	1996-99-99
Fish	<i>Oncorhynchus clarkii pleuriticus</i>	Colorado River Cutthroat Trout	G4T3	S3		SC	BLM/US FS	B	1997-99-99
Natural Communities	<i>Picea pungens</i> / <i>Cornus sericea</i> Woodland	Montane Riparian Forest	G4	S2				B	2015-07-21
Natural Communities	<i>Salix drummondiana</i> / Mesic Forbs Shrubland	Drummonds Willow / Mesic Forb	G4	S4				B	1993-07-21
Natural Communities	<i>Betula occidentalis</i> / <i>Maianthemum stellatum</i> Shrubland	Foothills Riparian Shrubland	G4?	S3					1996-09-20

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: The boundary encompasses Main Elk Creek and its tributaries in their entirety. Thus, the floodplain and immediate watershed, which are necessary to support natural hydrological processes are included to ensure the long-term maintenance of the riparian ecosystems, including the fish populations.

Protection Urgency Rank Comments (P3): SIA designation is warranted. Currently the site is entirely managed by the White River National Forest.

Management Urgency Rank Comments (M3): Immediate weed management is essential to prevent the spread of invasive weeds and maintain the quality of the occurrences. Non-native species such as hound's tongue (*Cynoglossum officinale*), Canada thistle (*Cirsium arvense*), and timothy (*Phleum pratense*) are prevalent in some portions of the lower part of the site. Common mullein (*Verbascum thapsus*) and musk thistle (*Carduus nutans*) infest several sites along this stream reach. The purity of the Colorado River cutthroat trout population needs to be reevaluated due to age. The quality of riparian vegetation and soil needs improvement and brook trout need removing. Grazing occurs in the middle to upper reaches of the creek. There are several roads in the upper reaches which should be watched for siltation. USFS should consider removing rainbow trout from Meadow Creek Lake. Management should include locating and/or erecting a downstream barrier. Installation of fish barriers to prevent further migration of non-native trout into the cutthroat habitat, elimination of the non-native brook trout through chemical treatment, and transplanting genetically pure cutthroat into the rehabilitated habitat (Spahr et al. 1991) would secure preservation of this cutthroat population. Streamside grazing by livestock could change the hydrology of Main Elk Creek by increasing sedimentation and reducing streamside shrub cover, stream shade, and ultimately increasing water temperatures. Restricting grazing along Main Elk Creek would benefit the cutthroat trout population. Cutthroat trout are

susceptible to overharvest if angling is unrestricted, so Colorado has instituted restrictive angling regulations. Strict enforcement of these regulations will help to ensure survival of this population of cutthroats.

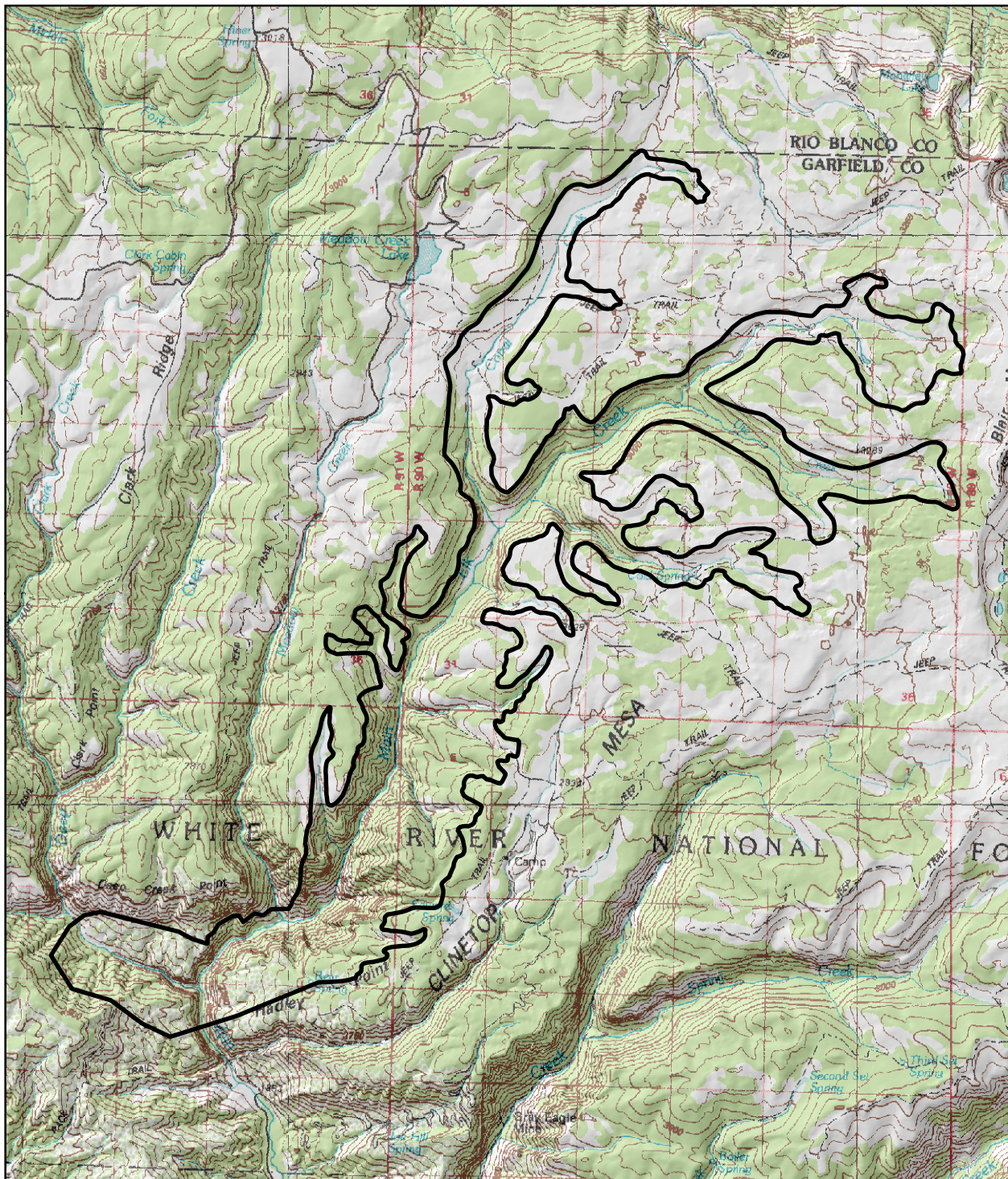
Off-Site Considerations: Hydrological processes originating outside of the planning boundary, including water quality, quantity, and timing, must be managed to maintain the population viability.

References

Malone, D. J. Emerick, P. Lyon, and J. Sovell. 2016. CNHP Final Report: Survey of Critical Biological Resources: a resurvey and update of Potential Conservation Areas in Garfield County, Colorado. Colorado Natural Heritage Program, Fort Collins, CO.

Version Author: Malone, D.G.

Version Date: 08/13/2016



 PCA Boundary

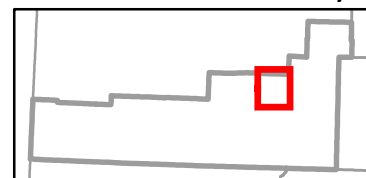
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Map Date: 10/13/2016



30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Glenwood Springs, 39107-E1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Main Elk Creek Potential Conservation Area, B3: High Biodiversity Significance

Mitchell Road

Biodiversity Rank - B3: High Biodiversity Significance

Protection Urgency Rank - P2: Threat/Opportunity within 5 Years

Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality

U.S.G.S. 7.5-minute quadrangles: Badger Wash, Carbonera, Jim Canyon, Bar X Wash

Size: 4,078 acres (1,650 ha)

Elevation: 4,938 - 5,377 ft. (1,505 - 1,639 m)

General Description: This site lies within the saltbush fans and flats characteristic of areas south of the Bookcliffs and possesses a large percentage of bare ground. It contains gently rolling hills of light gray clay soils derived from Mancos shale and covered by desert shrubs. Between the hills lie shallow draws and swales dominated by shortgrasses. Several drainages that are dry most of the year run generally south to West Salt Creek. Two pipelines pass through the site, and Mitchell Road and Baxter Pass Roads form the north and west boundaries. Vegetation is salt desert shrubland dominated by shadscale (*Atriplex confertifolia*) and Gardner saltbush (*A. gardneri*), with a substantial amount of bare soil. Other common plants are pretty buckwheat (*Eriogonum bicolor*), snakeweed (*Gutierrezia sarothrae*), and Prince's plume (*Stanleya pinnata*). Major weed species in the site are cheatgrass (*Bromus tectorum*) and Jim Hill mustard (*Sisymbrium altissimum*). In some areas, the grass understory is dominated by cheatgrass. The site is on private and BLM lands. The portion on BLM land is managed for livestock grazing. Substrata of the area consists of unconsolidated alluvial and gravel deposits of the Quaternary period and older sedimentary deposits of Mancos shale from the Cretaceous period. There are recent observations of a rare plant, mammal, and lizard, together with past records of a rare plant community.

Land Use History: Historically and at present this site is extensively grazed by livestock, although lack of water resources has prevented and will continue to prevent conversion of the area to agricultural cropland.

Biodiversity Significance Rank Comments (B3): This site contains an excellent (A-ranked) occurrence of Grand buckwheat (*Eriogonum contortum*) which is vulnerable on a global scale (G3/S2). Surveys conducted in 2015 documented a fair (C-rank) occurrence of the globally imperiled (G2/S1) Cisco sego lily (*Calochortus ciscoensis*), a fair (C-rank) occurrence of the globally vulnerable but state critically imperiled (G3/S1) southwestern cats-eye (*Oreocarya mensana*), and additional subpopulations of the state imperiled (G5/S1) long-nosed leopard lizard (*Gambela wislizenii*) reptile species. There are also fair (C-ranked) and poor (D-ranked) occurrences of white-tailed prairie dog (*Cynomys leucurus*).

Natural Heritage element occurrences at the Mitchell Road PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Mammals	<i>Cynomys leucurus</i>	White - tailed Prairie Dog	G4	S4			BLM/US FS	C	2000-06-19
Mammals	<i>Cynomys leucurus</i>	White - tailed Prairie Dog	G4	S4			BLM/US FS	D	2000-06-19
Natural Communities	<i>Atriplex confertifolia</i> / <i>Leymus salinus</i> Shrubland	Cold Desert Shrublands	G3G5	SU				BC	1983-05-12
Reptiles	<i>Gambelia wislizenii</i>	Longnose Leopard Lizard	G5	S1		SC	BLM	B	2015-05-20
Vascular Plants	<i>Calochortus ciscoensis</i>	Cisco sego lily	G2	S1				C	2015-05-20
Vascular Plants	<i>Eriogonum contortum</i>	Grand buckwheat	G3	S2			BLM	A	2000-06-13
Vascular Plants	<i>Oreocarya mensana</i>	southwestern cat's - eye	G3	S1				C	2015-05-20

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: The boundary was drawn to include a collection of rare species, but particularly the Grand buckwheat of which three subpopulations are included, as well as nearby occurrences of the longnose leopard lizard and white-tail prairie dog. The habitat of all three species is the salt desert shrub community below the Bookcliffs. Adjacent habitat not included in the boundary may support expansion of the buckwheat population and particularly the prairie dog colonies and are of equal value. The boundary includes habitat sufficient to enable the expansion and northward migration in response to climate change.

Protection Urgency Rank Comments (P2): Livestock-induced range degradation has decreased the resiliency of the landscape to environmental perturbations such as drought. Diminished system resiliency in combination with a changing climate has increased vulnerability to loss of species and diminished system function.

Management Urgency Rank Comments (M3): Grazing already heavily impacts the area and although reduction of grazing disturbance would be beneficial it does not appear to further threaten the elements. Due to inappropriate livestock grazing BLM's rangeland health standards are not met in this site or in the surrounding landscape (<http://www.peer.org/campaigns/public-lands/public-lands-grazing-reform/blm-grazing-data-interactive-map.html>). As indicated by vegetation cover and composition and soil condition, excessive livestock grazing has altered system function thereby diminished site potential and resiliency. Although this occurrence of *Calochortus ciscoensis* is currently small in areal extent, historically, prior to livestock grazing, given the current distribution this species likely covered large areas across this landscape. Restoring system function,

including particularly soils, vegetation and hydrology, by reducing livestock grazing intensity and duration would not only improve the potential for long term viability and recovery of this species but would also restore the system's resiliency to drought thereby improving range grazing capacity. Actions that increase ecosystem resilience and enhance the adaptive capacity of system will cushion their vulnerability to changing climate conditions, and should be a primary focus of management efforts (CNHP 2015).

Exotic Species Comments: Cheatgrass (*Bromus tectorum*), desert madwort (*Alyssum desertorum*) and cranesbill (*Erodium cicutarium*) dominate the herbaceous cover throughout this site.

References

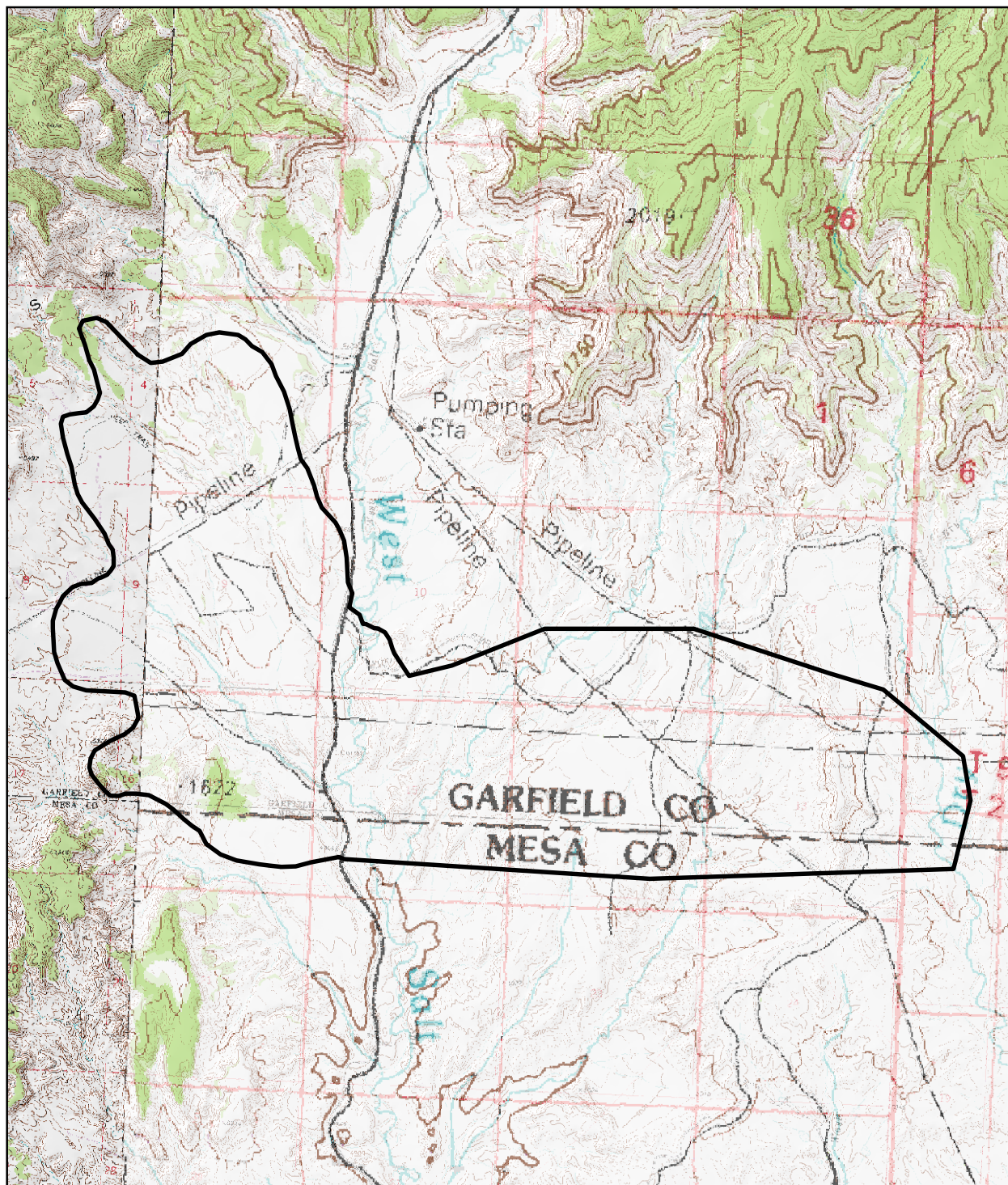
Batchelor, J.L., W.J Ripple, T.M Wilson and L.E. Painter. 2015. Restoration of Riparian Areas Following the Removal of Cattle in the Northwestern Great Basin, *Environmental Management*. DOI 10.1007/s00267-014-0436-2

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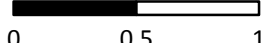
Malone, D. J. Emerick, P. Lyon, and J. Sovell. 2016. CNHP Final Report: Survey of Critical Biological Resources: a resurvey and update of Potential Conservation Areas in Garfield County, Colorado. Colorado Natural Heritage Program, Fort Collins, CO.

Version Author: Malone, D.G.

Version Date: 08/13/2016



 PCA Boundary

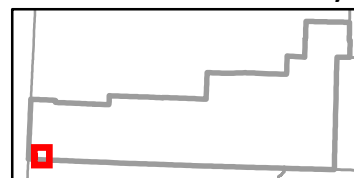
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Map Date: 10/13/2016



30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Grand Junction, 39108-A1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Mitchell Road Potential Conservation Area, B3: High Biodiversity Significance

Smith Gulch

Biodiversity Rank - B3: High Biodiversity Significance

Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years

Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality

U.S.G.S. 7.5-minute quadrangles: Stony Ridge, Carbondale, Cattle Creek, Mount Sopris

Size: 3,483 acres (1,410 ha)

Elevation: 7,000 - 8,000 ft. (2,134 - 2,438 m)

General Description: Edgerton Creek, Barbers Gulch and Smith Gulch are intermittent drainages that flow to the Crystal River just above its confluence with the Roaring Fork River. This area is characterized by a combination of pinon - juniper (*Pinus edulis* - *Juniperus osteosperma*) woodlands, oak (*Quercus gambelii*) shrublands, and sagebrush (*Artemisia tridentata*) shrublands. The sagebrush shrublands are known to support a globally rare plant species, Harrington's beardtongue (*Penstemon harringtonii*). Osterhout's beardtongue (*Penstemon osterhoutii*) is also found here. This species is common, though only known from Colorado.

Land Use History: State Wildlife Area

Biodiversity Significance Rank Comments (B3): This site supports a good (B-ranked) occurrence of Harrington's beardtongue (*Penstemon harringtonii*), a globally-vulnerable (G3) plant species which is restricted to Colorado and is found almost exclusively in sagebrush habitat. All locations are centered around Edwards, in Eagle County. In general, Harrington's beardtongue and its habitat are threatened by residential development. These threats, in addition to its restricted range, create an urgency for protection. Harrington's beardtongue populations are known to fluctuate in population numbers from year to year. Therefore, this specific location may be a higher priority than the current information reflects. The Smith Gulch site includes several scattered sub occurrences for this species which vary from good to poor condition.

Natural Heritage element occurrences at the Smith Gulch PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Vascular Plants	<i>Penstemon harringtonii</i>	Harrington beardtongue	G3	S3			BLM/US FS	D	1998-06-16
Vascular Plants	<i>Penstemon harringtonii</i>	Harrington beardtongue	G3	S3			BLM/US FS	F	1997-08-13
Vascular Plants	<i>Penstemon harringtonii</i>	Harrington beardtongue	G3	S3			BLM/US FS	B	1998-06-16
Vascular Plants	<i>Penstemon harringtonii</i>	Harrington beardtongue	G3	S3			BLM/US FS	C	2006-07-21

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

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

Protection Urgency Rank Comments (P3): The site includes both private and Bureau of Land Management lands. The area occupied by Harrington's beardtongue (*Penstemon harringtonii*) in the northern part of the site has been converted to a horse pasture and *P. harringtonii* is no longer present there. The entire area surrounding the occurrence also experiences heavy livestock grazing and no *P. harringtonii* were found in the surrounding habitat. The landscape may be impacted in the future by road or housing developments as there are high development pressures from Carbondale. One of the private landowners is interested in preserving the rangeland and the rare plant. Actions could include the development of conservation easements or management agreements with willing private landowners, and specific management plans for the BLM lands that would address the long-term viability of the rare plant at this location. BLM lands should be considered for Area of Critical Environmental Concern (ACEC) or Special Interest Area (SIA) designation.

Management Urgency Rank Comments (M3): Hay grasses are frequent and should be controlled, along with a few other exotic plant species such as yellow sweet clover (*Melilotis officinale*) and houndstongue (*Cynoglossum officinale*). Much of the land has been grazed since the 1930's, and smaller portions have been planted with hay grasses, which are likely spreading to other areas. Patches of sagebrush that are heavily grazed do not contain Harrington's beardtongue. Areas that are grazed less heavily contain populations of Harrington's beardtongue that are in good condition. Grazing activities should be managed to ensure that they are compatible with the survival of the rare plants.

Land Use Comments: The occurrence seems to be primarily on the roadsides; the adjacent land is being grazed and has been planted with hay grasses in some areas.

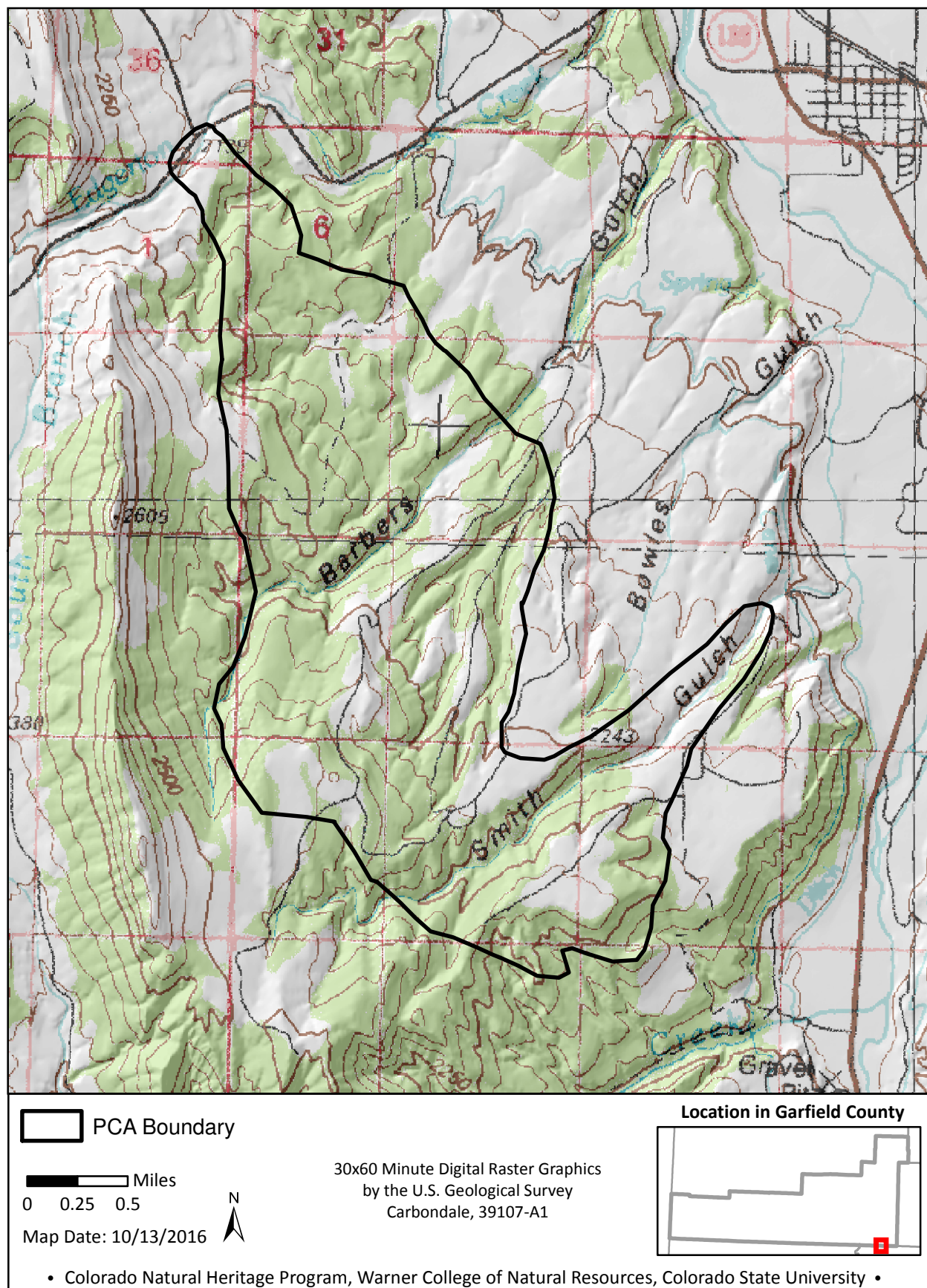
Exotic Species Comments: Hay grasses are common. Exotic plant species are widely distributed throughout the site and include: yellow sweet clover (*Melilotis officinale*), houndstongue (*Cynoglossum officinale*), musk thistle (*Carduus nutans*), and cheatgrass (*Bromus tectorum*).

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Version Date: 08/17/2016



Smith Gulch Potential Conservation Area, B3: High Biodiversity Significance

Trappers Lake

Biodiversity Rank - B3: High Biodiversity Significance

Protection Urgency Rank - P4: No Threat or Special Opportunity

Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality

U.S.G.S. 7.5-minute quadrangles: Trappers Lake, Big Marvine Peak, Devils Causeway

Size: 6,239 acres (2,525 ha)

Elevation: 9,600 - 11,200 ft. (2,926 - 3,414 m)

General Description: This site is composed of numerous subalpine lakes, ponds, willow carrs, and forested streams within a large matrix of a subalpine forest dominated by subalpine fir (*Abies lasiocarpa*), blue spruce (*Picea pungens*), and Engelmann spruce (*P. engelmannii*). Most of the site occurs in a beautiful, wide subalpine basin surrounded by cliffs and escarpments, which form the slopes of an elevated plateau. Numerous lakes atop the plateau drain into the subalpine basin, where smaller lakes are formed in depressions and from beaver activity. Eventually, these small creeks drain into Trappers Lake, which forms the headwaters of the North Fork White River. Planeleaf willow (*Salix planifolia*), wolf willow (*S. wolfii*), marsh marigold (*Caltha leptosepala*), water sedge (*Carex aquatilis*), beaked sedge (*C. utriculata*), and bluejoint reedgrass (*Calamagrostis canadensis*) are common along the creeks and edges of beaver ponds and lakes. Short-fruit willow (*Salix brachycarpa*), Ross sedge (*Carex rossii*), small-winged sedge (*Carex microptera*), and tufted hairgrass (*Deschampsia cespitosa*) are common in mesic/wet meadows found throughout the area. A boreal toad (*Anaxyrus boreas*) was observed near the edge of Trappers Lake and much of the wetland/riparian habitat within this site could provide potential habitat for the boreal toad. The numerous subalpine meadows dispersed throughout the site are potential habitat for the Theano alpine (*Erebia theano*), a state rare butterfly. A few of the lakes within the site support a breeding population of Barrow's Goldeneye (*Bucephala islandica*). Fraser Creek, one of the main tributaries draining into Trappers Lake, supports a population of the Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*). Soils at this site are not mapped by the county soil survey. The U.S. Forest Service in Glenwood Springs may have soil maps for this area. A functional assessment was conducted for this site; please see report (Survey of Critical Wetlands and Riparian Areas of Garfield County, Rocchio, J. 2001).

Biodiversity Significance Rank Comments (B3): This site supports a good (B-ranked) occurrence of the globally vulnerable (G4T3/S3) Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*) and excellent (A-ranked) occurrences of several globally common wetland and riparian plant communities. There are also two good (B-ranked) occurrences of the state imperiled Barrow's Goldeneye (*Bucephala islandica*), a poor (D-ranked) occurrence of the globally critically imperiled (G4T1Q/S1) boreal toad (*Anaxyrus boreas*) and an occurrence of the state vulnerable Theano alpine (*Erebia theano*). Surveys conducted in 2015 confirmed the presence of cutthroat trout although evaluation of condition is difficult based on the limited effort devoted to surveying. However, the fish appeared healthy and in good condition.

Natural Heritage element occurrences at the Trappers Lake PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Amphibians	Anaxyrus boreas pop. 1	Boreal Toad (Southern Rocky Mountain Population)	G4T1Q	S1		SE	USFS	D	1995-06-05
Birds	Aegolius funereus	Boreal Owl	G5	S2			USFS		1993-07-99
Birds	Bucephala islandica	Barrow's Goldeneye	G5	S2B				E	1993-08-99
Birds	Bucephala islandica	Barrow's Goldeneye	G5	S2B				B	2000-05-23
Fish	Oncorhynchus clarkii pleuriticus	Colorado River Cutthroat Trout	G4T3	S3		SC	BLM/US FS		2015-07-09
Fish	Oncorhynchus clarkii pleuriticus	Colorado River Cutthroat Trout	G4T3	S3		SC	BLM/US FS	B	1994-99-99
Insects	Erebia pawlowskii	Theano Alpine	G5	S3					1996-07-24
Natural Communities	Deschampsia caespitosa Herbaceous Vegetation	Mesic Alpine Meadow	G4	S4				A	1992-09-02
Natural Communities	Salix brachycarpa / Mesic Forbs Shrubland	Alpine Willow Scrub	G4	S4				A	1992-09-02
Natural Communities	Salix planifolia / Caltha leptosepala Shrubland	Subalpine Riparian Willow Carr	G4	S4				A	1992-08-25
Natural Communities	Salix wolfii / Carex aquatilis Shrubland	Subalpine Riparian Willow Carr	G4	S3				A	1992-09-03
Natural Communities	Abies lasiocarpa / Mertensia ciliata Forest	Montane Riparian Forests	G5	S5				A	1992-09-02
Natural Communities	Carex utriculata Herbaceous Vegetation	Beaked Sedge Montane Wet Meadows	G5	S5				A	1992-08-25

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: The site boundaries encompass the numerous subalpine lakes, ponds, willow carrs, and forested streams in the area. The site boundaries incorporate most of the upstream watershed, however there are many small lakes and ponds scattered atop the elevated plateau that may contribute groundwater flow to the streams and ponds within the site. Protection of the upstream watershed will allow fluvial processes to maintain a

dynamic distribution of aquatic and terrestrial habitat thereby sustaining viable populations of riparian and wetland plant communities which are also critical to the viability of the Colorado River cutthroat trout. The boundaries also encompass habitat needs for the populations of Barrow's Goldeneye, Theano alpine, and boreal toad.

Protection Urgency Rank Comments (P4): This site falls in a Wilderness Area. This forest here suffered a massive wildfire in the recent past, but the fire did not affect the quality of the Frazer River drainage or Trapper's Lake for the cutthroat trout. The area is undisturbed recreational land within the Flattops Wilderness Area that is dominated by the intensely burned forest, which has recovered to native ground cover and the riparian habitat consists of high quality native herbaceous vegetation. The entire Frazer Creek drainage is within the wilderness area and is without reservoirs, impoundments, livestock grazing, or any surface disturbance of any kind.

Management Urgency Rank Comments (M3): There are major outfitter camps in every drainage and high level of recreational activity around the lake and throughout the site. Fishing, hiking, and equestrian use are common, especially around Trappers Lake. Sheep grazing also occurs in the area. Current management appears compatible with sustaining the viability of the cutthroat trout population documented in Fraser Creek. Maintaining the current hydrologic regime and preventing disturbance of both the surrounding landscape and streamside vegetation should prevent excessive erosion and sedimentation while maintaining hydrologic integrity preventing the loss of this Colorado River cutthroat trout population.

Off-Site Considerations: Hydrological processes originating outside of the planning boundary, including water quality, quantity, and timing, must be managed to maintain the population viability.

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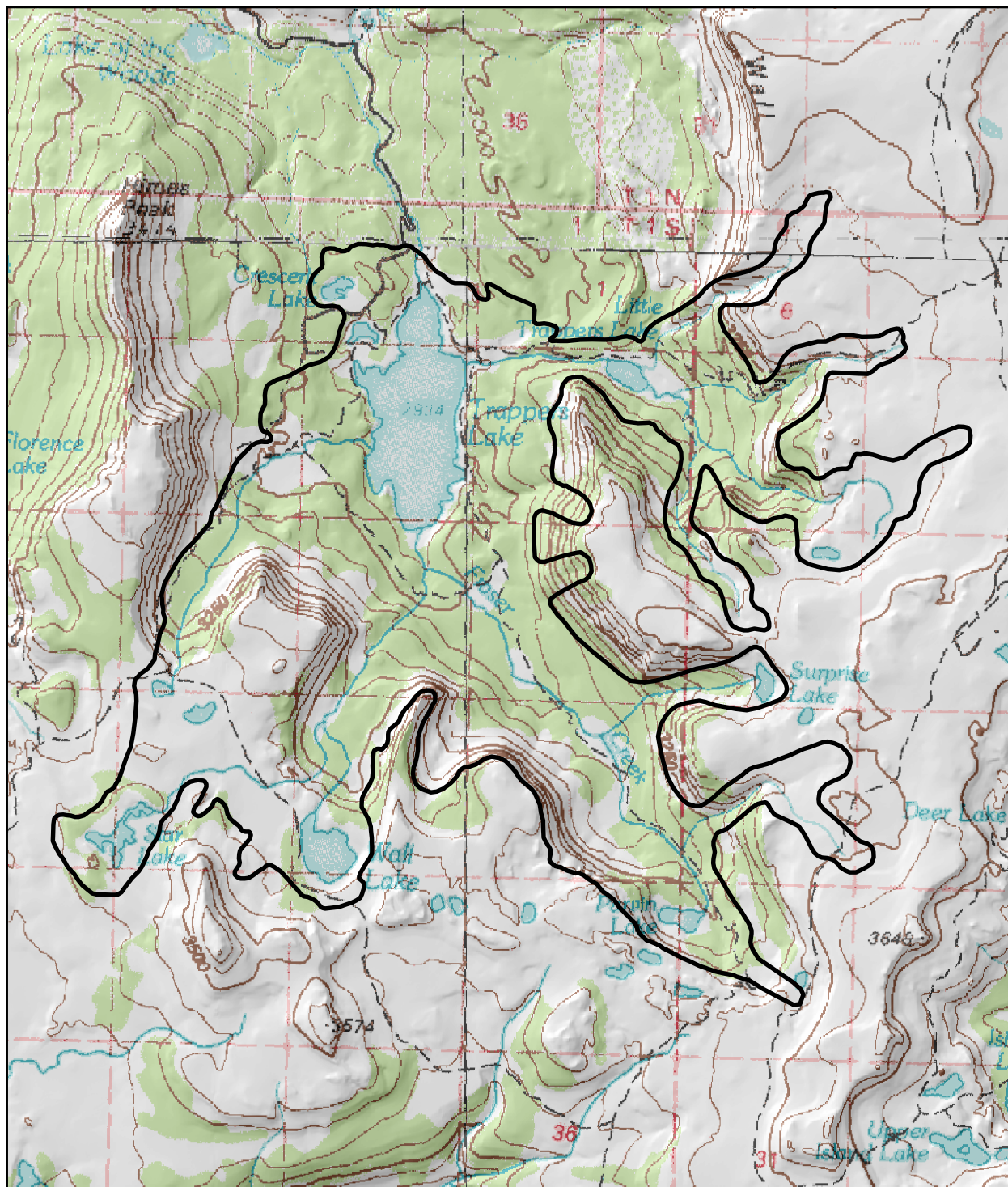
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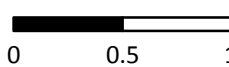
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Version Author: Sovell, J.R.

Version Date: 08/17/2016



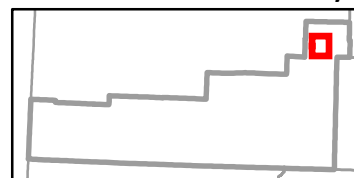
 PCA Boundary

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Map Date: 10/13/2016 

30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Glenwood Springs, 39107-E1
Meeker, 40107-A1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Trappers Lake Potential Conservation Area, B3: High Biodiversity Significance

Baldy Creek

Biodiversity Rank - B4: Moderate Biodiversity Significance

Protection Urgency Rank - P2: Threat/Opportunity within 5 Years

Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality

U.S.G.S. 7.5-minute quadrangles: Center Mountain, Gibson Gulch

Size: 5,691 acres (2,303 ha)

Elevation: 7,400 - 9,400 ft. (2,256 - 2,865 m)

General Description: Baldy Creek drains montane zone steep forested hillslopes. Upland vegetation is characterized by a mosaic of plant communities with aspen and Douglas-fir woodlands characterizing northeast-facing slopes and oak, sage shrublands and grasslands dominating southwest-facing slopes. Riparian habitat is a narrow band of vegetation with a linear mosaic of deciduous and coniferous woodlands and willow shrublands.

Key Environmental Factors: A natural flooding regime, replete with out-of-bank flows with a natural duration and intensity, is essential to the maintenance of riparian vegetation. Upland land use impacts riparian and stream habitat. Thus maintaining a natural cover of native plant species in upland habitat is also important to sustainable stream flows and consequently the maintenance of riparian habitat which, reciprocally, helps to maintain both water quality and quantity.

Biodiversity Significance Rank Comments (B4): This site supports a good (C-rank) occurrence of the globally vulnerable (G3S3) blue spruce / thinleaf alder (*Picea pungens* / *Alnus incana*) woodland community. This community occupies a montane zone floodplain along a narrow stream channel. Lower shrub layers are characterized by a mix of willow species including (*Salix lasiandra*) and Rocky Mountain willow (*S. monticola*), and red-osier dogwood (*Cornus sericea*).

Natural Heritage element occurrences at the Baldy Creek PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Natural Communities	<i>Picea pungens</i> / <i>Alnus incana</i> Woodland	Montane Riparian Forests	G3	S3				C	2015-07-14

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: Also present in this site was the globally common but state vulnerable (G5/S3B) northern goshawk (*Accipiter gentilis*). Breeding success was evidenced by observation of nestlings. This species is listed as "Sensitive" by the BLM and USFS. Greater than 80% of Colorado's native wildlife depend on riparian habitat during some phase of their life cycle including amphibians, large ungulates including elk, moose and deer, and small mammals including beaver, and songbirds.

Boundary Justification: Boundaries were drawn to encompass the landscape that enables the hydrologic processes that support streamflows and riparian habitat.

Protection Urgency Rank Comments (P2): Lower and upper reaches are owned by the State and managed by Colorado Parks and Wildlife with a GAP Status Code 3, indicating that the land is managed for multiple uses and is subject to extractive (e.g. mining or logging) or OHV use. Middle reaches are managed by the BLM also with a GAP Status Code of “3”. Livestock grazing (cattle) occurs throughout the site and extractive energy development, directional and horizontal wells, are common in this watershed (FracTracker 2016). Local hydrology and stream and riparian habitat functions are impacted by livestock grazing and may be impacted by extractive energy development.

Management Urgency Rank Comments (M3): A combination of factors result in diminished function and condition of this riparian community. Although trees and shrub cover is composed of native species, herbaceous cover commonly includes a high cover of non-native species. The hydrologic regime is slightly altered by a road that parallels the stream, consequently streambanks are often unstable with 40-50 percent of banks sloughing and failing due to road-induced channelization and inappropriate livestock grazing. Road-induced stream channelization in combination with inappropriate livestock grazing has negatively impacted streambanks and riparian vegetation and enabled weed invasion. Weed management in combination with the elimination of livestock use of the riparian zone would improve stream and riparian function and habitat resiliency.

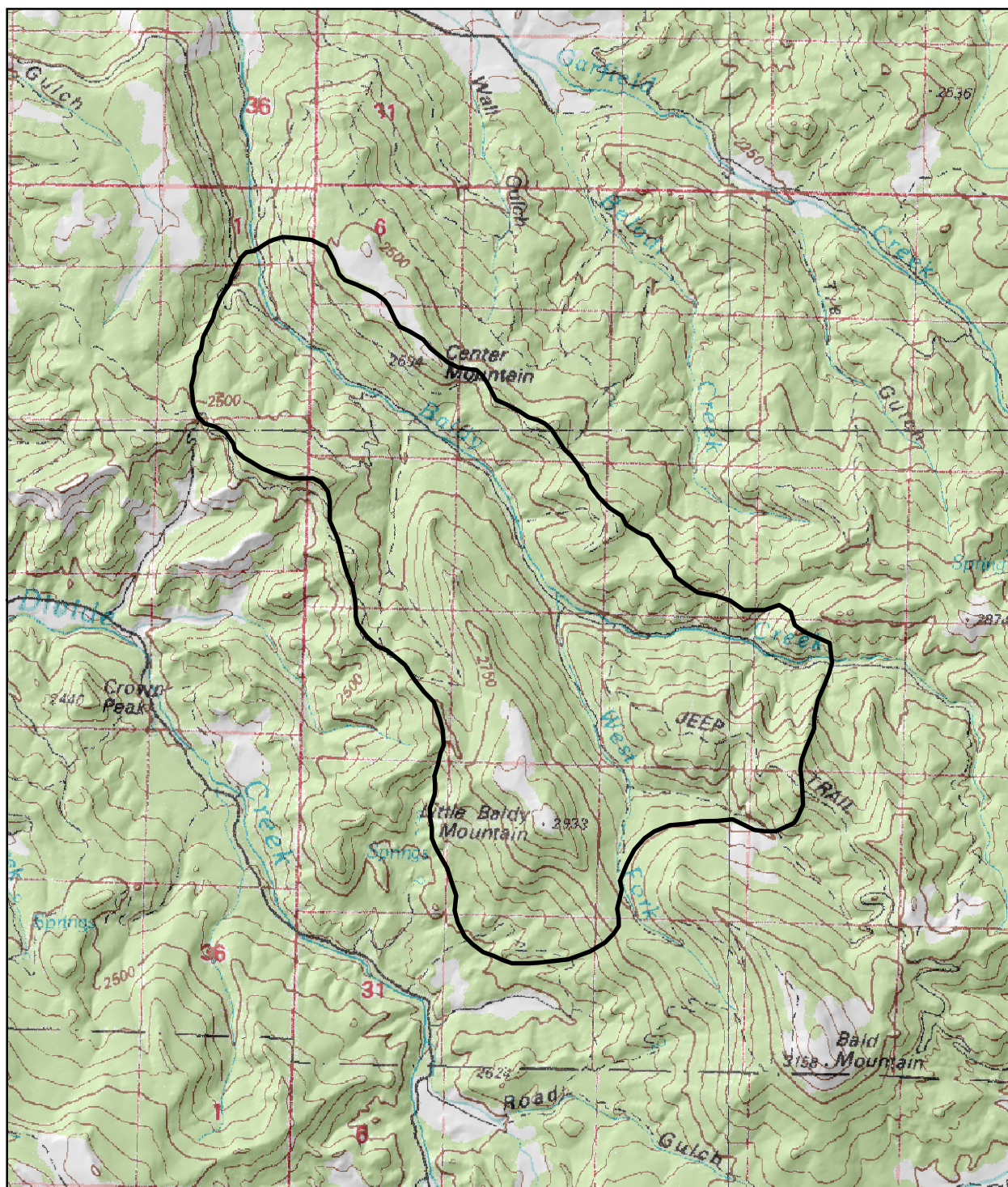
Land Use Comments: The lower reaches of this site are in the Garfield Creek State Wildlife Area.

References

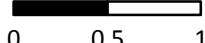
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Version Author: Malone, D.G.

Version Date: 08/21/2016



 PCA Boundary

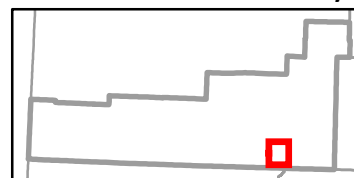
 Miles
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Map Date: 10/11/2016



30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Carbondale, 39107-A1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Baldy Creek Potential Conservation Area, B4: Moderate Biodiversity Significance

Cattle Creek at Coulter Creek

Biodiversity Rank - B4: Moderate Biodiversity Significance

Protection Urgency Rank - P2: Threat/Opportunity within 5 Years

Management Urgency Rank - M1: Essential within 1 Year to Prevent Loss

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

Size: 544 acres (220 ha)

Elevation: 6,600 - 7,200 ft. (2,012 - 2,195 m)

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

Biodiversity Significance Rank Comments (B4): This site includes a fair (C-ranked) occurrence of a globally vulnerable (G3/S3) mixed mountain shrubland (*Quercus gambelii* - *Cercocarpus montanus* / *Carex geyeri*) and a good (B-rank) occurrence of the state rare (G4/S2) Blue spruce / Red-osier dogwood (*Picea pungens* / *Cornus sericea*) forest.

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

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Natural Communities	<i>Quercus gambelii</i> - <i>Cercocarpus montanus</i> / (<i>Carex geyeri</i>) Shrubland	Mixed Mountain Shrublands	G3	S3				C	1998-08-19
Natural Communities	<i>Picea pungens</i> / <i>Cornus sericea</i> Woodland	Montane Riparian Forest	G4	S2				B	2015-07-16

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: Also documented at the site is a breeding pair of Olive-sided flycatchers (*Contopus cooperi*), a USFS sensitive species.

Boundary Justification: This boundary encompasses the north and south-facing slopes of Cattle Creek between 6,600 and 7,200 feet, which includes the mosaic of community types in which the element occurrences are found. The surrounding high quality habitat will protect the occurrences from direct disturbances, such as trampling, and indirect disturbances, such as unnatural erosion. The site also provides additional suitable habitat to allow for natural migration of the communities over time. A much larger area should be considered in order to protect the hydrological processes that support the riparian community.

Protection Urgency Rank Comments (P2): This site includes a combination of privately owned lands and lands that are owned and managed by the BLM. Residential and recreational development pressures are high. Any developments may threaten this site. Land exchanges between willing private landowners and the BLM should be considered.

Management Urgency Rank Comments (M1): Management is needed to maintain the quality of the site. There is one road along Cattle Creek which is causing erosion problems, and run-off sediments are being deposited in the riparian area. The road is also acting as a conduit for weeds. One of the best defenses against the spread of exotic species is to discourage future roads and/or trails. Management actions could include the development of a management plan, an exotic plant eradication program, and monitoring the occurrences to detect changes in their overall quality or condition. Management agreements should be sought with the BLM, private landowners, and the highway department. Maintaining natural stream flows and weed management is essential to sustaining the quality of the riparian community and stream water quality and quantity. Additionally, modifying road maintenance activities, which are currently resulting in excessive amounts of gravel moving into the stream and smothering stream macroinvertebrates, is essential to sustaining riparian habitat and maintaining water quality.

Exotic Species Comments: Weeds documented include yellow sweet clover (*Melilotis officinale*, which is rapidly invading and displacing native species), plumeless thistle (*Carduus acanthoides*), cheatgrass (*Bromus tectorum*), Russian thistle (*Salsola iberica*), common mullein (*Verbascum thapsus*), curly dock (*Rumex crispus*), houndstongue (*Cynoglossum officinale*), tansy (*Tanacetum vulgare*), reed canarygrass (*Phalaris arundinacea*, which forms dense, impenetrable stands that exclude most native riparian plants), Canada thistle (*Cirsium arvense*), and absinthe wormwood (*Artemisia absinthium*).

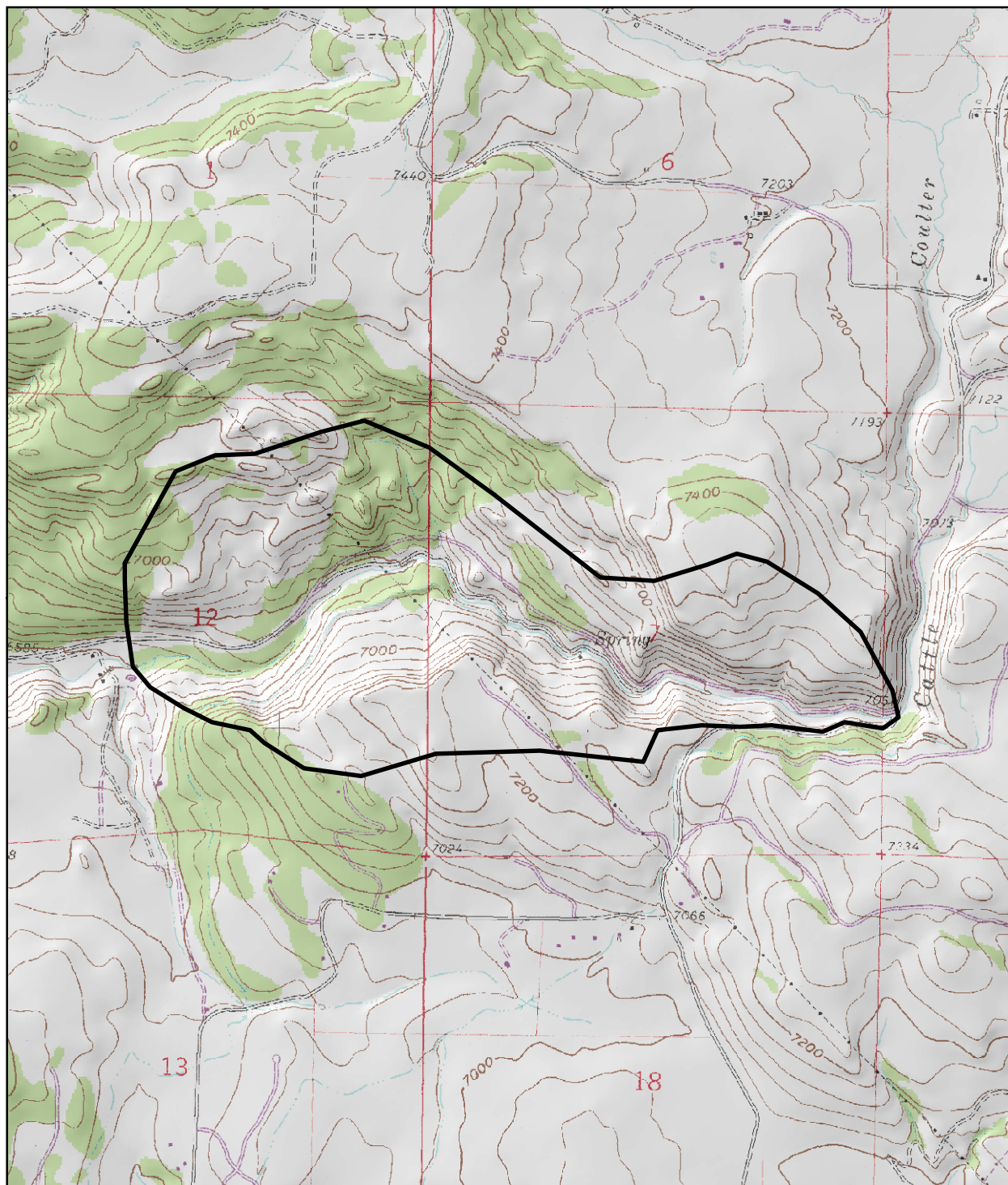
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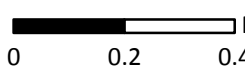
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Version Author: Malone, D.G.

Version Date: 08/13/2016



 PCA Boundary

 Miles
0 0.2 0.4

Map Date: 10/11/2016 

7.5 Minute Digital Raster Graphics
by the U.S. Geological Survey
Carbondale, 39107-D2

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Cattle Creek at Coulter Creek Potential Conservation Area, B4: Moderate Biodiversity Significance

East Douglas Creek

Biodiversity Rank - B4: Moderate Biodiversity Significance

Protection Urgency Rank - P4: No Threat or Special Opportunity

Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss

U.S.G.S. 7.5-minute quadrangles: Calf Canyon, Brushy Point

Size: 7,977 acres (3,228 ha)

General Description: East Douglas Creek is a narrow, eroding, sinuous stream that is cutting sharply into steep-sided valley walls. Upland habitat surrounding East Douglas Creek near its confluence with Brush Creek is a mosaic of ecosystems with *Quercus gambelii* shrublands characterizing drier west-facing slopes, and *Picea pungens* - *Quercus gambelii* woodlands occupying moister east-facing slopes. Riparian habitat is characterized by a moderately wide riparian floodplain dominated by herbaceous vegetation. The stream channel is downcut but, because beaver have recolonized the drainage, flows are recovering and a new channel is developing within the old downcut channel. Tree cover is dominated by *Picea pungens* which occupy only the outer margins of riparian habitat in a patchy distribution with 10-15% cover that is comprised only of mature age classes. Shrub cover dominates the community and occurs in a patchy distribution with a total of 50% cover that is characterized by a mix of species that includes *Salix lucida*, *S. serissima*, *Crataegus rivularis*, and *Betula occidentalis*. *Betula occidentalis* contributes 5% of shrub cover and is comprised of only decadent age classes with individuals occupying the historic and now abandoned floodplain. In the riparian zone herbaceous cover totals 70-80% with forbs contributing 10% and graminoids contributing 90% of herbaceous cover. Common graminoid species include *Juncus balticus*, *Carex utriculata* and *Carex pellita*. Commonly occurring forb species include *Mainenthemum stellatum*. Autumn willow (*Salix serissima*) is colonizing a newly developing riparian zone that is establishing within a historically downcut stream channel. Importantly, beaver (*Castor canadensis*) have recently moved back into this stream reach. Their activity is restoring function to this subwatershed and enabling revegetation by species such as autumn willow. Stream-flow in East Douglas Creek is maintained by numerous small seeps and springs scattered throughout the area. These seeps and springs emerge from the Green River shale formation that outcrops throughout most of the site. These areas are dominated by beaked sedge, Nebraska sedge (*Carex nebrascensis*), monkshood (*Aconitum columbianum*), fowl mannagrass (*Glyceria striata*), and alkali crowfoot. There is a unique stand of mature narrowleaf cottonwoods that has established at the base of a large shale cliff, where many small springs had or were emerging. The stand is linear, extensive, and obviously delineates the locations of numerous springs. The springs are extremely alkaline at their source, having a water pH ranging from 8.0 to 8.5. This is extremely high and cattle may purposely stay away from such areas due to the high alkalinity. Downstream riparian areas are not as alkaline, probably due to the spring waters being diluted from various sources such as litter decomposition within the stream channel and reaction with stream sediments and wetland soils. Although no rare butterflies were observed at this site, the dense herbaceous vegetation associated with the seeps and springs support a large population of butterflies including numerous fritillary and

crescents (Family *Nymphalidae*), whites and sulphurs (Family *Pieridae*), skippers (Family *Hesperiidae*), and swallowtails (Family *Papilionidae*).

Land Use History: At the confluence of Bear Park Creek and East Douglas Creek there is a large wet meadow in a park-like setting. Near the downstream end of the meadow, there appears to be a remnant of a natural dam that once blocked drainage, in a similar fashion as a beaver dam. The dam, which may have been the result of a landslide, probably created this wet meadow by slowing and/or blocking stream-flow. This resulted in the deposition of many layers of sediments. Evidence for this is suggested by the presence of large dead and dying blue spruce trees located throughout the meadow. The distribution pattern of these trees suggests that they originally established along a historical streambank, whose channel is no longer visible due to the accumulation of sediment in this area. It is likely that the fine soils that have accumulated behind the dam retain a locally high water table which may have stressed and killed the spruce trees.

Biodiversity Significance Rank Comments (B4): The site supports an extant occurrence of the state vulnerable (G4T3/S3) Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*) as well as fair (C-rank) occurrences of the state critically imperiled (G5/S1) Autumn willow (*Salix serissima*) and the state imperiled (G3?Q/S1S2) large-flower globe-mallow (*Iliamna grandiflora*). This site no longer supports a *Picea pungens/Betula occidentalis* community, which was documented in good condition in 1992.

Natural Heritage element occurrences at the East Douglas Creek PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Fish	<i>Oncorhynchus clarkii pleuriticus</i>	Colorado River Cutthroat Trout	G4T3	S3		SC	BLM/US FS	E	2015-07-08
Vascular Plants	<i>Iliamna grandiflora</i>	large - flower globe - mallow	G3?Q	S1S2				C	2015-07-02
Vascular Plants	<i>Salix serissima</i>	autumn willow	G5	S1			USFS	C	2015-07-02

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: This site harbors some of the most intact and pristine seeps and springs that were observed in western Garfield County during the course of the 2015-16 inventory.

Boundary Justification: This site encompasses the headwaters of East Douglas Creek, including Bear Park Creek and East Park Creek and numerous seeps and springs, to ensure that hydrological processes, such as maintenance of stream-flow and continued channel meandering, supporting the element are not disrupted.

Protection Urgency Rank Comments (P4): The site is currently managed by the Bureau of Land Management and is designated as the East Douglas Creek Area of Critical and Environmental Concern.

Management Urgency Rank Comments (M2): Much of the lower elevation streams of the

White River Basin, such as East Douglas Creek, were heavily grazed from the 1930s into the early 1960s (Kittel et al. 1999). East Douglas Creek was heavily impacted from such activities through excessive bank erosion and invasion of non-native species. Numerous non-native species such as tamarisk (*Tamarix ramosissima*), Canada thistle (*Cirsium arvense*), bull thistle (*C. vulgare*), houndstongue (*Cynoglossum officinale*), sweetclover (*Melilotus officinale*), and dandelion (*Taraxacum officinale*) were present in the lower portions of East Douglas Creek within this site. East Douglas Creek does seem to be recovering from past management activities but future management should ensure that grazing and populations of non-native species do not further degrade the elements. Grazing management should be conducive for minimizing bank erosion and additional spread of non-native species. Channel restoration might include planting pole cuttings or live stacks and using bioengineering techniques (e.g. tree revetments) to stabilize bank erosion. Return of beaver (*Castor canadensis*) to the site bodes well for the restoration of stream functions including biologically sustainable stream flows, water storage and the recovery of riparian vegetation. The recent documentation of cutthroat trout inhabiting the stream indicates the recovery of natural stream habitat and flow. Protecting and encouraging beaver activity along this stream reach is the single most effective strategy that can be used to restore and maintain environmentally sustainable stream flows by enabling water storage.

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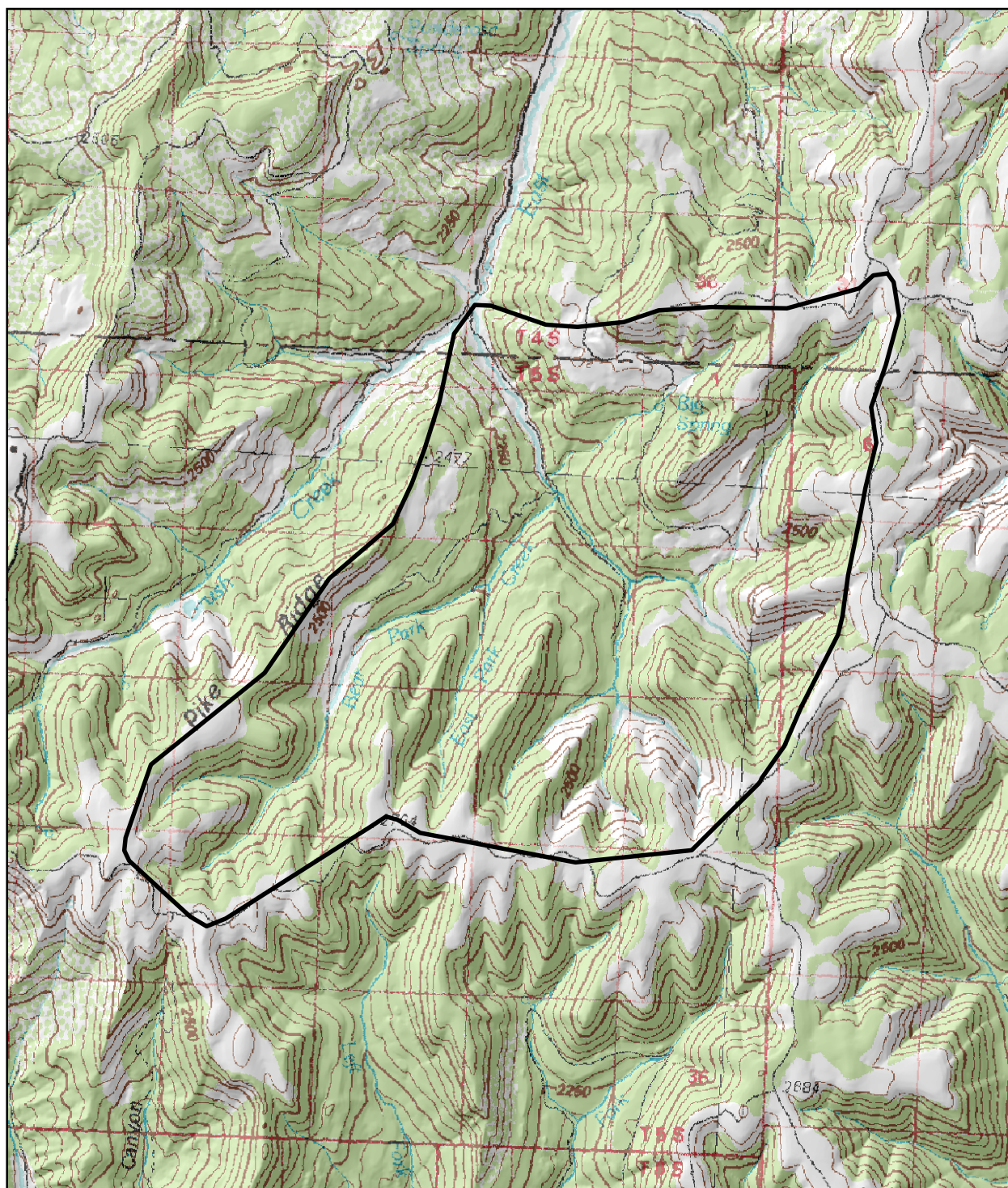
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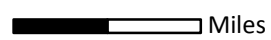
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Version Author: Malone, D.G.

Version Date: 08/13/2016



 PCA Boundary

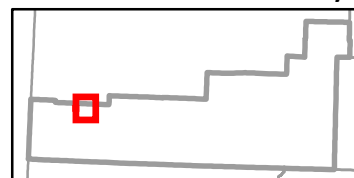
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Map Date: 10/12/2016



30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Douglas Pass, 39108-E1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

East Douglas Creek Potential Conservation Area, B4: Moderate Biodiversity Significance

East Rifle Creek

Biodiversity Rank - B4: Moderate Biodiversity Significance

Protection Urgency Rank - P2: Threat/Opportunity within 5 Years

Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss

U.S.G.S. 7.5-minute quadrangles: Rifle Falls

Size: 4,378 acres (1,772 ha)

Elevation: 7,000 - 9,000 ft. (2,134 - 2,743 m)

General Description: This site consists of a narrow box canyon surrounded by sheer vertical limestone cliffs. The riparian area is dominated by box elder (*Acer negundo*) and red-osier dogwood (*Cornus sericea*). Common understory species include gooseberry (*Ribes* sp.), red raspberry (*Rubus idaeus*), Wood's rose (*Rosa woodsii*), baneberry (*Actaea rubra* subsp. *arguta*), false-Solomon's seal (*Maianthemum stellatum*), monkshood (*Aconitum columbianum*), Richardson's geranium (*Geranium richardsonii*), black-eyed Susan (*Rudbeckia ampla*), cow parsnip (*Heracleum sphondylium* var. *montanum*), blue wild rye (*Elymus glaucus*), large-leaved avens (*Geum macrophyllum*), and yellow avens (*G. aleppicum*). A few non-native species, such as orchard grass (*Dactylis glomerata*) and Kentucky bluegrass (*Poa pratensis*) are common along trails within the riparian area. Sandbar willow (*Salix exigua*) and common reed (*Phragmites australis*) are common in open wetland areas. There are numerous springs discharging along this stretch of East Rifle Creek. These springs discharge from the Leadville Limestone, which has been shown to be a major local aquifer (Teller 1983). This aquifer is recharged via precipitation, snowmelt, and stream-flow and has a general subsurface flow toward the south, west, and northwest away from the White River Uplift (Teller 1983). Hanging garden sullivantia (*Sullivantia hapemanii* var. *purpusii*) and oil shale columbine (*Aquilegia barnebyi*) are found growing near seeps located on the canyon walls. A few of these seeps occur in alcoves nestled into the limestone walls. Numerous springs also discharge at the base of the steep limestone walls where they have formed small marshes before discharging into East Rifle Creek. These marshes are mainly dominated by watercress (*Nasturtium officinale*), beaked sedge (*Carex utriculata*), and monkeyflower (*Mimulus guttatus*). Colorado Parks and Wildlife has developed a few of these stream-level springs to supply the Rifle State Fish Hatchery, which is located just downstream from this site, with clear, fairly warm water (the spring water is 55 degrees C and slightly warmer than the stream-water from East Rifle Creek) high in calcium carbonate. As a result, many of the springs are currently dry or are discharging less water than prior to development. Common reed is fairly common in these disturbed areas. Upstream, above where the creek enters the narrow limestone canyon, the riparian community mainly consists of blue spruce (*Picea pungens*), red-osier dogwood, and various willow (*Salix*) species. Downstream from the Rifle State Fish Hatchery, there is an increase in non-native species in the understory, with reed canary grass (*Phalaris arundinacea*) and common reed becoming very abundant along the streamsides. At one time, a large colony of Black Swifts occupied the canyon, as did a nesting pair of Bald Eagles and Peregrine Falcons. Extensive traffic from recreational climbers, however, caused the abandonment of the swift colony and subsequent migration of both the Bald Eagle and Peregrine Falcon nesting pairs. Soils along the creek bottoms are mapped Torriorthents. These soils formed on colluvial slopes below

the steep cliff faces along this drainage. The soils are mostly well drained and vary from loamy to clayey with variable amounts of gravel, cobbles, and stones (Soil Conservation Service 1985). The porous nature of the soils is consistent with the presence of numerous seeps and springs that discharge within the floodplain.

Biodiversity Significance Rank Comments (B4): This site supports a fair (C-ranked) occurrence of the globally vulnerable (G3/S2) box elder / red-osier dogwood (*Acer negundo* / *Cornus sericea*) montane riparian deciduous forest, a plant association known from lower montane canyons in Utah and western Colorado. Surveys conducted in 2015 documented that the quality and thus the rank of the box elder / red-osier dogwood occurrence has been altered by hydrologic alteration and anthropogenic disturbance and diminished from a good (B-rank) occurrence to a fair (C-rank) occurrence. Additionally, there are historically known occurrences of the globally vulnerable, western Colorado endemic, hanging garden sullivania, a plant subspecies restricted to waterfalls, seeps, and moist cliffs of calcareous substrates, and false ricegrass (*Argillochloa dasyclada*) a globally vulnerable plant.

Natural Heritage element occurrences at the East Rifle Creek PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Natural Communities	<i>Acer negundo</i> / <i>Cornus sericea</i> Forest	Montane Riparian Deciduous Forest	G3?	S1				C	2015-06-07
Vascular Plants	<i>Argillochloa dasyclada</i>	False ricegrass	G3	S3				H	1991-06-25
Vascular Plants	<i>Sullivantia hapemanii</i> var. <i>purpusii</i>	Hanging Garden sullivania	G3T3	S3				H	1991-07-25

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: A caddisfly, thus far only known from Colorado, has also been documented from the site and is considered a conservation priority for invertebrates by Boris Konradieff, a Professor of Entomology and Curator of the C.P. Gillette Museum of Arthropod Diversity, at Colorado State University.

Boundary Justification: The boundaries were drawn to ensure that all or most of the springs and small side drainages would continue to provide a major portion of the hydrological input to the creek and maintain natural water quality conditions, both of which are vital to the viability of the elements. The site boundaries were not intended to encompass the entire upstream watershed, although consideration of these areas is important to ensure adequate hydrological processes.

Protection Urgency Rank Comments (P2): A portion of the site is managed by the U.S. Forest Service while the majority is managed by the City of Rifle. Hydrologic alteration and unmanaged recreation threaten the viability of the occurrences. Protecting the natural hydrologic regime in the surrounding uplands is essential to the maintenance of water quantity and quality in Rifle Creek as well as the many springs and seeps that maintain the element occurrences. Because livestock grazing is the predominant upland land use, ensuring land health standards are met through sustainable grazing is essential to the long

term sustainability of this site.

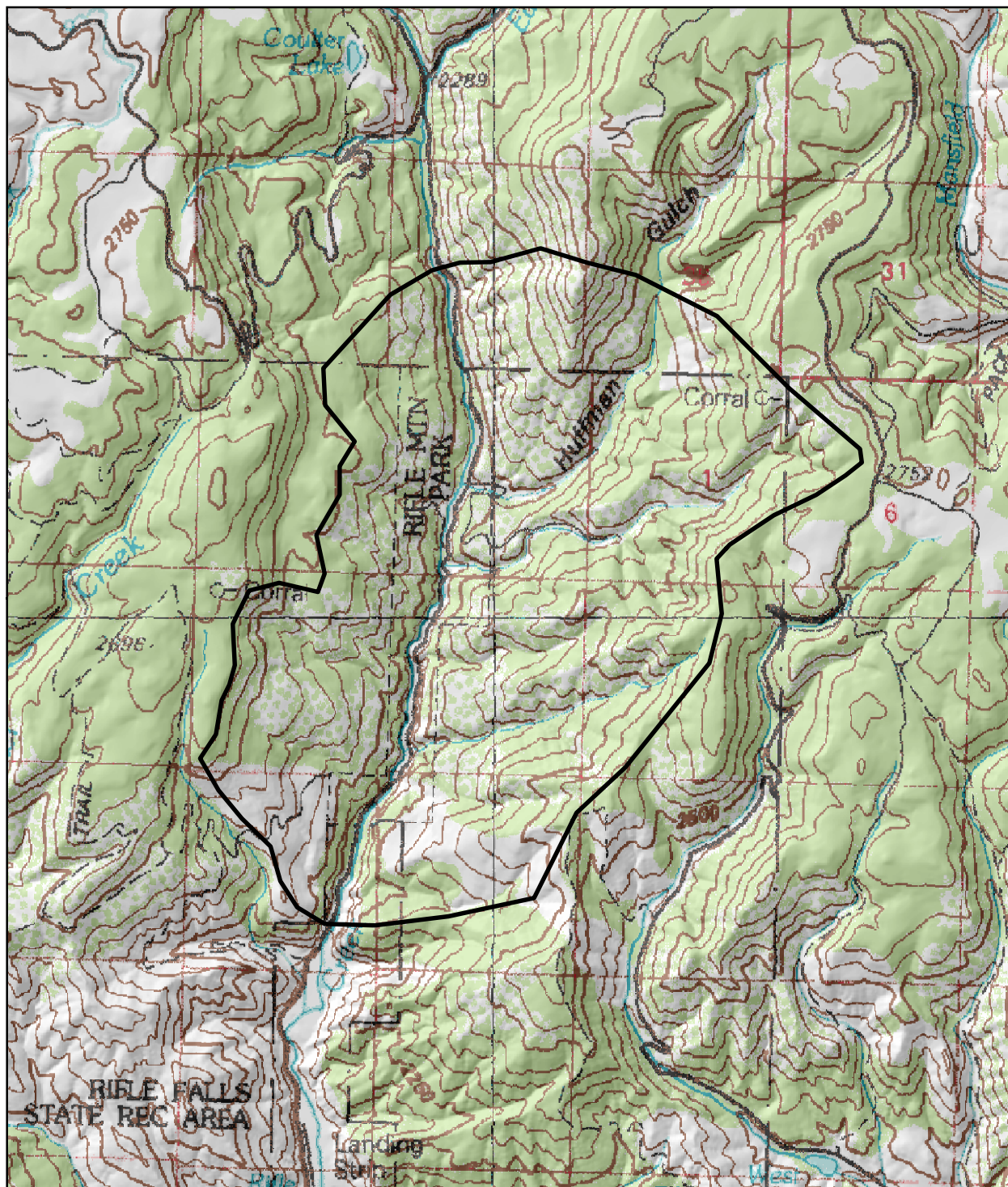
Management Urgency Rank Comments (M2): There is heavy recreational use throughout the site. Rock climbing is extremely popular on the limestone walls and there are at least three campgrounds located along the creek within the site. Current recreation use appears to be impacting localized areas but overall, use is mainly limited to canyon walls and campgrounds and has resulted in vegetation trampling which has destroyed herbaceous cover and diminished recruitment of *A. negundo* and *C. sericea* seedlings and saplings. Rock climbing is the only potential direct threat to the hanging garden sullivantia, however most climbing appears to stay clear of the moist cliff walls. There are numerous foot trails throughout the riparian zone but use of these trails is not extremely heavy and adjacent vegetation is so dense that the probability of hikers venturing off trail is minimal. Establishing climbing access trails and restricting recreational access to defined use areas is essential to maintaining the viability of the box elder / red-osier dogwood woodlands. Forest Road 832 runs directly through the riparian area and at times is immediately adjacent to the creek. There are non-native species associated with the road and recreation use. Thus far, their impact is not overwhelming, but the potential is high. These potential threats and their impact on the elements should be closely monitored. Restoring hydrological flow to the numerous springs, which have been developed for the fish hatchery, would ensure viability of this riparian community. The hydrologic regime is modified by a numerous diversions on the main stem and tributaries and by road that eliminates at least 50% of riparian zone habitat. These alterations inhibit precipitation infiltration and increase flooding flows and soil erosion.

References

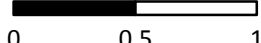
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Version Author: Malone, D.G.

Version Date: 08/13/2016



 PCA Boundary

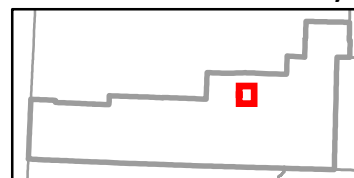
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Map Date: 10/13/2016



30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Glenwood Springs, 39107-E1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

East Rifle Creek Potential Conservation Area, B4: Moderate Biodiversity Significance

East Salt Creek Headwaters

Biodiversity Rank - B4: Moderate Biodiversity Significance

Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years

Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality

U.S.G.S. 7.5-minute quadrangles: Middle Dry Fork, Calf Canyon, Henderson Ridge, Garvey Canyon

Size: 16,963 acres (6,865 ha)

Elevation: 6,200 - 8,500 ft. (1,890 - 2,591 m)

General Description: The East Salt Creek Headwaters site occupies the ridge separating the East Salt Creek drainage to the west and the Roan Creek drainage to the east, along with the riparian zone of Corral Canyon, a tributary of East Salt Creek. The uplands consist of sparsely vegetated shale slopes of the Green River Formation. There are scattered Douglas-fir (*Pseudotsuga menziesii*), with snowberry (*Symphoricarpos rotundifolius*), spearleaf buckwheat (*Eriogonum lonchophyllum*) and *Penstemon* sp. There are numerous seeps and springs scattered throughout the area due to the outcropping of the Green River shale formation.

Biodiversity Significance Rank Comments (B4): This site supports a fair (C-ranked) occurrence of a globally vulnerable (G3/S3) narrowleaf cottonwood / skunkbrush plant community (*Populus angustifolia* / *Rhus trilobata*) which was expanded in 2015 to include the riparian zone on a second first order stream channel (East Salt Creek) that has its confluence with Corral Creek on the valley floor. These streams are excessively downcut with one consequence being that the riparian zone is never wider than 2-6 meters. These riparian woodlands likely were historically continuous and more extensive but habitat alteration due to livestock grazing and 4wd roads have eliminated much of the native vegetation. Surveys also documented a fair (C-ranked) occurrence of the globally vulnerable Gambel oak - mountain mahogany (*Quercus gambelii*- *Cercocarpus montanus* / (*Carex geyeri*)) mixed mountain shrubland. These shrublands are likely much more extensive and impart important wildlife and ecological values to system processes such as wildlife forage and cover, and soil building and precipitation infiltration-hydrologic processes. This site also contains an historical occurrence of a globally imperiled (G2/S2) plant species, Piceance bladderpod (*Physaria parviflora*).

Natural Heritage element occurrences at the East Salt Creek Headwaters PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Natural Communities	Populus angustifolia / Rhus trilobata Woodland	Narrowleaf Cottonwood / Skunkbrush	G3	S3				C	2015-05-24
Natural Communities	Quercus gambelii - Cercocarpus montanus / (Carex geyeri) Shrubland	Mixed Mountain Shrublands	G3	S3				C	2015-05-24
Natural Communities	Populus balsamifera Woodland	Montane Riparian Woodland	GU	S2				B	2000-08-28
Vascular Plants	Physaria parviflora	Piceance bladderpod	G2	S2			BLM	H	1987-07-11

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: Oak-mountain mahogany shrublands on north-facing slopes provide habitat for Virginia's warbler (*Oreothlypis virginiae*), a bird species that is watchlisted by the North American Bird Conservation Initiative (<http://www.stateofthebirds.org/2016/resources/species-assessments/>). Canyon habitat provides habitat for the state imperiled (G4T4/S2B) American peregrine falcon (*Falco peregrinus anatum*) which was observed first hunting and then roosting in cliff habitat on south-facing slopes of East Salt Creek.

Boundary Justification: The boundaries include ecosystem processes, especially hydrologic processes to enable the sustainability of the riparian cottonwood / skunkbush woodlands and the Gambel oak - mountain mahogany shrublands. The boundary encompasses the historic location of Piceance bladderpod, and takes in the suitable habitat from the ridge top to the bottom of the Green River Formation on southwest slopes. It also includes the riparian zone of Corral Canyon, and the adjacent uplands, which overlap with the Piceance bladderpod habitat.

Protection Urgency Rank Comments (P3): The site contains both private and BLM land managed by the Grand Junction Resource Area. There is no special protective status. However, any new oil or gas development would require an Environmental Assessment, at which time the presence of the Piceance bladderpod would be addressed, and efforts made to avoid direct disturbance to the plants. There is no protection for the plants that may occur on private land.

Management Urgency Rank Comments (M3): Heavy and excessive livestock grazing has degraded and altered vegetation throughout both upland and riparian habitat. Inappropriate livestock use will continue the decline of the riparian community occurrence. Currently the narrowleaf cottonwood tree canopy is dominated by mature and decadent cottonwood with little sign or potential for recruitment to replace dying individuals. Further, inappropriate livestock grazing in the surrounding uplands has removed excessive amounts of vegetation resulting in soil erosion and invasion of exotic plant species. No

management needs for the rare plants that grow on the dry shale slopes are known. Steepness and lack of forage tend to discourage cattle from using these areas. Beneficial management actions would include reduced frequency and duration of grazing. If gas wells are developed in the canyon bottom, consideration should be given to directional drilling to minimize direct impacts to riparian vegetation.

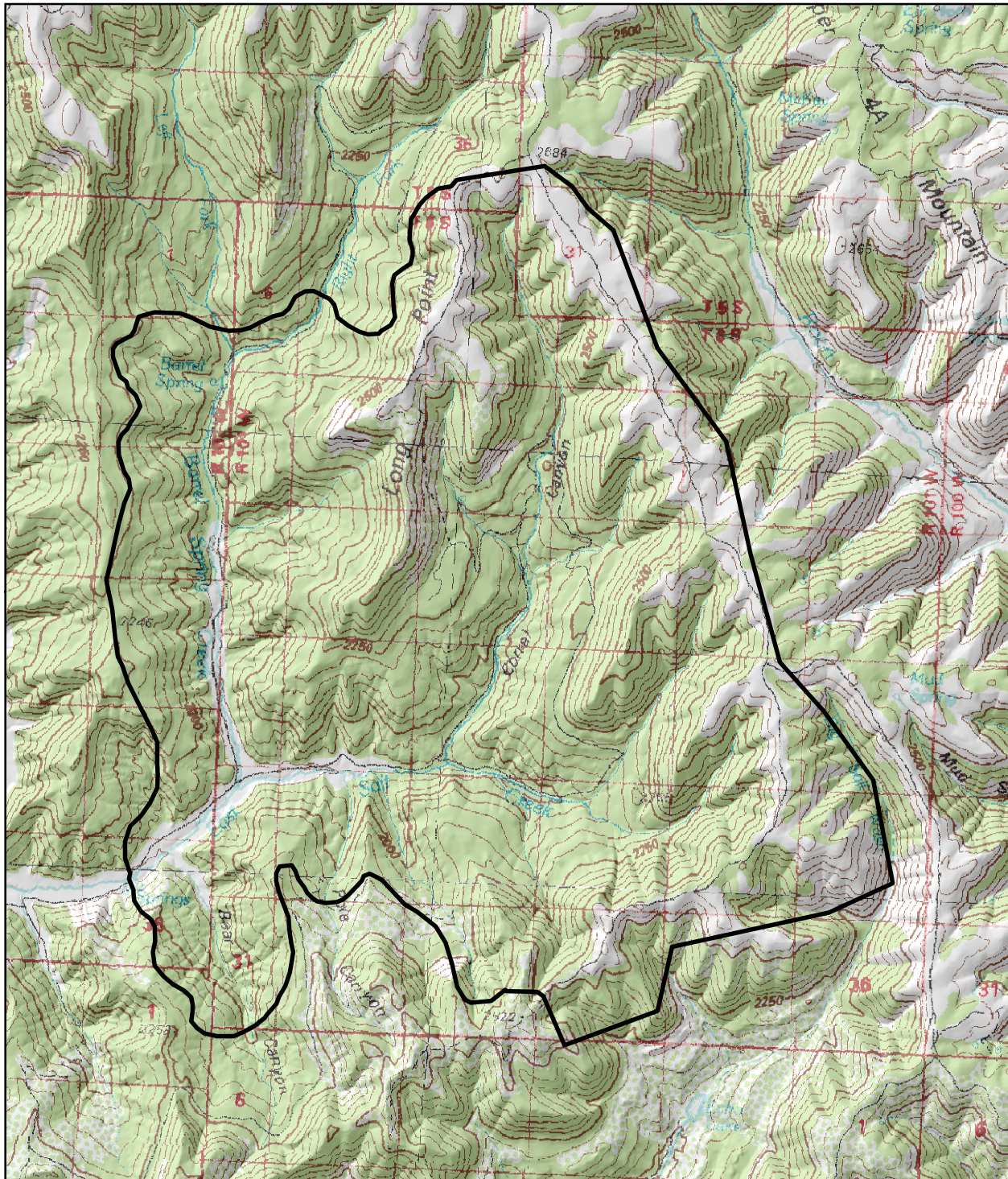
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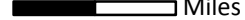
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Version Author: Malone, D.G.

Version Date: 08/13/2016



 PCA Boundary

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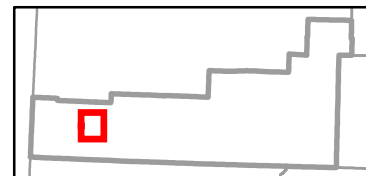
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Map Date: 10/13/2016



30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Douglas Pass, 39108-E1
Grand Junction, 39108-A1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

East Salt Creek Headwaters Potential Conservation Area, B4: Moderate Biodiversity Significance

Garfield Creek

Biodiversity Rank - B4: Moderate Biodiversity Significance

Protection Urgency Rank - P2: Threat/Opportunity within 5 Years

Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss

U.S.G.S. 7.5-minute quadrangles: New Castle

Size: 542 acres (219 ha)

Elevation: 6,100 - 6,500 ft. (1,859 - 1,981 m)

General Description: This reach of Garfield Creek is best described as a medium sized stream meandering through a long, wide valley. Surrounding slopes are dominated by pinon-juniper (*Pinus edulis* - *Juniperus osteosperma*) and sage (*Artemisia* sp.). Upstream, on adjacent upland areas, there are numerous hay meadows, pasture, new housing developments, and County Road 312. The riparian area along the downstream portion of this site is dominated by a sparse overstory of narrowleaf cottonwood (*Populus angustifolia*), river birch (*Betula occidentalis*), and hawthorn (*Crataegus rivularis*) with Canada goldenrod (*Solidago canadensis*) and Indian hemp (*Apocynum cannabinum*) being fairly common in the understory. Further downstream, there are a series of old beaver dams with high species diversity. Cattail (*Typha latifolia*), beaked sedge (*Carex utriculata*), water speedwell (*Veronica catenata*), spikerush (*Eleocharis palustris*), and hardstem bulrush (*Scirpus acutus*) dominate the wettest areas. Sandbar willow (*Salix exigua*), pale bulrush (*Scirpus pallidus*), wild mint (*Mentha arvensis*), showy milkweed (*Asclepias speciosa*), shortawn foxtail (*Alopecurus aequalis*), tall mannagrass (*Glyceria elata*), foxtail barley (*Hordeum jubatum*), tuberous rush (*Juncus nodosus*), wild licorice (*Glycyrrhiza lepidota*), and dock (*Rumex crispus*) occupy saturated areas surrounding the beaver ponds. A small meadow, which appears to have formed behind an old beaver dam and is now elevated above the current stream level, is dominated by woolly sedge (*Carex lanuginosa*), sloughgrass (*Beckmannia syzigachne*), and redtop (*Agrostis gigantea*). There are numerous non-native species that occupy the riparian area, especially the wetlands near the beaver ponds. Non-natives such as redtop, barnyard grass (*Echinochloa crus-galli*), Canada goldenrod, Canada thistle (*Cirsium arvense*), white sweetclover (*Melilotus albus*), smooth brome (*Bromus inermis*), orchard grass (*Dactylis glomerata*), and timothy (*Phleum pratense*) are common in the area. The soils along the creek are mapped as Torrifluvents. These soils formed in alluvium and are highly stratified and vary widely in texture and depth (Soil Conservation Service 1985). Organic matter is accumulating in the soils near the beaver ponds and in wet meadows on the floodplain. A functional assessment was also conducted for this site, please see report (Survey of Critical Wetlands and Riparian Areas of Garfield County, Rocchio, J. 2000). As of 2015, the riparian habitat is transitioning from a narrowleaf cottonwood (*Populus angustifolia*) woodland to a box elder (*Acer negundo*) dominated woodland, a community more tolerant of drying soils. The transition is likely in response to hydrologic alteration which has resulted in diminished stream flows and modification of the natural flooding regime. Surrounding uplands have been substantially altered by agricultural and energy development. Alteration of upland landscapes has contributed to degradation of riparian and stream habitat by diminishing extent of riparian habitat, altering the natural hydrologic regime and of the native community due to the removal of native

species and consequent incursion of non-native invasive plant and animal species.

Biodiversity Significance Rank Comments (B4): This site supports a fair (C-ranked) occurrence of the globally vulnerable but state imperiled (G3/S2) narrowleaf cottonwood/montane willow (*Populus angustifolia*/*Salix monticola*) riparian woodland. The site also supports a breeding pair of the (G4/S4) Lewis's woodpecker (*Melanerpes lewis*) and a breeding pair of the BLM and FS sensitive species yellow-billed cuckoo (*Coccyzus americanus occidentalis*) which is imperiled in the state (G5T2T3/S1B).

Natural Heritage element occurrences at the Garfield Creek PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Birds	<i>Melanerpes lewis</i>	Lewis's Woodpecker	G4	S4			USFS	E	2015-06-21
Birds	<i>Coccyzus americanus occidentalis</i>	Western Yellow-billed Cuckoo	G5T2T3	S1B	C	SC	BLM/US FS	E	2015-07-15
Natural Communities	<i>Populus angustifolia</i> / <i>Crataegus rivularis</i> Woodland	Narrowleaf Cottonwood Riparian Forests	G2?	S2				X	2015-07-15
Natural Communities	<i>Populus angustifolia</i> / <i>Salix</i> (<i>monticola</i> , <i>drummondiana</i> , <i>lucida</i>) Woodland	Narrowleaf Cottonwood / Mixed Willows Montane Riparian Forest	G3	S2				C	2015-07-15

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: These riparian woodlands provide important habitat for a wide diversity of wildlife species including birds such as wild turkey, red-naped sapsucker, western wood-peewee, gray catbird, and hairy woodpecker as well as mammals such as mule deer (*Odocoileus hemionus*) and black bear (*Ursus americanus*). Numerous northern leopard frogs (*Rana pipiens*) were observed in 2001, but not seen in 2015.

Boundary Justification: The boundary is drawn to encompass the riparian plant community. The downstream areas protect riparian woodland habitat important to two rare bird species documented at the site, the yellow-billed cuckoo (*Coccyzus americanus*) and Lewis's woodpecker (*Melanerpes lewis*). Riparian habitat comprises less than 2% of habitat types in the arid west yet provides habitat essential to greater than 80% of our native wildlife during some portion of their lives.

Protection Urgency Rank Comments (P2): The site is currently managed by Colorado Parks and Wildlife as the Garfield Creek State Wildlife Area. Current use appears to mainly be hunting and grazing, although no signs of recent grazing were observed. There are new houses being constructed in the area, thus it is suspected that development pressure in the area is high. The riparian corridor is managed for hunting and grazing. Surrounding uplands are heavily developed and fragmented by agriculture and extractive energy-related development. The natural hydrologic regime is extensively altered by upstream diversions,

livestock grazing, agricultural conversion of surrounding adjacent habitat, and road and development-induced fragmentation. These stresses may reduce the viability of the elements within approximately 5 years. However, there is opportunity to mitigate or eliminate the threats if action is taken within 5 years.

Management Urgency Rank Comments (M2): Management concerns mainly stem from upstream land and water use. Non-native species are abundant. Eradication and prevention of further spread of these species needs to be addressed. Upstream water diversions may be impacting stream dynamics, as portions of the stream appear to be entrenching. Control of non-native species would greatly benefit the ecological health of this area. Ensuring continued beaver activity would allow the mosaic of wetlands found along the creek to persist. This riparian community is transitioning to one with a tree canopy dominated by box elder (*Acer negundo*) and an understory dominated by skunkbush (*Rhus trilobata*), changes that indicate drying. The community for which this site was initially designated is no longer functionally present and has been replaced by a few scattered box elder with an understory of noxious weeds. Channel downcutting has resulted in abandonment and drying of the historic stream bench and consequent dying of riparian vegetation. Additionally, although records indicate that northern leopard frogs were commonly present, none were observed during this survey. The absence of leopard frogs may be due to an abundance of crawfish, a non-native species which has been implicated as major contributors to amphibian population declines, and in some instances local extinction (Kats and Ferrer 2003).

Exotic Species Comments: Weeds include Canada thistle (*Cirsium arvense*), smooth brome (*Bromus inermis*), cheatgrass (*Bromus tectorum*), common tansy (*Tanacetum vulgare*), bull thistle (*Cirsium vulgare*), oxeye daisy (*Leucanthemum vulgare*), poison hemlock (*Conium maculatum*), common mullein (*Verbascum thapsus*), and musk thistle (*Carduus nutans*). Crawfish are present and could be responsible for the decline of northern leopard frogs at the site.

References

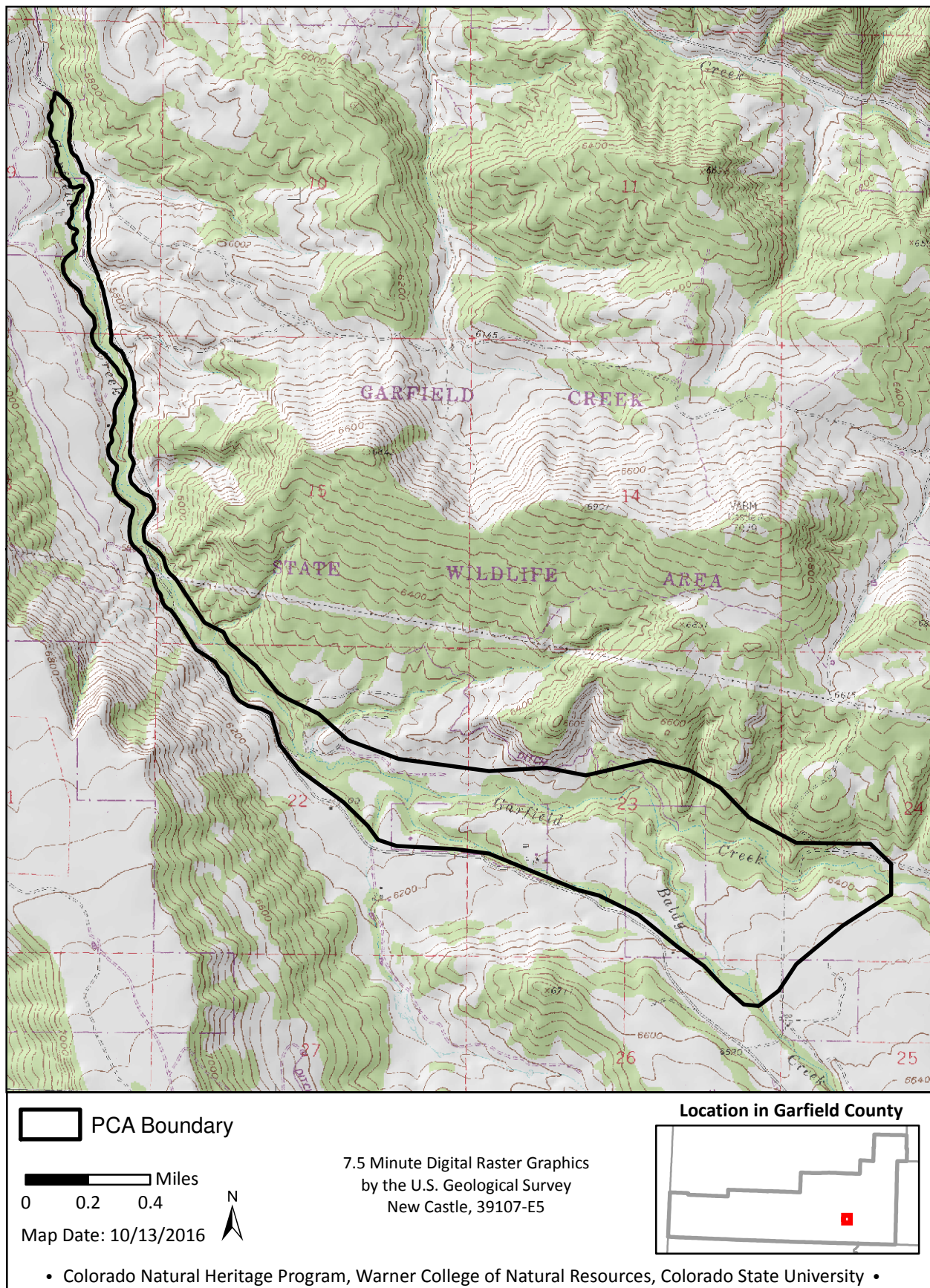
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Version Author: Malone, D.G.

Version Date: 08/15/2016



Garfield Creek Potential Conservation Area, B4: Moderate Biodiversity Significance

Middle Rifle Creek

Biodiversity Rank - B4: Moderate Biodiversity Significance

Protection Urgency Rank - P2: Threat/Opportunity within 5 Years

Management Urgency Rank - M3: Needed within 5 Years to Maintain Quality

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

Size: 1,359 acres (550 ha)

Elevation: 6,000 - 7,366 ft. (1,829 - 2,245 m)

General Description: This site contains many steep washes of sandstone leading down to Middle Rifle Creek. There is a mixture of riparian vegetation along Middle Rifle Creek and pinyon pine - juniper (*Pinus edulis*- *Juniperus* spp.) woodland upslope. The woodland has much brush (*Artemisia*, *Quercus*, *Amelanchier*, *Cercocarpus*, and *Rhus*), but the shrub understory is not dense enough to classify as a strong mountain shrub pinyon - juniper community. Portions of this site fall within Rifle Gap State Wildlife Area and within BLM land, while the northern one third of the site is privately owned. Both the private and BLM lands are presently grazed. The site contains a complex mix of sedimentary sandstone from the Pennsylvania, Triassic, Cretaceous, Permian and Jurassic ages. There are also formations of Mancos shale from the Cretaceous.

Climate Description: Annual precipitation averages 11.3 inches. Temperatures range from the low teens in January to the 90's in July, and the frost-free season is about 107 days.

Biodiversity Significance Rank Comments (B4): This site supports a good to fair (BC-ranked) occurrence of Wetherill's milkvetch, a plant species which is globally vulnerable (G3/S3). The population is moderately large but occupies a landscape that is altered by fire suppression and livestock grazing which has diminished viability and potential for long-term sustainability. There is also a good (B-ranked) occurrence of Gray Vireo (*Vireo vicinior*), which is rare in Colorado during the breeding season, and an unranked occurrence of the state rare (G5T5/S3) western yellowbelly racer (*Coluber constrictor mormon*).

Natural Heritage element occurrences at the Middle Rifle Creek PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Birds	Vireo vicinior	Gray Vireo	G5	S2B				B	1996-07-06
Reptiles	Coluber constrictor mormon	Western Yellowbelly Racer	G5T5	S3					1999-06-13
Vascular Plants	Astragalus wetherillii	Wetherill's milkvetch	G3	S3				BC	2015-06-27

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: State Park with open space recreation: hiking, fishing, and bird watching.

Boundary Justification: This site includes the plant occurrence and some additional adjacent suitable habitat to allow for additional individuals to become established over time. It also provides for the western yellow belly racer found in this area along Middle Rifle Creek. The site boundary protects the semi-arid shrubland and the dry open pinyon - juniper (*Pinus edulis- Juniperus*) woodlands, common nesting and foraging habitats of the Gray Vireo (*Vireo vicinior*).

Protection Urgency Rank Comments (P2): This site is partially owned by the state and protected as a wildlife area. Since the Gray Vireo population occurs on BLM land, similar protection through special designation is justified. Habitat alteration, especially fire suppression and livestock-induced vegetation alteration, in combination with a warming climate pose a clear threat to system and occurrence sustainability.

Management Urgency Rank Comments (M3): Livestock have trampled plants and soils throughout the site and noxious weeds, especially cheatgrass (*Bromus tectorum*) which is common throughout the site, contribute to an altered fire regime. Surrounding habitat is characterized by an excessively dense cover of pinyon - juniper woodlands characterized by a single age class indicating an altered disturbance/fire regime. A warming climate, in combination with livestock-induced habitat degradation, diminish system resiliency and render the occurrence vulnerable to extirpation.

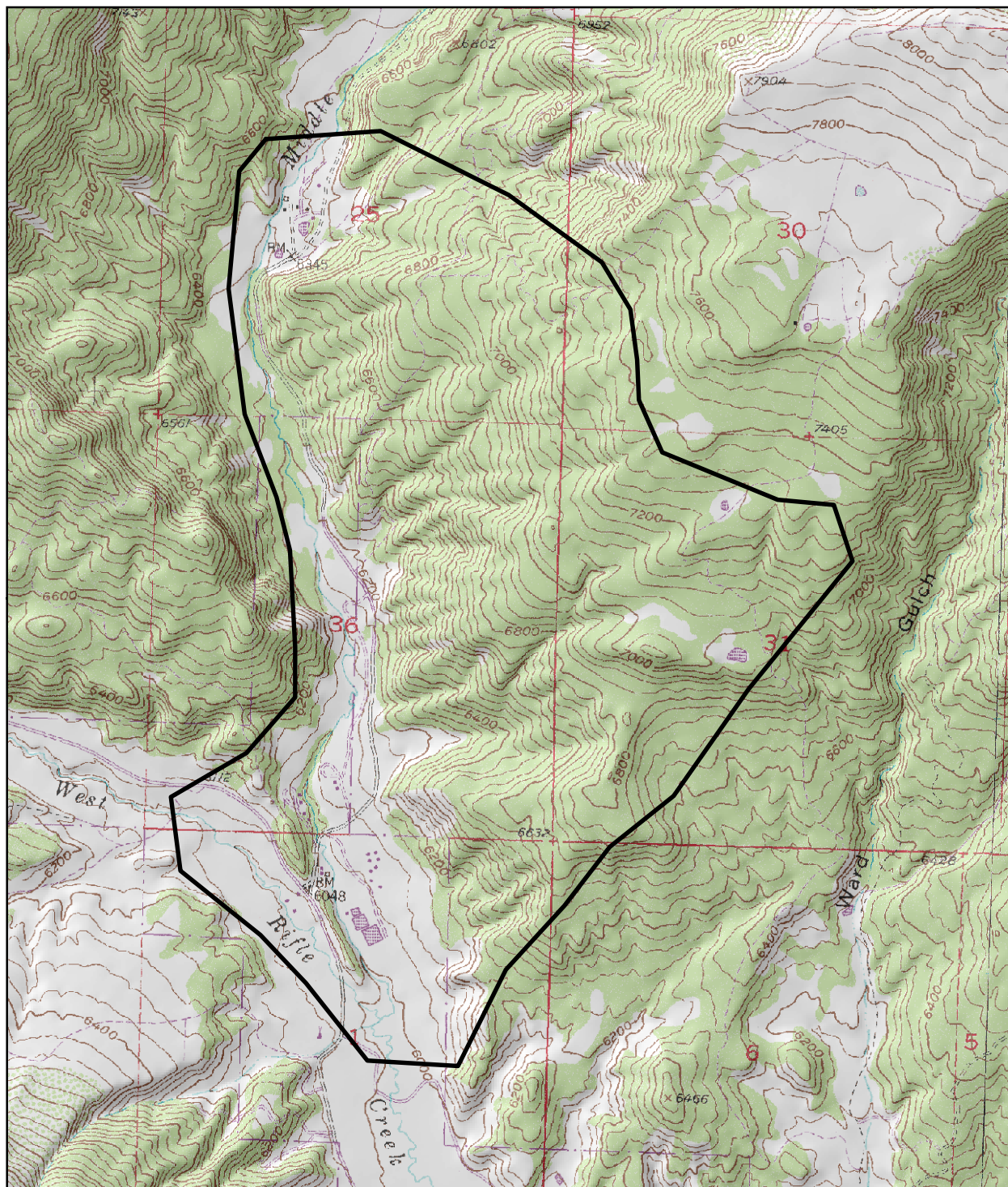
Exotic Species Comments: Both cheatgrass (*Bromus tectorum*) and sweet clover (*Melilotus officinale* and *M. alba*) occur along the roadsides, with *M. alba* extending up the washes.

References

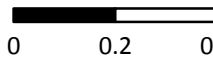
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Version Date: 08/13/2016



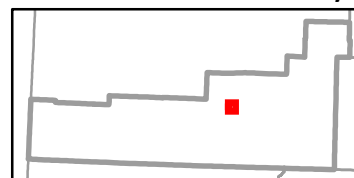
 PCA Boundary

 Miles
0 0.2 0.4

Map Date: 10/13/2016 

7.5 Minute Digital Raster Graphics
by the U.S. Geological Survey
Horse Mountain, 39107-F7

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Middle Rifle Creek Potential Conservation Area, B4: Moderate Biodiversity Significance

Rifle Falls State Park

Biodiversity Rank - B4: Moderate Biodiversity Significance

Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years

Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss

U.S.G.S. 7.5-minute quadrangles: Rifle Falls

Size: 341 acres (138 ha)

Elevation: 6,237 - 6,857 ft. (1,901 - 2,090 m)

General Description: The valley is bordered on both sides by ridges over 6,700 feet in height and that drop steeply over 450 feet to the valley along East Rifle Creek. The south boundary captures an unnamed mine used by Townsend's big-eared bats. This mine is located in pinon - juniper (*Pinus edulis* - *Juniperus* spp.) forest lying approximately 1/8 mile west of the perennial stream and riparian habitat of East Rifle Creek. The site includes the slopes on both sides of the creek with the boundary climbing to approximately the elevation of the mine. The boundary continues north along the riparian communities of East Rifle Creek where patches of boxelder and willow are found. The area upslope of the creek is dominated by pinon pine - juniper forest with a brush understory that includes sagebrush, Gambel's oak (*Quercus gambelii*), serviceberry (*Amelanchier* spp.) and mountain mahogany (*Cercocarpus montanus*). The boundary terminates at the waterfalls in Rifle Falls State Park. The falls are braided with three chutes that drop approximately 80 feet to a rocky pool. The cliffs over which the water falls are the result of calcium carbonate deposition from East Rifle Creek. Over geologic time the cliffs have formed from this deposition. The cliff face behind the falls is covered with scattered pockets of moss and is ideal nesting habitat for Black Swifts (*Cypseloides niger*). Rifle Falls State Park and BLM land comprise approximately 60% of the site. The remaining 40% includes privately owned land along East Rifle Creek at the south end. This area of the site is hayed and used for livestock grazing. The entire site lies within what is known as the Piceance Basin, which extends from approximately Maybell to Palisade, Colorado. Here the substratum of the Piceance Basin consists of sedimentary rock of the Cenozoic and Paleozoic eras including Jurassic, Triassic, Permian and Pennsylvanian sandstones. There are recurring records from the late 1990s of Black Swifts and Townsend's big-eared bats. There is also a historic account of a wolverine, but given the current level of human activity it is unlikely that wolverines have occurred here for many years.

Climate Description: Annual precipitation averages 11.3 inches. Temperatures range from the low teens in January to the 90's in July, and the frost-free season is about 107 days.

Biodiversity Significance Rank Comments (B4): This site contains an extant (E-ranked) occurrence of the globally apparently vulnerable (G3G4T3T4/S2) Townsend's big-eared bat (*Corynorhinus townsendii pallescens*) and a fair (C-ranked) occurrence of the state imperiled (G4T4/S2) Black Swift (*Cypseloides niger*). Also occurring in this site is a fair (C-rank) occurrence of the globally vulnerable (G3/S2) Box elder / Chokecherry (*Acer negundo* / *Prunus virginiana*) riparian woodland.

Natural Heritage element occurrences at the Rifle Falls State Park PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Birds	<i>Cypseloides niger</i>	Black Swift	G4	S3B			BLM/US FS	C	2000-08-27
Mammals	<i>Corynorhinus townsendii pallescens</i>	Townsend's Big-eared Bat Subsp	G3G4T3T4	S2		SC	BLM/US FS	E	1997-09-25
Natural Communities	<i>Acer negundo</i> / <i>Prunus virginiana</i> Forest	Montane Riparian Deciduous Forest	G3	S2				C	2015-06-10

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Other Values: State Park with open space recreation: hiking, fishing, and bird watching.

Boundary Justification: The site boundary protects specific habitat supporting ecological processes essential to the survival of two different elements. The site includes a mine utilized as a roosting site by the Townsend's big-eared bat (*Plecotus townsendii pallescens*). This roosting site is of particular importance because human disturbance at caves, deforestation, and urban and agricultural practices leave few alternatives for bats and they cannot change roosts in the time permitted by current rates of mine closures. The area at Rifle Falls protects a Black Swift (*Cypseloides niger*) nesting site. Black Swifts restrict their nesting to areas near or behind waterfalls, because waterfalls are uncommon, any that support breeding populations of Black Swifts are important to protect.

Protection Urgency Rank Comments (P3): From the headwaters of Rifle Creek to the confluence with the Colorado River, as well as on the majority of tributaries to Rifle Creek, streamflows are heavily diverted (DNR 2016). Landscape use surrounding this site is dominated by livestock grazing. Further, adjacent lower elevation habitat within the watershed is fragmented by anthropogenic alteration and by the grass valley canal that collects and diverts water. In combination these direct and indirect hydrologic alterations threaten the sustainability of the rare bird, mammal, and community occurrences.

Management Urgency Rank Comments (M2): Maintenance of natural stream flows is essential to sustaining the natural resources at Rifle Falls State Park. Additionally, managing recreation to prevent disturbance to wildlife and to prevent vegetation trampling is critical to viability of the element occurrences. There are few obvious threats to Black Swifts, except where development alters nesting habitat. The falls at Rifle Falls State Park are a popular tourist attraction, but the Black Swift nest is inaccessible and free of direct human disturbance. Protecting stream flows and the present physical state of the falls from alteration, and limiting direct access to the falls through the design and placement of trails would ensure continued nesting by the swifts. Diversion of stream water causing reduced flow at the falls could cause swifts to abandonment the site. Closure of the mine entrance would eliminate its further use by pale lump-nosed bats, however, access to the mine is unrestricted and the bats are sensitive to human disturbance. Construction of a bat gate to restrict human access, but allowing use by the bats would ensure that the population is

conserved. A monitoring program would aid in better defining the size and productivity of the elements and would assist in defining future management needs.

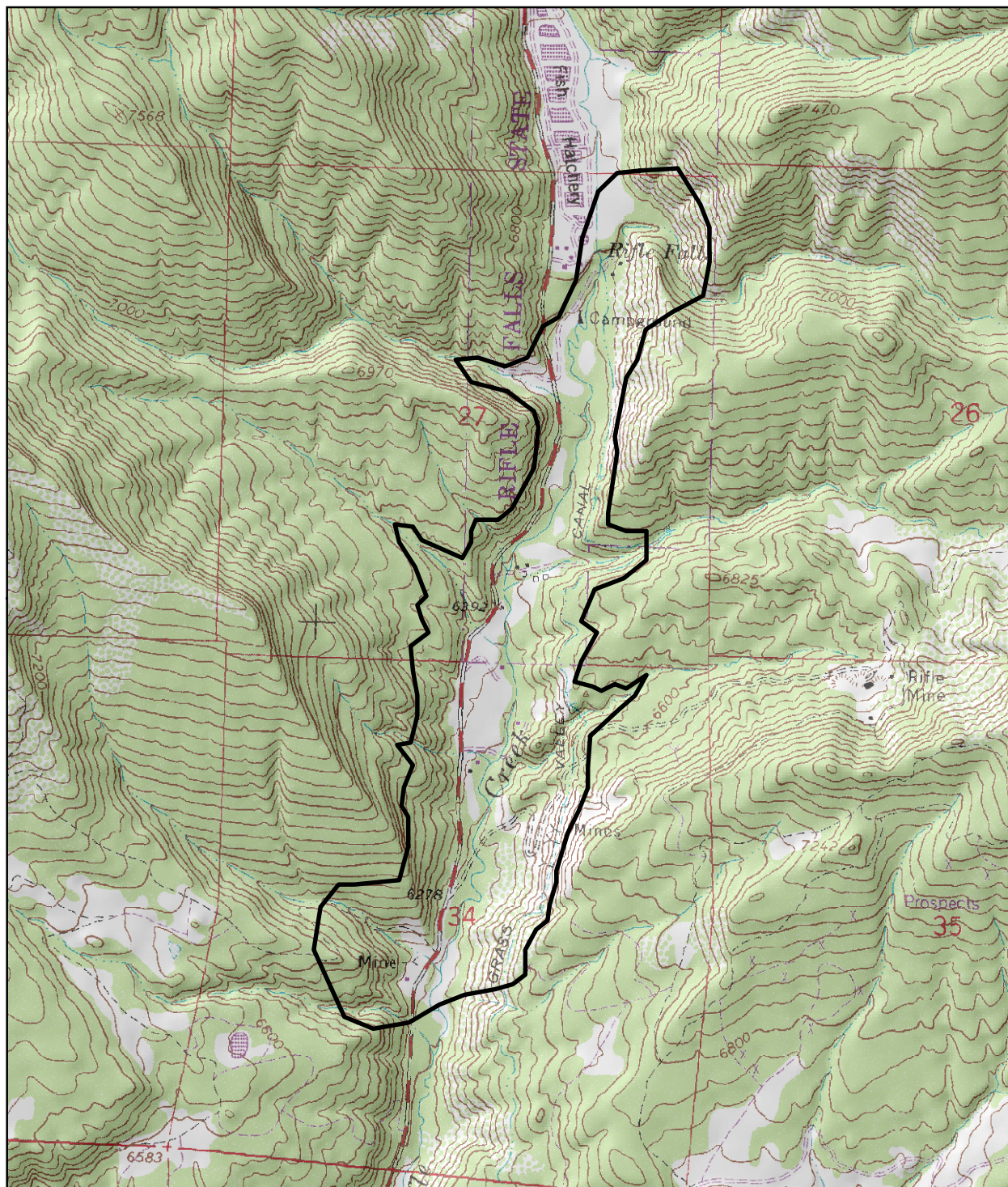
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Version Author: Malone, D.G.

Version Date: 08/13/2016



 PCA Boundary

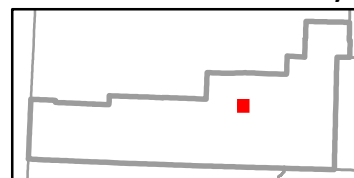
 Miles
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Map Date: 10/13/2016



7.5 Minute Digital Raster Graphics
by the U.S. Geological Survey
Rifle Falls, 39107-F6

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Rifle Falls State Park Potential Conservation Area, B4: Moderate Biodiversity Significance

Roaring Fork River at Red Canyon

Biodiversity Rank - B4: Moderate Biodiversity Significance

Protection Urgency Rank - P3: Definable Threat/Opportunity but not within 5 Years

Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss

U.S.G.S. 7.5-minute quadrangles: Glenwood Springs, Cattle Creek

Size: 250 acres (101 ha)

Elevation: 5,765 - 5,995 ft. (1,757 - 1,827 m)

General Description: Historically this river valley habitat was characterized by widely meandering river with broad riparian wetlands dominated by a mosaic of multiple communities including cottonwood gallery woodlands, willow shrublands and wet meadows. Currently, as a consequence of anthropogenic habitat conversion, only narrow, fragmented remnants of these riparian wetlands remain and habitat is now characterized by a variety of anthropogenic habitats including golf courses, housing developments, roads and domestic livestock grazing. Because of their rarity, these remaining remnants of a natural riparian ecosystems provide critical habitat for rare plants in the lower Roaring Fork Valley, making them all the more important to conserve.

Biodiversity Significance Rank Comments (B4): The site supports a poor (D-ranked) occurrence of the globally imperiled (G2) Ute's ladies tresses (*Spiranthes diluvialis*). The species is Federally listed as Threatened.

Natural Heritage element occurrences at the Roaring Fork River at Red Canyon PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Vascular Plants	<i>Spiranthes diluvialis</i>	Ute ladies' tresses	G2G3	S2	LT			D	2013-08-15

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: The boundary is drawn to encompass the riparian habitat and the rare species it supports.

Protection Urgency Rank Comments (P3): Throughout this stream reach, the majority of riparian habitat upon which the Ute ladies tresses depend has been modified by agricultural, rural and urban development. Consequences include elimination of native communities and stream channelization over much of the orchid's potential natural habitat. Anthropogenic activities have also resulted in alteration to stream disturbance (flooding) processes which would otherwise maintain early seral habitat which is essential to the viability and persistence of Ute ladies tresses.

Management Urgency Rank Comments (M2): Restoration of a natural hydrologic regime,

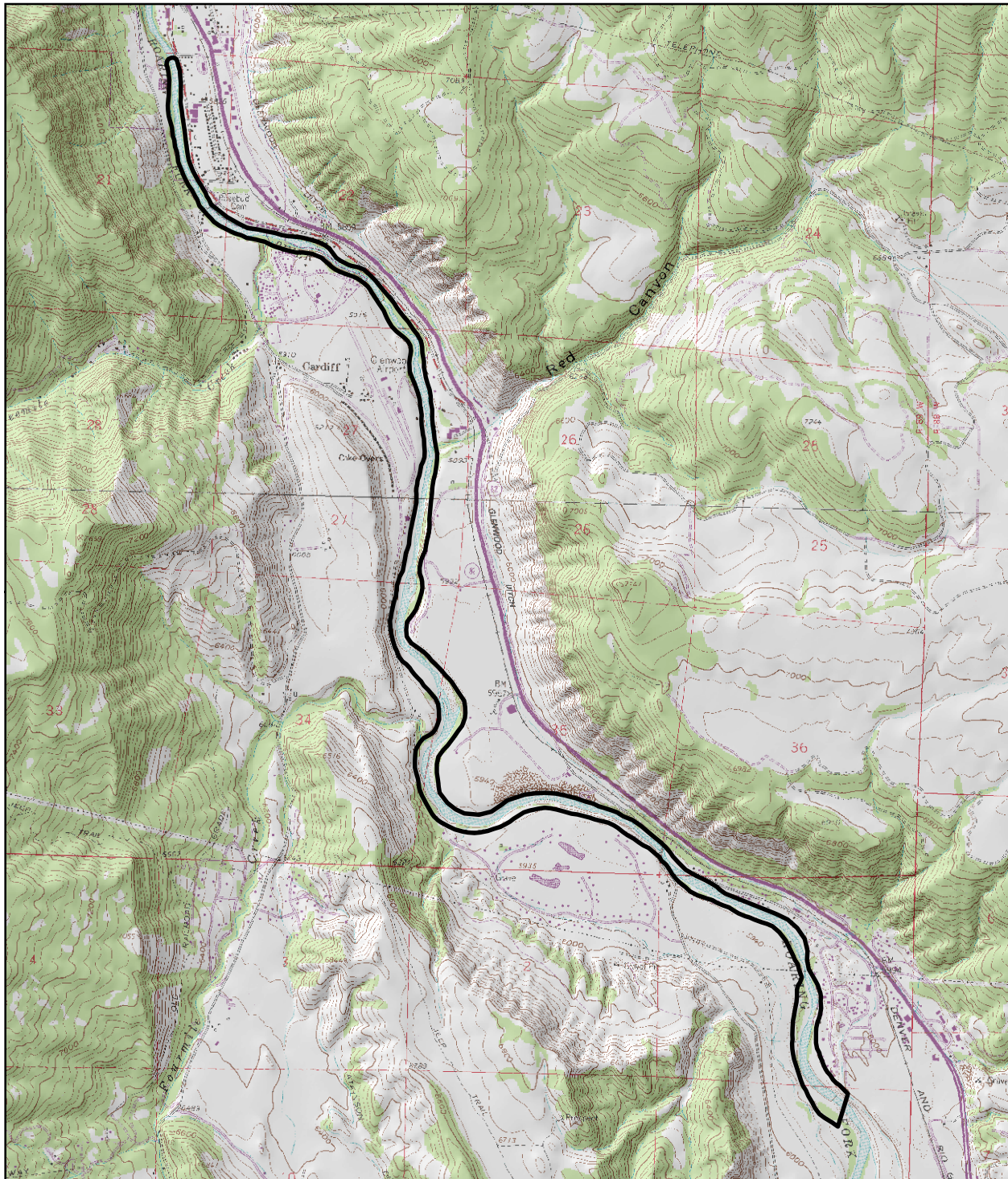
including restoring timing, duration and magnitude of stream flows is essential to restoring the processes that create habitat for *Spiranthes diluvialis*. Other conservation measures that would enhance long-term persistence include: 1) establishing a riparian setback of at least 100 feet that conserves native vegetation along streambanks to enhance and protect the natural values documented in this site, 2) eliminating grazing from riparian habitat, 3) eliminating recreational-induced trampling by routing fisherman access around, rather than through, *Spiranthes diluvialis* sites and 4) removal of non-native invasive plant species from riparian habitat.

References

Malone, D. J. Emerick, P. Lyon, and J. Sovell. 2016. CNHP Final Report: Survey of Critical Biological Resources: a resurvey and update of Potential Conservation Areas in Garfield County, Colorado. Colorado Natural Heritage Program, Fort Collins, CO.

Version Author: Handwerk, J. and D.G. Malone

Version Date: 10/04/2016



 PCA Boundary

 Miles

0 0.2 0.4

Map Date: 10/13/2016



7.5 Minute Digital Raster Graphics
by the U.S. Geological Survey
Cattle Creek, 39107-D3
Glenwood Springs, 39107-E3

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Roaring Fork River at Red Canyon Potential Conservation Area, B4: Moderate Biodiversity Significance

Douglas Pass

Biodiversity Rank - B5: General Biodiversity Interest

Protection Urgency Rank - P1: Immediately Threatened/Outstanding Opportunity

Management Urgency Rank - M1: Essential within 1 Year to Prevent Loss

U.S.G.S. 7.5-minute quadrangles: Douglas Pass

Size: 2,236 acres (905 ha)

Elevation: 7,400 - 8,000 ft. (2,256 - 2,438 m)

General Description: The Douglas Pass site encompasses an area east of Highway 139 and south of Douglas Pass, with steep hillsides and numerous springs. The dry hillsides have a cover of Gambel's oak, Utah serviceberry and other mountain shrubs, while the moist areas harbor a luxuriant plant community with Douglas-fir, aspen, and Rocky Mountain maple. Along the sides of Lookout Mountain Road is one of the largest populations known of the globally vulnerable large-flowered globemallow, a spectacular plant with bushy growth and large white or pink flowers. There are several ponds developed from springs, and there are historic records of northern leopard frogs occupying them, although none were observed during this survey.

Biodiversity Significance Rank Comments (B5): This site contains a poor (D-ranked) occurrence of the large-flower globe-mallow (*Iliamna grandiflora*) which is vulnerable on a global scale (G3?Q/S1S2). It also contains fair (C-ranked) occurrences of a state rare (G4?/S2) *Pseudotsuga menziesii* / *Acer glabrum* forest and a state rare (G3G5/S2) *Quercus gambelii* / *Amelanchier utahensis* shrubland. Surveys conducted in 2015 documented habitat deterioration and the near loss of the large-flower globe-mallow occurrence. Consequently the large-flower globe-mallow (*Iliamna grandiflora*) was downgraded from good (B-rank) to poor ("D-rank) and the Douglas-fir / mountain maple community (*Pseudotsuga menziesii* / *Acer glabrum*) was downgraded from good (B-rank) to fair (C-rank).

Natural Heritage element occurrences at the Douglas Pass PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Natural Communities	<i>Quercus gambelii</i> / <i>Amelanchier utahensis</i> Shrubland	Mixed Mountain Shrubland	G3G5	S2				C	2015-06-30
Natural Communities	<i>Pseudotsuga menziesii</i> / <i>Acer glabrum</i> Forest	Lower Montane Forests	G4?	S2				C	2015-06-30
Vascular Plants	<i>Iliamna grandiflora</i>	large - flower globe - mallow	G3?Q	S1S2				D	2015-06-30

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: The boundary is drawn to encompass the documented plant and community occurrences. However, the full extent of the forest community has not been established, and it may extend beyond the boundaries.

Protection Urgency Rank Comments (P1): The site is located primarily on BLM land, although a small amount of adjacent private land is included. There is no special protection in place for the site. The BLM Resource Management Plan (USDI 1987) emphasizes mineral extraction for this area. Oil and gas development may increase to the west of the site, leading to increased traffic and necessity of road maintenance. However, it is unlikely that new development will take place within the boundaries (Tappit, pers. comm.), since there are restrictions on development because of visual impacts near the highway and because the slopes are unstable. Invasion of non-native plant species has contributed to the loss or displacement of the large-flowered globe-mallow, and has degraded ecosystem processes throughout the site. Excessive livestock grazing has altered vegetation structure and degraded soils altering the hydrologic regime, enabling weed invasion and disconnecting ecosystem processes. The surrounding landscape does not meet BLM Rangeland Health Standards (<http://www.peer.org/campaigns/public-lands/public-lands-grazing-reform/blm-grazing-data-interactive-map.html>).

Management Urgency Rank Comments (M1): Weed invasion, road maintenance and excessive livestock grazing threaten both the occurrences and ecosystem processes. At this site, soil drying is negatively impacting the Douglas-fir/ mountain maple forest community. Modifying the grazing regime to less intensive and extensive use would help restore native vegetation cover and composition and potentially ecosystem health. Weed eradication is essential to restore system functions. This site was generally in good condition, but is now degraded.

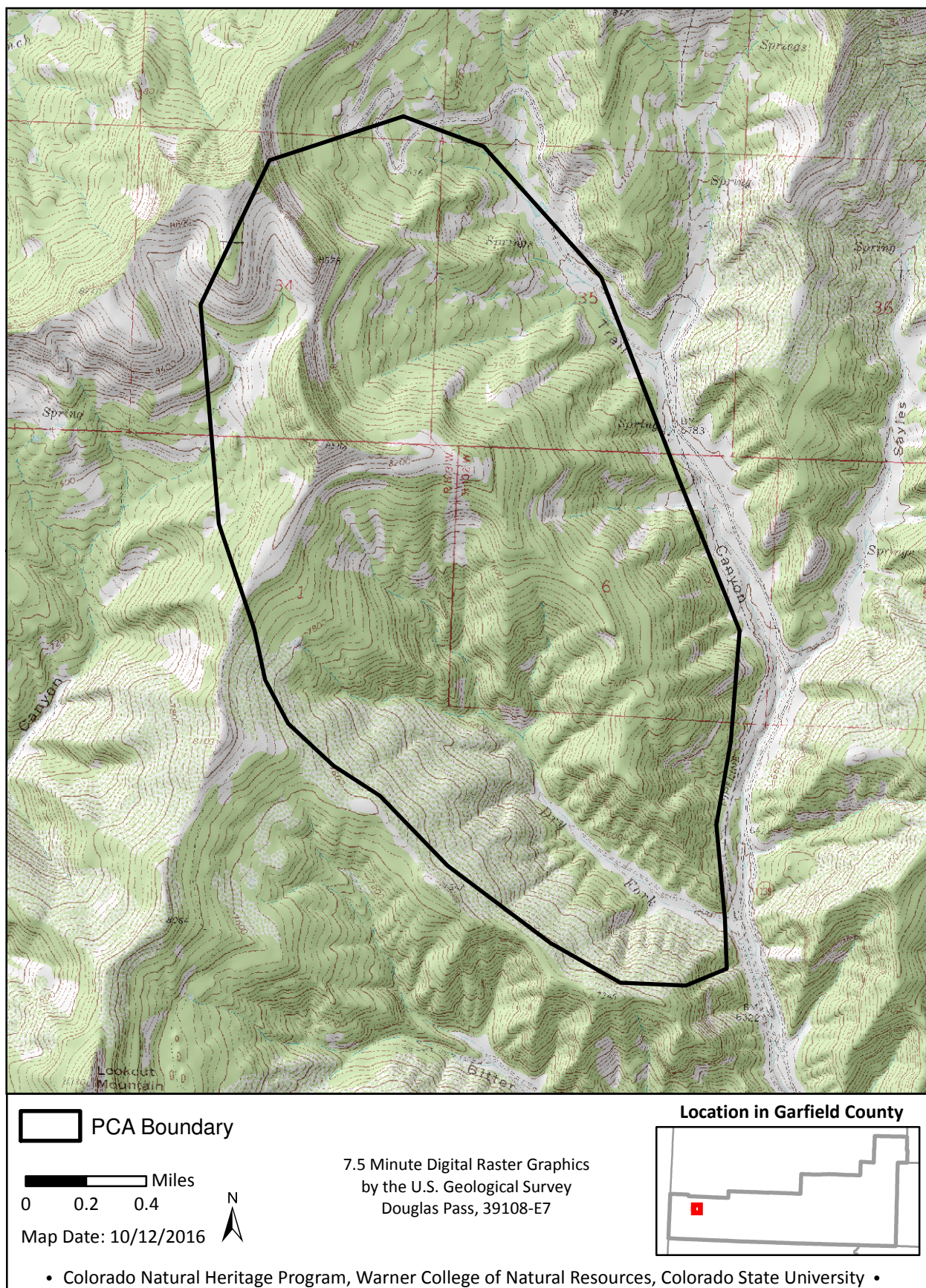
Exotic Species Comments: Yellow sweetclover (*Melilotus officinale*) is extensive and densely distributed throughout the site and in the surrounding landscape. Wet meadows are typically dominated by tamarisk (*Tamarix ramosissima*), Canada thistle (*Cirsium arvense*), houndstongue (*Cynoglossum officinalis*) and Kentucky bluegrass (*Poa pratensis*).

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Version Date: 08/13/2016



Prairie and South Canyons

Biodiversity Rank - B5: General Biodiversity Interest

Protection Urgency Rank - P2: Threat/Opportunity within 5 Years

Management Urgency Rank - M2: Essential within 5 Years to Prevent Loss

U.S.G.S. 7.5-minute quadrangles: Carbonera, Jim Canyon

Size: 7,244 acres (2,932 ha)

Elevation: 5,080 - 7,430 ft. (1,548 - 2,265 m)

General Description: This site includes the riparian habitats of South and Prairie Canyons within the West Salt Creek drainage where the vegetation is desert shrub dominated by big sagebrush. It extends for short distance upslope of the canyon bottoms into the pinyon - juniper woodlands. The boundaries continue south from the canyon openings into the saltbush fans and flats characteristic of areas south of the Bookcliffs. Here the vegetation consists of medium to tall shrubs including fourwing saltbush (*Atriplex canescens*), shadscale (*Atriplex confertifolia*) and greasewood (*Sarcobatus vermiculatus*) with an understory of perennial grasses including galleta and salina wildrye, and annual forbs. Approximately 40% of this site is privately owned; the remainder is BLM land and all is intensively grazed. It lies in the broad open area between the Bookcliffs and the Uncompahgre uplift geologically referred to as the Grand Valley. The southern saltbush fans and flats of the site contain recent unconsolidated alluvial and gravel deposits of the Quaternary period while the northern areas are characterized by older sedimentary deposits sandstone and shale from the Tertiary and Cretaceous periods.

Biodiversity Significance Rank Comments (B5): This site contains a poor (D-ranked) occurrence of the globally apparently secure (G4/S1) kit fox which is imperiled in the state. Surveys in 2015 verified the presence of the globally vulnerable but state imperiled (G3/S1) Ferron's milkvetch (*Astragalus musiniensis*) in poor condition.

Natural Heritage element occurrences at the Prairie and South Canyons PCA.

Major Group	State Scientific Name	State Common Name	Global Rank	State Rank	Federal Status	State Status	Fed Sens	EO Rank	Last Obs Date
Mammals	<i>Vulpes macrotis</i>	Kit Fox	G4	S1		SE	BLM/US FS	D	1997-99-99
Vascular Plants	<i>Astragalus musiniensis</i>	Ferron's milkvetch	G3	S1			BLM	D	2015-05-21

** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: The boundaries include the semi-desert shrub communities and margins of pinyon - juniper woodlands that are habitats of the kit fox (Fitzgerald et. al 1994).

Protection Urgency Rank Comments (P2): The majority of this site is owned and managed by the BLM. The area's lack of aesthetic qualities safeguard it from threats of development and lack of irrigation water will probably protect this site from conversion to agricultural uses. However, grazing is the predominant land use and it has degraded ecosystem processes and diminished resiliency. Because of grazing-induced environmental degradation, climate change has a greater probability of threatening the function and sustainability of this landscape.

Management Urgency Rank Comments (M2): BLM's rangeland health standards are not met in this PCA or in the vast surrounding landscape (<http://www.peer.org/campaigns/public-lands/public-lands-grazing-reform/blm-grazing-data-interactive-map.html>). Inappropriate and excessive livestock grazing has substantially altered vegetation species composition and structure, soils and hydrology, consequently diminishing ecosystem function and the long-term viability potential for native plant and animal species.

Land Use Comments: Both the private and BLM portions of the site are grazed. The past grazing practices have led to the introduction of exotic species in the area.

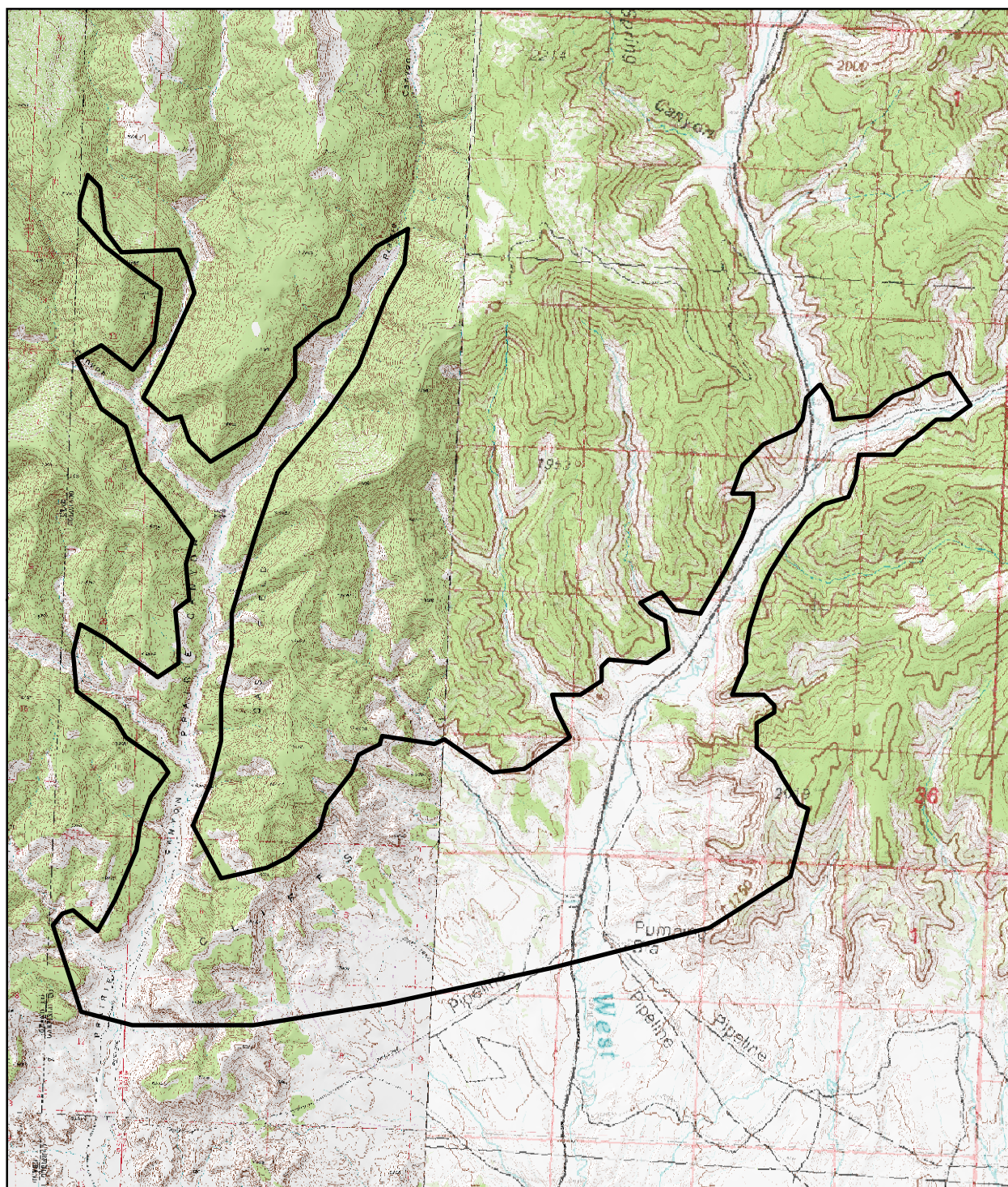
Exotic Species Comments: Cheatgrass is one of the more common species in the area and is spread throughout the site. Habitat is a mosaic of sage (*Artemisia tridentata* ssp. *wyomingensis*) and grasslands dominated by cheatgrass (*Bromus tectorum*). Restoration of the range with native graminoids is essential to restoring system function. New strategies using biocontrol are proving effective in eliminating cheatgrass (Kennedy et al.).

References

- Beck, T. D. I. 1999. Kit fox (*Vulpes macrotis*) status in Colorado. In Wildlife Research Report, Project No. W-153-R-12, Work Package 0663, Task 1: Colorado Division of Wildlife.
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- Fitzgerald, J. P., C. A. Meaney, and D. M. Armstrong. 1994. Mammals of Colorado. Denver Museum of Natural History and University Press of Colorado.
- Kennedy, A.C., T. L. Stubbs, and J. C. Hansen. 2014. Microbial Control of Cheatgrass Jointed Goatgrass and Medusahead. USDA-ARS, Washington State University. http://www.fwaa.org/accounts/fwaa/data_documents/60/files/10b-dl-2011-12-13_130p_kennedy,ann.pdf (accessed 12 September 2016).
- Malone, D. J. Emerick, P. Lyon, and J. Sovell. 2016. CNHP Final Report: Survey of Critical Biological Resources: a resurvey and update of Potential Conservation Areas in Garfield County, Colorado. Colorado Natural Heritage Program, Fort Collins, CO.
- McGrew, J.C. 1979. VULPES MACROTIS. Mammalian Species, 123: 1-6.

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 PCA Boundary

 Miles

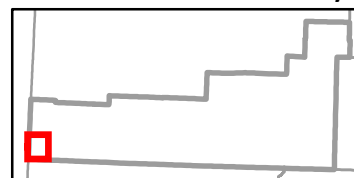
0 0.5 1

Map Date: 10/13/2016



30x60 Minute Digital Raster Graphics
by the U.S. Geological Survey
Grand Junction, 39108-A1

Location in Garfield County



• Colorado Natural Heritage Program, Warner College of Natural Resources, Colorado State University •

Prairie and South Canyons Potential Conservation Area, B5: General Biodiversity Interest