Survey of Critical Biological Resources
Rio Blanco County, Colorado
2008

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Colorado State University

Survey of Critical Biological Resources, Rio Blanco County, Colorado

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Cover photographs (clockwise): Raven Ridge (J.Huggins), White River, basin wildrye tallgrass prairie, and Cathedral Bluffs (D. Culver)

EXECUTIVE SUMMARY

Citizens and land managers of Rio Blanco County are concerned about issues of open space, wildlife habitat, and conservation of their unique natural surroundings. They recognize the need to plan for the conservation of the plants, animals and plant communities that are native to Rio Blanco County. They also recognize that with limited economic resources, it is important to prioritize conservation efforts. The need for information on the locations of the most significant biological resources of the area is urgent due to changing land uses.

In 2007, Rio Blanco County contracted with Colorado State University and the Colorado Natural Heritage Program (CNHP) to survey for critical biological resources in Rio Blanco County with funding provided by Rio Blanco County, Great Outdoors Colorado, Colorado Division of Wildlife (CDOW), and the Bureau of Land Management (BLM). A wetland and riparian survey was conducted concurrently with funding provided by the Colorado Department of Natural Resources via a U.S. Environmental Protection Agency, Region 8 Wetland Program Grant. The purpose of this project is to provide a data resource for managers, planners, and the citizens of Rio Blanco County for conducting proactive planning. This document should be considered a tool for managing lands that support rare, imperiled and/or sensitive plants, animals, and significant natural plant communities. This project will provide an additional resource for the Rio Blanco County's Land Use Resolution (Rio Blanco County Development Department 2002) and can be used to identify areas within the Overlay Zone Districts, especially within the Scenic Vistas (Sec. 188), Wildlife Protection (Sec.190), and Watershed Management (Sec. 191) districts.

In April 2007 CNHP and its Stakeholders identified potential areas for significant plants, animals, wetlands, and upland plant communities. Areas that were expected to contain significant elements were delineated as Targeted Inventory Areas (TIAs). These areas were prioritized for survey based on the relative rarity of the elements expected to be found there and the area's ability to maintain viable populations of those elements. Field surveys were conducted within the TIAs and areas found to contain significant elements were delineated as Potential Conservation Areas (PCAs).

Results of the survey confirm that there are many areas with outstanding to high biological significance in Rio Blanco County. There are several extremely rare plants that depend on these areas for survival. All together, 23 rare or imperiled plant species and 35 wetland and upland plant communities of concern were documented in Rio Blanco County. Thirteen rare or imperiled animal species have been documented by CDOW, BLM, and Forest Service. Natural history summaries for the plants, animals, and plant communities are presented in the final section of this report. Despite a very successful and productive field season, it is likely that some elements that are present in the County were not documented, due to either lack of access, phenology (reproductive timing) of species or time constraints.

CNHP has identified 28 PCAs in Rio Blanco County. Of the 28 PCAs presented in this report, one is of outstanding biodiversity significance (B1), seven are of very high significance (B2), and 20 are of high significance (B3). These PCAs represent the best examples of targeted species and plant communities and their ecological processes observed on the private and public lands

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

All of the PCAs presented in this report represent unique opportunities for Rio Blanco County and its Stakeholders to conserve significant components of the natural heritage of Rio Blanco County, and each is worthy of conservation attention. Several PCAs stand out as very significant such as Dudley Bluffs PCA which supports not only the world's only known population of the Dudley Bluffs bladderpod (*Lesquerella congesta*) but also one of the best known occurrences of Piceance twinpod (*Physaria obcordata*). The Piceance twinpod is also found within the Calamity Ridge PCA along with several occurrences of the globally imperiled (G2) basin big sagebrush with basin rye grass (*Artemisia tridentata* ssp. *tridentata*/*Leymus cinereus*) plant community. This sagebrush shrubland has been impacted throughout the Intermountain West due to hydrologic changes and introduction of the non native cheatgrass (*Bromus tectorum*). Numerous rare plants occur within the Raven Ridge PCA, of which the most significant is Graham's beardtongue (*Penstemon grahamii*). Raven Ridge encompasses all the known Colorado occurrences of this plant which is endemic to the Uinta Basin of northwestern Colorado and northeastern Utah. The Cathedral Bluffs PCA supports the best known occurrences for two globally imperiled (G2) plants: Piceance bladderpod (*Lesquerella parviflora*) and the sun-loving meadowrue (*Thalictrum heliophilum*). Both plants are endemic to Colorado and known only from Garfield, Mesa and Rio Blanco counties. Timber Gulch PCA supports good occurrences of the globally imperiled (G2) Piceance bladderpod (*Lesquerella parviflora*) and the sun-loving meadowrue. Hay Gulch PCA contains good occurrences of the globally imperiled (G2) elements; Piceance Twinpod and blue bunch wheatgrass (*Pseudoegneria spicata*) grassland plant community. Numerous PCAs, especially in the Piceance Creek Basin, include nesting and lek sites for the Greater Sage-grouse (*Centrocercus urophasianus*). The Greater Sage-grouse is a globally secure (G4) species; however, due to the loss of its habitat it is a State Special Concern species and a BLM/USFS sensitive species.

Rio Blanco County is truly unique with an amazing richness of rare fauna and flora well worth preserving for future generations. Overall, the concentration and quality of imperiled elements and habitats attest to the fact that conservation efforts in Rio Blanco County will have both statewide and global significance. The results of the survey will be provided to the stakeholders and will be available to the pubic on the CNHP website (www.cnhp.colostate.edu).

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INTRODUCTION

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

This survey of critical biological resources, including wetland and riparian areas of Rio Blanco County, is part of ongoing surveys of critical biological surveys of Colorado counties conducted by CNHP. To date, similar inventories have been conducted in all or parts of 33 Colorado counties. In 2007 Rio Blanco County and its stakeholders contracted with Colorado State University and CNHP to identify biologically significant areas within Rio Blanco County. Identification of sites containing natural heritage resources will allow conservation of these resources for future generations, and proactive planning to avoid land use conflicts in the future.

This *Survey of Critical Biological Resources in Rio Blanco County* used the methods that are employed worldwide throughout Natural Heritage Programs and Conservation Data Centers. The primary focus was to identify the locations of the plant and animal populations and plant communities on CNHP's list of rare and imperiled elements of biodiversity, assess their conservation value, and systematically prioritize these for conservation action.

The locations of biologically significant areas were identified by:

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

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

The PCA boundaries delineated in this report do not confer any regulatory protection of the site, nor do they automatically recommend exclusion of all activity. It is hypothesized that some activities will prove degrading to the element(s) or the ecological processes on which they depend, while others will not. The boundaries represent the best professional estimate of the primary area supporting the long-term survival of the targeted species or plant communities and are presented for planning

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

CNHP uses the Heritage Ranking Methodology to prioritize conservation actions by identifying those areas that have the greatest chance of conservation success for the most imperiled elements. The sites are prioritized according to their **biodiversity significance rank**, or "B-rank," which ranges from B1 (outstanding significance) to B5 (general or statewide significance). These ranks are based on the conservation (imperilment or rarity) ranks for each element and the element occurrence ranks (viability rank) for that particular location. Therefore, the highest quality occurrences (those with the greatest likelihood of long-term survival) of the most imperiled elements are the highest priority (receive the highest B-rank). See the section on Natural Heritage Ranking System for more details. The B1-B3 sites are the highest priorities for conservation actions (due to limited resources, only the B1-B3 PCAs are presented in the report). Based on current knowledge, the sites in this report represent areas CNHP recommends for protection in order to preserve the natural heritage of Rio Blanco County. In addition to presenting prioritized PCAs, this report also includes a section with summaries of selected plants and animals that are known to be found within the PCAs.

RECOMMENDED CONSERVATION STRATEGIES

Conservation Strategies can be classified as three major types:

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

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

1). Develop and implement a plan for protecting the Potential Conservation Areas profiled in this report, with most attention directed toward areas with a biodiversity rank of B1, B2 and B3. The PCAs in this report provide a basic framework for implementing a comprehensive conservation program. The B1, B2 and B3 sites, because they have global biological significance, are in need of priority attention. Consider incentive-based programs such as purchasing development rights or outright purchase from willing owners of land for significant sites that are in need of protection. Support local organizations, such as land trusts, in purchasing or acquiring conservation easements for protection of biological diversity or open space. Explore opportunities to form partnerships to access state and federal funding for conservation projects, such as those offered through the Colorado Division of Wildlife or the Farm Bill. Continue to promote cooperation among local entities to preserve the County's biodiversity. Encourage County leadership to institutionalize consideration of significant biological resources in land use planning.

2). Use this report in the review of proposed activities in or near Potential Conservation Areas to determine whether or not activities adversely affect elements of biodiversity. All of the PCAs presented contain elements of biodiversity of state or global significance. Weighing the biodiversity represented by PCAs should allow planners and biologists to consider natural resource conservation when making land use decisions.

Certain land uses on or near a site may affect the element(s) present there. Range-restricted species may be especially vulnerable to habitat destruction, while wetland and riparian areas are particularly susceptible to impacts from off-site activities if the activities affect water quality or hydrologic regimes. In addition, cumulative impacts from many small changes can have effects as profound and far-reaching as one large change. As proposed land use changes are considered, they should be compared to the

maps presented herein (also available in GIS format). If a proposed project has the potential to impact a site, planning personnel should contact persons, organizations, or agencies with the appropriate biological expertise for input in the planning process. The Colorado Natural Heritage Program routinely conducts site-specific environmental reviews and should be considered a valuable resource. Also, CNHP is continually updating biodiversity data throughout the state and can provide up-to-date information in the area of concern. To contact CNHP's Environmental Review Coordinator call (970) 491-7331. Other key partners, such as the Colorado Division of Wildlife, can be valuable resources as well, particularly in evaluating potential impacts to biological resources not tracked by CNHP (e.g., game species and fish).

3). Recognize the importance of larger, contiguous natural plant communities. While the PCAs identified in this report contain known locations of significant elements of natural diversity, protection of large areas in each vegetation type, especially where these are connected, may ensure that we do not lose species that have not yet been located. Work to protect large blocks of land in each of the major vegetation types in the County and avoid fragmenting large natural areas unnecessarily with roads, trails, etc. Although large migrating animals like deer and elk are not tracked by CNHP as rare species, they are part of our natural diversity, and their needs for winter range and access to protected corridors to food and water should be taken into consideration.

Fragmentation of the landscape also affects smaller animals and plants, opening more edge habitats and introducing exotic species. Encourage cluster developments that designate large common areas for preservation of natural communities, as an alternative to scattering residences over the landscape with a house on each 35-acre parcel. Work with developers early in the planning process to educate them about the benefits of retaining natural areas. Locate trails and roads to minimize impacts on native plants and animals. See Forman and Alexander (1998) for an excellent review of the literature on the ecological effects of roads. See *Planning Trails with Wildlife in Mind* published by the State Trails Program (Colorado Department Natural Resources 1998) for suggestions regarding planning trails with minimum impacts to wildlife.

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

5). Promote wise management of the biodiversity resources that exist within Potential Conservation Areas. Development of a site-specific conservation plan is a necessary component of the long-term protection of a PCA. Because some of the most

serious impacts to Rio Blanco County's ecosystems are at a large scale (e.g., altered hydrology, residential encroachment, and non-native species invasion), considering each area in the context of its surroundings is critical. Several organizations and agencies are available for consultation in the development of conservation plans, including the Colorado Natural Heritage Program, the Colorado Division of Wildlife, the Natural Resources Conservation Service, The Nature Conservancy, and various academic institutions. With the current rate of population growth in Colorado, rare and imperiled species will likely decline if not given appropriate protection or management attention. Coordinate with managers of public parks or other public lands that support sensitive biological resources. Engage local citizens, groups, and organizations (e.g., schools, 4-H clubs, Colorado Native Plant Society) in assisting with management and monitoring projects on public lands. Make a concerted effort to involve individual landowners in conservation dialogue, as applicable.

6). Stay informed and involved in public land management decisions. Approximately 76% of Rio Blanco County is publicly owned. The Bureau of Land Management owns and manages 57%, the U.S. Forest Service owns approximately 17%, and the State of Colorado collectively owns 2%. Many of the PCAs in Rio Blanco County are on public land and may be protected from development, but not from incompatible uses. Even ownership is not always secure, since federal and state agencies are becoming more and more involved in land exchanges. Encourage protection for the most biologically significant sites on public lands by implementing compatible management activities designated in Forest Management Plans, Grazing Management Plans, etc.

7). Continue inventories and monitoring where necessary, including inventories for species that cannot be surveyed adequately in one field season and continue inventories on lands that CNHP could not access in 2007. Not all targeted inventory areas can be surveyed in one field season due to several factors, including lack of access, phenology of species, or time constraints. Because some species are ephemeral or migratory, completing an inventory in one field season is often difficult. Despite the best efforts during one field season, it is likely that some elements were not documented during the survey. Thus, it is recommended that this report and the data included within it serve as a guide for subsequent surveys of Rio Blanco County. Monitoring rare elements is recommended to track population trends, especially with changing land management.

8). Continue to take a proactive approach to weed and exotic species control. Recognize that weeds affect both agriculture and native plant communities. Discourage the introduction and/or sale of non-native species that are known to significantly impact natural areas. These include, but are not limited to, exotic, invasive species such as tamarisk, Russian olive, yellow toadflax, purple loosestrife, and stocking of non-native fish species. Further, natural area managers, public agencies, and private landowners should be encouraged to remove these species from their properties. Enforce the use of weed-free forage on horse trails, campgrounds, and at trailheads. Encourage the use of native species for revegetation and landscaping efforts. Ideally, seed should be locally harvested. This includes any seeding done on County road right-of-ways. Refer to the Rio Blanco County Weeds Department for assistance on identifying and eradicating weeds

http://www.co.rio-blanco.co.us/weedcontrol/. The Colorado Natural Areas Program has published a book entitled *Native Plant Revegetation Guide for Colorado* that describes appropriate species to be used for revegetation. This resource is available at http://parks.state.co.us/cnap/Revegetation_Guide/Reveg_index.html.

9). Encourage public education functions and publications. A significant early step in the process of conserving biodiversity is educating local citizens and other stakeholders on the value that such areas offer the public. As described in this report, Rio Blanco County is rich in animal and plant diversity. Conveying the value and function of these habitats and the species that inhabit them to the public can generate greater interest in conserving lands. Conducting forums or presentations that highlight the biodiversity of Rio Blanco County should increase awareness of the uniqueness of the habitats within the County. Similarly, providing educational pamphlets or newsletters that explain why these areas are so valuable can increase public interest and support for biodiversity conservation. Consider developing a community conservation website to provide information on natural resource, biological diversity, and conservation opportunities in Rio Blanco County. Enlist the assistance of local media in public education efforts.

10). Develop and implement comprehensive program to address loss of wetlands. In conjunction with the information contained in this report, information regarding the degree and trend of loss for all wetland types (i.e., emergent marshes, riparian shrublands and forests, seeps/springs, etc.) should be sought and utilized to design and implement a comprehensive approach to the management and protection of Rio Blanco County wetlands. Encourage and support statewide wetland protection efforts such as the CDOW's Wetland Wildlife Conservation Program http://wildlife.state.co.us/LandWater/WetlandsProgram/ and the NRCS's Wetlands Reserve Program http://www.nrcs.usda.gov/Programs/WRP/ or Farm Bill http://www.nrcs.usda.gov/programs/farmbill/2002/.
County governments are encouraged to support research efforts on wetlands to aid in their conservation. Countywide education on the importance of wetlands could be implemented through the Colorado State University Extension or other local agencies. Encourage communication and cooperation with landowners regarding protection of wetlands in Rio Blanco County.

THE NATURAL HERITAGE NETWORK RANKING SYSTEM

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

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

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

Colorado is inhabited by some 800 vertebrate species and subspecies, and tens of thousands of invertebrate species. In addition, the state has approximately 4,300 species of plants and more than 450 recognized plant communities that represent terrestrial and wetland ecosystems. It is this rich natural heritage that has provided the basis for Colorado's diverse economy. Some components of this heritage have always been rare, while others have become imperiled with human-induced changes in the landscape. This decline in biological diversity is a global trend resulting from human population growth, land development, and subsequent habitat loss. Globally, the loss in species diversity has become so rapid and severe that Wilson (1988) has compared the phenomenon to the great natural catastrophes at the end of the Paleozoic and Mesozoic eras.

The need to address this loss in biological diversity has been recognized for decades in the scientific community. However, many conservation efforts made in this country were not based upon preserving biological diversity; instead, they primarily focused on preserving game animals, striking scenery, and locally favorite open spaces. To address the absence of a methodical, scientifically based approach to preserving biological diversity Dr. Robert Jenkins of The Nature Conservancy pioneered the Natural Heritage Methodology in the early 1970s.

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

The Natural Heritage Methodology is used by Natural Heritage Programs throughout North, Central, and South America, forming an international database network. The 85 Natural Heritage Network data centers are located in each of the 50 U.S. states, 11 Canadian provinces and territories, and many countries and territories in Latin America and the Caribbean. This network enables scientists to monitor the status of species from a state, national, and global perspective. Information collected by the Natural Heritage Programs can provide a means to protect species before the need for legal endangerment status arises. It can also enable conservationists and natural resource managers to make informed, objective decisions in prioritizing and focusing conservation efforts.

What is Biological Diversity?

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

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

Genetic Diversity — the genetic variation within a population and among populations of a plant or animal species. The genetic makeup of a species varies between populations within its geographic range. Loss of a population results in a loss of genetic diversity for that species and a reduction of total biological diversity for the region. Once lost, this unique genetic information cannot be reclaimed.

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

Community Diversity — the variety of plant communities within an area that represent the range of species relationships and inter-dependence. These communities may be diagnostic of or even restricted to an area.

Landscape Diversity — the type, condition, pattern, and connectedness of natural communities. A landscape consisting of a mosaic of natural communities may contain one multifaceted ecosystem, such as a wetland ecosystem. A landscape also may contain several distinct ecosystems, such as a riparian corridor meandering through short grass prairie. Fragmentation of landscapes, loss of connections and migratory corridors, and loss of natural communities all result in a loss of biological diversity for a region.

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

Colorado Natural Heritage Program

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

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

The multi-disciplinary team of scientists, planners, and information managers at CNHP gathers comprehensive information on the rare, threatened, and endangered species and significant plant communities of Colorado. Life history, status, and locational data are incorporated into a continually updated data system. Data maintained in CNHP database are an integral part of on-going research at Colorado State University and reflect the observations of many scientists, institutions and our current state of knowledge. These data are acquired from various sources, with varying levels of accuracy, and are continually updated and revised. Sources include published and unpublished literature, museum and herbaria labels, and field surveys conducted by knowledgeable naturalists, experts, agency personnel, and our own staff of botanists, ecologists, and zoologists.

All Natural Heritage Programs house data about imperiled species and are implementing use of the Biodiversity Tracking and Conservation System (BIOTICS) developed by NatureServe. This database includes taxonomic group, global and state rarity ranks, federal and state legal status, observation source, observation date, county, township, range, watershed, and other relevant facts and observations. BIOTICS also has an ArcView based mapping program for digitizing and mapping occurrences of rare plants, animals, and plant communities. These rare species and plant communities are referred to as “elements of natural diversity” or simply “elements.”

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

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

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

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

The Natural Heritage Ranking System

Key to the functioning of Natural Heritage Programs is the concept of setting priorities for gathering information and conducting inventories. The number of possible facts and observations that can be gathered about the natural world is essentially limitless. The financial and human resources available to gather such information are not. Because biological inventories tend to be under-funded, there is a premium on devising systems that are both effective in providing information that meets users' needs and efficient in gathering that information. The cornerstone of Natural Heritage inventories is the use of a ranking system to achieve these twin objectives of effectiveness and efficiency.

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

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

Element imperilment ranks are assigned both in terms of the element's degree of imperilment within Colorado (its State-rank or S-rank) and the element's imperilment over its entire range (its Global-rank or G-rank). Taken together, these two ranks indicate the degree of imperilment of an element. For example, the lynx, which is thought to be secure in northern North America but is known from less than five current locations in Colorado, is ranked G5 S1 (globally-secure, but critically imperiled in this state). The Rocky Mountain Columbine, which is known only in Colorado from about 30 locations, is ranked a G3 S3 (vulnerable both in the state and globally, since it only occurs in Colorado and then in small numbers). Further, a tiger beetle that is only known from one location in the world at the Great Sand Dunes National Monument is ranked G1 S1 (critically imperiled both in the state and globally, because it exists in a single location). CNHP actively collects, maps, and electronically processes specific occurrence information for animal and plant species considered extremely imperiled to vulnerable in the state (S1 - S3). Several factors, such as rarity, evolutionary distinctiveness, and endemism (specificity of habitat requirements), contribute to the conservation priority of each species. Certain species are "watchlisted," meaning that specific occurrence data are collected and periodically analyzed to determine whether more active tracking is warranted. A complete description of each of the Natural Heritage ranks is provided in Table 1.

This single rank system works readily for all species except those that are migratory. Those animals that migrate may spend only a portion of their life cycles within the state. In these cases, it is necessary to distinguish between breeding, non-breeding, and resident species. As noted in Table 1, ranks followed by a "B," for example S1B, indicate that the rank applies only to the status of breeding occurrences. Similarly, ranks followed by an "N," for example S4N, refer to non-breeding status, typically during migration and

winter. Elements without this notation are believed to be year-round residents within the state.

Table 1. Definition of Natural Heritage 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 is uncertain, but falls within the stated range.

Legal Designations for Rare Species

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

Table 2. 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 (for example, canopy, understory, and ground cover in a forest community), and biotic interactions (such as levels of competition, predation, and disease).
- **Landscape Context** – an integrated measure of two factors: the dominant environmental regimes and processes that establish and maintain the element, and connectivity. Dominant environmental regimes and processes include herbivory, hydrologic and water chemistry regimes (surface and groundwater), geomorphic processes, climatic regimes (temperature and precipitation), fire regimes, and many kinds of natural disturbances. Connectivity includes such factors as a species having access to habitats and resources needed for life cycle completion, fragmentation of ecological communities and systems, and the ability of the species to respond to environmental change through dispersal, migration, or re-colonization.

Each of these factors is rated on a scale of A through D, with A representing an excellent 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 3.

Table 3. Element Occurrence Ranks and their Definitions.

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

Potential Conservation Areas

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

The 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;
- Land necessary for management or monitoring activities.

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

Off-Site Considerations

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

Ranking of Potential Conservation Areas

CNHP uses element and element occurrence ranks to assess the overall biological diversity significance of a PCA, which may include one or many element occurrences. Based on these ranks, each PCA is assigned a biological diversity rank (or B-rank). See Table 4 for a summary of these B-ranks.

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

B1	**Outstanding Significance (indispensable):** only known occurrence of an element A-ranked occurrence of a G1 element (or at least C-ranked if best available occurrence) concentration of A- or B-ranked occurrences of G1 or G2 elements (four or more)
B2	**Very High Significance:** B- or C-ranked occurrence of a G1 element A- or B-ranked occurrence of a G2 element One of the most outstanding (for example, among the five best) occurrences rangewide (at least A- or B-ranked) of a G3 element. Concentration of A- or B-ranked G3 elements (four or more) Concentration of C-ranked G2 elements (four or more)
B3	**High Significance:** C-ranked occurrence of a G2 element A- or B-ranked occurrence of a G3 element D-ranked occurrence of a G1 element (if best available occurrence) Up to five of the best occurrences of a G4 or G5 community (at least A- or B-ranked) in an ecoregion (requires consultation with other experts)
B4	**Moderate Significance:** Other A- or B-ranked occurrences of a G4 or G5 community C-ranked occurrence of a G3 element 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 5 summarizes the P-ranks and their definitions.

Table 5. 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.

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.

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 potential conservation area.

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 potential conservation area. Table 6 summarizes M-ranks and their definitions.

Table 6. 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.

WETLAND DEFINITIONS, REGULATIONS, AND CONDITION ASSESSMENT

Wetland Definitions

The federal regulatory definition of a jurisdictional wetland is found in the regulations used by the U.S. Army Corps of Engineers (Corps) for the implementation of a dredge and fill permit system required by Section 404 of the Clean Water Act Amendments (Mitsch and Gosselink 1993). According to the Corps, wetlands are “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstance do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.” For Corps programs, a wetland boundary must be determined according to the mandatory technical criteria described in the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987). In order for an area to be classified as a jurisdictional wetland (i.e., a wetland subject to federal regulations), it must have all three of the following criteria: (1) wetland plants; (2) wetland hydrology; and (3) hydric soils.

The U.S. Fish and Wildlife Service defines wetlands from an ecological point of view. *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979) states that “wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water." Wetlands must have *one or more* of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes (wetland plants); (2) the substrate is predominantly undrained hydric soil; and/or (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year.

CNHP adheres to the wetland definition used by the U.S. Fish and Wildlife Service, because it recognizes that some areas display many of the attributes of wetlands without exhibiting all three characteristics required to fulfill the Corps’ criteria. For example, riparian areas, which often do not meet all three of the Corps' criteria, perform many of the same functions as other wetland types, including maintenance of water quality, storage of floodwaters, and enhancement of biodiversity, especially in the western United States (National Research Council 1995). Thus, the U.S. Fish and Wildlife Service wetland definition is more suitable to CNHP’s objective of identifying ecologically significant wetlands. Rio Blanco County also defines a wetland according to the U.S. Fish and Wildlife Service (Rio Blanco County Land Use Resolution 2002).

Wetland Regulation in Colorado

Wetlands in Colorado are currently regulated under the authority of the Clean Water Act. A permit issued by the Corps is required before placing fill in a wetland and before dredging, ditching, or channelizing a wetland. The Clean Water Act exempts certain filling activities, such as normal agricultural activities.

The 404(b)(1) guidelines, prepared by the Environmental Protection Agency in consultation with the Corps, are the federal environmental regulations for evaluating projects that will impact wetlands. Under these guidelines, the Corps is required to determine if alternatives exist for minimizing or eliminating impacts to wetlands. When unavoidable impacts occur, the Corps requires mitigation of the impacts. Mitigation may involve creation or restoration of similar wetlands in order to achieve an overall goal of no net loss of wetland area.

Colorado's state government has developed no guidelines or regulations concerning the management, conservation, and protection of wetlands, but a few county and municipal governments have, including the City and County of Boulder, Summit County, and San Miguel County. In Rio Blanco County, minimum buffer areas must be established from the wetland boundary as follows (Rio Blanco County Development Department 2002; Section 256):

1. 50 feet buffer for wetlands of one acre or less, and
2. 100 feet buffer for wetlands of more than one acre.

Wetland Mapping in Colorado

National Wetland Inventory Maps

The U.S. Fish and Wildlife Service has conducted inventories of the extent and types of our nation's wetlands. The Cowardin et al. (1979) classification system provides the basic mapping units for the U.S. National Wetlands Inventory (NWI). Photo-interpretation and field reconnaissance was used to refine wetland boundaries according to the wetland classification system. The information is summarized on 1:24,000 and 1:100,000 maps.

The NWI maps provide important and accurate information regarding the location of wetlands. They can be used to gain an understanding of the general types of wetlands in the county and their distribution. The NWI maps cannot be used for federal regulatory programs that govern wetlands for two reasons. First, the U.S. Fish and Wildlife Service uses a definition for a wetland that differs slightly from Corps, the agency responsible for executing federal wetland regulations. Secondly, there is a limit to the resolution of the 1:24,000 scale maps. For example, at this scale, the width of a fine line on a map represents about 5 m (17 ft) on the ground (Mitsch and Gosselink 1993). For this reason, precise wetland boundaries must be determined on a project-by-project basis.

Wetland Functions and Ecological Services

Wetland functions are natural processes of wetlands that continue regardless of their perceived value to humans (Novitzki et al. 1996). These include;

- storage of water;
- transformation of nutrients;
- growth of living matter; and
- diversity of wetland plants.

Ecological services are the wetland functions that are valued by society. For example, biogeochemical cycling (which includes retention and supply) is an ecological function whereas nutrient removal/retention is an ecological service to society. Also, overbank

flooding/subsurface water storage is an ecological function whereas flood abatement/flood-flow alteration is an important ecological service.

Ecological services are typically the value people place on wetlands that is the primary factor determining whether a wetland remains intact or is converted for some other use (National Audubon Society 1993). The actual value attached to any given function or value listed above depends on the needs and perceptions of society (National Research Council 1995).

Wetland Condition Assessment

For past county wetland survey and assessment projects, CNHP utilized a qualitative, descriptive functional assessment based on the best professional judgment of CNHP ecologists while incorporating some of the principles of the hydrogeomorphic (HGM) assessment method. The assessment was used to provide a rapid determination of each wetland's functional integrity. This functional assessment method used various qualitative indicators of structure, composition, and land use to represent and estimate the degree to which a function was being performed. This, as well as most functional assessments, requires the following assumptions: (1) the combination of variables adequately represents the function and (2) their combination results in an estimated "amount" of the function being performed.

Condition assessments are 'holistic' in that they consider *ecological integrity* to be an "integrating super-function" (Fennessy et al. 2004). Condition assessments or ecological integrity assessments provide insight into the integrity of a wetland's natural ecological functions that are directly related to the underlying integrity of biotic and abiotic processes. In other words, a wetland with excellent ecological integrity will perform all of its functions at full levels expected for its wetland class or type. Ecological integrity assessments are simply concerned with measuring the condition of the wetland and assume that ecological functions follow a similar trend. This assumption may not be true for all functions, especially ecological services or those functions which provide specific societal value. For example, ecological services such as flood abatement or water quality improvement may still be performed even if ecological integrity has been compromised. However, given that CNHP is attempting to identify and prioritize ecologically significant wetlands it seemed more pertinent to focus the assessment on ecological integrity or condition of each wetland rather than specific ecological functions, services or values.

The element occurrence rank (see CNHP methodology section, Table 3) used by CNHP is a rapid assessment of the condition of on-site and adjacent biotic and abiotic processes that support and maintain the element. This method was used to assess wetland condition for this report. Recently, NatureServe and CNHP (Faber-Langendoen et al. 2005) revised this method making it more transparent and repeatable. The revised method, tentatively called Ecological Integrity Assessment Scorecards, will be used in future projects to assess wetland condition.

PROJECT BACKGROUND

Location of the Study Area

Rio Blanco County derives its name from the White River, which bisects the county from east to west. Colorado's sixth largest county, Rio Blanco encompasses some 3,226 square miles (8,356 km^2) in northwestern Colorado (Figure 1). Situated a little over 50 miles south of the Wyoming border, Rio Blanco County is bordered by Moffat County on the north, Routt County to the east, Garfield County to the south, and Uinta County, Utah on the west. Elevations in the county range from 5,052 feet (1,540 m) along the White River at the western boundary to 12,001 ft. (3,661 m) in the vicinity of Pyramid Peak near the eastern border. The White River originates in the Flat Tops and White River Plateau just beyond the east boundary of the county. Across the river to the north, the southern end of the Danforth Hills crosses the boundary with Moffat County. Southwest of Meeker, the Grand Hogback runs from the southern boundary to the White River. West of Meeker, the drainages of Piceance and Yellow Creeks outline the northern portion of the Piceance Basin. At the western margin of the basin, the spectacular Cathedral Bluffs overlook the Douglas Creek drainage as it flows toward the town of Rangely. The western end of the county is adjacent to Utah's East Tavaputs Plateau.

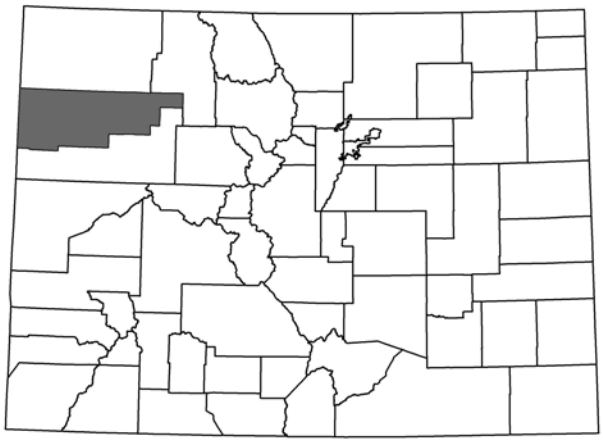


Figure 1. Location of Rio Blanco County, CO.

Ecoregions

Rio Blanco County is part of three different ecoregions as defined by The Nature Conservancy (The Nature Conservancy 1997, modified from Bailey 1995). The area east of the Grand Hogback belongs to the Southern Rocky Mountain ecoregion (Figure 2). To the west, the majority of the county falls within the Utah High Plateaus ecoregion (generally south of the White River) or the Wyoming Basins ecoregion (north of the White River, along the northern border of the county).

The Southern Rocky Mountain ecoregion includes the north-south trending mountain ranges with their intervening valleys and parks from southern Wyoming to northern New Mexico, and, in Colorado, more westerly mountain ranges and high plateaus, including the White River Plateau in eastern Rio Blanco County. The major ecological zones are

alpine, subalpine, upper montane, lower montane and foothill (Neely et al. 2001). Western Rio Blanco County represents the easternmost portion of the Utah High Plateaus ecoregion, which extends southwestward towards southern Utah in an arc encompassing the Piceance Basin, Roan Plateau, East and West Tavaputs Plateaus, and other high mesas in central Utah. The ecoregion is characterized by cool, mesic mid-elevation plateaus and deep canyons. The Wyoming Basin ecoregion is represented along the northern border of Rio Blanco County. This shrub-dominated semi-desert ecoregion dominates central and western Wyoming, extending from northern Colorado and Utah northward to Montana and Idaho. The area is characterized by basin, plain, desert, and "island" mountain ecological zones (Freilich et al. 2001)

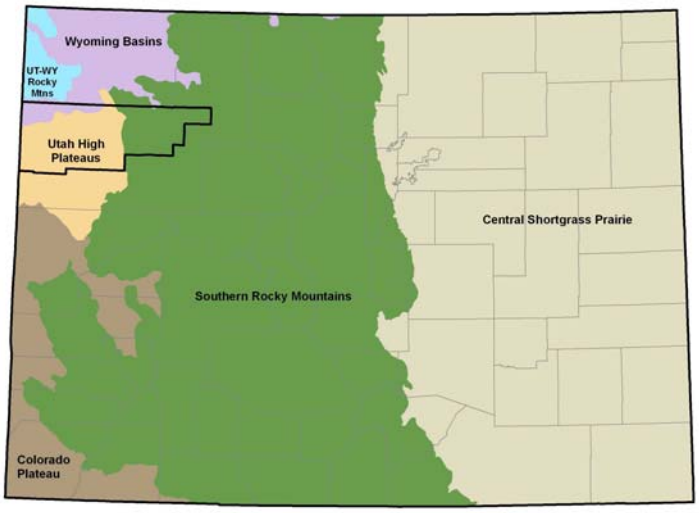


Figure 2. Colorado Ecoregions.

Hydrology

Rio Blanco County is drained almost exclusively by the White River and its tributaries within the Upper White, Piceance-Yellow Creeks, and Lower White watersheds (Figure 3). The northeasternmost areas drain to the Yampa River (Upper and Lower Yampa watersheds), and the extreme upper reaches of a few tributaries to the Colorado River are incidental along isolated areas of the southern border of the county. Major perennial tributaries to the White River include Piceance Creek, Yellow Creek, and Douglas Creek.

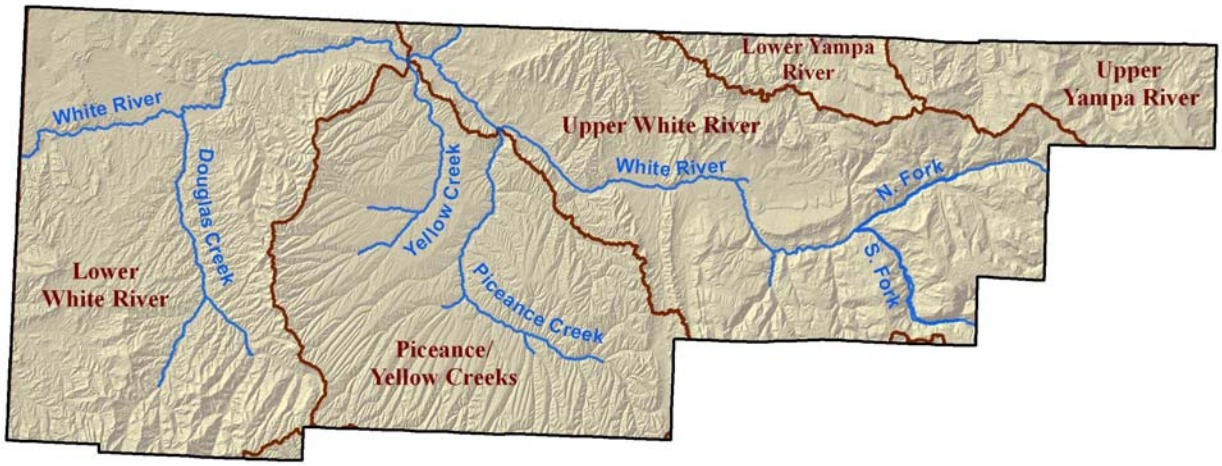


Figure 3. Major Watersheds in Rio Blanco County.

The White River accounts for about 5.5 percent of the total stream flow leaving Colorado, with an historic average annual flow at the Colorado-Utah border of 590,100 acre feet (Topper et al. 2003). The recorded peak flow at the gauge below Meeker was 6060 cfs in 1983, and the lowest flow recorded was 75 cfs in 2002 (USGS Surface Water Data Colorado 2008). Sediment concentrations in the White River increase downstream, and are frequently elevated (USDI BLM 1994). In addition, salinity levels increase downstream of the confluence with Piceance Creek, whose drainage area is very saline (USDA Natural Resources Service 1982, USDI BLM 1994).

Alluvial aquifers in Rio Blanco County are primarily associated with the White River and the Piceance and Yellow Creek tributaries. The White River alluvium is characterized by materials derived from sandstone, quartzite, basalt, and granite of the eastern mountains. Alluvium of the tributaries is finer-grained material of local origin (Topper et al. 2003). Rio Blanco County is also underlain by portions of the Piceance, Sand Wash, and Eagle structural basin sedimentary rock aquifers (Topper et al. 2003).

The earliest water rights appropriations in the area date from the 1880's to the 1900's, with appropriations in the drier western half of the county generally following those further east (USDA Natural Resources Service 1982). Agriculture (irrigation) is the largest consumer of water in the basin. Additional uses include industrial, domestic, recreation, wildlife, and livestock. Hydrological modification of the White River includes the operation of the Lake Avery, Rio Blanco Lake, and Kenney Reservoirs. Numerous additional smaller water developments throughout the county provide water for livestock or wildlife, and erosion control (USDI BLM 1994).

Geology

From east to west, Rio Blanco County possesses three principal geologic structural elements; the White River uplift, the northern end of the Piceance Basin, and the Douglas Creek arch (Figure 4). The central feature is the Piceance Basin, a structural and depositional basin bounded by uplifts of the Laramide Orogeny. From the Late

Cretaceous to Eocene times, this mountain-building episode formed the uplifts and intervening lake-filled basins characteristic of northwestern Colorado and adjacent Utah and Wyoming. The Piceance Basin is a syncline, or downward arching series of strata, between the Grand Hogback-White River Uplift on the east and the Douglas Creek Arch on the west. The basin is largely filled by Tertiary sediments of the Uinta and Green River formations deposited in the Eocene Lake Uinta, which, in addition to ground water contain oil shale, oil, natural gas, nahcolite, and dawsonite (Foutz 1994, MacLachlan 1987). To the northeast, the Axial Basin uplift with its associated hills and low relief mountains separates the Piceance basin from the Sand Wash basin to the north. To the west, exposed late Cretaceous strata of the Mesa Verde formation in the Douglas Creek Arch form the boundary between the Piceance and Uinta Basins. At the northern end of the arch, the Rangely anticline is a minor structure at right angles to the arch.

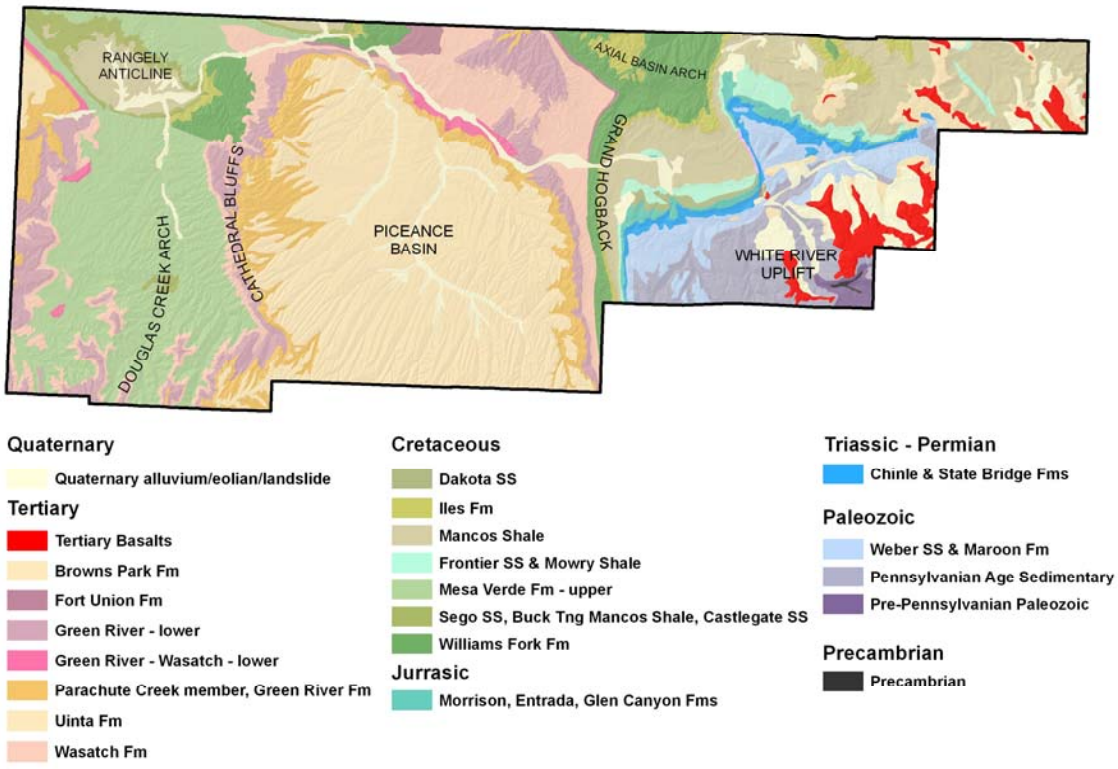


Figure 4. Geology of Rio Blanco County.

Soils

The semi-arid climate of Rio Blanco County, with its low precipitation, cool nights, and moderate temperatures generally restrains vegetation growth and thereby slows the chemical and biological processes needed for good soil development. Together with the rapid geologic erosion characteristic of the area, this has resulted in soils that lack distinct deep horizons. Soils in much of the county are shallow, and in some areas are high in sodium and other salts (USDI BLM 1994).

The USDA Natural Resources Service Soil Survey of Rio Blanco County Area (1982) divides the soils of the county (not including USFS lands on the eastern edge) into four landscape groups: 1) flood plains, terraces, alluvial valley floors, fans, and valley side slopes, 2) uplands and desert foothills, 3) foothills, and 4) mountains. Soils of the first group are deep and well to moderately well drained, and are suitable for irrigated forage production or rangeland. These soils are formed in mixed alluvium derived mostly from sedimentary rock. The soils of the uplands and desert foothills are derived predominantly from shale and sandstone, are dry, and generally support sparse vegetation. Soils of the foothills group are the most common in the area. They are derived from sedimentary rock, are well drained, and generally support pinyon-juniper, sagebrush or other shrub communities, and grassland. Mountain soils are generally steep, derived from sedimentary rock, and support vegetation communities of higher elevations.

Climate

Rio Blanco County has a continental climate characterized by dry air, sunny days, clear nights, variable precipitation, moderate evaporation, and large diurnal temperature changes (USDI BLM 1994). Corresponding to its wide elevational range, Rio Blanco County's climate is highly variable from east to west. Annual precipitation is highest in the vicinity of the Flat Tops, and decreases towards the northwest corner of the county (Figure 5). In contrast to other portions of the state, northwestern Colorado generally lacks a dominant seasonal pattern for precipitation. At Meeker and Rangely, annual precipitation for the period of record averages 16.43 and 9.99 inches, respectively (Western Regional Climate Center 2008). Temperatures follow a similar elevational pattern, with generally cooler temperatures with increasing elevation. Summer temperatures typically range from lows in the 40's to highs in the 80s and 90s, with an extreme high of 108 F recorded at Rangely in 1974. Winters bring highs in the upper 30s and lows in the single digits, although temperatures as low as -48 F have been recorded at Little Hills in 1963 (Western Regional Climate Center 2008).

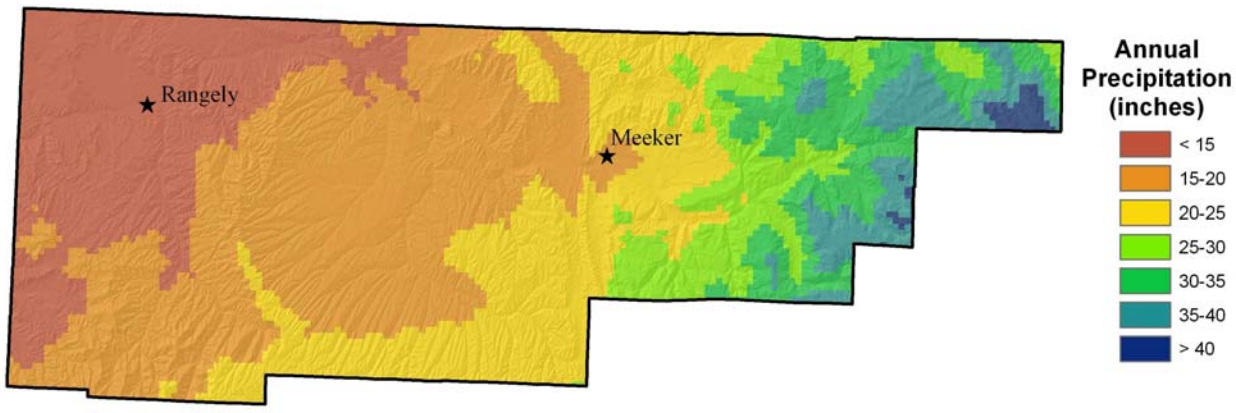


Figure 5. Annual Precipitation in Rio Blanco County.

Population

At the 2000 census, the population of Rio Blanco County was 5,986, which ranked 46th of 63 counties. This is projected to have increased to 6,180 by the year 2006. The

population of the county reached a high point in 1980 at 6,255, and has declined slightly while remaining more-or-less stable since then. Over 70% of the population of the county lives in the two principle towns of Meeker and Rangely.

Land Ownership

Nearly three quarters of the land in Rio Blanco County is federally managed (Figure 6). Of this, the Bureau of Land Management accounts for about 57% of the county's acreage, primarily in the western half of the county, while USFS lands of the White River and Routt National Forests make up about 17%, and are concentrated in the eastern end. A number of Colorado State Wildlife Areas and a single parcel of state school land on the outskirts of Rangely account for some 2% of the area, and the remaining 24% of the county is privately owned. USFS lands include a portion of the Flat Tops Wilderness Area. BLM lands include two Wilderness Study Areas (Windy Gulch and Black Mountain), and 12 Areas of Critical Environmental Concern (Raven Ridge, Coal Oil Rim, Yanks Gulch/Upper Greasewood Creek, Lower Greasewood Creek, Blacks Gulch, Duck Creek, Ryan Gulch, Dudley Bluffs, Deer Gulch, Coal Draw, Oil Spring Mountain, and East Douglas Creek). State Wildlife Areas include Piceance, Little Hills, Rio Blanco Lake, Oak Ridge and Lake Avery, Bel Aire, Jensen, and Meeker Pasture.

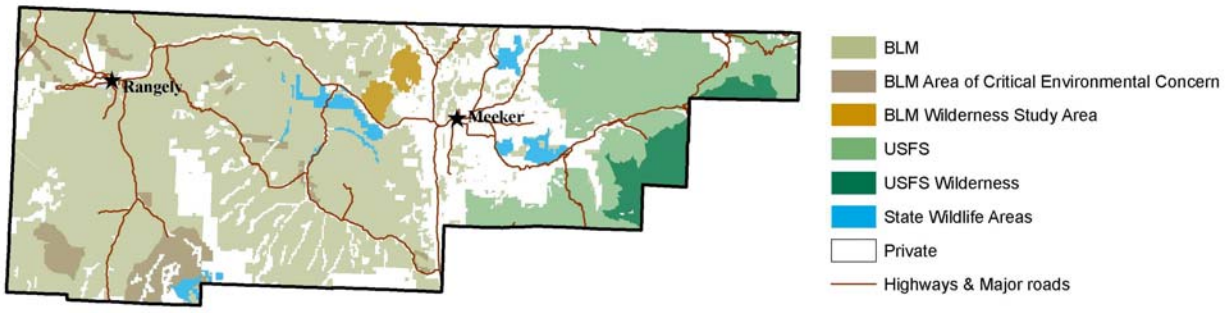


Figure 6. Land Ownership in Rio Blanco County.

Land Use

Lands in Rio Blanco County, especially those areas along river bottoms and drainages that are suitable for agriculture, were homesteaded beginning in the late 1800s and early 1900s. Crop farming in Rio Blanco County is now largely restricted to the production of forage (USDA National Agricultural Statistics Service 2007); many areas require irrigation for successful production. Cattle ranching in the county began in the 1870's; sheep ranching followed in the 1890's and became well established by the early 1920's (USDA Natural Resources Service 1982).

Natural resource extraction is a primary land use in Rio Blanco County, which possesses significant amounts of oil, natural gas, oil shale, coal, uranium, and other minerals. Oil production is primarily from the Rangely, Wilson Creek, and Nine Mile fields, while natural gas production is dominant along the Douglas Creek Arch and in the Piceance Creek Basin (USDI BLM 1994). The world's largest known single source of oil shale, containing an estimated 1.25 trillion barrels of oil, underlies the Piceance Basin in Rio

Blanco and Garfield Counties. Exploration and evaluation of oil shale began in the early 1970's, and has recently become active again. The Deserado coal mine northeast of Rangely produces about two million tons annually (Colorado Division Reclamation, Mining, and Safety 2008), and supplies coal to the Bonanza Power Plant in Utah. In the Piceance Creek area, natural sodium bicarbonate from nahcolite is produced by solution mining, and the county also supports numerous sand and gravel mines, as well as small scale uranium mining. The large amount of public land in Rio Blanco County provides ample opportunities for recreation, including hunting, fishing, and off-road vehicle use.

Ecological Systems

The eastern end of Rio Blanco County is dominated by ecological systems of higher elevations, characteristic of the Southern Rocky Mountain ecoregion. Limited alpine area is found in the Flat Tops region, and with descending elevation, vegetation communities shift through subalpine spruce-fir forests, aspen and mixed conifer forests to Gambel oak woodlands. The western portion of the county supports ecological systems characteristic of the intermountain west. The most widespread types are pinyon-juniper woodlands and shrublands, sagebrush shrublands, and other shrubland types. Table 7 lists all ecological system types of the county. Important system types with smaller acreage not shown in Figure 7 include the riparian woodlands and shrublands, mesic and wet meadows, grasslands, and alpine vegetation types. Agriculture accounts for about 5% of the land area of Rio Blanco County and developed areas cover about 1,000 acres.

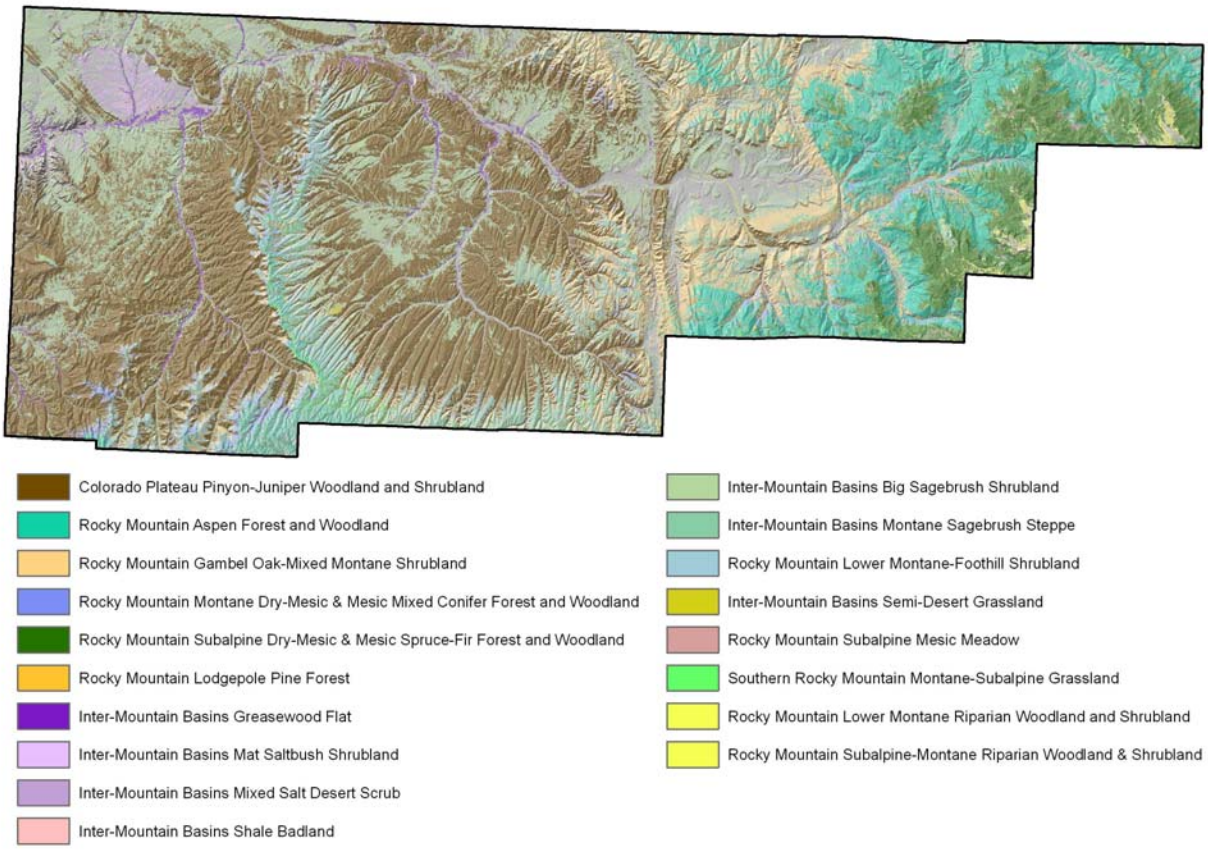


Figure 7. Ecological Systems in Rio Blanco County.

Table 7. List of Ecological Systems in Rio Blanco County.

Ecological System	Acres	Percent of County
Colorado Plateau Pinyon-Juniper Woodland & Shrubland	683,787	33.1%
Inter-Mountain Basins Big Sagebrush Shrubland	356,638	17.3%
Rocky Mountain Aspen Forest and Woodland	224,442	10.9%
Rocky Mountain Gambel Oak-Mixed Montane Shrubland	201,403	9.8%
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	115,521	5.6%
Inter-Mountain Basins Montane Sagebrush Steppe	103,779	5.0%
Agriculture	102,629	5.0%
Rocky Mountain Lower Montane-Foothill Shrubland	73,084	3.5%
Inter-Mountain Basins Greasewood Flat	24,135	1.2%
Southern Rocky Mountain Montane-Subalpine Grassland	20,848	1.0%
Inter-Mountain Basins Mixed Salt Desert Scrub	18,415	0.9%
Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland	17,900	0.9%
Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland	14,562	0.7%
Inter-Mountain Basins Mat Saltbush Shrubland	12,629	0.6%
Rocky Mountain Subalpine Mesic Meadow	8,284	0.4%
Rocky Mountain Lodgepole Pine Forest	6,982	0.3%
Inter-Mountain Basins Shale Badland	4,471	0.2%
Rocky Mountain Lower Montane Riparian Woodland and Shrubland	4,365	0.2%
Inter-Mountain Basins Semi-Desert Grassland	1,920	0.1%

The following are brief descriptions of the major ecological systems found in Rio Blanco County derived mainly from Ecological Systems Viability Specifications for Southern Rocky Mountains Ecoregion (Rondeau 2001).

Colorado Plateau Pinyon-Juniper Woodland and Shrubland

Pinyon-juniper (*Pinus edulis-Juniperus scopulorum*) woodland ecological system occupies approximately 33% in Rio Blanco County, primarily in the western portion of the County. The stands exhibit considerable diversity in appearance and composition. Stands may consist of all ages or one age (Mehl 1992). Dominant trees are often 400 years old (Mehl 1992). Trees 800 to 1000 years old have been recorded (Mehl 1992). Some stands may have closed canopies with single or both tree species, with little or no understory. Many stands are open with widely scattered trees of one or both species with a wide variety of understory vegetation. In Rio Blanco County, common herbaceous plants include: blue gramma (*Bouteloua gracilis*), bluebunch wheatgrass (*Pseudoroegneria spicata*), Fendler's bluegrass (*Poa fendleriana*), and needle and thread grass (*Stipa comata*). The pinyon-juniper woodland is a shade intolerant, climax cover type remaining on the site until disturbed by fire. When disturbed by fire it will revert to grasses and eventually return to pinyon-juniper woodland (Mehl 1992).

Inter-Mountain Basins Big and Montane Sagebrush Shrubland

Sagebrush shrubland and steppe ecological systems occupy 22% of Rio Blanco County. The dominant shrubs include: basin big, Wyoming and mountain big sagebrush (*Artemesia tridentata* ssp. *tridentata, A. tridentata.*ssp. *wyomingensis, A. tridentata* ssp.*vaseyana*), with occasional rabbitbrush (*Chrysothamnus* spp., *Ericameria nauseosa*), antelope bitterbrush (*Purshia tridentata*), and winterfat (*Krascheninnikovia lanata*).

Dominant herbaceous species include: Idaho fescue (*Festuca idahoensis*), basin wildrye (*Leymus cinereus*), saline wildrye (*Leymus salinus*), bluebunch wheatgrass (*Pseudoroegneria spicata*), needle and thread grass (*Stipa comata*), western wheatgrass (*Pascopyrum smithii*), elk sedge (*Carex geyeri*), and blue grama (*Bouteloua gracilis*).

Pre-settlement stand-replacing fire frequency was 40-60 years, with smaller fires every 20-25 years (Wright et al. 1979 as cited in Johnston 1997). Repeated burning every few years or burning in summer will deplete a stand of perennial grasses and allow weeds, invasive forbs, and cheatgrass (*Bromus tectorum*) to increase (Wright et al. 1979 as cited in Johnston 1997). The dominance of cheatgrass increases the likelihood of fire in mixed sagebrush-cheatgrass sites (Bunting et al. 1987 as cited in Johnston 1997). Following fire, sagebrush must re-establish itself by seeds, therefore growth is slow and recovery is slow (Bunting et al. 1997 as cited in Johnston 1997). Fire favors shrubs like rubber rabbitbrush (*Ericameria nauseosus*) that can re-sprout after fire (Wambolt et al. 1999). However, fire supression of the montane grasslands could lead to its conversion to sagebrush shrublands.

The Greater Sage-grouse (*Centrocercus urophasianus*), a sagebrush obligate; needs sagebrush as a source of food and cover (Braun et al.1977, Connelly et al. 2000 as cited in Connelly et al. 2004). The viability of Greater Sage-grouse depends on large, continuous blocks of viable sagebrush habitat (Braun et al. 1977). Greater Sage-grouse nests are generally located within a 2 mile radius around the strutting ground (Crawford et al. 2004, Apa 2005). Sagebrush control by prescribed burning can be used to enhance Greater Sage-grouse habitat by reducing sagebrush canopy cover where dense sagebrush canopy cover limits understory forbs and grasses. Livestock grazing may positively or negatively affect Greater Sage-grouse and their habitat, depending on the timing and intensity of grazing. Chemical and mechanical treatments intended to provide increased quantities of grass forage for livestock have indirectly reduced the acceptability of sagebrush rangelands for the Greater Sage-grouse (Beck and Mitchell 2000). Other sagebrush shrubland obligates include: Columbian Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*), Sage Sparrow (*Amphispiza belli*) and Brewer's Sparrow (*Spizella breweri*).

Rocky Mountain Aspen Forest and Woodland

Quaking aspen (*Populus tremuloides*) forest system (11%) is found throughout the County between 8,000-10,000 feet in elevation. Aspen forest is a matrix community usually maintained by fires. It usually occurs as a mosaic of many plant associations and may be surrounded by a diverse array of other systems, including grasslands, wetlands, and coniferous forests. Aspen is usually a seral tree in climax sub-alpine fir associations at the higher elevations. In such situations it may dominate the forest community for many decades following severe disturbance, such as fire or clear-cutting, but will gradually decline as the conifers become reestablished. At lower elevations aspen can occur either as a temporary dominant seral species in a variety of climax conifer associations, or it can achieve permanent dominance as the climax forest type. The environmental conditions related to aspen's role as a seral and as a climax species remain ill-defined (Mueggler and Campbell 1986).

The aspen ecosystem is rich in number and species of animals, especially in comparison to associated coniferous forest types. This natural species diversity and richness has been both increased and influenced by the introduction of domestic livestock. Typical understory species include: Rocky Mountain maple (*Acer glabrum*), alder (*Alnus incana*), snowberry (*Symphoricarpos oreophilus*), twinberry honeysuckle (*Lonicera involucrate*), russet buffaloberry (*Shepherdia canadensis*), brome grass (*Bromus* sp.), bluegrass (*Poa* sp.), and fescue (*Festuca* sp.). The high value of the aspen type as a forage resource for livestock and as forage and cover for wildlife makes the subject of animal impacts important to understanding and management of this ecosystem (DeByle and Winokur 1985).

Rocky Mountain Gambel Oak Mixed Montane Shrubland

The Gambel Oak (*Quercus gambelii*) shrubland occupies 10% of the County. This ecological system typically occupies the lower slope positions of the foothill and lower montane zones. They may occur on level to steep slopes, cliffs, escarpments, rimrock slopes, rocky outcrops, and scree slopes. Although this is a shrub-dominated system, some trees may be present. In older occurrences, or occurrences on mesic sites, some of the shrubs may acquire tree-like sizes. Adjacent communities often include woodlands or forests of Ponderosa pine (*Pinus ponderosa*), lodgepole pine (*Pinus contorta*), Douglas fir (*Pseudotsuga menziesii*), or quaking aspen (*Populus tremuloides*) at higher elevations, and pinon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) on the lower and adjacent elevations. Shrublands of sagebrush (*Artemisia tridentata*) or grasslands of fescue (*Festuca* sp.), needle and thread grass (*Stipa* sp.), or bluebunch wheatgrass (*Pseudoroegneria spicata*) may also be present at the lower elevations.

Vegetation types in this system may occur as sparse to dense shrublands composed of moderate to tall shrubs. Occurrences may be multi-layered, with some short shrubby species occurring in the understory of the dominant overstory species. In many occurrences of this system, the canopy is dominated by the broad-leaved deciduous shrub Gambel oak, which occasionally reaches small tree size. Occurrences can range from dense thickets with little understory to relatively mesic mixed-shrublands with a rich understory of shrubs, grasses and forbs. These shrubs often have a patchy distribution with grass growing in between. Scattered trees are occasionally present in stands typically include species of pine or juniper. Characteristic shrubs that may co-occur, or be singularly dominant, include serviceberries (*Amelanchier alnifolia, A utahensis*), kinnikinnik (*Arctostaphylos uva-ursi*), sagebrush (*Artemisia tridentata*), mountain mahogany (*Cercocarpus montanus*), chokecherry (*Prunus virginiana*), rose (*Rosa* spp.), and snowberry (*Symphoricarpos rotundifolius*). The herbaceous layer is sparse to moderately dense, ranging from 1-40% cover. Perennial graminoids are the most abundant species, particularly sideoats grama (*Bouteloua curtipendula*), blue grama (*Bouteloua gracilis*), three-awn grass (*Aristida* spp.), Geyer sedge (*Carex geyeri*), fescues (*Festuca* spp.), june grass (*Koeleria macrantha*), muhly grasses (*Muhlenbergia* spp.), and needle and thread grasses (*Stipa* spp.). Many forb species can occur, but none have much cover. Commonly present forbs include: yarrow (*Achillea millefolium*), wormwood

(*Artemisia* spp.), geranium (*Geranium* spp.), false soloman seal (*Maianthemum stellatum*), meadow rue (*Thalictrum fendleri*), and vetch (*Vicia americana*).

Fire typically plays an important role in this system, causing die-back of the dominant shrub species in some areas, promoting stump sprouting of the dominant shrubs in other areas, and controlling the invasion of trees into the shrubland system. Natural fires typically result in a system with a mosaic of dense shrub clusters and openings dominated by herbaceous species. In some instances these associations may be seral to the adjacent ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) woodlands and forests.

Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland

Approximately 6% of Rio Blanco County is classified as an Englemann spruce-subalpine fir (*Picea engelmannii-Abies lasiocarpa*) forest ecological system. Spruce-fir dominated stands occur on all but the most xeric sites above 9,000 feet and in cool, sheltered valleys at elevations as low as 8,200 feet. The relative dominance of the two canopy tree species and the understory composition vary substantially over a gradient from excessively moist to xeric sites (Peet 1981). The mesic spruce-fir type occurs on cool, sheltered, but well drained sites and is one of the most widespread forest types in the subalpine zone. In lower elevations, the spurce-fir types give way, often along abrupt fire-induced boundaries, to lodgepole pine or aspen-dominated forests.

Fire, spruce-beetle outbreaks, avalanches, and wind all play an important role in shaping the dynamics of spruce-fir forests. Fires in the subalpine forest are typically stand replacing, resulting in the extensive exposure of mineral soil and initiating the development of new forests. Fifty year return interval for high intensity surface fires and 100-400 years return interval for crown fires which cover 1,000 to 10,000 acres are noted for this ecological system (Peet 1981, Habeck and Mutch 1973). Spruce beetle (*Dendroctonus rufipennis*) outbreaks may be as significant as fire in the development of spruce-fir forests. In addition to fires and beetle kill, wind disturbance in spruce-fir forests has been well documented (Schaupp et al. 1999). Pine marten (*Martes americana*) is mostly a spruce-fir obligate that requires a healthy and sizeable occurrence of old growth forest. Therefore a viable population of pine marten has been chosen as an indicator of a healthy and viable occurrence of the spruce fir system (Rondeau 2001).

Rocky Mountain Lower Montane-Foothill Shrubland

This system occupies 4% of the County. It is found in the foothills, canyon slopes and lower mountains of the County. These shrublands occur between 4,800 – 9,280 feet (1500-2900 m) elevations and are usually associated with exposed sites, rocky substrates, and dry conditions, which limit tree growth. This system is generally drier than Rocky Mountain Gambel Oak-Mixed Montane Shrubland, but may include mesic montane shrublands where Gambel oak (*Quercus gambelii*) does not occur. Scattered trees or inclusions of grassland patches or steppe may be present, but the vegetation is typically dominated by a variety of shrubs including Utah serviceberry (*Amelanchier utahensis*), mountain maghogony (*Cercocarpus montanus*), antelope bitterbush (*Purshia tridentata*), skunkbush (*Rhus trilobata*) wax current (*Ribes cereum*), snowberry (*Symphoricarpos oreophilus*), or narrow-leaf yucca (*Yucca glauca*). Grasses are represented as muhly

grasses (*Muhlenbergia* spp.), blue grama (*Bouteloua gracilis*), needle and thread grass (*Hesperostipa comata*), and bluebunch wheatgrass (*Pseudoroegneria spicata*). Fires play an important role in this system as the dominant shrubs usually have a severe die-back, although some plants will stump sprout. Mountain maghogony requires a disturbance such as fire to reproduce, either by seed sprout or root crown sprouting. Fire suppression may have allowed an invasion of trees into some of these shrublands, but in many cases sites are too xeric for tree growth.

Inter-Mountain Basins Greasewood Flat

This ecological system occurs throughout Rio Blanco County, mainly in the Piceance Creek Basin.The Greasewood Flats ecological system typically occurs near drainages on stream terraces and flats, on alluvial fans along streams or arroyos, or may form rings around playas. Sites typically have saline soils, a shallow water table and flood intermittently, but remain dry for most of the growing season. The Greasewood Flats ecological system usually occurs as a mosaic of multiple communities, with open to moderately dense shrublands dominated or codominated by greasewood (*Sarcobatus vermiculatus*). Four-wing saltbush (*Atriplex canescens*), shadscale saltbush (*Atriplex confertifolia*),rubber rabbitbush (*Ericameria nauseosus*), or winter fat (*Krascheninnikovia lanata*) may be present to codominant. The herbaceous layer, if present, is usually dominated by graminoids such as, salt grass (*Distichlis spicata*), three-square bulrush (*Scirpus pungens*), and blue grama (*Bouteloua gracilis*). Small patches of *Distichlis spicata* (where water remains ponded the longest), or spikerush (*Eleocharis palustris*) herbaceous types may be found within the shrubland system (NatureServe 2006).

Although most studies indicate that black greasewood is relatively unharmed by fire, the degree of damage may vary according to season of burn, fuel loading, and intensity of fire. Greasewood is competitive after disturbance, including fire, but is not primarily a disturbance driven system (Tirmenstein 1987). Because greasewood flats are tightly associated with saline soils and groundwater that is near the surface, the primary ecological process that maintains greasewood flats is groundwater recharge, rather than surface water.

Rocky Mountain Subalpine-Montane Riparian Woodland and Shrubland

Montane/subalpine riparian shrubland ecological system can be either a linear or small patch system, confined to specific environments occurring on floodplains or terraces of rivers and streams and shallow broad valleys. Even though the montane/subalpine riparian shrubland ecological system occupies less than 1% of Rio Blanco County, it provides vital habitat for brooding, foraging, nesting, and migration for the majority of birds and mammals. In Rio Blanco County, this system often occurs as a mosaic of multiple communities that are shrub dominated. The dominant shrubs include: alder (*Alnus incana*), red-osier dogwood (*Cornus sericea*), Bebb's, Booth's, short-fruited, Drummond's, strapleaf, Geyer's, Rocky Mountain, Plane-leaf, and Wolf willows (*Salix bebbiana, S. boothii, S. brachycarpa, S. drummondiana, S. eriocephala, S. geyeriana, S.moniticola, S. planifolia,* and *S. wolfii*). Generally the upland vegetation surrounding these riparian systems consist of either conifer or aspen forests, while adjacent riparian

systems range from herbaceous dominated communities to tree dominated communities. Beaver (*Castor canadensis*) is the primary user as well as maintainer of this system. In addition to the beaver, the primary abiotic ecological process necessary to maintain this ecological system is hydrology and more specifically surface flow. Annual and episodic flooding is important in maintaining this system. Alteration of the flooding regime due to water impoundment, diversions, etc. may produce changes to plant composition as well as community composition (Kittel et al. 1999).

Fauna

As with the ecological systems, the varied topography and climate in Rio Blanco County lead to a diversity of fauna. No vertebrates (at the species level) are endemic to the study area (Armstrong 1972, Ferris and Brown 1981, Woodling 1985, Andrews and Righter 1992, Hammerson 1999). Extirpations of large-sized and predaceous mammals are common in Rio Blanco County as well as throughout the west. Black-footed ferret (*Mustela nigripes*), wolf (*Canis lupus*), and grizzly bear (*Ursus arctos*) have been restricted throughout their range, and no longer occur in natural populations (Fitzgerald et al. 1994). As of 2004, 56 reintroductions of the black-footed ferret have been completed with ten of those occurring in northwestern Colorado (CDOW 2008). However, large ungulates such as mule deer (*Odocoileus hemionus*), elk (*Cervus elephus*), and moose (*Alces alces*) are all well known in the area, as are coyote (*Canis latrans*), black bear (*Ursus americanus*), and mountain lion (*Felis concolor*).

Typical bird species found in spruce-fir and lodgepole forests include a large number of passerine birds. Jays, chickadees, thrushes, tanagers and finches are all known to breed in Rio Blanco County. Raptors, including Ferruginous Hawk (*Buteo regalis*) in Piceance Creek Basin and Bald eagle (*Haliaeetus leucocephalus*) near the White River are found within the lake and river areas, as are waterfowl and some shorebirds. The Greater Sage-grouse (*Centrocercus urophasiannus*) is found in sagebrush shrublands, as is the Sage Sparrow (*Amphispiza belli*). There are historic occurrences documented for nesting Greater Sandhill Cranes (*Grus canadensis tabida*) within the floodplain of the White River.

Fish in Rio Blanco County include the Listed Endangered species razorback sucker (*Xyrauchen texanus*) and the Colorado pikeminnow (*Ptychocheilus lucius*). The Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) and roundtail chub (*Gila robusta*), species of State Concern are found in the White River and its tributaries. Several game fish such as brook trout (*Salvelinus fontinalis*), German brown trout (*Salmo trutta*), lake trout (*Salvelinus namaycush*), Northern pike (*Esox lucius*) and the mountain whitefish (*Prosopium williamsoni*), indigenous to the White and Yampa Rivers, are also documented in Rio Blanco County.

Amphibians are uncommon in Rio Blanco County. The Great Basin Spadefoot is found on dry rocky slopes and canyons vegetated by pinyon-juniper woodlands or sagebrush, saltbrush, and other semi-desert shrublands. The boreal toad (*Bufo boreas boreas*) is a State listed Endangered species. Currently there are no known boreal toad populations in the Flat Tops. The last reported observation was one adult found in 2000 on North Derby

Creek in Garfield County. Follow up surveys in 1999 did not find any toads. There were also some early to mid 1990's observations around Trappers Lake. Surveys in 1999 and 2004 by CNHP in the Trappers Lake area were unsuccessful for boreal toads.

Mammals that are adapted to the low palatability and summer moisture of the sagebrush shrublands include: desert cottontail (*Sylvilagus audubonii*), Wyoming ground squirrel (*Spermophilus elegans*), kangaroo rat (*Dipodomys* spp.) and shrew (*Sorex* spp.), which all seem to thrive in this environment. Pinon-juniper woodlands provide rich food resource of pinon nuts for many mammals. Rock squirrel (*Spermophilus variegates*) and several species of mice (*Peromyscus* spp.), especially the pinon mouse (*Peromyscus truei*) occur in areas with large rocks and well developed woodlands. Montane forests mammals use conifers for food and shelter, many feed on the cambium layer and stems and make their nests or roost sites on the trees. Porcupine (*Erethizon dorsatum*), least and Colorado chipmunks (*Tamias minimus, T. quadrivittatus*) feed on fruits, nuts, berries, seeds, leaves, and stems. Subalpine forests support a number of mammalian species. Adaptations to harsh winters include; hibernation e.g., yellowbellied marmot (*Marmota flaviventris*), seasonal color change, e.g., snowshoe hare (*Lepus species*), use of runways beneath the snow (mice and shrews) and use of windswept, snowfree ridges e.g., mountain goat (*Oreamnos americanus*). Wolverine (*Gulo gulo*) and lynx (*Lynx lynx*), boreal forest predators, are restricted in Colorado to this ecosystem. The pale-lump-nosed bat (*Corynorhinus townsendii pallescens*) is known to roost in Spring Cave above the South Fork of the White River. Wetlands riparian ecosystems support American beaver (*Castor canadensis*) and muskrat (*Ondatra zibethicus*), both are dependent on river corridors for shelter and food (Fitzgerald et al. 1994).

CONSERVATION ASSESSMENT

Potential Impacts to Biological Diversity in Rio Blanco County

General threats that may affect biodiversity on a large, landscape-level scale in Rio Blanco 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 critical habitat resides.

Hydrological Modifications

Of all Colorado's major river basins, the White River watershed is one of the few that is not over-appropriated. Within the County, the only major water storage is Taylor Draw Dam, 5 miles east of Rangely. In 1984, Taylor Draw Dam was completed creating Kenney Reservoir, the only significant impoundment in the White River Basin. However, with only 13,800 Annual Flow of storage capacity out of an annual average yield of 500,000 Annual Flow (Colorado Water Conservation Board 2002), its greatest impact is the barrier it presents to migrating Colorado pikeminnow, denying them access to 50 miles (32%) of their historic habitat in the White River. The reservoir also is a likely source of nonnative fishes that escape downstream into habitat occupied by Colorado pikeminnow, as well as razorback sucker which inhabit the Green River near its confluence with the White.

Annual flooding on the White River exists, until about mid-June when flood irrigation practices begin. Flooding is a natural ecological process that can be severely altered by the construction of dams, reservoirs, major diversion projects and other water diversions such as local irrigation ditches. These water diversions and impoundments have altered the normal high peak flows that were once a part of the natural hydrological regimes of the rivers and their tributaries in Rio Blanco County. These periodic floods are necessary for continued viability of most riparian vegetation. For example, many plants, including cottonwood trees, reproduce primarily with flooding events (Rood and Mahoney 1993). As plant composition changes in response to alterations in the flooding regime, the composition of the aquatic and terrestrial fauna may also change.

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

on plant communities have caused a gradual shift from diverse multi-aged riparian woodlands to mature single-aged forest canopies.

Many wetlands not directly associated with fluvial processes (e.g., seeps and springs) have been altered by irrigation practices, water diversions, and groundwater withdrawals. However, the increase of irrigated agriculture in Rio Blanco County since European settlement has inadvertently created many new wetlands in areas where wetland never existed, and at the same time has destroyed many existing wetlands. For example, seepage from the miles of unlined canals and earthen ditches, and much of the water applied in irrigation contributes to groundwater recharge and surface water runoff. As a result, many areas have developed wetland characteristics where none existed prior to irrigation. Conversely, many historical wetlands including seeps and springs have been lost or altered due to water "development" projects, such as water diversions or impoundments (e.g., 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 biodiversity significance of an integrated network of river bottom wetlands, sinuous marshy stream, and extensive intact seep and spring wetlands can be equated to the dispersed pattern of irrigation –induced wetlands across an agricultural landscape. For example, the number of species supported by a man-made pond with minimal edge habitat is generally less than the number supported by an extensive intact seep and spring wetland or naturally occurring pond.

Development

Residential development is increasing in Rio Blanco County, especially due to the increase employment of the oil and gas industry. Development creates a number of stresses, including habitat loss and fragmentation, introduction and proliferation of non-native species, fire suppression, and predation and disturbance from domestic animals (dogs and cats) (Oxley et al. 1974, Coleman and Temple 1995). Increasing human density in an area can lead to a change in the composition of wildlife populations (e.g., numbers of foxes and coyotes may increase, or number of bird species present may decrease), and may also alter movement patterns and behavior of wildlife. Loss of habitat to development is considered irreversible.

Roads

There is a complex network of roads in many parts of Rio Blanco County, due primarily to oil and gas industry, agricultural uses, residential development, past timber harvests, and recreational uses. Expansion of the existing road network in some areas will detrimentally affect the biodiversity of the region. Roads are associated with a wide variety of impacts to natural communities, including invasion by non-native plant species, increased depredation and parasitism of bird nests, increased impacts of pets, fragmentation of habitats, erosion, pollution, and road mortality (Noss et al. 1997).

Roads function as conduits, barriers, habitats, sources, and sinks for some species and populations of species (Forman 1995). Road networks crossing landscapes can increase erosion and alter local hydrological regimes. Runoff from roads may impact local vegetation via contribution of petroleum products, heavy metals, and sediments. Road

networks interrupt horizontal ecological flows, alter landscape spatial patterns, and therefore inhibit important interior species (Forman and Alexander 1998).

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

Recreation

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

Non-motorized recreation, mostly hiking but also some horseback riding, mountain biking and rock climbing, presents a different set of issues (Knight and Cole 1991; Miller et al. 1998, 2001). 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 (Colorado Department Natural Resources 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. Thus, impacts to native vegetation (mainly trampling) in these areas can be high.

Livestock Grazing

Domestic livestock grazing has been a traditional livelihood in Rio Blanco County since the mid 1800s and has left a broad and sometimes subtle impact on the landscape. For some species, properly managed grazing can be a compatible activity. However, some range management practices can adversely affect the region's biological resources. Many riparian areas in Rio Blanco 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, incompatible 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).

Mining

In Rio Blanco County, mining endeavors (coal, oil, and gas) account for about 19% of the County's employment (Topper et al. 2003). The Piceance Basin is underlain by oil shale estimated to contain 1,200 billion barrels of shale oil; the largest single shale-oil resource known (Taylor 1987, Dyni 2006). The Piceance Basin also contains other mineral resources, including natural gas, crude oil, coal, shale oil, nahcolite, and dawsonite. Until recently, it was not economically feasible to extract the shale oil locked underground. However, rising oil prices, new technologies and a means to secure independence from external suppliers of energy has increased mining activities in Rio Blanco County (Taylor 1987, Dyni 2006, Natural Resources Defense Council 2008).

Surface-mining of oil shale deposits has the same environmental impacts as those of open-pit mining. These impacts include acid drainage induced by the sudden rapid exposure and subsequent oxidation of formerly buried materials, the introduction of metals into surface water and groundwater, increased erosion, and air pollution caused by the creation of particulates during processing, transport, and support activities (EPA 2000; Bartis et al. 2005). It may damage biological and recreational value of land and an ecosystem in the mining area. In addition, combustion and thermal processing generate waste material, and the atmospheric emissions include carbon dioxide, a major greenhouse gas. Environmentalists oppose production and usage of oil shale, as it creates even more greenhouse gases than conventional fossil fuels (Natural Resources Defense Council 2008). Experimental in-situ conversion processes and carbon capture and storage technologies may reduce some of these concerns in the future, but at the same time they may cause other problems, including groundwater pollution (USDI BLM 2007).

Areas of mining activity are also home to valuable wildlife habitat supporting one of Colorado's largest populations of mule deer and elk, as well as habitat for the Greater Sage-grouse and other sagebrush obligate species. Fisheries could also be severely threatened. In 1996, the BLM found that oil shale development in Colorado would reduce the annual flow of the White Rive up to 8.2% and permanently erase or severely degrade nearly 50% of BLM stream fisheries, including that of the Colorado River cutthroat trout (USDI. BLM 2007).

Logging

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

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 (Forman and Gordon 1986). Edges are often created by naturally occurring processes such as floods, fires, and wind. Edges can also be created by human activities such as roads, 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 waterbirds).

Non-native Species

Invasion of non-native and aggressive species, and their replacement of native species, is one of the biggest threats to Colorado's natural diversity (James 1993, D'Antonio and Vitousek 1992). 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.

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 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. For example, former attempts to control salt lover (*Halogeton glomeratus*) were given up because land managers were unable to come up with a desirable species to replace it, especially on saline or alkaline soils (Young 1981). 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. Most of the major river corridors and many of their tributaries have been invaded by pasture grasses.

METHODS

The methods for assessing and prioritizing conservation needs over a large area, such as a county, are necessarily diverse. CNHP follows a general method that is continuously being developed specifically for this purpose. The Survey for Critical Biological Resources in Rio Blanco County was conducted in several steps summarized below. Additionally, input from Rio Blanco County and its stakeholders was sought at all stages.

Collect Available Information

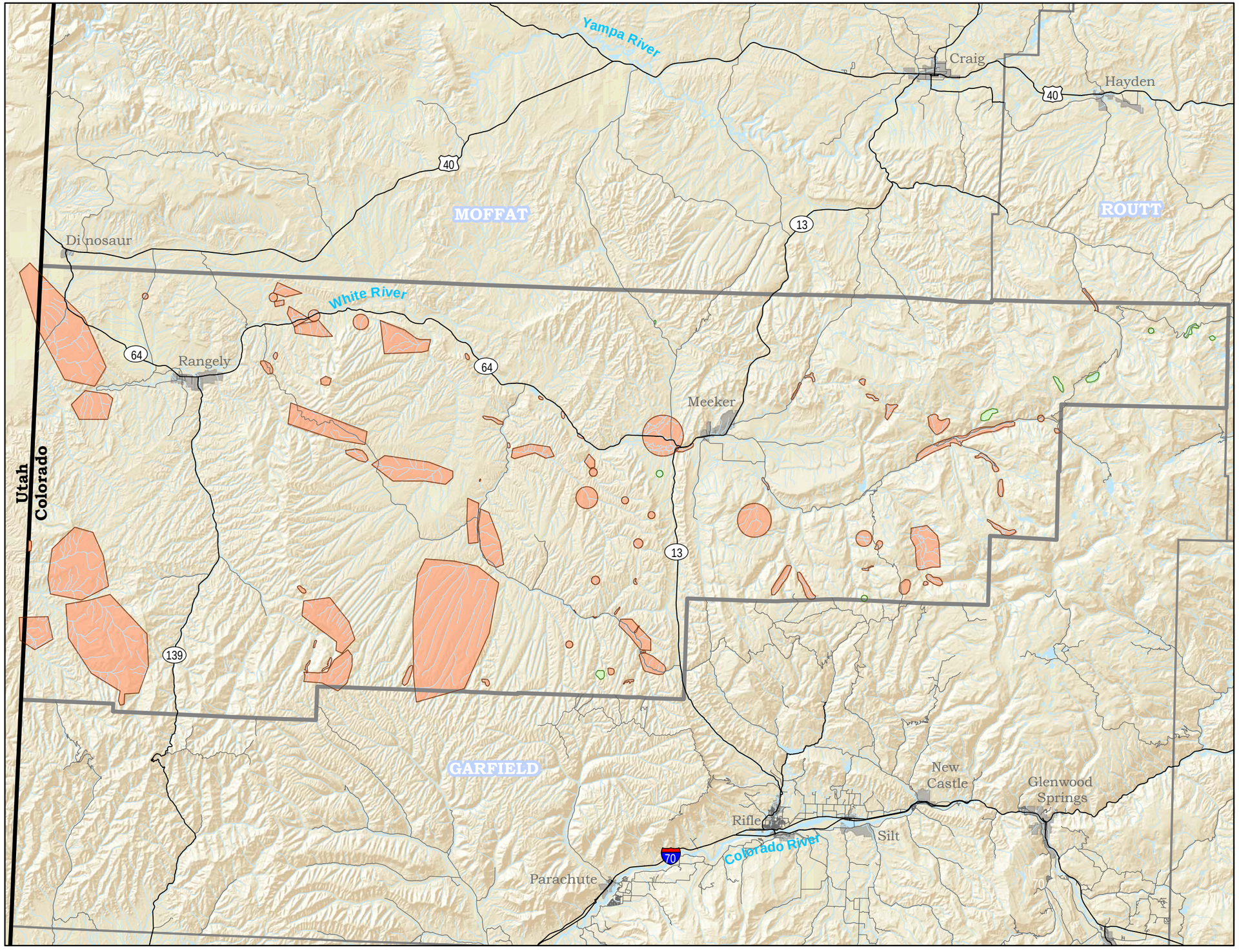
CNHP databases were updated with information regarding the known locations of species and significant plant associations within Rio Blanco County. A variety of information sources were searched for this information. The Colorado State University museums and herbaria were searched, as were plant and animal collections at the University of Colorado, Rocky Mountain Herbarium, and local private collections. Both general and specific literature sources were incorporated into CNHP databases, either in the form of locational information or as biological data pertaining to a species in general. Other information was gathered to help locate additional occurrences of natural heritage elements. Such information covers basic species and community biology including range, habitat, phenology (reproductive timing), food sources, and substrates. This information was entered into CNHP's Biodiversity Tracking and Conservation System (BIOTICS).

Identify rare or imperiled species and significant plant associations with potential to occur in Rio Blanco County

The information collected in the previous step was used to refine a list of potential species and natural plant communities and to refine our search areas. In general, species and plant communities that have been recorded from Rio Blanco County or from adjacent counties are included in this list. Over 100 rare species and significant plant communities were targeted in this survey. Given the limited amount of time and funding, a specific subset of species and communities were the priority of our inventory efforts. These elements were considered to be a priority because of their high level of biological significance (G1-G3) and/or because they are known to occur in areas that are subject to various development pressures such as hydrological alterations and residential development.

Identify Targeted Inventory Areas

Survey sites were chosen based on their likelihood of harboring rare or imperiled species or significant plant communities (Map 1). Previously documented locations were targeted, and additional potential areas were chosen using available information sources. Areas with potentially high natural values were selected using soil surveys, geology maps, vegetation surveys, personal recommendations from knowledgeable local residents, and numerous roadside surveys by our field scientists. Using the biological information stored in the CNHP databases, areas having the highest potential for supporting specific elements were identified. Those chosen for survey sites appeared to be in the most natural condition. In general, this means those sites that are the largest, least fragmented, and relatively free of visible disturbances such as roads, trails, fences, and quarries were identified.



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Map Date: 04/25/2008

Legend

CNHP Targeted Inventory Areas (TIAs)

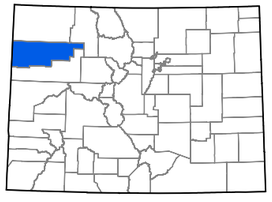
- Visited in 2007
- Not Visited

Colorado Base Data

- Colorado State Line
- Counties
- Municipalities
- Lakes, Reservoirs
- Rivers, Streams, Creeks
- Highways
- Major Roads

Digital Elevation Model Produced by the USGS

Location in Colorado



Targeted Inventory Areas are believed to have a relatively high probability of harboring significant biological resources.

N

0 3 6 12 Miles

Map 1. CNHP Targeted Inventory Areas in Rio Blanco County

The above information was used to delineate Targeted Inventory Areas (TIAs) that were believed to have relatively high probability of harboring significant natural resources. Additional TIAs were identified by Rio Blanco County and its stakeholders.

Roadside surveys were useful in further resolving the natural condition of these areas. The condition of shrublands is especially difficult to discern from aerial photographs, and a quick survey from the road can reveal such aspects as weed infestation or vegetation composition. Because there were limited resources to address an overwhelming number of potential sites, surveys for all elements were prioritized by the degree of imperilment. For example, the species with Natural Heritage Program ranks of G1-G3 were the primary target of our inventory efforts. Although species with lower Natural Heritage Program ranks were not the main focus of inventory efforts, many of these species occupy similar habitats as the targeted species, and were searched for and documented if encountered.

Contact Landowners

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

Conduct Field Surveys and Gather Data

Survey sites where access could be obtained were visited at the appropriate time as dictated by the seasonal occurrence (or phenology) of the individual elements. It was essential that surveys took place during a time when the targeted elements were detectable. For instance, plants are often not identifiable without flowers or fruit that are only present during certain times of the year. The methods used in the surveys vary according to the elements that were being targeted. In most cases, the appropriate habitats were visually searched in a systematic fashion that would attempt to cover the area as thoroughly as possible in the given time. Where necessary and permitted, voucher specimens were collected and deposited in local university museums and herbaria.

When a rare species or significant plant community was discovered, its precise location and known extent was recorded 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 previous section on Natural Heritage Program Methodology for more about element occurrence ranking.

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

1). Roadside or adjacent land assessments. Many of the sites could be viewed at a distance from a public road or from adjacent public land. While on the ground the field scientist can see, even from a distance, many features not apparent on maps and aerial photos. The road assessments determined the extent of human and livestock impacts on the survey area, which included ditching, adventive plant species, plant species indicative of intensive livestock use, stream bank destabilization, major hydrologic alterations, excessive cover of non-native plant species, or new construction. Sites with one or more of these characteristics were generally excluded as potential conservation areas and no extensive data were gathered at these areas. If roadside assessments of private lands yielded the potential presence of an element occurrence, landowner contact was initiated, and if permission was given, an on-site assessment was performed.

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

During on-site assessments, the following information was collected for the PCAs in this report:

General Field Information

- A list of all plant associations in the survey area, including the percent cover by that community. In almost all cases, plant associations were immediately placed within either the International National Vegetation Classification (Anderson et al. 1998; Comer et al. 2003) and the Comprehensive Statewide Wetlands Classification (Carsey et al. 2003). Plant synonym follows Kartesz (1999).
- Vegetation data for each major plant association in the wetland were collected using visual ocular estimates of species cover in a representative portion of the plant association, including non-native species.
- A list of non-native plants within the survey area.
- A sketch of the site layout, with distribution of plant community types indicated (this was generally done on the 7.5-min. USGS topographic map, but occasionally for clarity a separate map was drawn on the site survey form).
- UTM coordinates from Garmin GPS 12 Personal Navigator.
- Elevation (from 7.5-min. USGS topographic maps and GPS).
- Current and historic land use (e.g., grazing, logging, recreational use) when apparent.
- Notes on geology and geomorphology.
- Reference photos of the site.

- Indicators of disturbance such as logging, grazing, flooding, etc.

Natural Heritage Information

- A list of elements present or expected at the site
- Element occurrence (EO) ranks or information that will lead to EO Rank
- Proposed conservation area boundaries

General Wetland Information

- Water source
- Hydroperiod
- Water chemistry (pH and conductivity)
- General soils description (these are based on either a detailed description of a soil profile in the field (e.g., horizons, texture, color, cobble size, percent mottling) or from information from the county soil surveys.

Delineate Potential Conservation Area Boundaries

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

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

RESULTS

Results of the 2007 survey of Rio Blanco confirmed that there are many areas with high biological significance. Several extremely rare plants depend on these areas for survival. A total 23 rare or imperiled plant species, 13 rare or imperiled animal species, and 35 plant communities of concern were documented from 2007 field work (Table 8). A total of 28 new element occurrences were documented as well as 47 existing element occurrences that were updated.

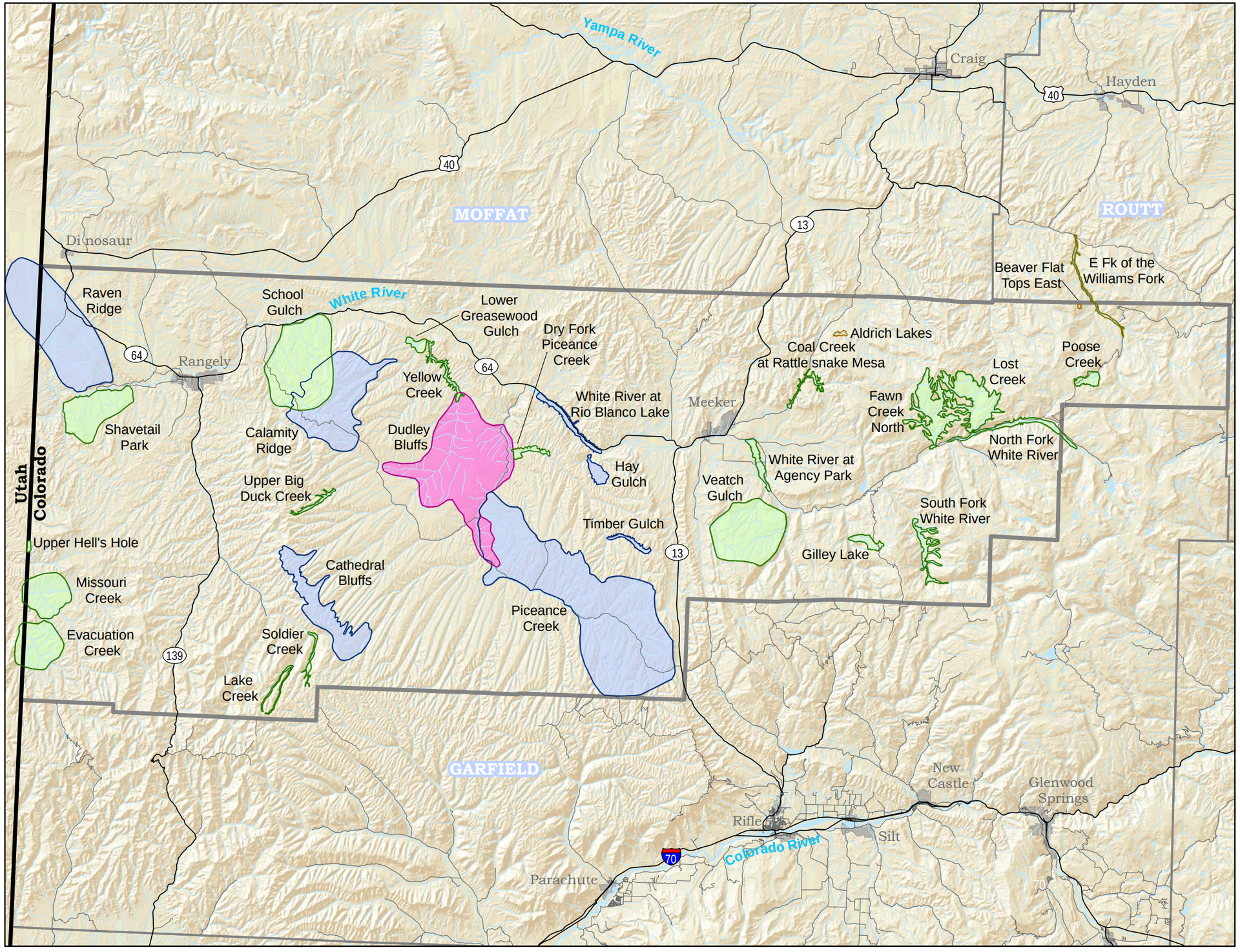
CNHP identified 75 element occurrences that are contained within 28 Potential Conservation Areas (PCAs) in Rio Blanco County (Table 10, Map 2). Of the 28 PCAs presented in the report,

- One is of outstanding biodiversity significance (B1),
- Seven are of very high biodiversity significance (B2), and
- Twenty are of high biodiversity significance (B3).

The B1 site, Dudley Bluffs, is based on populations of two Federally Listed Threatened plants: Dudley Bluffs Bladderpod (*Lesquerella congesta*) and the Piceance Twinpod (*Physaria obcordata*). The Dudley Bluffs PCA was thoroughly surveyed and the boundaries were enlarged to encompass newly documented sub-populations. The B2 PCAs, Calamity Ridge, Cathedral Bluffs, Hay Gulch, Piceance Creek, Raven Ridge, Timber Gulch, and White River at Rio Blanco Lake support excellent to good occurrences of the following globally imperiled (G2) plants and plant communities;

- Calamity Ridge--Piceance twinpod (*Physaria obcordata*) and Basin big sagebrush/Basin rye grass (Artemisia *tridentata*. ssp. *tridentata*/*Leymus cinereus*),
- Cathedral Bluffs--sun-loving meadowrue (*Thalictrum heliophilum*) and blue bunch wheatgrass (*Pseudoegneria spicata*),
- Hay Gulch—Piceance Twinpod and blue bunch wheatgrass,
- Raven Ridge—Graham's beardtongue (*Penstemon grahamii*),
- Piceance Creek—Piceance Bladderpod and bluebunch wheatgrass grassland
- Timber Gulch—Piceance Bladderpod (*Lesquerella parviflora*), and
- White River at Rio Blanco Lake—boxelder-narrowleaf cottonwood/red-osier dogwood riparian forest (*Acer negundo-Populus angustifolia/Cornus sericea*)

One hundred and twelve Targeted Inventory Areas (TIAs) were delineated within Rio Blanco County (Map 1), of which 93 (83%) were visited during the summer of 2007. Of the TIAs visited, on-site inspection revealed that eight (.07%) were heavily impacted by roads, buildings, non-native species, agriculture, and/or grazing and were dropped from the surveys. For reasons such as time limitation and the inability to contact landowners, .09% of the TIAs were not visited. With the assistance of the stakeholders and Rio Blanco County, CNHP was very successful in obtaining permission from landowners to conduct these surveys and were only denied access to 1 site (.001%).



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Map Date: 04/24/2008

Legend

CNHP Potential Conservation Areas (PCAs) by Biodiversity Significance Rank

- B1: Outstanding Biodiversity Significance
- B2: Very High Biodiversity Significance
- B3: High Biodiversity Significance
- B4: Moderate Biodiversity Significance
- B5: General Biodiversity Interest

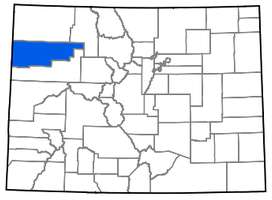
B4 and B5 PCAs are not described in the report

Colorado Base Data

- Colorado State Line
- Counties
- Municipalities
- Lakes, Reservoirs
- Rivers, Streams, Creeks
- Highways
- Major Roads

Digital Elevation Model Produced by the USGS

Location in Colorado



PCAs represent CNHP's best estimate of the primary area supporting long-term survival of targeted species, subspecies and natural communities.

N

0 3 6 12 Miles

Map 2. CNHP Potential Conservation Areas in Rio Blanco County

Non-Native Plants

For each PCA, non-native plants were noted when present (see Exotic Species Comments in PCA descriptions). The Colorado Department of Agriculture Noxious Weed Program lists species according to their degree of invasiveness. List A species are designated by the State Commissioner for eradication. List B weed species are species for which the State (in consultation with the state noxious weed advisory committee, local governments, and other interested parties) develops and implements state noxious weed management plans designed to stop the continued spread of these species. And List C weed species are species for which the Commissioner (in consultation with the state noxious weed advisory committee, local governments, and other interested parties) will develop and implement state noxious weed management plans designed to support the efforts of local governing bodies to facilitate more effective integrated weed management on private and public lands.

There were no List A species documented during the 2007 field season.

Sixteen List B species documented in the County are:
Black henbane (*Hyoscyamus niger*)
Bull thistle (*Cirsium vulgare*)
Canada thistle (*Cirsium arvense*/*Breea arvense*)
Dalmatian toadflax (*Linaria dalmatica*)
Eurasian watermilfoil (*Myriophyllum spicatum*)
White top (*Cardaria pubescens*)
Houndstongue (*Cynoglossum officinale*)
Leafy spurge (*Euphorbia esula*)
Musk thistle (*Carduus nutans*)
Oxeye daisy (*Leucanthemum vulgare*)
Quackgrass (*Elytrigia repens*)
Russian knapweed (*Acroptilon repens*/ *Centaurea repens*)
Russian-olive (*Elaeagnus angustifolia*)
Salt cedar (*Tamarix ramosissima*)
Spotted knapweed (*Centaurea maculosa*)
Yellow toadflax (*Linaria vulgaris*)

Seven List C species documented in the County:
Common burdock (*Arctium minus*)
Common mullein (*Verbascum thapsus*)
Downy brome (*Bromus tectorum*)
Field bindweed (*Convolvulus arvensis*)
Halogeton *(Halogeton glomeratus*)
Perennial sowthistle (*Sonchus arvensis*)
Poison hemlock (*Conium maculatum*)

Eleven other non-native species not on the State weed list documented in the County:
Tansy-mustard (*Descurainia* spp.)

Tumble mustard (*Sisymbrium* spp.)
White Dutch clover (*Trifolium repens*)
Reed canarygrass (*Phalaris arundinacea*)
Timothy (*Phleum pratense*)
Horehound (*Marrubium vulgare*)
Kentucky bluegrass (*Poa pratensis*)
Field pepperweed *(Lepidium campestris*)
Common dandelion (*Taraxacum officinale*)
Tumbleweed (*Salsola tragus*)
Purple mustard (*Chorispora tenella*)

Significant Elements in Rio Blanco County

Table 8 presents CNHP elements of biological significance known to occur in a Potential Conservation Areas (PCAs) in this report. This is not a comprehensive list of all elements of biological significance known to occur in Rio Blanco County, but rather only includes those elements associated with PCAs that are significant enough to be archived in CNHP's Biodiversity Tracking and Conservation Data System (BIOTICS). For a key to Federal and State Status Codes, please refer to the table of Federal and State Agency special designations for rare species, within the section of the report entitled The Natural Heritage Network and Ranking System.

Table 8. Colorado Natural Heritage Elements Known From Rio Blanco County (as of 12/30/2007).

Scientific Name	Common Name	Global Rank	State Rank	US ESA	Federal Sensitive List	State Sensitive List
Amphibians						
Bufo boreas boreas	Boreal toad (S. Rocky Mountain population)	G4T1Q	S1		FS	E
Spea intermontana	Great Basin spadefoot	G5	S3		BLM	SC
Birds						
Buteo regalis	Ferruginous Hawk	G4	S3BS4N		BLM/USFS	
Centrocercus urophasianus	Greater Sage-grouse	G4	S4		BLM/USFS	SC
Grus canadensis tabida	Greater Sandhill Crane	G5T4	S2B,S4N			SC
Haliaeetus leucocephalus	Bald Eagle	G5	S1B,S3N			T
Vireo vicinior	Gray Vireo	G4	S2B			
Fish						
Gila robusta	Roundtail chub	G2G3	S2		BLM	SC
Oncorhynchus clarkii pleuriticus	Colorado River Cutthroat Trout	G4T3	S3		USFS	SC

Scientific Name	Common Name	Global Rank	State Rank	US ESA	Federal Sensitive List	State Sensitive List
Xyrauchen texanus	Razorback sucker	G1	S1	LE		E
Mammals						
Lynx	*Lynx lynx*	G5	S1	LT		E
Mustela nigripes	Black-footed ferret	G1	S1	LE, XN		E
Corynorhinus townsendii pallescens	Pale Lump-nosed Bat	G4T4	S2		BLM/USFS	SC
Plant Communities						
Abies lasiocarpa / Alnus incana Forest	Subalpine Fir/ Alder Forest	G5	S5			
Abies lasiocarpa / Mertensia ciliata Forest	Subalpine Fir/Bluebells Forest	G5	S5			
Acer negundo - Populus angustifolia / Cornus sericea Forest	Box-elder - Narrowleaf Cottonwood / Red-osier Dogwood forest	G2	S2			
Acer negundo / Prunus virginiana Forest	Box-elder / Choke Cherry Forest	G3	S2			
Alnus incana - Salix (monticola, lucida, ligulifolia) Shrubland	Alder-Willow Shrubland	G3	S3			
Alnus incana / Mesic Forbs Shrubland	Alder / Mesic Forbs Shrubland	G3	S3			
Artemisia tridentata ssp. *tridentata / Leymus cinereus* Shrubland	Basin big sagebrush/Basin Wildrye Grass Shrubland	G2	S1			
Artemisia tridentata ssp. *vaseyana / Poa secunda* Shrubland	Mountain Sagebrush/ Sandberg Bluegrass Shrubland	G3	S3			
Atriplex confertifolia / Achnatherum hymenoides Shrubland	Shadscale Saltbush / Indian Ricegrass Shrubland	G3	S2			
Atriplex confertifolia / Pseudoroegneria spicata Shrubland	Shadscale Saltbush / Bluebunch Wheatgrass Shrubland	G3	S2S3			
Betula occidentalis / Maianthemum stellatum Shrubland	River Birch/False Soloman Seal Shrubland	G4?	S2			
Cornus sericea Shrubland	Red Osier Dogwood Shrubland	G4Q	S3			
Distichlis spicata Herbaceous Vegetation	Inland Saltgrass Saline Prairie	G5	S3			

Scientific Name	Common Name	Global Rank	State Rank	US ESA	Federal Sensitive List	State Sensitive List
Eleocharis palustris Herbaceous Vegetation	Creeping Spikerush Wet Meadow	G5	S4			
Juniperus osteosperma / Leymus salinus Woodland	Utah Juniper / Saline Wildrye Woodland	G3	S3			
Leymus cinereus Herbaceous Vegetation	Basin Wild Rye Tallgrass Prairie	G2G3Q	S1S2			
Picea pungens / Alnus incana Woodland	Colorado Blue Spruce / Alder	G3	S3			
Pinus edulis - Juniperus osteosperma / Cercocarpus intricatus Woodland	Pinon Pine – Utah Juniper/ Curl-leaf Mountain Mahogany	G3	S3			
Populus angustifolia - Picea pungens / Alnus incana Woodland	Narrowleaf Cottonwood - Colorado Blue Spruce / Thinleaf Alder	G3	S3			
Populus angustifolia / Betula occidentalis Woodland	Narrowleaf Cottonwood / River Birch Woodland	G3	S3			
Populus angustifolia / Rhus trilobata Woodland	Narrowleaf Cottonwood / Skunkbrush Woodland	G3	S3			
Populus tremuloides / Pteridium aquilinum Forest	Aspen / Bracken Fern Forest	G4	S3S4			
Pseudoroegneria spicata - Achnatherum hymenoides Herbaceous Vegetation	Bluebunch Wheatgrass - Indian Ricegrass Mixed grass	G3G4	SU			
Pseudoroegneria spicata Herbaceous Vegetation	Bluebunch Wheatgrass Herbaceous Vegetation	G2	S2?			
Pseudotsuga menziesii / Acer glabrum Forest	Douglas Fir / Rocky Mountain Maple Forest	G4?	S1			
Pseudotsuga menziesii / Betula occidentalis Woodland	Douglas Fir / River Birch Woodland	G3?	S3			
Salix boothii / Mesic Forbs Shrubland	Booth's Willow / Mesic Forbs Shrubland	G3	S3			

Scientific Name	Common Name	Global Rank	State Rank	US ESA	Federal Sensitive List	State Sensitive List
Salix boothii / Mesic Graminoids Shrubland	Booth's Willow / Mesic Graminoids Shrubland	G3?	S3			
Salix drummondiana / Mesic Forbs Shrubland	Drummond Willow / Mesic Forbs Shrubland	G4	S4			
Salix exigua / Barren Shrubland	Coyote Willow / Barren Shrubland	G5	S5			
Salix geyeriana - Salix monticola / Mesic Forbs Shrubland	Geyer Willow – Rocky Mountain Willow / Mesic Forbs Shrubland	G3	S3			
Salix monticola / Carex aquatilis Shrubland	Rocky Mountain Willow / Water Sedge Shrubland	G3	S3			
Salix monticola / Mesic Forbs Shrubland	Rocky Mountain Willow / Mesic Forbs Shrubland	G4	S3			
Schoenoplectus pungens Herbaceous Vegetation	Bulrush Wet Meadow	G3G4	S3			
Typha (latifolia, angustifolia) Western Herbaceous Vegetation	Broadleaf Cattail Marsh	G5	S4			
Plants						
Artemisia pygmaea	Pygmy Sagebrush	G4	S1			
Astragalus detritalis	Debris Milk-vetch	G3	S2		BLM	
Astragalus duchesnensis	Duchesne Milk-vetch	G3	S1S2		BLM	
Ceanothus martinii	Martin's Ceanothus	G4	S1			
Cirsium barnebyi	Barneby's Thistle	G3	S3			
Cryptantha rollinsii	Rollins' Cat's-eye	G3	S2		BLM	
Cymopterus duchesnensis	Uinta Basin Spring-parsley	G3	S1		BLM	
Eriogonum ephedroides	Ephedra Wild Buckwheat	G3	S1		BLM	
Festuca (Argillocholla) dasyclada	Sedge Fescue	G3	S3			
Gentianella tortuosa	Utah Gentian	G3?	S1		BLM	
Gilia stenothyrsa	Narrow-stem Gilia	G3	S1		BLM	
Lesquerella congesta	Dudley Bluffs Bladderpod	G1	S1	LT		
Lesquerella parviflora	Piceance Bladderpod	G2G3	S2S3			
Listera convallarioides	Broadlipped Twayblade	G5	S2			
Mentzelia multicaulis	Many-stem Stickleaf	G3	S3			

Scientific Name	Common Name	Global Rank	State Rank	US ESA	Federal Sensitive List	State Sensitive List
Monardella odoratissima	Mountain Wild mint	G4G5	S2			
Parthenium ligulatum	Ligulate Feverfew	G3	S2		BLM	
Penstemon fremontii var. *glabrescens*	Fremont's Beardtongue	G3G4T2	S2			
Penstemon grahamii	Graham's Beardtongue	G2	S1			
Penstemon scariosus var. *albifluvis*	White River Beardtongue	G4T1	S1			
Physaria obcordata	Piceance Twinpod	G1G2	S1S2	LT		
Sullivantia hapemanii var. *purpusii*	Hanging Garden Sullivantia	G3T3	S3			
Thalictrum heliophilum	Sun-loving Meadowrue	G2	S2		USFS	

SITES OF BIODIVERSITY SIGNIFICANCE

The 28 most important sites in Rio Blanco County are profiled in this section as Potential Conservation Areas (PCAs) with biodiversity ranks (Table 9, Map 2). **One is identified as being irreplaceable biodiversity significance (B1), seven are identified as being nearly irreplaceable biodiversity significance (B2), and twenty of high biodiversity significance (B3). The highest ranking PCAs are the highest priorities for conservation action.**

Each Potential Conservation Area (PCA) is described in a standard PCA profile report that reflects data fields in CNHP's Biodiversity Tracking and Conservation System (BIOTICS). The contents of the profile report are outlined and explained below:

PCA Profile Explanation

Biodiversity Rank: B#
The overall significance of the PCA in terms of rarity of the Natural Heritage resources and the quality (condition, abundance, etc.) of the occurrences. Please see *Natural Heritage Ranking System* section for more details.
Protection Urgency Rank: P#
A summary of major land ownership issues that may affect the long-term viability of the PCA and the element(s).
Management Urgency Rank: M#
A summary of major management issues that may affect the long-term viability of the PCA and the element(s).

USGS 7.5-minute Quadrangle name(s): A list of USGS 7.5 minute quadrangles which contain the boundary of the PCA; all quadrangles are from Colorado unless otherwise noted.
Size: Expressed in acres.
***Elevation:** Expressed in feet.
General Description: A brief narrative of the topography, hydrology, vegetation, and current use of the potential conservation area.
***Key Environmental Factors:** A description of key environmental factors that are known to have an influence on the PCA, such as seasonal flooding, wind, geology, soil type, etc.
***Climate Description:** Where climate has a significant influence on the elements within a PCA, a brief description of climate, weather patterns, seasonal and annual variations, temperature and precipitation patterns is included.
***Land Use History:** General comments concerning past land uses within the PCA which may affect the elements occurring within the boundary.
***Cultural Features:** Where pertinent, a brief description is given of any historic, cultural, or archeological features found within the PCA.
Biodiversity Significance Rank Comments: A synopsis of the rare species and significant plant communities that occur within the proposed conservation area. A table within the area profile lists each element occurrence found in the PCA, global and state

ranks of these elements, the occurrence ranks and federal and state agency special designations. See Table 1 for explanations of ranks and Table 2 for legal designations.
Boundary Justification: Justification for the location of the proposed PCA boundary delineated in this report, which includes all known occurrences of Natural Heritage resources and, in some cases, adjacent lands required for their protection.
***Protection Urgency Rank Comments:** Brief comments to justify the rating assigned to the PCA.
***Management Urgency Rank Comments:** Brief comments to justify the rating assigned to the PCA.
***Land Use Comments**: Brief comments describing the current and/or past land use as it affects those elements contained in the PCA.
***Natural Hazard Comments**: If any potential natural hazards such as cliffs, caves, poisonous plants, etc. are prominent within the PCA and relevant to a land manager or steward, comments are included along with any precautions that may need to be taken.
***Exotic Species Comments**: A description of potentially damaging exotic (i.e., alien) flora and/or fauna within the PCA, including information on location, abundance, and their potential effect on the viability of the targeted elements within the PCA.
***Offsite Considerations:** Where offsite land uses or other activities (e.g., farming, logging, grazing, dumping, watershed diversion, etc.) may have a significant influence on the elements within a PCA, a brief description of these is included.
***Information Needs**: A brief summary of any information that may still be needed in order to effectively manage the PCA and the elements within it.

* Optional fields, may or may not be included in Potential Conservation Area descriptions.

Table 9. Potential Conservation Areas in Rio Blanco County.

Potential Conservation Area	Biodiversity Rank
Dudley Bluffs	B1
Calamity Ridge	B2
Cathedral Bluffs	B2
Hay Gulch	B2
Piceance Creek	B2
Raven Ridge	B2
Timber Gulch	B2
White River at Rio Blanco Lake	B2
Coal Creek at Rattlesnake Mesa	B3
Dry Fork Piceance Creek	B3
Evacuation Creek	B3
Fawn Creek North	B3
Gilley Lake	B3
Lake Creek	B3
Lost Creek	B3
Lower Greasewood Gulch	B3
Missouri Creek	B3
North Fork White River	B3
Poose Creek	B3
School Gulch	B3
Shavetail Park	B3
Soldier Creek	B3
South Fork White River	B3
Upper Big Duck Creek	B3
Upper Hell's Hole	B3
Veatch Gulch	B3
White River at Agency Park	B3
Yellow Creek	B3

SITES OF BIODIVERSITY SIGNIFICANCE

IN RIO BLANCO COUNTY

Dudley Bluffs

Biodiversity Rank - B1: Outstanding Biodiversity Significance

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: Barcus Creek, Barcus Creek SE, Greasewood Gulch, Rock School, Square S Ranch, White River City, Wolf Ridge

Size: 45,897 acres (18,574 ha) **Elevation:** 5,850 - 6,870 ft. (1,783 - 2,094 m)

General Description: The site is situated in central Rio Blanco County, south of Highway 64 between Rangely and Meeker along the Piceance and Yellow creek drainages. It is irregularly shaped, but basically extends approximately 16 miles north to south and 12 miles east to west. The soils are decomposing shale of the Green River and Uinta Formations. These formations create a landscape of dissected tablelands in the Dudley Bluffs area. Shale outcrops are exposed along dry drainages through erosion from downcutting of streams (Spackman et al. 1997). Two rare plant species listed as federally Threatened grow on the exposed shale barrens. Associated plants in the rare plant communities include pinon pine (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*), fringed sagebrush (*Artemisia frigida*), white sagebrush (*Artemisia ludoviciana*), Wyoming sagebrush (*Artemisia tridenta* ssp. *wyomingensis*), shadscale (*Atriplex confertifolia*), rabbitbrush (*Chrysothamnus nauseous*), skunkbush (*Rhus aromatica trilobata*), lavender-leaf evening primrose (*Calylophus lavandulifolius*), dwarf sand verbena (*Abronia elliptica*), Italian parsley (*Aletes anisates*), Barneby's thistle (*Cirsium barnebyi*), spearleaf wild buckwheat (*Eriogonum lonchophyllum*), spurge (*Euphorbia* sp.), ballhead ipomopsis (*Gilia congesta*), greasewood (*Sarcobatus vermiculatus*), fineleaf hymenopappus (*Hymenopappus filiformis*), rayless aster (*Macaranthera grindeliodes*), many-stem stickleaf (*Nuttallia multicaulis*), Torrey's bitterweed (*Tetraneuris torreyana*), thickleaf beardtongue (*Penstemon pachyphyllus*), heliotrope phacelia (*Phacelia crenulata*), Hood's phlox (*Phlox hoodii*), bottlebrush squirreltail (*Elymus elymoides*), and Indian ricegrass (*Achnatherum hymenoides*).

Key Environmental Factors: Dry erodible soils, and intermittent moisture.

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Biodiversity Significance Rank Comments (B1): The site supports five excellent (A-ranked) and several good (B-ranked) occurrences of the globally critically imperiled (G1/S1) Dudley Bluffs bladderpod (*Lesquerella congesta*). There are also excellent (A-ranked), good (B-ranked) and fair (C-ranked) occurrences of Piceance twinpod (*Physaria obcordata*), which is globally imperiled (G1G2/S1S2). Both of these species are federally listed as Threatened. In addition, there is one good (B-ranked) occurrence of the globally imperiled (G2/S2) Piceance bladderpod (*Lesquerella parviflora*), which is on the BLM Sensitive Species list, and two good (B-ranked) occurrences of the globally vulnerable (G3/S3) many-stem stickleaf (*Nuttallia multicaulis*). There are several extant and historical occurrences of the globally imperiled subspecies (G3G4T2/S2) Fremont's beardtongue (*Penstemon fremontii* var. *glabrescens*) and an extant occurrence of the globally vulnerable (G3/S2) Rollins' cat's-eye (*Oreocarya rollinsii*).

Natural Heritage element occurrences at the Dudley Bluffs 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	Lesquerella congesta	Dudley Bluffs bladderpod	G1	S1	LT			A	1998-10-02
Vascular Plants	Lesquerella congesta	Dudley Bluffs bladderpod	G1	S1	LT			A	1998-10-08
Vascular Plants	Lesquerella congesta	Dudley Bluffs bladderpod	G1	S1	LT			A	2007-05-08
Vascular Plants	Lesquerella congesta	Dudley Bluffs bladderpod	G1	S1	LT			A	2007-05-09
Vascular Plants	Lesquerella congesta	Dudley Bluffs bladderpod	G1	S1	LT			A	2007-06-08
Vascular Plants	Lesquerella congesta	Dudley Bluffs bladderpod	G1	S1	LT			B	1998-11-05
Vascular Plants	Lesquerella congesta	Dudley Bluffs bladderpod	G1	S1	LT			B	1999-06-99
Vascular Plants	Physaria obcordata	Piceance twinpod	G1G2	S1S2	LT			A	2007-06-08
Vascular Plants	Physaria obcordata	Piceance twinpod	G1G2	S1S2	LT			AB	2007-05-08
Vascular Plants	Physaria obcordata	Piceance twinpod	G1G2	S1S2	LT			B	2000-05-19
Vascular Plants	Physaria obcordata	Piceance twinpod	G1G2	S1S2	LT			C	1993-07-08
Vascular Plants	Physaria obcordata	Piceance twinpod	G1G2	S1S2	LT			C	1999-06-99
Vascular Plants	Nuttallia multicaulis	many - stem stickleaf	G3	S3				B	2007-07-21
Vascular Plants	Nuttallia multicaulis	many - stem stickleaf	G3	S3				B	2007-07-24
Vascular Plants	Oreocarya rollinsii	Rollins' cat's - eye	G3	S2			BLM	E	2005-08-01
Vascular Plants	Penstemon fremontii var. glabrescens	Fremont's beardtongue	G3G4T2	S2				E	1989-06-22
Vascular Plants	Penstemon fremontii var. glabrescens	Fremont's beardtongue	G3G4T2	S2				H	1986-06-04
Vascular Plants	Penstemon fremontii var. glabrescens	Fremont's beardtongue	G3G4T2	S2				H	1986-06-26

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

Boundary Justification: The boundary incorporates the occurrences and additional suitable habitat which is adjacent. The Yellow Creek and Piceance Creek drainages and their tributaries are included where the rare plants have been documented. Future surveys will likely reveal new locations of plants that will expand the site boundary.

Protection Urgency Rank Comments (P1): About 87% of the site is BLM land with the remaining 13% state and private lands. Of the BLM land, 6,498 acres are designated as Areas of Critical Environmental Concern (Dudley Bluffs ACEC, Ryan Gulch ACEC, and Duck Creek ACEC). The protected areas do not cover all of the rare plant occurrences. The remaining acreage is highly threatened by oil and gas development.

Management Urgency Rank Comments (M1): Based on the comments from the BLM's White River Field Office (2007), and the rapid development of oil and gas interests in Rio Blanco County, management actions may be required within 1 year to prevent the plants from being lost or irretrievably degraded. Oversight by BLM is essential. The BLM gave the following comments: "There are NSO (No Surface Occupancy) designations for the Dudley Bluffs, Duck Creek, and Ryan Gulch ACECs; however there are exceptions to the NSO. It states that if an inventory and analysis indicate no direct or indirect impact to sensitive plant populations then the project would be allowed. The WRFO RMPA for oil and gas will look at additional NSO on unleased or as a COA "de-fact-o NSO" within 200 meters of suitable and/or occupied T&E, candidate, or BLM sensitive species habitat. There is NSO outside the ACECs for the Thirteen Mile Tongue formation, and several raptor nest buffer sites. The exception to the NSO is the same for the Thirteen Mile Tongue as is for the ACEC. There are exception criteria for the raptor NSO as well. There are CSU (conditional surface occupancy) stipulations for sensitive soils along Piceance and Yellow Creeks. All of the site has been leased. This is ground zero for oil and gas development. Williams, Bass, and ExxonMobil all have gas units in the site and each company is actively developing the resource. Each company has come to BLM with large scale plans to increase drilling. These companies' plans are the major driving force behind the RMP amendment for oil and gas that the field office is undertaking. Several major right-of-ways are pending (primarily large gas distribution lines) with at least one of these lines wishing to go through Horse Draw in the Ryan Gulch ACEC. There is some interest in oil shale with one research lease just outside the southwest corner of the site. If they prove up on the lease there would be potential to expand the lease to 5,120 acres which would likely infringe on the site. This would likely not happen for the next decade as the demonstration lease will need to prove that it is commercially viable before expansion to the larger acreage."

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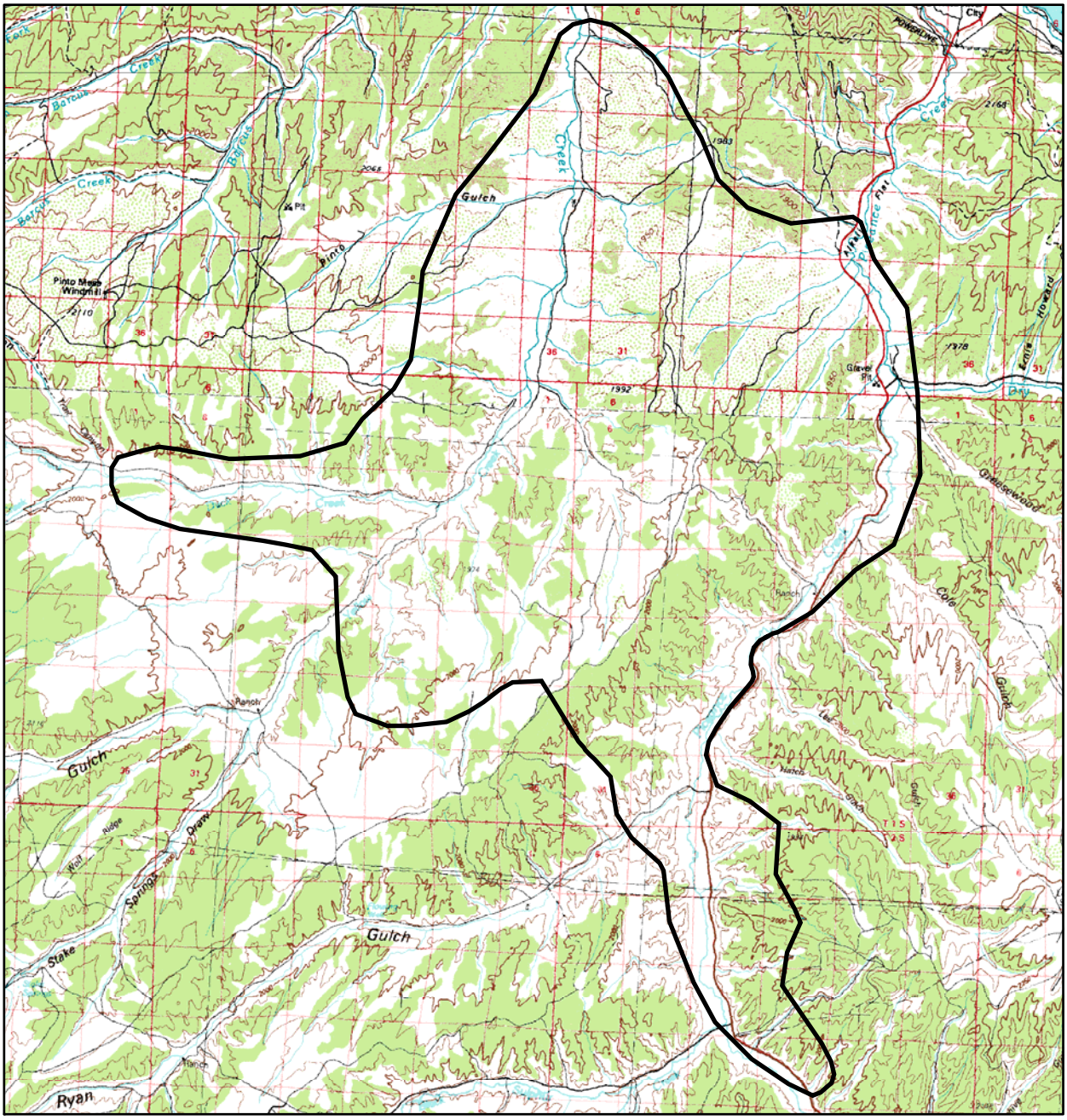

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Legend

PCA Boundary

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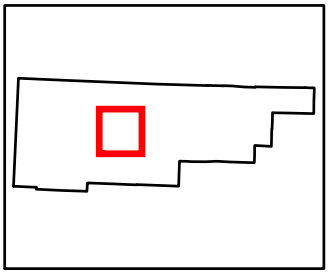
30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 3. Dudley Bluffs Potential Conservation Area, B1: Outstanding Biodiversity Significance

Calamity Ridge

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: Barcus Creek, Calamity Ridge, Divide Creek, Gillam Draw, Sagebrush Hill

Size: 27,921 acres (11,299 ha) **Elevation:** 6,600 - 8,268 ft. (2,012 - 2,520 m)

General Description: Calamity Ridge is a north/south trending ridge with drainages to the east and west. Elevations range from a from low of 6,600 ft at Indian Springs Draw and Spring Creek, to high of 8,268 ft at Cathedral. Geology is mapped as the Parachute member of the Green River Formation on the ridge top, lower member of the Green River Formation on the west side, and the Uinta Formation, (formerly known as the Evacuation Creek member of the Green River Formation) on the east side. Soils are mainly decomposed shale. Ecological systems include Rocky Mountain Lower Montane Foothill shrubland at the higher elevations, with serviceberry, mountain mahogany and Wyoming sagebrush. Slightly lower elevations have Colorado Plateau Pinon - Juniper Woodland. There are also inclusions of Intermountain Basins Sagebrush Steppe and Big Sagebrush Shrubland, and small pockets of Intermountain Basins shale badland. The wetland community with sagebrush and basin wild rye (*Leymus cinereus*) in Trail Canyon (County Road 122) was described as the best occurrence of this community in the Piceance Basin. It occupies the floodplain of an ephemeral stream. Soils at this location were identified as Glendive fine sandy loam (Torrifluvent). Six rare plant species occur within the site. Rare plants along County Road 122 were first described in 1986 when the road was new, and were found to be invading the steep road cut on nearly white, recently exposed shale with very little other vegetation. In 2007, the plants are still present, probably in greater abundance, although exact counts have not been made. There is a high diversity of plant species, in addition to the rare plants. These include the following trees: Utah juniper (*Juniperus osteosperma*), pinon pine (*Pinus edulis*); and shrubs: serviceberry (*Amelanchier utahensis*), white sagebrush (*Artemisia ludoviciana*), green-leaf Manzanita (*Arctostaphylos patula*), shadscale (*Atriplex canescens*), mountain mahogany (*Cercocarpus montanus*), sticky rabbitbrush (*Chrysothamnus viscidiflorus*), green Mormon tea (*Ephedra viridis*), rabbitbrush (*Ericameria nauseosa*), Oregon grape (*Mahonia repens*), mountain lover (*Paxistima myrsinites*), snowberry (*Symphoricarpus oreophilus*), horsebrush (*Tetradymia canescens*); and grasses or grass-like plants: Indian rice grass (*Achnatherum hymenoides*), cheatgrass (*Bromus tectorum*), bottlebush squirreltail (*Elymus elymoides*), Great Basin wild rye (*Leymus cinereus*), white mountain sedge (*Carex geophila*). The following forbs are also present in this area: Barneby's thistle (*Cirsium barnebyi*), linear leaf collomia *(Collomia linearis*), erect Cryptantha *(Cryptantha stricta*), spearleaf wild buckwheat (*Eriogonum lonchophyllum*),

wild buckwheat (*Eriogonum umbellatum*), monument plant (*Frasera speciosa*), northern bedstraw *(Galium septentrionale*), snakeweed (*Gutierrezia sarothrae*), granite prickly phlox (*Leptodactylon pungens*), blue flax (*Linum lewisii*), rayless aster (*Machaeranthera grindelioides*), many-stem stickleaf (*Nuttallia multicaulis*), creeping penstemon (*Penstemon caespitosus*), thickleaf beardtongue (*Penstemon pachyphyllus*), heliotrope phacelia (*Phacelia crenulata*), desert mountain phlox (*Phlox austromontana*), double bladderpod (*Physaria acutifolia*), Piceance twinpod (*Physaria obcordata*), bitterbrush (*Purshia tridentata*), and lobeleaf groundsel (*Senecio multilobatus*).

Key Environmental Factors: Arid, dry climate.

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Biodiversity Significance Rank Comments (B2): The site supports an excellent (A-ranked) and a good (B-ranked) occurrence of the globally critically imperiled (G1G2/S1S2) Piceance twinpod (*Physaria obcordata*). There is also a fair (C-ranked) occurrence of the globally imperiled (G2/S2) Piceance bladderpod (*Lesquerella parviflora*), two good (B-ranked) occurrences of many-stem stickleaf (*Nuttallia multicaulis*), a globally vulnerable (G3/S3) plant, and historic or unranked occurrences of several other plants. In addition, there is an excellent to good (AB-ranked) occurrence of the globally imperiled (G2/S1) basin big sagebrush/ basin rye (*Artemisia tridentata* ssp. *tridentata* / *Leymus cinereus*) sagebrush shrubland.

Natural Heritage element occurrences at the Calamity 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	Artemisia tridentata ssp. tridentata / Leymus cinereus Shrubland	Sagebrush Bottomland Shrublands	G2	S1				AB	1982-07-22
Natural Communities	Artemisia tridentata ssp. tridentata / Leymus cinereus Shrubland	Sagebrush Bottomland Shrublands	G2	S1				BC	1982-07-22
Natural Communities	Leymus cinereus Herbaceous Vegetation	Western Slope Grasslands	G2G3Q	S1S2				C	2007-07-24
Vascular Plants	Physaria obcordata	Piceance twinpod	G1G2	S1S2	LT			A	1982-07-29
Vascular Plants	Physaria obcordata	Piceance twinpod	G1G2	S1S2	LT			B	2007-07-24
Vascular Plants	Lesquerella parviflora	Piceance bladderpod	G2	S2			BLM	C	2007-05-13
Vascular Plants	Lesquerella parviflora	Piceance bladderpod	G2	S2			BLM	H	1986-06-15
Vascular Plants	Nuttallia multicaulis	many - stem stickleaf	G3	S3				B	2007-07-24
Vascular Plants	Nuttallia multicaulis	many - stem stickleaf	G3	S3				C	2007-07-24
Vascular Plants	Cirsium barnebyi	Barneby's thistle	G3G4	S3				E	2000-09-14
Vascular Plants	Penstemon fremontii var. glabrescens	Fremont's beardtongue	G3G4T2	S2				H	1986-06-15
Vascular Plants	Ceanothus martinii	Utah mountain lilac	G4	S1					2000-09-13
Vascular Plants	Ceanothus martinii	Utah mountain lilac	G4	S1					2000-10-07
Vascular Plants	Ceanothus martinii	Utah mountain lilac	G4	S1					2000-10-23

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

Boundary Justification: Boundary is drawn to capture all element occurrences according to the edaphic requirements.

Protection Urgency Rank Comments (P2): The site encompasses the Yanks Gulch and Upper Greasewood ACECs, which have an NSO (No Surface Occupancy) stipulation, and the Yanks Gulch designated State Natural Area. However, the ACECs and Natural Areas are in the northern part of the site, and do not cover most of the rare plant occurrences. Although much of the remainder of the site is designated CSU (Conditional Surface Use) for sensitive soils, extending the ACEC and the NSO designation to the rest of the site would give these plants further protection. The White River Field Office gave the following comments: "Over 1/2 the site is NSO for suitable or occupied habitat for T&E, listed, candidate, or BLM sensitive plant species and remnant vegetation associations. Exceptions are in place if the action can be mitigated to avoid impacts to the species. WRFO RMPA for oil and gas will look at additional NSO on unleased or as a COA "de-fact-o NSO" of no surface occupancy within 200 meters of suitable and/or occupied T&E, candidate, or BLM sensitive species. Oil and gas potential is high here, for the moment much of the activity is confined to the E and SE portion of the site. Oil Shale potential seems rather high here as well. All except one section of the site is leased, the unleased section is in the southern 1/2 of the site."

Management Urgency Rank Comments (M3): The occurrences of Piceance twinpod and Piceance bladderpod are adjacent to County Road 122. Direct impacts from road maintenance could damage the rare plant populations. On the other hand, some disturbance may actually benefit their establishment. More study is needed.

Exotic Species Comments: Cheatgrass (*Bromus tectorum*) is present.

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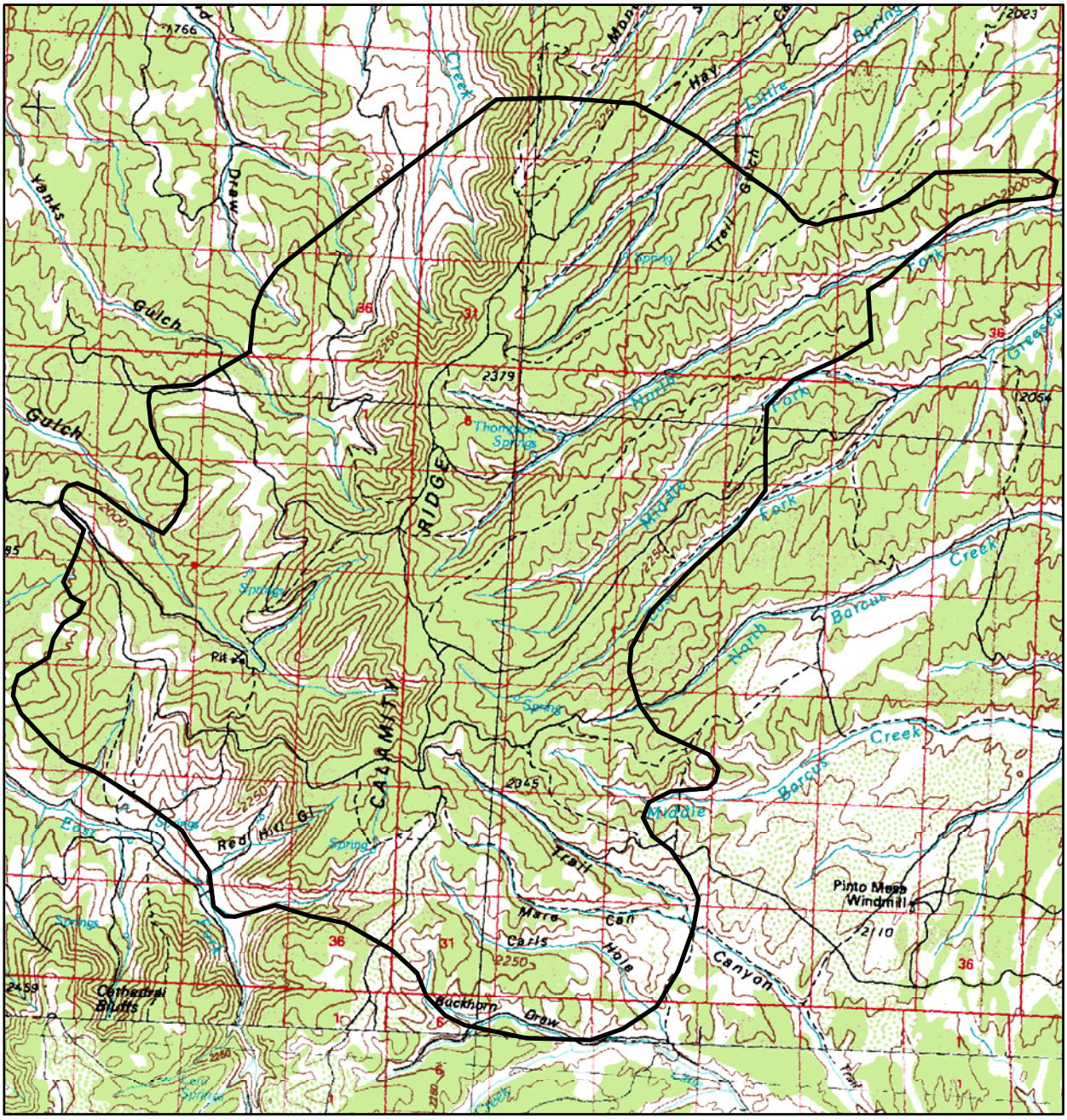

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PCA Boundary

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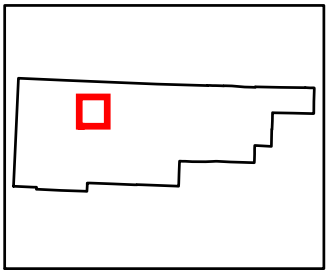

Map 4. Calamity Ridge Potential Conservation Area, B2: Very High Biodiversity Significance

Cathedral Bluffs

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: Black Cabin Gulch, Figure Four Spring, Razorback Ridge, White Coyote Draw, Yankee Gulch

Size: 14,310 acres (5,791 ha) **Elevation:** 8,150 - 8,625 ft. (2,484 - 2,629 m)

General Description: This area in Rio Blanco County includes the large northwest to southeast-trending, relatively flat surface above Cathedral Bluffs and the adjoining steep cliff exposures of shale and marlstone of the Parachute Creek Member of the Green River Formation. The cliffs face southwest. The southeastern 3/4 of the site is private, owned by Exxon-Mobile, and was surveyed in 2007 with their written permission. The northwestern 1/4 is BLM, Craig District. The relatively flat, open areas are predominately composed of Indian parsley (*Aletes anisatus*), rock jasmine (*Androsace septentrionalis*), tufted milk-vetch (*Astragalus spatulatus*), rough Indian paintbrush (*Castilleja scabrida*), bastard toadflax (*Comandra umbellatum*), erect cat's-eye (*Cryptantha stricta*), western wallflower (*Erysimum capitatum*), common flax (*Linum lewisii*), rayless tansyaster (*Machaeranthera grindelioides*), Lambert's locoweed (*Oxytropis lambertii*), mat penstemon (*Penstemon caespitosus*), longleaf phlox (*Phlox longifolia*), and thrift mock goldenweed (*Stenotus armerioides*). The steep, white shale slopes above the cliffs support Colorado bedstraw (*Galium coloradoense*), spearleaf wild buckwheat (*Eriogonum loncophyllum*), narrowleaf paintbrush (*Castilleja linariifolia*), an unusual glabrate version of Barneby's thistle (*Cirsium barnebyi*), fineleaf hymenopappus (*Hymenopappus filifolius*), rayless tansyaster, mountain mahogany (*Cercocarpus montanus*), Douglas-fir (*Pseudotsuga menziesii*), and pinon pine (*Pinus edulis*). Piceance bladderpod (*Lesquerella parviflora*) and sun-loving meadowrue (*Thalictrum heliophilum*), both globally imperiled species, were found inhabiting each area surveyed along the bluffs above the cliffs. In those areas, the following plants were also present: Barneby's columbine (*Aquilegia barnebyi*), nettle (*Urtica gracilis*) and oceanspray (*Holodiscus dumosus*). The northern end of the site contains grasslands with bluebunch wheatgrass (*Pseudoroegneria spicata*), needle and thread (*Hesperostipa comata*), sticky-flowered rabbitbrush (*Chrysothamnus viscidiflorus*), snakeweed (*Gutierrezia sarothrae*), prairie junegrass (*Koeleria macrantha*), Sandberg bluegrass (*Poa secunda*) and fringed sagewort (*Artemisia frigida).* Historically, the area was primarily used for cattle grazing. Although almost entirely privately-owned by Exxon-Mobile, there are currently no well sites and no evidence of activity in the area.

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer

thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Biodiversity Significance Rank Comments (B2): This site includes a large, excellent (A-ranked) occurrence of the globally imperiled (G2/S2) Piceance bladderpod (*Lesquerella parviflora*) and a good (B-ranked) occurrence of the globally imperiled (G2/S2) sun-loving meadowrue (*Thalictrum heliophilum*), both endemic to Colorado and known only from Garfield, Mesa and Rio Blanco counties. The bladderpod is on the BLM Sensitive Species list, and the meadowrue is on the USFS Sensitive Species list. Historical records indicate an excellent occurrence of the state critically imperiled (G3?/S1) Utah gentian (*Gentianella tortuosa*); however, in 2007 we were only able to verify a fair (C-ranked) occurrence. This species is known only from Rio Blanco County in Colorado and is on the BLM Sensitive Species list. In addition, there is a good (B-ranked) occurrence of the globally imperiled (G2/S2?) western slope grassland, *Pseudoroegneria spicata*, and a good (B-ranked) occurrence of the globally vulnerable (G3/S2) montane riparian forest, *Acer negundo / Prunus virginiana*. All the plants of special concern are oil shale endemics, restricted to either Piceance Basin or Uinta Basin. Although not drawn for this species, there are documented Greater Sage-grouse (*Centrocercus urophasianus*) nest sites adjacent to this site. This is a globally secure (G4/S4) species with a restricted range and is also a State Special Concern species and BLM/USFS sensitive species. The Greater Sage-grouse and other sagebrush obligates such as Columbian Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*), Sage Sparrow (*Amphispiza belli*), and the Brewer's Sparrow (*Spizella breweri*) depend on large, continuous blocks of viable sagebrush habitat such as identified within and adjacent to this site.

Natural Heritage element occurrences at the Cathedral Bluffs 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	Pseudoroegneria spicata Herbaceous Vegetation	Western Slope Grasslands	G2	S2?				B	2007-07-26
Natural Communities	Acer negundo / Prunus virginiana Forest	Montane Riparian Deciduous Forest	G3	S2				B	1992-07-14
Vascular Plants	Lesquerella parviflora	Piceance bladderpod	G2	S2			BLM	A	2007-06-20
Vascular Plants	Lesquerella parviflora	Piceance bladderpod	G2	S2			BLM	H	1982-07-16
Vascular Plants	Lesquerella parviflora	Piceance bladderpod	G2	S2			BLM	H	1986-06-28
Vascular Plants	Thalictrum heliophilum	sun - loving meadowrue	G2	S2			USFS	B	2007-06-29
Vascular Plants	Thalictrum heliophilum	sun - loving meadowrue	G2	S2			USFS	H	1987-07-01
Vascular Plants	Nuttallia multicaulis	many - stem stickleaf	G3	S3				C	2007-07-26
Vascular Plants	Gentianella tortuosa	Utah gentian	G3?	S1			BLM	C	2007-06-19
Vascular Plants	Gentianella tortuosa	Utah gentian	G3?	S1			BLM	E	1987-07-01
Vascular Plants	Gentianella tortuosa	Utah gentian	G3?	S1			BLM	H	1983-06-10

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

Boundary Justification: The boundaries encompass the areas with existing populations of rare plants and a rare plant community. The Cathedral Bluffs access road serves as the northeastern boundary and the base of the Bluffs serves as the southwestern boundary. This is also the most important scenic area of Cathedral Bluffs and it is important to protect the entire vertical exposure of Green River Formation in order to perpetuate the outstanding scenic value of the site as well as the rare plant populations.

Protection Urgency Rank Comments (P2): There is high potential for oil shale development in the future on several private tracts owned by oil companies. Oil shale mining and oil and gas development threaten the habitat of *Lesquerella parviflora* and *Thalictrum heliophilum* throughout their range. BLM lands are included in the South Cathedral ACEC, which carries an NSO (no surface occupancy)

stipulation. The rest of the BLM lands outside of the ACEC are protected by standard lease stipulations, except for areas with suitable or occupied habitat or T&E listed, candidate, or BLM sensitive species, which will carry an NSO. There are CSU (controlled surface occupancy) stipulations on the BLM lands for sensitive soils, and NSOs for any potential raptor nests and sage grouse leks. Approximately three sections, or less than half, of BLM lands in the site are leased. These are in the southern 1/3 of the site.

Management Urgency Rank Comments (M2): Since the site contains populations of nationally significant plants and a nationally significant plant association, it would qualify as a Research Natural Area under Section 6225.0-6 of the BLM Regulations, which states that RNA's may be established for "the preservation... of significant natural ecosystems" and as "Preserves for rare and endangered species of plants and animals." The site has outstanding scenic values in the spectacular near-vertical exposures of white Green River Formation marlstone. As such, it would qualify as an Outstanding Natural Area under Section 6225.0-5 of the BLM Regulations, which states that ONA's may be "established to preserve scenic values and areas of natural wonder." The site meets the Identification Criteria of Relevance and Importance outlined in "Areas of Critical Environmental Concern: Policy and Procedures Guidelines" (USDI, BLM-June 1980). It has "Relevance" in that it contains "communities of living plants, and vital components of their habitat..." (p. 7). It has "Importance" in that it has "(a) special worth ... when compared to any like or similar resource" (p. 9) in that other parts of the Cathedral Bluffs do not contain such a concentration of Special Concern taxa and the plant association, and it has "(b) more-than-local significance" in that it contains Nationally significant plants and a plant association. Although the RNA and ONA designations are somewhat overlapping, it is important to recognize both outstanding scenic values and outstanding scientific values by the two designations. The ONA designation would allow for public access and recreation on the site. These activities, if confined to foot travel, would not result in adverse impacts to the values of the RNA. The White River Field Office Resource Management Plan for oil and gas will look at additional NSO on unleased or as a COA "de-facto NSO" of no surface occupancy within 200 meters of suitable and/or occupied T&E, candidate, or BLM sensitive plant species. It will also look at development thresholds to offset Sage-grouse behavioral impacts by limiting the timing and extent of oil and gas development. This may delay immediate gas development.

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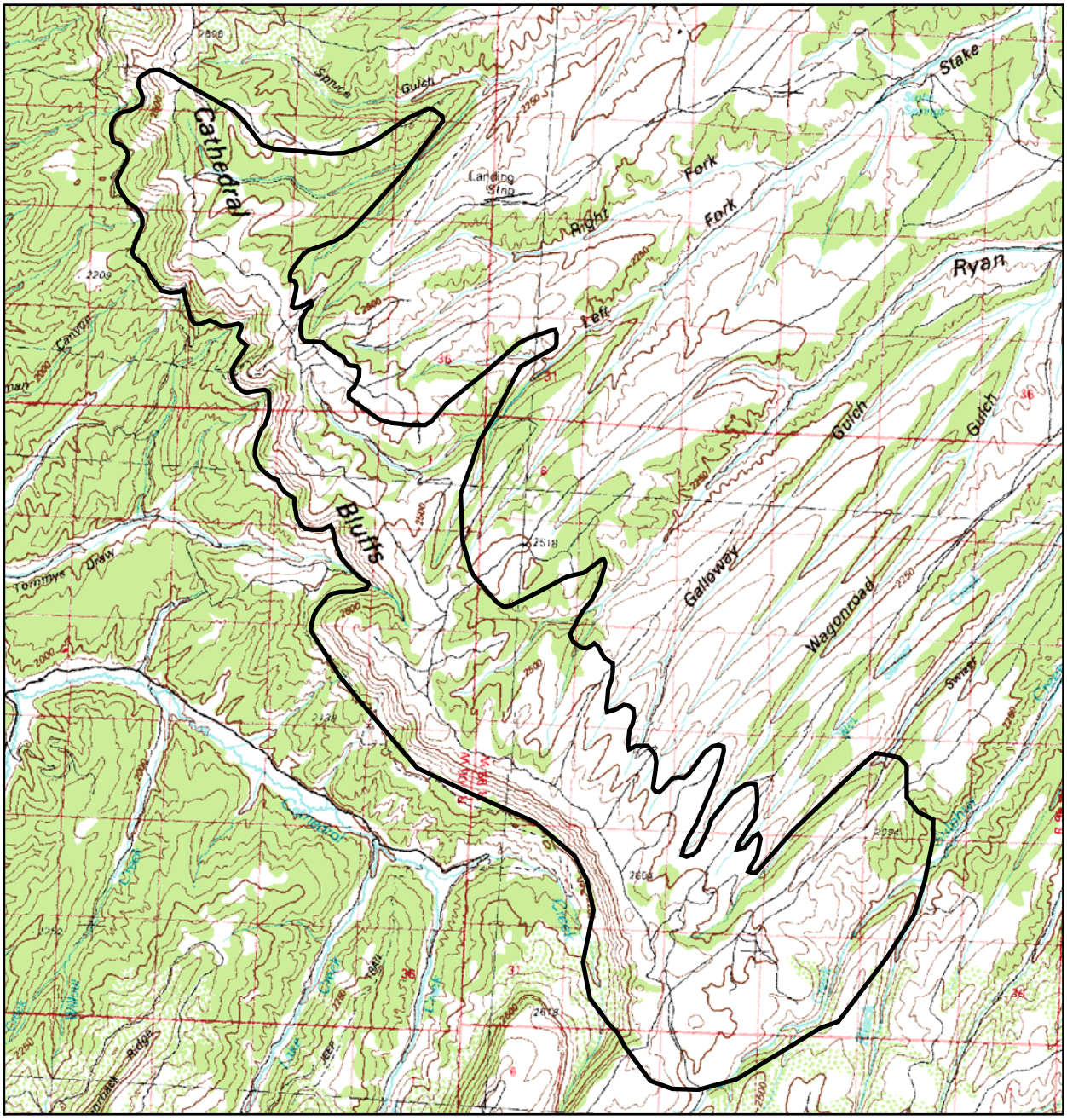

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Legend

PCA Boundary

Douglas Pass, 39108-E1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

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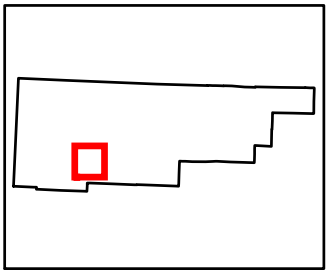


Map 5. Cathedral Bluffs Potential Conservation Area, B2: Very High Biodiversity Significance

Hay Gulch

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: Buckskin Point, Segar Mountain

Size: 1,549 acres (627 ha) **Elevation:** 6,080 - 6,800 ft. (1,853 - 2,073 m)

General Description: Situated southwest of Meeker about 10.3 air miles, between State Highway 64 and County Road 13, Hay Gulch is a large draw/gulch trending northwest to southeast, about 1 mile south of the White River. The northern 2/3 of the site are within the Parachute Creek member of the Green River Formation (oil shale, marlstone and siltstone), while the lower 1/3 is predominately within the Uinta Formation, composed mostly of sandstones and siltstones. The valley floor contains deep soils from erosion, as there is an intermittent drainage which appears to flood frequently, washing out the BLM road. The sides of the gulch are steep and eroded, with intermittent white to tan shale cliffs above. There is a history of grazing and recreation, which has allowed for the invasion of many exotic plant species in the bottom of the gulch. There is also a pipeline cutting across the northern end of Hay Gulch within the site. Higher slopes above the cliffs have scattered pinon - juniper woodlands with bluebunch wheatgrass (*Pseudoroegneria spicata*). Steep side slopes are mostly open with Barneby's thistle (*Cirsium barnebyi*), bluebunch wheatgrass (*Pseudoroegneria spicata*), Indian ricegrass (*Achnatherum hymenoides*), spearleaf wild buckwheat (*Eriogonum lonchophyllum*), fringed sage (*Artemisia frigida*), and shadscale (*Atriplex confertifolia*). There are patches of dense shrubs on the slopes and their base areas, with serviceberry (*Amelanchier utahensis*), chokecherry (*Prunus virginiana*) and big sagebrush (*Artemisia tridentata* var. *wyomingensis*). The north-facing slopes often include clumps of Gambel's oak (*Quercus gambelii*). The valley floor is dominated by big sagebrush (*Artemisia tridentata* var. *tridentata*), rabbitbrush (*Chrysothamnus nauseous*), Jim Hill mustard (*Sisymbrium altissimum*), snakeweed (*Gutierrezia sarothrae*) and cheatgrass (*Bromus tectorum*). The site encloses an area about 2.9 miles long and averages 1/3 mile wide.

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Land Use History: Recreation and grazing.

Biodiversity Significance Rank Comments (B2): The site supports a good (B-ranked) occurrence of Piceance Twinpod (*Physaria obcordata*), a plant that is critically imperiled globally (G1G2/S1S2) and listed as Threatened (LT). It also includes a good (B-ranked) occurrence of a bluebunch wheatgrass (*Pseudoroegneria spicata*) grassland community, considered globally imperiled (G2/S2?). A historic occurrence of the globally imperiled (G2/S2) Piceance bladderpod (*Lesquerella parviflora*) was searched for but not found in 2007.

Natural Heritage element occurrences at the Hay 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
Natural Communities	Pseudoroegneria spicata Herbaceous Vegetation	Western Slope Grasslands	G2	S2?				B	2007-09-17
Vascular Plants	Physaria obcordata	Piceance twinpod	G1G2	S1S2	LT			B	2007-09-18

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

Boundary Justification: The site encompasses an occurrence of Piceance twinpod (*Physaria obcordata*) and the adjacent community dominated by bluebunch wheatgrass (*Pseudoroegneria spicata*) located on the Parachute member of the Green River formation. Upland areas of the gulch are included as well, since activities upstream may have an effect on the occurrences, particularly by introduction of further non-native species.

Protection Urgency Rank Comments (P2): The rare plants are within the Piceance State Wildlife Area. A pipeline crosses through this part of the site. Uplands are on BLM land, which has been leased for oil and gas development. There are some small areas on the BLM land with NSO (No Surface Occupancy) stipulations to protect remnant vegetation, and CSU (Controlled Surface Occupancy) designations for steep slopes. According to the BLM field office in Meeker, Hay Gulch has some exploratory wells planned for the eastern side of the site along the Kindall Peak Road. The Hay Gulch Road is being heavily used by industry for transportation of water and materials to two well locations above the Dry Fork of Piceance Creek. Topography will likely limit development, as much of it is very steep. The BLM portion would be appropriate for an ACEC. Means of protecting the rare plant occurrences on state land are unknown and need to be researched.

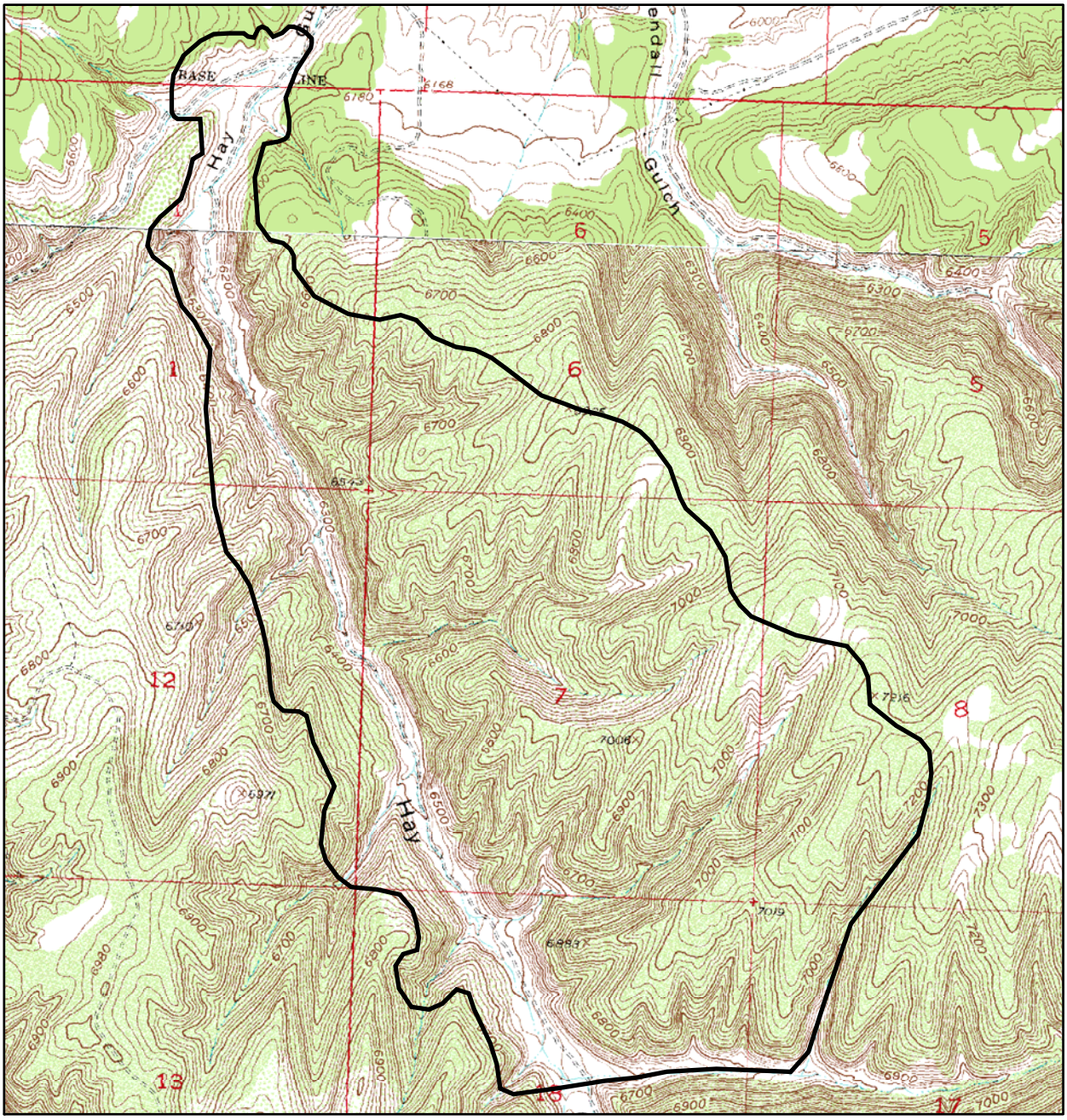
Management Urgency Rank Comments (M3): Although rare plants are on steep slopes of the gulch, additional management may be necessary within the next 5 years to control the exotic plant species in the bottoms that could affect the rare plant populations. Additional survey for rare plants on BLM land, and assessment of the impacts of oil and gas development are needed. Weeds, primarily leafy spurge and

spotted knapweed, are of concern along Hay Gulch and Kindall Peak Road. According to the BLM Field Office in Meeker, it appears that the weed problems have expanded since industry started using these routes.

Exotic Species Comments: A single plant of leafy spurge (*Euphorbia esula)* was found on the BLM road within the site and reported to BLM. Other non-native species found in the valley bottom were cheatgrass (*Bromus tectorum*), weinerleaf (*Halogeton glomeratus*), houndstongue (*Cynoglossum officinale*), horehound (*Marrubium vulgare*), mullein (*Verbascum thapsus*), Jim Hill mustard (*Sisymbrium altissimum*), and Russian thistle (*Salsola australis*).

Information Needs: Confirm identification and extent of *Physaria obcordata* during flowering season.

Version Author: Lyons, M.J. and J. Huggins
Version Date: 12/11/2007



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Map Date: 02/15/2008

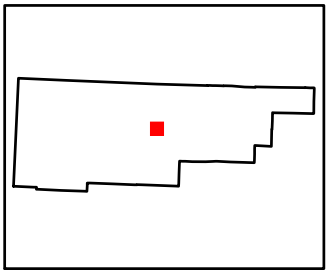
Legend

PCA Boundary

Segar Mountain, 39108-H1
Buckskin Point, 40108-A1

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 6. Hay Gulch Potential Conservation Area, B2: Very High Biodiversity Significance

Piceance Creek

Biodiversity Rank - B2: Very High Biodiversity Significance

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

Management Urgency Rank - M1: Essential within 1 Year to Prevent Loss

U.S.G.S. 7.5-minute quadrangles: Greasewood Gulch, Jessup Gulch, McCarthy Gulch, No Name Ridge, Rio Blanco, Rock School, Segar Mountain, Square S Ranch, Thirteenmile Creek

Size: 81,106 acres (32,823 ha) **Elevation:** 5,053 - 8,240 ft. (1,540 - 2,512 m)

General Description: Although the broad valley of Piceance Creek is primarily cultivated for hay, and includes significant oil and gas development, the barren shale hills above the valley are home to several rare plants and plant communities. Bottomlands along Piceance Creek are primarily privately owned, while most of the upland areas are BLM. Undeveloped areas in the main drainage and tributary drainages support a tall shrub community of greasewood (*Sarcobatus vermiculatus*) and basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*). Higher up, light gray shale slopes are sparsely vegetated with Wyoming sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and other low shrubs, including snakeweed (*Gutierrezia sarothrae*), low rabbitbrush (*Chrysothamnus viscidiflorus*), prickly gilia (*Leptodactylon pungens*), fringed sage (*Artemisia frigida*) and shadscale (*Atriplex confertifolia*). A good diversity of native grasses are mixed with these shrubs, including bluebunch wheatgrass (*Pseudoroegneria spicata*), Indian ricegrass (*Achnatherum hymenoides*), needle and thread (*Hesperostipa comata*), blue grama (*Bouteloua gracilis*) and galleta *(Pleuraphis jamesii*). There are also significant patches of non-native cheatgrass (*Bromus tectorum*). Common forbs are Barneby's thistle (*Cirsium barnebyi*), spearleaf buckwheat (*Eriogonum lonchophyllum*), rayless aster (*Machaeranthera grindelioides*), mountain pepperweed (*Lepidium montanum*), hairy golden aster (*Heterotheca villosa*), white sagebrush (*Artemisia ludoviciana*), Oregon grape (*Mahonia repens*) and twin bladderpod (*Physaria acutifolia*). Upper slopes have pinon - juniper (*Pinus edulis - Juniperus osteosperma*) woodlands, with Douglas-fir (*Pseudotsuga menziesii*) in many of the cooler drainages.

Key Environmental Factors: The rare elements are adapted to the dry climate and special edaphic environment of the Green River Shale. The geologic substrates are, from west to east, the Tertiary Uinta Formation, the Parachute member of the Green River Formation, and the lower member of the Green River Formation. Soils have been identified as the Torriorthent-Rock outcrop complex (Baker 1982).

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer

thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Land Use History: The area has been grazed and bottomlands have been cultivated for hay for many years. Recently oil and gas development has made major impacts.

Biodiversity Significance Rank Comments (B2): The Piceance Creek site supports good (B-ranked) occurrences of several globally vulnerable plants and plant communities, including Utah fescue (*Argillochloa dasyclada*, G3/S3), Western Slope grasslands (*Pseudoroegneria spicata / Achnatherum hymenoides*, G3G4/SU) and cold desert shrublands (*Atriplex confertifolia / Achnatherum hymenoides*, G3/S2, and *Atriplex confertifolia / Pseudoroegneria spicata*, G3/S2S3). There is also a good (B-ranked) occurrence of the globally imperiled (G2/S2?) *Pseudoroegneria spicata* herbaceous vegetation community, a fair (C-ranked) occurrence of the globally imperiled (G2/S2) Piceance bladderpod (*Lesquerella parviflora*), an unranked occurrence of the globally vulnerable (G3G4T2/S2) subspecies Fremont's penstemon (*Penstemon fremontii* ssp. *glabrescens*), and a good (B-ranked) occurrence of the state rare (G4G5/S2) mountain wild mint (*Monardella odoratissima*).

Natural Heritage element occurrences at the Piceance 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	Pseudoroegneria spicata Herbaceous Vegetation	Western Slope Grasslands	G2	S2?				B	2007-09-16
Natural Communities	Atriplex confertifolia / Achnatherum hymenoides Shrubland	Cold Desert Shrublands	G3	S2				B	1982-06-22
Natural Communities	Atriplex confertifolia / Achnatherum hymenoides Shrubland	Cold Desert Shrublands	G3	S2				BC	1982-06-17
Natural Communities	Atriplex confertifolia / Pseudoroegneria spicata Shrubland	Cold Desert Shrublands	G3	S2S3				B	1982-06-11
Natural Communities	Atriplex confertifolia / Pseudoroegneria spicata Shrubland	Cold Desert Shrublands	G3	S2S3				B	1982-06-29
Natural Communities	Atriplex confertifolia / Pseudoroegneria spicata Shrubland	Cold Desert Shrublands	G3	S2S3				B	1982-08-25
Natural Communities	Atriplex confertifolia / Pseudoroegneria spicata Shrubland	Cold Desert Shrublands	G3	S2S3				C	1982-06-22
Natural Communities	Pseudoroegneria spicata - Achnatherum hymenoides Herbaceous Vegetation	Western Slope Grasslands	G3G4	SU				AB	1982-07-05
Natural Communities	Pseudoroegneria spicata - Achnatherum hymenoides Herbaceous Vegetation	Western Slope Grasslands	G3G4	SU				BC	1982-06-29

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	Pseudoroegneria spicata - Achnatherum hymenoides Herbaceous Vegetation	Western Slope Grasslands	G3G4	SU				C	1982-07-02
Vascular Plants	Lesquerella parviflora	Piceance bladderpod	G2	S2			BLM	C	1996-07-99
Vascular Plants	Lesquerella parviflora	Piceance bladderpod	G2	S2			BLM	H	1982-06-16
Vascular Plants	Lesquerella parviflora	Piceance bladderpod	G2	S2			BLM	H	1986-06-03
Vascular Plants	Argillochloa dasyclada	Utah fescue	G3	S3				B	2007-07-20
Vascular Plants	Argillochloa dasyclada	Utah fescue	G3	S3				B	2007-08-30
Vascular Plants	Argillochloa dasyclada	Utah fescue	G3	S3				H	1982-07-09
Vascular Plants	Argillochloa dasyclada	Utah fescue	G3	S3				H	1982-07-99
Vascular Plants	Nuttallia multicaulis	many - stem stickleaf	G3	S3				B	2007-08-30
Vascular Plants	Nuttallia multicaulis	many - stem stickleaf	G3	S3				H	1982-07-10
Vascular Plants	Penstemon fremontii var. glabrescens	Fremont's beardtongue	G3G4T2	S2				E	1991-06-11
Vascular Plants	Penstemon fremontii var. glabrescens	Fremont's beardtongue	G3G4T2	S2				H	1986-06-03
Vascular Plants	Monardella odoratissima	mountain wild mint	G4G5	S2				B	2007-07-20

** 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 steep slopes above Piceance Creek that support a suite of rare plants and plant communities. In the northern section, it follows the base of the hills on the east side of Piceance Creek. Further south, it encompasses populations of Utah fescue (*Argillochloa dasyclada*). The eastern side includes the drainages flowing west into Piceance Creek, since upland activities may affect the quality of the habitat downstream.

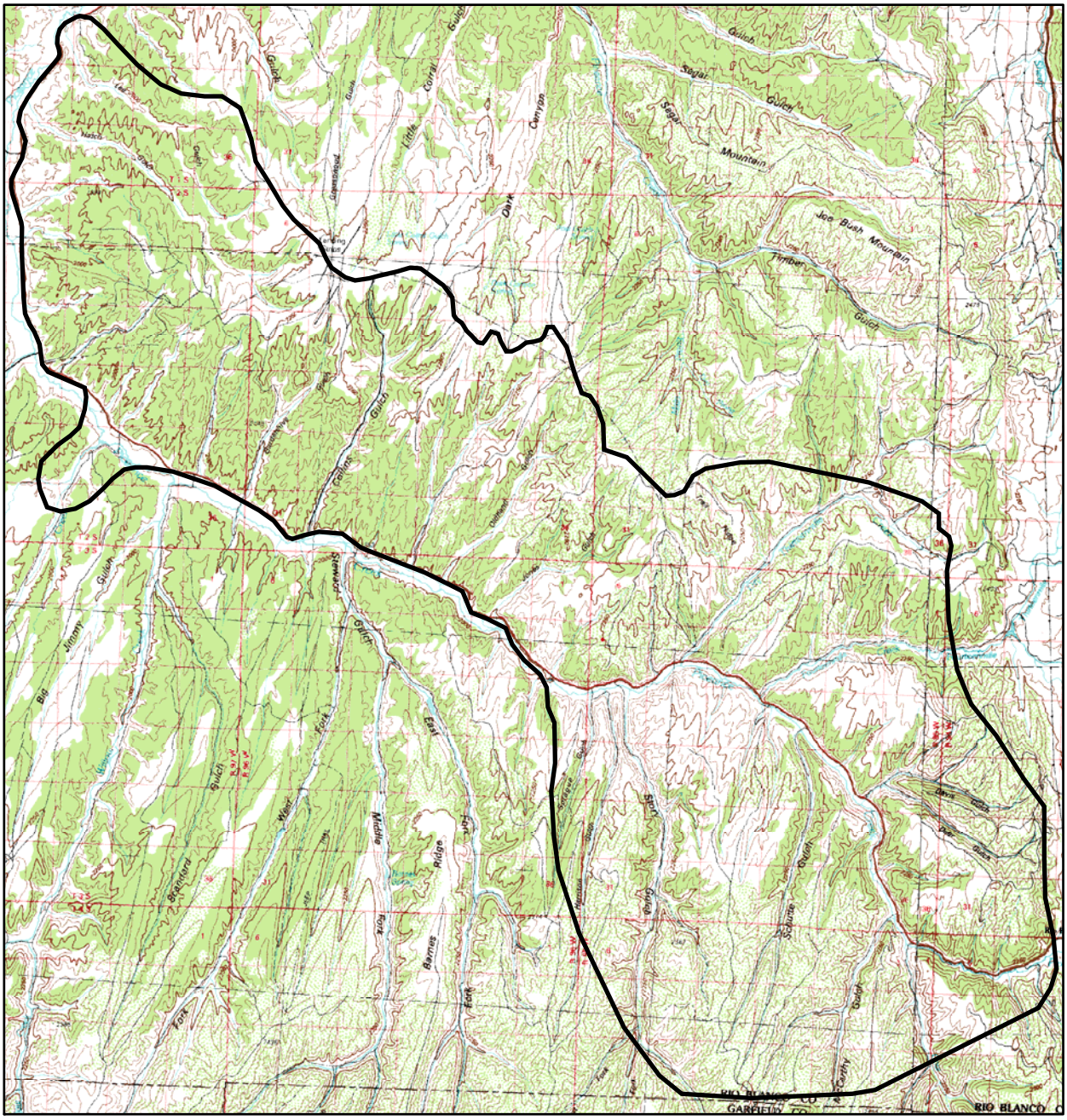
Protection Urgency Rank Comments (P3): Two BLM Areas of Critical

Environmental Concern (ACECs), Dudley Bluffs and Deer Gulch, overlap this site. Expansion of these areas would offer further protection to the rare elements.

Management Urgency Rank Comments (M1): Primary considerations are oil and gas development, including pipelines, roads and well pads that would directly disturb rare plants. Cattle grazing is of less concern since much of the rare plant habitat is too steep to graze and provides little forage. The BLM offered the following comments: "This site includes the Dudley Bluffs ACEC with the NSO (No Surface Occupancy) designation for the ACEC. It also encompasses the Deer Gulch ACEC which is NSO for plants and remnant vegetation associations. There are exceptions to the NSO. It states that if an inventory and analysis indicate no direct or indirect impact to sensitive plant populations then the project would be allowed. There is NSO outside the ACECs for the Thirteen Mile Tongue formation, and several raptor nest buffer sites. The exception to the NSO is the same for the Thirteen Mile Tongue as is for the ACEC. There are exception criteria for the raptor NSO as well. The WRFO RMPA for oil and gas will look at additional NSO on unleased or as a COA "de-fact-o NSO" within 200 meters of suitable and/or occupied T&E, candidate, or BLM sensitive species habitat. There is NSO for all BLM lands along Piceance Creek for Bald Eagles. Unclear with delisting how this will be managed. BLM will probably list it as a BLM sensitive species. Because of the topography, much of the steep slopes have a CSU for sensitive soils. All but 560 acres of the site is leased. This is ground zero for oil and gas development. ExxonMobil and XTO Energy have gas units here and each company is actively developing the resource. Each company has come to BLM with large scale plans to increase drilling. These companies' plans are the major driving force behind the RMP amendment for oil and gas that the field office is undertaking. Most of the site encompasses the ExxonMobil Piceance Development project approved in 2007. The project included 20 well pads, with an additional 80 pads to be analyzed case by case. The project included several large gas distribution sites and a 50 acre gas plant above Hunter Creek. Many of the well pads approved are in very close proximity to the Ryan and Dudley Bluffs ACECs. Several major right-of-ways are pending (primarily large gas distribution lines) because of the industrial distribution center on Magnolia Bench and the interstate distribution lines that were established in Piceance Creek. Ryan Gulch and Dudley Bluffs will constantly be looked at as routes to place gas lines coming form the infrastructure down to the distribution lines in Piceance Creek."

Exotic Species Comments: Cheatgrass (*Bromus tectorum*) is abundant in wetter areas along Piceance Creek, in gulches, often the primary grass species occurring with greasewood (*Sarcobatus vermiculatus*), and also in drier areas in patches on shale slopes.

Version Author: Lyon, M.J. and J. Huggins
Version Date: 12/15/2007



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Map Date: 02/15/2008

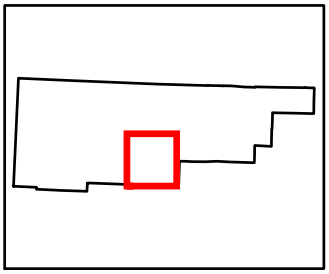
Legend

PCA Boundary

Glenwood Springs, 39107-E1
Douglas Pass, 39108-E1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 7. Piceance Creek Potential Conservation Area, B2: Very High Biodiversity Significance

Raven Ridge

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: Banty Point, Dinosaur, Mellen Hill, Walsh Knolls

Size: 36,956 acres (14,956 ha) **Elevation:** 5,100 - 6,400 ft. (1,554 - 1,951 m)

General Description: The Raven Ridge site is located northwest of Rangely, trending northwest to southeast. Approximately 1/3 of the site extends across the Utah/Colorado border. The majority of the area is BLM land, but there is also a small portion of private land. The area covered averages 13 air miles northwest to southeast and 4.75 miles southwest to northeast. A portion of the geology consists of shale barrens of the Green River Formation, a white to tan oil shale layer. Other geology present includes sandstones, shales and coal beds above Sego Sandstone that are part of the upper Mesa Verde Formation, as well as some exposed Buck Tongue of Mancos Shale and Castlegate Sandstone along with modern alluvium soils along the southern tip. The shale barrens support several rare plants including Graham beardtongue (*Penstemon grahamii*) and White River penstemon (*Penstemon scariosus* var. *albifluvis*), both globally rare plants. These and other rare plants grow within sparsely vegetated desert shrub and pinon - juniper communities on knolls, bluffs, ledges, benches, talus slopes, or dry washes in loose shale soils derived from the shale. Four globally vulnerable plants designated as sensitive species by the BLM occur within the site, including ephedra buckwheat (*Eriogonum ephedroides*), Uinta Basin spring parsley (*Cymopterus duchesnensis*), Rollins' cat's-eye (*Oreocarya rollinsii*), and ligulate feverfew (*Bolophyta ligulata*). Due to the diversity and rarity of the plant life, much of the area has been designated as a BLM Area of Critical Environmental Concern (ACEC) and a State Natural Area. Some common plants associated with this site are as follows: Utah juniper (*Juniperus osteosperma*), shadscale (*Atriplex confertifolia*), winterfat (*Kraschenninnikovia lanata*), littleleaf mountain mahogany, (*Cercocarpus intricatus*), birchleaf mountain mahogany (*Cercocarpus montanus*), Mormon tea (*Ephedra viridis*), Utah greasebush (*Forsellesia meionandra*), littleleaf bricklebush (*Brickellia microphylla*), lavender-leaf evening primrose (*Calyphus lavandulifolia*), sandaster (*Chaetopappa ericoides*), dwarf pincushion (*Chamaechaenactis scaposa*), roughseed cat's-eye (*Cryptantha flavoculata*), snakeweed (*Gutierrezia sarothrae*), large-flower skeleton-plant (*Lygodesmia grandiflora*), thickleaf penstemon (*Penstemon pachyphyllus*), Mofatt's Penstemon (*Penstemon moffattii*), Hood's phlox (*Phlox hoodii*), prince's plume (*Stanleya pinnata*), thrift mock goldenweed (*Stenotus armerioides*), heartleaf twistflower (*Streptanthus cordatus*), gray horsebrush (*Tetradymia canescens*), Salina wild rye (*Leymus salina*), Sandberg bluegrass (*Poa secunda*), and needle and thread grass (*Hesperostipa comata*).

Key Environmental Factors: Dry, easily eroded soils and intermittent moisture.

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Biodiversity Significance Rank Comments (B2): There are numerous occurrences of rare plants. Most significant are the fair (C-ranked), extant (unrankable) and historic occurrences of the globally imperiled (G2/S1) Graham's beardtongue (*Penstemon grahamii*). All known occurrences of Graham's beardtongue in Colorado are in this site. *P. grahamii* is endemic to the Uinta Basin of northwestern Colorado and northeastern Utah where it grows in small, scattered occurrences. There is also a fair (C-ranked) occurrence of the globally critically imperiled subspecies (G4T1/S1) White River penstemon (*Penstemon scariosus* var. *albifluvis*) and an excellent (A-ranked) occurrence of ephedra buckwheat (*Eriogonum ephedroides*), a globally vulnerable (G3/S1) species. There is a high likelihood that with further inventory of *Penstemon grahamii* and *Penstemon scariosus* var. *albifluvis*, occurrences of good (B-ranked), or better viability, could be documented.

Natural Heritage element occurrences at the Raven 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	Pinus edulis - Juniperus osteosperma / Cercocarpus intricatus Woodland	Mesic Western Slope Pinyon - Juniper Woodlands	G3	S3				BC	1981-06-20
Natural Communities	Pinus edulis - Juniperus osteosperma / Cercocarpus intricatus Woodland	Mesic Western Slope Pinyon - Juniper Woodlands	G3	S3				BC	1983-99-99
Vascular Plants	Penstemon grahamii	Graham beardtongue	G2	S1				C	1998-05-99
Vascular Plants	Penstemon grahamii	Graham beardtongue	G2	S1				E	1996-05-10
Vascular Plants	Penstemon grahamii	Graham beardtongue	G2	S1				H	1980-06-99
Vascular Plants	Penstemon grahamii	Graham beardtongue	G2	S1				H	1981-05-28
Vascular Plants	Penstemon grahamii	Graham beardtongue	G2	S1				H	1981-07-28
Vascular Plants	Astragalus duchesnensis	Duchesne milkvetch	G3	S1S2			BLM	H	1979-05-31
Vascular Plants	Bolophyta ligulata	ligulate feverfew	G3	S2			BLM	H	1981-06-99
Vascular Plants	Cymopterus duchesnensis	Uinta Basin spring - parsley	G3	S1			BLM	C	1982-05-99
Vascular Plants	Eriogonum ephedroides	ephedra buckwheat	G3	S1			BLM	A	2007-07-01
Vascular Plants	Oreocarya rollinsii	Rollins' cat's - eye	G3	S2			BLM	C	2007-06-30
Vascular Plants	Oreocarya rollinsii	Rollins' cat's - eye	G3	S2			BLM	D	1981-06-17
Vascular Plants	Seriphidium pygmaeum	pygmy sagebrush	G4	S1				B	2007-07-01
Vascular Plants	Penstemon scariosus var. albifluvis	White River penstemon	G4T1	S1	C			C	1999-06-99

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

Boundary Justification: The site extends into Utah. It encompasses the ridge and slopes to the east and west that support rare plants.

Protection Urgency Rank Comments (P2): The site includes the Raven Ridge ACEC, which covers the top of the ridge, but does not take in all rare plant occurrences. Due to the fact that approximately 1/2 of the site is leased, including the southern 1/2 of the Raven Ridge ACEC, there is a possibility that oil and gas development could be a threat to the existing rare plant occurrences within 5 years. Also, many of the rare plant occurrences have not been documented since the 1980s and still need to be surveyed.

Management Urgency Rank Comments (M2): Based on the comments from the BLM's White River Field Office (WRFO), and the rapid development of oil and gas interests in Rio Blanco County, management actions may be required within the next 5 years to prevent the element occurrences from being lost or irretrievably degraded. There is also a possibility of damage from grazing and trampling by livestock, off-road vehicle use, and collection (Center for Native Ecosystems 2002). Continued survey and oversight by BLM to ensure that the plants are protected is essential, as there are multiple sensitive species that may not be located in any single year due the fact that they may not flower every year. The White River Field Office gave the following comments: "2,090 acres of the site is encompassed by the Raven Ridge ACEC and that area carries an No Surface Occupancy (NSO) designation. The remaining areas outside of the ACEC are protected by standard lease stipulations, except for areas with suitable or occupied habitat for Threatened and Endangered (T&E), candidate, or BLM sensitive species which will carry an NSO. There are Controlled Surface Use (CSU) designations for the area for sensitive soils, and NSO for any potential raptor nests. The WRFO Resource Management Plan Amendment (RMPA) for oil and gas will look at additional NSO on unleased, or as a Condition of Approval (COA) "de-fact-o NSO" within 200 meters of suitable and/or occupied T&E, candidate, or BLM sensitive species habitat. Energy development in this area is slow for the moment, as companies focus on the Piceance watershed with development."

Exotic Species Comments: There is abundant purple mustard (*Corispora tenella*) in the rare plant habitat.

Information Needs: There are many historical occurrences. More on-site surveys are needed to verify and rank these populations.

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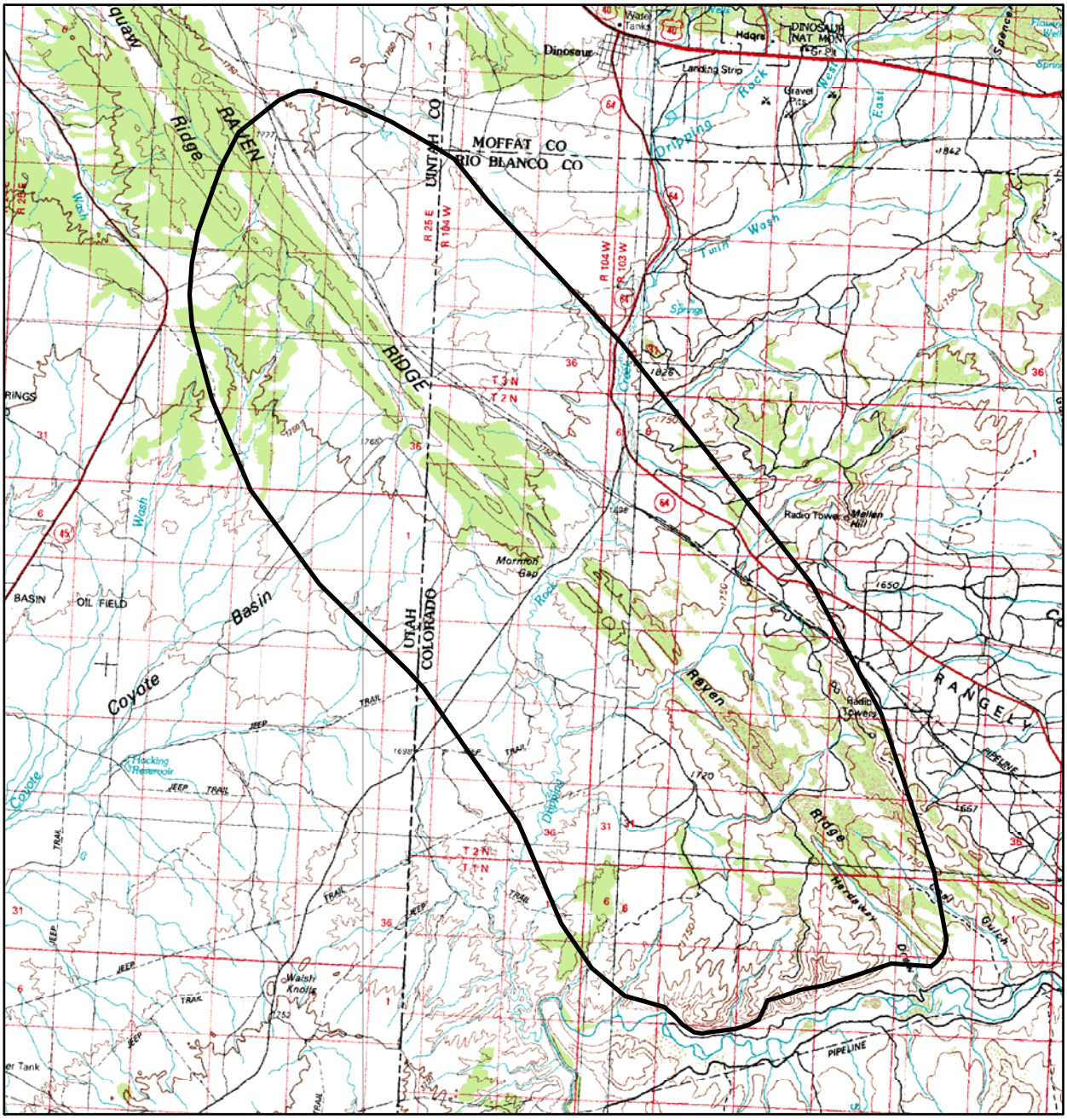

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Map Date: 02/15/2008

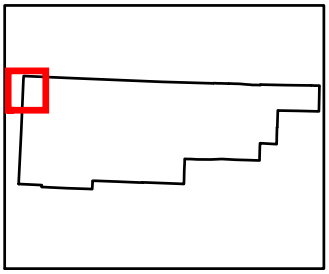
Legend

PCA Boundary

Rangely, 40108-A1
Vernal, 40109-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 8. Raven Ridge Potential Conservation Area, B2: Very High Biodiversity Significance

Timber Gulch

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: Segar Mountain

Size: 884 acres (358 ha) **Elevation:** 6,900 - 7,800 ft. (2,103 - 2,377 m)

General Description: Slopes above Timber Gulch are covered with shale fragments of the Parachute member of the Green River Formation, and support a vigorous population of a rare plant, Piceance bladderpod (*Lesquerella parviflora*) that is restricted to this formation. Associated species are typical of this habitat, and include pinon pine (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*), Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), mountain mahogany (*Cercocarpus montanus*), snowberry (*Amelanchier utahensis*), serviceberry (*Symphoricarpos oreophilus*), Gambel's oak (*Quercus gambelii*), bluebunch wheatgrass (*Pseudoroegneria spicata*), spearleaf buckwheat (*Eriogonum lonchophyllum*) and Barneby's thistle (*Cirsium barnebyi*). Steep slopes have protected the site from grazing impacts.

Key Environmental Factors: Shale fragments from the decomposition of the Parachute member of the Green River Formation provide the specific habitat that supports Piceance bladderpod.

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent. Of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Biodiversity Significance Rank Comments (B2): The site supports a good (B-ranked) occurrence of the globally imperiled (G2/S2) Piceance bladderpod (*Lesquerella parviflora*) and a fair (C-ranked) occurrence of the globally imperiled (G2/S2) sun-loving meadowrue (*Thalictrum heliophilum*). Additionally, there is a historical occurrence of Piceance bladderpod that was documented in excellent condition in 1986. More field work is needed to verify the condition of this occurrence.

Natural Heritage element occurrences at the Timber 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	Lesquerella parviflora	Piceance bladderpod	G2	S2			BLM	B	1997-07-99
Vascular Plants	Lesquerella parviflora	Piceance bladderpod	G2	S2			BLM	H	1986-06-03
Vascular Plants	Thalictrum heliophilum	sun - loving meadowrue	G2	S2			USFS	C	1982-06-99

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

Boundary Justification: The site encompasses three rare plant occurrences within Timber Gulch. The boundary is drawn to include adjacent areas of the gulch that may contain more of these species.

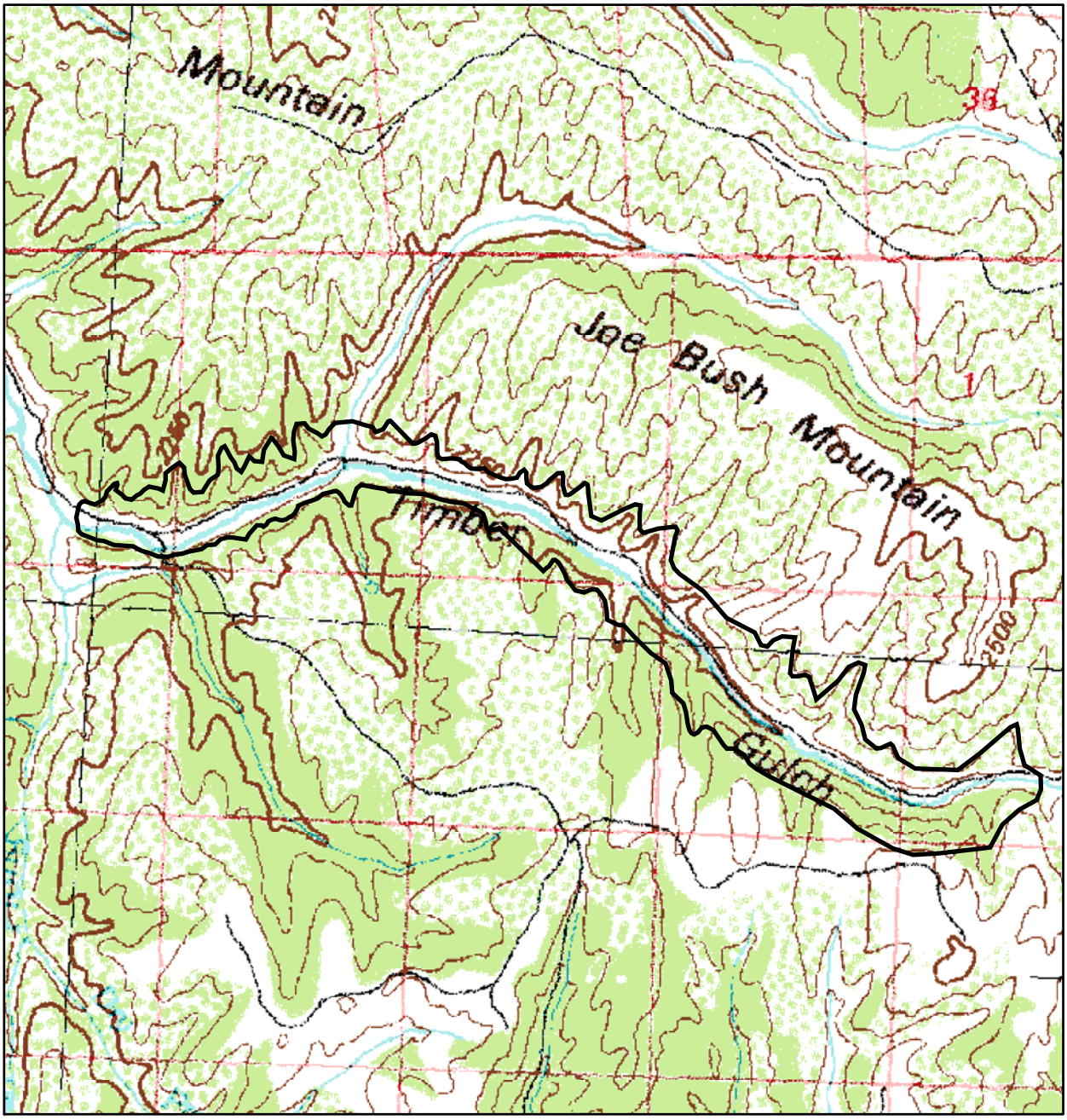
Protection Urgency Rank Comments (P2): Most of the site is owned by BLM. There are no special protection designations; however, standard protection for BLM sensitive species and remnant vegetation is in effect. The site would be worthy of an ACEC based on the excellent occurrences of the rare Piceance bladderpod.

Management Urgency Rank Comments (M2): The BLM's White River Field Office made the following comments: "There is a NSO (No Surface Occupancy) designation for remnant vegetation associations (RVAs) and BLM sensitive plant species. The largest NSO is for a Goshawk nest site in the eastern portion of the site. Much of the steep slopes are CSU (Conditional Surface Use) for sensitive soils. An exception would apply if the nature of the action is determined to not be detrimental to the RVAs or BLM sensitive species or if denial of the action would preclude exercising valid existing rights associated with the lease. The entire site is leased to ExxonMobil and framed out to XTO Energy. There are no current plans for development. However, there are several well pads constructed above Bear Gulch on the south side, one on private lands and one location on BLM. One 10 inch natural gas flow line is permitted within the site. The permitted portion of the line is on private land."

Information Needs: The site was not visited in 2007, and needs to be checked to verify its present condition and the continued presence of the rare plants.

Version Author: Culver, D.R.

Version Date: 01/09/2007



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Map Date: 02/15/2008

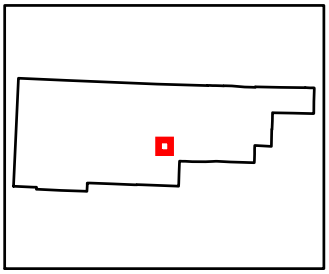
Legend

PCA Boundary

Douglas Pass, 39108-E1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 9. Timber Gulch Potential Conservation Area, B2: Very High Biodiversity Significance

White River at Rio Blanco Lake

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: Buckskin Point, White River City

Size: 2,231 acres (903 ha) **Elevation:** 5,760 - 5,900 ft. (1,756 - 1,798 m)

General Description: The White River at Rio Blanco Lake site contains portions of the White River and its floodplain between Rio Blanco Lake (State Wildlife Area) and Powell Park. The White River dissects this part of the county, cutting across the sandstone and siltstone of the Uinta Formation. Several gulches flow into the White River within the site: Rattlesnake Gulch, Tom Stith Gulch, Beavers Gulch, Smith Gulch and Kissinger Gulch. The riparian shrubland is dominated by a multi-layered, deciduous riparian forest. Boxelder - narrowleaf cottonwood / red-osier dogwood (*Acer negundo - Populus angustifolia / Cornus sericea*) with willow hawthorn (*Crataegus saligna*) also dominate in the shrub layer. Point bars are well established throughout, dominated by sandbar willow (*Salix exigua*). Abandoned oxbows and sloughs are found adjacent or within the occurrence and are typically dominated by beaked sedge (*Carex utriculata*), cattails (*Typha angustifolia*) or bulrush (*Scirpus acutus*). Along the sandstone cliff on the southern edge of the White River, red-osier dogwood forms a very dense, narrow band between the cliff and the river.

Key Environmental Factors: Gravels and alluviums from the Quaternary Age dominate the riparian area. Uplands consist of sandstone, siltstone, and marlstones of the Green River and Uinta Formations. Soils range from Redrob loam, Patent loam, and Shawa loams.

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Land Use History: In 1868, Major John Wesley Powell, his wife, and about twenty others came to the valley and established winter quarters in Powell Park.

Biodiversity Significance Rank Comments (B2): The site supports a good (B-ranked) example of a globally imperiled (G2/S2) *Acer negundo - Populus angustifolia / Cornus sericea* riparian forest. This plant association is a narrow regional endemic which is undergoing continued fragmentation and degradation throughout

its range due to agricultural impacts and fluvial instability. It is presently recorded only from northwestern Colorado in broad alluvial valleys and has significantly declined from historical distributions. Additionally, a good to poor (BD-ranked) occurrence of a common (G4Q/S3) riparian shrubland, *Cornus sericea*, is documented. Several other common communities were documented in 1992 in good (B-ranked) to fair (C-ranked) condition.

Natural Heritage element occurrences at the White River at Rio Blanco 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
Natural Communities	Acer negundo - Populus angustifolia / Cornus sericea Forest	Narrowleaf Cottonwood Riparian Forests	G2	S2				B	2007-08-13
Natural Communities	Alnus incana - Salix (monticola, lucida, ligulifolia) Shrubland	Thinleaf Alder - Mixed Willow Species	G3	S3				B	1992-08-27
Natural Communities	Populus angustifolia / Rhus trilobata Woodland	Narrowleaf Cottonwood / Skunkbrush	G3	S3				C	1992-06-25
Natural Communities	Betula occidentalis / Maianthemum stellatum Shrubland	Foothills Riparian Shrubland	G4?	S2				C	1992-06-25
Natural Communities	Cornus sericea Shrubland	Foothills Riparian Shrubland	G4Q	S3				BD	2007-08-13
Natural Communities	Salix exigua / Barren Shrubland	Coyote Willow / Bare Ground	G5	S5				A	1992-06-26
Natural Communities	Typha (latifolia, angustifolia) Western Herbaceous Vegetation	Narrow - leaf Cattail Marsh	G5	S4				B	1992-08-22

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

Boundary Justification: Boundary is delineated to encompass the known occurrences of the riparian plant communities and potential habitat along the floodplain, as well as the lower portions of the White River's tributaries. The boundary encompasses both public and private property, however, only private lands with written permission and public lands were surveyed.

Protection Urgency Rank Comments (P2): This site is owned by several private landowners and the BLM. The BLM portions are designated as the White River Riparian Area of Critical Environmental Concern due to botanical reasons.

Management Urgency Rank Comments (M2): Russian olive (*Elaeagnus angustifolia*) is found throughout. Tamarisk (*Tamarix ramosissima*) is currently only in a few areas. The site does contain agriculture fields with hay grasses. Noxious weeds such as hounds tongue (*Cynoglossum officinale*), Canada thistle (*Breea arvensis*) and mullein (*Verbascum thapsus*) are found throughout the understory. Management may be needed in the future to prevent the spread of these noxious plants.

Exotic Species Comments: Russian olive (*Elaeagnus angustifolia*) is found throughout. Tamarisk (*Tamarix ramosissima*) is currently only in a few areas. The site does contain agriculture fields with hay grasses. Noxious weeds such as hounds tongue (*Cynoglossum officinale*), Canada thistle (*Breea arvensis*) and mullein (*Verbascum thapsus*) are found throughout the understory

Version Author: Culver, D.R.
Version Date: 01/14/2008

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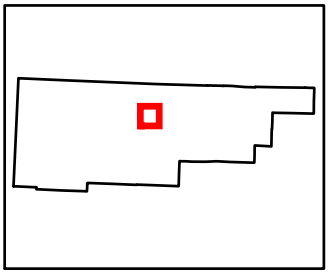
Legend

PCA Boundary

Rangely, 40108-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 10. White River at Rio Blanco Lake Potential Conservation Area, B2: Very High Biodiversity Significance

Coal Creek at Rattlesnake Mesa

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: Rattlesnake Mesa, Sawmill Mountain, Thornburgh

Size: 726 acres (294 ha) **Elevation:** 6,800 - 7,400 ft. (2,073 - 2,256 m)

General Description: The Coal Creek at Rattlesnake Mesa site is located along County Road 15, south of Yellow Jacket Pass. Coal Creek flows west from the White River National Forest until it is directed south by the shale slopes of Rattlesnake Mesa. Within the site, Coal Creek flows at a gentle grade, 4-8%, creating thick willow carrs and enabling beaver to erect numerous dams. The dominant plants include Booth's willow (*Salix boothii*), Geyer willow (*Salix geyeriana*), Rocky Mountain willow (*Salix monticola*), strap-leaf willow (*Salix eriocephala* var. *ligulifolia*) and alder (*Alnus incana*), with an understory of dogwood (*Cornus sericea*), snowberry (*Symphoricarpos rotundifolius*), serviceberry (*Amelanchier utahensis*), gooseberry (*Ribes inerme*) and rose (*Rosa woodsii*). Sedges (*Carex utriculata, C. praegracilis, C. pellita*) and rushes (*Juncus balticus*, *J. saximontanus*, and *Eleocharis palustris*) dominate the wetter areas. The ground is uneven and hummocky due to past flooding and beaver activity. Patches of narrowleaf cottonwood (*Populus angustifolia*) with box elder (*Acer negundo*) occur, especially where there is a confluence with a major tributary such as Boxelder Draw or Ninemile Draw. The uplands consist of big basin sagebrush (*Artemisia tridentata* ssp. *tridentata*.), Gambel's oak (*Quercus gambelii*), pinon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*).

Key Environmental Factors: Geology is derived from sedimentary rocks of the Cretaceous Age: Williams Fork and Iles Formation and Mancos Shale. Soils consist of well drained loams from Shawa Series and from Jerry-Thornburgh-Rhone complex.

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Biodiversity Significance Rank Comments (B3): This site supports an excellent (A-ranked) example of a globally vulnerable (G3/S3) riparian shrub community, *Salix boothii* / mesic forb. This plant community is common in northern Colorado

and is typically associated with wetter areas within the floodplain (Carsey et al. 2003).

Natural Heritage element occurrences at the Coal Creek at Rattlesnake Mesa 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	Salix boothii / Mesic Forbs Shrubland	Booth's Willow / Mesic Forb	G3	S3				A	2007-07-13

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

Boundary Justification: Boundary was delineated to encompass the known occurrence of the willow plant community and potential habitat along the immediate floodplain. This boundary only includes the immediate ecological processes. Only private properties with written permission were surveyed.

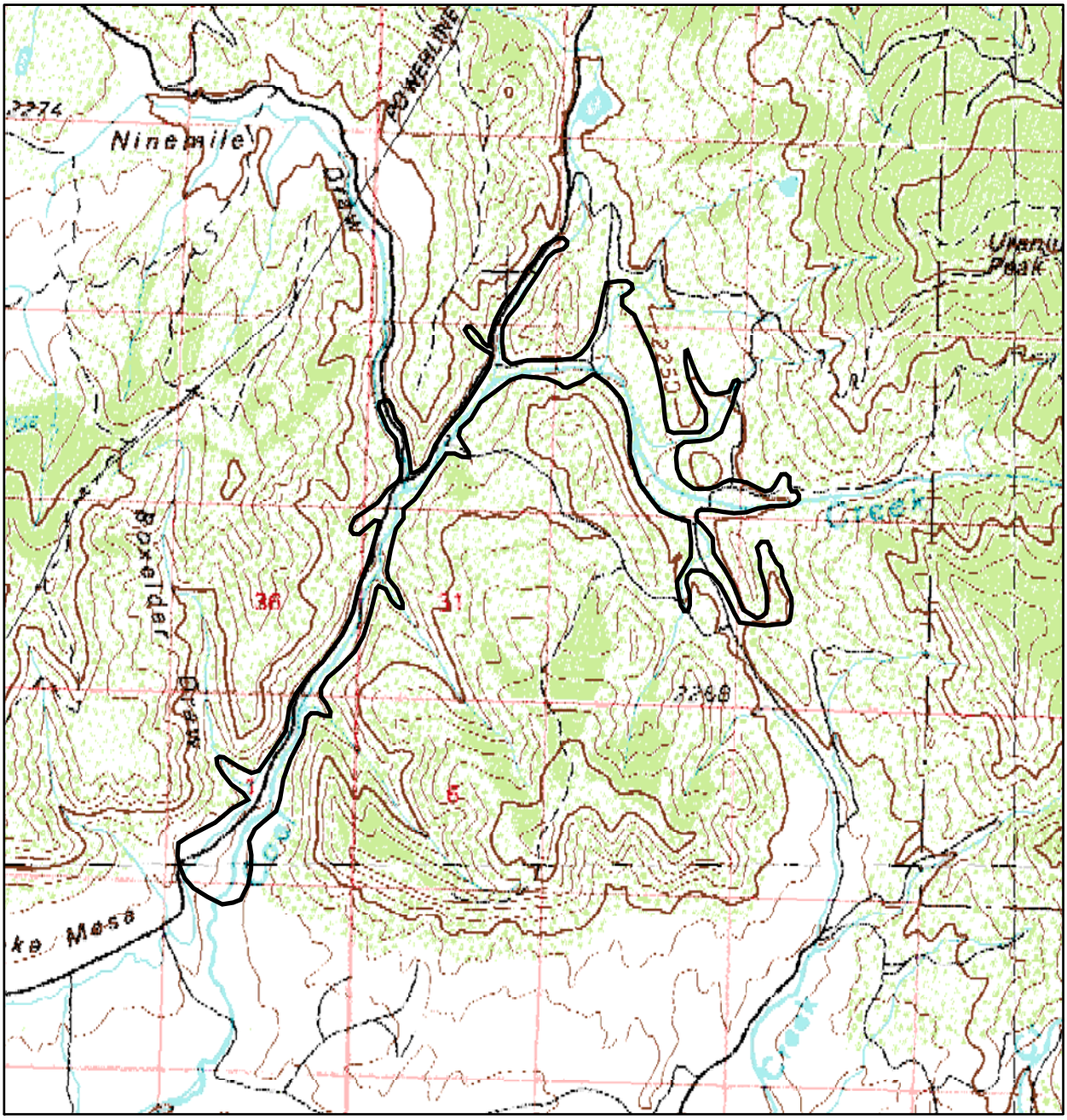
Protection Urgency Rank Comments (P4): Current ownership is private. The owners are conservation minded and have an easement on other portions of the property.

Management Urgency Rank Comments (M3): Controlling the spread of noxious weeds, such as spotted knapweed (*Acosta maculosa*) and tamarisk (*Tamarix ramosissima*).

Exotic Species Comments: Knapweed and tamarisk are present.

Version Author: Culver, D.R.

Version Date: 01/29/2008



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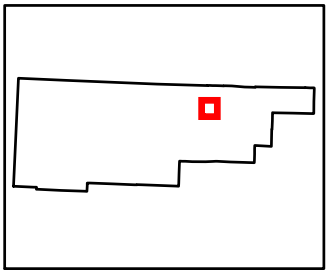
Legend

PCA Boundary

Meeker, 40107-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 11. Coal Creek at Rattlesnake Mesa Potential Conservation Area, B3: High Biodiversity Significance

Dry Fork Piceance 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: Greasewood Gulch, White River City

Size: 1,016 acres (411 ha) **Elevation:** 5,900 - 6,500 ft. (1,798 - 1,981 m)

General Description: This site is located on sparsely vegetated, dry shale hills north of County Road 22 within a shrub/grass community containing scattered pinons and junipers. It is predominately drawn to encompass the boundaries of a globally imperiled plant community, but also includes a globally vulnerable plant occurrence. The plant community is located on convex slopes, interrupted by drainages. The bottomlands to the south are interspersed with hay meadows. Geologically modern alluvium, including Piney Creek and younger deposits, covers nearly the entire northern half of the site. The Uinta Formation (formerly the Evacuation Creek Member of Green River Formation), made up of sandstones and siltstones, covers most of the southern portion, which is a little more than half of the site. The shape of the area is irregular, but basically averages 3.4 air miles in length (west to east) and 0.74 air miles in width (north to south). Typical native plant species include shrubs: fringed sagebrush (*Artemisia frigida*), mountain mahogany (*Cercocarpus montanus*), chokecherry (*Prunus virginiana*), bitterbrush (*Purshia tridentata*), snowberry (*Symphoricarpus oreophilus*), horsebrush (*Tetradymia canescens*), rabbitbrush (*Chrysothamnus nauseosus*) and Oregon grape (*Mahonia repens*); grasses Indian rice grass (*Achnatherum hymenoides*), Prairie junegrass (*Koeleria macrantha*), and muttongrass (*Poa fendleriana*); and forbs white sagebrush (*Artemisia ludoviciana*), dragon milkvetch (*Astragalus lutosus*), Barneby's thistle (*Cirsium barnebyi*), erect chryptantha (*Cryptantha stricta*), spearleaf wild buckwheat (*Eriogonum lonchophyllum*), sticky rabbitbrush (*Chrysothamnus viscidiflorus*), snakeweed (*Gutierrezia sarothrae*), Hood's phlox (*Phlox hoodii*), and sharpleaf twinpod (*Physaria acutifolia*). Non-native species include cheatgrass (*Bromus tectorum*) and Kentucky bluegrass (*Poa pratensis*).

Key Environmental Factors: Dry, easily eroded soils.

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Biodiversity Significance Rank Comments (B3): The site supports a good (B-ranked) occurrence of the globally vulnerable (G3/S3) many-stem stickleaf (*Nuttallia multicaulis*) and a fair (C-ranked) occurrence of a globally imperiled (G2/S2?) western slope grassland community, *Pseudoroegneria spicata* herbaceous vegetation.

Natural Heritage element occurrences at the Dry Fork Piceance 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	Pseudoroegneria spicata Herbaceous Vegetation	Western Slope Grasslands	G2	S2?				C	2007-09-16
Vascular Plants	Nuttallia multicaulis	many - stem stickleaf	G3	S3				B	2007-07-20

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

Boundary Justification: The boundary encompasses a rare plant community on shale hills above the Dry Fork of Piceance Creek and includes a rare plant in similar habitat in the next drainage to the south.

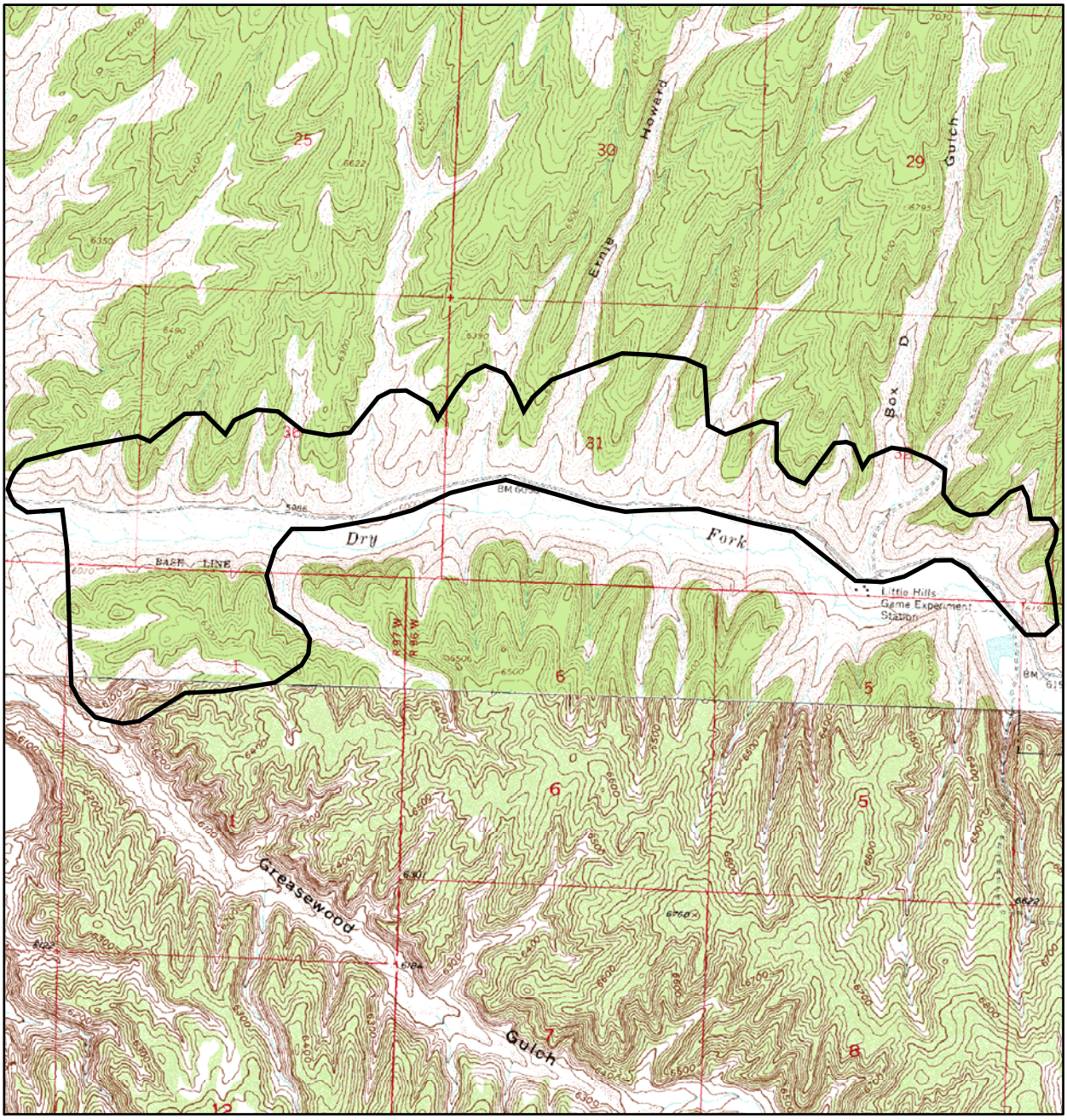
Protection Urgency Rank Comments (P2): According to the BLM, the federal lands are all leased, although there is no pending development at this time. Most of the land in the Dry Fork valley bottom is in the Piceance Creek State Wildlife Area, with small patches of private lands or private surface and minerals. Uplands are on BLM land, which has been leased for oil and gas development. There are some small areas on the BLM land with NSO (No Surface Occupancy) stipulations to protect remnant vegetation, and CSU (Controlled Surface Occupancy) designations for steep slopes. Topography will likely limit development, as much of it is very steep. The BLM portion would be appropriate for an ACEC. Means of protecting the rare plants on state land are unknown and need to be researched.

Management Urgency Rank Comments (M3): Although most of the rare plant community is on steep slopes above the gulch, additional management may be necessary to control possible impacts of oil and gas development, such as pipelines, due to the fact that all of the BLM land is currently leased.

Exotic Species Comments: Cheatgrass (*Bromus tectorum*) and Kentucky bluegrass (*Poa pratensis*) are common.

Version Author: Lyon, M.J. and J. Huggins

Version Date: 12/11/2007



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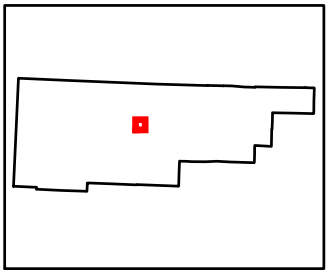
Legend

PCA Boundary

Greasewood Gulch, 39108-H2
White River City, 40108-A2

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map12. Dry Fork Piceance Creek Potential Conservation Area, B3: High Biodiversity Significance

Evacuation 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: Davis Canyon, Dragon, East Evacuation Creek, Texas Creek

Size: 9,430 acres (3,816 ha) **Elevation:** 5,880 - 7,250 ft. (1,792 - 2,210 m)

General Description: This site is in Rio Blanco County in the Davis, Evacuation Creek and Dragon USGS quadrangles, east of the Utah/Colorado state line. The northern boundary is just north of County Road 109. The entire site is on is owned by BLM, except for about 160 acres of private land. The geological features include a portion of the Evacuation Creek Gulch and Davis Canyon, as well as the base of White Face Butte. Approximately 2/3 of the site is sandstone, shale and coal beds above Sego sandstone (upper part of Mesa Verde Formation), while most of the remaining 1/3 is Wasatch Formation claystone, shale and sandstone, with a small portion nearer the Colorado/Utah border composed of shale, sandstone and marlstone of the Green River Formation. This area supports open pinon - juniper (*Pinon edulis - Juniperus osteosperma*) woodlands and mixed shrublands, as well as sagebrush shrublands (*Artemisia* spp.). Greasewood (*Sarcobatus vermiculatus*) occurs along the creeks. Other common species found in this area include Wyoming sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), black sage (*Artemisia nova*), rubber rabbitbrush (*Chrysothamnus nauseous*), shadscale (*Atriplex confertifolia*), mountain mahogany (*Cercocarpus montanus*), wild buckwheat (*Eriogonum* sp.), yucca (*Yucca* sp.), Indian rice grass (*Achnatherum hymenoides*), James' galleta (*Hilaria jamesii*), blue gramma (*Bouteloua gracilis)*, Mormon tea (*Ephedra* sp.), and snakeweed (*Gutierrezia sarothrae*).

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Cultural Features: Bordered by the Utah/Colorado state line.

Biodiversity Significance Rank Comments (B3): The site supports a good (B-ranked) occurrence of globally vulnerable (G3/S2) Rollins' cat's-eye (*Oreocarya rollinsii*) and a fair (C-ranked) occurrence of the globally vulnerable (G3/S1) narrow

stem gilia (*Gilia stenothyrsa*), considered extremely rare in Colorado. Both species are on the BLM Sensitive Species List.

Natural Heritage element occurrences at the Evacuation 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
Vascular Plants	Gilia stenothyrsa	narrow - stem gilia	G3	S1			BLM	C	2007-07-18
Vascular Plants	Oreocarya rollinsii	Rollins' cat's - eye	G3	S2			BLM	B	2007-07-18

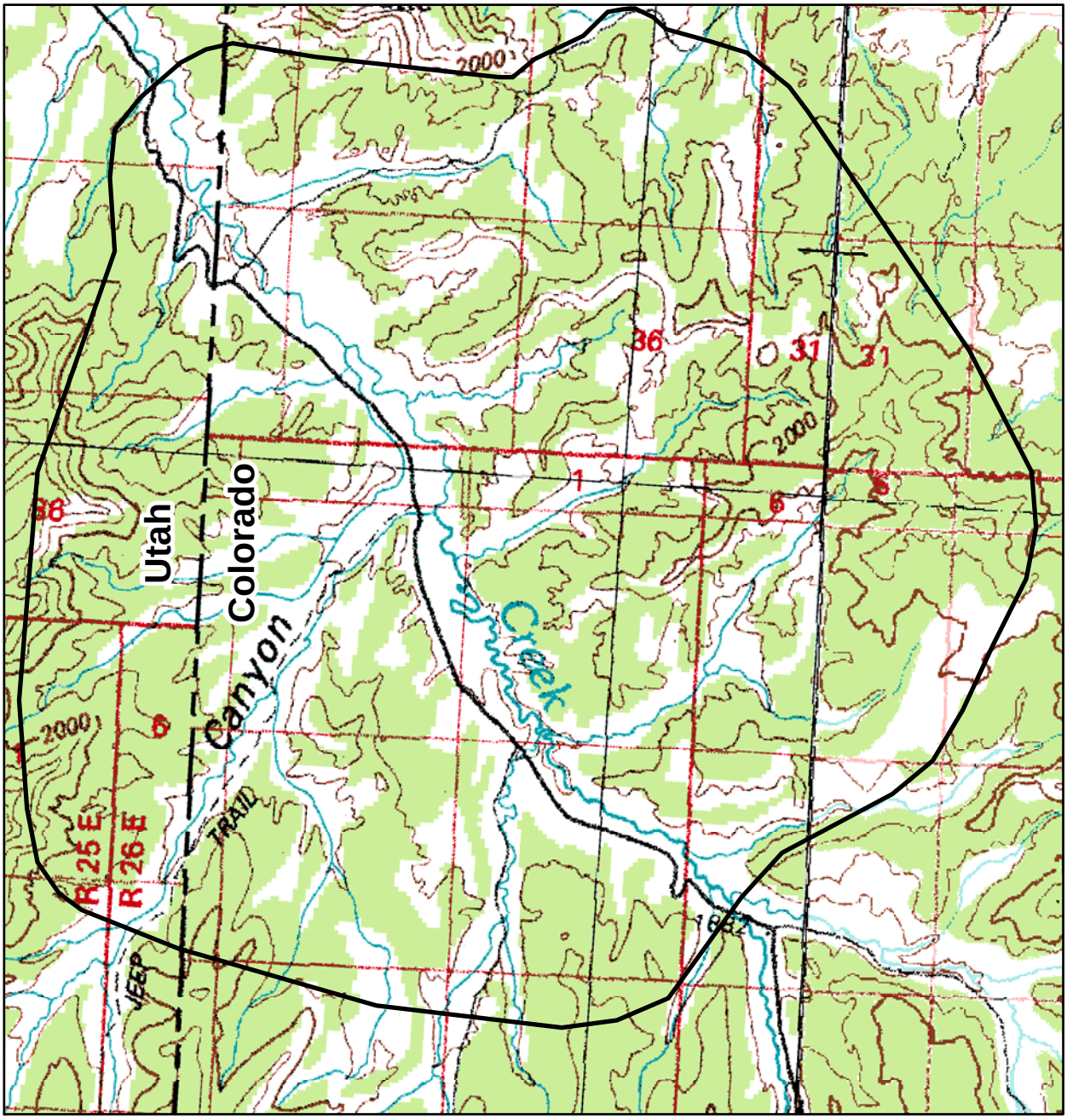
** The records above are sorted in the following order 1) Major Group 2) Global Rank and 3) Scientific name.

Boundary Justification: The Evacuation Creek site includes the lower slopes of Whiteface Butte and the western Colorado part of the drainages of Evacuation Creek and Davis Creek. The northern boundary is just to the north of Rio Blanco County Road 109. Two rare plants, narrow-stem gilia (*Gilia stenothyrsa*) and Rollins' cat's-eye (*Oreocarya rollinsii*) were found within the area. Their locations and similar habitat are included in the site. The boundary terminates near the state line, although the habitat continues into Utah.

Protection Urgency Rank Comments (P3): Both rare plant species are on the BLM sensitive list and will result in this area receiving an NSO (No Surface Occupancy) designation; however, the entire area is leased and needs long term protection.

Management Urgency Rank Comments (M3): There is pressure from oil and gas in this area. BLM states "The majority of the acres are protected by standard lease stipulations, except for areas with suitable or occupied habitat for candidate, or BLM sensitive species which will carry a no surface occupancy (NSO) designation. There are controlled surface use (CSUs) designations for the entire Evacuation Creek site for sensitive soils, and NSO for any potential raptor nests. New approach in the White River Field Office Resource Management Plan Amendment for oil and gas will look at additional NSO on unleased or as a condition of approval (COA), de-fact-o NSO of no surface occupancy within 200 meters of suitable and/or occupied T&E, candidate, or BLM sensitive species habitat. Energy development in this area is slow for the moment, possibly only 3-5 wells have been developed per year in the last 5 years. All of the site is leased."

Version Author: Lyon, M.J. and J. Huggins
Version Date: 12/01/2007



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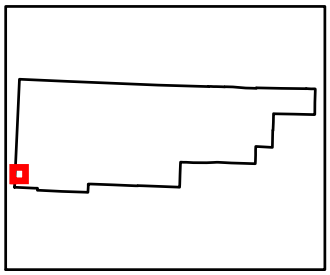
Legend

PCA Boundary

Douglas Pass, 39108-E1
Seep Ridge, 39109-E1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map13. Evacuation Creek Potential Conservation Area, B3: High Biodiversity Significance

Fawn Creek North

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: Fawn Creek, Lost Park, Sleepy Cat Peak

Size: 7,562 acres (3,060 ha) **Elevation:** 7,350 - 10,000 ft. (2,240 - 3,048 m)

General Description: The Fawn Creek North site is located in the North Fork of the White River Valley. The area encompasses the East and West Forks of Fawn Creek and Moeller Creek. The northern portion is located on the south side of Sleepy Cat Peak. The southern extension consists of a wide floodplain with multiple terraces. The highest terraces are used for agriculture. The lower terraces and point bars are in good condition supporting a riparian mosaic of narrowleaf cottonwood (*Populus angustifolia*) and coyote willow (*Salix exigua*). Thinleaf alder (*Alnus incana*) and willows (*Salix monticola, S. drummondiana*) line the immediate stream bank. The active floodplain supports a diverse cottonwood forest with a thick shrub understory of hawthorn and several willow species. The herbaceous undergrowth is dominated by non-native hay-meadow grass species.

Key Environmental Factors: Geology is classified as sedimentary rocks of Permian and Pennsylvanian Age Weber Sandstone and Maroon Formation.

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Biodiversity Significance Rank Comments (B3): The site supports an excellent (A-ranked) occurrence of a globally vulnerable (G4T3/S3) fish subspecies, Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*). There are also good (B-ranked) occurrences of globally secure plant communities, Drummond's willow (*Salix drummondiana*) / mesic forb (G4/S4) riparian shrubland and quaking aspen with bracken fern (*Populus tremuloides / Pteridium aquilinum*) (G4/S3S4) forest.

Natural Heritage element occurrences at the Fawn Creek North 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	Oncorhynchus clarkii pleuriticus	Colorado River Cutthroat Trout	G4T3	S3		SC	USFS	A	1993-99-99
Natural Communities	Populus tremuloides / Pteridium aquilinum Forest	Aspen Wetland Forests	G4	S3S4				B	2001-07-07
Natural Communities	Salix drummondiana / Mesic Forbs Shrubland	Drummonds Willow / Mesic Forb	G4	S4				B	1992-06-29

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

Boundary Justification: This boundary includes Fawn Creek and its major tributaries, including 1,000 foot buffer on all sides of the streams. Downstream barrier to exotic salmonids is presumed to exist, but its location and condition are unknown. The lower boundary of the site should correspond with this barrier. This should be adequate to protect the elements from degradation of habitat including severe alterations of hydrology or riparian vegetation. Off-site considerations will be important.

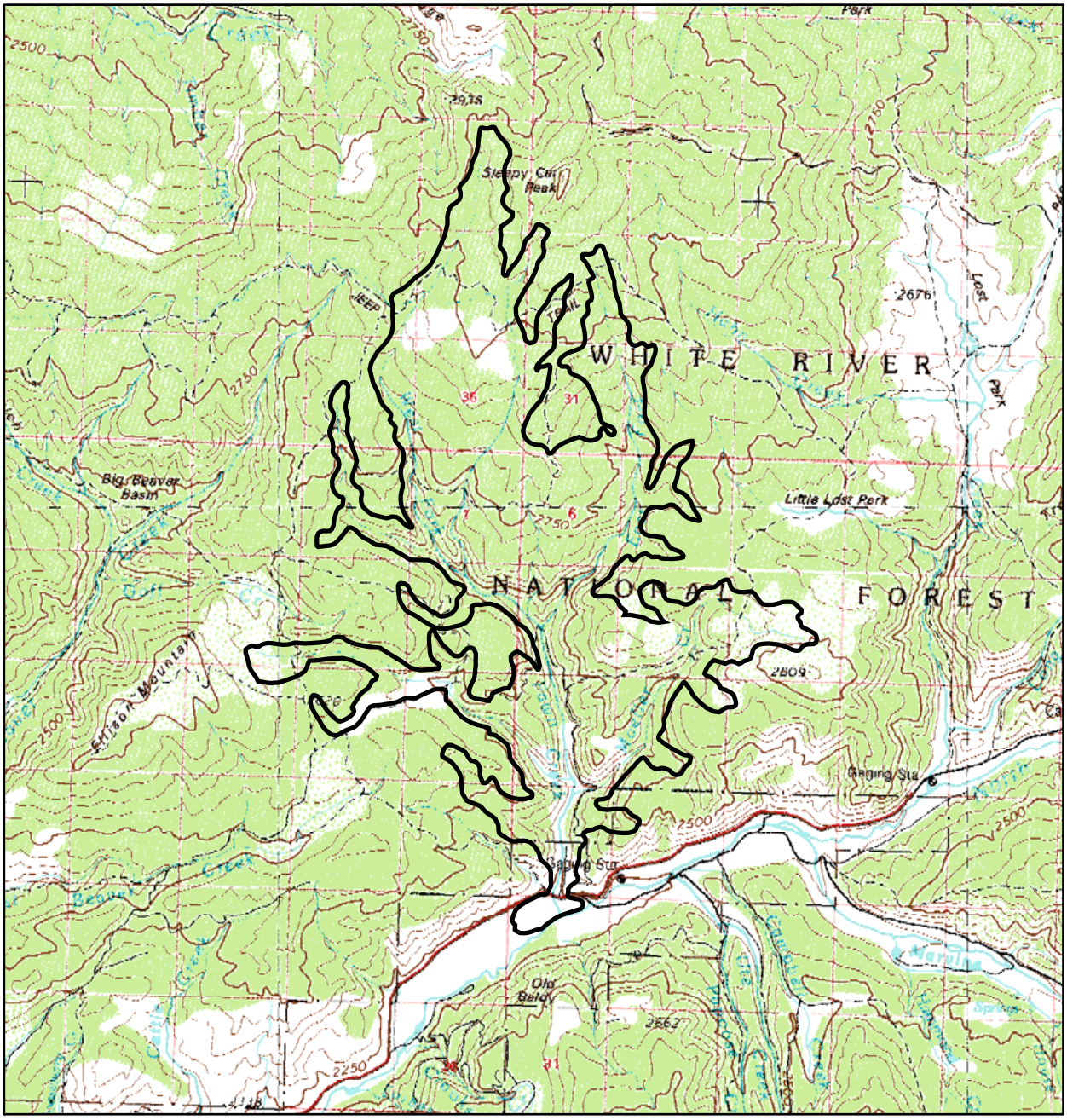
Protection Urgency Rank Comments (P4): In the southern extension, private land owner desires conservation easement (TNC 1995).

Management Urgency Rank Comments (M3): In the southern extension, continued grazing at current levels may degrade occurrences. On-going coordinated resource management plan with the BLM, CDOW, USFS, etc. would benefit elements of biodiversity.

Off-Site Considerations: Any activities within the watershed that have potential to significantly alter hydrological processes need to be evaluated for their impact on the elements present.

Version Author: Culver, D.R.

Version Date: 02/08/2008



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Map Date: 02/15/2008

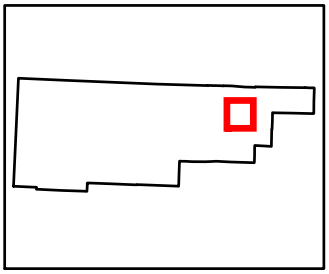
Legend

PCA Boundary

Meeker, 40107-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 14. Fawn Creek North Potential Conservation Area, B3: High Biodiversity Significance

Gilley Lake

Biodiversity Rank - B3: 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: Big Beaver Reservoir, Buford

Size: 1,317 acres (533 ha) **Elevation:** 7,100 - 8,600 ft. (2,164 - 2,621 m)

General Description: The Gilley Lake site is located in the White River National Forest, south of Buford. It encompasses several lakes: Seventh, Beaver, Cabin, Shadow, Stump and Gilley. Vaughn Creek flows to the south of the lake complex towards its confluence with North Elk Creek. The riparian area consists of Colorado blue spruce (*Picea pungens*) with narrowleaf cottonwood (*Populus angustifolia*), thinleaf alder (*Alnus incana*), and willows (*Salix boothii, S. drummondiana, S. monticola*). The uplands consist of subalpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea engelmannii*) on the north-facing slopes and quaking aspen (*Populus tremuloides*) on the drier slopes above the riparian and lake areas. Herbaceous wetlands are associated along the lake shores. Beaver activity is evident in the riparian area and floodplain.

Key Environmental Factors: Geology is classified as arkosic sandstone, conglomerate, shale, and limestone of the Minturn Formation of the Pennsylvanian Age.

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Biodiversity Significance Rank Comments (B3): This site contains a good (B-ranked) occurrence of globally vulnerable (G3/S3) *Salix boothii* / mesic forb riparian shrubland and an excellent to good (AB-ranked) occurrence of *Populus angustifolia - Picea pungens / Alnus incana*, a globally vulnerable (G3/S3) riparian woodland. The uplands consist of a fair (C-ranked) occurrence of a globally secure (G5/S5) *Abies lasiocarpa / Alnus incana* forest. There are also extant and historical occurrences of the state rare (G5/S3) mossy valvata (*Valvata sincera*).

Natural Heritage element occurrences at the Gilley 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
Mollusks	Valvata sincera	Mossy Valvata	G5	S3				E	1989-99-99
Mollusks	Valvata sincera	Mossy Valvata	G5	S3				H	1965-10-12
Natural Communities	Populus angustifolia - Picea pungens / Alnus incana Woodland	Montane Riparian Forests	G3	S3				AB	1992-06-29
Natural Communities	Salix boothii / Mesic Forbs Shrubland	Booth's Willow / Mesic Forb	G3	S3				B	1992-08-22
Natural Communities	Abies lasiocarpa / Alnus incana Forest	Montane Riparian Forests	G5	S5				C	1992-08-22

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

Boundary Justification: This planning boundary is intended to maintain water quality by including the entirety of the small watershed above the lakes and also the significant riparian communities. Beaver Lake is included as adjacent contiguous habitat. The boundary encompasses both private and public lands, however, only public lands were surveyed.

Protection Urgency Rank Comments (P3): Current use of private lands is compatible.

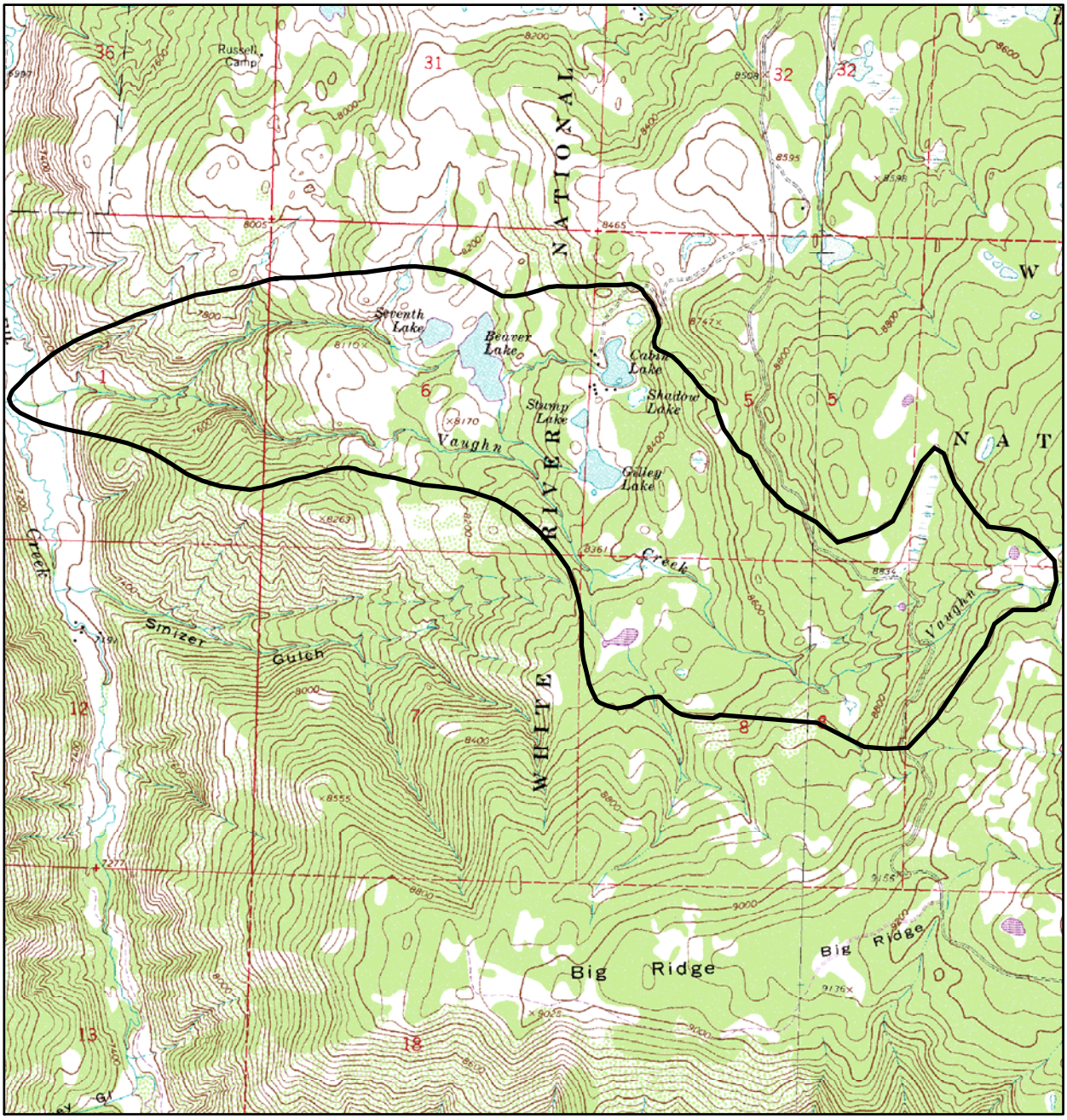
Management Urgency Rank Comments (M4): Current management is adequate. Long-term management agreement with inholding landowners is desirable.

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

Information Needs: Upslope wetlands and ponds should be surveyed for additional populations of mossy valvata.

Version Author: Culver, D.R.

Version Date: 02/07/2008



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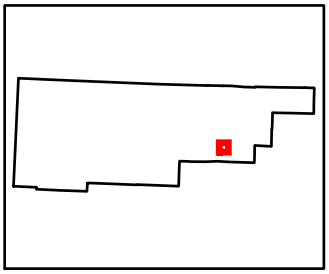
Legend

PCA Boundary

Buford, 39107-H5
Big Beaver Reservoir, 39107-H6

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 15. Gilley Lake Potential Conservation Area, B3: High Biodiversity Significance

Lake 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: Brushy Point, Razorback Ridge

Size: 640 acres (259 ha) **Elevation:** 7,000 - 8,950 ft. (2,134 - 2,728 m)

General Description: The Lake Creek site is located in the western portion of the Piceance Creek Basin (Basin). Lake Creek drains the first basin to the east of the prominent physiographic feature, Razorback Ridge. This portion typifies the Basin features with depositional valleys at the base of uplifted hills that dip towards the creeks. Lake Creek and its tributaries, Right and Left Forks, are fed by numerous springs and alluvial fan and gulches throughout its length within the site. Lake Creek cuts down through the sedimentary rocks of the Parachute Creek Member forming a steep, entrenched stream with deep pools. The floodplain is formed by both alluvial and colluvial processes. The overstory layer is dominated by Douglas-fir (*Pseudotsuga menziesii*). The shrub layer is diverse with river birch (*Betula occidentalis*), dogwood (*Cornus sericea*), Rocky Mountain maple (*Acer glabrum*), rose (*Rosa woodsii*), golden currant (*Ribes aureum*), snowberry (*Symphoricarpos rotundifolia*), and saplings of Douglas-fir. The forb and herbaceous layer is diverse. Only non-native plants are present at the confluence of the Forks where some grazing is evident.

Key Environmental Factors: The Parachute Creek Member (Green River Formation) dominates this portion of the County. It is comprised of marlstone, standstone, and oil shale. Lake Creek is located is modern alluvium from the Quaternary Age. Soils are shallow and well drained, derived from sandstone and shale residues. Soils are classified as Irigul channery loam, Irigul-Parachute complex and Razorba channery loam.

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Biodiversity Significance Rank Comments (B3): This site encompasses an excellent (A-ranked) occurrence of a globally vulnerable (G3?/S3) Douglas-fir (*Pseudotsuga menziesii*) / river birch (*Betula occidentalis*) riparian forest. This plant community can be a late seral stage and associated with perennial streams where cold air drainage

and perennial stream flow provide a cool and moist environment to support the diverse shrub canopy (Carsey et al. 2003). Additionally, there is an historical occurrence (last observed 1996) of the Colorado River cutthroat trout (G4T3/S3) (*Oncorhynchus clarkii pleuriticus*). Although not designed for these species, the Greater Sage-grouse and other sagebrush obligates such as Columbian Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*), Sage Sparrow (*Amphispiza belli*), and the Brewer's Sparrow (*Spizella breweri*) depend on large, continuous blocks of viable habitat such as identified within and adjacent to this site.

Natural Heritage element occurrences at the Lake 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	Oncorhynchus clarkii pleuriticus	Colorado River Cutthroat Trout	G4T3	S3		SC	USFS	H	9999-99-99
Natural Communities	Pseudotsuga menziesii / Betula occidentalis Woodland	Montane Riparian Forest	G3?	S3				A	2007-06-14

** 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 riparian forest plant community, the Colorado River cutthroat trout population and potential habitat along the floodplain; however, it only includes the immediate ecological processes. Both private and public lands are included, however, only the public lands were surveyed.

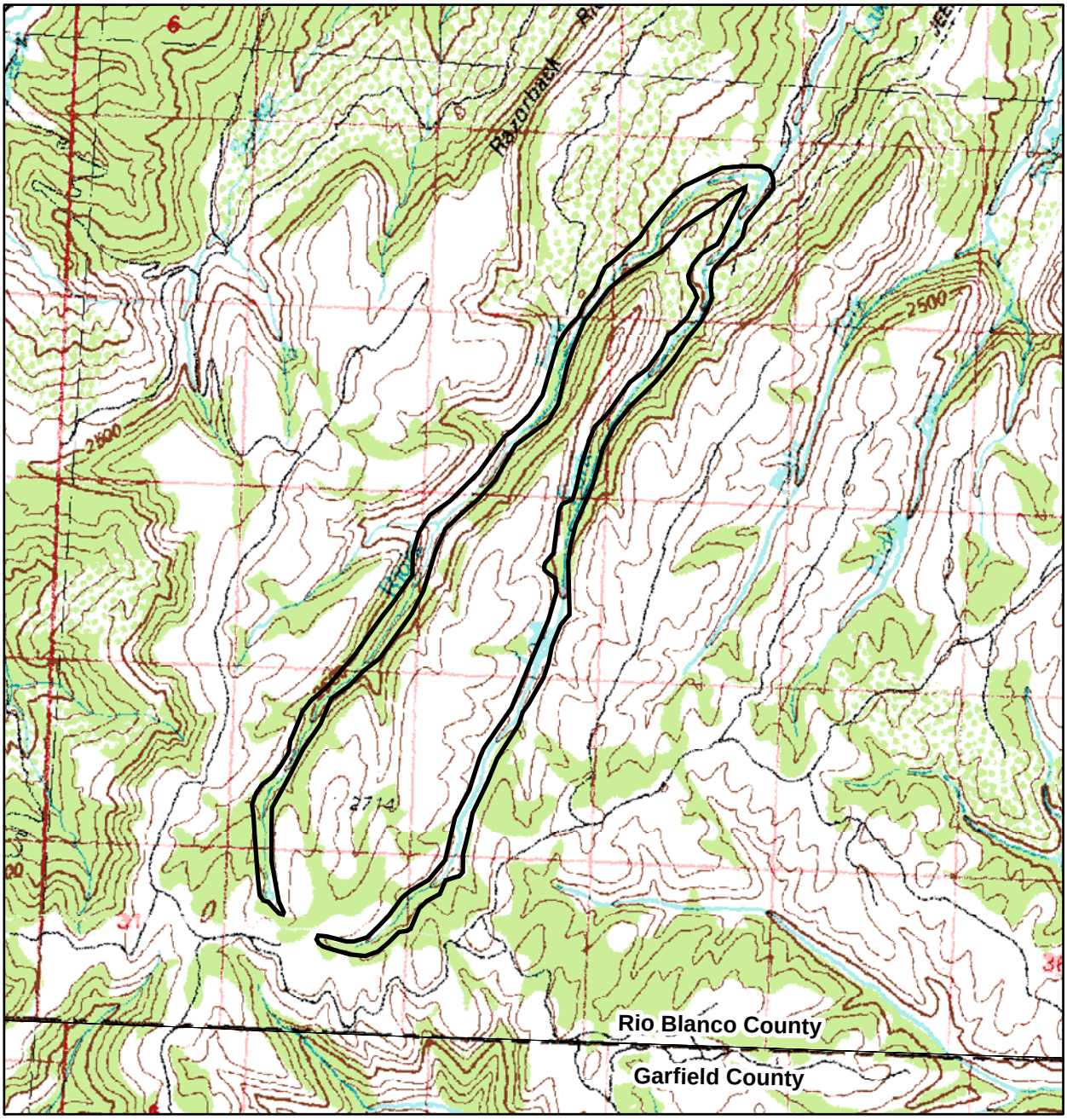
Protection Urgency Rank Comments (P2): Most of the property is owned by the BLM, White River Field Office. It is contained in the East Douglas Creek Area of Critical Environmental Concern (ACEC) due to botanical reasons. Soldier Creek has been identified by the BLM as a high priority system ACEC. Threats include oil and gas exploration that uses water for mineral extraction. This will affect the surface water and ground water aquifer.

Management Urgency Rank Comments (M3): Non-native plants present include Canada thistle (*Breea arvensis*), houndstongue (*Cynoglossum officinale*), and mullein (*Verbascum thapsus*) especially at the northern section where the Forks confluence.

Exotic Species Comments: Non-native plants present include Canada thistle (*Breea arvensis*), houndstongue (*Cynoglossum officinale*), and mullein (*Verbascum thapsus*) especially at the northern section where the Forks confluence.

Version Author: Culver, D.R.

Version Date: 01/10/2008



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Map Date: 01/25/2008

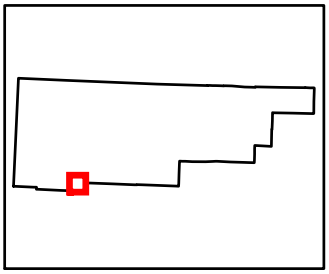
Legend

PCA Boundary

Douglas Pass, 39108-E1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 16. Lake Creek Potential Conservation Area, B3: High Biodiversity Significance

Lost 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: Fawn Creek, Lost Park, Sleepy Cat Peak, Slide Creek

Size: 8,775 acres (3,551 ha) **Elevation:** 7,650 - 10,200 ft. (2,332 - 3,109 m)

General Description: The Lost Creek site is located in the White River National Forest above the North Fork of the White River. It encompasses several tributaries of the White River: Lost Creek, Long Park Creek, and Hahn Creek. Lost Park, Little Lost Park and Long Park are located on the Mancos Shale and Frontier Sandstone outcrops. Prominent trailheads are located at Lost Creek and Long Park. The area is used for foot and horse travel as well as hunting and fishing activities. The riparian vegetation is comprised of willow carrs (*Salix boothii, S. monticola*) with snowberry (*Symphoricarpos rotundifolia*) and serviceberry (*Amelanchier alnifolia*).

Key Environmental Factors: Geology is comprised of shale and sandstones from the Mancos Shale and Frontier Sandstone Formations.

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Biodiversity Significance Rank Comments (B3): The site supports an excellent (A-ranked) occurrence of the globally vulnerable (G4T3/S3) Colorado River Cutthroat Trout (*Oncorhynchus clarkii pleuriticus*). Additionally there is an excellent (A-ranked) occurrence of the globally vulnerable (G3/S3) Booth's willow with mesic forbs shrubland (*Salix boothii* / mesic forb) plant community.

Natural Heritage element occurrences at the Lost 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	Oncorhynchus clarkii pleuriticus	Colorado River Cutthroat Trout	G4T3	S3		SC	USFS	A	1996-99-99
Natural Communities	Salix boothii / Mesic Forbs Shrubland	Booth's Willow / Mesic Forb	G3	S3				A	2001-06-23

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

Boundary Justification: The planning boundary includes the full length of the creek and its tributaries to the downstream barrier. The boundary includes an upland buffer which should be sufficient to limit direct physical disturbance and local hydrologic alterations.

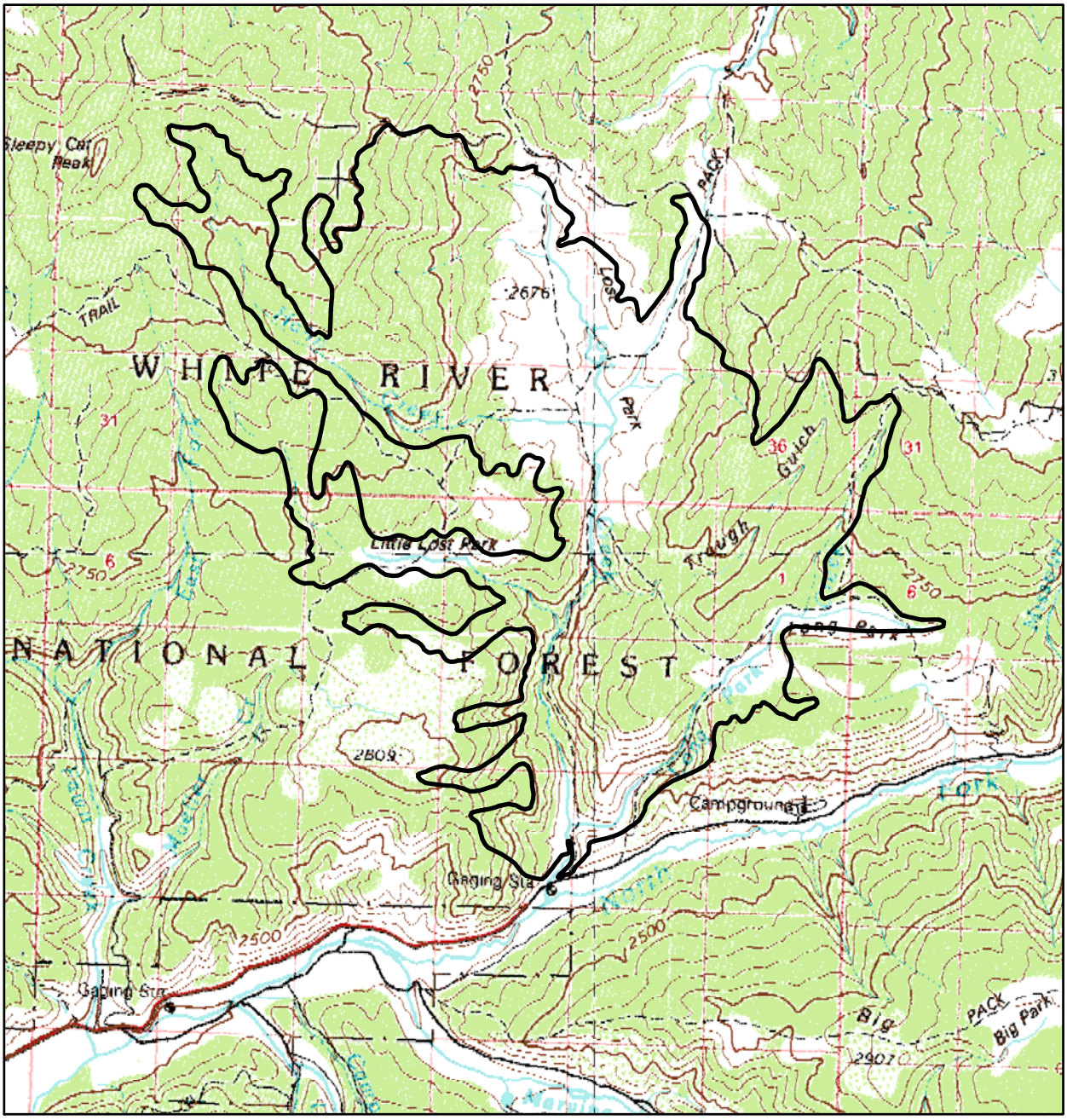
Protection Urgency Rank Comments (P3): The site falls within the White River National Forest.

Management Urgency Rank Comments (M3): Sheep are grazing the northeast part, but no adverse impacts have been noted. Weeds control needs to be addressed.

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.

Version Author: Culver, D.R.

Version Date: 02/07/2008



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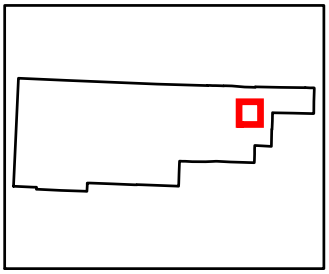
Legend

PCA Boundary

Meeker, 40107-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 17. Lost Creek Potential Conservation Area, B3: High Biodiversity Significance

Lower Greasewood Gulch

Biodiversity Rank - B3: 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: Rough Gulch

Size: 934 acres (378 ha) **Elevation:** 5,800 - 6,300 ft. (1,768 - 1,920 m)

General Description: This site is located in central Rio Blanco County within the Piceance Basin, approximately 2.25 air miles due south from the White River, in a wide gulch that runs west/northwest from Greasewood Creek (which runs south from Yellow Creek). The geology consists of the Uinta Formation with tan shales and Green River Formation with white shale. The gulch is bounded by low hills that are sparsely vegetated with scattered junipers. Where the rare narrow-stem gilia is dominant, associated species include fringed sage (*Artemisia frigida*), Wyoming sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), adobe milkweed (*Asclepias cryptocerus*), desert alyssum (*Allysum desetorum*), dragon milkvetch (*Astragalus lutosus*), shadscale (*Atriplex confertifolia*), false flax (*Camelina sp.*), mountain mahogany (*Cercocarpus montanus*), sandaster (*Chaetopappa erecoides*), cheatgrass (*Bromus tectorum*), common purple mustard (*Chorispora tenella*), rubber rabbitbrush (*Chrysothamnus nauseous*), Barneby's thistle (*Cirsium barnebyi*), hawksbeard (*Crepis sp.*), pinnateleaf tansy mustard (*Descurainia pinnata*), spreading woolstar (*Eriastrum diffusum*), spearleaf wild buckwheat (*Eriogonum lonchophyllum*), ballhead ipomopsis (*Ipomopsis congesta*), snakeweed (*Gutierrezia sarothrae*), boreal chainpod (*Hedysarum boreale*), scarlet gilia (*Ipomopsis aggregata*), stickseed (*Lappula redowskii*), western tansy-aster (*Macaranthera grindelioides*), many-stem stickleaf (*Nuttallia multicaulis*), stemless evening-primrose (*Oenothera caespitosa*), juniper prickly pear (*Opuntia polyacantha*), Indian ricegrass (*Achnatherum hymenoides*), creeping penstemon (*Penstemon caespitosa*), penstemon (*Penstemon* sp.), rock goldenrod (*Petradoria pumila*), Hood's phlox (*Phlox hoodii*), longleaf phlox (*Phlox longifolia*), sharpleaf twinpod (*Physaria acutifolia*), bluebunch wheatgrass (*Pseudoroegneria spicata*), Utah juniper (*Sabina osteosperma*), senecio (*Senecio neomexicana*), perennial twistflower (*Streptanthus cordatus*) and gray horsebrush (*Tetradymia canescens*).

Key Environmental Factors: Drought

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Biodiversity Significance Rank Comments (B3): The site supports an excellent (A-ranked) occurrence of the globally vulnerable (G3/S1) narrow-stem gilia (*Gilia stenothyrsa*). The site also includes a historic occurrence of the globally vulnerable (G3G4T2/S2) Fremont's penstemon (*Penstemon fremontii* var. *glabrescens*) last observed in 1986.

Natural Heritage element occurrences at the Lower Greasewood 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	Gilia stenothyrsa	narrow - stem gilia	G3	S1			BLM	A	2007-07-15
Vascular Plants	Penstemon fremontii var. glabrescens	Fremont's beardtongue	G3G4T2	S2				H	1986-06-15

** 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 several locations of narrow-stem gilia, as well as adjacent similar habitat that has not been thoroughly surveyed, but is also likely to contain this species.

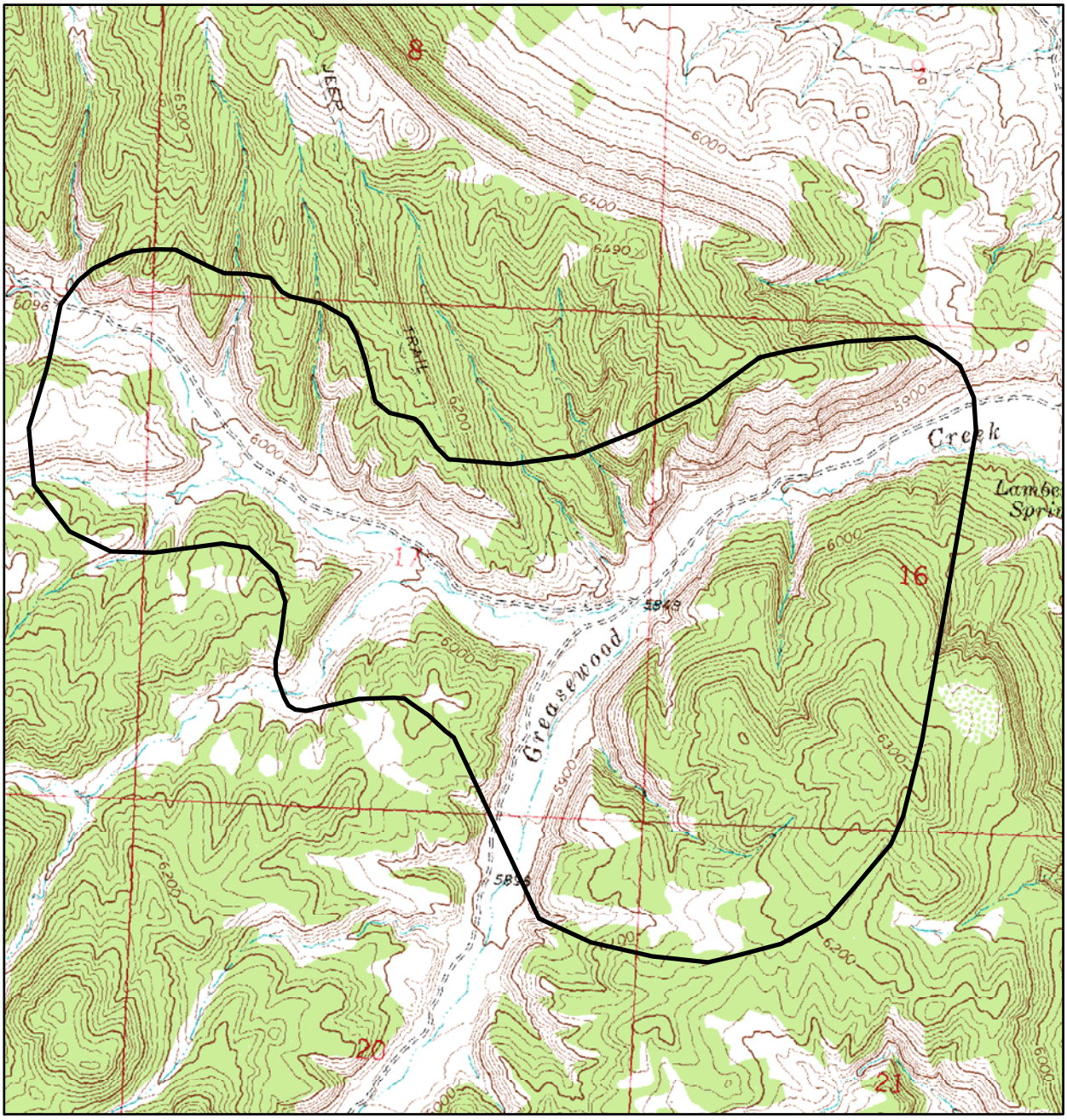
Protection Urgency Rank Comments (P2): The site contains the 205 acre Lower Greasewood ACEC, which carries an NSO (No Surface Occupancy) designation. However, the ACEC does not include the area of the rare plant occurrences found in 2007. Expanding the ACEC would ensure that these additional sites are protected. The remaining areas outside of the ACEC are protected by standard lease stipulations, except for areas with suitable or occupied habitat for T&E listed, candidate, or BLM sensitive species which will carry an NSO. There are CSU (Conditional Surface Occupancy) stipulations for approximately 40% of the site for sensitive soils.

Management Urgency Rank Comments (M2): The entire site has been leased.

Exotic Species Comments: Cheatgrass (*Bromus tectorum*) is ubiquitous. Common purple mustard (*Chorispora tenella*) is also present in several sites.

Off-Site Considerations: There has been some coal bed methane interest far to the west (Fletcher Gulch) but it has not been profitable to develop yet, so for the moment the area has no imminent development plans.

Version Author: Lyon, M.J. and J. Huggins
Version Date: 12/11/2007



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Map Date: 02/15/2008

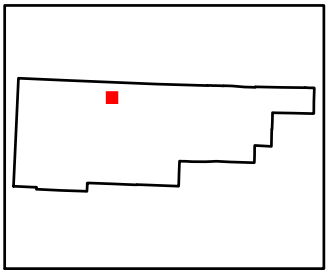
Legend

PCA Boundary

Rough Gulch, 40108-B4

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 18. Lower Greasewood Gulch Potential Conservation Area, B3: High Biodiversity Significance

Missouri 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: Dragon, Texas Creek

Size: 8,416 acres (3,406 ha) **Elevation:** 5,756 - 6,900 ft. (1,754 - 2,103 m)

General Description: The site is located in western Rio Blanco County between Highway 139 and the Colorado/Utah border. It encompasses the westernmost part of the drainages of Missouri Creek and Texas Creek in Colorado. From an elevation of 5,756 feet at the Utah border, the land slopes upward to the north to Park Mountain at 6,900 ft. Three geological formations are present, from west to east: Lower Green River formation, Wasatch, and Upper Mesa Verde, consisting primarily of sandstones and shales. The site includes both private and BLM lands. The lower elevations are composed of sagebrush shrublands, with Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensi*s), black sagebrush (*A. nova*) and pygmy sagebrush (*Seriphidium pygmaeum*). Upper slopes are covered with pinon - juniper woodlands. Rare plants of four species were found in thirty different locations. Common species include snakeweed (*Gutierrezia sarothra*e), rock goldenrod (*Petradoria pumila*), tufted milkvetch (*Astragalus spatulatus*), fineleaf Hymenopappus (*Hymenopappus filifolius*), shadscale (*Atriplex confertifolia*) and Mormon tea (*Ephedra viridis*). Historically, the area was primarily used for cattle grazing. There is currently major oil and gas development in the area, with associated access roads, well pads and pipelines.

Key Environmental Factors: Drought

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Biodiversity Significance Rank Comments (B3): The site supports a good (B-ranked) occurrence of the globally vulnerable (G3/S1) narrow-stem gilia (*Gilia stenothyrsa*) and the globally vulnerable (G3/S2) Rollins' cat's-eye (*Oreocarya rollinsii*). In addition, there is a good (B-ranked) occurrence of pygmy sagebrush (*Seriphidium pygmaeum*), a globally apparently secure plant that is rare in Colorado (G4/S1). There are also unranked occurrences of narrow-stem gilia, Rollins' cat's-eye and the globally vulnerable (G3/S2) debris milkvetch (*Astragalus detritalis*). All of the

above occurrences were documented in 2006 and 2007.

Natural Heritage element occurrences at the Missouri 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
Vascular Plants	Astragalus detritalis	debris milkvetch	G3	S2			BLM	E	2006-05-16
Vascular Plants	Gilia stenothyrsa	narrow - stem gilia	G3	S1			BLM	B	2007-07-18
Vascular Plants	Oreocarya rollinsii	Rollins' cat's - eye	G3	S2			BLM	B	2007-06-28
Vascular Plants	Oreocarya rollinsii	Rollins' cat's - eye	G3	S2			BLM	E	2006-06-10
Vascular Plants	Oreocarya rollinsii	Rollins' cat's - eye	G3	S2			BLM	E	2006-06-22
Vascular Plants	Seriphidium pygmaeum	pygmy sagebrush	G4	S1				B	2007-07-17

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

Boundary Justification: The site encompasses multiple occurrences of four rare plant species in the western part of the drainages of Texas Creek and Missouri Creek within Colorado. There is abundant habitat within the site that is expected to support additional populations of these species.

Protection Urgency Rank Comments (P2): Protection may be needed, due to the high activity of oil and gas activity in the area. These stresses may reduce the viability of the rare elements in the immediate future.

Management Urgency Rank Comments (M3): New management actions may be needed within 5 years due to increase of non-native plants in areas of improper grazing and oil and gas development with associated roads, pipelines and pad sites. Many of the *Gilia stenothyrsa* plants at one well pad location were apparently damaged early in the season and produced multiple stems. Further investigation into this phenomenon may add to our knowledge of the plant's response to disturbance.

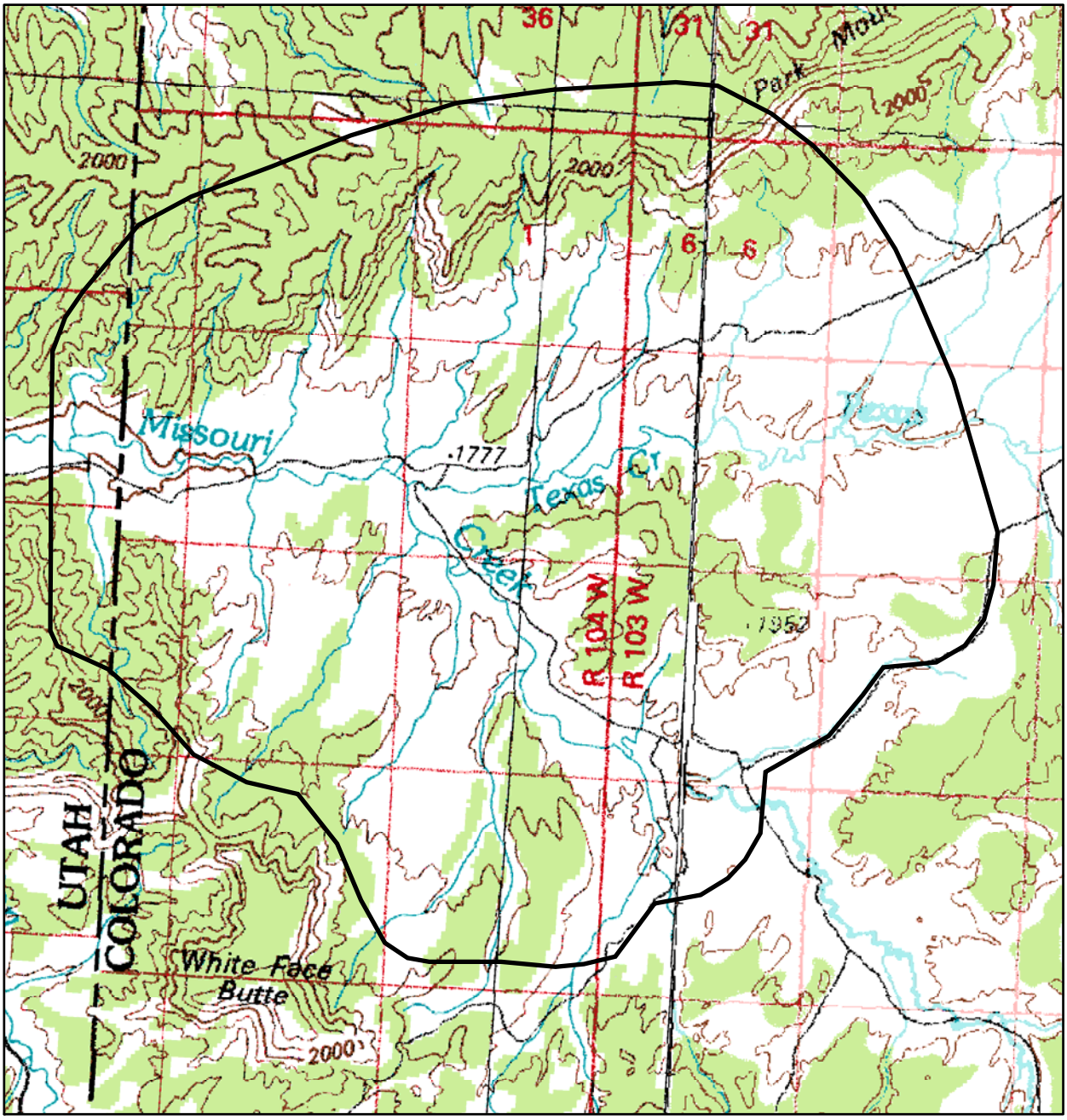
Land Use Comments: Grazing and oil and gas activities are present.

Exotic Species Comments: Cheat grass (*Bromus tectorum*), wienerleaf (*Halogeton glomeratus*), and many other exotics are present in lower disturbed areas. Russian wild rye (*Psathrostachys juncea*) has been extensively planted in the area. Other non-native species observed include Russian thistle (*Salsola australis*), desert alyssum (*Alyssum desertorum*), hornhead (*Ranunculus testiculatus*), spreading wallflower (*Erysimum repandum*), yellow sweetclover (*Melilotus officinalis*), smooth brome

(*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), dandelion (*Taraxacum officinale*), and salsify (*Tragopogon dubius*).

Information Needs: More information on the response of the rare plants to disturbance would be useful for management.

Version Author: Lyon, M.J. and J. Huggins
Version Date: 12/11/2007



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Map Date: 02/15/2008

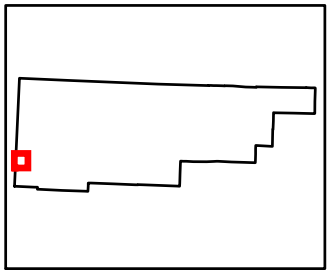
Legend

PCA Boundary

Douglas Pass, 39108-E1
Seep Ridge, 39109-E1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 19. Missouri Creek Potential Conservation Area, B3: High Biodiversity Significance

North Fork White River

Biodiversity Rank - B3: High Biodiversity Significance

Protection Urgency Rank - P5: No Action to be Taken on this Site

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

U.S.G.S. 7.5-minute quadrangles: Fawn Creek, Lost Park, Ripple Creek

Size: 2,483 acres (1,005 ha) **Elevation:** 7,380 - 8,630 ft. (2,249 - 2,630 m)

General Description: The headwaters of the North Fork of the White River are located at Trappers Lake in the Flat Tops Wilderness Area. The site begins approximately 10 miles northwest of the headwaters, west of Rainbow Lake. It is located in a broad U-shaped valley that is adjacent to County Road 8. Bands of thinleaf alder (*Alnus incana*) occur along the rocky river banks then grade to willows (*Salix boothii, S. monticola, S. planifolia, S. geyeriana)* as the floodplain widens. Uplands consist of aspen (*Populus tremuloides*) and spruce - fir forests on the slopes. The site ends where Marvine Creek flows into the North Fork.

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Biodiversity Significance Rank Comments (B3): This site supports an excellent (A-ranked) and a good (B-ranked) occurrence of the globally vulnerable (G3/S3) thinleaf alder (*Alnus incana*) / mesic forb community, two good (B-ranked) occurrences of the globally vulnerable (G3/S3) Booth's willow (*Salix boothii*) / mesic forb community, a good (B-ranked) occurrence of the globally vulnerable (G3?/S3) Booth's willow (*Salix boothii*) / mesic graminoid community, a good (B-ranked) occurrence of a globally vulnerable (G3/S3) montane riparian forest community, *Picea pungens* / *Alnus incana*, and a good (B-ranked) occurrence of the state rare (G4/S3) *Salix monticola* / mesic forb shrubland.

Natural Heritage element occurrences at the North Fork White 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
Natural Communities	Alnus incana / Mesic Forbs Shrubland	Thinleaf Alder / Mesic Forb Riparian Shrubland	G3	S3				A	1992-08-09
Natural Communities	Alnus incana / Mesic Forbs Shrubland	Thinleaf Alder / Mesic Forb Riparian Shrubland	G3	S3				B	1992-08-08
Natural Communities	Picea pungens / Alnus incana Woodland	Montane Riparian Forests	G3	S3				B	1992-09-03
Natural Communities	Salix boothii / Mesic Forbs Shrubland	Booth's Willow / Mesic Forb	G3	S3				B	1992-08-09
Natural Communities	Salix boothii / Mesic Forbs Shrubland	Booth's Willow / Mesic Forb	G3	S3				B	1992-08-12
Natural Communities	Salix boothii / Mesic Graminoids Shrubland	Riparian Willow Carr	G3?	S3				B	1992-09-03
Natural Communities	Salix monticola / Mesic Forbs Shrubland	Montane Riparian Willow Carr	G4	S3				B	1992-08-09

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

Boundary Justification: Boundary includes the communities and potential habitat within the adjacent floodplain, from Rainbow Lake to the confluence of the White River and Ute Creek.

Protection Urgency Rank Comments (P5): No known USFS activities are planned.

Management Urgency Rank Comments (M4): Horse grazing and trampling by fisherman may need to be addressed. County road maintenance may need watching, especially re-seeding mixes.

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

Version Author: Culver, D.R.

Version Date: 01/18/2008

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Map Date: 01/25/2008

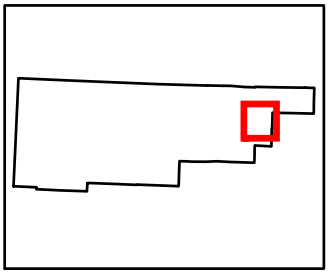
Legend

PCA Boundary

Meeker, 40107-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 20. North Fork White River Potential Conservation Area, B3: High Biodiversity Significance

Poose 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: Pagoda Peak, Ripple Creek

Size: 1,285 acres (520 ha) **Elevation:** 9,300 - 10,400 ft. (2,835 - 3,170 m)

General Description: The Poose Creek site is located in the Routt National Forest, downslope of CR 8. The riparian vegetation is characteristic of high montane first order streams dominated by willows (*Salix monticola, S. geyeriana, S. drummondiana*), thinleaf alder (*Alnus incana*), bush honeysuckle (*Lonicera involucrata*) and mesic forbs, e.g. corn husk lily (*Veratrum tenuipetalum*), meadowrue (*Thalictrum fendleri)*, and hay grasses. The uplands steeply rising up from Poose Creek consist of subalpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea engelmannii)* on the west-facing slope. Quaking aspen (*Populus tremuloides)* dominates the gentler east-facing slope.

Key Environmental Factors: The geology is classified as Mancos shale with intertongues of units of Frontier Sandstone and Mowry Shale Members.

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Biodiversity Significance Rank Comments (B3): This site supports a good (B-ranked) occurrence of a globally vulnerable (G3/S3) plant community, *Salix monticola / Carex aquatilis*, a fair (C-ranked) occurrence of the globally vulnerable (G3/S3) *Salix geyeriana - Salix monticola* / mesic forbs community, an excellent to good (AB-ranked) occurrence of the globally common (G5/S5) *Abies lasiocarpa / Mertensia ciliata* plant community and an historical occurrence of a globally vulnerable (G4T3/S3) subspecies, Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*).

Natural Heritage element occurrences at the Poose 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	Oncorhynchus clarkii pleuriticus	Colorado River Cutthroat Trout	G4T3	S3		SC	USFS	H	9999-99-99
Natural Communities	Salix geyeriana - Salix monticola / Mesic Forbs Shrubland	Geyer's Willow - Rocky Mountain Willow/Mesic Forb	G3	S3				C	1994-07-04
Natural Communities	Salix monticola / Carex aquatilis Shrubland	Montane Riparian Willow Carr	G3	S3				B	1994-09-24
Natural Communities	Abies lasiocarpa / Mertensia ciliata Forest	Montane Riparian Forests	G5	S5				AB	1990-09-24

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

Boundary Justification: The boundary should be sufficient to protect the elements from direct disturbance including alteration of structure of riparian vegetation, local invasion of exotic plants and local hydrologic alterations or pollution.

Protection Urgency Rank Comments (P3): Timber management has potential direct and indirect impacts.

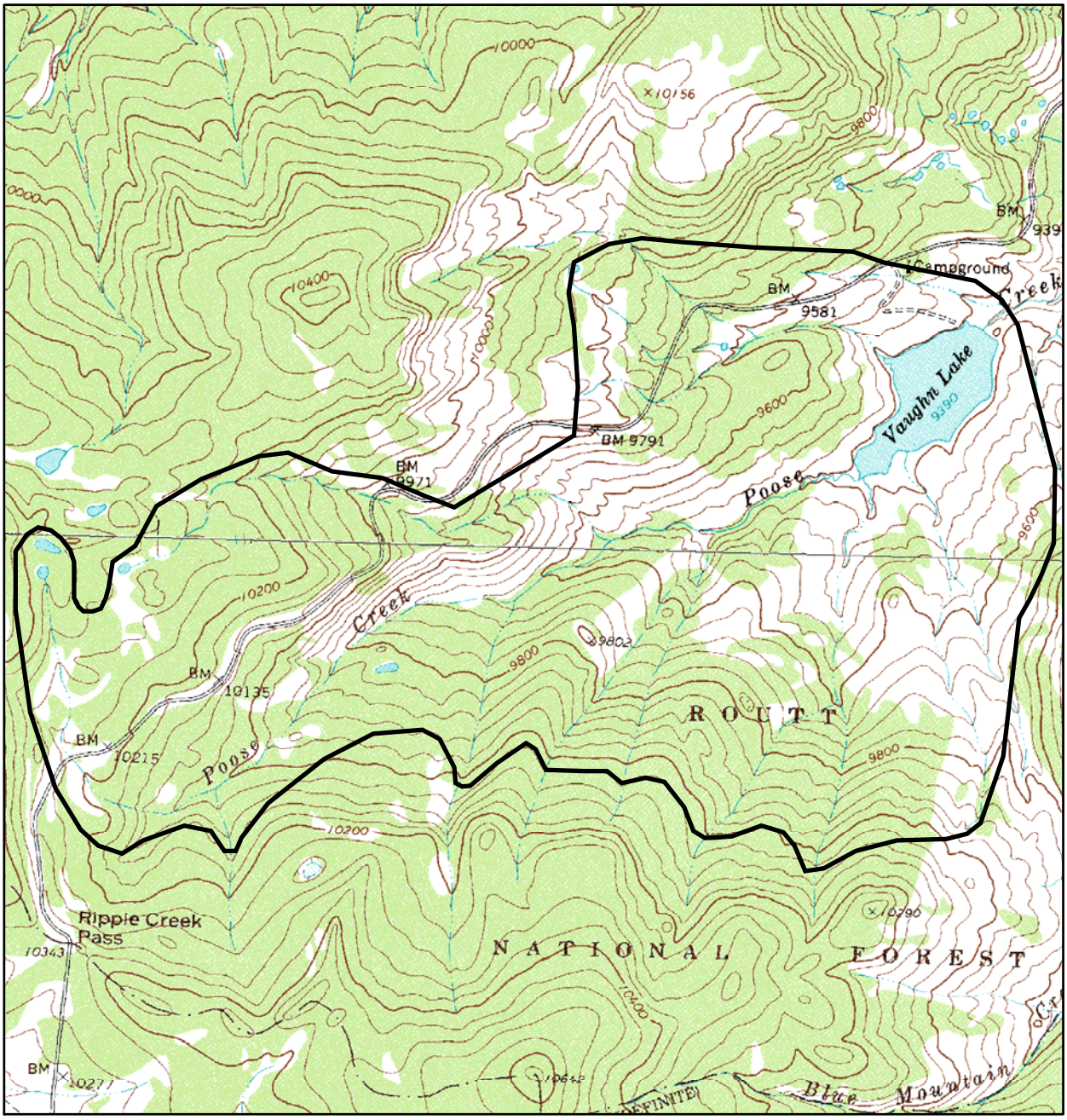
Management Urgency Rank Comments (M3): The lake has been stocked. The shore is heavily trampled. Grazing has been closed. Negative effects of stocking and grazing activity should be mitigated.

Off-Site Considerations: Hydrology is important to all elements. Any activities within the watershed which could affect hydrology should be evaluated for impacts on the elements present.

Information Needs: On-site visit needed to verify fish population.

Version Author: Culver, D.R.

Version Date: 02/07/2008



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Map Date: 02/15/2008

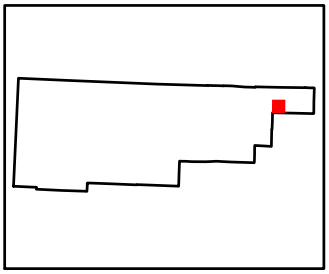
Legend

PCA Boundary

Ripple Creek, 40107-A3
Pagoda Peak, 40107-B3

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 21. Poose Creek Potential Conservation Area, B3: High Biodiversity Significance

School Gulch

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: Cactus Reservoir, Calamity Ridge, Divide Creek, Gillam Draw

Size: 26,125 acres (10,573 ha) **Elevation:** 5,400 - 6,980 ft. (1,646 - 2,128 m)

General Description: The School Gulch site is located in the Piceance Basin, south of Colorado Highway 64 and the White River. Hammond Draw, School Gulch, Alkali Gulch and Boise Creek dissect the area. Calamity Ridge rises prominently to the south. The topography is characteristic of this portion of the Piceance Basin with draws dissecting the Utah juniper (*Juniperus osteosperma*) shrubland, with pinon pine (*Pinus edulis*) occurring sporadically with mountain mahogany (*Cercocarpus montanus*) and serviceberry (*Amelanchier utahensis*). Associated species include shadscale saltbush (*Atriplex confertifolia*), Wyoming sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), green rabbitbrush (*Chrysothamnus viscidiflorus*), spear-leaf buckwheat (*Eriogonum lonchophyllum*), snakeweed (*Gutierrezia sarothrae*), and prickly pear cactus (*Opuntia polyacantha*). The herbaceous layer is dominated by saline wild rye (*Leymus salinus*). Additional graminoids present include Indian ricegrass (*Achnatherum hymenoides*), blue bunch wheatgrass (*Pseudoroegneria spicata*), and Sandberg bluegrass (*Poa secunda*). Forbs also provide sparse cover and include Hooker's desert sandwort (*Arenaria hookeri*), Fendler's sandwort (*Arenaria fendleri*), sulphur flowered buckwheat (*Eriogonum umbellatum*), prickly phlox (*Leptodactylon pungens*), mountain pepperweed (*Lepidium montanum*), mountain phlox (*Phlox austromontana*), rock goldenrod (*Petradoria pumila*), spiny phlox (*Phlox hoodii*), scarlet globemallow (*Sphaeralcea coccinea*), and stemless goldenweed (*Stenotus acaulis*).

Key Environmental Factors: Geology consists of shale, sandstone, and claystone from Green River and Wasatch Formations. Soils range from Rentsac channery loam and Piceance fine sandy loams to rock outcrops of Rentsac Moyerson outcrop complex.

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Biodiversity Significance Rank Comments (B3): This site encompasses an excellent

(A-ranked) occurrence of the globally vulnerable (G3/S3) *Juniperus osteosperma / Leymus salinus* spp. *salinus* plant association. This was one of the best observed occurrences of this community type in Rio Blanco during 2007. This plant community is only known from Utah and Colorado, however, the potential for more occurrences is very likely. Although not drawn for this species, there are documented Greater Sage-grouse (*Centrocercus urophasianus*) nest sites adjacent to this site. This is a globally apparently secure (G4/S4) species, however, it has a restricted range, is a State Special Concern species and a BLM/USFS sensitive species. The Greater Sage-grouse and other sagebrush obligates such as Columbian Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*), Sage Sparrow (*Amphispiza belli*), and the Brewer's Sparrow (*Spizella breweri*) depend on large, continuous blocks of viable habitat such as identified within this site.

Natural Heritage element occurrences at the School 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
Natural Communities	Juniperus osteosperma / Leymus salinus spp. salinus Wooded Herbaceous Vegetation	Mesic Western Slope Pinyon - Juniper Woodlands	G3	S3				A	2007-08-28

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

Boundary Justification: Boundary was delineated to encompass the known occurrence of the *Juniperus osteosperma / Leymus salinus* spp. *salinus* plant community, potential habitat, and adjacent hillsides and gulches. White River represents the northern extent of the site and Calamity Ridge represents the southern boundary. This area only includes the immediate ecological processes and does not consider insect and mammal pollinators. Only public lands were surveyed in 2007.

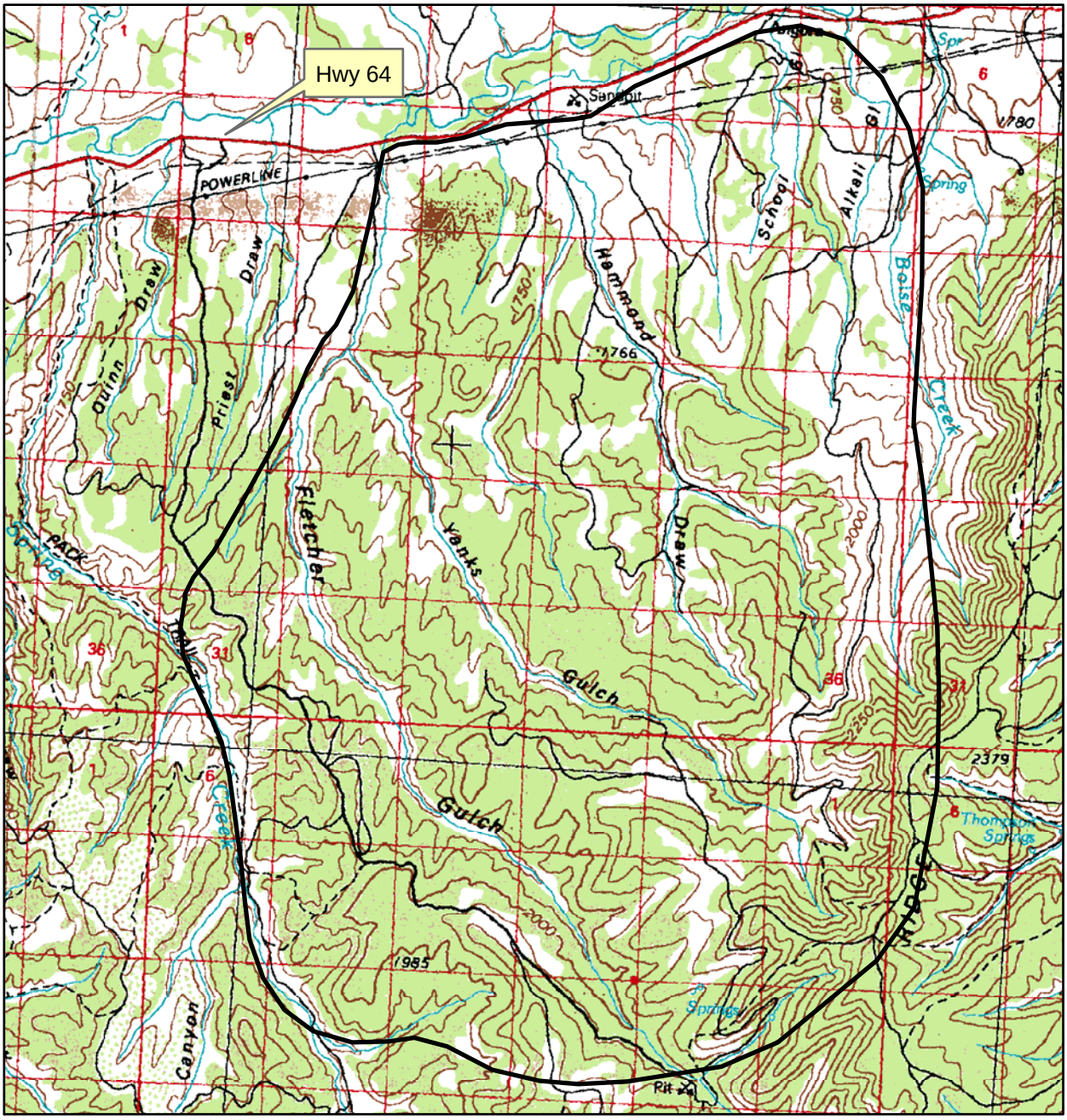
Protection Urgency Rank Comments (P2): The majority of the site is owned by the BLM, except for one parcel to the south. The southeastern portion of the site, 2,687 acres, is in the Yank's Gulch ACEC Natural Area which has been recognized as critical due to the high quality examples of three Great Basin plant communities: pinon - juniper, sagebrush shrublands, and western slope grassland. However, the rest of the area has the potential to be leased for oil and gas explorations.

Management Urgency Rank Comments (M3): Cheatgrass (*Bromus tectorum*) is present, typically only along two tracks. Otherwise, the presence of non-native plants is minimal. There is currently no disturbance from oil and gas exploration. The only roads within the site are two tracks likely used for hunting.

Exotic Species Comments: Cheatgrass (*Bromus tectorum*) is present, typically only

along two tracks. Otherwise, the presence of non-native plants is minimal.

Version Author: Culver, D.R.
Version Date: 01/23/2008



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Map Date: 01/25/2008

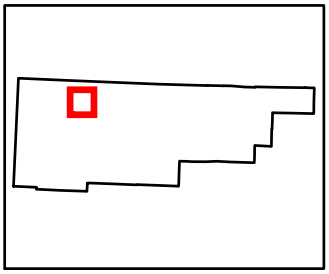
Legend

PCA Boundary

Rangely, 40108-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 22. School Gulch Potential Conservation Area, B3: High Biodiversity Significance

Shavetail Park

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: Banta Ridge, Banty Point, Walsh Knolls

Size: 11,371 acres (4,602 ha) **Elevation:** 5,021 - 5,920 ft. (1,530 - 1,804 m)

General Description: Located in Rio Blanco County, south of the White River and east of Rangely, the Shavetail Park site includes low hills with several washes running north to the White River, and a large level area called Shavetail Park. There are two named drainages, Shavetail Wash and Cottonwood Creek, and seven un-named washes. Most of the site is between 5,200 and 5,500 feet. Banty Point, in the western part of the site, reaches an elevation of 5,920 feet. Ownership is primarily BLM, with some private lands in the north and west. The geology of the SW 2/3 of the site is composed of the Parachute member of the Green River Formation (oil shale, marlstone and siltstone of the Piceance Basin) and the lower part (shale, sandstones and marlstone, and limestone in Anvil Points, Garden Gulch, and Douglas Creek Members). The northeast 1/3 is composed of the upper part of the Mesa Verde Formation (sandstones, shale and coal beds above Sego sandstone). Vegetation consists of sagebrush shrublands with some pinon - juniper woodlands on the upper slopes and shadscale in the lower areas. Major shrub species are Wyoming sagebrush (*Artemisia tridentata* ssp. w*yomingensis*), black sagebrush (*Artemisia nova*), pygmy sagebrush (*Seriphidium pygmaeum*), spiny greasebrush (*Forsellesia meionandra*), shadscale (*Atriplex confertifolia*) and greasewood (*Sarcobatus vermiculatus*). Grasses include bluebunch wheatgrass (*Pseudoroegneria spicata*), Indian ricegrass (*Achnatherum hymenoides*), galleta (*Pleuraphis jamesii*), squirreltail (*Elymus elymoides*), and Sandberg bluegrass (*Poa secunda*). Common forbs are basin-daisy (*Platyschkuhria integrifolia*), snakeweed (*Gutierrezia sarothrae*), tansy mustard (*Descurainia pinnata*), Hood's phlox (*Phlox hoodii*), scarlet globemallow (*Sphaeralcea coccinea*), twin bladderpod (*Physaria acutifolia*), sego lily (*Calochortus nuttallii*), and western tansy-aster (*Macheranthera grindelioides*). Rare plants include Rollins' cat's-eye (*Oreocarya rollinsii*), ephedra buckwheat (*Eriogonum ephedroides*), pygmy sagebrush and ligulate feverfew (*Bolophyta ligulata*). Two non-native species of concern, cheatgrass (*Bromus tectorum*) and purple mustard (*Corispora tenella*), are abundant in some areas. Other non-native species observed were desert alyssum (*Alyssum desertorum*) and curveseed butterwort (*Ranunculus testiculatus*).

Key Environmental Factors: Dry, sandy soils

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer

thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Land Use History: Grazing.

Biodiversity Significance Rank Comments (B3): The site rank is based on a good (B-ranked) occurrence of ephedra buckwheat (*Eriogonum ephedroides*), a globally vulnerable (G3) plant that is rare (S1) in Colorado. It also includes excellent (A-ranked) and fair (C-ranked) occurrences of Rollin's cat's-eye (*Oreocarya rollinsii*), and one historical occurrence of ligulate feverfew (*Bolophyta ligulata*), both globally vulnerable (G3) species that are rare (S2) in Colorado. The state rare (G4/S1) pygmy sagebrush (*Seriphidium pygmaeum*) has also been documented in good (B-ranked) condition.

Natural Heritage element occurrences at the Shavetail 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
Vascular Plants	Bolophyta ligulata	ligulate feverfew	G3	S2			BLM	H	1979-05-31
Vascular Plants	Eriogonum ephedroides	ephedra buckwheat	G3	S1			BLM	B	2007-06-30
Vascular Plants	Oreocarya rollinsii	Rollins' cat's - eye	G3	S2			BLM	A	1981-06-99
Vascular Plants	Oreocarya rollinsii	Rollins' cat's - eye	G3	S2			BLM	C	1981-06-17
Vascular Plants	Oreocarya rollinsii	Rollins' cat's - eye	G3	S2			BLM	E	1990-05-05
Vascular Plants	Seriphidium pygmaeum	pygmy sagebrush	G4	S1				B	2007-06-30

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

Boundary Justification: The site is bounded on the north by the White River and County Road 2, and on the west by Cottonwood Creek and BLM road 1070. It encompasses six rare plant occurrences, and the sagebrush shrublands and pinon - juniper woodlands that provide habitat for four rare plant species.

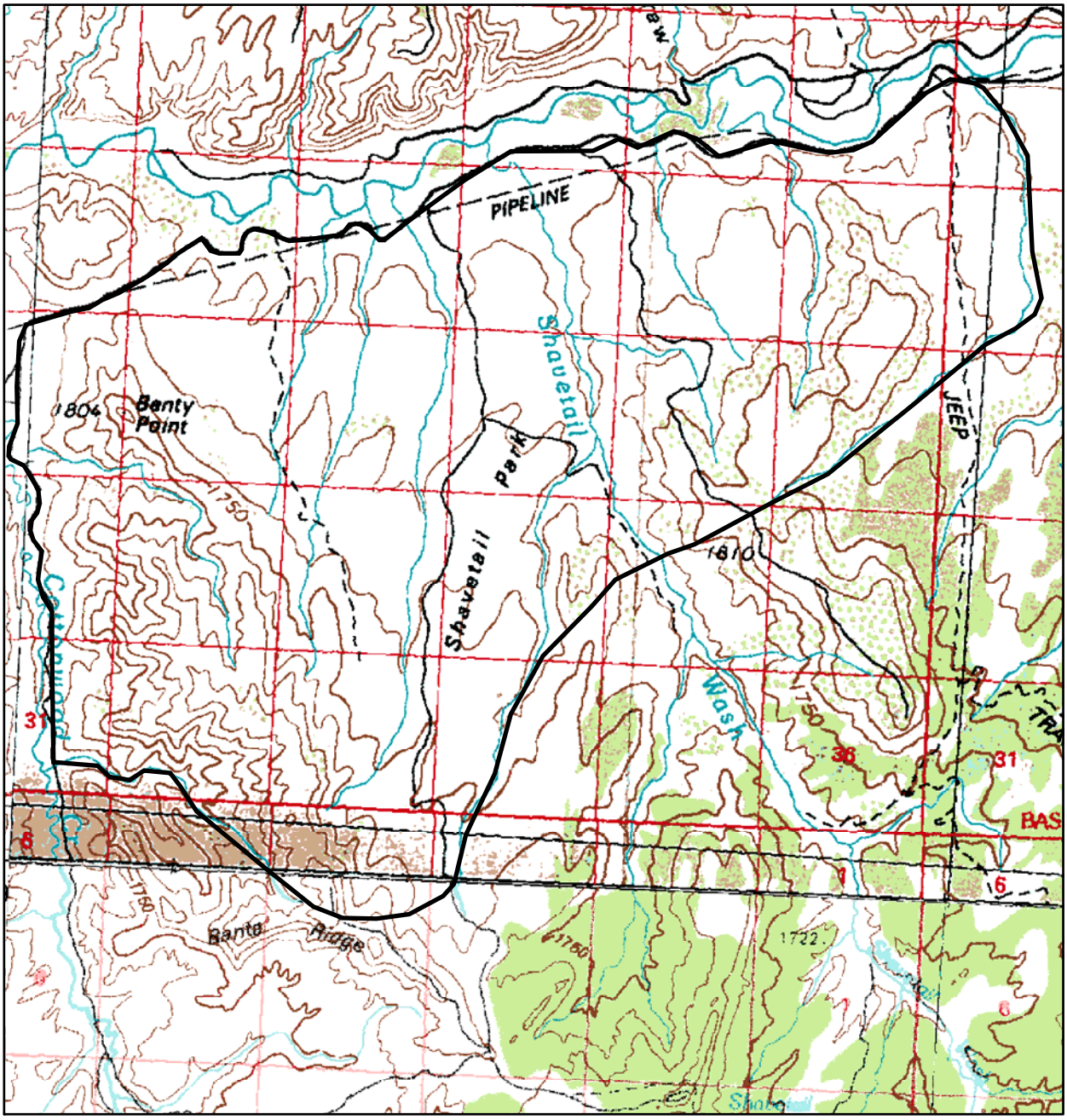
Protection Urgency Rank Comments (P2): 60% of the Shavetail Park area is leased for energy development.

Management Urgency Rank Comments (M3): There may need to be new management actions within 5 years to maintain the current quality of the element occurrences. According to the BLM office, "The majority of the acres are protected by

standard lease stipulations, except for areas with suitable or occupied habitat for threatened and endangered (T & E), listed, candidate, or BLM sensitive species, which will carry a no surface occupancy (NSO) designation. There are controlled surface use (CSU) designations for the area for sensitive soils, and NSO's for any potential raptor nests. The White River Field Office Resource Management Plan Amendment for oil and gas will look at additional NSO's on unleased land or as a condition of approval (COA), de-fact-o NSO within 200 meters of suitable and/or occupied T&E, candidate, or BLM sensitive species habitat. Energy development in this area is slow for the moment; possibly only 3-5 wells have been developed in the last 5 years. Approximately 60% of Shavetail Park is leased."

Exotic Species Comments: Two non-native species of concern, cheatgrass (*Bromus tectorum*) and purple mustard (*Corispora tenella*), are abundant in some areas. Other non-native species observed were desert alyssum (*Alyssum desertorum*) and curveseed butterwort (*Ranunculus testiculatus*).

Version Author: Lyon, M.J. and J. Huggins
Version Date: 12/07/2007



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Map Date: 02/15/2008

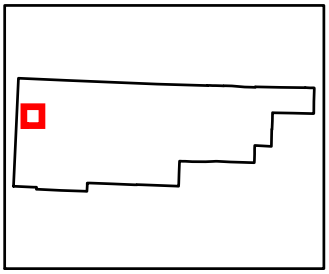
Legend

PCA Boundary

Douglas Pass, 39108-E1
Rangely, 40108-A1
Vernal, 40109-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 23. Shavetail Park Potential Conservation Area, B3: High Biodiversity Significance

Soldier 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: Black Cabin Gulch, Razorback Ridge

Size: 642 acres (260 ha) **Elevation:** 6,567 - 8,400 ft. (2,002 - 2,560 m)

General Description: Soldier Creek and its tributaries, Right, Middle, and Left Forks, are perennial streams located in the western portion of the Piceance Creek Basin (Basin). Soldier Creek drains the second basin to the east of the prominent physiographic feature, Razorback Ridge. This portion typifies the Basin features with depositional valleys at the base of uplifted hills that dip towards the creeks. Soldier Creek is fed by numerous springs and alluvial fan and gulches throughout its length within the site. Soldier Creek cuts down through the sedimentary rocks of the Parachute Creek Member forming a steep, entrenched stream with deep pools. The floodplain is formed by both alluvial and colluvial processes. The overstory layer is dominated by Douglas-fir (*Pseudotsuga menziesii*) and boxelder (*Acer negundo*) with an occasional narrowleaf cottonwood (*Populus angustifolia*). The shrub layer is diverse with chokecherry (*Prunus virginiana*), Rocky Mountain willow (*Salix monticola*), dogwood (*Cornus sericea*), Rocky Mountain maple (*Acer glabrum*), elderberry (*Sambucus microbotrys*), snowberry (*Symphoricarpos rotundifolia*) and golden currant (*Ribes aureum*). The forb and graminoid layers consist mainly of native plants, except for hay grasses.

Key Environmental Factors: The Parachute Creek Member (Green River Formation) dominates this portion of the County. It is comprised of marlstone, standstone, and oil shale. Lake Creek is located is modern alluvium from the Quaternary Age. Soils are shallow and well drained derived from sandstone and shale residues. Soils are classified as Kobar silty loam, Razorba channery sandy loam, and Patent loam.

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Biodiversity Significance Rank Comments (B3): This site encompasses an excellent (A-ranked) occurrence of a globally vulnerable (G3/S2) boxelder / chokecherry (*Acer negundo / Prunus virginiana*) riparian forest and an excellent (A-ranked)

occurrence of a state rare (G4?/S1) Doulas-fir / Rocky Mountain maple (*Pseudotsuga menziesii / Acer glabrum*) riparian forest. The box elder / chokecherry plant community is found on the wider portions of the floodplain. The shrub canopy is very thick indicating that it has not been disturbed (Carsey et al. 2003). The Douglas-fir / Rocky Mountain maple plant community is found throughout the intermountain west and Canada, but is uncommon in Colorado (Carsey et al. 2003). There is an historical occurrence of the globally vulnerable (G3T3/S3) Purpus' sullivantia (*Sullivantia hapemanii* var. *purpusii*), last seen in 1982. This species was not found in 2007; however, appropriate habitat still exists and further surveys could locate the occurrence. There are documented nest sites above the site for Greater Sage-grouse (*Centrocercus urophasianus*), a globally apparently secure (G4/S4) species with a restricted range. This is also a State Special Concern species and a BLM/FS sensitive species. The Greater Sage-grouse and other sagebrush obligates such as Columbian Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*), Sage Sparrow (*Amphispiza belli*), and the Brewer's Sparrow (*Spizella breweri*) depend on large, continuous blocks of viable habitat such as identified within and adjacent to the site.

Natural Heritage element occurrences at the Soldier 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	Oncorhynchus clarkii pleuriticus	Colorado River Cutthroat Trout	G4T3	S3		SC	USFS	H	9999-99-99
Natural Communities	Acer negundo / Prunus virginiana Forest	Montane Riparian Deciduous Forest	G3	S2				A	2007-06-14
Natural Communities	Pseudotsuga menziesii / Acer glabrum Forest	Lower Montane Forests	G4?	S1				A	2007-06-14

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

Boundary Justification: Boundary was delineated to encompass the known occurrence of the riparian forest plant communities and potential habitat along the floodplain. This boundary only includes the immediate ecological processes. Both public and private property are included, however, only public lands were surveyed.

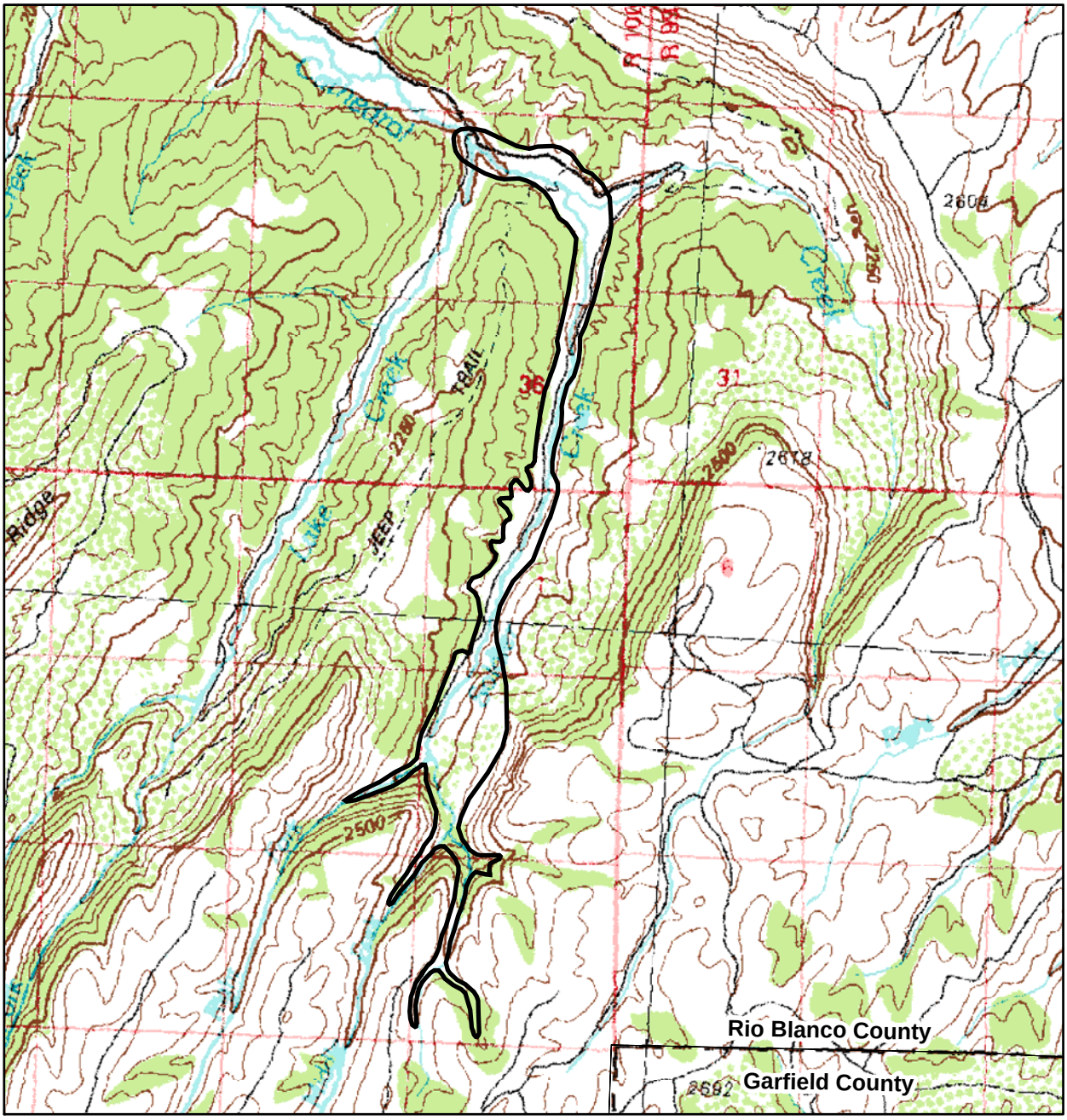
Protection Urgency Rank Comments (P3): The majority of the site is owned by BLM, White River Field Office. It is contained in the East Douglas Creek Area of Critical Environmental Concern (ACEC) due to botanical reasons. Soldier Creek has been identified by the White River Field Office as a high priority system ACEC. Threats include oil and gas exploration that uses water for mineral extraction as this

will affect the surface water and ground water aquifer.

Management Urgency Rank Comments (M3): There were several non-native plants present: Canada thistle (*Breea arvensis*), houndstongue (*Cynoglossum officinale*), and mullein (*Verbascum thapsus*), especially at the northern section adjacent to the two track.

Exotic Species Comments: There were several non-native plants present: Canada thistle (*Breea arvensis*), houndstongue (*Cynoglossum officinale*), and mullein (*Verbascum thapsus*) especially at the northern section adjacent to the two track.

Version Author: Culver, D.R.
Version Date: 01/22/2008



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Map Date: 01/25/2008

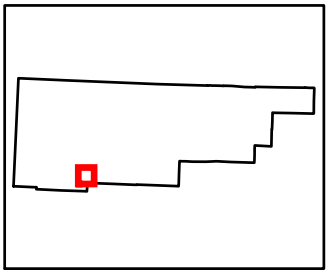
Legend

PCA Boundary

Douglas Pass, 39108-E1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 24. Soldier Creek Potential Conservation Area, B3: High Biodiversity Significance

South Fork White River

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: Buford, Meadow Creek Lake

Size: 2,394 acres (969 ha) **Elevation:** 7,200 - 8,000 ft. (2,195 - 2,438 m)

General Description: The South Fork of the White River (South Fork) begins in the Flat Top Wilderness Area. It flows northwest out of South Fork Canyon into the scenic Stillwater Valley flanked to the south and east by the Flat Tops. Several streams feed the South Fork of the White River: Swede Creek, White Creek, Wand Creek, Peltier Creek, Hazard Creek, Beckman Creek, Moose Creek, Cave Creek, Fowler Creek, and Hill Creek. The Valley is widest at northwest end near the Town of Buford and narrowest at the south where limestone outcrops are present. These limestone outcrops are suitable habitat for the globally rare hanging garden sullivantia (*Sullivantia hapemanii* var. *purpusii*) where seeps are present. Spring Cave, Colorado's third largest cave, is located in this outcrop of Leadville limestone (Belden Formation). Spring Cave contains Colorado's largest cave stream that regularly floods in the spring, often completely filling the cave with water. It contains a lake several hundred meters inside as well as several caverns only accessible through underwater diving. The riparian area vegetation is dominated by Drummond's willow (*Salix drummondiana*), Bebb's willow (*Salix bebbiana*), strap-leaf willow (*Salix eriocephala* var. *ligulifolia*), coyote willow (*Salix exigua*), Rocky Mountain willow (*Salix monticola*), hawthorn (*Crataegus rivularis*), alder (*Alnus incana*), and narrowleaf cottonwood (*Populus angustifolia*) with an understory consisting of beaked sedge (*Carex utriculata*), reed canarygrass (*Phalaroides arundinacea*) and hay grasses. The South Fork of the White River is allowed to meander across the floodplain and thus supports several sloughs and abandoned oxbows. The South Fork of the White River does not have any major hydrological alterations so is allowed to seasonally flood. The benches above the riparian area consist of big basin sagebrush (*Artemisia tridentata* ssp. *tridentata*) with snowberry (*Symphoricarpos rotundifolius*) with several bunchgrasses e.g., *Festuca* spp., *Muhlenbergia* spp., and *Stipa* spp. Located at the base of Cave Creek is a very prolific spring that creates an oasis for songbirds. The vegetation surrounding the spring is lush and consists of the following: narrowleaf cottonwood (*Populus angustifolia*), cottonwood hybrid (*Populus x acuminata*), box elder (*Acer negundo*), chokecherry (*Prunus virginiana*), cow parsnip (*Heracleum sphondylium* subsp. *montanum*), wood rose (*Rosa woodsii*), nettle (*Urtica gracilis*), snowberry (*Symphoricarpos rotundifolius*), and serviceberry (*Amelanchier utahensis*). The pH of the spring water is slightly basic (8.2) which is to be expected due to the limestone parent material. The foothills and lower hillsides are dominated by Gambel's oak (*Quercus gambelii*) and snowberry. The upper

hillsides are dominated by Colorado blue spruce (*Picea pungens*), aspen (*Populus tremuloides*), and Douglas-fir (*Pseudotsuga menziesii*). The White River National Forest and Flat Tops Wilderness border the site. This area provides an important wildlife corridor for elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*), bighorn sheep (*Ovis canadensis*), and black bear (*Ursus americanus*), as well as many smaller mammals e.g., badger (*Taxidea taxus*), squirrels, chipmunks, etc.

Key Environmental Factors: Gravels and alluviums from the Quaternary Age dominate the riparian area of the site. Leadville limestone is found above the South Fork and particularly at Spring Cave. Soils range from stony loam of Delson-Perma complex to deep, poorly drained soils of the Redrob Variant loam.

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Biodiversity Significance Rank Comments (B3): The site supports excellent (A-ranked) examples of several globally rare (G3) riparian wetlands. The floodplain is relatively intact with few hydrological alterations (few irrigation ditches present) with well-vegetated banks thus stabilized shores and overhanging vegetation for a healthy fishery. There was no recent evidence of cattle grazing and little impact was observed due to horse pasturing. It is unusual to encounter a riparian wetland in the intermountain west, let alone in Colorado, that has not experienced improper grazing from domestic animals. There is also a fair (C-ranked) occurrence of the state rare (G4T4/S2) Townsend's big-eared bat subspecies (*Plecotus townsendii pallescens*) and an extant occurrence of the state rare (G5/S1B,S3N) Bald Eagle (*Haliaeetus leucocephalus*). An occurrence of hanging garden sullivantia (*Sullivantia hapemanii* var. *purpusii*), a globally vulnerable (G3T3/S3) plant, was observed in 1997. This species was searched for and not found in 2007; however, appropriate habitat still exists. Future surveys could locate this occurrence.

Natural Heritage element occurrences at the South Fork White 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	Haliaeetus leucocephalus	Bald Eagle	G5	S1B,S3N		ST		E	2002-06-03
Mammals	Plecotus townsendii pallescens	Townsend's Big - eared Bat Subsp	G4T4	S2		SC	BLM/ USFS	C	2005-02-24
Natural Communities	Picea pungens / Alnus incana Woodland	Montane Riparian Forests	G3	S3				A	2002-06-03
Natural Communities	Populus angustifolia - Picea pungens / Alnus incana Woodland	Montane Riparian Forests	G3	S3				A	1992-08-06
Natural Communities	Populus angustifolia - Picea pungens / Alnus incana Woodland	Montane Riparian Forests	G3	S3				A	2007-06-24
Natural Communities	Cornus sericea Shrubland	Foothills Riparian Shrubland	G4Q	S3				A	1992-08-08
Natural Communities	Cornus sericea Shrubland	Foothills Riparian Shrubland	G4Q	S3				AB	1992-08-06

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

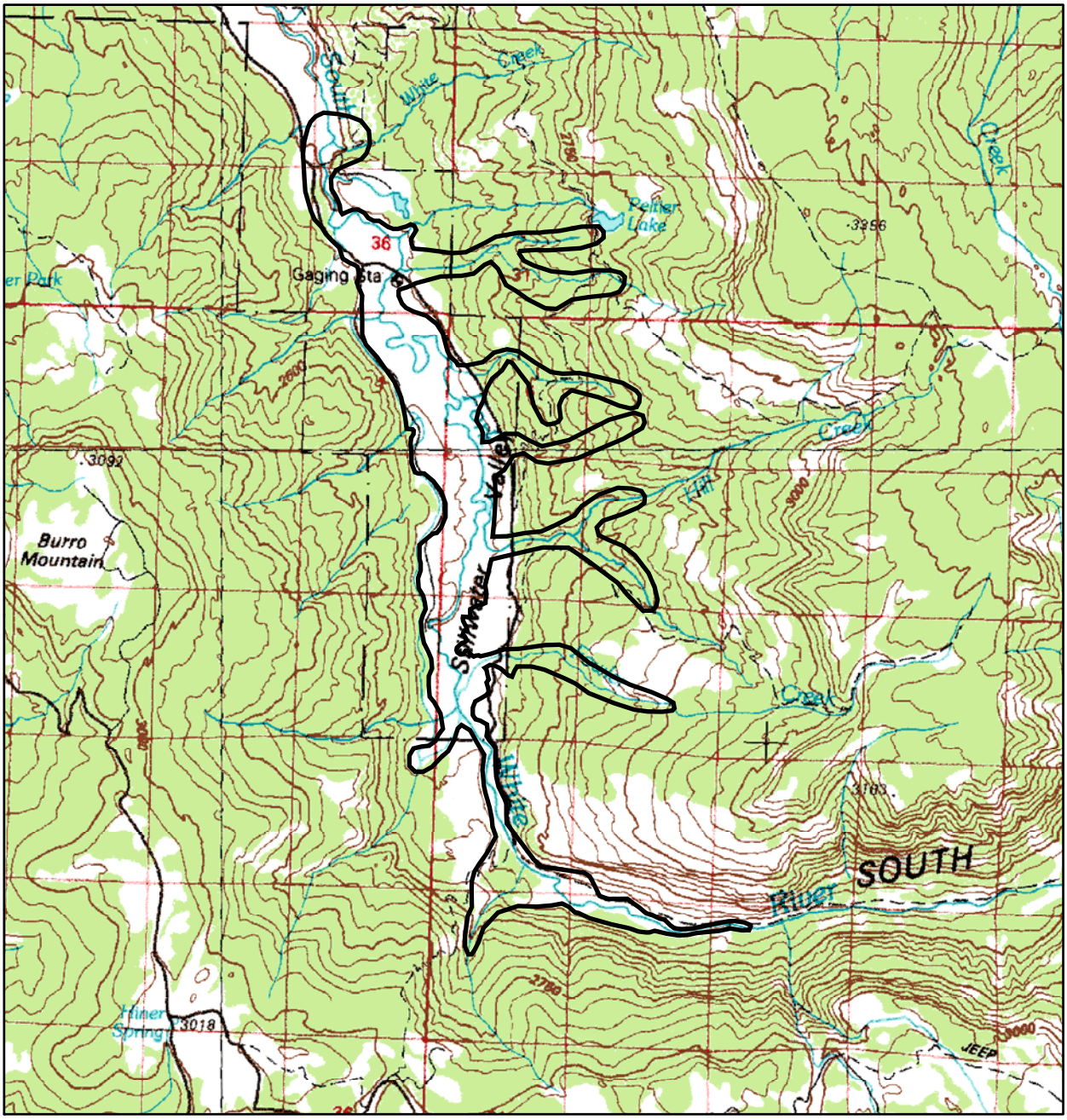
Boundary Justification: Boundary is delineated to encompass the known occurrences of the riparian plant communities and potential habitat along the floodplain, as well as the seeps and springs and Spring Cave. The boundary encompasses both public and private property, however, only public lands were surveyed.

Protection Urgency Rank Comments (P4): The Stillwater Valley is privately owned with a conservation easement. The remainder of the site is owned and managed by the White River National Forest.

Management Urgency Rank Comments (M3): Currently, the site does contain agriculture fields with hay grasses and some noxious weeds (e.g., hounds tongue, *Cynoglossum officinale*, and mullein, *Verbascum thapsus*) adjacent to the riparian area. Management may be needed in the future to prevent the spread of these noxious plants. The site is located in a very scenic area of Rio Blanco County. There is always an increased threat of residential development that would threaten the hydrology of the site.

Exotic Species Comments: Noxious weeds such as hounds tongue (*Cynoglossum officinale*) and mullein (*Verbascum thapsus*) are adjacent to the riparian area.

Version Author: Culver, D.R.
Version Date: 01/11/2008



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Map Date: 01/25/2008

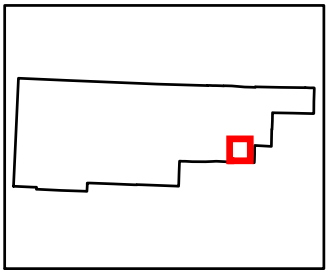
Legend

PCA Boundary

Glenwood Springs, 39107-E1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 25. South Fork White River Potential Conservation Area, B3: High Biodiversity Significance

Upper Big Duck 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: Sagebrush Hill

Size: 689 acres (279 ha) **Elevation:** 6,200 - 8,100 ft. (1,890 - 2,469 m)

General Description: The Upper Big Duck Creek site is located in the Piceance Creek Basin. Big Duck Creek is one of a series of ephemeral streams that drain the eastern slope of the Cathedral Bluffs. Dead Horse Ridge rises up from Big Duck Creek forming the southern border of the site. This area typifies the basin and range topography of the Piceance Creek Basin with depositional valleys at the base of uplifted hills that dip towards the creeks. Pinon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) are prevalent on the drier, south-facing sides of the hills. Douglas-fir (*Pseudotsuga menziesii*) with snowberry (*Symphoricarpos rotundifolia*) plant community is located on the north-facing sides of the gullies and hills. The riparian vegetation consists of Great Basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) and rubber rabbitbrush (*Chrysothamnus nauseosus*) with Great Basin ryegrass (*Leymus cinereus*). Cottonwood Springs is a viable spring located above Big Duck Creek. It is the only spring observed during 2007 that was not impaired or developed. Narrowleaf cottonwood (*Populus angustifolia*) and river birch (*Betula occidentalis*) thrive in this green oasis, along with yellow currant (*Ribes aueum*), rose (*Rosa woodsii*) and snowberry. The herbaceous layer is dominated by forbs with false lily of the valley (*Maianthemum stellatum*) and nettle (*Urtica gracilis*).

Key Environmental Factors: Geology consists of Parachute Creek Member of Green River Formation and Uinta Formation. Soils range from well drained Rhone and Parachute loam to rock outcrops of Torriorthents

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Biodiversity Significance Rank Comments (B3): This site contains Cottonwood Spring, one of the best observed springs during 2007 in Rio Blanco County. It also supports a good (B-ranked) occurrence of the globally vulnerable (G3/S2) *Populus angustifolia / Betula occidentalis* riparian forest. This plant association is an indicator

of a seep or spring, a perennial water source. There were few non-native plants, mainly hay grasses, and little evidence of grazing pressure. In addition, there is a fair (C-ranked) occurrence of the globally imperiled (G2/S1) sagebrush bottomland shrublands (*Artemisia tridentata* spp. *tridentata* / *Leymus cinereus*). Although not drawn for this species, there are documented Greater Sage-grouse (*Centrocercus urophasianus*) nest sites adjacent to this site. This is a globally secure (G4/S4) species with a restricted range and is also a State Special Concern species and BLM/USFS sensitive species. The Greater Sage-grouse and other sagebrush obligates such as Columbian Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*), Sage Sparrow (*Amphispiza belli*), and the Brewer's Sparrow (*Spizella breweri*) depend on large, continuous blocks of viable sagebrush habitat such as identified within and adjacent to this site.

Natural Heritage element occurrences at the Upper Big Duck 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	Artemisia tridentata ssp. tridentata / Leymus cinereus Shrubland	Sagebrush Bottomland Shrublands	G2	S1				C	2007-06-26
Natural Communities	Populus angustifolia / Betula occidentalis Woodland	Montane Riparian Forest	G3	S3				A	2007-06-26

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

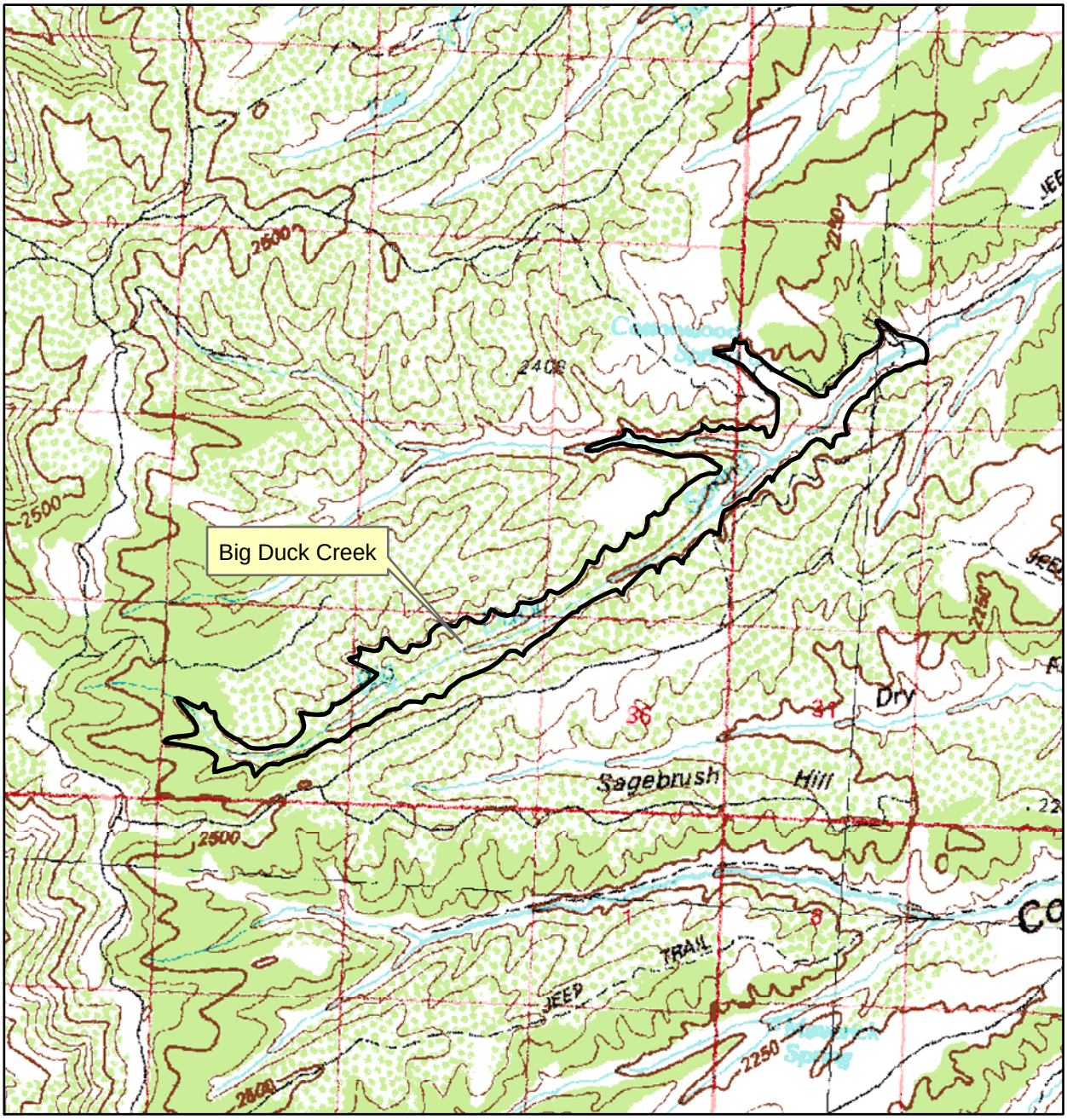
Boundary Justification: Boundary is drawn to capture the mesic area of Big Duck Creek from its headwaters at the base of Cathedral Bluffs to where the sagebrush / Great Basin ryegrass grades into the more saline plant communities of greasewood (*Sarcobatus vermiculatus*) dominated shrubland. Both public and private lands are within the site, however, only the public lands were surveyed.

Protection Urgency Rank Comments (P3): The BLM is the land manger and owner of the majority of the site. Since it supports a perennial water source in good condition, ACEC status is recommended.

Management Urgency Rank Comments (M3): Weed control may be needed in the future. Continue with current grazing rotation.

Version Author: Culver, D.R.

Version Date: 01/16/2008



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Map Date: 01/25/2008

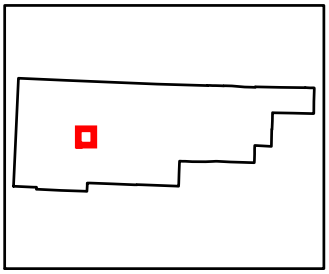
Legend

PCA Boundary

Douglas Pass, 39108-E1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 26. Upper Big Duck Creek Potential Conservation Area, B3: High Biodiversity Significance

Upper Hell's Hole

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: Dragon

Size: 181 acres (73 ha) **Elevation:** 6,644 - 6,835 ft. (2,025 - 2,083 m)

General Description: The Upper Hell's Hole site is located in Rio Blanco County at the Utah/Colorado state line, approximately 2.4 air miles due west of Rabbit Mountain and 1.5 air miles north of Park Canyon. The site is also roughly 17 air miles due west from State Highway 139, and 17 air miles due south from the point where Co Rd 21 (off of State 64 near Rangely) intersects the Utah/CO state line. The state line gate is on BLM 1215, and the site extends about 0.2 miles north of the gate on BLM 1215 and .72 mi south of that gate. The average width west to east is approximately 0.2 miles, and the approximate length is 1 mile from north to south. Soils are derived predominantly from shale of the Parachute Creek Member of the Green River Formation. The topography is composed of several low hills running north to south, separated by valleys dominated by greasewood (*Sarcobatus vermiculatus*) and cheatgrass (*Bromus tectorum*). Most of the slopes are south-facing, from gentle to quite steep (5 to 45 %) with scattered pinon pine (*Pinus edulis*) and mountain mahogany (*Cercocarpus montanus*) and intermittent Utah junipers (*Juniperus osteosperma*). Other plants common to the area include thickleaf beardtongue (*Penstemon pachyphyllus*), crispleaf wild buckwheat (*Eriogonum corymbosum*), oval-leaf buckwheat (*Eriogonum ovalifolium*), sand aster (*Chaetopappa ericoides*), wedgeleaf whitlow-grass (*Draba cuneifolia*), bluebunch wheatgrass (*Pseudoroegneria spicata*), Indian ricegrass (*Achnatherum hymenoides*), stickseed (*Lappula redowskii*), curlleaf mountain mahogany (*Cercocarpus ledifolius*), shadscale (*Atriplex confertifolia*), dragon milkvetch (A*stragalus lutosus*), and western wheatgrass (*Pascopyrum smithii*).

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Cultural Features: Bordered by the Utah/Colorado state line.

Biodiversity Significance Rank Comments (B3): This site encompasses a good (B-ranked) occurrence of globally vulnerable (G3) ephedra buckwheat (*Eriogonum*

ephedroides), which is extremely rare (S1) in Colorado and on the BLM Sensitive Species List. There is also a good to fair (BC-ranked) occurrence of the globally critically imperiled subspecies (G4T1/S1) White River penstemon (*Penstemon scariosus* var. *albifluvis*).

Natural Heritage element occurrences at the Upper Hell's Hole 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	Eriogonum ephedroides	ephedra buckwheat	G3	S1			BLM	B	2007-06-28
Vascular Plants	Penstemon scariosus var. albifluvis	White River penstemon	G4T1	S1	C			BC	1994-06-08

** 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 encompass two rare plant occurrences and adjacent potential habitat on barren shale slopes. The habitat extends into Utah, but that area was not included.

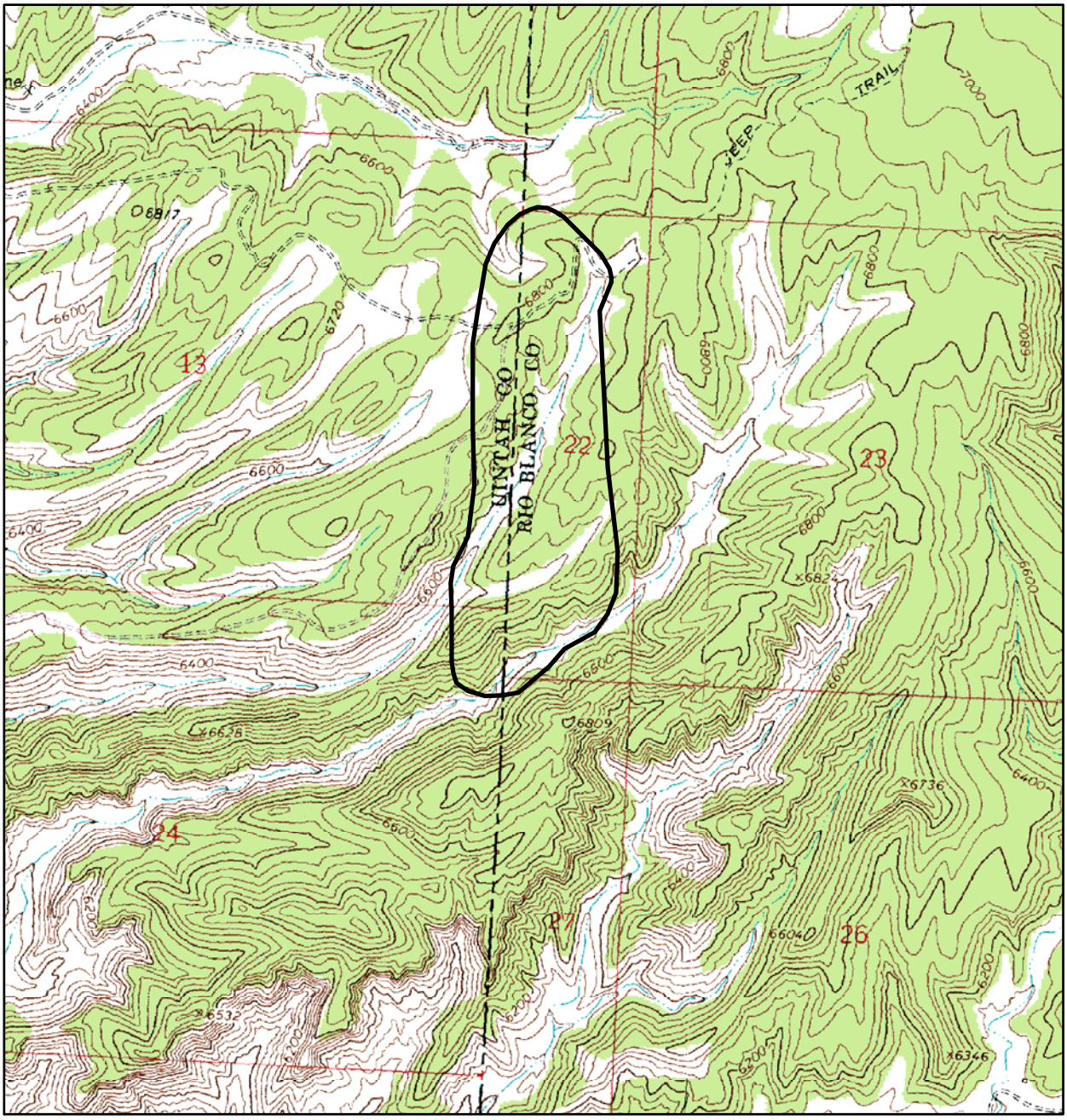
Protection Urgency Rank Comments (P2): Most of the area is protected by standard lease stipulations, except for areas with suitable or occupied habitat for T&E listed, candidate, or BLM sensitive species, which will carry an NSO (No Surface Occupancy) designation. There are CSU (Conditional Surface Occupancy) stipulations for the area for sensitive soils, and NSO for any potential raptor nests.

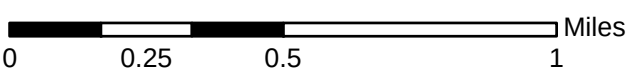
Management Urgency Rank Comments (M3): According to BLM: "The majority of the acres are protected by standard lease stipulations, except for areas with suitable or occupied habitat for threatened and endangered (T&E), listed, candidate, or BLM sensitive species which will carry a no surface occupancy (NSO) designation. There are controlled surface use (CSUs) designations for the area for sensitive soils, and NSO for any potential raptor nests. The White River Field Office Resource Management Plan Amendment for oil and gas will look at additional NSO on unleased or as a condition of approval (COA), de-fact-o NSO within 200 meters of suitable and/or occupied T&E, candidate, or BLM sensitive species habitat. Energy development in this area is slow for the moment, possibly only 3-5 wells have been developed in the last 5 years. All of the site is unleased at this time."

Exotic Species Comments: Cheatgrass (*Bromus tectorum*) is present in the valleys between the low hills where the rare species are present, but does not seem to be spreading.

Version Author: Lyon, M.J. and J. Huggins

Version Date: 12/15/2007





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Map Date: 02/15/2008

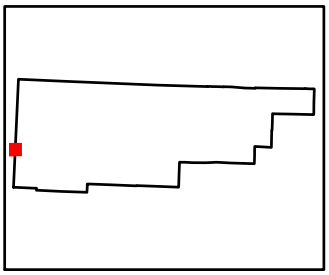
Legend

PCA Boundary

Dragon, 39109-G1

7.5 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 27. Upper Hell's Hole Potential Conservation Area, B3: High Biodiversity Significance

Veatch Gulch

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: Lo 7 Hill, Red Elephant Point, Veatch Gulch

Size: 19,181 acres (7,762 ha) **Elevation:** 7,100 - 8,200 ft. (2,164 - 2,499 m)

General Description: The Veatch Gulch site is located south of Meeker between the Grand Hogback and Miller Creek. The prominent topographic feature, Veatch Gulch, is an ephemeral stream that drains into the White River. The north portion of the site is dominated by steep mud or siltstone cliffs, derived from the Chinle and State Bridge silt and sandstones that rise dramatically from Veatch Gulch. These hillsides are sparsely vegetated, mainly with tufts of the big bunch bluegrass (*Pseudoroegneria spicata*), Western wheatgrass (*Pascopyrum smithii*), long flower rabbitbrush (*Chrysothamnus depressus*), fringed sagebrush (*Artemisia frigida*), lacy tansy aster (*Machaeranthera pinnatifida*), and Oregon grape (*Mahonia repens*). The sagebrush shrubland is dominated by Great Basin and Wyoming big sagebrush (*Artemisia tridentata* ssp. *tridentata* and *Artemisia tridentata* ssp. *wyomingensis*) with snowberry (*Symphoricarpos rotundifolius*). Native grasses dominate the understory and include Idaho fescue (*Festuca idahoensis*), blue grama (*Bouteloua gracilis*), green needle and thread grass (*Stipa viridula*), June grass (*Koeleria macrantha*), Fendler's bluegrass (*Poa fendleriana*), Sandberg bluegrass (*Poa secunda*), slender wheatgrass (*Elymus trachycaulus*), and Western wheatgrass (*Pascopyrum smithii*). Of special note is the near absence of cheatgrass (*Bromus tectorum*) which dominates graminoid cover in sagebrush shrublands throughout western Colorado. Several gulches with ephemeral streams are present and include Veatch Gulch, Moog Gulch, and Bloodsworth Gulch. The gulches and gullies are dominated quaking aspen (*Populus tremuloides*), serviceberry (*Amelanchier* sp.), and scattered narrowleaf cottonwoods (*Populus angustifolia*). Several springs have been enhanced for cattle and the ponds support Rocky Mountain willow (*Salix monticola*), planeleaf willow (*Salix planifolia*), cattails (*Typha* sp.) and spikerush (*Eleocharis palustris*).

Key Environmental Factors: The north portion of the site is dominated by steep mud or siltstone cliffs, derived from the Chinle and State Bridge silt and sandstones. The sagebrush area consists of deep, well drained soils that are formed in colluvium and alluvium derived from red-bed sandstone and shale (Tampico Series).

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time

temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Land Use History: Several abandoned homesteads are evident throughout. At one time, there were 35 families present. The area was hayed and lime outcrops in the southeastern portion of the site were mined from 1917- 1930s.

Cultural Features: Remnants of a schoolhouse and cabins remain.

Biodiversity Significance Rank Comments (B3): This site encompasses a good (B-ranked) occurrence of a globally vulnerable (G3/SNR) sagebrush plant community, Wyoming sagebrush with Sandberg bluegrass (*Artemisia tridentata* ssp. *vaseyana / Poa secunda*). This was one of the best observed locations of this element during 2007. There is currently no disturbance from oil and gas exploration, and the only roads within the site are two tracks to summer cabins. The presence of non-native plants is minimal and is being aggressively eradicated by owners. Although not designed for this species, there are documented Greater Sage-grouse (*Centrocercus urophasianus*) nest sites adjacent to the site. This globally apparently secure species (G4/S4) has a restricted range and is a State Special Concern species as well as a BLM/USFS sensitive species. The Division of Wildlife is currently considering a wildlife management plan for the area. The Greater Sage-grouse and other sagebrush obligates such as Columbian Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*), Sage Sparrow (*Amphispiza belli*), and the Brewer's Sparrow (*Spizella breweri*) depend on large, continuous blocks of viable sagebrush habitat such as identified within this site.

Natural Heritage element occurrences at the Veatch 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
Natural Communities	Artemisia tridentata ssp. vaseyana / Poa secunda Shrubland	Mountain Big Sagebrush / Curly Bluegrass Shrubland	G3	S3				B	2007-09-12

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

Boundary Justification: Boundary was delineated to encompass the known occurrence of the sagebrush plant community, potential habitat, and adjacent hillsides and gulches. The boundary is drawn using Flag Creek as the western border and Miller Creek its eastern border. It only includes the immediate ecological processes and does not consider insect and mammal pollinators. Only private lands with written permission were surveyed.

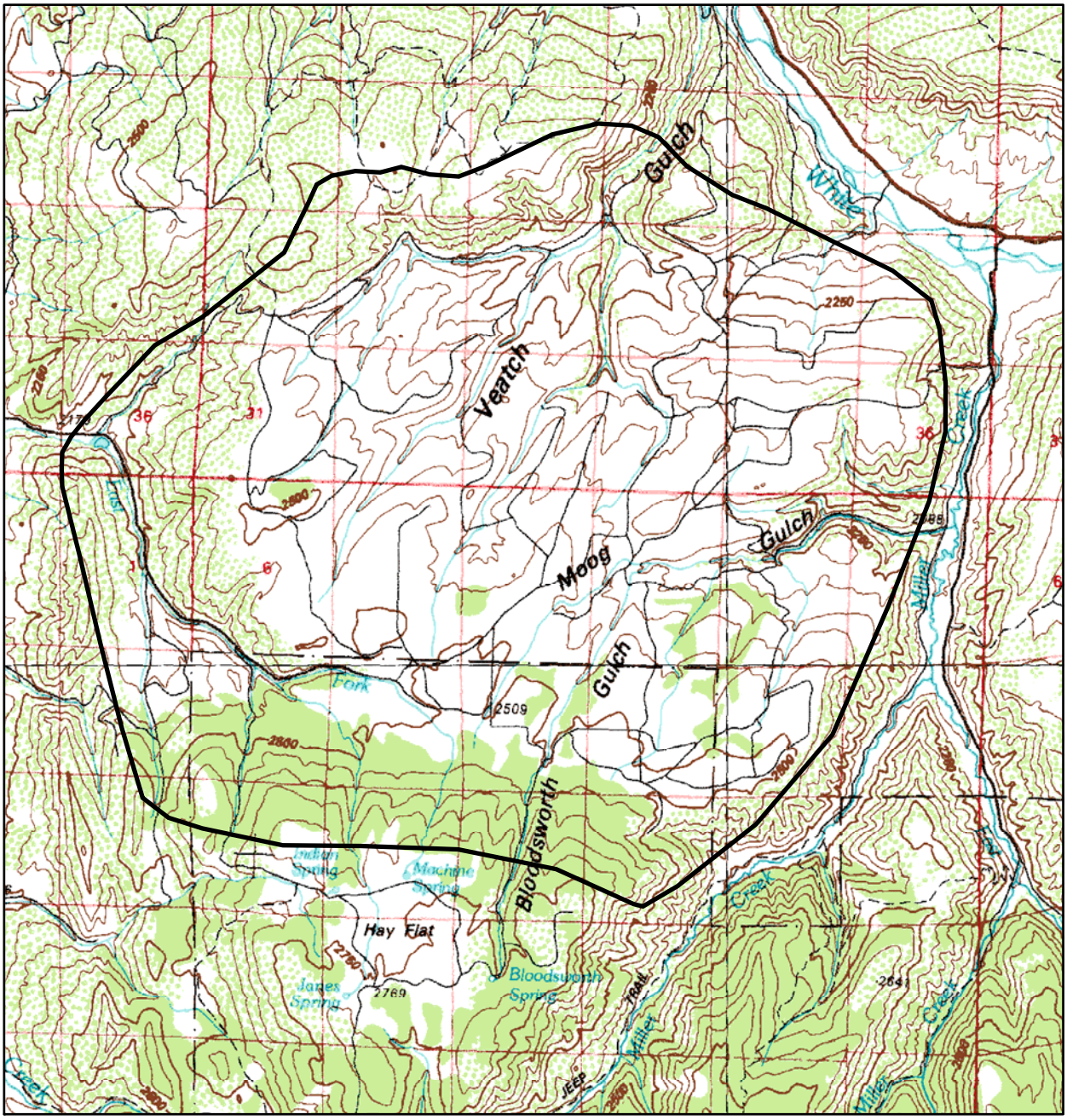
Protection Urgency Rank Comments (P4): The site is owned by several private landowners, all who are interested in placing conservation easements.

Management Urgency Rank Comments (M3): There were several non-native forbs present: musk thistle (*Carduus nutans*), houndstongue (*Cynoglossum officinale*), mullein (*Verbascum thapsus*), especially in areas of disturbance such as salt licks and stock ponds. However, landowners are aggressively eradicating the weeds. Special note, very little cheat grass (*Bromus tectorum*) was present, typically only along two tracks.

Exotic Species Comments: There were several non-native forbs present: *Carduus nutans, Cynoglossum officinale, Verbascum thapsus,* especially in areas of disturbance such as salt licks and stock ponds.

Version Author: Culver, D.R.

Version Date: 01/15/2008



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Map Date: 01/25/2008

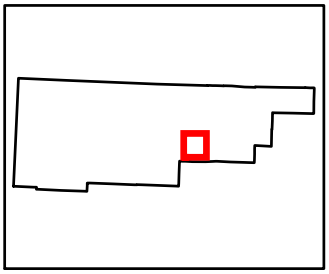
Legend

PCA Boundary

Glenwood Springs, 39107-E1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 28. Veatch Gulch Potential Conservation Area, B3: High Biodiversity Significance

White River at Agency Park

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: Rattlesnake Mesa, Veatch Gulch

Size: 1,547 acres (626 ha) **Elevation:** 5,760 - 5,900 ft. (1,756 - 1,798 m)

General Description: The White River at Agency Park site is located west of the Town of Meeker in a wide floodplain created by the White River cutting through the adjacent sandstone hills. The hydrology of the White River is intact due to no major water retention projects; however, there are irrigation take outs throughout the site. The White River meanders across a broad floodplain with a low gradient (< 3%). The potential for flood attenuation is high due to the density of riparian vegetation and presence of microtopography and sandy, alluvial soils. The river banks are moderately stable, due to a few areas where the hay meadows have reached the river bank, removing woody vegetation that can stabilize the banks during a flood event. The riparian vegetation along the White River is dominated by narrowleaf cottonwood (*Populus angustifolia*) with lanceleaf cottonwood (*Populus* x *acuminata*) in the tree canopy. The riparian shrub layer is dominated by strap-leaf willow (*Salix eriocephala* var. *ligulifolia*), whiplash willow (*Salix lasiandra*), willow hawthorn (*Crataegus saligna*), river hawthorn (*Crataegus rivularis*), river birch (*Betula occidentalis*), thinleaf alder (*Alnus incana*), and red-osier dogwood (*Cornus sericea*). Coyote willow (*Salix exigua*) dominates the point bars and sandy shoreline. The herbaceous understory along the river banks is characterized by sedges (*Carex utriculata*, *C. nebrascensis*, *C. praegracilis*) and grasses (*Phalaroides arundinacea*, *Glyceria grandis*, *Phleum pretense*, *Poa pratensis*, *Dactylis glomerata*, *Beckmannia syzigachne*). Above the immediate floodplain, meadows are flood irrigated for hay production and cattle grazing. The wildlife and fish value for Rio Blanco County is high. Evidence of elk (*Cervus elephus*) and mule deer (*Odocoileus hemionus*) was found throughout the property. Two Bald Eagles (*Haliaeetus leucocephalus*) and Greater Sandhill Cranes (*Grus canadensis tabida*) were observed on the property, as well as many songbirds and woodpeckers.

Key Environmental Factors: Gravels and alluviums from the Quaternary Age dominate the riparian area of the site. Uplands consist of sandstone and siltstones from Mancos Shale and Frontier sandstone. Soils range from Redrob loam, Patent loam, and Shawa loams.

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between

April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Land Use History: Nathan C. Meeker arrived in the White River Valley in 1878 to accept the position of Indian Agent in the White River Valley. The original site of the Indian Agency was approximately 6 miles east of Meeker along the river, now called Agency Park. Eventually, Nathan Meeker had the agency disassembled and floated the logs downstream to the Powell Park location.

Biodiversity Significance Rank Comments (B3): The site supports a fair (C ranked) example of a globally rare (G2/S2) *Acer negundo - Populus angustifolia / Cornus sericea* riparian forest. This plant association is a narrow regional endemic which is undergoing continued fragmentation and degradation throughout its range due to agricultural impacts and fluvial instability. It is presently recorded only from western Colorado in broad alluvial valleys and has significantly declined from historical distributions. There is also an active Bald Eagle (*Haliaeetus leucocephalus*) (G5/S1B,S3N) nest. Although not drawn for this species, there are documented Greater Sage-grouse (*Centrocercus urophasianus*) lek sites nearby. This globally apparently secure (G4/S4) species has a restricted range and is a State Special Concern species and a BLM/FS sensitive species. The Greater Sage-grouse and other sagebrush obligates such as Columbian Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*), Sage Sparrow (*Amphispiza belli*), and the Brewer's Sparrow (*Spizella breweri*) depend on large, continuous blocks of viable sagebrush habitat such as identified within and adjacent to the site.

Natural Heritage element occurrences at the White River at Agency 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	Haliaeetus leucocephalus	Bald Eagle	G5	S1B,S3N		ST		E	1995-05-31
Natural Communities	Acer negundo - Populus angustifolia / Cornus sericea Forest	Narrowleaf Cottonwood Riparian Forests	G2	S2				C	2007-08-13

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

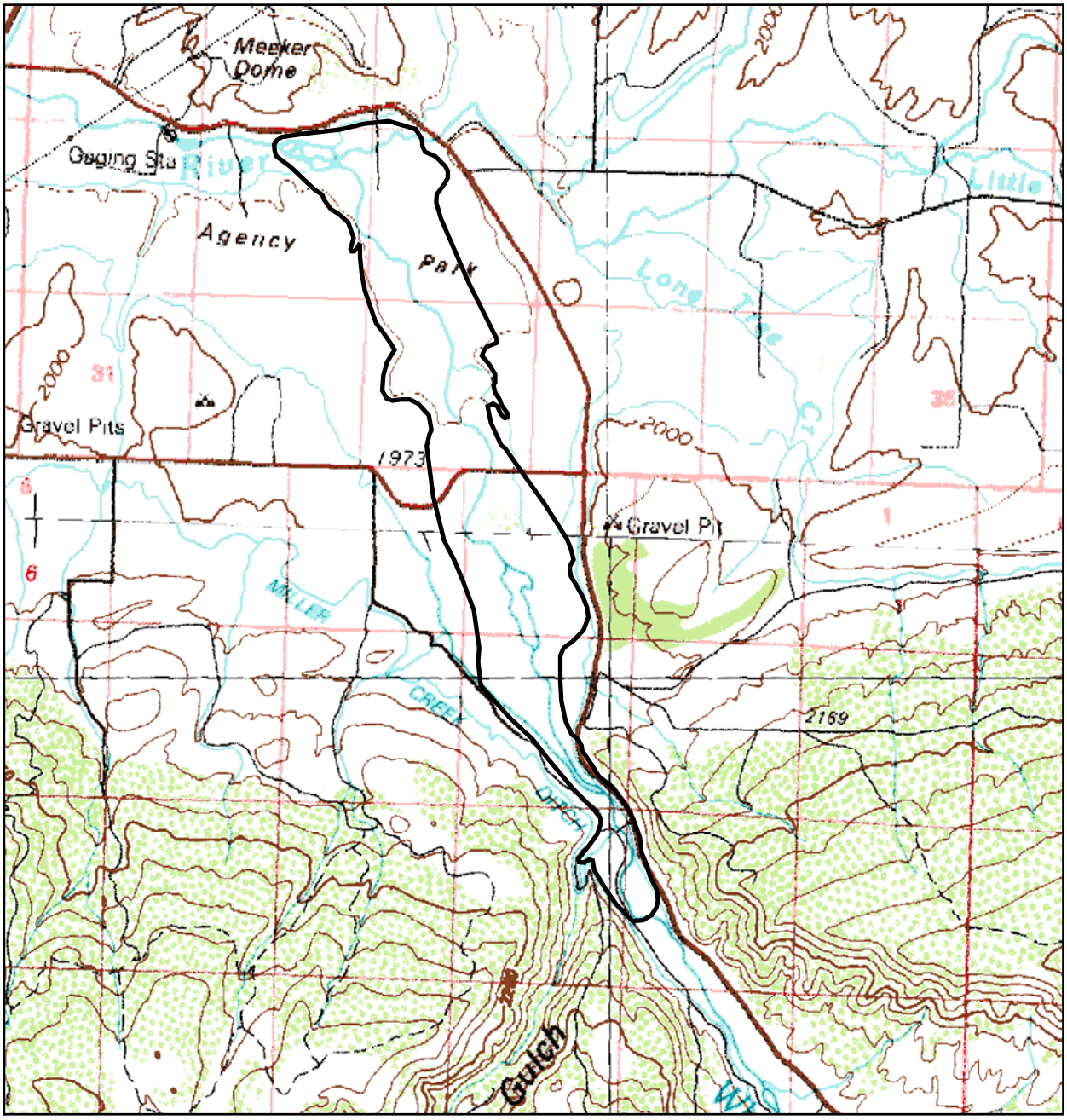
Boundary Justification: Boundary was delineated to encompass the known occurrence of the riparian plant communities and potential habitat along the floodplain, as well as the lower portions of the White River's tributaries. The boundary encompasses several private properties, however, only those properties with written permission were surveyed.

Protection Urgency Rank Comments (P4): This site is owned by several landowners. Several of these landowners are currently working with a local land trust to establish conservation easements.

Management Urgency Rank Comments (M3): Russian olive (*Elaeagnus angustifolia*) is found throughout the site. The site does contain agriculture fields with hay grasses. Noxious weeds such as hounds tongue (*Cynoglossum officinale*), Canada thistle (*Breea arvensis*), butter and eggs (*Linaria vulgaris*) and mullein (*Verbascum thapsus*) are found throughout the understory. Management may be needed in the future to prevent the spread of these noxious plants.

Exotic Species Comments: Russian olive (*Elaeagnus angustifolia*) is found throughout the site. The site does contain agriculture fields with hay grasses. Noxious weeds such as hounds tongue (*Cynoglossum officinale*), Canada thistle (*Breea arvensis*), butter and eggs (*Linaria vulgaris*) and mullein (*Verbascum thapsus*) are found throughout the understory.

Version Author: Culver, D.R.
Version Date: 01/14/2008



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Map Date: 01/25/2008

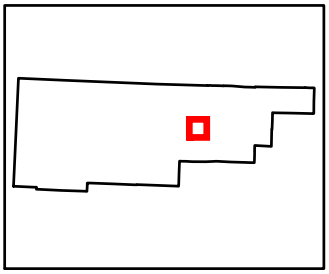
Legend

PCA Boundary

Glenwood Springs, 39107-E1
Meeker, 40107-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 29. White River at Agency Park Potential Conservation Area, B3: High Biodiversity Significance

Yellow Creek

Biodiversity Rank - B3: 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: Barcus Creek, Barcus Creek SE, Rough Gulch

Size: 1,202 acres (486 ha) **Elevation:** 5,700 - 5,960 ft. (1,737 - 1,817 m)

General Description: Yellow Creek is a perennial stream, located in the Piceance Creek Basin (Basin). Yellow Creek and Piceance Creek are the two major drainages in the Basin. This portion typifies the Basin features with depositional valleys at the base of uplifted hills that dip towards the creeks. Yellow Creek is fed by numerous springs and alluvial fan and gulches throughout its length within the site. Two prominent springs, Lambert and Stinking, are located within this portion of the Yellow Creek watershed. Lambert Spring is adjacent to CR 89 and is utilized extensively for cattle. Stinking Springs, located 1 mile south of Lambert Spring, is an undeveloped, groundwater-fed spring with a large shallow pool, surrounded by an alkaline wetland. The spring, located on a terrace above Yellow Creek, emerges at the base of a small cliff derived from Uinta sandstone. Saltgrass (*Distichlis spicata*), goosefoot (*Chenopodium glaucum*), arrowgrass (*Triglochin maritima*), and alkali grass (*Puccinellia airoides*) form rings outward according to alkalinity to the greasewood (*Sarcobatus vermiculatus*) shrubland. The riparian vegetation adjacent to Yellow Creek forms a band according to the soil alkalinity. Common threesquare (*Scirpus pungens*) and spikerush (*Eleocharis palustris*) are located in or adjacent to Yellow Creek. The floodplain is dominated by saltgrass (*Distichlis spicata*) community with alkali grass and goosefoot. Uplands support greasewood (*Sarcobatus vermiculatus*) with big basin sagebrush (*Artemisia tridentata* ssp. *tridentata*) and Western wheatgrass (*Pascopyrum smithii*) that grade into pinon pine (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*) shrublands with blue bunch wheatgrass (*Pseudoroegneria spicata*).

Key Environmental Factors: The main geologic feature within the river basin is modern alluvium from the Quaternary Age. Soils are fine sandy loam comprised of Glendive and Havre series typical in drainages of alluvial valley floors.

Climate Description: In the County, summers are warm or hot in most valleys but are much cooler in the mountains. Winters are cold in the mountains. Summer thunderstorms are prevalent; of the total precipitation, 55% usually falls between April and September. Average seasonal snowfall is 74.4 inches, average day time temperature is 45 degrees and average precipitation is 16.5 inches for Meeker between 1948 -2007 (Western Regional Climate Center 2008).

Biodiversity Significance Rank Comments (B3): This site encompasses good (B-ranked) occurrences of herbaceous wetland plant communities, the state rare (G5/S3) saltgrass (*Distichlis spicata*) and the globally rare (G3G4/S3) bulrush (*Schoenoplectus pungens*). Both of these occurrences were one of the best observed examples in Rio Blanco in 2007. There is also a good (B-ranked) occurrence of a globally secure (G5/S4) emergent wetland community (*Eleocharis palustris*).

Natural Heritage element occurrences at the Yellow 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	Schoenoplectus pungens Herbaceous Vegetation	Bulrush	G3G4	S3				B	2007-05-15
Natural Communities	Distichlis spicata Herbaceous Vegetation	Salt Meadows	G5	S3				B	2007-05-15
Natural Communities	Eleocharis palustris Herbaceous Vegetation	Emergent Wetland	G5	S4				B	1992-06-15

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

Boundary Justification: Boundary was delineated to encompass the known occurrences of the saltgrass and bulrush plant communities and potential habitat along the floodplain. This boundary only includes the immediate ecological processes. Only public lands were surveyed.

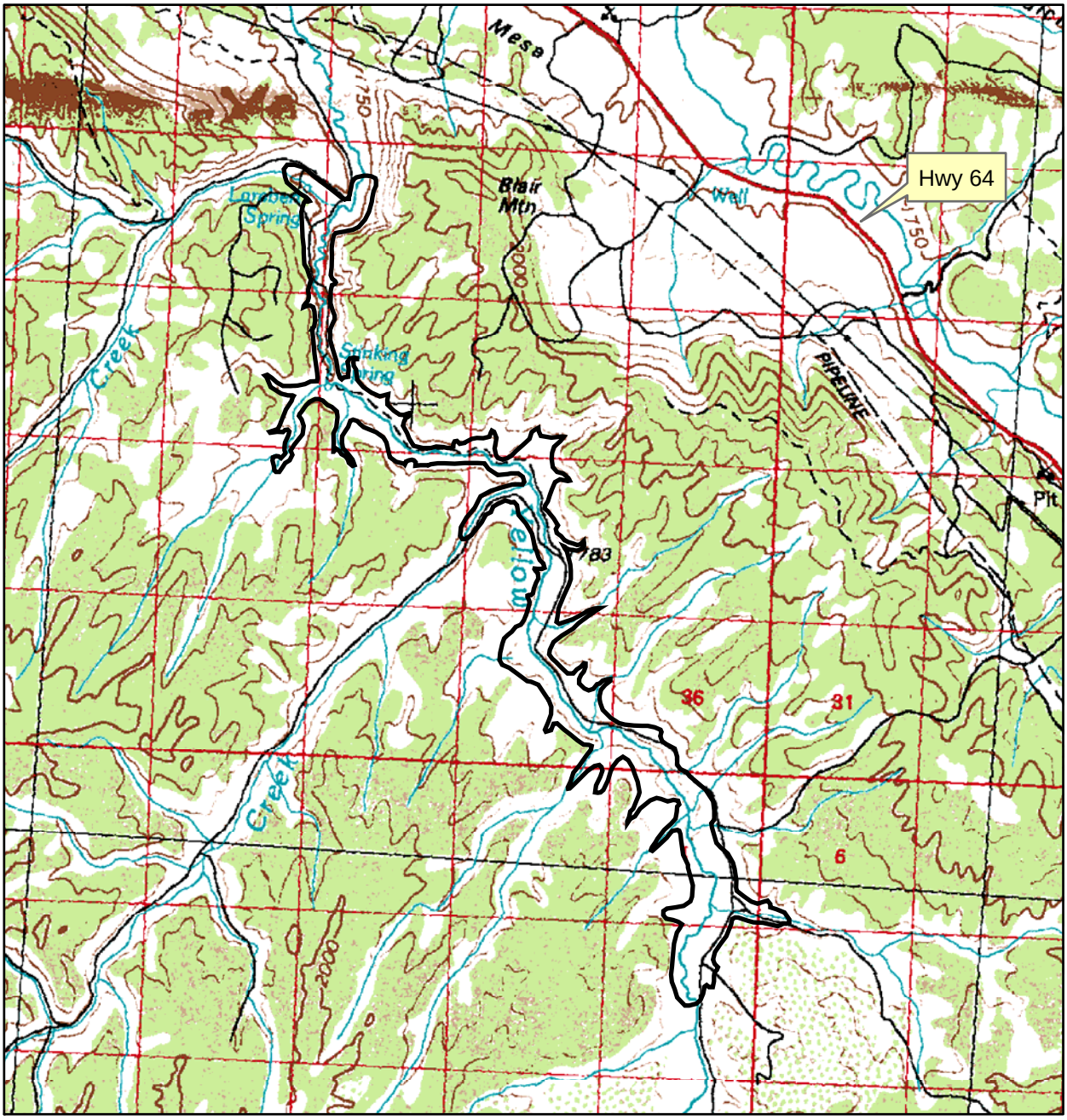
Protection Urgency Rank Comments (P2): The site is owned by the BLM, White River Field Office, and the upper portion is within the Piceance East Douglas Wild Horse Management Area. In 1997, the BLM identified Yellow Creek as a high priority system. Due to the good condition of Yellow Creek and Stinking Springs it is recommended for ACEC status. Threats include oil and gas exploration that uses water for mineral extraction as this will affect the surface water and ground water aquifer. There are Controlled Surface Use (CSU) stipulations along Yellow Creek. This means that BLM recognizes that there are specific resource concerns that may be mitigated and if not, the permitted use may not be granted.

Management Urgency Rank Comments (M2): The Proper Functioning Condition report from BLM on Yellow Creek states that many reaches were either non-functioning or functioning at risk due to livestock impacts. The most visible impact are the non-native plants present: tamarisk (*Tamarix ramosissima*), wierner leaf (*Halogeton glomeratus*), and mullein (*Verbascum thapsus*), especially in areas of disturbance such as Lambert Spring. Additionally, bank erosion and sedimentation are evident throughout the site. Wild horse impacts are also contributing to the

degradation of stream banks.

Exotic Species Comments: Non-native plants include tamarisk (*Tamarix ramosissima*), wierner leaf (*Halogeton glomeratus*), and mullein (*Verbascum thapsus*). These are especially prevalent in areas of disturbance.

Version Author: Culver, D.R.
Version Date: 01/21/2008



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Map Date: 01/25/2008

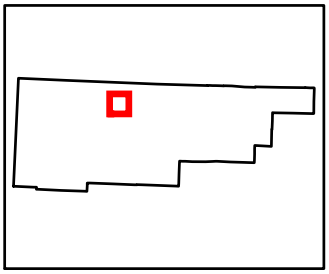
Legend

PCA Boundary

Rangely, 40108-A1

30x60 Minute Digital Raster Graphic produced by the U.S. Geological Survey

Location in Rio Blanco County



Map 30. Yellow Creek Potential Conservation Area, B3: High Biodiversity Significance

NATURAL HISTORY INFORMATION FOR PLANT COMMUNITIES ASSOCIATED WITH POTENTIAL CONSERVATION AREAS IN RIO BLANCO COUNTY

Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Abies lasiocarpa / Alnus incana* Forest
State Common Name Montane Riparian Forests

Global Scientific Name: *Abies lasiocarpa / Alnus incana* Forest
Global Common Name: Subalpine Fir / Speckled Alder Forest

Community Classification

System:	International Vegetation Classification
Class:	Forest
Subclass:	Evergreen forest
Group:	Temperate or subpolar needle-leaved evergreen forest
Subgroup:	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest
Formation:	Seasonally flooded temperate or subpolar needle-leaved evergreen forest
Alliance:	Subalpine Fir Seasonally Flooded Forest Alliance

Global Rank: G5
Global Rank Reasons: This plant community occurs in Colorado, Idaho, Nevada, Utah, and Wyoming. It is apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.

Subnational Rank: S5
Subnational Rank Reasons: This is a common community on streams above 8,000 ft (2,745 m) in elevation. Though less common, it also occurs between 7,000 (2,134 m) and 8,000 ft. There are over 1,000 miles of this type on Colorado's upper montane streams.

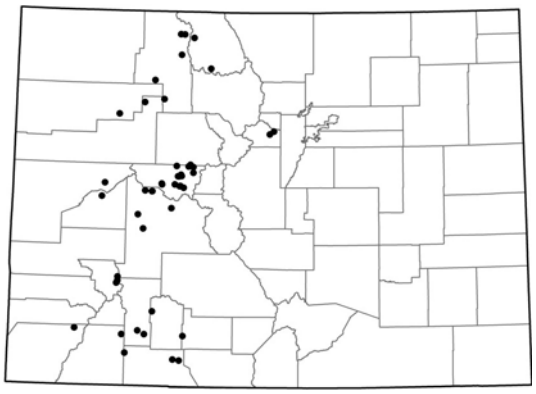
General Description: Occurs on heavily forested stream reaches where *Abies lasiocarpa - Picea engelmannii* (subalpine fir-Engelmann spruce) forests also occur on adjacent hillslopes. Tall *Alnus incana* (thinleaf alder) and *Salix drummondiana* (Drummond willow) grow in a thick band along the edge of the stream. At lower elevations, *Alnus incana* is more abundant than *Salix drummondiana*. At mid-elevations, the two shrubs can be codominant. At higher elevations, *Salix drummondiana* becomes dominant and *Alnus incana* drops out, forming the *Abies lasiocarpa - Picea engelmannii / Salix drummondiana* plant association. This is a common community on first- and second-order streams above 8,000 ft in elevation. It is generally found on stream benches and banks in narrow, 150-800 ft (40-250 m) wide, V-shaped valleys. Most commonly occurs within 15-20 ft (5-6 m) of the channel edge and is rarely more than 2 ft (0.5 m) above the stream bank.

Stream channels are narrow and steep, moderately wide with a moderate gradient or wide and very sinuous.

Vegetation: *Picea engelmannii* (Engelmann spruce) and/or *Abies lasiocarpa* (subalpine fir) dominates the upper canopy, with *Picea engelmannii* present more often that *Abies lasiocarpa.* Other tree species such as *Picea pungens* (blue spruce), *Pinus contorta* (lodgepole pine), and *Populus tremuloides* (quaking aspen) are occasionally present. *Alnus incana* (thinleaf alder) is always present in the shrub canopy layer, and other shrubs are often present as well. The herbaceous undergrowth is usually rich in forb species, with an overall herbaceous cover of 20-70%.

Similar Communities: Closely related communities include the *Abies lasiocarpa* / *Alnus incana* - *Cornus sericea* (subalpine fir/thinleaf alder-redosier dogwood) plant association (Kettler and McMullen 1996), the Conifer / *Cornus sericea* (conifer/redosier dogwood) community type (Padgett *et al*. 1989, Manning and Padgett 1995), and the *Picea* / *Cornus stolonifera* (spruce/redosier dogwood) community type (Youngblood *et al.* 1985a). Note that *Cornus stolonifera* is a synonym for *Cornus sericea* (Kartesz 1994). These communities have significant cover of *Cornus sericea* (redosier dogwood) and very little *Alnus incana* (thinleaf alder). They are considered phases of the *Abies lasiocarpa* - *Picea engelmannii* / *Alnus incana* (subalpine fir-Engelmann spruce/thinleaf alder) association.

Regional Distribution: This plant association occurs in Nevada (Manning and Padgett 1995), Utah (Padgett et. al. 1989), eastern Idaho, western Wyoming (Youngblood et al. 1985a), and the southern Rocky Mountains in Colorado (CONHP 1997). In Colorado, this association occurs in the Yampa, San Miguel/Dolores (Kittel and Lederer 1993), Gunnison (Kittel et al. 1995), Colorado (Kittel et al. 1994), and South Platte river basins (Kittel et al. 1996), the San Juan, Rio Grande and Routt national forests (Kettler and McMullen 1996, Richard et al. 1996), and Rocky Mountain National Park (Baker 1989b).



Colorado Distribution: There are over 1,000 miles of this type on Colorado's upper montane streams.

Elevation Range in Colorado: 7,200.00 - 10,300.00 ft / 2,194.56 - 3,139.44 m

Site Geomorphology: This plant association generally occurs in narrow, 150-800 ft (45-245 m), V-shaped valleys on stream benches and banks. It usually occurs within 15-20 ft (5-6 m) of the channel edge and is rarely more than 2 ft (0.5 m) above the streambank. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are narrow and steep (Rosgen's Channel Type: A2, A3, A4), moderately wide with a moderate gradient (Rosgen's Channel Type: B1-B6) or wide and very sinuous (C2, C3, C4).

Soil: Soils are shallow, dark-colored, thin layers of loamy sands, silty loams, and sandy clay loams over cobbly alluvium. There is generally a high organic matter content in the top 20 inches (50 cm) and mottles at 40 inches (100 cm), becoming skeletal at 60 inches (150 cm).

Successional and Ecological Processes: This association appears to be a late-seral, or at least a long-lived, riparian community that may represent a successional change from deciduous-dominated overstory to a conifer-dominated overstory at lower elevations, a shift which may be attributed to a lack of flooding or other frequent disturbance. The successional process of the sprucefir forest is slow (200 + years); factors such as fire frequency, wind-throw and insect attack can affect the composition and age structure of *Abies lasiocarpa* and *Picea engelmannii* stands.

Adjacent Vegetation: Adjacent Riparian Vegetation: this plant association generally is the only riparian association along a stream. Adjacent riparian associations can include *Abies lasiocarpa - Picea engelmannii* (subalpine fir - Engelmann spruce) forests or *Populus angustifolia - Picea pungens* (narrowleaf cottonwood - blue spruce) forests along wider floodplains. Adjacent shrub-dominated associations include *Alnus incana* (thinleaf alder), *Salix boothii* (Booth's willow), *S. geyeriana* (Geyer's willow), or *S. planifolia* (planeleaf willow) shrublands. *Calamagrostis canadensis* (bluejoint reedgrass) and *Carex aquatilis* (water sedge) meadows can also occur in adjacent riparian areas. Adjacent Upland Vegetation: *Picea engelmannii* (Engelmann spruce), *Abies lasiocarpa* (subalpine fir), *Picea pungens* (blue spruce), and *Populus tremuloides* (quaking aspen) forests occur on adjacent hillsides, usually intergrading with the riparian canopy.

Management: The dense shrub layer of the *Abies lasiocarpa - Picea engelmannii / Alnus incana* (subalpine fir - Engelmann spruce / thinleaf alder) plant association may limit livestock access (Manning and Padgett 1995). *Alnus incana* is not particularly palatable to livestock, but can be damaged as animals search for more palatable forb species (Hansen *et al.* 1995). *Alnus incana* (thinleaf alder) is an excellent streambank stabilizer due to its rhizomatous roots. Young stands can re-sprout after flood damage or fire and can tolerate a short duration of standing water. This plant association is sensitive to timber harvesting activities due to high soil moisture content. Timber activity is best restricted to the driest sites. Timber productivity is fairly low. Management usually considers *Picea engelmannii* (Engelmann spruce) the most productive species. However, consideration must be given to the uneven-aged structure and the inability of *Picea* (spruce) to regenerate without providing protection for seedling survival. Small clearcuts, shelterwood, or group or individual tree selection methods can be designed to prevent seedling mortality from frost, desiccation from winter winds, sunscald, and soil movement (Youngblood and Mauk 1985). This type is poorly suited for roads, trails, or other developments. Protection of water resources is a major consideration for any management activity (TNC 1992).

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Abies lasiocarpa / Mertensia ciliata* Forest
State Common Name Montane Riparian Forests

Global Scientific Name: *Abies lasiocarpa / Mertensia ciliata* Forest
Global Common Name: Subalpine Fir / Mountain Bluebells Forest

Community Classification

System:	International Vegetation Classification
Class:	Forest
Subclass:	Evergreen forest
Group:	Temperate or subpolar needle-leaved evergreen forest
Subgroup:	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest
Formation:	Temporarily flooded temperate or subpolar needle-leaved evergreen forest
Alliance:	Subalpine Fir Temporarily Flooded Forest Alliance

Global Rank: G5
Global Rank Reasons: This is a very common community on first- and second-order streams in the subalpine zone of all Rocky Mountain States.

Subnational Rank: S5
Subnational Rank Reasons: This community occurs in all mountain ranges and National Forests in Colorado, comprising approximately 2000+ miles in Colorado alone.

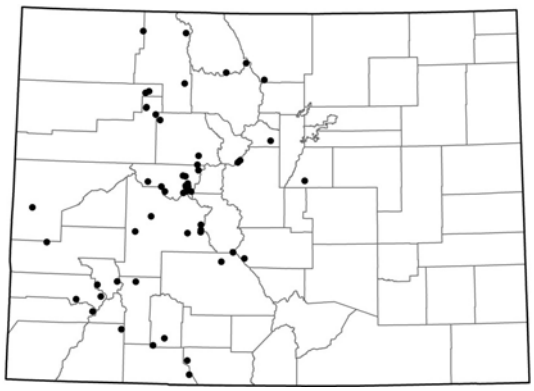
General Description: This association is a heavily shaded forest with no shrubs and a thick line of wildflowers lining the stream edge. It is a common community in the subalpine zone along first- and second-order streams. *Mertensia ciliata* (tall fringed bluebells) is nearly always present but can be absent. Other forbs consistently present include *Cardamine cordifolia* (heartleaf bittercress), *Saxifraga odontoloma* (brook saxifrage) and *Senecio triangularis* (arrowleaf ragwort). *Salix drummondiana* (Drummond willow), *Lonicera involucrata* (twinberry honeysuckle), and *Ribes* (currant) species can be present, but with less than 10% cover. At high levations, *Vaccinium myrtillus* (whortleberry), typically an upland species, can intergrade with this riparian plant association on the stream banks. This is a common plant association throughout the southern Rocky Mountains of Colorado and occurs in all mountain ranges and National Forests in Colorado, comprising approximately 2,000+ miles of stream habitat in Colorado alone. This association occurs in narrow to wide valleys, 35-350 feet (10-100 m) wide, and is

limited to the immediate stream channel edge and overflow areas. It usually establishes within 15 feet (5 m) of the channel and within 2 feet (0.5 m) of channel bankfull height. Typically this association occurs along steep (2-15% gradient), narrow streams, but can also be found along moderate gradient stretches.

Vegetation: Either *Picea engelmannii* (Engelmann spruce) or *Abies lasiocarpa* (subalpine fir) is present, although they are not always present together. The tree canopy can be very thick, completely overhanging the stream, or it can be quite open, with a wide gap over the stream. There is generally very little shrub cover. *Vaccinium myrtillus* (whortle-berry), can be abundant, but it was present in only a third of the stands sampled. Other shrub species that may be present include *Salix drummondiana* (Drummond willow), *S. planifolia* (planeleaf willow), *S. monticola* (mountain willow), *Alnus incana* (thinleaf alder), *Lonicera involucrata* (twinberry honeysuckle), and several *Ribes* (currant) species. The dense, mossy forb layer is the diagnostic part of this vegetation type. The forb layer is usually very narrow, often well under 3 ft (1 m) wide, clinging to and undulating with the side of the narrow stream channel. It is species-rich with 20-80% total combined forb cover. No single forb species is consistently present in every stand, however, a distinct suite of species is present in varying combinations.

Similar Communities: There are two closely related communities. The *Picea engelmannii - Abies lasiocarpa / Senecio triangularis* (Engelmann spruce-subalpine fir/arrowleaf groundsel) plant association (Hess 1981, Komarkova 1986) occurs on steep, wet hillsides, rather than in valley bottoms. The *Picea / Galium triflorum* (spruce/fragrant bedstraw) community type (Youngblood *et al.* 1985a) has *Picea pungens* (blue spruce), rather than *Abies lasiocarpa* (subalpine fir) and *Picea engelmannii* (Engelmann spruce), as the dominate overstory species.

Regional Distribution: This association is found from northern Colorado down to northern New Mexico.



Colorado Distribution: This is a common plant association throughout the southern Rocky Mountains of Colorado (Alexander 1981, Baker 1984, Boyce 1977, DeVelice *et al.* 1986, Dix 1974, Dix and Richards 1976, Johnston 1987, Kettler and McMullen 1996, Kittel and Lederer 1993, Kittel *et al*. 1994, Kittel *et al*. 1995, Peet 1981 [as cited in Baker 1989], Richard *et al*. 1996, Steen and Dix 1974 [as cited in Johnston 1987], Powell 1988).

Elevation Range in Colorado: 8,200.00 - 11,500.00 ft / 2,499.36 - 3,505.20 m

Site Geomorphology: This plant association occurs in narrow to wide valleys, 35-350 ft (10-100 m) wide, and is limited to the immediate stream channel edge and overflow areas. It usually establishes within 15 ft (5 m) of the channel and within 2 ft (0.5 m) of channel bankfull height. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Typically this association occurs along steep (2-15% gradient), narrow streams (Rosgen's Channel Type: A2-A6, G3), but can also be found

along moderate gradient stretches (Rosgen's Channel Type: B2-B6).

Soil: Soils range from a thin layer of skeletal sandy loams to somewhat deep, mottled loamy sands over colluvial boulders. Total soil depth is never more than 7 feet (2 m), and is typically less than 3 feet (1 m). Consistent to all profiles is a deep, dark brown color and high organic content.

Successional and Ecological Processes: Many first- and second-order streams run through subalpine spruce-fir forests providing habitats for obligate riparian shrubs, forbs, and grasses, forming a number of riparian *Abies lasiocarpa - Picea engelmannii* (subalpine fir - Engelmann spruce) plant associations. Although *Abies lasiocarpa* and *Picea engelmannii* are not obligate riparian species, the two species strongly influence subalpine riparian ecosystems.

Adjacent Vegetation: Adjacent Riparian Vegetation: this plant association commonly dominates the entire stream reach and is rarely part of a mosaic. However, adjacent riparian vegetation can include *Abies lasiocarpa - Picea engelmannii* (subalpine fir-Engelmann spruce) forests and *Alnus incana* (thinleaf alder) shrublands. Along steep, narrow streams adjacent to broader valleys, *Salix geyeriana* (Geyer's willow) and *Salix planifolia* (planeleaf willow) shrublands occur in adjacent riparian areas. Adjacent Upland Vegetation: the upland vegetation is *Abies lasiocarpa - Picea engelmannii* (subalpine fir-Engelmann spruce) and *Populus tremuloides* (quaking aspen) forests.

Management: Forage value of this plant association is minimal due to the limited understory. Soils may be easily compacted by livestock grazing along the wet, mossy streambanks (Hansen *et al.* 1995). This type is poorly suited for roads, trails, or other developments. Protection of water resources is a major consideration for any management activity (TNC 1992).

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Acer negundo - Populus angustifolia / Cornus sericea* Forest
State Common Name Narrowleaf Cottonwood Riparian Forests

Global Scientific Name: *Acer negundo - Populus angustifolia / Cornus sericea* Forest
Global Common Name: Box-elder - Narrowleaf Cottonwood / Red-osier Dogwood

Community Classification

System:	International Vegetation Classification
Class:	Forest
Subclass:	Deciduous forest
Group:	Cold-deciduous forest
Subgroup:	Natural/Semi-natural cold-deciduous forest
Formation:	Temporarily flooded cold-deciduous forest
Alliance:	Box-elder Temporarily Flooded Forest Alliance

Global Rank: G2
Global Rank Reasons: This association is a narrow regional endemic which is undergoing continued fragmentation and degradation throughout its range due to agricultural impacts and fluvial instability (Richter 1999). It is presently recorded only from northwestern Colorado in broad alluvial valleys from 6000-7000 feet elevation, and has significantly declined from historical distributions. It occurs along rivers in broad alluvial valleys at low elevation, where habitat degradation has been extensive. There are few occurrences in protected status, and the poor regeneration of dominant trees, habitat instability, and presence of non-native understory species within protected stands are sources of ongoing concern. The watershed processes necessary to maintain this association are strongly influenced by surrounding land use in the watershed and poorly controlled at present (Richter 1999).

Subnational Rank: S2
Subnational Rank Reasons: Only one large functioning example of this community occurs along the Yampa River. Several smaller (< 5 acres, 2 ha) stands have been documented in the White, Gunnison, San Juan watersheds.

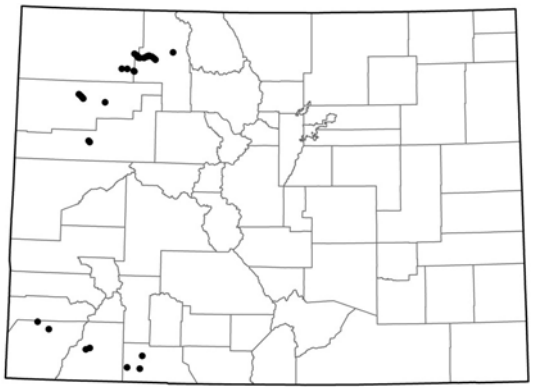
General Description: The *Acer negundo-Populus angustifolia / Cornus sericea* (box elder-narrowleaf / red-osier dogwood) plant association is a tall (12-25 ft, 4-8 m), multi-layered, deciduous riparian forest. It grows on broad alluvial floodplains with strongly meandering stream channels, where it can form extensive riparian forests. It can also occur as small stands on narrow streams at high elevations. This plant association occurs along moderately sinuous stream reaches within narrow valleys or broad alluvial floodplains. It occurs at 2-10 ft (0.5-2 m) above the bankfull channel level.

Stream channels are slightly meandering to strongly meandering.

Vegetation: This community is characterized by a tall gallery forest of *Populus angustifolia* (narrowleaf cottonwood) and a subcanopy of *Acer negundo* (boxelder). In most of the stands sampled, *Acer negundo* (boxelder) formed a subcanopy underneath the taller canopy of narrowleaf cottonwoods. However, patches of *Acer negundo* (boxelder) do occur on the floodplain without the cottonwood over-story as part of the overall mosaic of different aged stands. These are thought to be older stands where the cottonwood has died. *Juniperus scopulorum* (Rocky Mountain juniper), *Pseudotsuga menziesii* (Douglas-fir), and *Picea pungens* (blue spruce) are occasionally present in small amounts. Mesic shrubs form a dense and diverse mid-canopy layer. *Cornus sericea* (red-osier
dogwood) is the most abundant and dominant shrub. Other shrub species which may be present include *Alnus incana* (thinleaf alder), *Rosa woodsii* (Woods rose), *Acer glabrum* (Rocky Mountain maple), *Rhus trilobata* (skunkbush sumac), *Salix ligulifolia* (strapleaf willow), *Salix monticola* (mountain willow), *Salix boothii* (Booth willow), and *Salix lucida* ssp. *caudata* (shining willow). Forb and graminoid cover vary from low to abundant. Species include *Maianthemum racemosum* (feathery false Solomon seal), *Rudbeckia laciniata* var. *ampla* (cutleaf coneflower), and *Solidago gigantea* (giant goldenrod). In disturbed stands *Cirsium arvense* (Canada thistle), *Agrostis gigantea* (redtop), and *Taraxacum officinale* (dandelion) can occur.

Similar Communities: Closely related communities include the *Populus angustifolia* / *Cornus sericea* (narrowleaf cottonwood/redosier dogwood) community type (Padgett *et al*. 1989), which has an occasional and minor *Acer negundo* (boxelder) component, and the *Acer negundo* phase of a *Populus angustifolia* / *Amelanchier* spp. (narrowleaf cottonwood/serviceberry) habitat type (Hess and Wasser 1982).

Regional Distribution: This association is recorded from northwestern and southwestern Colorado in broad alluvial valleys from 6000-7000 feet elevation.



Colorado Distribution: The largest and best example of this association occurs on the Yampa River (Kittel and Lederer 1993, TNC 1996). Small, relict stands occur on the White and Colorado Rivers (Kittel *et al*. 1994) and on San Juan National Forest (Richard *et al*. 1996). Documented in 7counties in Colorado.

Elevation Range in Colorado: 5,700.00 - 7,700.00 ft / 1,737.36 - 2,346.96 m

Site Geomorphology: This plant association occurs along moderately sinuous stream channels within narrow valleys or broad alluvial floodplains. It occurs at 2-10 ft (0.5-2 m) in height above the bankfull channel level. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are slightly meandering (Rosgen's Channel Type: B2, B4, B5) to strongly meandering (Rosgen's Channel Type: C3, C4).

Soil: Soil textures range from loamy sand to silty clay loam with minimal skeletal fraction. Mottling may occur at about 20-25 inches (50-60 cm).

Successional and Ecological Processes: The *Acer negundo - Populus angustifolia / Cornus sericea* (boxelder - narrowleaf cottonwood/red-osier dogwood) plant association appears to be late-seral. This is evident from the mature *Populus angustifolia* trees and dense stands of *Cornus sericea* within the closed forest canopy. Young, early-seral stands of regenerating cottonwoods may be found on the inside bends of the channel and on point bars and lower terraces. Channel migration and meander movement may cut into the mature forest on the outside of meander bends, leaving the stands immediately adjacent to, yet potentially several meters above, the channel. Over time, the riparian communities can convert to upland plant associations.

Adjacent Vegetation: Adjacent Riparian Vegetation: younger stands of *Populus angustifolia* (narrowleaf cottonwood), *Salix exigua* (coyote willow), and *S. lucida* ssp. *lasiandra* (Pacific willow) shrublands; and *Typha* spp. (cattail), *Scirpus* spp. (bulrush) marshes occur in adjacent riparian areas. Adjacent Upland Vegetation: at lower elevations, mixed conifer - *Populus tremuloides* (mixed conifer-quaking aspen) forests; *Pinus edulis - Juniperus* spp. (two needle pinyon-juniper) woodlands; and *Quercus gambelii* (Gambel's oak) and *Artemisia tridentata* (big sagebrush) shrublands often occur an adjacent hill slopes. At higher elevations, mixed conifer - *Pseudotsuga menziesii* (mixed conifer-Douglas-fir) forests are present.

Management: Because the regeneration and establishment of new stands of *Populus angustifolia* (narrowleaf cottonwood) and *Acer negundo* (boxelder) are dependent upon flooding events, any alterations to the natural flow regime of a river can affect the *Populus angustifolia* ecosystem. Upstream dams stabilize stream flows by reducing the frequency and magnitude of floods. This results in fewer flood events that would allow for *Populus angustifolia* stand regeneration. Without periodic disturbance by flooding, riparian areas become dominated by late-seral communities. These late-seral communities are dominated by more upland species, such as conifers in montane areas or other, more drought tolerant species in the foothill and plains environments. Riparian forage can be very productive and palatable to livestock. *Populus angustifolia* (narrowleaf cottonwood) seedlings and saplings are frequently browsed by cattle. *Cornus sericea* (redosier dogwood) is considered a palatable, preferred browse species for livestock and wildlife. Excessive grazing and browsing will reduce plant vigor and allow less palatable, non-native plant species to gain a competitive advantage. Riparian areas in Colorado dominated by *Populus angustifolia* are best grazed moderately for short periods during the growing season or solely during the winter season. This maintains high forage quality and quantity. *Cornus sericea* (redosier dogwood) provides good streambank stability due to its rhizomatous growth. *Acer negundo* (boxelder) is not rhizomatous, but has strong roots that also provide streambank stability (Padgett *et al*. 1989). Grazing can severely damage standing trees and reduce the success of *Acer negundo* reproduction. Female trees of the dioecious *Acer negundo* are better adapted to growing along the channel edge and are recommended over male trees used for restoration of disturbed streambanks (Dawson and Ehleringer 1993).

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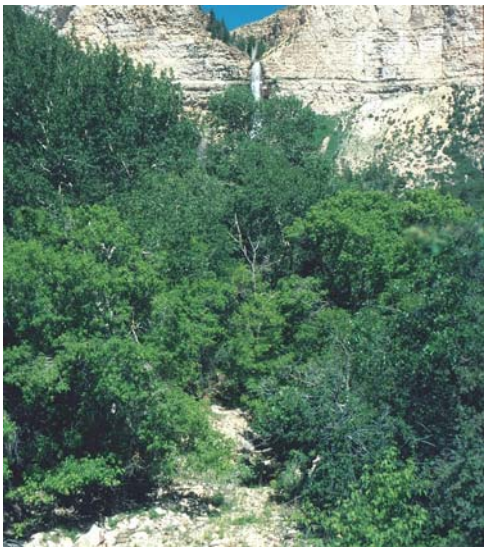
Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Acer negundo / Prunus virginiana* Forest
State Common Name Montane Riparian Deciduous Forest
Global Scientific Name: *Acer negundo / Prunus virginiana* Forest
Global Common Name: Box-elder / Choke Cherry Forest

Community Classification

System:	International Vegetation Classification
Class:	Forest
Subclass:	Deciduous forest
Group:	Cold-deciduous forest
Subgroup:	Natural/Semi-natural cold-deciduous forest
Formation:	Temporarily flooded cold-deciduous forest
Alliance:	Box-elder Temporarily Flooded Forest Alliance



Global Rank: G3
Global Rank Reasons: Fewer than two-hundred stands are known globally and is threatened throughout its range.

Subnational Rank: S2
Subnational Rank Reasons: This association is limited to Colorado Western Slope streams in arid climates. It is highly threatened by stream alterations, heavy recreational use, and long-term grazing.

General Description: The *Acer negundo/Cornus sericea* (boxelder/red-osier dogwood) plant association is a medium-tall (5-15 ft, 1.5-4.5 m) deciduous forest. It flourishes in narrow, shady canyons, often with a controlled stream flow and is known from lower montane canyons in Utah and western Colorado. This plant association occurs within narrow, 40 ft (12 m) wide, box canyons about 10 ft (2-3 m) above the channel bankfull level. Stream channels are steep and narrow or moderately wide and sinuous.

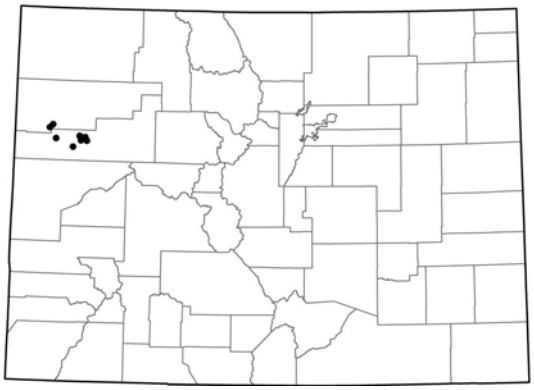
Vegetation: *Acer negundo* (boxelder) dominates the overstory with 15-70% cover. The shrub layer is dense and diverse with *Cornus sericea* (red-osier dogwood) (40-60% cover) as the dominant shrub. Other shrub species (present with 50% or less frequency) include *Ribes inerme* (whitestem gooseberry), *Alnus incana* ssp. *tenuifolia* (thinleaf alder), *Acer glabrum* (Rocky Mountain maple), *Salix exigua* (sandbar willow), *Quercus gambelii* (Gambel oak), *Rubus idaeus* (American red raspberry), and *Salix irrorata* (bluestem

willow). Forb and graminoid species include *Heracleum maximum* (common cowparsnip), *Geranium richardsonii* (Richardson geranium), *Actaea rubra* (red baneberry), and *Mertensia franciscana* (Franciscan bluebells).

Similar Communities: -

Regional Distribution: This riparian forest grows on broad alluvial floodplains at warm elevations in the western and northern Great Plains of the United States, ranging from Colorado to Montana.

Colorado Distribution: This association occurs in the White and Colorado River Basins (Kittel *et al*. 1994).



Elevation Range in Colorado: 6,800.00 - 7,700.00 ft / 2,072.64 - 2,346.96 m

Site Geomorphology: This association occurs on moderately wide, flat valley bottoms. It can also occur on colluvial deposits and narrow, confined terraces where the stream channel has been downcut. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels were mostly straight, narrow and steep (Rosgen's Channel Type: A2, A3), some channels are wider and slightly sinuous (Rosgen's Channel Type: B2, B3), one channel is very steep and entrenched (Rosgen's Channel Type: G3).

Soil: The soils of Colorado River basin stands classify as fragmental ustic Torrifluvents to clayey ardic Ustorthents. On terraces, the soils classify as pachic Haplustolls to loamy calcareous Torrifluvents.

Successional and Ecological Processes: *Acer negundo* (boxelder) may be a riparian climax type, unless the site becomes too dry due to channel migration and downcutting. This association appears to flourish in narrow canyons with natural flood regimes or altered flows (e.g., Black Canyon of the Gunnison). With scouring floods, *Acer negundo* may survive only if it grows on upper colluvial slopes. This may provide a seed source for regeneration after flooding and deposition.

Adjacent Vegetation: Adjacent Riparian Vegetation: stands of *Populus angustifolia* (narrowleaf cottonwood) occur in adjacent riparian areas. Adjacent Upland Vegetation: *Quercus gambelii* (Gambel's oak) and *Pseudotsuga menziesii* (Douglas-fir) forests; and *Amelanchier utahensis* (Utah serviceberry) and *Artemisia tridentata* (big sagebrush) shrublands occur on the uplands.

Management: Grazing can severely damage standing *Acer negundo* (boxelder) trees and reduce their reproductive success. Thick stands of *Prunus virginiana* (common chokecherry) may preclude use by livestock (Hansen *et al.* 1989), while open stands may provide adequate grazing opportunities. Hansen *et al*. (1989) suggest that with moderate grazing, the canopy may open up and less palatable species, such as *Rosa woodsii* (Woods' rose) and *Crataegus* (hawthorn) species, will invade. With excessive browsing,

shrub densities may be reduced altogether. Season-long grazing can also increase the abundance and vigor of non-native grasses. *Prunus virginiana* provides low quality forage for livestock and eating excessive amounts of the leaves can be fatal (Hansen *et al.* 1995). Normally, livestock do not eat fatal quantities, except when other forage is scarce (Wasser 1982, Johnson and Nichols 1982). *Prunus virginiana* (common chokecherry) provides thermal cover for fish, livestock, large mammals and upland birds as well as providing fruit for birds and mammals. It is a relatively fire-resistant shrub and will vigorously sprout from surviving root crowns after a fire. This shrub can be used in controlling erosion along streambanks (Hansen *et al*. 1995). Female trees of the dioecious *Acer negundo* (boxelder) are better adapted to growing along the channel edge and are recommended over male trees for restoration of disturbed streambanks (Dawson and Ehleringer 1993). *Acer negundo* is not rhizomatous, but has strong roots that provide streambank stability (Padgett *et al*. 1989).

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Alnus incana - Salix (monticola, lucida, ligulifolia)* Shrubland
State Common Name Thinleaf Alder-Mixed Willow Species
Global Scientific Name: *Alnus incana - Salix (monticola, lucida, ligulifolia)* Shrubland
Global Common Name: Speckled Alder - (Mountain Willow, Whiplash Willow, Strapleaf Willow) Shrubland

Community Classification

System:	International Vegetation Classification
Class:	Shrubland
Subclass:	Deciduous shrubland
Group:	Cold-deciduous shrubland
Subgroup:	Natural/Semi-natural cold-deciduous shrubland
Formation:	Seasonally flooded cold-deciduous shrubland
Alliance:	Speckled Alder Seasonally Flooded Shrubland Alliance

Global Rank: G3
Global Rank Reasons: The association is widespread in the mountains of Colorado and expected to occur in New Mexico and possibly Wyoming. There are over 20 documented occurrences and, since the biophysical setting is not uncommon, at least another 15 are estimated. High-quality sites require a natural hydrologic regime, as *Alnus incana* is one of the first species to establish on fluvial or glacial deposits as well as the spoils of placer mining, and young stands require continual flooding. While these shrubs are not particularly palatable to livestock, grazing may lead to physical degradation of shrubs, and assist the establishment of exotics and weedy species. Roads, mining, logging, and development introduce exotic species and provide conditions for their establishment.

Subnational Rank: S3
Subnational Rank Reasons: This association is known from throughout the Colorado Western Slope and in the mountains of the Colorado Front Range. Threats include altered hydrologic regime, livestock grazing, exotic weeds, and habitat alterations.

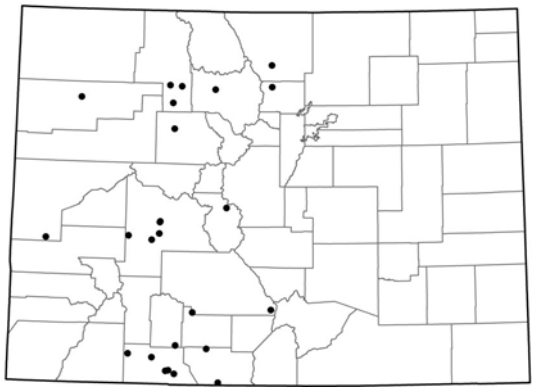
General Description: The *Alnus incana/Salix (monticola, lucida, ligulifolia)* (thinleaf alder/mixed willow species) plant association is a more general type than other *Alnus incana* types. It has a high diversity of associated shrub species, unlike the nearly pure stands of alder found in other *Alnus incana* dominated plant associations. The abundance of other shrubs may represent a transition in the physical setting, for example, from a broad floodplain dominated by *Salix* to a narrow valley bottom and channel lined with only *Alnus incana* (thinleaf alder). This association occurs along

narrow, moderately steep streams (30-65 ft (10-20 m) wide with a gradient of 3-10%) and in moderately wide to wide river valleys on cobble point bars, islands, flat alluvial benches, and large alluvial floodplains. Stream channels are steep and narrow, moderately steep and wide, or wide and sinuous.

Vegetation: This plant association is characterized by the dominance of *Alnus incana* (thinleaf alder). There is considerable variation of associated shrub species in the stands. Several willow species are often present, but no single willow species consistently occurred in all stands. Other shrubs frequently present include *Salix lucida* (ssp. *caudata* or ssp. *lasiandra*) (shining willow), *S. monticola* (mountain willow), *S. drummondiana* (Drummond willow), *S. bebbiana* (Bebb willow), *S. exigua* (sandbar willow), *S. geyeriana* (Geyer willow), *S. ligulifolia* (strapleaf willow), *Acer glabrum* (Rocky Mountain maple), and *Amelanchier utahensis* (Utah serviceberry). Tree cover is sparse, but can include *Picea pungens* (blue spruce), *Populus tremuloides* (quaking aspen), *P. angustifolia* (narrowleaf cottonwood) and *Picea engelmannii* (Engelmann spruce). The herbaceous undergrowth is varied with 10-90% total cover. Native herbaceous species include *Equisetum arvense* (field horsetail), *Heracleum maximum* (common cowparsnip), *Rudbeckia laciniata* var. *ampla* (cutleaf coneflower), *Mertensia ciliata* (tall fringed bluebells), *Calamagrostis canadensis* (bluejoint reedgrass), *Cardamine cordifolia* (heartleaf bittercress) and *Carex utriculata* (beaked sedge). Introduced species include *Trifolium repens* (white clover), *Taraxacum officinale* (dandelion) and *Poa pratensis* (Kentucky bluegrass)

Similar Communities: Two closely related communities are the *Alnus incana* / Bench (thinleaf alder/bench) community type (Manning and Padgett 1995), which has a wide variety of co-dominant shrubs including *Salix* spp. (willow), and the *Alnus incana* / *Equisetum arvense* (thinleaf alder/field horsetail) community type (Padgett *et al.* 1989, Komarkova 1986, Hess 1981), which also has a wide variety of co-dominant shrub species.

Regional Distribution: The association is documented throughout the mid-elevations of the Southern Rocky Mountains in Colorado and is expected to occur in New Mexico and Wyoming, but is currently undocumented there.



Colorado Distribution: This association occurs in the Yampa (Kittel and Lederer 1993), White, Colorado (Kittel *et al*. 1994), Gunnison (Kittel *et al*. 1995), Arkansas, and Rio Grande and Closed Basin Watersheds (Kittel et al. 1999b), and the San Juan National Forest (Richard *et al*. 1996).

Elevation Range in Colorado: 5,820.00 - 9,260.00 ft / 1,773.94 - 2,822.45 m

Site Geomorphology: This association occurs along narrow (33-66 ft, 10-20 m), moderately steep (3-10%) streams, and in moderately wide to wide river valleys on cobble point bars, islands, flat alluvial benches, and large alluvial floodplains. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are steep and narrow (Rosgen's Channel Type: A3), moderately steep

and wide (Rosgen's Channel Type: B3, B4, B6), or wide and sinuous (Rosgen's Channel Type: C3, C4).

Soil: Soils are poorly developed with loamy sands, sand, sandy loams, and silt loams over coarse alluvium.

Successional and Ecological Processes: -

Adjacent Vegetation: Two closely related communities are the *Alnus incana* / bench (thinleaf alder/bench) community type (Manning and Padgett 1995), which has a wide variety of co-dominant shrubs including *Salix* spp. (willow), and the *Alnus incana* / *Equisetum arvense* (thinleaf alder/field horsetail) community type (Padgett *et al.* 1989, Komarkova 1986, Hess 1981), which also has a wide variety of co-dominant shrub species.

Management: Dense stands of *Alnus incana* (thinleaf alder) hinder livestock access. *Alnus incana* is not particularly palatable to livestock, but can be trampled as animals search for more palatable species (Hansen *et al*. 1995). Most *Salix* (willow) species are highly palatable to livestock, large mammals, and beaver. Open stands may provide moderate forage and shade in the summer (Hansen *et al*. 1995). According to Hansen *et al*. (1995), most fires destroy *Alnus incana* (thinleaf alder) dominated stands, resulting in a sparse herbaceous understory and bank destabilization due to root death. *Alnus incana* sprouts quickly when cut at 4-5 year intervals and can be used as pole plantings for restabilizing streambanks. Cutting in spring and winter results in rapid sprouts. Cutting in the summer results in fewer, slow-growing sprouts (Hansen *et al*. 1995).

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Alnus incana* / Mesic Forbs Shrubland
State Common Name Thinleaf Alder/Mesic Forb Riparian Shrubland
Global Scientific Name: *Alnus incana* / Mesic Forbs Shrubland
Global Common Name: Speckled Alder / Mesic Forbs Shrubland

Community Classification

System:	International Vegetation Classification
Class:	Shrubland
Subclass:	Deciduous shrubland
Group:	Cold-deciduous shrubland
Subgroup:	Natural/Semi-natural cold-deciduous shrubland
Formation:	Temporarily flooded cold-deciduous shrubland
Alliance:	Speckled Alder Temporarily Flooded Shrubland Alliance

Global Rank: G3
Global Rank Reasons: This association has a wide range, but stands of this riparian shrubland association are restricted to small patches less than 10 acres in size. High-quality examples of this association without non-native species are uncommon as most stands are within watersheds with numerous threats including livestock grazing, logging, recreational activities, hydrologic modifications, and road building. Recent classification work in Washington and Oregon indicates that this association does not occur in those states. The rank is changed from G3G4 to G3 as the range of the association is not as widespread as it was originally considered.

Subnational Rank: S3
Subnational Rank Reasons: There are over 50 documented occurrences of this plant association in Colorado. However, none are very large and only one or two are in pristine condition. All stands are highly threatened by improper livestock grazing, stream flow alterations, road and railroad improvements and maintenance and heavy recreational use.

General Description: This association is characterized by stands of medium-tall, deciduous shrubs and a thick, herbaceous undergrowth of forbs and wetland grasses. A low canopy of shorter shrubs may also be present with *Ribes* (currant) and *Salix* (willow) species and *Cornus sericea* (red-osier dogwood). Undisturbed stands have abundant forbs and native grasses. Stands disturbed by season-long livestock grazing have

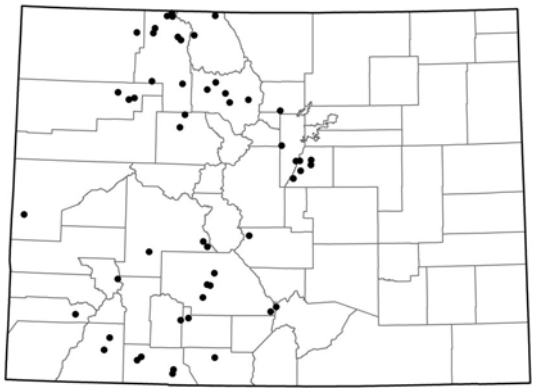
reduced forb cover and an increase in non-native grasses including *Poa pratensis* (Kentucky bluegrass) and *Agrostis stolonifera* (creeping bentgrass). Large stands (>0.5 acre, 0.2 ha) with the native herbaceous undergrowth intact are uncommon. This plant association occurs along narrow, 130-230 ft (40-70 m) wide, alluvial benches and terraces of canyons and valleys. It also occurs as narrow bands in wider valleys and occasionally forms a wide band on the floodplain. Stream channels are highly variable. They can be steep (3-12%) gradient and narrow or wider, rocky, and moderately sinuous. Occasionally, stream channels are low gradient and highly sinuous, narrow and highly sinuous, or braided.

Vegetation: *Alnus incana* (thinleaf alder) creates a dense, tall shrub canopy. Other shrubs occasionally present include *Lonicera involucrata* (twinberry honeysuckle), *Ribes inerme* (whitestem gooseberry), *R. montigenum* (gooseberry currant) *Rosa woodsii* (Woods rose), *Salix bebbiana* (Bebb willow), *S. drummondiana* (Drummond willow), *S. geyeriana* (Geyer willow), *S. lucida* ssp. *caudata* (shining willow) and *S .monticola* (mountain willow). A few trees, including *Picea engelmannii* (Engelmann spruce), *Populus tremuloides* (quaking aspen), and *Populus angustifolia* (narrowleaf cottonwood) may be present along the edges of the stand. The ground is generally very wet and covered with tall, 3-7 ft (1-2 m), forbs and graminoids. Forb cover is high in undisturbed stands, with total cover often exceeding 60%. Dominant forb species include *Heracleum maximum* (common cowparsnip), *Angelica ampla* (giant angelica), *Aconitum columbianum* (Columbian monkshood), *Mertensia ciliata* (tall fringed bluebells), *Rudbeckia laciniata* var. *ampla* (cutleaf coneflower), *Viola canadensis* var. *scopulorum* (Canada white violet) and *Streptopus amplexifolius* (claspleaf twistedstalk). Graminoid species include *Glyceria striata* (fowl mannagrass), *Calamagrostis canadensis* (bluejoint reedgrass), *Carex microptera* (smallwing sedge), and *C. utriculata* (beaked sedge) A dense ground cover also includes *Equisetum arvense* (field horsetail), *Equisetum hyemale* (scouringrush horsetail) and *Equisetum pratense* (meadow horsetail).

Similar Communities: Closely related communities include the *Alnus incana* / *Rudbeckia laciniata* (thinleaf alder/cutleaf coneflower) association (Cooper and Cottrell 1990), the *Alnus incana* - *Betula fontinalis*/*Salix* spp. (thinleaf alder-water birch/willow) and *Alnus incana* - *Salix drummondiana* / *Equisetum arvense* (thinleaf alder-Drummond's willow/field horsetail) plant associations (Johnston 1987). *Alnus tenuifolia* (thinleaf alder) dominates closely related communities in Alaska (Viereck *et al.* 1992) that grow in very wet, swampy areas with an understory of *Calamagrostis canadensis* (bluejoint reedgrass) and *Equisetum* spp. (horsetail). *Alnus tenuifolia* and *Betula fontinalis* are synonyms for *Alnus incana* ssp. *tenuifolia* and *Betula occidentalis*, respectively (Kartesz 1994).

Regional Distribution: The plant association is a minor type in Montana, Idaho, Nevada, Utah, and Colorado.

Colorado Distribution: This association occurs throughout the Rocky Mountains of Colorado (Carsey et al. 2003, Cooper and Cottrell 1990, Johnston 1987)



Elevation Range in Colorado: 5,800.00 - 9,600.00 ft / 1,767.84 - 2,926.08 m

Site Geomorphology: This plant association occurs along narrow, alluvial benches and terraces of canyons and valleys that are 130-230 ft (40-70 m) wide. It also occurs as narrow bands in wider valleys that are greater than 400 ft (120 m) wide, and occasionally forms a wide band on the floodplain. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are highly variable. They can be steep (3-12%) gradient and narrow (Rosgen's Channel Type: A3, A4, A6, G4) or wider, rocky and moderately sinuous (Rosgen's Channel Type: B2, B3, B4, B5). Occasionally, stream channels are low gradient and highly sinuous (Rosgen's Channel Type: C3, C4), narrow and highly sinuous (Rosgen's Channel Type: E3), or braided (Rosgen's Channel Type: D5).

Soil: Soils are well drained silt loams, loams, sandy clay loams, sandy loams, or just sand. Some profiles have a high percentage of organic matter and are either skeletal or stratified with skeletal layers. Some profiles have significant silt fractions in the upper layers.

Successional and Ecological Processes: *Alnus incana* (thinleaf alder) is a long-lived, early-seral species. It is one of the first species to establish on fluvial or glacial deposits as well as the spoils of placer mining. After establishment, young stands of *Alnus incana* are continually flooded. As stands mature, the stems can slow flood waters and trap sediment. Fine textured sediments accumulate on top of the coarser alluvial material and the land surface eventually rises above annual flood levels. Flooding is then less frequent and soils begin to develop.

Adjacent Vegetation: Adjacent Riparian Vegetation: *Abies lasiocarpa - Picea engelmannii* (subalpine fir-Engelmann spruce) forests occur along narrow channels and on higher ground above streambanks and floodplains. *Populus angustifolia* (narrowleaf cottonwood) and mixed *Populus angustifolia* - conifer (narrowleaf cottonwood - conifer) forests occur along wide channels. *Salix boothii* (Booth's willow), *S. drummondiana* (Drummond's willow), *S. exigua* (coyote willow), and *S. monticola* (mountain willow) shrublands occur on streambanks and floodplains. *Calamagrostis canadensis* (bluejoint reedgrass) and *Carex utriculata* (Northwest Territory sedge) meadows may also occur in low-lying swales on adjacent floodplains. Adjacent Upland Vegetation: at higher elevations, *Abies lasiocarpa - Picea engelmannii* (subalpine fir-Engelmann spruce) forests and *Populus tremuloides* (quaking aspen) woodlands occur on adjacent hillslopes. At lower elevations, open woodlands of *Pinus ponderosa* (ponderosa pine) and *Juniperus osteosperma* (Utah juniper) or *J. monosperma* (oneseed juniper) occur on south-facing

slopes, while thick forests of *Pseudotsuga menziesii* (Douglas-fir) and *Pinus contorta* (lodgepole pine) occur on north-facing slopes.

Management: The *Alnus incana* / Mesic Forbs (thinleaf alder / mesic forbs) plant association is a relatively long-lived, stable community, but can change in response to the impacts of improper livestock grazing. Dense stands of *Alnus incana* (thinleaf alder) may hinder livestock access. *Alnus incana* is not particularly palatable to livestock, but can be trampled as animals search for more palatable forb species (Hansen *et al*. 1995). Season-long grazing reduces the native forb cover and allows non-native, invasive grasses to increase. This can convert the site to an *Alnus incana* / Mesic Graminoids (thinleaf alder/mesic graminoids) community. With rotation and rest, this type may be reverted back to the *Alnus incana* / Mesic Forbs plant association (Padgett *et al.* 1989, Hansen *et al.* 1995). In general, a site is considered in excellent condition and well managed if the undergrowth is dominated by native forbs, with less than 5% non-native species, and likely subjected to improper grazing if the undergrowth is dominated by non-native, invasive species. Most fires destroy *Alnus incana* (thinleaf alder) dominated stands, resulting in a sparse herbaceous understory and bank destabilization due to root death. *Alnus incana* sprouts quickly when cut at 4-5 year intervals and can be used as pole plantings for restabilizing streambanks. Cutting in spring and winter results in rapidly growing sprouts. Cutting in the summer results in fewer, slow-growing sprouts (Hansen *et al*. 1995).

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Artemisia tridentata* ssp. *tridentata / Leymus cinereus* Shrubland
State Common Name Sagebrush Bottomland Shrublands

Global Scientific Name: *Artemisia tridentata* ssp. *tridentata / Leymus cinereus* Shrubland
Global Common Name: Basin Big Sagebrush / Great Basin Lyme Grass

Community Classification

System:	International Vegetation Classification
Class:	Shrubland
Subclass:	Evergreen shrubland
Group:	Microphyllous evergreen shrubland
Subgroup:	Natural/Semi-natural microphyllous evergreen shrubland
Formation:	Lowland microphyllous evergreen shrubland
Alliance:	(Basin Big Sagebrush, Foothill Big Sagebrush) Shrubland Alliance

Global Rank: G2
Global Rank Reasons: This plant association was formerly widespread in the western United States and is rare due to habitat loss and degradation of stands. The association is believed to be extirpated in Washington. In other western states high-quality examples are of rare occurrence and most stands are small and fragmented. Livestock use has reduced the quality of stands and continues to threaten remaining occurrences. Agricultural conversion has also eliminated habitat previously occupied by the association. Exotic species, including *Poa pratensis* or *Bromus tectorum*, may become locally dominant, nearly replacing the diagnostic graminoid.

Subnational Rank: S1
Subnational Rank Reasons: Small occurrences, many are fragmented and of poorer quality. Threatened by livestock, agriculture activities and exotic species. Incision of smaller streams and intermittent drainages throughout the West also has affected this association by dropping the water table and causing stands to dry out to the point that they will no longer support *Leymus cinereus*.

General Description: This association occurs throughout Colorado, in every major watershed without exception. *Salix exigua* (sandbar willow) is one of the most common willow species in Colorado and occurs as a dominant in two associations, the *Salix exigua*/mesic graminoid and the *Salix exigua*/barren ground. These are easy to recognize as they are nearly pure stands of the willow, with few other species present. An undergrowth of a few, widely scattered forbs and grasses, where exposed cobbles or sand characterizes the ground cover, constitutes the *Salix exigua*/barren ground

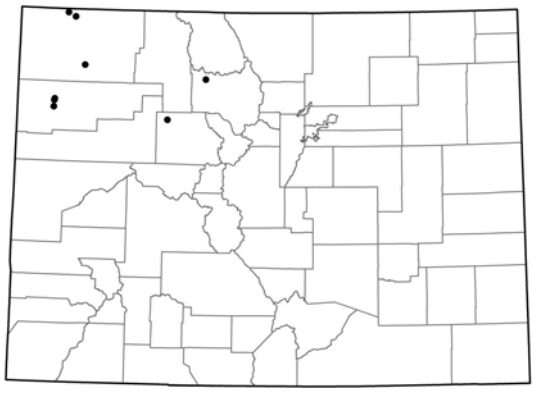
association, while an undergrowth of dense grasses and forbs covering at least 30% of the ground falls into the mesic graminoid type. *Salix exigua*/barren ground association occurs within the annual flood zone of a river on point bars, islands, sand or cobble bars and stream banks, while the *Salix exigua*/mesic graminoid association generally occurs along backwater channels and other perennially wet, but less scoured sites, such as floodplain swales and irrigation ditches.
This early seral plant association occurs primarily on sand and cobble bars of larger (second order and up) rivers. It is associated with annual flooding and inundation and will grow well into the channel, where it is flooded, even in drier years. It can form large, wide stands on mid-channel islands on larger rivers such as the Gunnison, Colorado and South Platte, or narrow stringer bands on small, rocky tributaries. This plant association occurs along a wide variety of stream reaches from moderately sinuous and moderate gradient reaches, to broad, meandering rivers with wide floodplains or broad, braided channels. Many stands also occur within highly entrenched or eroding gullies.

Vegetation: This association is characterized by an almost exclusive canopy of *Salix exigua* (sandbar willow) (1-98% cover) with very little herbaceous cover. Other shrubs and tree species may be present, but these rarely have greater cover than *Salix exigua.* Because this is such a widespread and common association, many other species can be present. A variety of other woody species may include *Populus angustifolia* (narrowleaf cottonwood), *P. deltoides* (plains cottonwood), *Abies lasiocarpa* (subalpine fir), *Salix ligulifolia* (strapleaf willow), *S. lucida* ssp. *caudata* (shining willow), *S. monticola* (mountain willow), *Acer negundo* (boxelder), and *Alnus incana* (thinleaf alder). The herbaceous cover is typically very low, but can be as high as 30%. No single key herbaceous species is an indicator for this association, rather it is the combined amount of bare soil (dirt), gravel, cobble, or boulders that make up the ground cover that is the diagnostic indicator for this association. Common herbaceous species include *Poa pratensis* (Kentucky bluegrass), *Carex* spp. (sedge), *Melilotus officinalis* (yellow sweetclover), and *Cirsium* spp. (thistle). Although some species may appear high in cover, it is usually not representative of the whole stand, or it occurs between cobbles and boulders. Another key indicator for this association is the lack of soil development, and high ground cover of coarse alluvial material.

Similar Communities: The floristics are similar to the *Artemisia tridentata* ssp. *wyomingensis-Atriplex confertifolia/Elymus salina* association described by (Baker 1982b), but it is not codominated by both shrub species.

Regional Distribution: This was formerly a widespread association in the western United States. Today it is known from California to Washington and east to Montana and Colorado.

Colorado Distribution: Known from Moffat, Rio Blanco, Grand and Eagle Counties.



Elevation Range in Colorado: 3,600.00 - 9,900.00 ft / 1,097.28 - 3,017.52 m

Site Geomorphology: This early-seral plant association occurs primarily on sand and cobble bars of larger (second order and up) rivers. It is associated with annual flooding and inundation and will grow well into the channel, where it is flooded, even in drier years. It can form large, wide stands on mid-channel islands on larger rivers such as the Gunnison, Colorado and South Platte Rivers, or narrow stringer bands on small, rocky tributaries. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). This plant association occurs along a wide variety of stream channels: from moderately sinuous with moderate gradients (Rosgen's Channel Type: B2-B6); broad, meandering rivers with wide floodplains (Rosgen's Channel Type: C3-C5); or broad, braided channels (Rosgen's Channel Type: D5). Many stands also occur within highly entrenched or eroding gullies (Rosgen's Channel Type: F3, F6).

Soil: Soils of this association are typically coarse alluvial deposits of sand, silt and cobbles that are highly stratified with depth from flooding scour and deposition. Highly stratified profiles consist of alternating layers of clay loam and organic material with coarser sand or thin layers of sandy loam over very coarse alluvium. Occasionally, this association occurs on deep pockets of sand.

Successional and Ecological Processes: The *Salix exigua*/barren ground (sandbar willow/barren ground) plant association is considered an early seral community, capable of colonizing freshly deposited sand and gravel bars. *Salix exigua* is an excellent soil stabilizer with a deep root system and flexible stems that can withstand flooding. *Salix exigua* reduces erosion potential by increasing the friction of stream flow, trapping sediments and building a protected seed bed for a number of tree and shrub species. Succession without disturbance may lead to a greater understory cover, which, in turn, facilitates the establishment of shrub and tree seedlings. The presence of cottonwood seedlings within this association indicates succession to a cottonwood stand, if seedlings survive subsequent flooding events.

Adjacent Vegetation: -

Management: -

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Artemisia tridentata* ssp. *vaseyana / Poa secunda* Shrubland
State Common Name Mountain Big Sagebrush / Curly Bluegrass Shrubland
Global Scientific Name: *Artemisia tridentata* ssp. *vaseyana / Poa secunda* Shrubland
Global Common Name: Mountain Big Sagebrush / Curly Bluegrass Shrubland

Community Classification

System:	International Vegetation Classification
Class:	Shrubland
Subclass:	Evergreen shrubland
Group:	Microphyllous evergreen shrubland
Subgroup:	Natural/Semi-natural microphyllous evergreen shrubland
Formation:	Lowland microphyllous evergreen shrubland
Alliance:	Mountain Big Sagebrush Shrubland Alliance

Global Rank: G3
Global Rank Reasons: This plant association is widely scattered in eastern Oregon, locally common in Idaho, and probably present in Nevada. Rangewide, however, it is not abundant and it is discontinuously distributed. There are less than 100 element occurrences of this type known, though some occurrences cover large areas. The association is probably limited to the least productive soils within the range of *Artemisia tridentata* ssp. *vaseyana*. At lower elevations, these poorly developed and exposed soils are susceptible to surface disturbance and subsequent *Bromus tectorum* invasion. Once *Bromus tectorum* has invaded the *Artemisia tridentata* ssp. *vaseyana* understory, recovery of the original association after prescribed burns or wildfire becomes very difficult.

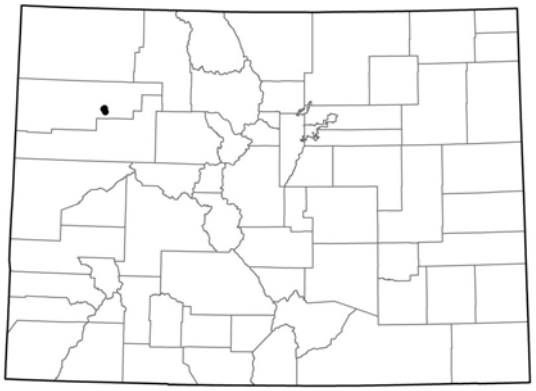
Subnational Rank: S3
Subnational Rank Reasons: Limited to one good occurrence in Rio Blanco County.

General Description: Stands of the plant association are known from Craters of the Moon National Monument in Idaho and scattered locations in south-central and southeastern Oregon. It is noted in northern and central Nevada, but these may be early seral stands of other *Artemisia tridentata* ssp. *vaseyana* plant associations. Although uncommon throughout the range of *Artemisia tridentata* ssp. *vaseyana*, at Craters of the Moon National Monument, this plant association is the most widespread vegetation type. At the national monument, the plant association is found on xeric sites with shallow soil. Sites are usually on (but not limited to) lava flows and cinder buttes. *Artemisia tridentata* ssp. *vaseyana* dominates stands, though other shrubs are also common. *Poa secunda* dominates the relatively sparse herbaceous understory. Other perennial grasses are occasionally found on pockets of better soil. Common forbs

include *Eriogonum heracleoides, Eriogonum ovalifolium*, and *Eriogonum umbellatum*.

Vegetation: Stands of this plant association are known from Craters of the Moon National Monument in Idaho and scattered locations in south-central and southeastern Oregon and northwestern Colorado. It is noted in northern and central Nevada, but these may be early-seral stands of other *Artemisia tridentata* ssp. *vaseyana* plant associations. At Craters of the Moon, the plant association is the most widespread vegetation type and is found on xeric sites with shallow soil, usually on (but not limited to) lava flows and cinder buttes. In the Uinta Basin, stands occur on gentle to moderate slopes on high plateaus above 2200 m (7200 feet) elevation. Soils in these sites are deep and well-developed and include silt loams and sandy loams. *Artemisia tridentata* ssp. *vaseyana* dominates stands, though other shrubs, such as *Ericameria* spp. (= *Chrysothamnus* spp.), *Eriogonum microthecum, Leptodactylon pungens, Purshia tridentata, Amelanchier utahensis*, and *Symphoricarpos oreophilus*, are also common. *Poa secunda* dominates the relatively sparse herbaceous understory. Other perennial grasses, such as *Achnatherum thurberianum, Poa fendleriana, Hesperostipa comata*, and *Pseudoroegneria spicata*, are occasionally found on pockets of better soil. Common forbs include *Eriogonum heracleoides, Eriogonum ovalifolium, Trifolium gymnocarpon*, and *Eriogonum umbellatum*.

Similar Communities: -



Regional Distribution: This plant association is known from Craters of the Moon National Monument in Idaho, south-central and southeastern Oregon, and, possibly, north and central Nevada (Day and Wright 1985, Tueller and Eckert 1987, ORNHP 2001) and northwestern Colorado (CNHP 2008). The distribution of this association is discontinuous, partly due to the restriction of *Artemisia tridentata* ssp. *vaseyana* to cooler and moister higher elevations. However, within the range of *Artemisia tridentata* ssp. *vaseyana*, the discontinuous distribution also probably reflects the lack of sites unsuitable for the growth of perennial grasses other than *Poa secunda*.

Colorado Distribution: Only documented in Rio Blanco County.

Elevation Range in Colorado: 7,000.00 - 8,200.00 ft / 2,133.60 - 2,499.36 m

Site Geomorphology: Sites are usually on (but not limited to) lava flows and cinder buttes.

Soil: In the Uinta Basin, stands occur on gentle to moderate slopes on high plateaus. Soils in these sites are deep and well-developed and include silt loams and sandy loams.

Successional and Ecological Processes: -

Adjacent Vegetation: -

Management: -

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Atriplex confertifolia / Achnatherum hymenoides* Shrubland
State Common Name Cold Desert Shrublands

Global Scientific Name: *Atriplex confertifolia / Achnatherum hymenoides* Shrubland
Global Common Name: Shadscale / Indian Ricegrass Shrubland

Community Classification

System:	International Vegetation Classification
Class:	Shrubland
Subclass:	Evergreen shrubland
Group:	Extremely xeromorphic evergreen shrubland
Subgroup:	Natural/Semi-natural extremely xeromorphic evergreen shrubland
Formation:	Facultatively deciduous extremely xeromorphic subdesert shrubland
Alliance:	Shadscale Shrubland Alliance

Global Rank: G3
Global Rank Reasons: This plant association is widespread, but not abundant. Throughout its range, this association is discontinuously distributed and large stands are uncommon. Its long-term security throughout its range is questionable. Stands undisturbed by livestock grazing, off-highway vehicles, or other activities have healthy understories of *Achnatherum hymenoides* and minimal *Bromus tectorum*. However, such high-quality stands are probably uncommon, especially in Idaho and parts of Nevada. The historic range of this type is unknown. However, widespread *Bromus tectorum* invasion and subsequent large-scale wildfires have likely decreased the number of total occurrences. Petroleum extraction from oil shale in Colorado may also be a threat to this association.

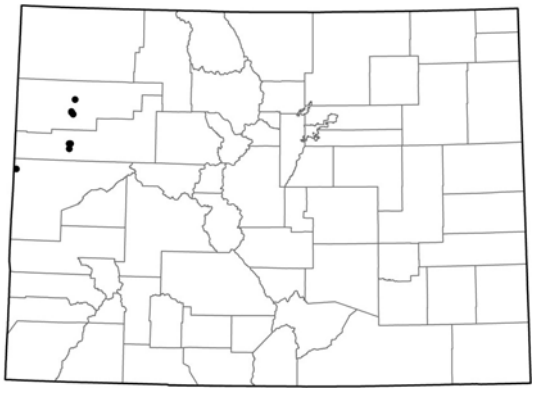
Subnational Rank: S2
Subnational Rank Reasons: Less than 10 occurrences documented in Colorado, with none being of excellent condition. Threats include grazing and oil and gas extraction.

General Description: This plant association is widely scattered within the *Atriplex confertifolia* zone of Colorado, Idaho, Nevada, and Oregon, and is also purported to occur in California, Utah, and Wyoming. The association is typically found on well-drained, sediment-derived soils with parent materials such as alluvial fans, volcanic tuff, and oil shale. Soils include rocky and gravelly sandy loams and may have an argillic horizon. Low-growing *Atriplex confertifolia* is the dominant shrub, usually with up to 15% cover, though other shrubs may also be present in low amounts. In high-quality, ungrazed stands of *Achnatherum hymenoides* (with up to 20% cover) dominates the otherwise sparse herbaceous understory. Lesser amounts of other

perennial grasses, including *Elymus elymoides, Hesperostipa comata*, and *Poa secunda*, are often present. The most common forbs present all with low cover. Stands degraded by excessive livestock grazing have abundant *Bromus tectorum* in the understory and higher total herbaceous cover.

Vegetation: Low-growing *Atriplex confertifolia* is the dominant shrub, usually with up to 15% cover, though other shrubs, including *Picrothamnus desertorum (= Artemisia spinescens), Artemisia tridentata ssp. wyomingensis, Gutierrezia sarothrae, Opuntia polyacantha, Grayia spinosa*, and *Sarcobatus vermiculatus*, may also be present in low amounts. In high-quality, ungrazed stands *Achnatherum hymenoides* may have up to 20% cover and dominates the otherwise sparse herbaceous understory. Lesser amounts of other perennial grasses, including *Elymus elymoides, Hesperostipa comata, Pleuraphis jamesii, Poa fendleriana*, and *Poa secunda*, are often present. Forbs vary greatly across the range of this association and never contribute significant cover. Some locally common species include *Eriogonum* spp., *Phlox hoodii, Sphaeralcea grossulariifolia, Thelypodium flexuosum*, and *Townsendia florifera*. Over grazed areas have abundant *Bromus tectorum* in the understory and higher total herbaceous cover.

Similar Communities: This plant association is distinguished from other *Atriplex confertifolia* types by the dominance of *Achnatherum hymenoides* in the herbaceous layer (Young et al. 1986, Rust et al. 2000). Indicators of other *Atriplex confertifolia* associations (e.g., *Picrothamnus desertorum, Elymus elymoides*) may be present but in amounts less than those of *Atriplex confertifolia* and *Achnatherum hymenoides*.



Regional Distribution: This plant association ranges from southeastern Oregon, southern Idaho, and Nevada to Colorado. It is purported to occur in California, Utah, and Wyoming. In Idaho, it is known from the South Fork Owyhee River canyon, the Owyhee Mountains lowland front near the Snake River, and the Salmon River canyon near Challis (Moseley 1987a, Rust *et al.* 2000). In Nevada, it has been observed in Grass Valley and elsewhere, including the Nevada Test Site (Rickard and Beatley 1965, Young *et al.* 1986). It has been documented in the oil shale region of Colorado by several researchers (e.g., Ward *et al.* 1974, Keammerer 1977). Though widely distributed, its presence is discontinuous in environments dominated by either *Atriplex confertifolia* or *Artemisia tridentata* ssp. *wyomingensis*.

Colorado Distribution: Found in Rio Blanco, Garfield and Mesa Counties, Colorado.

Elevation Range in Colorado: 4,940.00 - 7,000.00 ft / 1,505.71 - 2,133.60 m

Site Geomorphology: This association is typically found on well-drained, sediment-derived soils with parent materials such as alluvial fans, volcanic tuff, and oil shale.

Soil: The association is typically found on well-drained, alkaline soils derived from volcanic tuff or shale that often have been modified by alluvial deposits.

Successional and Ecological Processes: -

Adjacent Vegetation: -

Management: -

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Atriplex confertifolia / Pseudoroegneria spicata* Shrubland
State Common Name Cold Desert Shrublands

Global Scientific Name: *Atriplex confertifolia / Pseudoroegneria spicata* Shrubland
Global Common Name: Shadscale / Bluebunch Wheatgrass Shrubland

Community Classification

System:	International Vegetation Classification
Class:	Shrubland
Subclass:	Evergreen shrubland
Group:	Extremely xeromorphic evergreen shrubland
Subgroup:	Natural/Semi-natural extremely xeromorphic evergreen shrubland
Formation:	Facultatively deciduous extremely xeromorphic subdesert shrubland
Alliance:	Shadscale Shrubland Alliance

Global Rank: G3
Global Rank Reasons: Less than 100 occurrences throughout its range. *Atriplex confertifolia* has a short lifespan and is often killed by drought Naturally sparse plant cover and fine-grained saline soils make this association especially vulnerable to water and wind erosion (Blaisdell and Holmgren 1984). When trampling or other disturbances weaken the soil crust, soil particles are easily moved by wind or water. In addition to livestock grazing, disturbances such as construction of transportation corridors, mining, seismic exploration and drilling for oil and gas, and recreation have caused the deterioration of much of this system. Depleted salt-desert shrub communities are very slow to recover, even under good management. Even revegetation is difficult (Blaisdell and Holmgren 1984).

Subnational Rank: S2S3
Subnational Rank Reasons: Less than 15 documented occurrences in Colorado. Community is threatened by oil and gas extraction which has increased dramatically. Along with the direct disturbance from well pads, pipelines and roads, is the increased likelihood of non-native species invasion.

General Description: This salt desert scrub association includes open-canopied shrublands of typically saline basins, alluvial slopes and plains. Substrates are often saline and calcareous, medium- to fine-textured, alkaline soils, but include some coarser-textured soils.

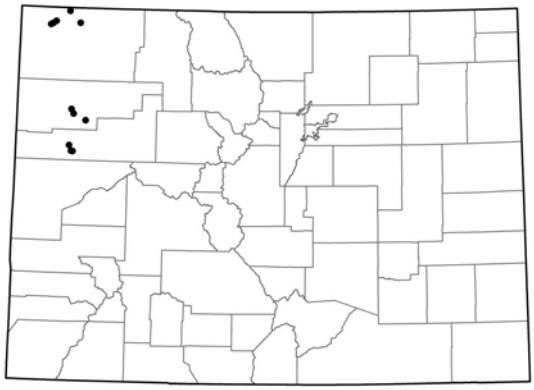
Vegetation: The vegetation is characterized by a typically open to moderately dense shrubland. The herbaceous layer varies from sparse to moderately dense and is

dominated by perennial graminoids. Various forbs are also present.

Similar Communities: -

Regional Distribution: Found in Colorado and Idaho. Potentially occurring in Wyoming and Nevada.

Colorado Distribution: Found in NW Colorado in Moffat, Rio Blanco and Garfield Counties.



Elevation Range in Colorado: 6,120.00 - 7,400.00 ft / 1,865.38 - 2,255.52 m

Site Geomorphology: Found on sideslopes and benches on Green River FM-Laney Member, Uinta FM Sandstone-Talus Slope and Wasatch FM-Cathedral Bluffs.

Soil: -

Successional and Ecological Processes: -

Adjacent Vegetation: -

Management: Susceptible to grazing and mining activities.

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Betula occidentalis / Maianthemum stellatum* Shrubland
State Common Name Foothills Riparian Shrubland

Global Scientific Name: *Betula occidentalis / Maianthemum stellatum* Shrubland
Global Common Name: Water Birch / Starflower False Solomon's-seal Shrubland

Community Classification

System:	International Vegetation Classification
Class:	Shrubland
Subclass:	Deciduous shrubland
Group:	Cold-deciduous shrubland
Subgroup:	Natural/Semi-natural cold-deciduous shrubland
Formation:	Temporarily flooded cold-deciduous shrubland
Alliance:	Water Birch Temporarily Flooded Shrubland Alliance

Global Rank: G4?
Global Rank Reasons: Throughout the association's range, fewer than thirty stands are documented. While more occurrences are known, good condition occurrences are difficult to find at the lower elevational habitats where this community typically is found. This association is highly threatened by development, road building, recreation, stream modifications, and other similar human impacts. It appears to be relatively common in Nevada, so the Global rank is lower than might otherwise be indicated by the threats. Future inventory and ranking of occurrences may result in a raising of the rank.

Subnational Rank: S2
Subnational Rank Reasons: In Colorado, fewer than thirty stands are documented. While more are estimated to occur, this association is highly threatened by development, road and railroad improvements and maintenance, heavy recreational use and stream-flow alterations.

General Description: This association is characterized by a tall, narrow band of shrubs lining the stream channel. The undergrowth can be sparse or a thick carpet of grasses and forbs. In undisturbed stands, forb species richness can be high. This association occupies moderately wide stream benches and floodplains in narrow to moderately wide valleys and on hillside seeps. At lower elevations along sunny valley bottoms, well-developed, large occurrences occupy relatively flat stream benches and often

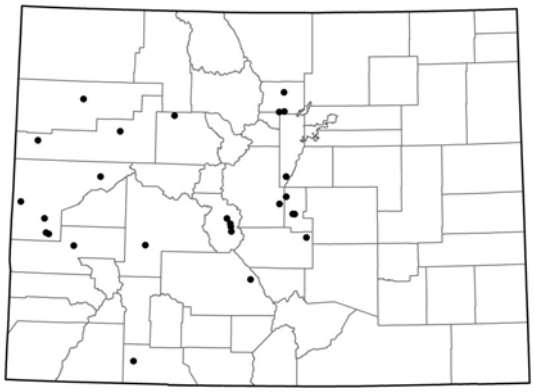
extend away from the channel edge. Stream channels are wide, rocky/cobble-bottomed, moderately steep, and sinuous, wide, cobble-bottomed, less steep, and highly sinuous, or braided from beaver activity. This association also occurs along small floodplains of steep-gradient, narrow streams where the valley side slope meets the stream edge. In such settings *Betula occidentalis* (river birch) is squeezed between large boulders and herbaceous growth is limited to small pockets, or is found around seeps adjacent to the stream channel and along isolated springs on hillslopes away from the valley bottom (these may be in different HGM subclasses).

Vegetation: *Betula occidentalis* (river birch) forms a nearly continuous tall-shrub to small-tree canopy along the stream bank. Other shrubs may include *Alnus incana* (thinleaf alder), *Cornus sericea* (red-osier dogwood), *Salix exigua* (sandbar willow), *Jamesia americana* (cliffbush), *Amelanchier utahensis* (Utah serviceberry), *Prunus virginiana* (chokecherry), and *Salix monticola* (mountain willow). Along narrow valleys at higher elevations, conifers may overhang the stream edge. Conifer species include *Pseudotsuga menziesii* (Douglas-fir), *Abies lasiocarpa* (subalpine fir), *Picea pungens* (blue spruce), and *Pinus ponderosa* (ponderosa pine). Although some stands have considerable herbaceous cover, herbaceous undergrowth is usually limited due to the dense shrub canopy. Forb cover can include *Maianthemum stellatum* (starry false Solomon seal), *Heracleum maximum* (common cowparsnip), *Thalictrum fendleri* (Fendler meadowrue) and *Rudbeckia laciniata* var. *ampla* (cutleaf coneflower). Graminoid cover is usually low, but can include *Poa pratensis* (Kentucky bluegrass), *Carex utriculata* (beaked sedge), *Juncus balticus* var. *montanus* (mountain rush), *Calamagrostis canadensis* (bluejoint reedgrass), and *Agrostis stolonifera* (creeping bentgrass). *Equisetum arvense* (field horsetail) may also be present.

Similar Communities: Closely related communities include: 1) the *Betula occidentalis* - *Cornus sericea* (water birch - red-osier dogwood) community type (Padgett *et al.* 1989), 2) the *Betula occidentalis* (water birch) community type (Hansen *et al.* 1995) of degraded stands with abundant non-native grasses, 3) the *Alnus incana* - *Betula occidentalis* (thinleaf alder - water birch) community type (Kittel 1994), and 4) the *Alnus incana* - *Betula fontinalis* / *Salix* spp. (thinleaf alder - water birch/willow) plant association (Johnston 1987). *Betula fontinalis* is a synonym for *Betula occidentalis* (Kartesz 1994).

Regional Distribution: This plant association occurs in many western states.

Colorado Distribution: Found on west and east slopes of Colorado. Documented in 16 counties.



Elevation Range in Colorado: 6,300.00 - 8,800.00 ft / 1,920.24 - 2,682.24 m

Site Geomorphology: This plant association occupies moderately wide stream benches and floodplains in narrow to moderately wide valleys and on hillside seeps. At lower elevations along sunny valley bottoms, well-developed, large occurrences occupy relatively flat stream benches and often extend away from the channel edge. Streams

were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are typically wide, rocky/cobble-bottomed, moderately steep and sinuous (Rosgen's Channel Type: B2, B3, B4), wide, cobble-bottomed, less steep and highly sinuous (Rosgen's Channel Type: C3), or braided from beaver activity (Rosgen's Channel Type: D6). This association also occurs along small floodplains of steep-gradient, narrow streams where the valley side slope meets the stream edge (Rosgen's Channel Type: A2). In these stands, *Betula occidentalis* (water birch) is squeezed between large boulders and herbaceous growth is limited to small pockets. This association also occurs around seeps adjacent to the stream channel and along isolated springs on hillslopes away from the valley bottom.

Soil: Soils are fairly shallow, ranging from 12 to 25+ inches (30-60+ cm). and have a surface layer of 50-90% organic matter. Subsurface layers are clay loams, sandy clays, and sandy loams. Stands along narrow, steep stream channels occur between large alluvial and colluvial boulders and have almost no soil development.

Successional and Ecological Processes: This association is considered a mid-seral type. With prolonged heavy grazing, it may succeed to a *Salix* (willow) dominated association. It may also be an early successional stage for conifer-dominated associations. *Betula occidentalis* can tolerate flooding, but not permanent inundation. *Betula occidentalis* occurs at slightly lower elevations and on lower- gradient stream reaches than *Alnus incana* (thinleaf alder). Because *Betula occidentalis* communities occupy low elevation, foothill habitats in Colorado, they are more threatened by development and stream impoundments than *Alnus incana* or *Cornus sericea* (red-osier dogwood) riparian communities.

Adjacent Vegetation: Adjacent Riparian Vegetation: the *Betula occidentalis* / Mesic Forbs (water birch/mesic forbs) plant association is often the only association along narrow steams. However, *Populus angustifolia* (narrowleaf cottonwood) and *Populus tremuloides* (quaking aspen) woodlands occur on adjacent floodplains. *Cornus sericea* (redosier dogwood) and *Salix monticola* (mountain willow) shrublands occur on adjacent wider floodplains. *Salix exigua* (coyote willow) shrublands occur on nearby sandbars while open hay meadows occur on adjacent cultivated floodplains. Adjacent Upland Vegetation: adjacent upland communities include *Pinus edulis - Juniperus osteosperma* or *J. monosperma* (two needle pinyon - Utah or oneseed juniper) and *Pinus ponderosa* (ponderosa pine) woodlands on south-facing slopes. *Pseudotsuga menziesii* (Douglas-fir) and mixed *Abies - Pinus* (fir-pine) forests are present on north-facing slopes.

Management: Due to the dense shrub cover, stands of this plant association may hinder livestock access. In the Arkansas River Basin, this plant association has a lush undergrowth dominated by native grasses and forbs in areas where livestock grazing is minimal. With season-long grazing, however, non-native grasses, such as *Poa pratensis* (Kentucky bluegrass) and *Agrostis stolonifera* (creeping bentgrass), may begin to dominate the undergrowth. Livestock grazing can also reduce streambank stability and cause sloughing. *Betula occidentalis* (water birch) provides shade, organic matter and overhanging banks for fish habitat (Hansen *et al.* 1988). *Betula occidentalis* (water birch) is an effective streambank stabilizer. Nursery grown seedlings can be successfully transplanted and will typically grow quickly (Hansen *et al.* 1988). Fire can easily kill *Betula occidentalis* shoots due to the shrub's thin bark. However, new shoots will resprout from uninjured basal buds (Hansen *et al.* 1988).

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Cornus sericea* Shrubland
State Common Name Foothills Riparian Shrubland
Global Scientific Name: *Cornus sericea* Shrubland
Global Common Name: Red Osier Dogwood Shrubland

Community Classification

System:	International Vegetation Classification
Class:	Shrubland
Subclass:	Deciduous shrubland
Group:	Cold-deciduous shrubland
Subgroup:	Natural/Semi-natural cold-deciduous shrubland
Formation:	Temporarily flooded cold-deciduous shrubland
Alliance:	Red-osier Dogwood Temporarily Flooded Shrubland Alliance

Global Rank: G4Q
Global Rank Reasons: This association is a common riparian type that occurs in several western states.

Subnational Rank: S3
Subnational Rank Reasons: In Colorado, this is a fairly common association, however, it is threatened by poor livestock management.

General Description: The *Cornus sericea* (red-osier dogwood) plant association is a medium-height (3-6 ft, 1-2 m), shrubland that often forms continuous, narrow bands along stream banks, benches, and bars. It can form very dense, small stands with limited disturbance, often at the base of a cliff. This plant association occurs adjacent to stream channels and near seeps on moist toeslopes of canyon walls. It also occurs on narrow benches in ravines and on narrow terraces of wider valleys. Stream channels are narrow and moderately steep with gravel streambeds.

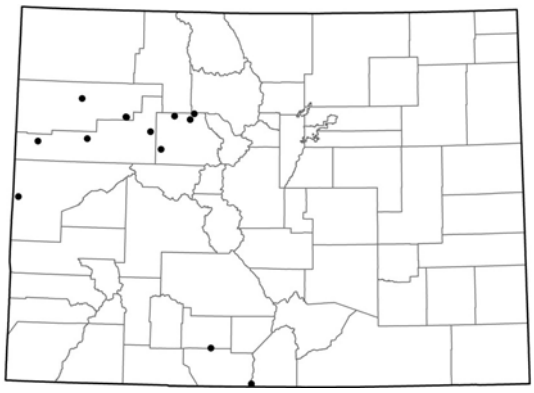
Vegetation: This plant association is characterized by a dense stand of *Cornus sericea* (red-osier dogwood). Other abundant shrub species, which may be present include *Rosa woodsii* (Woods rose), *Symphoricarpos oreophilus* (mountain snowberry), *Ribes inerme* (whitestem gooseberry), *Betula occidentalis* (river birch), *Acer glabrum* (Rocky Mountain maple), and *Alnus incana* (thinleaf alder). While trees occasionally occur in or adjacent to and overhang some stands, typically this shrubland has no overstory canopy. Scattered

tree species may include mature *Populus angustifolia* (narrowleaf cottonwood), *Picea pungens* (blue spruce), *Pinus ponderosa* (ponderosa pine), or *Pseudotsuga menziesii* (Douglas-fir). The herbaceous undergrowth is highly variable and depends on the amount of sunlight reaching the ground. Commonly encountered forbs include *Maianthemum stellatum* (starry false Solomon seal), *Geranium richardsonii* (Richardson geranium), *Mertensia ciliata* (tall fringed bluebells), and *Urtica dioica* (stinging nettle). Some stands are without an herbaceous understory.

Similar Communities: Two closely related communities have significant herbaceous cover, whereas the Colorado stands generally have a sparse herbaceous understory. Related communities are the *Cornus sericea / Heracleum lanatum* (red-osier dogwood/common cowparsnip) community type (Padgett *et al.* 1989, Youngblood *et al.* 1985a) and the *Cornus stolonifera / Galium triflorum* (redosier dogwood/fragrant bedstraw) community type (Youngblood *et al.* 1985a). Note that *Cornus stolonifera* and *Heracleum lanatum* are synonyms for *Cornus sericea* and *Heracleum maximum*, respectively (Kartesz 1994).

Regional Distribution: -

Colorado Distribution: This association occurs in the White and Colorado River Basins (Kittel *et al*. 1994) and the San Juan National Forest (Richard *et al.* 1996). It is documented in 7 counties.



Elevation Range in Colorado: 5,800.00 - 8,800.00 ft / 1,767.84 - 2,682.24 m

Site Geomorphology: This plant association occurs adjacent to stream channels and near seeps on moist toe-slopes of canyon walls. It also occurs on narrow benches in ravines and on narrow terraces of wider valleys. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are narrow and moderately steep with gravel streambeds (Rosgen's Channel Type: A4, B4).

Soil: The soils are relatively deep silty to sandy clay loams with stratified layers.

Successional and Ecological Processes: *Cornus sericea* (red-osier dogwood) forms a relatively stable community because of its ability to form dense thickets through vegetative reproduction. Subsequent succession takes place over a long period of time. In Montana, this plant association is considered to be early-seral since it colonizes stream bars and adjacent floodplains. With time, the association may eventually become dominated by conifer or deciduous tree species.

Adjacent Vegetation: Adjacent Riparian Vegetation: *Juniperus scopulorum* (Rocky Mountain juniper) and *Pseudotsuga menziesii* (Douglas-fir) woodlands, and *Salix monticola* (mountain willow) shrublands occur in adjacent riparian areas. Adjacent Upland Vegetation: *Pinus ponderosa* (ponderosa pine), mixed conifer - *Pseudotsuga menziesii* (Douglas-fir), and *Picea pungens* - *Populus tremuloides* (blue spruce-quaking

aspen) forests, *Quercus gambelii* (Gambel's oak) and *Juniperus osteosperma* (Utah juniper) or *J. monosperma* (oneseed juniper) woodlands occur on adjacent hillslopes.

Management: *Cornus sericea* (redosier dogwood) is considered a palatable, preferred browse species for livestock and has moderate to high forage production. In open areas, livestock use can be quite high. Dense stands of *Cornus sericea*, however, may restrict livestock access (Hansen *et al*. 1995). *Cornus sericea* (redosier dogwood) is a very effective streambank stabilizer due to its strong, rhizomatous root structure and should be considered for revegetating degraded sites. The rapid growth following direct seeding or transplanting allows this shrub to quickly establish on streambanks. It can also resprout after burial by fluvial deposition. *Cornus sericea* can survive all the but the most severe fires. After fire, new shoots sprout from the surviving rhizomes (Hansen *et al*. 1995).

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Distichlis spicata* Herbaceous Vegetation
State Common Name Salt Meadows

Global Scientific Name: *Distichlis spicata* Herbaceous Vegetation
Global Common Name: Inland Saltgrass Saline Prairie

Community Classification

System:	International Vegetation Classification
Class:	Herbaceous Vegetation
Subclass:	Perennial graminoid vegetation
Group:	Temperate or subpolar grassland
Subgroup:	Natural/Semi-natural temperate or subpolar grassland
Formation:	Intermittently flooded temperate or subpolar grassland
Alliance:	Saltgrass Intermittently Flooded Herbaceous Alliance

Global Rank: G5
Global Rank Reasons: This is a common association especially in the Intermountain west.

Subnational Rank: S3
Subnational Rank Reasons: This is a common association in Colorado. However, it has declined in abundance since European settlement. Large, pristine stands are virtually unknown. This association is threatened by agricultural conversion and groundwater development.

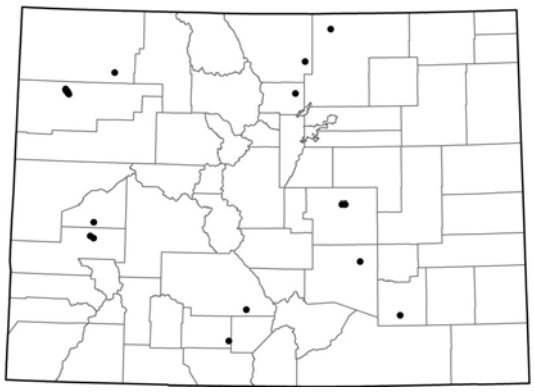
General Description: This plant association is characterized by sparse to thick stands of pure *Distichlis spicata* (inland saltgrass) growing on alkaline or saline soils in shallow basins, swales or on pond margins. This is a common association in Colorado that has decline in abundance and in quality. This association is threatened by agricultural conversion and groundwater development. This plant association occurs on alkaline or saline soils (soils that have been formed from the accumulation of bases and soluble salts in poorly drained areas). This association occurs along narrow streams or the margins of playa lakes.

Vegetation: This plant association is characterized by almost pure stands of *Distichlis spicata* (inland saltgrass) with up to 95% cover. Occasionally several clumps of *Ericameria nauseosa* ssp. *nauseosa* var. *glabrata* (rubber rabbitbrush) or *Sarcobatus vermiculatus* (black greasewood) can be present. In degraded stands, *Iva axillaris*

(povertyweed) or *Bromus tectorum* (cheatgrass) can be present.

Similar Communities: Closely related communities that are not synonymous with the Colorado *Distichlis spicata* (inland saltgrass) plant association have various associated species including: *Distichlis spicata - Elytrigia smithii* (inland saltgrass-western wheatgrass), documented from Nebraska, northeastern Wyoming, and Saskatchewan, Canada, and *Distichlis spicata - Sporobolus airoides - Elytrigia smithii* (inland saltgrass-alkali sacaton-western wheatgrass), documented from Colorado, Kansas, Nebraska, Oklahoma, Utah, and Wyoming (Johnston 1987).

Regional Distribution: This grassland association occurs in low areas in semi-arid and arid western North America from southern Saskatchewan to Mexico.



Colorado Distribution: Documented in 14 counties through out Colorado. This association has been found along the Colorado Front Range, on the eastern plains, in the San Luis Valley in south-central Colorado, and in the Yampa, White, Colorado, and Gunnison River Basins.

Elevation Range in Colorado: 3,800.00 - 8,900.00 ft / 1,158.24 - 2,712.72 m

Site Geomorphology: This plant association occurs on alkaline or saline soils; soils that have been formed from the accumulation of bases and soluble salts in poorly drained areas. This association occurs along narrow streams or the margins of playa lakes. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Two classified stream sites had sinous, gently sloping, silty and shallow channels (Rosgen's Channel Type: C6, D6).

Soil: Soils are alkaline and have textures of sandy clay, sandy loams, and sandy clay loams with gravel and cobbles. The soils may be heavily gleyed and can have fine, distinct mottles at a depth of about 20 in (50 cm).

Successional and Ecological Processes: *Distichlis spicata* (inland saltgrass) is a warm season grass and grows from early summer until fall primarily from rhizomes. *Distichlis spicata* can tolerate low to moderately alkaline soils and is resistant to trampling by livestock. Cover of *Distichlis spicata* increases when grazing reduces competition from other plants, but eventually *Hordeum jubatum* (foxtail barley) or weedy species will take over if heavy
grazing persists.

Adjacent Vegetation: Adjacent Riparian Vegetation: adjacent vegetation includes meadows of *Triglochin* spp. (arrowgrass), *Eleocharis palustris* (common spikerush), *Juncus balticus* (Baltic rush) and *Carex* spp. (sedge). Adjacent Upland Vegetation: adjacent uplands vegetation include *Sarcobatus vermiculatus* (greasewood), *Sarcobatus vermiculatus / Distichlis spicata* (greasewood/inland saltgrass), and *Artemisia tridentata* (big sagebrush) shrublands and *Juniperus osteosperma* (Utah juniper) woodlands.

Management: *Distichlis spicata* (inland saltgrass) is not particularly palatable to livestock and forage production is low in this plant association. With prolonged heavy grazing, *Hordeum jubatum* (foxtail barley) may replace *Distichlis spicata*. In heavily grazed stands of *Sporobolus airoides* (alkali sacaton), *Distichlis spicata* will increase significantly. *Distichlis spicata* can be effective in revegetating degraded saline and alkaline sites due to its rhizomatous growth (Hansen *et al*. 1995).

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Eleocharis palustris* Herbaceous Vegetation
State Common Name Emergent Wetland

Global Scientific Name: *Eleocharis palustris* Herbaceous Vegetation
Global Common Name: Creeping Spikerush Wet Meadow

Community Classification

System:	International Vegetation Classification
Class:	Herbaceous Vegetation
Subclass:	Perennial graminoid vegetation
Group:	Temperate or subpolar grassland
Subgroup:	Natural/Semi-natural temperate or subpolar grassland
Formation:	Seasonally flooded temperate or subpolar grassland
Alliance:	Marsh Spikerush Seasonally Flooded Herbaceous Alliance

Global Rank: G5
Global Rank Reasons: This association is known throughout the western states.

Subnational Rank: S4
Subnational Rank Reasons: This association is a common, if small component of many streams in Colorado.

General Description: The *Eleocharis palustris* (common spikerush) plant association is a conspicuous, if small, common emergent association that occurs in shallow, mostly still water. Most of the sites where it occurs experience water levels that fluctuate to some degree throughout the growing season. It is recognized by the clear dominance, although sometimes sparse cover, of *Eleocharis palustris*. The largest known occurrence consists of broad concentric rings around a series of playa lakes at The Nature Conservancys Mishak Lake Preserve in the San Luis Valley in south central Colorado. This association occurs on wet sand bars and on finer substrates in backwater areas within the stream channel at low elevations and in shallow waters of ponds in montane and subalpine regions. This association often occurs along narrow, sinuous headwater rivulets where roundwater flow is lateral, primarily fed from toeslope seeps.

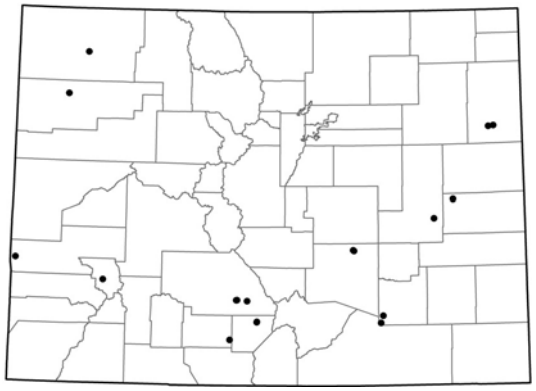
Vegetation: This community can be very sparse to quite dense, but *Eleocharis palustris* (common spikerush) is always the dominant species, and the only species always present. Because the *Eleocharis palustris* (common spikerush) plant association occurs within a wide elevational range, the species composition can be quite variable, but this community is easily recognized by its single, low herbaceous canopy cover of bright

green, nearly pure stands of *Eleocharis palustris* (common spikerush). Other species, when present, can contribute as much as 40% cover, but never exceed that of the *Eleocharis palustris*. On the Colorado Western Slope in low elevation stands, co-occurring species can include *Phalaris arundinacea* (reed canarygrass) and *Juncus balticus* var. *montanus* (mountain rush) as well as the introduced *Melilotus officinalis* (yellow sweetclover) and *Bromus inermis* (smooth brome). Other species may include 377 *Sparganium angustifolium* (narrowleaf burreed), *Lemna* spp. (duckweed) and *Potamogeton* spp. (pondweed). On the eastern plains, co-occurring species can include *Leersia oryzoides* (rice cutgrass), *Schoenoplectus pungens* (threesquare bulrush), *Panicum virgatum* (switchgrass), *Carex pellita* (woolly sedge), and *Spartina pectinata* (prairie cordgrass). At higher, montane elevations other graminoids present include *Carex aquatilis* (water sedge), *C. utriculata* (beaked sedge), and *Deschampsia caespitosa* (tufted hairgrass). Forb cover is typically low, but can occasionally be abundant in some stands. Common forb species include *Pedicularis groenlandica* (elephanthead lousewort), *Rhodiola integrifolia* (ledge stonecrop), and *Caltha leptosepala* (marsh marigold).

Similar Communities: -

Regional Distribution: This spikerush wet meadow community is found in the central Great Plains of the United States and Canada and in the western United States.

Colorado Distribution: Documented in 12 counties in Colorado.



Elevation Range in Colorado: 3,800.00 - 11,400.00 ft / 1,158.24 - 3,474.72 m

Site Geomorphology: This association occurs on wet sandbars and on finer substrates in backwater areas within the stream channel at low elevations. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). This association usually occurs along narrow, sinuous (Rosgen's Channel Type: E3, E4, E6) headwater rivulets where ground water flow is lateral, primarily fed from toe slope seeps.

Soil: High elevation stands consistently occur on organic soils, or on a thick organic horizon that overlies fine to coarse alluvial material. Lower elevation stands occur on fresh alluvial deposits of fine-textured loamy sands, clays, clay loams, and sandy clays.

Successional and Ecological Processes: At lower elevations the *Eleocharis palustris* (common spikerush) plant association occurs well within the active channel and is inundated annually. This early seral community colonizes backwater eddies and shallow edges of slow moving reaches of small and larger rivers. It is probably an ephemeral community, scoured out each year during high spring flows. At montane elevations, this association occurs in ponded sites on faster moving streams. If siltation occurs, sites may become dominated by *Carex utriculata* (beaked sedge). At higher elevations, this association appears to be stable. It occurs near seeps on soils with deep organic layers, often sapric, and saturated throughout the growing season.

Adjacent Vegetation: Adjacent Riparian Vegetation: at higher elevations *Carex aquatilis* (water sedge) or *C. utriculata* (Northwest Territory sedge) meadows and *Salix wolfii* (Wolf's willow) or *S. planifolia* (planeleaf willow) shrublands occur within the riparian mosaic. At lower elevations *Schoenoplectus pungens* (threesquare bullrush) and *Schoenoplectus acutus* (hardstem bulrush) can occur within the stream channel and wet meadow prairies of *Panicum virgatum* (switchgrass) and *Sorghastrum nutans* (yellow Indiangrass) occupy the immediate streambanks and low floodplains. Stands with *Populus deltoides* (eastern cottonwood) and *Salix amygdaloides* (peachleaf willow) can also be scattered across the floodplain. Adjacent Upland Vegetation: low elevation streams on the Colorado Western Slope have *Pinus edulis - Juniperus* spp.(twoneedle pinyon-juniper) woodlands and *Artemisia tridentata* (sagebrush) or *Sarcobatus vermiculatus* (greasewood) shrublands on adjacent hillslopes. At higher montane and subalpine elevations, *Abies lasiocarpa - Picea engelmannii* (subalpine fir-Engelmann) forests occupy adjacent slopes. On the eastern plains, rolling upland hills are occupied by *Bouteloua gracilis* (blue grama) short grass prairie, or *Artemisia* (sagebrush) shrublands.

Management: The low palatability of *Eleocharis palustris* (common spikerush) and seasonally wet soils limit the grazing value of this type for livestock (Hansen *et al.* 1995).

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Juniperus osteosperma / Leymus salinus spp. salinus Wooded Herbaceous Vegetation*

State Common Name Mesic Western Slope Pinyon-Juniper Woodlands

Global Scientific Name: *Juniperus osteosperma / Leymus salinus Woodland*

Global Common Name: Utah Juniper / Salinas Lyme Grass Woodland

Community Classification

System: International Vegetation Classification

Class: Not determined at this time.

Subclass: -

Group: -

Subgroup: -

Formation: -

Alliance: _

Global Rank: G3

Global Rank Reasons: The Colorado Natural Heritage Program tracks this association and has given it a rank of S3. It may be somewhat more common in Utah, as there is more potential habitat, but it is unlikely that there are more than 100 viable occurrences worldwide. All stands tend to be small, generally less than five hectares.

Subnational Rank: S3

Subnational Rank Reasons: Less than 20 occurrences documented in Colorado. Potential habitat is limited.

General Description: This sparse woodland association occurs on low- to mid-elevation hogbacks, colluvial slopes and badlands in the Colorado Plateau of western Colorado and southeastern Utah. Elevations range from 1488 to 1997 m (4880-6550 feet), and most sites are on cooler north and east aspects. Slopes may be gentle to moderately steep (3-46% slope) and are generally underlain by Mesozoic marine shales of the Morrison Formation or Mancos shale. Colluvium from sandstone cliffs or outcrops upslope from the stand may cover the ground surface. Soils are rapidly drained and may be sandy loams or silty clays. The vegetation is characterized by a sparse to open canopy of Juniperus osteosperma with between 1 and 25% cover. *Pinus edulis* is either absent or present in very low amounts in the canopy, although *Juniperus osteosperma* and *Pinus edulis* seedlings may be present. There is no shrub layer, but scattered short and dwarf-shrubs may total up to 10% cover in more heavily vegetated stands.

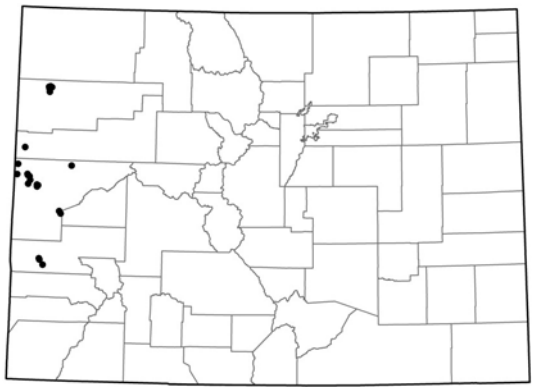
Vegetation: The vegetation is characterized by a sparse to open canopy of Juniperus osteosperma with between 1 and 25% cover. *Pinus edulis* is either absent or present in

very low amounts in the canopy, although *Juniperus osteosperma* and *Pinus edulis* seedlings may be present. There is no shrub layer, but scattered short and dwarf-shrubs may total up to 10% cover in more heavily vegetated stands. Common species include *Atriplex confertifolia*, *Artemisia bigelovii*, *Artemisia nova*, *Artemisia tridentata* ssp. *wyomingensis*, *Chrysothamnus viscidiflorus*, *Gutierrezia sarothrae*, *Glossopetalon spinescens* var. *meionandrum*, *Ephedra viridis*, *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, *Opuntia erinacea*, *Opuntia polyacantha*, *Shepherdia rotundifolia*, and *Yucca harrimaniae*. The herbaceous layer is dominated by *Leymus salinus* with between 1 and 25% cover. The remainder of the herbaceous cover is sparse but diverse. Additional graminoids present include *Achnatherum hymenoides*, *Pleuraphis jamesii*, *Poa fendleriana*, and *Poa secunda*. Forbs include *Arenaria hookeri, Arenaria fendleri, Calochortus gunnisonii*, *Cymopterus bulbosus*, *Cymopterus purpureus*, *Eriogonum umbellatum*, *Leptodactylon pungens*, *Lepidium montanum*, *Oenothera pallida*, *Phlox austromontana*, *Petradoria pumila*, *Phlox hoodii*, *Sphaeralcea coccinea*, *Streptanthella longirostris*, *Stenotus acaulis*, and *Xylorhiza venusta*.

Similar Communities: There may be some difficulty in clearly distinguishing *Pinus edulis - Juniperus* spp. / *Leymus salinus* Woodland (CEGL002340) from this association, in which case they may need to be combined. In particularly sparse stands, it may also be difficult to distinguish *Leymus salinus* Shale Sparse Vegetation (CEGL002745) from this association.

Regional Distribution: The plant association occurs on low-elevation marine shales in western Colorado and eastern Utah.

Colorado Distribution: Found in Moffat, Rio Blanco, Garfield, Mesa and Montrose Counties.



Elevation Range in Colorado: 1,488.00 - 1,997.00 ft / 453.54 - 608.69 m

Site Geomorphology: This sparse woodland association occurs on canyon rims, ledges, low- to mid-elevation hogbacks, colluvial slopes, toeslopes and badlands in the Colorado Plateau of western Colorado. Slopes may be gentle to moderately steep (3-46% slope) and are generally underlain by Mesozoic marine shales of the Morrison Formation, Chinle Formation or Mancos shale. Other parent materials include Kayenta Formation and Cedar Mesa sandstone. Colluvium from sandstone cliffs or outcrops upslope is common on the ground surface.

Soil: Soils are rapidly drained and may be sandy loams or silty clays.

Successional and Ecological Processes: In some stands, this association is the result of *Leymus salinus* Shale Sparse Vegetation (CEGL002745) grasslands being invaded by *Juniperus osteosperma*. This change may be indicative of shifts in seasonal precipitation rather than fire suppression, since most stands are too sparse to carry fire.

Adjacent Vegetation: -

Management: -

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Leymus cinereus* Herbaceous Vegetation
State Common Name Western Slope Grasslands

Global Scientific Name: *Leymus cinereus* Herbaceous Vegetation
Global Common Name: Basin Wild Rye Tallgrass Prairie

Community Classification

System:	International Vegetation Classification
Class:	Herbaceous Vegetation
Subclass:	Perennial graminoid vegetation
Group:	Temperate or subpolar grassland
Subgroup:	Natural/Semi-natural temperate or subpolar grassland
Formation:	Tall bunch temperate grassland
Alliance:	Great Basin Lyme Grass Herbaceous Alliance

Global Rank: G2G3Q
Global Rank Reasons: This is a very widespread community, being found in many western states, but is badly degraded everywhere. It has declined markedly throughout its range, and probably represents two or more separate community types. This type was formerly very abundant in interior valleys. Early settlers described the very tall grasslands (up to the their horses backs) in many areas. Most of these sites have been converted to agriculture. Even as described here as a broad association floristically and geographically - the size and quality of most occurrences should make it a G2. More knowledge of its distribution is needed, but it should remain a priority for conservation. Most sites are threatened by livestock grazing, agriculture, altered stream hydrology, and altered fire regime.

Subnational Rank: S1S2
Subnational Rank Reasons: Less than 5 documented element occurrences in Colorado covering less than 25 acres; none in exceptional condition. Cattle grazing, conversion to agriculture, altered stream hydrology, altered fire regime, exotics and oil and gas development are all potential threats to this community type.

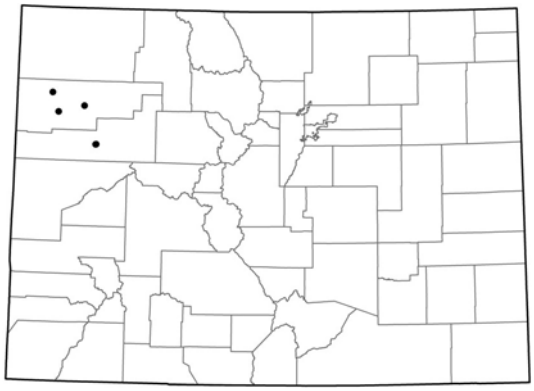
General Description: This Great Basin lyme grass association is found along lower elevation riparian corridors and some moderately alkaline valley bottomlands from Colorado at elevations ranging from 1830 to 2451 m (6000-8036 feet). Generally, stands of this type are described as growing on mesic sites with more soil moisture than is available to the surrounding vegetation, including mesic swales and seeps, canyon bottoms, foothill ravines, moist bottomlands, and along streams. Sites are flat to steep

and occur on all aspects. Soils are rapidly drained, often with a shallow water table. Soil texture is variable and ranges from silty clays to deep loamy sands derived from alluvium and colluvium. The vegetation is characterized by a tall (over 1.5 m), moderately dense to more typically dense grassland dominated by high cover (30-95%) of *Leymus cinereus (= Elymus cinereus*). Other plants are found mainly between the clumps of *Leymus cinereus* or on the edges of the dense stands. Scattered shrubs may be present.

Vegetation: The association is a characteristically tall (over 1.5 m), moderately dense to more typically dense grassland dominated by high cover (30-95%) of *Leymus cinereus (= Elymus cinereus*). Other plants are found mainly between the clumps of *Leymus cinereus* or on the edges of the dense stands. Scattered shrubs may be present, including *Amelanchier utahensis, Artemisia tridentata, Chrysothamnus viscidiflorus, Ericameria nauseosa (= Chrysothamnus nauseosus), Purshia tridentata, Rhus trilobata, Ribes* spp., *Rosa* spp., and *Symphoricarpos oreophilus*. Associated species occurring at lower cover include graminoids such as *Achnatherum hymenoides, Achnatherum lettermanii, Carex douglasii, Elymus glaucus, Hesperostipa comata, Juncus balticus, Pascopyrum smithii*, and introduced species *Bromus tectorum* and *Poa pratensis*, and forbs such as *Achillea millefolium, Agastache urticifolia, Balsamorhiza sagittata, Castilleja* spp., *Eriogonum brevicaule, Iris missouriensis, Iva axillaris, Mertensia oblongifolia, Pteryxia terebinthina (= Cymopterus terebinthinus), Potentilla gracilis var. flabelliformis (= Potentilla flabelliformis), Rumex crispus, Sidalcea oregana, Stephanomeria minor*, and *Vicia americana*.

Similar Communities: -

Regional Distribution: This type is found mainly in the Great Basin and the Intermountain Region, and just reaches the western part of the Northern Great Plains. Although it occupies a small amount of area in Oregon or in any western state, it has a fairly large range. Unfortunately, few high-quality remnants remain.



Colorado Distribution: Found in Garfield and Rio Blanco Counties, Colorado.

Elevation Range in Colorado: 6,520.00 - 8,600.00 ft / 1,987.30 - 2,621.28 m

Site Geomorphology: Generally, stands of this type are described as growing on mesic sites with more soil moisture than is available to the surrounding vegetation, including mesic swales and seeps, canyon bottoms, foothill ravines, moist bottomlands, and along streams. Sites are flat to steep and occur on all aspects.

Soil: Soils are rapidly drained, often with a shallow water table. Soil texture is variable and ranges from silty clays to deep loamy sands derived from alluvium and colluvium.

Successional and Ecological Processes: Walker and Brotherson (1982) describe a process by which stands of *Leymus cinereus* are established and maintained in a matrix of sagebrush-steppe on sites disturbed by badger digging. If badgers abandon a site, the *Leymus cinereus* is gradually replaced by shrubs and lower grasses from the surrounding

vegetation matrix, and this replacement may be hastened by livestock grazing on the young *Leymus cinereus* shoots. Other references to *Leymus cinereus* stands do not describe this dependence on disturbance.

Adjacent Vegetation: Stands of this herbaceous vegetation (CEGL001479) typically are surrounded by sagebrush steppe (Knight et al. 1976, Walker and Brotherson 1982).

Management: *Leymus cinereus* is sensitive to spring grazing, and extensive stands of this association have been eliminated by overgrazing in the spring (USFS 1937).

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Picea pungens / Alnus incana* Woodland
State Common Name Montane Riparian Forests

Global Scientific Name: *Picea pungens / Alnus incana* Woodland
Global Common Name: Colorado Blue Spruce / Thinleaf Alder

Community Classification

System:	International Vegetation Classification
Class:	Woodland
Subclass:	Evergreen woodland
Group:	Temperate or subpolar needle-leaved evergreen woodland
Subgroup:	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland
Formation:	Temporarily flooded temperate or subpolar needle-leaved evergreen woodland
Alliance:	Blue Spruce Temporarily Flooded Woodland Alliance

Global Rank: G3
Global Rank Reasons: This riparian plant association is somewhat widespread on the western slope of Colorado, and may also occur in Wyoming and New Mexico. In Colorado, it has been found in the Routt National Forest, south to the Rio Grande and San Juan National Forests. This association occurs along narrow to moderately wide floodplains and stream benches in narrow canyons subject to cold air drainage and limited sunlight, typically in small patches and scattered locations. Recent inventory efforts by the Colorado Natural Heritage Program have found this association to be more common in Colorado than previously thought. While many stands have been negatively impacted by livestock grazing, and dams or hydrologic alterations are threats, the association does not appear to be rare or severely threatened. Therefore the global rank has been lowered to G3.

Subnational Rank: S3
Subnational Rank Reasons: Fewer than 100 stands are documented in Colorado, and very few of these are in pristine condition. This association is threatened by development, road building and maintenance, heavy recreational use, improper livestock grazing, and stream flow alterations.

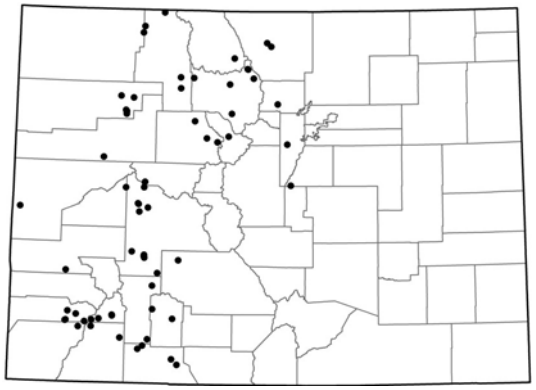
General Description: The *Picea pungens/Alnus incana* (blue spruce/thinleaf alder) plant association occurs in montane riparian areas in Colorado. It occurs in deep, shaded

canyons and narrow valleys along relatively straight stream reaches. It generally forms small patches, but can be continuous for several river miles. This plant association occurs along narrow to moderately wide floodplains and stream benches in canyons subject to cold air drainage and limited sunlight. Stream channels are steep and narrow, moderately broad and slightly sinuous, or broad and highly sinuous.

Vegetation: *Picea pungens* (blue spruce) dominates the overstory with 1-70% cover. There are typically many seedling and saplings as well as mature trees. *Abies lasiocarpa* (subalpine fir) is usually present with up to 50% cover. Other tree species that occurred in half or fewer of the stands sampled include *Picea engelmannii* (Engelmann spruce), *Populus tremuloides* (quaking aspen), *Pinus contorta* (lodgepole pine) and *Pinus ponderosa* (ponderosa pine). The thick shrub understory is confined to a narrow band lining the stream channel. *Alnus incana* (thinleaf alder) was present in all stands sampled, and ranged in cover from 1 to 80%. Other shrub species present were highly variable, with constancy of less then 40%, but often appearing with abundant cover when present. These shrubs include *Salix drummondiana* (Drummond willow), *Cornus sericea* (redosier dogwood), *Ribes lacustre* (current), *Acer glabrum* (Rocky Mountain maple), *Vaccinium* spp. (whortleberry), *Salix boothii* (Booth willow), and *Salix wolfii* (Wolf willow). The forb canopy layer is thick, up to 50% total cover and species-rich, often with more than 40 species represented in one stand. Species include *Actaea rubra* (red baneberry), *Conioselinum scopulorum* (Rocky Mountain hemlockparsley), *Oxypolis fendleri* (cowbane), *Geranium richardsonii* (Richardson geranium), *Heracleum maximum* (common cowparsnip), *Maianthemum stellatum* (starry false Solomon seal), *Mertensia ciliata* (tall fringed bluebells), *Rudbeckia laciniata* var. *ampla* (cutleaf cornflower), and *Equisetum arvense* (field horsetail).

Similar Communities: A closely related community, the *Picea pungens* / *Alnus incana* (blue spruce/thinleaf alder) plant association (Johnston 1987), includes some New Mexico stands containing significant amounts of *Abies concolor* (white fir).

Regional Distribution: Reported from scattered locations from northwestern Wyoming to northern New Mexico, although only Colorado actually has documented occurrences. In Colorado, it has been found in the Routt National Forest, south to the Rio Grande and San Juan national forests.



Colorado Distribution: From Steamboat Springs south to the San Juan mountains, the Flat Tops to the Front Range.

Elevation Range in Colorado: 6,100.00 - 10,650.00 ft / 1,859.28 - 3,246.12 m

Site Geomorphology: This plant association occurs along narrow to moderately wide floodplains (7-17 ft, 25-55 m) and stream benches in canyons subject to cold air drainage and limited sunlight. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are steep and narrow (Rosgen's Channel Type: A3, A4), moderately broad and slightly sinuous (Rosgen's Channel Type: B3, B4), or broad and highly sinuous (Rosgen's Channel Type: C3, C4).

Soil: Soils are generally shallow and range from loamy sand to silty clay loams with heavy organic matter content over gravel, cobbles, and boulders.

Successional and Ecological Processes: In deep, narrow canyons with swift-moving streams and narrow floodplains and benches, *Picea pungens* (blue spruce) appears to be a climax riparian species, and will remain until removed or damaged by a catastrophic flood. In Colorado, the closely related *Picea pungens / Equisetum arvense* (blue spruce / field horsetail) plant association is considered an indicator of frequent flooding. With less frequent flooding, this association may gradually change to a *Picea pungens / Alnus incana* (blue spruce / thinleaf alder) plant association.

Adjacent Vegetation: Adjacent Riparian Vegetation: this plant association is often the only community along narrow streams. However, adjacent riparian communities can include *Abies lasiocarpa - Picea engelmannii* (subalpine fir -Engelmann spruce), or *Populus angustifolia* (narrowleaf cottonwood) forests; and *Alnus incana* (thinleaf alder), *Salix geyeriana* (Geyer's willow), or *Salix boothii* (Booth's willow) shrublands. Adjacent Upland Vegetation: at higher altitudes, *Abies lasiocarpa - Picea engelmannii* (subalpine fir - Engelmann spruce) and *Populus tremuloides* (quaking aspen) forests often occur on adjacent hill slopes. At lower altitudes, *Populus tremuloides*, *Pseudotsuga menziesii* (Douglas-fir), and *Pinus ponderosa* (ponderosa pine) forests; and *Pinus edulis - Juniperus osteosperma* or *J. monosperma* (two needle pinyon - Utah (or one seed) juniper) and *Quercus gambelii* (Gambel's oak) woodlands often occur on adjacent hill slopes.

Management: Due to heavy shading, this plant association provides low forage value for livestock. Dense stands of *Alnus incana* (thinleaf alder) hinder livestock access into this plant association. *Alnus incana* is not particularly palatable to livestock, but can be trampled as animals search for more palatable species. Open stands may provide moderate forage and shade in the summer (Hansen *et al*. 1995).

Most fires kill *Alnus incana* (thinleaf alder) dominated stands, resulting in a sparse herbaceous understory and bank destabilization due to root death. *Alnus incana* sprouts quickly when cut at 4-5 year intervals and can be used for restabilizing streambanks. Cutting in spring and winter results in rapid sprouts. Cutting in the summer results in fewer, slow growing sprouts (Hansen *et al*. 1995).

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Pinus edulis - Juniperus osteosperma / Cercocarpus intricatus* Woodland

State Common Name Mesic Western Slope Pinyon-Juniper Woodlands

Global Scientific Name: *Pinus edulis - Juniperus osteosperma / Cercocarpus intricatus* Woodland

Global Common Name: Two-needle Pinyon Utah - Juniper / Littleleaf Mountain-mahogany Woodland

Community Classification

System:	International Vegetation Classification
Class:	Woodland
Subclass:	Evergreen woodland
Group:	Temperate or subpolar needle-leaved evergreen woodland
Subgroup:	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland
Formation:	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland
Alliance:	Two-needle Pinyon - (Juniper species) Woodland Alliance

Global Rank: G3
Global Rank Reasons: The plant association is limited to a small geographic area and is documented from a narrow elevational band on sandstone substrates in extreme northwestern Colorado and possibly adjacent Utah. There are 11 documented stands in Colorado with size ranging from 4-450 acres. Although most occurrences are considered in good to excellent condition, those in excellent condition tend to be small. Grazing and woodcutting are the primary threats where stands are accessible.

Subnational Rank: S3
Subnational Rank Reasons: The plant association is limited to a small geographic area and is documented from a narrow elevational band on sandstone substrates in northwestern Colorado. There are 11 documented stands in Colorado with size ranging from 4-450 acres. Although most occurrences are considered in good to excellent condition, those in excellent condition tend to be small. Grazing and woodcutting are the primary threats where stands are accessible.

General Description: This woodland association occurs on dry sandstone ridgetops, mesa edges, outcrops, colluvial slopes, slickrock hills, benches and knolls on the Colorado Plateau and in extreme northwestern Colorado, adjacent Utah, and possibly

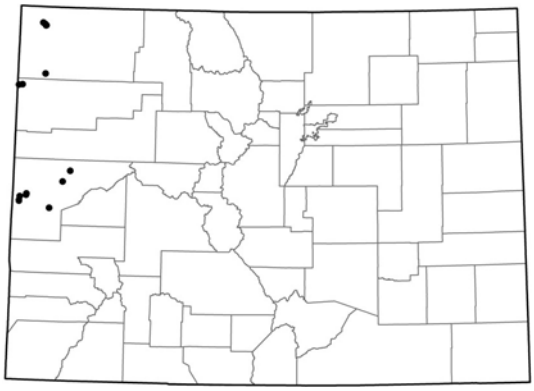
Wyoming. South and southwest aspects are common, and slopes can be variable in steepness. Exposed bedrock and large rock may cover over 50% of the stand, with vegetation growing in the cracks. The vegetation is characterized by a short (2-10 m), open tree canopy (10-25% cover) codominated by *Pinus edulis* and *Juniperus osteosperma*, and by the dominance of *Cercocarpus intricatus* in the relatively sparse short-shrub layer (5-25%). Shrubs are often present in many stands. Herbaceous cover is sparse (<5% cover) and is composed of scattered forbs and grasses.

Vegetation: The association is characterized by an open tree canopy (10-25% cover) codominated by *Pinus edulis* and *Juniperus osteosperma*, and by the dominance of *Cercocarpus intricatus* in the relatively sparse short-shrub layer (5-25% cover). The tree canopy may be between 2 and 10 m tall; *Pinus edulis* and *Juniperus osteosperma* vary in cover between 1 and 15%, with some stands having up to 25% cover of *Pinus edulis*. Some stands may have an occasional emergent *Pinus ponderosa, Pseudotsuga menziesii*, or *Juniperus scopulorum* tree. Additionally, some sparse (<10% total cover), tree-dominated stands from extremely dry, rocky sites in the Colorado Plateau are included in this woodland association as a best fit. The shrub layer represents the mesic end of the pinyon-juniper / mixed shrub understory communities found on slickrock exposures. *Amelanchier utahensis, Arctostaphylos patula, Gutierrezia sarothrae, Mahonia fremontii, Quercus gambelii* (low cover), or *Yucca* spp. are often present in many stands. A variety of other shrubs and dwarf-shrubs may be present depending on location, including *Artemisia bigelovii, Brickellia microphylla, Cercocarpus montanus, Chrysothamnus viscidiflorus, Echinocereus triglochidiatus, Ephedra viridis, Eriogonum corymbosum, Fendlerella utahensis, Fraxinus anomala, Glossopetalon spinescens var. meionandrum, Holodiscus dumosus, Philadelphus microphyllus, Purshia stansburiana, Quercus turbinella*, or *Shepherdia rotundifolia*. *Coleogyne ramosissima* is typically absent. Herbaceous cover is sparse (<5% cover) and is composed of scattered forbs and grasses, such as species of *Cryptantha, Penstemon*, and *Opuntia, Achnatherum hymenoides (= Oryzopsis hymenoides), Bouteloua gracilis, Elymus elymoides, Pleuraphis jamesii*, and *Poa fendleriana*.

Similar Communities: Compare this association with *Juniperus osteosperma / Cercocarpus intricatus* Woodland (CEGL000733) which is very similar, but lacks *Pinus edulis*. On dry, rocky or slickrock sites on the Colorado Plateau, this pinyon-juniper woodland association may include stands with very open tree canopies (5-10% cover) in cases where the total vegetation cover is less than 15%. These stands may be similar to open *Cercocarpus intricatus* shrublands with scattered pinyon and juniper trees but is considered to be a variation of the woodland type because of the ecological values of the trees.

Regional Distribution: This plant association is found on the Colorado Plateau and in extreme northwestern Colorado, adjacent Utah, and possibly Wyoming.

Colorado Distribution: Known from Mesa, Rio Blanco and Moffat Counties, Colorado.



Elevation Range in Colorado: 5,400.00 - 7,800.00 ft / 1,645.92 - 2,377.44 m

Site Geomorphology: -

Soil: Exposed bedrock and large rock may cover over 50% of the stand, with vegetation growing in soil that has collected in joints and cracks. These sandstone-derived soils are generally poorly developed, coarse-textured and skeletal. Soils are rapidly drained sandy loams, sands, or silt loams derived from colluvium derived from a variety of parent materials, including Carmel Formation, Cedar Mesa sandstone, Chinle Formation, Dakota Formation, Kayenta Formation, Morrison Formation, Navajo Formation, or Wingate Formation. Bare soil is common.

Successional and Ecological Processes: -

Adjacent Vegetation: -

Management: -

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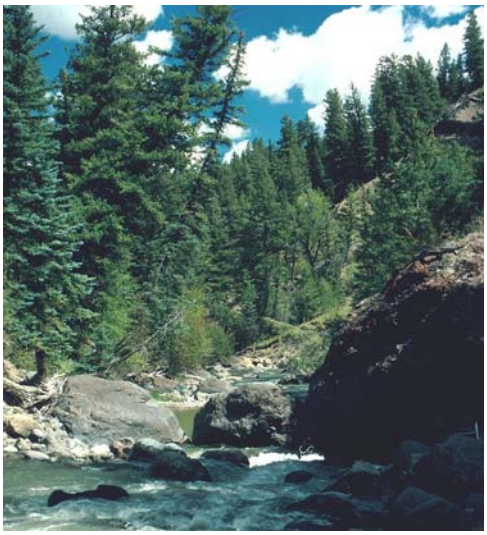
Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Populus angustifolia - Picea pungens / Alnus incana* Woodland
State Common Name Montane Riparian Forests

Global Scientific Name: *Populus angustifolia - Picea pungens / Alnus incana* Woodland
Global Common Name: Narrowleaf Cottonwood - Colorado Blue Spruce / Thinleaf Alder

Community Classification

System:	International Vegetation Classification
Class:	Woodland
Subclass:	Deciduous woodland
Group:	Cold-deciduous woodland
Subgroup:	Natural/Semi-natural cold-deciduous woodland
Formation:	Temporarily flooded cold-deciduous woodland
Alliance:	Narrowleaf Cottonwood Temporarily Flooded Woodland Alliance



Global Rank: G3
Global Rank Reasons: This association may be geographically widespread, but it is centered in western Colorado, where there are 33 known sites. Similar associations have been described as far west as Idaho and Utah and as far north as Montana, but primarily in small stands (Hansen et al. 1995). Most stands of this association have been altered in species composition by livestock grazing. Many streams of the southern Rockies have been impacted by dams or water diversion, gravel and gold mining, and development. The mixture of coniferous (*Picea*) and deciduous vegetation (*Populus*) is maintained by a combination of periodic flooding and cold-air drainage (Baker 1989b). Perturbations of flow regime due to water development, logging, or channel entrenchment could detrimentally impact this association.

Subnational Rank: S3
Subnational Rank Reasons: This is a common community of montane valleys. However, only a handful of good condition stands are known, and it is highly threatened by improper livestock grazing, heavy recreational use, and stream flow alterations.

General Description: The *Populus angustifolia/Alnus incana* (narrowleaf cottonwood/thinleaf alder) plant association is characterized by a dense stand of *Alnus incana* lining the stream bank and an open to nearly closed canopy of *Populus angustifolia.* Other shrubs may occur but *Alnus incana* (thinleaf alder) usually has at least

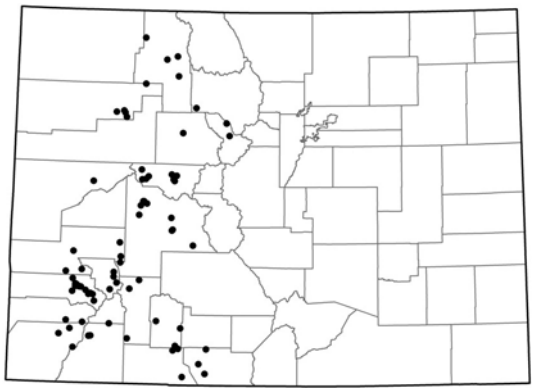
10-20% cover and is the most abundant of all other shrubs within the stand. It occurs along narrow, fast-moving stream reaches in montane areas. This plant association occurs on active floodplains in narrow to broad valleys. It forms a narrow, dense band along stream banks and benches. Some of the stands have signs of recent flooding. Stream gradient and channel width are highly variable. Some sites occur along steep, narrow reaches with little sinuosity. Other sites occur along low gradient, moderately sinuous, broad channel reaches, low gradient, highly sinuous reaches, or very narrow and highly sinuous stream sections.

Vegetation: The dominance of *Populus angustifolia* (narrowleaf cottonwood) and *Alnus incana* (thinleaf alder) are the key diagnostic characteristics of this association. Several other tree and shrub species may be present, but they rarely equal the abundance of the diagnostic species. The overstory is an open to dense canopy of *Populus angustifolia*, which is always present, if sometimes only as sapling-sized individuals. Other tree species that may be present include *Pseudotsuga menziesii* (Douglas-fir), *Juniperus scopulorum* (Rocky Mountain juniper), *Populus tremuloides* (quaking aspen), *Pinus ponderosa* (ponderosa pine), *Populus* x *acuminata* (lanceleaf cottonwood), *Abies concolor* (white fir), or *Picea pungens* (blue spruce). The shrub understory is dominated by a dense band of *Alnus incana* (thinleaf alder) lining the stream bank. A variety of other shrubs may be present, intermingling with the alder but usually providing less than the total alder cover. Other shrub species include *Salix bebbiana* (Bebb willow), *Salix monticola* (mountain willow), *Salix drummondiana* (Drummond willow), *Salix ligulifolia* (strapleaf willow), *Salix lucida* ssp. *caudata* (shining willow), *Salix exigua* (sandbar willow), *Cornus sericea* (red-osier dogwood), *Rosa woodsii* (Woods rose), *Acer glabrum* (Rocky Mountain maple), and *Betula occidentalis* (river birch). The herbaceous undergrowth is generally sparse. Herbaceous species include *Poa pratensis* (Kentucky bluegrass), *Taraxacum officinale* (dandelion), *Equisetum arvense* (field horsetail), *Rudbeckia laciniata* var. *ampla* (cutleaf coneflower), *Heracleum maximum* (common cowparsnip), *Maianthemum stellatum* (starry false Solomon seal), *Trifolium repens* (white clover), *Calamagrostis canadensis* (bluejoint reedgrass), *Oxypolis fendleri* (Fendler cowbane), and *Cardamine cordifolia* (heartleaf bittercress).

Similar Communities: Closely related communities are described from Montana, Wyoming, New Mexico, and Utah. The related communities are dominated by conifers such as *Pinus contorta* (lodgepole pine), *Abies lasiocarpa* (subalpine fir), *Picea engelmannii* (Engelmann spruce), and *Picea pungens* (blue spruce) but are not synonymous with the Colorado *Populus angustifolia* - *Picea pungens* / *Alnus incana* (narrowleaf cottonwood-blue spruce/thinleaf alder) plant association. However, some of the stands within these communities contain significant cover of *Populus angustifolia* and *Alnus incana* and could be included in the Colorado *Populus angustifolia* - *Picea pungens* / *Alnus incana* plant association. These closely related communities are: 1) the *Picea* / *Cornus stolonifera* (spruce/redosier dogwood) habitat type (Hansen *et al.* 1995), 2) the *Picea pungens* / *Alnus incana* (blue spruce/thinleaf alder) plant association (Johnston 1987), 3) the Conifer / *Cornus sericea* (conifer/redosier dogwood), and 4) the Conifer / *Equisetum arvense* (conifer/field horsetail) and Conifer / *Actaea rubra* (conifer/red baneberry) community types (Padgett *et al.* 1989). Note that *Cornus stolonifera* is a synonym for *Cornus sericea* (Kartesz 1994).

Regional Distribution: This type may be geographically widespread, but it is centered in western Colorado. Similar associations have been described as far west as Idaho and Utah and as far north as Montana, but primarily in small stands (Hansen et al. 1995).

Colorado Distribution: Along the Front Range and western Colorado.



Elevation Range in Colorado: 6,000.00 - 9,600.00 ft / 1,828.80 - 2,926.08 m

Site Geomorphology: This association occurs in valleys with narrow to moderately wide floodplains, 30-600 ft (10-200 m), and in deep canyons. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). This association is commonly found on slightly meandering to meandering floodplains in narrow to broad valleys (Rosgen's Channel Type: B2-B5, C2-C4). Occasionally, stands occur along steep streams (Rosgen's Channel Type: A2, A3).

Soil: Soils are mostly coarse textured ranging from deep sands to shallow sandy loams. Some profiles show stratification with loams to clay loams alternating with sands. Most profiles become skeletal at an average depth of 12 inches (30 cm).

Successional and Ecological Processes: The *Populus angustifolia/Alnus incana* (narrowleaf cottonwood/thinleaf alder) plant association is considered a mid-seral community (not the youngest and not the oldest stands of cottonwoods within a reach). With time and without flooding disturbance, stands may become dominated by invading conifers from adjacent upland communities such as *Pseudotsuga menziesii* (Douglas-fir), *Juniperus* spp. (juniper), or *Picea engelmannii* (Engelmann spruce).

Adjacent Vegetation: Adjacent Riparian Vegetation: the adjacent riparian vegetation depends on the width and complexity of the riparian area. In narrow canyons, *Populus angustifolia* (narrowleaf cottonwood) may drop out, leaving a *Picea pungens / Alnus incana* (blue spruce/thinleaf alder) stand. *Alnus incana* (thinleaf alder) and mixed *Alnus incana - Cornus sericea* (thinleaf alder-redosier dogwood) or *Alnus incana - Salix drummondiana* (thinleaf alder-Drummond's willow) shrublands occur adjacent to the floodplain forest on steep-sided banks. *Salix* (willow) species shrublands occur in low, open areas, on point bars, overflow channels, and islands. Adjacent Upland Vegetation: at lower elevations, mixed coniferous forests including *Pseudotsuga menziesii* (Douglas-fir), *Pinus ponderosa* (ponderosa pine), *Abies concolor* (white fir), or *Picea pungens* (blue spruce) occur on adjacent hill slopes. *Pinus edulis - Juniperus monosperma* (twoneedle pinyon-Rocky Mountain juniper) and *Populus tremuloides* (quaking aspen) woodlands, *Quercus gambelii* (Gambel's oak) scrub, and *Amelanchier alnifolia* (Saskatoon serviceberry) shrublands also occur. At higher elevations, *Picea engelmannii - Abies lasiocarpa* (Engelmann spruce-subalpine fir) forests occur on adjacent hill slopes.

Management: Regeneration and establishment of new stands of cottonwood are dependent upon flooding events, and any alterations to the natural flow regime of a river can affect the cottonwood ecosystem. Upstream dams stabilize stream flows by

reducing the frequency and magnitude of floods. This results in fewer flood events that allow cottonwood stand regeneration. Without periodic disturbance by flooding, riparian areas become dominated by late-seral communities. These late-seral communities are dominated by more upland species, such as conifers in montane areas or other, more drought tolerant species in the foothill and plains environments. Forage productivity for this plant association can be high and very palatable to livestock. Cottonwood seedlings and saplings and the associated shrub species are frequently browsed by cattle. Excessive grazing and browsing will reduce plant vigor and allow non-native plant species to gain a competitive advantage. Cottonwood-dominated riparian areas in Colorado are best grazed moderately for short periods during the growing season or solely during the winter season. This maintains high forage quality and quantity. This plant association also provides excellent hiding and thermal cover for mammals and birds (Hansen *et al.* 1995).

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Populus angustifolia / Betula occidentalis* Woodland
State Common Name Montane Riparian Forest

Global Scientific Name: *Populus angustifolia / Betula occidentalis* Woodland
Global Common Name: Narrowleaf Cottonwood / Water Birch Woodland

Community Classification

System:	International Vegetation Classification
Class:	Woodland
Subclass:	Deciduous woodland
Group:	Cold-deciduous woodland
Subgroup:	Natural/Semi-natural cold-deciduous woodland
Formation:	Temporarily flooded cold-deciduous woodland
Alliance:	Narrowleaf Cottonwood Temporarily Flooded Woodland Alliance

Global Rank: G3
Global Rank Reasons: This riparian woodland is uncommon and occurs locally throughout much of its range. Although this association appears stable, the condition of high quality occurrences is extremely threatened because of easy access to this relatively low elevation community. Development, heavy recreation use, expansion and maintenance of roads and railroads, improper grazing, and modification of the hydrologic processes threaten this community with the introduction of non-native species, accelerated erosion, and damage to native vegetation. Hydrologically modified streams may lack the processes necessary to regenerate the *Populus angustifolia* tree canopy.

Subnational Rank: S3
Subnational Rank Reasons: Threatened by development, stream flow alterations, road/bridge building and maintenance, improper grazing, and heavy recreational use.

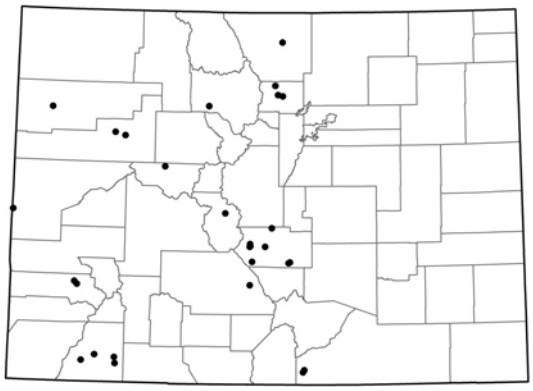
General Description: This plant association is a lush deciduous community of *Populus angustifolia* (narrowleaf cottonwood) and *Betula occidentalis* (river birch) growing in a thick band along the stream banks. The community is one of the wetter *Populus angustifolia* plant associations, which indicates a perennial source of water and possibly lateral seepage to the channel. Some stands occur on hillside seeps.

This plant association occurs on stream banks and benches along narrow, somewhat steep streams with little to moderate floodplain development. It also occurs on immediate stream banks or steep-sided overflow channel areas along larger streams with well-developed floodplains. Stream channels are steep and narrow with rocky beds or broad and meandering.

Vegetation: This plant association is characterized by an overstory of 5-80% cover of *Populus angustifolia* (narrowleaf cottonwood) and a thick shrub understory of *Betula occidentalis* (river birch). Other tree species that can be present include *Pseudotsuga menziesii* (Douglas-fir) and *Juniperus scopulorum* (Rocky Mountain juniper). Other shrubs that can be abundant, but never more than birch include *Alnus incana* ssp. *tenuifolia* (thinleaf alder), *Acer glabrum* (mountain maple), *Cornus sericea* (red-osier dogwood), *Salix bebbiana* (Bebb willow), *Crataegus rivularis* (river hawthorn), *Ribes inerme* (whitestem gooseberry), *Salix ligulifolia* (strapleaf willow), *Rhus trilobata* (skunkbush sumac), *Salix irrorata* (bluestem willow), *Rubus parviflorus* (thimbleberry), and *Prunus virginiana* (chokecherry). Graminoid and forb cover is minor, except in degraded stands, where introduced, nonnative species can be abundant. These include *Poa pratensis* (Kentucky bluegrass), *Taraxacum officinale* (dandelion), *Melilotus* spp. (sweetclover). Native herbaceous species include *Maianthemum stellatum* (starry false Solomon seal), *Rudbeckia laciniata* var. *ampla* (cutleaf coneflower), *Carex utriculata* (beaked sedge), and *Angelica ampla* (giant angelica).

Similar Communities: Two closely related communities have similar species composition but include significant amounts of other species not found in the Colorado association. They are the *Populus / Betula occidentalis* (cottonwood/water birch) community type (Manning and Padgett 1995), which has *Populus trichocarpa* (black cottonwood), and the *Populus angustifolia / Prunus virginiana* (narrowleaf cottonwood/common chokecherry) community type (Girard *et al*. 1997), which includes scattered *Betula occidentalis*.

Regional Distribution: This association occurs in the mountains and canyons in Utah, Idaho, Wyoming, and Colorado. These riparian woodlands are major type the Wasatch Mountains, but appears minor elsewhere.



Colorado Distribution: Along the Front Range and in western and southwestern Colorado.

Elevation Range in Colorado: 6,000.00 - 8,400.00 ft / 1,828.80 - 2,560.32 m

Site Geomorphology: This plant association occurs on streambanks and benches along narrow, somewhat steep streams with little to moderate floodplain development. It also occurs on immediate streambanks or steep-sided overflow channel areas along larger streams with well-developed floodplains. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are steep and narrow with rocky beds (Rosgen's Channel Type: A3, A4) or broad and meandering (Rosgen's Channel Type: B3, C3).

Soil: Soils have a surface layer of partially decomposed organic matter 2-4 inches (5-10 cm) thick. Subsurface layers are very coarse with 10-60% gravel or cobbles. Subsurface textures range from clay loams to loamy sands.

Successional and Ecological Processes: The *Populus angustifolia / Betula occidentalis* (narrowleaf cottonwood / river birch) plant association is considered to be early- to mid-seral. *Betula occidentalis* becomes abundant along stream banks with perennial stream flow and well-aerated soils. With continued aggradation of the alluvial surface and shading from a thick shrub canopy, successful *Populus angustifolia* reproduction may cease and the stand may become a *Betula occidentalis* dominated shrubland with a graminoid understory. *Populus angustifolia* appears to be reproducing in two of the stands sampled, however, the individuals may be sprouting from roots rather than developing from seeds.

Adjacent Vegetation: Adjacent Riparian Vegetation: this plant association is usually the only riparian community along a narrow stream channel and generally does not form a mosaic with other communities. Occasionally, there may be adjacent stands of *Pseudotsuga menziesii* (Douglas-fir), or shrublands of *Alnus incana* (thinleaf alder) or *Salix exigua* (coyote willow). Adjacent Upland Vegetation: south-facing canyon slopes have *Pinus edulis* (twoneedle pinyon) and *Juniperus monosperma* (oneseed juniper) woodlands. North-facing slopes have *Pinus ponderosa* (ponderosa pine) or *Pseudotsuga menziesii* (Douglas-fir) forests.

Management: Because regeneration and establishment of new stands of cottonwood are dependent upon flooding events, any alteration to the natural flow regime of a river can affect the cottonwood ecosystem. Upstream dams stabilize stream flows by reducing the frequency and magnitude of floods. This results in fewer flood events that provide conditions for cottonwood stand regeneration. Without periodic disturbance by flooding, riparian areas become dominated by late-seral communities. These late-seral communities are dominated by upland species, such as conifers in montane areas or other, more drought tolerant species in the foothill and plains environments. Forage productivity for this plant association is high and very palatable to livestock. Cottonwood seedlings and saplings as well as *Betula occidentalis* (water birch) shrubs are frequently browsed by cattle. Excessive grazing and browsing will reduce plant vigor and allow non-native plant species to gain a competitive advantage. Moist soils also make this community susceptible to soil compaction. Cottonwood-dominated riparian areas in Colorado are best grazed moderately for short periods during the growing season or solely during the winter season. This maintains high forage quality and quantity (Hansen *et al.* 1995).

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Populus angustifolia / Rhus trilobata* Woodland
State Common Name Narrowleaf Cottonwood/Skunkbrush

Global Scientific Name: *Populus angustifolia / Rhus trilobata* Woodland
Global Common Name: Narrowleaf Cottonwood / Squawbush Woodland

Community Classification

System:	International Vegetation Classification
Class:	Woodland
Subclass:	Deciduous woodland
Group:	Cold-deciduous woodland
Subgroup:	Natural/Semi-natural cold-deciduous woodland
Formation:	Temporarily flooded cold-deciduous woodland
Alliance:	Narrowleaf Cottonwood Temporarily Flooded Woodland Alliance

Global Rank: G3
Global Rank Reasons: This riparian woodland is uncommon and occurs locally throughout much of its range. There are over 20 occurrences estimated for this type rangewide. Although this association appears stable, the condition of high quality occurrences is extremely threatened. Development, heavy recreation use, expansion and maintenance of roads and railroads, improper grazing, and modification of the hydrologic processes threaten this community with the introduction of non-native species, accelerated erosion, and damage to native vegetation. Hydrologically modified streams may lack the processes necessary to regenerate the *Populus angustifolia* tree canopy.

Subnational Rank: S3
Subnational Rank Reasons: This association is limited to western and south-central Colorado. It is highly threatened by improper livestock grazing, development, road building and maintenance, and altered stream flow regimes.

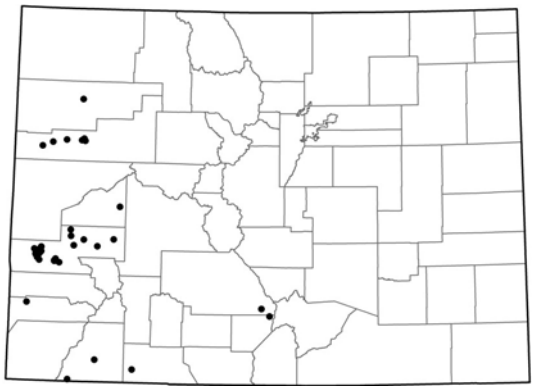
General Description: The *Populus angustifolia/Rhus trilobata* (narrowleaf cottonwood/skunkbush sumac) plant association is characterized by a scattered overstory of *Populus angustifolia* with an occasional *P.* x *acuminata* (lanceleaf cottonwood) or *P. deltoides* ssp. *wislizeni* (Rio Grande cottonwood). The shrub understory is a dense layer of *Rhus trilobata*. It occurs in sandstone canyons and on streams adjacent to sand dunes. This plant association occurs on immediate river banks, floodplain meanders, and narrow benches in narrow to wide, 65-500 ft (20-150 m),

sandstone canyons. Stands generally occur within 3 ft (1 m) of the high water mark, but can also occur on higher terraces, up to 10 ft (3 m) above the channel. In the western portion of the Colorado River drainage, this association occurs on small streams in shale canyon areas. Stream channels are wide and highly sinuous or wide and moderately sinuous. Occasionally, stream channels are narrow and steep.

Vegetation: This plant association is characterized by the presence and abundance of *Rhus trilobata* (skunkbush sumac) with *Populus angustifolia* (narrowleaf cottonwood), or *P.* x *acuminata* (lanceleaf cottonwood). The cottonwoods may be young or mature trees. Other trees that may be present in the overstory include *Acer negundo* (boxelder), *Juniperus osteosperma* (Utah juniper), *Juniperus scopulorum* (Rocky Mountain juniper), *Pinus ponderosa* (ponderosa pine), *Pseudotsuga menziesii* (Douglas-fir), *Pinus edulis* (pinyon pine), and *Ulmus pumila* (Siberian elm), an introduced species found in a single plot. The shrub layer is dominated by *Rhus trilobata* (skunkbush sumac). Other shrubs that may be present include *Clematis ligusticifolia* (western white clematis), *Rosa woodsii* (Woods rose), *Quercus gambelii* (Gambel oak), *Salix exigua* (sandbar willow), *Amelanchier utahensis* (Utah serviceberry), *Cornus sericea* (red-osier dogwood), *Forestiera pubescens* (wild privet), *Prunus virginiana* (chokecherry), *Berberis fendleri* (Colorado barberry), *Shepherdia argentea* (silver buffaloberry), and *Acer glabrum* (Rocky Mountain maple). The herbaceous undergrowth is usually sparse.

Similar Communities: -

Regional Distribution: This riparian woodland occurs locally in the mountains and canyons in Utah, Wyoming, Colorado, and Idaho.



Colorado Distribution: This association is limited to western and south-central Colorado. Found on the Uncompahgre Plateau in the San Miguel and Dolores River Basins (Kittel and Lederer 1993), the Colorado River Basin (Kittel *et al*. 1994), the White River Basin, the Gunnison River Basin and the Upper San Juan River Basin, the San Juan and Rio Grande National Forests (Richard *et al*. 1996, Kittel et al. 1999b), and in the San Luis Valley.

Elevation Range in Colorado: 5,000.00 - 8,000.00 ft / 1,524.00 - 2,438.40 m

Site Geomorphology: This plant association occurs on immediate river banks, floodplain meanders, and narrow benches in narrow to wide, 65-500 ft (20-150 m), sandstone canyons. Stands generally occur within 3 ft (1 m) of the high water mark, but can also occur on higher terraces, up to 10 ft (3 m) above the channel. In the western portion of the Colorado River drainage, this association occurs on small streams in shale canyon areas. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are wide and highly sinuous (Rosgen's Channel Type: C3, C4, C6) or wide and moderately sinuous (Rosgen's Channel Type: B3). Occasionally, stream channels are narrow and steep (Rosgen's Channel Type: A3).

Soil: The soils associated with this plant association are often alkaline and of a calcareous parent material. The soil textures are fine sandy loams, clay loams, silty clay loams, and silty clay.

Successional and Ecological Processes: In southwestern Colorado, *Rhus trilobata* is present in both young and old cottonwood stands. As the stand matures, *Rhus trilobata* becomes denser and excludes other shrubs. On higher terraces that are less frequently flooded, *Populus angustifolia* does not reproduce. This indicates succession to an upland community. The presence of *Quercus gambelii* (Gambel oak) in some stands may indicate a trend toward an upland oak shrub community. As with all cottonwood woodlands, this association is found within a continually changing alluvial environment where riparian vegetation is constantly being "re-set" by flooding disturbance. The process of cottonwood regeneration is dependent on flooding disturbance. Periodic flooding allows cottonwood seedlings to germinate and become established on newly deposited, moist sandbars. Natural river processes of bank erosion, deposition and channel migration result in a dynamic patchwork of different age classes, plant associations and habitats.

Adjacent Vegetation: Adjacent Riparian Vegetation: this plant association may intergrade with *Populus deltoides* ssp. *wislizeni* / *Rhus trilobata* (Rio Grande cottonwood/skunkbush sumac) forests at lower elevations where the distributions of the two *Populus* (cottonwood) species overlap. *Salix exigua* (coyote willow) shrublands can also occur on adjacent point bars and streambanks. Adjacent Upland Vegetation: *Pinus edulis* - *Juniperus osteosperma* (two needle pinyon-Utah juniper) woodlands; *Pinus ponderosa* - *Quercus gambelii* (ponderosa pine - Gambel's oak) forests; *Quercus gambelii* (Gambel's oak) scrub; and *Artemisia tridentata* (big sagebrush) and *Chrysothamnus* spp. (rabbitbrush) shrublands often occur on adjacent hill slopes.

Management: Because regeneration and establishment of new stands of cottonwood are dependent upon flooding events, any alteration to the natural flow regime of a river can affect the cottonwood ecosystem. Upstream dams stabilize stream flows by reducing the frequency and magnitude of floods. This results in fewer flood events that provide conditions for cottonwood stand regeneration. Without periodic disturbance by flooding, riparian areas become dominated by late-seral communities. These late-seral communities are dominated by more upland species, such as conifers in montane areas or other, more drought tolerant species in the foothill and plains environments. Forage productivity for this plant association is high and very palatable to livestock. Cottonwood seedlings and saplings are frequently browsed by cattle. However, in California, *Rhus trilobata* (skunkbush sumac) is considered to be useless browse for livestock and only fair to poor browse for wildlife (Padgett *et al*. 1989). In areas with limited cover of palatable species, *Rhus trilobata* may be more heavily browsed. Excessive grazing and browsing of both *Populus angustifolia* (narrowleaf cottonwood) and *Rhus trilobata* will reduce plant vigor and allow non-native plant species to gain a competitive advantage. Cottonwood-dominated riparian areas in Colorado are best grazed moderately for short periods during the growing season or solely during the winter season. This maintains high forage quality and quantity (Hansen *et al*. 1995).

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Populus tremuloides / Pteridium aquilinum* Forest
State Common Name Aspen Wetland Forests

Global Scientific Name: *Populus tremuloides / Pteridium aquilinum* Forest
Global Common Name: Aspen / Bracken Fern Forest

Community Classification

System:	International Vegetation Classification
Class:	Forest
Subclass:	Deciduous forest
Group:	Cold-deciduous forest
Subgroup:	Natural/Semi-natural cold-deciduous forest
Formation:	Montane or boreal cold-deciduous forest
Alliance:	Quaking Aspen Forest Alliance

Global Rank: G4
Global Rank Reasons: Apparently secure globally, though it might me quite rare in parts of its range, especially at the periphery. Found in the central and southern Rocky Mountains and in the Black Hills.

Subnational Rank: S3S4
Subnational Rank Reasons: Although less than 10 occurrences are documented in Colorado, it is expected to occur with more frequency, possibly up to 100 occurrences.

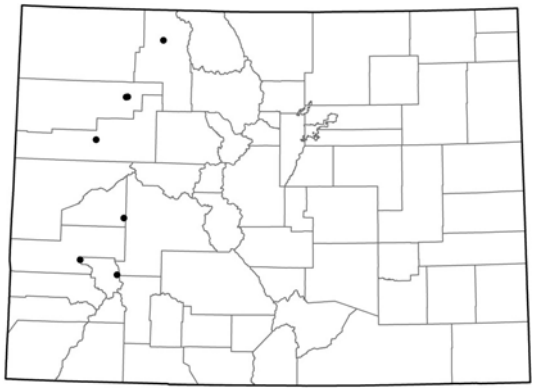
General Description: This *Populus tremuloides* forest association is found in the central and southern Rocky Mountains and in the Black Hills. It occurs on moist, concave or flat drainages with intermittent or perennial streams or in areas of poor soil drainage or a high water table. Some sites are frost pockets with cold-air drainage. This forest type occurs on mid- and low slopes with gentle to steep pitch (12-49% slope) with variable aspect from 1585 to 2850 m (5200-9350 feet) in elevation. Soils tend to be deep and loamy. This deciduous forest is characterized by a moderately dense to dense canopy solely dominated by *Populus tremuloides* with the understory dominated by *Pteridium aquilinum*. Conifers such as *Pseudotsuga menziesii, Pinus ponderosa, Abies lasiocarpa*, or *Picea engelmannii* may occur sporadically in the tree canopy with low cover. These trees are incidental and in areas where adjacent associations are conifer-dominated. This forest type typically lacks a well-developed shrub component, although some stands may have a moderately dense short-shrub layer.

Vegetation: This deciduous forest is characterized by a moderately dense to dense canopy solely dominated by *Populus tremuloides* with the understory dominated by *Pteridium aquilinum*. Conifers such as *Pseudotsuga menziesii, Pinus ponderosa, Abies*

lasiocarpa, or *Picea engelmannii* may occur sporadically in the tree canopy with low cover. These trees are incidental and in areas where adjacent associations are conifer-dominated. This forest type typically lacks a well-developed shrub component, although some stands may have a moderately dense short-shrub layer. Moderate cover to scattered individuals of *Symphoricarpos oreophilus, Symphoricarpos albus, Sambucus racemosa, Ribes inerme, Amelanchier alnifolia, Corylus cornuta*, or *Prunus virginiana* may be present. The herbaceous layer is characterized by dominance of *Pteridium aquilinum* (30-80%) (Hoffman and Alexander 1980, 1983, Komarkova et al. 1988b, Mueggler 1988). Other important herbs include *Elymus glaucus, Bromus carinatus, Agastache urticifolia, Eucephalus engelmannii (= Aster engelmannii), Fragaria* spp., *Galium boreale, Geranium richardsonii, Lathyrus lanszwertii var. leucanthus (= Lathyrus leucanthus), Mertensia ciliata, Osmorhiza depauperata, Polemonium pulcherrimum, Rudbeckia occidentalis, Senecio serra, Thalictrum fendleri*, and *Vicia americana*, among others. *Carex geyeri* is common in Colorado (Hoffman and Alexander 1980, Komarkova et al. 1986, 1988b).

Similar Communities: -

Regional Distribution: This type is found in the Rocky Mountain front range and Black Hills of the United States, extending from Colorado and Utah northward to South Dakota.



Colorado Distribution: Known from Delta, Garfield, Ouray, Rio Blanco and Routt Counties, Colorado.

Elevation Range in Colorado: 7,640.00 - 9,400.00 ft / 2,328.67 - 2,865.12 m

Site Geomorphology: t occurs on moist, concave or flat drainages with intermittent or perennial streams or in areas of poor soil drainage or a high water table. Some sites are frost pockets with cold-air drainage. This forest type occurs on mid- and low slopes with gentle to steep pitch (12-49% slope) with variable aspect from 1585 to 2850 m (5200-9350 feet) in elevation.

Soil: Soils tend to be deep and loamy.

Successional and Ecological Processes: Both *Populus tremuloides* and *Pteridium aquilinum* establish readily after fire and may persist for some time (Hoffman and Alexander 1983, Komarkova et al. 1988b). In the Black Hills, some of these *Populus tremuloides* stands are nearly 100 years old, with *Pteridium aquilinum* still vigorous and dominant (Hoffman and Alexander 1987). It has been suggested that *Pteridium aquilinum* abundance can result from heavy grazing; *Pteridium aquilinum* itself is unpalatable, and heavy grazing can reduce or eliminate palatable species associated in the herbaceous layer (e.g., *Elymus glaucus, Bromus carinatus, Eucephalus engelmannii*). This type is considered to be a stable climax association on mesic bottomlands by Komarkova (1986) and Powell (1988a), who described it as a "topoedaphic climax."

Adjacent Vegetation: -

Management: -

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Pseudoroegneria spicata - Achnatherum hymenoides* Herbaceous Vegetation

State Common Name Western Slope Grasslands

Global Scientific Name: *Pseudoroegneria spicata - Achnatherum hymenoides* Herbaceous Vegetation

Global Common Name: Bluebunch Wheatgrass - Indian Ricegrass Mixedgrass

Community Classification

System:	International Vegetation Classification
Class:	Herbaceous Vegetation
Subclass:	Perennial graminoid vegetation
Group:	Temperate or subpolar grassland
Subgroup:	Natural/Semi-natural temperate or subpolar grassland
Formation:	Medium-tall bunch temperate or subpolar grassland
Alliance:	Bluebunch Wheatgrass Herbaceous Alliance

Global Rank: G3G4
Global Rank Reasons: As this association is currently understood, it extends from southwestern Montana southward through Wyoming to western Colorado. It is assigned a conservation rank of G3G4 because it seems to have a wide geographic distribution and to occupy common habitats. However, the number of stands that have not been altered by livestock grazing may be small. The rank is questionable because it is unclear if the stands in Wyoming and Montana should be considered part of this association or if they belong to some other association, or whether this association is restricted to Colorado where it was first described.

Subnational Rank: SU
Subnational Rank Reasons: Only 5 occurrences documented in Colorado. More information is needed to assign an Srank.

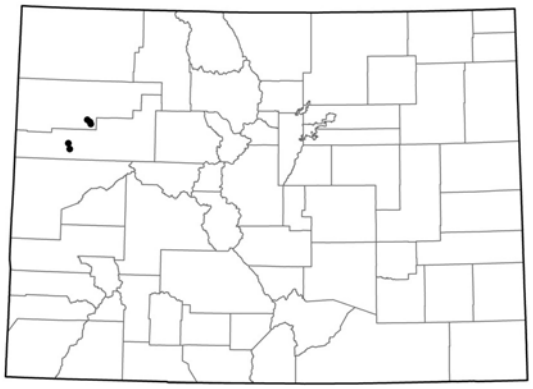
General Description: This sparse grassland association has been described from western Colorado, south-central Wyoming, and southwestern Montana. Stands occupy rocky or badland slopes with shallow, usually unstable soils. Common species in the sparse vegetation are *Pseudoroegneria spicata* (which generally dominates) and *Achnatherum hymenoides (= Oryzopsis hymenoides)*. Among the other species which may be present, usually in small amounts, are *Gutierrezia sarothrae, Aristida purpurea var. longiseta (= Aristida longiseta), Artemisia tridentata ssp. wyomingensis, Phlox* spp., *Artemisia frigida*, and *Ericameria* spp. (= *Chrysothamnus* spp.).

Vegetation: Common species in the sparse vegetation are *Pseudoroegneria spicata* (which generally dominates) and *Achnatherum hymenoides (= Oryzopsis hymenoides)*. Among the other species which may be present, usually in small amounts, are *Gutierrezia sarothrae, Aristida purpurea var. longiseta (= Aristida longiseta), Artemisia tridentata ssp. wyomingensis, Phlox* spp., *Artemisia frigida*, and *Ericameria* spp. (= *Chrysothamnus* spp.).

Similar Communities: -

Regional Distribution: As this association is currently understood, it extends from southwestern Montana southward through Wyoming to western Colorado.

Colorado Distribution: Found in Garfield and Rio Blanco Counties, Colorado.



Elevation Range in Colorado: 5,880.00 - 8,140.00 ft / 1,792.22 - 2,481.07 m

Site Geomorphology: -

Soil: Rocky or badland slopes with shallow, usually unstable soils.

Successional and Ecological Processes: -

Adjacent Vegetation: -

Management: -

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Pseudoroegneria spicata* Herbaceous Vegetation
State Common Name Western Slope Grasslands

Global Scientific Name: *Pseudoroegneria spicata* Herbaceous Vegetation
Global Common Name: Bluebunch Wheatgrass Herbaceous Vegetation

Community Classification

System:	International Vegetation Classification
Class:	Herbaceous Vegetation
Subclass:	Perennial graminoid vegetation
Group:	Temperate or subpolar grassland
Subgroup:	Natural/Semi-natural temperate or subpolar grassland
Formation:	Medium-tall bunch temperate or subpolar grassland
Alliance:	Bluebunch Wheatgrass Herbaceous Alliance

Global Rank: G2
Global Rank Reasons: This association is known only from western Colorado but is expected to occur in Utah and Wyoming. Grazing has a negative effect on this association and it is believed that it now occupies a very small portion of the original range. Baker (1982b) reports that *Pseudoroegneria spicata* does not tolerate grazing and will eventually convert to a *Koeleria macrantha* grassland if grazing pressures continue. Baker (1982b) also estimates that at least two-thirds of the original *Pseudoroegneria spicata* grassland community in the Piceance Basin has been replaced by *Koeleria macrantha* grasslands. The size of most occurrences is very small, five under 15 acres and two under 60 acres.

Subnational Rank: S2?
Subnational Rank Reasons: 10 documented occurrences limited to three northwestern counties in Colorado. Threatened by grazing and habitat alteration.

General Description: This grassland association occurs on rock outcrops, talus, mesas, plateaus, windswept bluffs, ridgetops and mountains in northern Colorado, northeastern Utah and western and southwestern Wyoming. It frequently occurs on moderately to steep, mid- to high-slope landforms, although gentle slopes are not uncommon. Sites are relatively xeric and are often found on southerly aspects at lower elevations or on harsh or on windswept areas at higher elevation sites. Substrates are typically shallow, often calcareous, rocky soils. Ground surface often has significant cover of bare ground, gravel and/or rock (10-90% cover). Stands are also reported east of the Continental Divide in Rocky Mountain National Park on a windward knoll and at

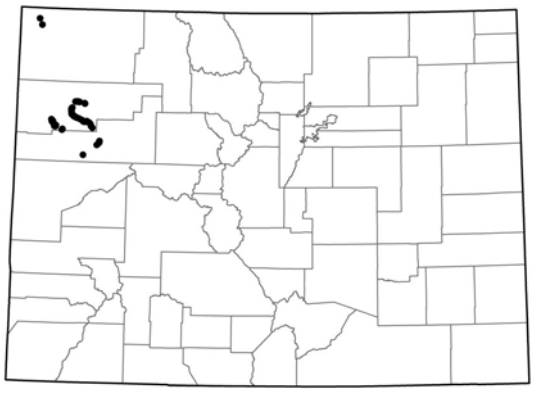
Grand Teton National Park from a very steep northeast-facing high slope. The vegetation is characterized by an open herbaceous layer that is typically dominated by the cool-season, perennial bunchgrass *Pseudoroegneria spicata* with low to moderate cover (5-30%) and low-growing forbs. *Koeleria macrantha* is repeatedly present in low abundance. Other dry grasses may be present with low cover (less than half the cover of *Pseudoroegneria spicata*). A sparse dwarf-shrub layer (<10% cover) occurs with a variety of woody species of *Artemisia, Atriplex confertifolia, Cercocarpus, Eriogonum, Gutierrezia, Krascheninnikovia* or *Tetradymia* depending on elevation and substrate. There are several to many low-growing forbs (cushion plants) present with low cover, such as *Arenaria* spp., *Arenaria hookeri, Astragalus* spp., *Paronychia sessiliflora, Phlox* spp., *Stenotus acaulis, Tetraneuris acaulis (= Hymenoxys acaulis)*, and *Townsendia incana*. There are no clear dominants in this list, and the percent cover of each species present will vary from site to site. A diverse and abundant forb layer probably indicates a degraded occurrence.

Vegetation: This association is characterized by an open vegetation layer that is typically dominated by the cool-season, perennial bunchgrass *Pseudoroegneria spicata* with low to moderate cover (7-30%) and low-growing forbs. *Koeleria macrantha* is repeatedly present in low abundance. Other grasses may include *Achnatherum hymenoides, Hesperostipa comata, Leptodactylon pungens, Poa fendleriana, Poa secunda*; if present they have low cover (less than half the cover of *Pseudoroegneria spicata*). A sparse dwarf-shrub layer (<10% cover) may be present and includes a variety of woody species, such as *Artemisia arbuscula ssp. longiloba, Artemisia frigida, Artemisia nova, Artemisia tridentata, Atriplex confertifolia, Cercocarpus intricatus, Cercocarpus montanus, Eriogonum corymbosum, Eriogonum microthecum, Gutierrezia sarothrae, Krascheninnikovia lanata, Chrysothamnus greenei, Chrysothamnus viscidiflorus, Heterotheca villosa, Rosa woodsii, Ribes cereum, Symphoricarpos oreophilus*, or *Tetradymia canescens*, depending on elevation and substrate. Several to many low-growing forbs (cushion plants) are present with low cover. Species may include *Arenaria fendleri, Arenaria hookeri, Astragalus spatulatus, Astragalus tenellus, Chaetopappa ericoides, Draba oligosperma, Eriogonum lonchophyllum, Lesquerella alpina, Machaeranthera grindelioides, Mertensia oblongifolia, Paronychia sessiliflora, Penstemon paysoniorum, Phlox austromontana, Phlox hoodii, Sphaeralcea coccinea, Stenotus acaulis, Tetraneuris acaulis (= Hymenoxys acaulis), Townsendia incana*, and *Trifolium gymnocarpon*.

Similar Communities: -

Regional Distribution: Documented in northwestern Colorado in three counties. It is predicited that this community may also be found in Utah and Wyoming.

Colorado Distribution: Known from Garfield, Moffat and Rio Blanco Counties.



Elevation Range in Colorado: 6,400.00 - 9,250.00 ft / 1,950.72 - 2,819.40 m

Site Geomorphology: It frequently occurs on moderately to steep, mid- to high-slope

landforms, although gentle slopes are not uncommon.

Soil: Substrates are typically shallow, often calcareous, rocky soils.

Successional and Ecological Processes: -

Adjacent Vegetation: -

Management: -

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Pseudotsuga menziesii / Acer glabrum* Forest
State Common Name Lower Montane Forests

Global Scientific Name: *Pseudotsuga menziesii / Acer glabrum* Forest
Global Common Name: Douglas-fir / Rocky Mountain Maple Forest

Community Classification

System:	International Vegetation Classification
Class:	Forest
Subclass:	Evergreen forest
Group:	Temperate or subpolar needle-leaved evergreen forest
Subgroup:	Natural/Semi-natural temperate or subpolar needle-leaved evergreen forest
Formation:	Conical-crown temperate or subpolar needle-leaved evergreen forest
Alliance:	Douglas-fir Forest Alliance

Global Rank: G4?
Global Rank Reasons: This community is demonstrably secure and is known from the montane zone in the southern, central and northern Rocky Mountains

Subnational Rank: S1
Subnational Rank Reasons: Few occurrences documented in Colorado. Expected to have between 6 and 20 occurrences and S rank may be updated soon to an S2.

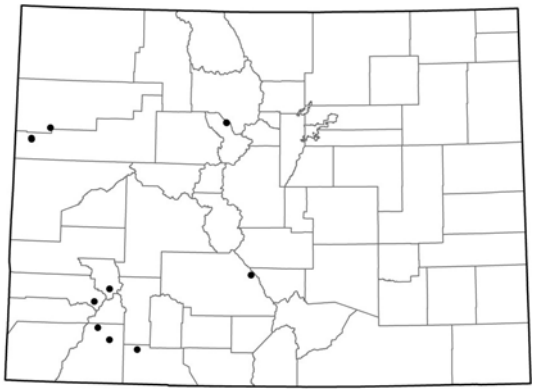
General Description: This montane forest association occurs in the montane zone in the southern, central and northern Rocky Mountains. Sites are cool and moist, generally occurring on northern or eastern aspects, on steep, mid to lower slopes, and ravines or stream bottoms where cold-air drainage is a factor. Substrates are variable and may be gravelly or not, with soil texture ranging from sandy loam to clay derived from colluvium. The vegetation is characterized by a *Pseudotsuga menziesii*-dominated tree canopy with *Acer glabrum* dominating or codominating the understory. The tall-shrub layer is open (patchy) to moderately dense and dominated or codominated by *Acer glabrum* with other tall shrubs present. An open to moderately dense short-shrub layer is usually present. Herbaceous layer generally has low cover and is composed of diverse forbs with graminoids present to codominant.

Vegetation: This minor Rocky Mountain conifer association is characterized by a *Pseudotsuga menziesii*-dominated tree canopy with *Acer glabrum* dominating or codominating the understory. The evergreen needle-leaved tree canopy is generally

moderately dense to dense (50-80% cover), although occasionally the cover will be as low as 15%. Mature seral tree species like *Pinus contorta, Pinus flexilis, Pinus ponderosa, Larix occidentalis, Populus angustifolia*, or *Populus tremuloides* may be present to codominant. *Abies concolor* is typically absent. The tall-shrub layer is open (patchy) to moderately dense and dominated or codominated by *Acer glabrum* with other tall shrubs such as *Amelanchier alnifolia, Cornus sericea, Quercus gambelii, Prunus virginiana, Sorbus scopulina, Spiraea betulifolia*, or *Salix scouleriana*. An open to moderately dense short-shrub layer is usually present and often dominated by *Physocarpus malvaceus* with other species such as *Holodiscus dumosus, Lonicera utahensis, Mahonia repens, Paxistima myrsinites, Prunus virginiana, Rosa* spp., *Ribes cereum, Ribes inerme, Sambucus racemosa, Symphoricarpos albus*, or *Symphoricarpos oreophilus*. The vine *Clematis columbiana* may also be present in small amounts. In some stands the tall- and short-shrub layers are not distinct. Herbaceous layer generally has low cover and is composed of diverse forbs with graminoids present to codominant. Species may include *Agrostis scabra, Arnica cordifolia, Calamagrostis rubescens, Carex geyeri, Cystopteris fragilis, Elymus glaucus, Erigeron speciosus, Heracleum maximum (= Heracleum lanatum), Eurybia conspicua, Fragaria vesca, Galium triflorum, Mitella stauropetala, Moehringia macrophylla (= Arenaria macrophylla),Osmorhiza berteroi (= Osmorhiza chilensis), Penstemon wilcoxii, Poa nervosa, Maianthemum racemosum ssp. amplexicaule, Thalictrum fendleri*, or *Thalictrum occidentale*.

Similar Communities: -

Regional Distribution: This forest association occurs in the montane zone in the southern, central and northern Rocky Mountains from northern Colorado, through Utah, Wyoming, and Idaho, extending into Oregon and Alberta, and possibly Montana.



Colorado Distribution: Found in western Colorado, most occurrences located in the southwest of the state, but also documented in the northwest portion.

Elevation Range in Colorado: 4,800.00 - 8,700.00 ft / 1,463.04 - 2,651.76 m

Site Geomorphology: Sites are cool and moist, generally occurring on northern or eastern aspects, on steep, mid to lower slopes, and ravines or stream bottoms where cold-air drainage is a factor.

Soil: Substrates are variable and may be gravelly or not, with soil texture ranging from sandy loam to clay derived from colluvium. Parent materials include loess, basalt, diorite, dolomite, limestone, granite, quartz monzonite or sandstone.

Successional and Ecological Processes: -

Adjacent Vegetation: -

Management: -

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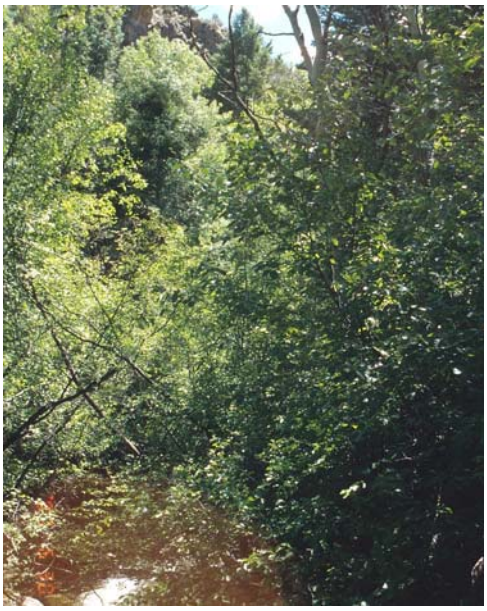
Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Pseudotsuga menziesii / Betula occidentalis* Woodland
State Common Name Montane Riparian Forest

Global Scientific Name: *Pseudotsuga menziesii / Betula occidentalis* Woodland
Global Common Name: Douglas-fir / Water Birch Woodland

Community Classification

System:	International Vegetation Classification
Class:	Woodland
Subclass:	Evergreen woodland
Group:	Temperate or subpolar needle-leaved evergreen woodland
Subgroup:	Natural/Semi-natural temperate or subpolar needle-leaved evergreen woodland
Formation:	Temporarily flooded temperate or subpolar needle-leaved evergreen woodland
Alliance:	Douglas-fir Temporarily Flooded Woodland Alliance



Global Rank: G3?
Global Rank Reasons: This plant association is documented from 11occurrences in Colorado with less than 20 occurrences expected, though thought to occur in Nevada and Utah. It appears to be limited to perennial streams where cold-air drainage and perennial water provide a cool, moist environment to support a diverse shrub canopy. Severe flooding must be infrequent enough to allow *Pseudotsuga menziesii* to achieve dominance. This plant association is highly threatened by development, road maintenance and improvements, and heavy recreational use. The question mark in the rank indicates that the community is suspected to be more abundant, but additional locations have not been documented.

Subnational Rank: S3
Subnational Rank Reasons: This plant association is limited mostly to foothill tributaries along the Colorado Front Range. It is highly threatened by development, road maintenance and improvements, and heavy recreational use.

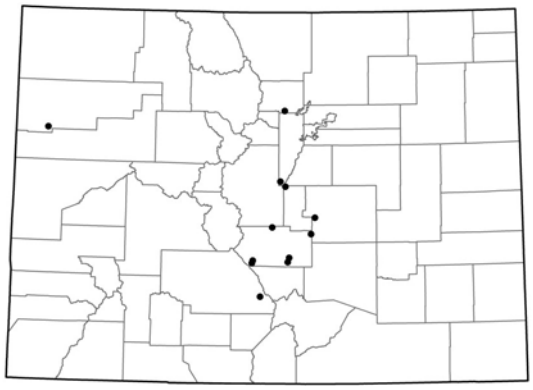
General Description: The *Pseudotsuga menziesii/Betula occidentalis* (Douglas-fir/river birch) association occurs in narrow foothill canyons of the Colorado Front Range in the upper Arkansas and South Platte River Basins and in the Rio Grande National Forest. This plant association occurs in narrow canyons with small streams and is limited to a narrow band along stream banks. Stream channels are steep and narrow with mostly

rocky beds.

Vegetation: This association is characterized by a dominance of *Pseudotsuga menziesii* (Douglasfir) and *Betula occidentalis* (river birch), which are key indicators for this type, even if other tree and shrub species present are abundant. The overstory canopy of this plant association is dominated by 25-50% cover of *Pseudotsuga menziesii* (Douglas-fir). Other tree species that may be present include *Populus angustifolia* (narrowleaf cottonwood), *Juniperus scopulorum* (Rocky Mountain juniper), *Pinus ponderosa* (ponderosa pine), *Abies concolor* (white fir), *Abies lasiocarpa* (subalpine fir), *Picea pungens* (blue spruce), and *Populus tremuloides* (quaking aspen). The shrub canopy is fairly thick and diverse with 20-80% cover of *Betula occidentalis* (river birch). Other shrubs that may be present include *Alnus incana* (thinleaf alder), *Acer glabrum* (Rocky Mountain maple), *Rosa woodsii* (Woods rose), *Jamesia americana* (wax flower), *Cornus sericea* (red-osier dogwood), *Quercus gambelii* (Gambel oak), *Salix bebbiana* (Bebb willow), *Salix ligulifolia* (strapleaf willow), *Salix monticola* (mountain willow), and *Salix irrorata* (bluestem willow). The herbaceous undergrowth is sparse and limited by heavy shade. Some of the more abundant species that may be present include *Maianthemum stellatum* (starry false Solomon seal), *Equisetum arvense* (field horsetail), *Carex disperma* (softleaf sedge), and *Melilotus officinalis* (yellow sweetclover).

Similar Communities: One closely related community, the Conifer / *Betula occidentalis* (conifer/water birch) community type (Manning and Padgett 1995), includes stands in the Snake Range, Nevada having *Pseudotsuga menziesii* (Douglas-fir) with *Betula occidentalis* (water birch) in the understory.

Regional Distribution: Documented locations occur across the eastern half of the Colorado Rocky Mountains ecoregion in Colorado.



Colorado Distribution: This plant association occurs in narrow foothill canyons of the Colorado Front Range, in the upper Arkansas and South Platte River Basins (Kittel *et al.* 1996, Kittel *et al.* 1997), in the Rio Grande National Forest (Kittel et al. 1999b) and 1 occurrence in the White River Basin. Documented in 7 counties.

Elevation Range in Colorado: 6,600.00 - 8,400.00 ft / 2,011.68 - 2,560.32 m

Site Geomorphology: The *Pseudotsuga menziesii* / *Betula occidentalis* (Douglas-fir/water birch) plant association occurs in narrow canyons with small streams and is limited to a narrow band along streambanks. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are steep and narrow with mostly rocky beds (Rosgen's Stream Classification: A2-A3, one B3).

Soil: The soils, derived from alluvial and colluvial deposits, are fairly shallow (60-135 in, 25-55 cm) and become skeletal with depth. Surface layers are sandy loams, clay loams, and loams. Subsurface layers are sandy loams with 10-30% cobbles and gravels. Organic matter from accumulated litter appears to be concentrated in the upper layers.

Successional and Ecological Processes: The *Pseudotsuga menziesii/Betula occidentalis* (Douglas-fir/river birch) plant association appears to be in a late-seral stage since *Pseudotsuga menziesii* is successfully reproducing. It also appears that this association is limited to perennial streams where the cold-air drainage and perennial stream flow provide a cool and moist environment to support a diverse shrub canopy.

Adjacent Vegetation: Adjacent Riparian Vegetation: in general, this is the only riparian community occurring along narrow stream channels. Occasionally, stands of *Betula occidentalis* (water birch) or *Alnus incana* (thinleaf alder) may occur on adjacent stream benches and overflow areas. Adjacent Upland Vegetation: steep colluvial slopes and canyon walls have *Pseudotsuga menziesii* (Douglas-fir) and *Pinus ponderosa* (ponderosa pine) forests or *Juniperus monosperma* (oneseed juniper) and *Pinus edulis* (twoneedle pinyon) woodlands mixed with patches of *Quercus gambelii* (Gambel's oak).

Management: *Pseudotsuga menziesii* (Douglas-fir) regeneration is favored by fire, which creates seedbeds and eliminates competition. Mature trees are relatively fire resistant, but seedlings and saplings are vulnerable to surface fires due to their thin bark and resin blisters (Hansen *et al.* 1995). The thick shrub cover and multiple vertical canopy layers of this plant association provide excellent wildlife habitat for hiding and thermal cover. Severe disturbance to this plant association may reduce the shrub cover (Hansen *et al.* 1988) and result in a more open, herbaceous understory community of introduced species (Hansen *et al*. 1995).

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Salix boothii* / Mesic Forbs Shrubland
State Common Name Booth's Willow/Mesic Forb

Global Scientific Name: *Salix boothii* / Mesic Forbs Shrubland
Global Common Name: Booth's Willow / Mesic Forbs Shrubland

Community Classification

System:	International Vegetation Classification
Class:	Shrubland
Subclass:	Deciduous shrubland
Group:	Cold-deciduous shrubland
Subgroup:	Natural/Semi-natural cold-deciduous shrubland
Formation:	Temporarily flooded cold-deciduous shrubland
Alliance:	Booth's Willow Temporarily Flooded Shrubland Alliance

Global Rank: G3
Global Rank Reasons: This association occurs in Idaho, California, and is a widespread type across Utah and Colorado where most of the known occurrences are located. In many parts of its range this association is threatened by livestock overgrazing, stream flow alterations, and heavy recreational use.

Subnational Rank: S3
Subnational Rank Reasons: This association is common in the northern half of Colorado. Over 50 stands are expected to occur in the state. It is threatened by improper livestock grazing, stream flow alterations, and heavy recreational use.

General Description: The *Salix boothii*/mesic forb (Booth willow/mesic forb) plant association is a tall (4-5 ft, 1-2 m) shrubland that often forms extensive thickets (willow carrs) on broad montane floodplains. This association is common in the northern half of Colorado.This association occurs on wetter sites within the floodplain environment. It is usually found within 2.5 ft (0.75 m) of the water table, but is occasionally located above the channel on low terraces of straighter sections of river. The ground surface is often uneven and hummocky due to past flooding and beaver activity. A narrow to broad, low-gradient floodplain is common along all of the river reaches. Stream channels are steep and narrow, broad and sinuous, narrow and meandering, or recently eroding.

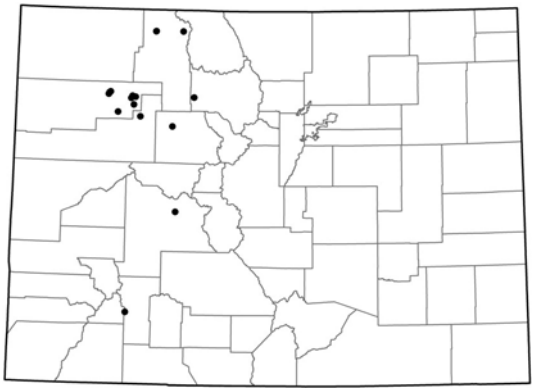
Vegetation: *Salix boothii* (Booth willow) forms large stands with a canopy ranging from 20-80% cover. Other shrub species can be as abundant but do not exceed that of *Salix boothii* nor are they consistently present. Other shrub species include *Salix drummondiana* (Drummond willow), *Salix geyeriana* (Geyer willow), *Salix monticola* (mountain willow), *Dasiphora floribunda* (shrubby cinquefoil), *Betula nana* = *glandulosa)* (bog birch), and *Alnus incana* (thinleaf alder). The undergrowth is characterized by a sparse to lush forb

layer growing on raised hummocks. No one forb species is dominant, instead several abundant species have a 195 combined cover of 40-60%. Forb species include *Swertia perennis* (star gentian), *Pedicularis groenlandica* (elephanthead lousewort), *Polygonum bistortoides* (American bistort), *Heracleum maximum* (common cowparsnip), and *Achillea millefolium* var. *occidentalis* (western yarrow). Graminoid cover is typically low (<20%), but it can be as high as 80%. Graminoid species include *Carex aquatilis* (water sedge), *Carex utriculata* (beaked sedge), and *Calamagrostis canadensis* (bluejoint reedgrass).

Similar Communities: Closely related communities include the *Salix boothii - Salix geyeriana - Salix lasiandra* var. *caudata* (Booth's willow-Geyer's willow-greenleaf willow) plant association (CNHP 1999) and the *Salix geyeriana / Poa pratensis* (Geyer's willow/Kentucky bluegrass) community type (Hansen *et al.* 1989). Both communities have stands with *Salix boothii* (Booth's willow) as the dominant shrub and they could be included in the Colorado *Salix boothii* / Mesic Forbs (Booth's willow/mesic forbs) plant association. Note that *Salix lasiandra* var. *caudata* is a synonym for *Salix lucida* ssp. *caudata* (Kartesz 1994).

Regional Distribution: This association is known from Colorado, Utah, Idaho, California, and possibly Wyoming.

Colorado Distribution: Found in Eagle, Garfield, Grand, Gunnison, Hinsdale, Rio Blanco, Routt, and San Juan counties in Colorado.



Elevation Range in Colorado: 7,000.00 - 9,500.00 ft / 2,133.60 - 2,895.60 m

Site Geomorphology: This plant association occurs on wetter sites within the floodplain environment. It is usually found within 2.5 ft (0.75 m) of the water table, but is occasionally located above the channel on low terraces of straighter sections of river. The ground surface is often uneven and hummocky due to past flooding and beaver activity. A low gradient floodplain is common to all sites. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are steep and narrow (Rosgen's Channel Types: A3), broad and sinuous (Rosgen's Channel Types: B3, C4), narrow and meandering (Rosgen's Channel Types: E4, E6), or recently eroding (Rosgen's Channel Types: F3, F4).

Soil: Soils are highly stratified with alternating layers of sandy loams and clay loams and mottled within the top 4 inches (10 cm). Others are finely textured, dark-colored, highly organic soils with silty clay loam mottling. Lower profiles contain a gravel or cobble layer which may indicate that the soil section is a silted-in beaver pond.

Successional and Ecological Processes: The *Salix boothii* (Booth willow)/mesic forb plant association appears to be a stable and long-lived community on sites that are neither completely saturated nor dry throughout the growing season. The undergrowth of *Salix boothii* dominated associations varies according to the substrate and water regime. Wetter stands have an understory of *Carex utriculata* (beaked sedge), while drier

stands may have *Calamagrostis canadensis* (bluejoint reedgrass) and various forb species. It is unclear whether grazing increases the dominance of either mesic forbs or graminoids or if there are subtle environmental differences between sites that contribute to this. With excessive grazing, this community may be replaced by a *Salix boothii/Poa pratensis* (Booth willow/Kentucky bluegrass) type with native forbs once dominant in the *Salix boothii*/mesic forb plant association growing under the protection of shrub bases.

Adjacent Vegetation: Adjacent wetland vegetation: *Alnus incana* (thinleaf alder) and *Salix drummondiana* (Drummond's willow) shrublands occur on rocky, well-drained streambanks or beaver dams; *Salix boothii* (Booth's willow) plant associations occur in slightly wetter areas; mixed conifer woodlands occupy adjacent reaches that are steep and narrow; and *Carex* (sedge) spp. meadows occupy swales and pond edges in and around the floodplain. Adjacent upland vegetation: mixed conifer - *Populus tremuloides* (mixed conifer - quaking aspen) and pure *Populus tremuloides* (quaking aspen) forests occur on adjacent hillslopes at higher elevations and *Artemisia tridentata* (big sagebrush) scrub occurs on hillsides at lower elevations.

Management: *Salix boothii* (Booth's willow) is highly palatable to livestock, ungulates and beaver, although dense stands may preclude livestock use (Kovalchik *et al*. 1988). Use by ungulates may be especially heavy in the winter when shoots stick up above the snow level (Hansen *et al.* 1988). Livestock and ungulates may actually prefer to browse *Salix geyeriana* (Geyer's willow), when available, over *Salix boothii*, according to observations in Montana (Hansen *et al.* 1989). As with most willow species, *Salix boothii* (Booth's willow) is an effective streambank stabilizer and can be successfully planted to rejuvenate degraded riparian areas. Prescribed burning can also be a useful tool for rejuvenating dying and non-regenerating stands of *Salix boothii* since the species rapidly sprouts after fires. Hot, quick fires are most effective because more plants sprout and fewer are killed (Hansen *et al.* 1988).

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Salix boothii* / Mesic Graminoids Shrubland
State Common Name Riparian Willow Carr

Global Scientific Name: *Salix boothii* / Mesic Graminoids Shrubland
Global Common Name: Booth's Willow / Mesic Graminoid Shrublands

Community Classification

System:	International Vegetation Classification
Class:	Shrubland
Subclass:	Deciduous shrubland
Group:	Cold-deciduous shrubland
Subgroup:	Natural/Semi-natural cold-deciduous shrubland
Formation:	Temporarily flooded cold-deciduous shrubland
Alliance:	Booth's Willow Temporarily Flooded Shrubland Alliance

Global Rank: G3?
Global Rank Reasons: This association is known over a broad range including Colorado, Utah, Idaho, and possibly Wyoming and Montana. There are at least 21 known occurrences with at least 75 to 100 more expected. Invasion by non-native herbaceous species is cited as the greatest threat to this community. In mid-montane locations with low gradients, impacts from development in the riparian zone may alter this community.

Subnational Rank: S3
Subnational Rank Reasons: This association is known from 25 occurrences, but is expected to occur in more. It appears to be restricted to the northern half of the state.

General Description: *Salix boothii* (Booth willow) is a medium to tall shrub that often forms dense thickets on moist stream terraces and drier alluvial terraces. This plant association is generally found along wide riparian corridors, often surrounding beaver ponds. In the Yampa River Basin, this association occurs on gently sloping floodplains in soils saturated from irrigation runoff and hillside seepage. Stream channels are wide and meandering.

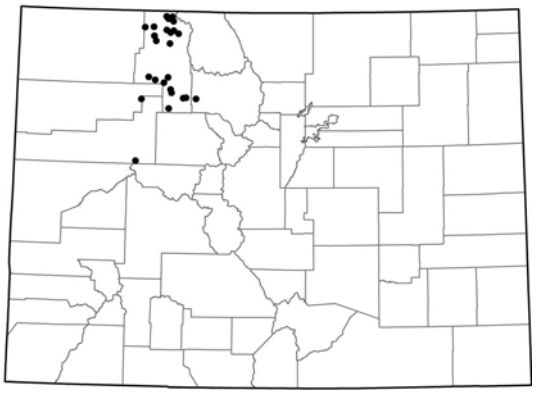
Vegetation: *Salix boothii* (Booth willow) provides a fairly dense canopy in this association, usually with about 70% cover. Other shrub species that may be present include *Salix geyeriana* (Geyer willow) and *Salix wolfii* (Wolf willow). Wetter sites support a dense graminoid layer dominated by *Calamagrostis canadensis* (bluejoint reedgrass), with smaller amounts of *Carex utriculata* (beaked sedge) and *Carex pellita*

(woolly sedge). In drier sites, the graminoid component often includes *Agrostis gigantea* (redtop), *Agrostis stolonifera* (creeping bentgrass), or *Poa pratensis* (Kentucky bluegrass). Forb cover is often minor but may include *Vicia americana* (American vetch) or *Fragaria virginiana* (strawberry).

Similar Communities: This association is similar to other *Salix boothii* associations in Colorado.

Regional Distribution: This riparian community is currently known from major runoff dominated rivers in Colorado, Idaho, Utah, and may also occur in Wyoming and Montana.

Colorado Distribution: Documented in Routt, Grand and Garfield counties in Colorado.



Elevation Range in Colorado: 7,800.00 - 8,900.00 ft / 2,377.44 - 2,712.72 m

Site Geomorphology: This plant association is generally found along wide riparian corridors, often surrounding beaver ponds. In the Yampa River Basin, this association occurs on gently sloping floodplain in soils saturated from irrigation runoff and hillside seepage. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are wide and meandering (Rosgen's Channel Type: C4).

Soil: The upper soil layers are generally mineral soils that may be fine sands, loams, and clays. Some mottling is evident. Lower layers are gravel or cobble.

Successional and Ecological Processes: This plant association commonly becomes established following beaver pond siltation and some drying. *Salix boothii* appears to establish on relatively mesic sites with soils that become neither completely saturated nor dry during the growing season. With continued drying, the undergrowth will be replaced with less hydrophytic species. With disturbance, such as excessive grazing, this plant association may be replaced with a *Salix boothii / Poa pratensis* (Booth willow / Kentucky bluegrass) plant association.

Adjacent Vegetation: Adjacent Riparian Vegetation: adjacent floodplain plant associations include mixed conifer and aspen *(Populus tremuloides*) stands; willow thickets are also common and may include: *Salix wolfii* (wolf willow), *Salix geyeriana* (Geyer willow), or *Salix drummondiana* (Drummond willow), and *Carex aquatilis-Carex utriculata* (aquatic sedge-beaked sedge) meadows. Adjacent Upland Vegetation: mixed conifer-*Populus tremuloides* (aspen) forests occur on adjacent hill.

Management: *Salix Boothii* (Booth's's willow) is highly palatable to livestock, ungulates and beaver (Kovalchik *et al*. 1988). Wild ungulates (moose, deer) use may be especially heavy in the winter when willow shoots are available above the snow level (Hansen *et al*. 1988). Livestock and wild ungulates may prefer to browse *Salix geyeriana* (Geyer

willow), when available, over *Salix Boothii*, according to observations in Montana (Hansen *et al.* 1989). The soils of *Salix Boothii*/ Mesic graminoid sites are susceptible to trampling and compaction by livestock and heavy machinery when wet (Padgett *et al.* 1989). As with most willow species, *Salix Boothii* is an effective stream bank stabilizer and can be successfully planted to rejuvenate degraded riparian areas. Prescribed burning can also be a useful tool for rejuvenating dying and non-regenerating stands of *Salix Boothii* since the species rapidly sprouts after fires. Hot, quick fires are most effective because more plants sprout and fewer are killed (Hansen *et al.* 1988).

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Salix drummondiana* / Mesic Forbs Shrubland
State Common Name Drummonds Willow/Mesic Forb

Global Scientific Name: *Salix drummondiana* / Mesic Forbs Shrubland
Global Common Name: Drummond's Willow / Mesic Forbs Shrubland

Community Classification

System:	International Vegetation Classification
Class:	Shrubland
Subclass:	Deciduous shrubland
Group:	Cold-deciduous shrubland
Subgroup:	Natural/Semi-natural cold-deciduous shrubland
Formation:	Temporarily flooded cold-deciduous shrubland
Alliance:	Drummond's Willow Temporarily Flooded Shrubland Alliance

Global Rank: G4
Global Rank Reasons: Apparently secure. Occurs in Colorado, Montana and Alberta, Canada. It is likely to be more widespread, but is currently undocumented elsewhere.

Subnational Rank: S4
Subnational Rank Reasons: In Colorado, over 50 stands have been documented and many more are expected to occur. However, it is currently threatened by improper livestock grazing, stream flow alterations, and heavy recreational use.

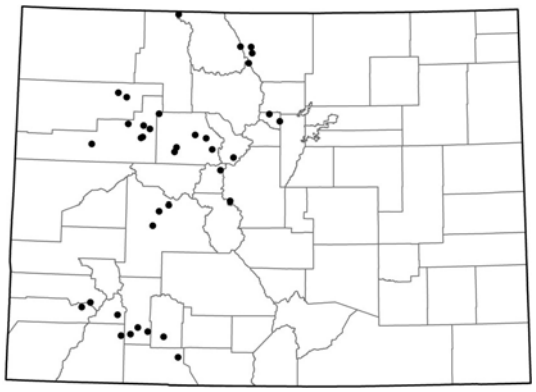
General Description: The *Salix drummondiana*/mesic forb (Drummond willow/mesic forb) plant association most commonly occurs on relatively steep streams and rarely forms more than a narrow, 5-25 ft (1.5-7.5 m) wide, band along streambanks. The closed to partially open canopy of *Salix drummondiana* and a thick carpet of many forb species characterize this plant association. This plant association occurs throughout the Western Slope and in montane regions along the Colorado Front Range. The association occurs as a narrow band along high gradient streams in narrow, V-shaped valleys and as large willow carrs in the broad valleys of low gradient (1-3%), moderately sinuous streams. It is also located along broad, highly sinuous streams and broad, actively downcutting channels. This association also occurs near seeps.

Vegetation: *Salix drummondiana* (Drummond willow) forms an open to closed, narrow

canopy of tall shrubs lining the stream bank. Other shrub species may be present with cover equal to but not exceeding that of *Salix drummondiana*. Mature trees may be present as a few individuals scattered through the shrubland or as canopy from an adjacent forested association. Stands with an overstory canopy of aspen are currently included in this association, although a *Populus tremuloides/Salix drummondiana* type may be separated at a later date. The herbaceous undergrowth may be sparse or richly diverse. In general, total forb cover exceeds that of graminoid cover, and no single species is dominant.

Similar Communities: -

Regional Distribution: This plant association occurs in Colorado, Montana and Alberta, Canada. It is likely to be more widespread, but is currently undocumented elsewhere.



Colorado Distribution: This plant association occurs throughout the West Slope and in montane regions along the Colorado Front Range (Kittel and Lederer 1993, Kittel *et al.* 1994, Kittel *et al.* 1995, Kittel *et al.* 1996, Richard *et al.* 1996, Rondeau *et al.* 1997, Cooper and Cottrell 1990, Phillips 1977).

Elevation Range in Colorado: 7,500.00 - 11,300.00 ft / 2,286.00 - 3,444.24 m

Site Geomorphology: -

Soil: Soils range from deep sandy loams and sandy clay loams with no coarse fragments to shallow silty clay loams and sandy clay loams over coarse, angular cobbles.

Successional and Ecological Processes: The *Salix drummondiana*/mesic forb (Drummond willow/mesic forb) association is often an early colonizer of first-order, boulder-strewn, steep streams. This association could be an early-seral stage of the *Abies lasiocarpa-Picea engelmannii* (subalpine fir- Engelmann spruce) plant association which also occurs along steep streams and alternates with the willow carrs. In wider valleys, this association occurs as a broad willow carr on well-developed soils near seeps or downstream from beaver dams. It appears to be a stable community in these environments.

Adjacent Vegetation: Adjacent Riparian Vegetation: at higher elevations, *Abies lasiocarpa - Picea engelmannii* (subalpine fir-Engelmann spruce) forests or "Mesic Forbs" seeps occur on adjacent streambanks along narrow channels; and *Salix planifolia* (planeleaf willow) shrublands occur in wider, subalpine valleys. At lower elevations, adjacent riparian vegetation includes *Alnus incana* (thinleaf alder), *Cornus sericea* (redosier dogwood), or *Salix monticola* (mountain willow) dominated shrublands; and *Populus angustifolia - Picea pungens* (narrowleaf cottonwood-blue spruce), *Picea pungens* (blue spruce) or *Populus angustifolia* (narrowleaf cottonwood) riparian woodlands.

Adjacent Upland Vegetation: at higher elevations, north-facing slopes are covered with *Abies lasiocarpa - Picea engelmannii* (subalpine fir-Engelmann spruce) forests. South-facing slopes are more open stands of *Pinus ponderosa* (ponderosa pine), *P. contorta* (lodgepole pine) or *P. edulis* (twoneedle pinyon) woodlands and *Populus tremuloides* (quaking aspen) forests. Dry, upland grasslands with *Danthonia* spp. (oatgrass) and *Festuca thurberi* (Thurber's fescue) occur on steep hillsides. At lower elevations, *Pseudotsuga menziesii* (Douglas-fir) forests and *Quercus gambelii* (Gambel's oak) shrublands occur on surrounding hillslopes.

Management: *Salix drummondiana* (Drummond's willow) is highly palatable to livestock and wildlife (Kovalchik 1987). Season-long grazing can reduce native forb cover and increase the abundance of non-native grasses including *Poa pratensis* (Kentucky bluegrass) and *Agrostis stolonifera* (creeping bentgrass). Continued heavy grazing and browsing may weaken the root systems of *Salix drummondiana* (Padgett *et al.* 1989). Deferred and rest rotation grazing systems are recommended for maintaining the vigor and productivity of this plant association. Rest periods are recommended in order to provide time for plant establishment. Late summer and fall grazing are not recommended because willow species are vulnerable to pruning damage due to limited regrowth at the end of the growing season (Hansen *et al*. 1995). Beaver activity in the vicinity of this plant association is important for maintaining the health of the riparian ecosystem. Beaver dams abate channel downcutting, bank erosion, and downstream movement of sediment. Beaver dams raise the water across the floodplain and provide year-round saturated soils. Plant establishment and sediment build-up behind beaver dams raise the channel bed and create a wetland environment. and managers should consider maintaining beaver rather than removing them (Hansen *et al*. 1995). Prescribed burning in this association is an effective method of rejuvenating decadent stands of the associated willow species. The willows will vigorously sprout following fire, especially in wetter stands. Quick, hot fires produce more sprouts than slower fires (Hansen *et al*. 1995). *Salix drummondiana* (Drummond's willow) is useful for revegetating streambanks. The best results come from transplanting nursery grown cuttings (local genetic material is preferred). Cuttings should be taken in the spring from dormant 2-4 year old wood, and they should be 12-20 in (30-50 cm) long with a diameter of at least 0.5 in (1 cm). Roots and shoots should appear 10-15 days after planting if conditions are right (Hansen *et al*. 1995).

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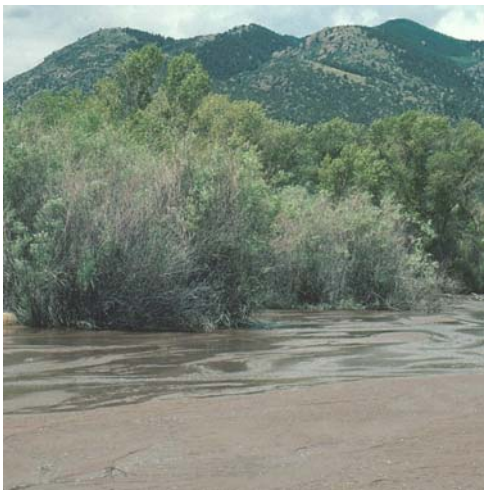
Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Salix exigua* / Barren Shrubland
State Common Name Coyote Willow/Bare Ground
Global Scientific Name: *Salix exigua* / Barren Shrubland
Global Common Name: Coyote Willow / Barren Shrubland

Community Classification

System:	International Vegetation Classification
Class:	Shrubland
Subclass:	Deciduous shrubland
Group:	Cold-deciduous shrubland
Subgroup:	Natural/Semi-natural cold-deciduous shrubland
Formation:	Temporarily flooded cold-deciduous shrubland
Alliance:	(Coyote Willow, Sandbar Willow) Temporarily Flooded Shrubland Alliance



Global Rank: G5
Global Rank Reasons: This is a common and widespread early-seral association in all states where reported to occur. It is expected to be equally abundant in other states.

Subnational Rank: S5
Subnational Rank Reasons: This is a common early-seral association of nearly all Colorado streams below 8,000 ft (2,400 m) elevation.

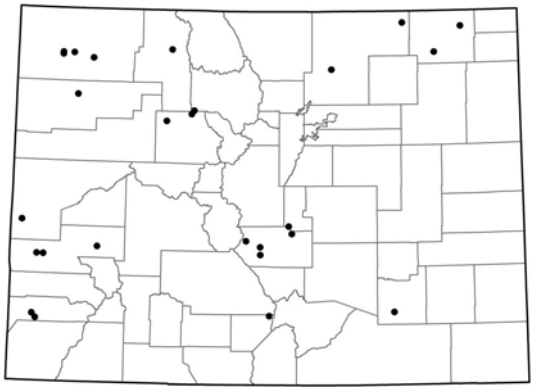
General Description: This association occurs throughout Colorado, in every major watershed without exception. *Salix exigua* (sandbar willow) is one of the most common willow species in Colorado and occurs as a dominant in two associations, the *Salix exigua*/mesic graminoid and the *Salix exigua*/barren ground. These are easy to recognize as they are nearly pure stands of the willow, with few other species present. An undergrowth of a few, widely scattered forbs and grasses, where exposed cobbles or sand characterizes the ground cover, constitutes the *Salix exigua*/barren ground association, while an undergrowth of dense grasses and forbs covering at least 30% of the ground falls into the mesic graminoid type. *Salix exigua*/barren ground association occurs within the annual flood zone of a river on point bars, islands, sand or cobble bars and stream banks, while the *Salix exigua*/mesic graminoid association generally occurs along backwater channels and other perennially wet, but less scoured sites, such as floodplain swales and irrigation ditches.
This early seral plant association occurs primarily on sand and cobble bars of larger (second order and up) rivers. It is associated with annual flooding and inundation and will grow well into the channel, where it is flooded, even in drier years. It can form large, wide stands on mid-channel islands on larger rivers such as the Gunnison,

Colorado and South Platte, or narrow stringer bands on small, rocky tributaries. This plant association occurs along a wide variety of stream reaches from moderately sinuous and moderate gradient reaches, to broad, meandering rivers with wide floodplains or broad, braided channels. Many stands also occur within highly entrenched or eroding gullies.

Vegetation: This association is characterized by an almost exclusive canopy of *Salix exigua* (sandbar willow) (1-98% cover) with very little herbaceous cover. Other shrubs and tree species may be present, but these rarely have greater cover than *Salix exigua*. Because this is such a widespread and common association, many other species can be present. A variety of other woody species may include *Populus angustifolia* (narrowleaf cottonwood), *P. deltoides* (plains cottonwood), *Abies lasiocarpa* (subalpine fir), *Salix ligulifolia* (strapleaf willow), *S. lucida* ssp. *caudata* (shining willow), *S. monticola* (mountain willow), *Acer negundo* (boxelder), and *Alnus incana* (thinleaf alder). The herbaceous cover is typically very low, but can be as high as 30%. No single key herbaceous species is an indicator for this association, rather it is the combined amount of bare soil (dirt), gravel, cobble, or boulders that make up the ground cover that is the diagnostic indicator for this association. Common herbaceous species include *Poa pratensis* (Kentucky bluegrass), *Carex* spp. (sedge), *Melilotus officinalis* (yellow sweetclover), and *Cirsium* spp. (thistle). Although some species may appear high in cover, it is usually not representative of the whole stand, or it occurs between cobbles and boulders. Another key indicator for this association is the lack of soil development, and high ground cover of coarse alluvial material.

Similar Communities: Closely related communities include: 1) the *Salix exigua* (coyote willow) community type (Hansen *et al*. 1995), 2) the *Salix exigua* - *Salix* spp. / *Poa* spp. (coyote willow-willow/bluegrass) (Johnston 1987), and 3) unclassified stands of *Salix exigua* (Jones and Walford 1995).

Regional Distribution: This riparian shrubland association is common at lower to middle elevations in the Great Basin, Colorado Plateau and Rocky Mountains extending out into the western Great Plains along major rivers.



Colorado Distribution: This association occurs throughout Colorado, in every major watershed without exception.

Elevation Range in Colorado: 3,600.00 - 9,900.00 ft / 1,097.28 - 3,017.52 m

Site Geomorphology: This early-seral plant association occurs primarily on sand and cobble bars of larger (second order and up) rivers. It is associated with annual flooding and inundation and will grow well into the channel, where it is flooded, even in drier years. It can form large, wide stands on mid-channel islands on larger rivers such as the Gunnison, Colorado and South Platte Rivers, or narrow stringer bands on small, rocky tributaries. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). This plant association occurs along a wide variety of stream channels: from moderately sinuous with moderate gradients (Rosgen's Channel Type:

B2-B6); broad, meandering rivers with wide floodplains (Rosgen's Channel Type: C3-C5); or broad, braided channels (Rosgen's Channel Type: D5). Many stands also occur within highly entrenched or eroding gullies (Rosgen's Channel Type: F3, F6).

Soil: Soils of this association are typically coarse alluvial deposits of sand, silt and cobbles that are highly stratified with depth from flooding scour and deposition. Highly stratified profiles consist of alternating layers of clay loam and organic material with coarser sand or thin layers of sandy loam over very coarse alluvium. Occasionally, this association occurs on deep pockets of sand.

Successional and Ecological Processes: The *Salix exigua*/barren ground (sandbar willow/barren ground) plant association is considered an early seral community, capable of colonizing freshly deposited sand and gravel bars. *Salix exigua* is an excellent soil stabilizer with a deep root system and flexible stems that can withstand flooding. *Salix exigua* reduces erosion potential by increasing the friction of stream flow, trapping sediments and building a protected seed bed for a number of tree and shrub species. Succession without disturbance may lead to a greater understory cover, which, in turn, facilitates the establishment of shrub and tree seedlings. The presence of cottonwood seedlings within this association indicates succession to a cottonwood stand, if seedlings survive subsequent flooding events.

Adjacent Vegetation: Adjacent Riparian Vegetation: because this is one of the most abundant riparian plant associations in Colorado, nearly any type of low montane, foothill, plains, or western valley riparian vegetation may be adjacent, and *Populus angustifolia* (narrowleaf cottonwood), *P. deltoides* (eastern cottonwood), or *Juniperus scopulorum* (Rocky Mountain juniper) woodlands are often present. Along the South Platte River, the *Populus deltoides* - (*Salix amygdaloides*) / *Salix exigua* [eastern cottonwood-(peachleaf willow)/coyote willow] community occurs in an early-seral phase (seedlings and sapling size trees only) on adjacent sandbars and low terraces; older stands of *Populus deltoides* - *Salix amygdaloides* / *Spartina pectinata* (eastern cottonwood-peachleaf willow/prairie cordgrass) occur on higher terraces. Other adjacent riparian vegetation includes *Tamarix ramosissima* (saltcedar), *Alnus incana* (thinleaf alder), *Cornus sericea* (redosier dogwood) or *Betula occidentalis* (water birch) shrublands, and *Eleocharis palustris* (common spikerush), *Typha angustifolia* (narrowleaf cattail), or *Carex* spp. (sedge) wetlands. Adjacent Upland Vegetation: agricultural fields (sugar beets, winter wheat, and others) and rolling hills of *Artemisia filifolia* (sand sagebrush), xeric tall-grass prairies and *Bouteloua gracilis* (blue grama) short-grass prairies occur on surrounding rolling hills and plains of the South Platte River on the eastern plains. In the steep canyons of the foothills, upland vegetation includes *Pseudotsuga menziesii* (Douglas-fir) and *Pinus ponderosa* (ponderosa pine) forests, *P. edulis* (twoneedle pinyon), *Juniperus monosperma* (oneseed juniper) and *J. osteosperma* (Utah juniper) woodlands, *Quercus gambelii* (Gambel's oak) shrublands, and *Artemisia tridentata* (big sagebrush) and *Sarcobatus vermiculatus* (greasewood) scrub. In the lower montane, upland vegetation includes *Pinus contorta* (lodgepole pine) and *Populus tremuloides* (quaking aspen) forests.

Management: Forage production is typically low to moderate in *Salix exigua* (coyote willow) stands due to the high densities of stems. The dense overstory may limit livestock movement within the association (Manning and Padgett 1995). Overgrazing by livestock will reduce the vigor of the willows present and may eventually eliminate

them from the site. The opening up of *Salix exigua* stands may result in the invasion of introduced and non-palatable native species. However, release from heavy grazing pressure will allow *Salix exigua* to reestablish itself, provided it has not been completely eliminated from the site. Soil compaction is generally not a problem in this association because of the high coarse fragment content of the soils. However, fine-textured soils are subject to compaction when moist (Hansen *et al.* 1995). The limited information on fire as a management tool in this association indicates that *Salix exigua* (coyote willow) vigorously sprouts following fire. Quick, hot fires result in more sprouts than slow fires which are actually more damaging to willows and tend to result in fewer sprouts (Hansen *et al.* 1995). *Salix exigua* (coyote willow) is an excellent streambank stabilizer due to its ability to send up individual stems from an underground root system. It also has an excellent capability of re-colonizing and spreading on disturbed areas. Once *Salix exigua* becomes established on disturbed areas, other shrubs and herbaceous species can become established as well. Removal of this association and subsequent streambank exposure can lead to severe degradation and devastating results (Hansen *et al*. 1995). *Salix exigua* (coyote willow) can be useful for revegetating degraded sites and exposed sand/gravel bars since it will produce many roots along the entire stem. For best results, cuttings should be taken in the spring from dormant 2-4 year old wood, and they should be 12-20 in (30-50 cm) long with a diameter of at least 0.5 in (1 cm). To insure survival, the cuttings should be rooted and grown in a nursery [local genetic material is prefered]. Roots and shoots can be expected within 10 days of planting (Hansen *et al*. 1995).

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Salix geyeriana - Salix monticola* / Mesic Forbs Shrubland
State Common Name Geyer's Willow-Rocky Mountain Willow/Mesic Forb
Global Scientific Name: *Salix geyeriana - Salix monticola* / Mesic Forbs Shrubland
Global Common Name: Geyer's Willow - Mountain Willow / Mesic Forbs Shrubland

Community Classification

System:	International Vegetation Classification
Class:	Shrubland
Subclass:	Deciduous shrubland
Group:	Cold-deciduous shrubland
Subgroup:	Natural/Semi-natural cold-deciduous shrubland
Formation:	Temporarily flooded cold-deciduous shrubland
Alliance:	Geyer's Willow Temporarily Flooded Shrubland Alliance

Global Rank: G3
Global Rank Reasons: There are over 20 documented occurrences of this association, but less than 50 are expected to exist in Colorado. No known occurrences of this association have been reported from outside of Colorado. The often saturated soils of this plant association are vulnerable to compaction by livestock, vehicles, and heavy equipment. Overgrazing by livestock can desiccate the site, increase non-native grass cover, and damage the roots of the shrubs.

Subnational Rank: S3
Subnational Rank Reasons: In Colorado, this association is documented from over twenty locations, and at least that many more are expected to occur. Stands with their native herbaceous undergrowth intact are extremely rare.

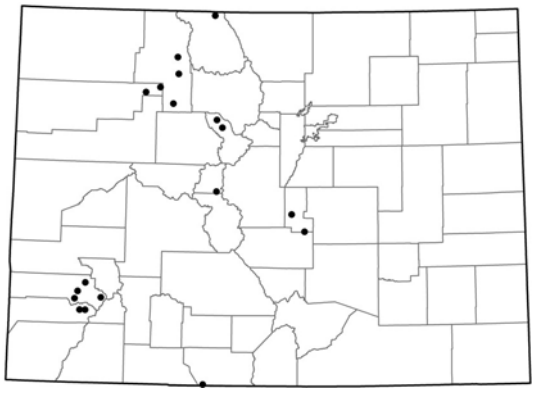
General Description: The *Salix geyeriana-Salix monticola*/mesic forb plant association is a tall, mixed willow shrubland with an undergrowth species composition that is grazing-induced. The undergrowth is a carpet of grasses and forbs on a hummocky ground surface. Season-long grazing has increased the non-native grass cover and reduced the native forbs in most occurrences. This plant association occurs on broad alluvial floodplains with steep side slopes. Stream channels are broad and moderately sinuous to highly sinuous or narrow, entrenched, ephemeral gullies.

Vegetation: This plant association is characterized by a tall, nearly closed canopy of *Salix monticola* (mountain willow) and *Salix geyeriana* (Geyer willow), with a combined cover between 10-90% and usually so near in abundance, one cannot determine which is the dominant willow in the stand. Other shrubs that may be present include *Ribes*

inerme (whitestem gooseberry), *Alnus incana* (thinleaf alder), *Salix drummondiana* (Drummond willow), and *Dasiphora floribunda* (shrubby cinquefoil). The undergrowth in undisturbed stands is a thick carpet of forbs including *Mertensia ciliata* (tall fringed bluebells), *Achillea millefolium* var. *occidentalis* (western yarrow), *Heracleum maximum* (common cowparsnip), *Conioselinum scopulorum* (Rocky Mountain hemlockparsley), *Senecio triangularis* (arrowleaf ragwort), and *Cardamine cordifolia* (heartleaf bittercress). The graminoid layer is usually sparse, but includes *Carex utriculata* (beaked sedge) and *Carex aquatilis* (water sedge). Disturbed stands have a high cover of non-native grasses including *Agrostis stolonifera* (creeping bentgrass) and *Poa pratensis* (Kentucky bluegrass).

Similar Communities: There are three closely related communities. Both the *Salix geyeriana - Salix monticola / Calamagrostis canadensis - Carex aquatilis - Carex rostrata* (Geyer's willow-mountain willow/bluejoint reedgrass-water sedge-beaked sedge) plant association (Baker 1989) and the *Salix geyeriana - Salix* spp. / *Calamagrostis canadensis* (Geyer's willow-willow/bluejoint reedgrass) plant association (Johnston 1987) have only native graminoids in the undergrowth. The *Salix boothii* (Booth's willow) community type (Padgett *et al.* 1989) includes stands co-dominated with *Salix geyeriana* (Geyer's willow) or *S. monticola* (mountain willow).

Regional Distribution: This association is known from the Routt National Forest, the San Miguel River Basin, the Arkansas River Basin, and the Rio Grande/Closed Basin areas of Colorado.



Colorado Distribution: This association occurs in the Routt National Forest (Kettler and McMullen 1996), the San Miguel River Basin (Kittel and Lederer 1993), the Arkansas River Basin (Kittel *et al*. 1996), the Rio Grande/Closed Basin (Kittel et al. 1999b), the White River Basin, the Upper Yampa, the Upper Colorado-Dolores River Basin, the N. Platte Basin, and the Blue and Conejos River Basins.

Elevation Range in Colorado: 7,700.00 - 9,800.00 ft / 2,346.96 - 2,987.04 m

Site Geomorphology: This plant association occurs on broad alluvial floodplains with steep side slopes. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are broad and moderately sinuous to highly sinuous (Rosgen's Channel Type: B3, C4) or narrow, entrenched, ephemeral gullies (Rosgen's Channel Type: G4).

Soil: Soils are silt, silty loams, silty clay loams, sandy clay loams and deep sands. Several stands in the San Miguel River Basin occur on deep clay loams of old beaver ponds. Some soil profiles have considerable coarse materials while others are relatively fine textured. Mottling is evident near the surface indicating elevated water tables during part of the year.

Successional and Ecological Processes: The *Salix geyeriana - Salix monticola* / mesic forb plant association differs from the *Salix geyeriana* / mesic forb plant association because *Salix monticola* is always present with a significant cover and sometimes in a greater abundance than *Salix geyeriana*. The presence of *Salix monticola* may be due to differences in environmental factors or may represent a different successional stage of the *Salix geyeriana* / mesic forb association. This plant association may be a grazing-induced type due to the abundance of non-native grasses in some stands. With removal of season-long grazing, this association may return to a native forb dominated undergrowth or a dominance of *Calamagrostis canadensis* (bluejoint reedgrass), becoming a *Salix geyeriana - Salix monticola / Calamagrostis canadensis* plant association.

Adjacent Vegetation: Adjacent Riparian Vegetation: a narrow band of *Alnus incana* (thinleaf alder) or *Betula occidentalis* (water birch) shrublands may occur at the stream edge. Other plant associations include mixed *Populus angustifolia - Picea pungens* (narrowleaf cottonwood - blue spruce) forests; *Alnus incana* (thinleaf alder) and *Salix planifolia* (planeleaf willow) shrublands; and *Carex aquatilis* (water sedge), *C. utriculata* (Northwest Territory sedge), and *Eleocharis quinqueflora* (fewflower spikerush) meadows. Adjacent Upland Vegetation: *Abies lasiocarpa - Picea engelmannii* (subalpine fir - Engelmann spruce), *Pseudotsuga menziesii* (Douglas-fir), *Picea pungens* (blue spruce), and *Populus tremuloides* (quaking aspen) forests and *Quercus gambelii* (Gambel's oak) woodlands occur on adjacent hillslopes.

Management: The management responses of this plant association are likely to be similar to other tall-willow shrublands dominated by *Salix geyeriana* (Geyer's willow) or *S. monticola* (mountain willow). The wet and often saturated soils of this plant association are vulnerable to compaction by livestock and heavy equipment. Overgrazing by livestock can dry the site, increase non-native grass cover, and reduce the vigor of willow root structure. In order to maintain productivity and vigor of the plants and prevent damage to the soils, livestock grazing should be deferred until soils dry (Hansen *et al*. 1995) and continue for only short duration. Deferred and rest rotation grazing systems are recommended for maintaining the vigor and productivity of this plant association. Rest periods are recommended in order to provide time for plant regrowth. Late summer and fall grazing are not recommended because willow species are vulnerable to pruning damage due to limited regrowth at the end of the growing season (Hansen *et al*. 1995). Beaver activity in the vicinity of this plant association is important for maintaining the health of the riparian ecosystem. Beaver dams abate channel downcutting, bank erosion, and downstream movement of sediment. Beaver dams raise the water across the floodplain and provide year-round saturated soils. Plant establishment and sediment build-up behind beaver dams raise the channel bed and create a wetland environment. Land managers should consider maintaining beaver rather than removing them (Hansen *et al*. 1995). Prescribed burning is an effective method of rejuvenating decadent stands of willows. The willow species in this plant association vigorously sprout following quick, hot fires. Slow-burning fires can actually damage the plants (Hansen *et al*. 1995). *Salix geyeriana* (Geyer's willow) is an effective streambank stabilizer that can be grown from nursery cuttings and then transplanted. Cuttings should be taken in the spring from dormant 2-4 year old wood, and they should be 12-20 in (30-50 cm) long with a diameter of at least 0.5 in (1 cm). Roots and shoots should appear 10-15 days after planting if conditions are right (Hansen *et al*. 1995).

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Salix monticola / Carex aquatilis* Shrubland
State Common Name Montane Riparian Willow Carr

Global Scientific Name: *Salix monticola / Carex aquatilis* Shrubland
Global Common Name: Mountain Willow / Aquatic Sedge Shrubland

Community Classification

System:	International Vegetation Classification
Class:	Shrubland
Subclass:	Deciduous shrubland
Group:	Cold-deciduous shrubland
Subgroup:	Natural/Semi-natural cold-deciduous shrubland
Formation:	Temporarily flooded cold-deciduous shrubland
Alliance:	Mountain Willow Temporarily Flooded Shrubland Alliance

Global Rank: G3
Global Rank Reasons: In Colorado, this association is documented at only 10 locations, although an additional 20-30 are expected to occur. This minor association appears to require coarse-textured soils along braided or meandering streams in narrow mountain valleys in the Colorado Rocky Mountains. It is threatened by improper grazing, inappropriate stream flow alterations, and heavy recreational use. There are no known protected sites.

Subnational Rank: S3
Subnational Rank Reasons: In Colorado, this association is documented at only ten locations; however, an additional 20-30 stands are expected to occur. This association is threatened by improper livestock grazing, inappropriate stream flow alterations, and heavy recreation use.

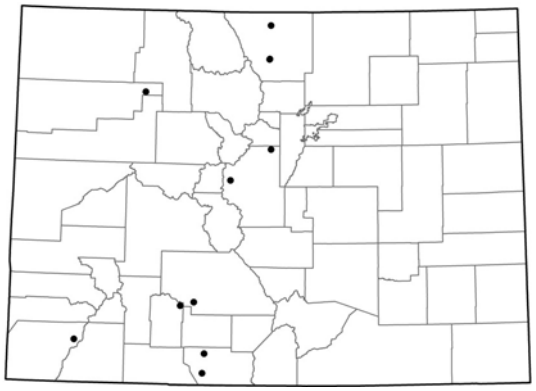
General Description: The *Salix monticola/Carex aquatilis* (mountain willow/water sedge) plant association is a tall (5-8 ft, 1.5-2.5 m), deciduous shrubland with a fairly open willow canopy and a thick carpet of grasses and sedges in the undergrowth. It occurs on open floodplains, often occuping the entire valley floor. The undergrowth is dominated by patches of *Carex aquatilis* (water sedge). This association often includes *Carex utriculata* (beaked sedge) and *Calamagrostis canadensis* (bluejoint reedgrass), but is distinguished from the *Salix monticola/Carex utriculata* (mountain willow/beaked sedge) and *Salix monticola / Calamagrostis canadensis* (mountain willow/bluejoint reedgrass) associations because *Carex aquatilis* (water sedge) is either the clear dominant or most consistently present of the three throughout the stand. This plant association occurs in narrow valleys on coarse-textured stream banks. Stream channels are narrow and

highly sinuous or braided by beaver activity.

Vegetation: This plant association forms a tall willow carr dominated by *Salix monticola* (mountain willow) as the matrix species. The matrix species is the willow with the highest abundance, even though other willow species combined may have greater canopy cover. Other shrubs that may be present include *Salix bebbiana* (Bebb willow), *Salix drummondiana* (Drummond willow), *Cornus sericea* (red-osier dogwood), and *Lonicera involucrata* (twinberry honeysuckle). The herbaceous undergrowth is dominated by *Carex aquatilis* (water sedge). Cover of other graminoid and forb species is low due to shading and flood disturbance. Stands with abundant *Carex utriculata* (beaked sedge) or *Calamagrostis canadensis* (bluejoint reedgrass) may indicate a transitional stage to another *Salix monticola* (mountain willow) association.

Similar Communities: *Salix monticola* (mountain willow) occurs as nearly pure stands in Colorado, but is replaced by other *Salix* (willow) species, *e.g.*, *S. boothii* (Booth's willow) and *S. drummondiana* (Drummond's willow), farther north and west of the state line. Closely related communities include the *Salix boothii / Carex aquatilis* (Booth's willow/water sedge) community type (Padgett *et al*. 1989), which occasionally has *Salix monticola* (mountain willow) in the canopy.

Regional Distribution: The plant association has been documented in the Yampa, South Platte, Rio Grande/Closed Basin, and Arkansas river basins in Colorado.



Colorado Distribution: This plant association is a minor type known to occur in the Yampa (Kittel and Lederer 1993), South Platte (Kittel *et al*. 1997), Arkansas (Kittel et al. 1999a), Rio Grande Rivers and Closed Basins (Kittel et al. 1999b), and in the San Juan National Forest (Richard *et al*. 1996).

Elevation Range in Colorado: 7,700.00 - 10,800.00 ft / 2,346.96 - 3,291.84 m

Site Geomorphology: This plant association occurs in narrow valleys on coarse-textured streambanks. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Stream channels are narrow and highly sinuous (Rosgen's Channel Type: D6E4) or braided by beaver activity (Rosgen's Channel Type: D6).

Soil: Soils are sandy clay loams to sandy loams with layers of gravel and organic matter. Mottles appear at 8 inches (20 cm) depth.

Successional and Ecological Processes: *Salix monticola* (mountain willow) dominated plant associations appear to be longlived and stable. They occur on mesic sites that support a diversity of graminoids and forbs. *Salix monticola* appears to grow only where the water table does not drop below 3 ft (1 m) of the surface. It appears to be limited to cold, wet environments in broad valley bottoms at high elevations. The presence of

dying conifer trees in these associations may indicate a rise in the water table. *Carex utriculata* (beaked sedge), *Carex aquatilis* (water sedge), and *Calamagrostis canadensis* (bluejoint reedgrass) are common dominant undergrowth of several *Salix* plant associations. These three graminoids indicate different micro-environments, generally separating out along a moisture gradient related to the depth of the water table, and can represent different stages of succession of the floodplain. C*arex utriculata* (beaked sedge) occurs on the wettest sites, such as shallow pond margins, low-lying swales, and overflow channel with the shallowest water tables. *Carex aquatilis* (water sedge) occurs on intermediate sites that have saturated but not inundated soils. *Calamagrostis canadensis* (bluejoint reedgrass) dominates the drier sites with lower water tables.

Adjacent Vegetation: Adjacent Riparian Vegetation: *Picea pungens* (blue spruce), *Populus angustifolia* (narrowleaf cottonwood) forests, and *Alnus incana* (thinleaf alder) shrublands occur in adjacent riparian areas. Adjacent Upland Vegetation: at higher elevations, *Abies lasiocarpa - Picea engelmannii* (subalpine fir-Engelmann spruce) forests and *Populus tremuloides* (quaking aspen) woodlands occur on adjacent hill slopes. At lower elevations, *Pinus ponderosa* (ponderosa pine) forests and *Quercus gambelii* (Gambel's oak) scrub occur on adjacent hillslopes.

Management: *Salix monticola* (mountain willow) appears to be less tolerant of browsing pressure than other tall montane willow species. It forms, in the same way that *Salix geyeriana* (Geyer's willow) does, the classic "mushroom" shape under heavy browsing pressure by deer and cattle (Hansen *et al.* 1995). *Carex* spp. (sedges) in riparian areas of mid-elevation rangelands are often heavily grazed by livestock. Improper grazing by livestock in this plant association can dry sites, increase non-native cover, and reduce the vigor of willow root structure. The wet and often saturated soils of this plant association are also vulnerable to compaction by livestock and heavy equipment. In order to maintain productivity and vigor of the plants and prevent damage to the soils, livestock grazing should be deferred until soils dry (Hansen *et al*. 1995). Deferred and rest rotation grazing systems are recommended for maintaining the vigor and productivity of this plant association. Rest periods are recommended in order to provide time for plant establishment. Late summer and fall grazing are not recommended because willow species are vulnerable to pruning damage due to limited regrowth at the end of the growing season (Hansen *et al*. 1995, Kovalchik and Elmore 1992). Beaver activity in the vicinity of this plant association is important for maintaining the health of the riparian ecosystem. Beaver dams abate channel downcutting, bank erosion, and downstream movement of sediment. Beaver dams raise the water table across the floodplain and provide year-round saturated soils. Plant establishment and sediment build-up behind beaver dams raise the channel bed and create a wetland environment. Land managers should consider maintaining beaver rather than removing them (Hansen *et al*. 1995). According to Hansen *et al*. (1995), burning of this plant association temporarily increases the productivity of *Carex aquatilis* (water sedge). However, livestock grazing needs to be eliminated for the year prior to burning and for at least 2-3 years after in order to prevent livestock from consuming young, palatable regrowth. Prescribed burning is also an effective method of rejuvenating decadent stands of willows. The willow species in this plant association vigorously sprout following quick, hot fires. Slow-burning fires can actually damage the plants (Hansen *et al*. 1995). Both *Salix monticola* (mountain willow) and *Carex aquatilis* (water sedge) are effective streambank stabilizers. *Carex aquatilis* holds streambanks with its dense network of rhizomatous roots. *Salix monticola*, much like *Salix geyeriana*

(Geyer's willow), can probably be grown and transplanted from nursery cuttings. Cuttings should be taken in the spring from dormant 2-4 year old wood, and they should be 12-20 in (30-50 cm) long with a diameter of at least 0.5 in (1 cm). Roots and shoots should appear 10-15 days after planting if conditions are right (Hansen *et al*. 1995). Local genetic material is prefered in any restoration project.

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Salix monticola* / Mesic Forbs Shrubland
State Common Name Montane Riparian Willow Carr
Global Scientific Name: *Salix monticola* / Mesic Forbs Shrubland
Global Common Name: Mountain Willow / Mesic Forbs Shrubland

Community Classification

System:	International Vegetation Classification
Class:	Shrubland
Subclass:	Deciduous shrubland
Group:	Cold-deciduous shrubland
Subgroup:	Natural/Semi-natural cold-deciduous shrubland
Formation:	Temporarily flooded cold-deciduous shrubland
Alliance:	Mountain Willow Temporarily Flooded Shrubland Alliance

Global Rank: G4
Global Rank Reasons: This upper montane shrubland association is widespread throughout the mountains of Colorado. However, most stands have been degraded by grazing, past or present. Very few pristine occurrences.Grazing, recreational use, and exotic plant species impact the plant community across its range. While most sites occur on Federal lands (BLM, USFS) and a few are in wilderness areas, none, apparently, have grazing exclosures or other protective tenants. The rank was changed from G3 to G4 because it is more abundant than previously thought.

Subnational Rank: S3
Subnational Rank Reasons: In Colorado, fifty stands have been documented. Many stands of this association may represent grazing-induced shifts from other *Salix monticola* (mountain willow) dominated plant associations. Stands with a complete native herbaceous understory intact are threatened by improper livestock grazing, inappropriate stream flow alterations, and heavy recreational use.

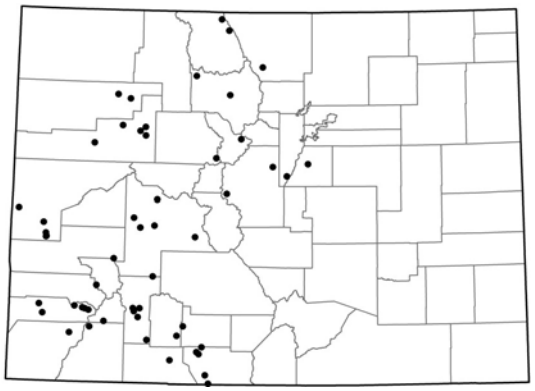
General Description: The *Salix monticola* / mesic forb (mountain willow / mesic forb) plant association is a tall (5-8 ft, 1.5-2.5 m), deciduous shrubland with a dense or open canopy and an herbaceous layer dominated by a variety of forbs and grasses. While no single herbaceous species is a clear dominant, total forb cover is generally greater than 30% and exceeds total graminoid cover. This association occurs along broad, swift-moving streams and active floodplains in narrow to moderately wide valleys. The ground surface is usually undulating, from past flooding or beaver activity. Stands form narrow bands at the stream edge, ranging from 1-6 ft (0.1-2 m) above the channel elevation. In wider valley bottoms, stands occur further from the bank, but never more

than 2.5 ft (0.75 m) above the annual high water mark. Most stands occur adjacent to straight, wide, and shallow channels ranging from bedrock to silty-bottomed reaches. A few stands occur on meandering, cobble-bottomed reaches or streams braided by beaver activity. Soils are fine textured sandy clays to silty and sandy clay loams.

Vegetation: *Salix monticola* (mountain willow) forms a dense to open canopy, and if not the clear dominant, then it is the matrix willow. The matrix species is the willow with the highest abundance, even though other willow species combined may have greater canopy cover. Other shrub species that may be present include *Ribes inerme* (whitestem gooseberry), *Salix drummondiana* (Drummond willow), *S. planifolia* (planeleaf willow), *S. bebbiana* (Bebb willow), *S. geyeriana* (Geyer willow), *S.brachycarpa* (barren ground willow), *S. wolfii* (Wolf willow), *S. lucida* ssp. *caudata* or *lasiandra* (shining willow), *Alnus incana* (thinleaf alder) and *Lonicera involucrata* (twinberry honeysuckle). Total forb cover ranges from 10-70%. No one forb species is noticeably more abundant than any other, nor is any species consistently present in all stands. Forb species that may be present include *Heracleum maximum* (common cowparsnip), *Rudbeckia laciniata* var. *ampla* (cutleaf coneflower), *Mertensia ciliata* (tall fringed bluebells), and *Fragaria virginiana* (strawberry). Graminoid cover may be absent or up to 50% cover; in general it does not exceed the total forb cover. Graminoid species that may be present include *Calamagrostis canadensis* (bluejoint reedgrass) and *Carex utriculata* (beaked sedge). Generally, forbs are dominant under shrubs on hummocks and ridges while graminoids dominate the undergrowth in low-lying, wetter swales. Exotic graminoid and forb species include *Poa pratensis* (Kentucky bluegrass), *Trifolium repens* (white clover), and *Taraxacum officinale* (dandelion).

Similar Communities: *Salix monticola* (mountain willow) occurs as nearly pure stands in Colorado, but is replaced by other *Salix* (willow) species, *e.g.*, *S. boothii* (Booth's willow) and *S. drummondiana* (Drummond's willow), farther north and west of the state line. A similar *Salix boothii* / Mesic Forbs (Booth's willow/mesic forbs) type described from Utah and southeastern Idaho includes stands occasionally having some *Salix monticola* (Padgett *et al.* 1989). Similar types with *Salix monticola* as an associated canopy species and *Calamagrostis canadensis* (bluejoint reedgrass) as the dominant undergrowth have been described by Johnston (1987) and Cooper and Cottrell (1990). However, the *Salix monticola* / Mesic Forbs (mountain willow/mesic forbs) plant association tends to have a higher forb cover compared to the *Calamagrostis canadensis* types. Similar types include the *Salix drummondiana* / *Calamagrostis canadensis* (Drummond's willow/bluejoint reedgrass) plant association from the Gunnison National Forest in Colorado; the *Salix geyeriana* - *Salix* spp. / *Calamagrostis canadensis* plant association (Johnston 1987) from Idaho, Wyoming, and Colorado; and the *Salix monticola* / *Calamagrostis canadensis* plant association (Cooper and Cottrell 1990) from the Colorado Front Range. Another closely related community is the *Salix drummondiana* / *Mertensia ciliata* (Drummond's willow/mountain bluebells) plant association (Cooper and Cottrell 1990), which has some *Salix monticola* (mountain willow).

Regional Distribution: This plant association is known only from Colorado; however, within the state it is widespread in the Southern Rocky Mountains ecoregion. It has also been found in the eastern portions (the Colorado portions) of the Utah High Plateaus and the Colorado Plateau ecoregions.



Colorado Distribution: This plant association is a major type in the upper montane areas of the San Miguel/Dolores (Kittel and Lederer 1993), Colorado, White (Kittel *et al.* 1994), Gunnison (Kittel *et al.* 1995), South Platte (Cooper and Cottrell 1990, Kittel *et al*. 1997), North Platte and Rio Grande/Closed Basin (Kittel et al. 1999b), as well as the western half of the San Juan National Forest (Richard *et al.* 1996).

Elevation Range in Colorado: 6,800.00 - 10,700.00 ft / 2,072.64 - 3,261.36 m

Site Geomorphology: The *Salix monticola* / Mesic Forbs (mountain willow/mesic forbs) plant association occurs along broad, swift-moving streams and active floodplains in narrow to moderately wide valleys (65-820 ft, 20-250 m). The ground surface is usually undulating, from past flooding or beaver activity. Stands form narrow bands at the stream edge, ranging from 1-6 ft (0.3-2 m) above the channel elevation. In wider valley bottoms, stands occur farther from the bank, but never more than 2.5 ft (0.76 m) above the annual high water mark. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Most stands occur adjacent to fairly straight, wide, and shallow channels ranging from bedrock to silty-bottoms (Rosgen's Channel Type: B1-B6). A few stands occur on meandering channels with cobble-bottoms (Rosgen's Channel Type: C3) or streams braided by beaver activity (Rosgen's Channel Type: D6).

Soil: Soils are fine textured sandy clays to silty and sandy clay loams.

Successional and Ecological Processes: *Salix monticola* (mountain willow) dominated plant associations appear to be longlived and stable. They occur on mesic sites that support a diversity of graminoids and forbs. *Salix monticola* appears to grow only where the water table does not drop below 3 ft (1 m) of the surface. It appears to be limited to cold, wet environments in broad valley bottoms at high elevations. Due to the colder environments, organic matter builds up in the soils, and it is likely that succession to other associations is slow. This plant association occurs on mesic sites and supports a rich diversity of forbs. On broad, hummocky floodplains stands can form extensive willow carrs. Sites with a higher abundance of exotic forbs and graminoids may be grazing-induced. At higher elevations, this association grades into the *Salix planifolia*/mesic forb (planeleaf willow/mesic forb) association.

Adjacent Vegetation: Adjacent Riparian Vegetation: *Populus angustifolia* (narrowleaf cottonwood) and *Populus angustifolia - Picea pungens* (narrowleaf cottonwood-blue

spruce) forests, and *Salix planifolia* (planeleaf willow), *S. wolfii* (Wolf's willow), *S. boothii* (Booth's willow), *S. geyeriana* (Geyer's willow) or *Alnus incana* (thinleaf alder) shrublands occur on well-drained, adjacent floodplains. Mesic meadows of *Carex aquatilis* (water sedge), *Eleocharis quinqueflora* (fewflower spikerush), or *Juncus balticus* (Baltic rush) also occur on flat areas of the floodplain. In narrow valleys at higher elevations, *Abies lasiocarpa - Picea engelmannii* (subalpine fir-Engelmann spruce) forests occur. Adjacent Upland Vegetation: at higher elevations, *Abies lasiocarpa - Picea engelmannii* (subalpine-fir-Engelmann spruce) forests and *Populus tremuloides* (quaking aspen) woodlands occur on adjacent hill slopes. At lower elevations, *Pinus ponderosa* (ponderosa pine), *Pinus ponderosa - Quercus gambelii* (ponderosa pine-Gambel's oak), and mixed *Pinus contorta* (lodgepole pine) forests occur on adjacent hill slopes.

Management: Stands with an abundance on non-native and increaser herbaceous species in the undergrowth are likely grazing-induced shifts from either the native forb component of the *Salix monticola* / Mesic Forbs (mountain willow/mesic forbs) plant association, or a shift from another *Salix monticola* (mountain willow) dominated plant association. Improper livestock grazing can dry sites, increase non-native cover, and reduce the vigor of willow root structure. Rest periods from grazing are recommended in order to provide time for plant regrowth. Late summer and fall grazing are not recommended because willow species are vulnerable to pruning damage due to limited regrowth at the end of the growing season (Hansen *et al*. 1995, Kovalchik and Elmore 1992). Disturbed stands or stands with a history of improper grazing may respond to rest and rotation periods. These stands may have potential for higher graminoid biomass including species such as *Carex aquatilis* (water sedge) and *Calamagrostis canadensis* (bluejoint reedgrass). Beaver activity in the vicinity of this plant association is important for maintaining the health of the riparian ecosystem. Beaver dams abate channel down cutting, bank erosion, and downstream movement of sediment. Beaver dams raise the water table across the floodplain and provide year-round saturated soils. Plant establishment and sediment build-up behind beaver dams raise the channel bed and create a wetland environment. Land managers should consider maintaining beaver in an area rather than removing them (Hansen *et al*. 1995). Prescribed burning in this plant association is also an effective method of rejuvenating decadent stands of willows. The willow species in this plant association vigorously sprout following quick, hot fires. Slow-burning fires can actually damage the plants (Hansen *et al*. 1995). *Salix monticola* (mountain willow) is an effective streambank stabilizer. It, much like *Salix geyeriana* (geyer's willow), can probably be grown and transplanted from nursery cuttings. Cuttings should be taken in the spring from dormant 2-4 year old wood, and they should be 12-20 in (30-50 cm) long with a diameter of at least 0.5 in (1 cm). Roots and shoots should appear 10-15 days after planting if conditions are right (Hansen *et al*. 1995).

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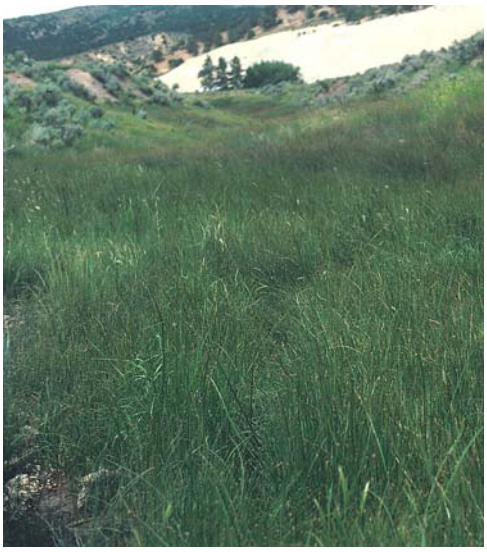
Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Schoenoplectus pungens* Herbaceous Vegetation
State Common Name Bulrush

Global Scientific Name: *Schoenoplectus pungens* Herbaceous Vegetation
Global Common Name: Bulrush Wet Meadow

Community Classification

System:	International Vegetation Classification
Class:	Herbaceous Vegetation
Subclass:	Perennial graminoid vegetation
Group:	Temperate or subpolar grassland
Subgroup:	Natural/Semi-natural temperate or subpolar grassland
Formation:	Semipermanently flooded temperate or subpolar grassland
Alliance:	Threesquare Semipermanently Flooded Herbaceous Alliance



Global Rank: G3G4
Global Rank Reasons: This association has a wide distribution, but few stands have been documented.

Subnational Rank: S3
Subnational Rank Reasons: In Colorado, more than 20 stands are documented. Few of these are large or in pristine condition.

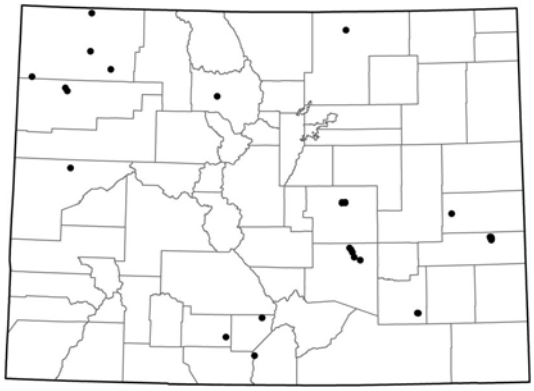
General Description: The *Schoenoplectus pungens (=Scirpus pungens)* (threesquare bulrush) plant association forms small low stature (1-3 ft, 0.3-1 m) marshes in low-lying swales, abandoned channels, and overflow channels where soils remain saturated. This association is characterized by pure stands of *Schoenoplectus pungens,* occasionally associated with a few other graminoid species. This association also occurs on silt and sand bars within the active channel where the water velocity is lowest.

Vegetation: This plant association can be pure stands of *Schoenoplectus pungens* (threesquare bulrush). Some stands include other graminoids such as *Juncus balticus* var. *montanus* (mountain rush), *Hordeum jubatum* (foxtail barley), *Phragmites australis* (common reed), *Spartina gracilis* (alkali cordgrass), *Muhlenbergia asperifolia* (alkali muhly), and *Eleocharis palustris* (common spikerush). On alkaline soils, *Distichlis spicata* (inland saltgrass) is a common associat

Similar Communities: Closely related communities that have different associated

species include: the *Scirpus americanus* / *Carex* spp. (chairmaker's bulrush/sedge) community from Saskatchewan, Montana, Wyoming, Utah, Colorado, Kansas, and Nebraska (Johnston 1987) and the *Scirpus* spp. / *Distichlis spicata* (bulrush/inland saltgrass) from Utah, Kansas, Nebraska, and North Dakota (Johnston 1987).

Regional Distribution: This community is found in the western United States in the intermountain basins, as well as in western parts of the Great Plains, from Montana south to Colorado, and west into Nevada, Utah, and Wyoming.



Colorado Distribution: This plant association occurs in the Yampa (Kittel and Lederer 1993), White and Colorado River Basins (Kittel *et al*. 1994), and in the Arkansas River Basin (Kittel et al. 1999a).

Elevation Range in Colorado: 3,800.00 - 7,800.00 ft / 1,158.24 - 2,377.44 m

Site Geomorphology: The *Scirpus pungens* (threesquare bulrush) plant association occurs in low-lying swales, abandoned channels, and overflow channels. The water table is generally at or near the surface. This association also occurs on silt and sandbars within the active channel where the water velocity is lowest. Streams were classified according to the Rosgen Classification of Natural Rivers (Rosgen 1996). Streams are low gradient, meandering, alluvial channels with broad, well defined floodplains (Rosgen Channel Types: C6) or very wide, braided channels with eroding banks (Rosgen Channel Types: D5).

Soil: Soils from the Colorado River Basin are black, anoxic, organic soils and gleyed, clay-loam, alkaline soils. The alkaline soils are classified as loamy typic Cryaquents.

Successional and Ecological Processes: *Schoenoplectus pungens* (threesquare bulrush) is an early colonizer and is adapted to saturated conditions on streamsides, sandy shores, marshes, and reservoir margins. Because of the wet soil conditions and aggressive growth of *Schoenoplectus pungens*, most other species are precluded from the sites. Disturbance can cause the establishment of increaser species such as *Juncus balticus* var. *montanus* (mountain rush) and *Hordeum jubatum* (foxtail barley). Lowering the water table may dry the site and result in decreased cover of *Schoenoplectus pungens*. An increase in salinity may increase alkaline tolerant species.

Adjacent Vegetation: Adjacent wetter sites often support stands of ~*Eleocharis palustris* Herbaceous Vegetation (CEGL001833)$$, ~*Typha latifolia* Western Herbaceous Vegetation (CEGL002010)$$, or ~*Schoenoplectus acutus* Herbaceous Vegetation (CEGL001840)$$. Adjacent drier riparian sites often support stands of ~*Spartina pectinata* Western Herbaceous Vegetation (CEGL001476)$$, ~*Spartina gracilis* Herbaceous Vegetation (CEGL001588)$$, ~*Distichlis spicata* Herbaceous Vegetation (CEGL001770)$$, or ~*Pascopyrum smithii* Herbaceous Vegetation (CEGL001577)$$.

Management: *Scirpus pungens* (=*Schoenoplectus pungens*) (threesquare bulrush) has low to moderate palatability to livestock and is seldom grazed. However, if water levels

drop or upland forage is limited, livestock may heavily utilize this plant association (Hansen *et al*. 1995). *Scirpus pungens* (=*Schoenoplectus pungens*) (threesquare bulrush) helps filter sediments to build streambanks. This species is a prolific seed producer but seeds require moist, bare soil for germination. Its rhizomes spread quickly into exposed areas, rapidly colonizing mudflats and drawdown areas (Hansen *et al*. 1995).

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Colorado Natural Heritage Program
Community Characterization Abstract

State Scientific Name *Typha (latifolia, angustifolia)* Western Herbaceous Vegetation
State Common Name Narrow-leaf Cattail Marsh

Global Scientific Name: *Typha (latifolia, angustifolia)* Western Herbaceous Vegetation
Global Common Name: Broadleaf Cattail Marsh

Community Classification

System:	International Vegetation Classification
Class:	Herbaceous Vegetation
Subclass:	Perennial graminoid vegetation
Group:	Temperate or subpolar grassland
Subgroup:	Natural/Semi-natural temperate or subpolar grassland
Formation:	Semipermanently flooded temperate or subpolar grassland
Alliance:	(Narrowleaf Cattail, Broadleaf Cattail) - (Clubrush species) Semipermanently Flooded Herbaceous Alliance

Global Rank: G5
Global Rank Reasons: This association is widely distributed, occurring across the western United States and western Great Plains.

Subnational Rank: S4
Subnational Rank Reasons: This association may be declining in Colorado even though it is not uncommon. It is threatened by development, wetland draining, and stream flow alterations. However it is also a natural invader to newly created wetlands, and will appear in newly ponded areas on its own.

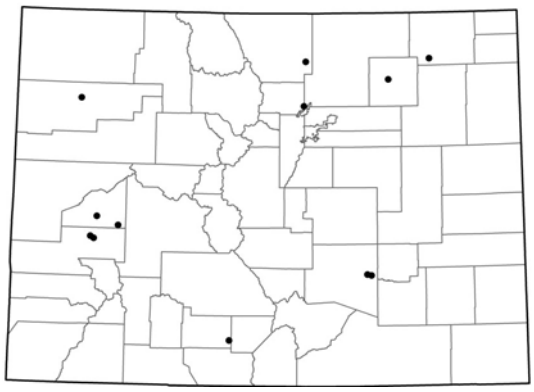
General Description: The *Typha (latifolia,angustifolia)*(cattail) plant association is a commonly seen tall, dark green community growing in 2-4 feet of standing water. It is found in the shallow edges of ponds and lakes, and can occur in backwaters of larger river floodplains. This association is a common wetland community occurring throughout the western and midwestern states. Soils are deep, heavy silty clay loam and organic mucks. Some profiles have 10-30% coarse material and are fairly well drained, others remain anoxic throughout most of the year.

Vegetation: *Typha angustifolia* (narrowleaf cattail) and/or *Typha latifolia* (broadleaf cattail) forms near-monotypic (70-85%) stands between 3 and 6 feet tall (1-2 m). *Typha domingensis* (southern cattail) is much less common than the other two species. It may or

may not be present and is restricted to Western Slope stands. *Schoenoplectus acutus* and *Schoenoplectus tabernaemontani* are common associates. Other species which may be present include *Potamogeton* (pondweed) spp., *Spartina pectinata* (prairie cordgrass), and *Veronica* (speedwell) spp.

Similar Communities: A closely related community, the *Typha latifolia* / *Sagittaria latifolia* (broadleaf cattail/broadleaf arrowhead) plant association, occurs in Nebraska, northeastern Colorado, western Wyoming, eastern Idaho, and North Dakota (Johnston 1987).

Regional Distribution: This association is widely distributed, occurring across the western United States and western Great Plains.



Colorado Distribution: The *Typha latifolia* (broadleaf cattail) plant association is not well documented in the literature, but the species are known to occur throughout the plains of eastern Colorado (Weber 1990). It is also in this region of Colorado where the association was observed along overflow channels and oxbow lakes of large rivers, and in small ponded areas around stock ponds, railroad embankments, and other small depressions where water can pool. It has also been documented in several counties in western Colorado.

Elevation Range in Colorado: 3,900.00 - 8,900.00 ft / 1,188.72 - 2,712.72 m

Site Geomorphology: This plant association occurs in standing water at least 1 foot (0.3 m) in depth, although it will persist during drier periods. It is found along the margins of beaver ponds, overflow channels, backwater sloughs, floodplain swales, drainage ditches, behind railroad embankments, and any place where water collects and remains for two-thirds of the growing season. This association can be found on nearly every type of stream channel, but typically along meandering, low gradient streams.

Soil: Soils are deep, heavy silty clay loam and organic mucks. Some profiles have 10-30% coarse material and are fairly well drained, others remain anoxic throughout most of the year.

Successional and Ecological Processes: *Typha angustifolia* (narrowleaf cattail) occupies inundated and disturbed grounds and can tolerate deeper water and higher alkalinity levels than *T. latifolia* (broadleaf cattail). *Typha* species are prolific seed producers, spreading rapidly to become the early colonizers of wet mineral soil, and will persist under wet conditions. The roots and lower stems are well adapted to prolonged submergence but germination and establishment require periods of drawdown to expose bare soil. This association may be declining in Colorado. It is threatened by development, wetland draining, and stream flow alterations. However it is also a natural invader to newly created wetlands, and will appear in newly ponded areas on

its own.

Adjacent Vegetation: Adjacent Riparian Vegetation: *Scirpus* (bulrush) marshes and *Carex* (sedge) meadows can be found adjacent to the *Typha* spp. (cattail) plant association. Stands of *Populus deltoides* (eastern cottonwood) and *Salix amygdaloides* (peachleaf willow) occur on higher terraces. Adjacent Upland Vegetation: on the plains, *Bouteloua gracilis* (blue grama) short grass prairies or agricultural fields occur on the uplands.

Management: This association does not provide much forage for livestock. It is an important wetland type for many species of birds and waterfowl. It is reported, however, that with heavy livestock use stands can be converted to the *Carex nebrascensis* (Nebraska sedge) community type in Montana (Hansen *et al.* 1995).

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NATURAL HISTORY INFORMATION FOR PLANT SPECIES ASSOCIATED WITH POTENTIAL CONSERVATION AREAS IN RIO BLANCO COUNTY

State Name: *Argillochloa dasyclada* (Utah fescue)
Global Name: *Festuca dasyclada* (Sedge Fescue)

Taxonomy
Class: Monocotyledoneae
Order: Cyperales
Family: Poaceae

Taxonomic Comments: Synonymous with *Argillochloa dasyclada* Hack. ex Beal.

Ranks and Status
Global Rank: G3
State Rank: S3
Federal Protection Status: None
State Protection Status: None

Description and Phenology
Densely tufted perennial to 4 dm tall. Auricles are an erect swelling with long pilose-like hair. Ligules to 0.5 mm long and ciliate. Leaf blades flat or loosely rolled to 5 mm wide and up to 6 cm long with 7 to 10 veins. Culm nodes sometimes dark purple, the internodes densely pubescent. Sheaths are glabrous and open with spreading panicle branches which break at the base at maturity and become tumbleweeds. Inflorescence an open panicle 6 to 12 cm long with two florets per spikelet; the lemma with a terminal awn over 1 mm in length. Inflorescence branches at the lowest node spreading almost at right angles to each other.

Look Alikes: Similar to *Oryzopsis hymenoides* because of growth form. Distinguished from other *Festuca* sp. because it has 2-flowered spikelets rather than 3 common for *Festucas* (Peterson et al. 1982).

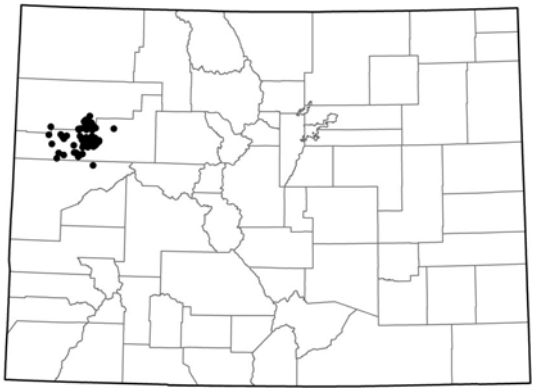
Phenology: This species flowers in July through mid-August (Eberle 1980).

Habitat
Found in sagebrush, mountain brush and juniper communities on dry rocky slopes of the Green River Shale (Parachute Creek Member).

Elevation Range Feet: 6,988 - 10,000
Elevation Range Meters: 2,129 - 2,129

Distribution
Global Range: Known from NW Colorado and Wasatch and Garfield Counties, Utah.

Colorado State Range: Known from northern Garfield, southern Rio Blanco and northern Mesa Counties, Colorado.



Threats and Management Issues
Grazing is a threat, but the most prominent threat is gas and oil drilling.

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Version Date: 03/06/2008

State Name: *Astragalus detritalis* (debris milkvetch)
Global Name: *Astragalus detritalis* (Debris Milk-vetch)

Taxonomy
Class: Dicotyledoneae
Order: Fabales
Family: Fabaceae

Taxonomic Comments: Synonymous with *Astragalus spectabilis* and *Homalobus detritalis*. Similar in appearance to *A. calycosus* var. *scaposus* which has oval leaflets and smaller, densely strigose pods and *A. spatulatus* which has smaller flowers and much shorter pods.

Ranks and Status
Global Rank: G3
State Rank: S2
Federal Protection Status: BLM Sensitive Species
State Protection Status: None

Description and Phenology
Stemless, erect, cushion-shaped perennial from 2 to 6 cm in height. Leaves with 3 to 5 narrowly oblanceolate to linear spinulose-tipped leaflets from 3 to 30 mm in length. Three to six purple flowers produced; erect pods form in a close terminal cluster. The dark-colored pods are more than twice as long as wide, are not inflated and are unilocular.

Look Alikes: No close look alikes in the vicinity. *A. calycosus* var. *scaposus* differs from *A. detritalis* in having oval leaflets and smaller, densely strigose pods. *A. spatulatus* is similar but has a much shorter pod. *A. chloodes* has longer leaves and many more flowers in the inflorescence and a taller growth form (pers. comm. Coles 1994).

Phenology: Flowering late April to early June with a peak in mid-May; fruiting late May to late June (Neese and Smith 1982; pers. comm. Jennings, 1994).

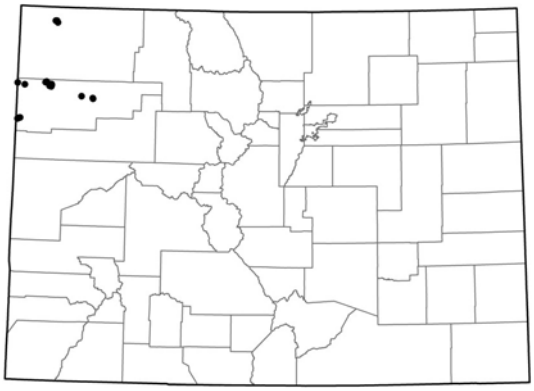
Habitat
Found in pinyon-juniper and mixed desert shrub communities associated with *Artemisia, Stipa, Phlox, Trifolium*, and cactus species (pers. comm. Coles 1994). Often in rocky soils ranging from sandy clays to sandy loams, and on alluvial terraces with cobbles.

Elevation Range Feet: 5,400 - 7,200
Elevation Range Meters: 1,645 - 1,645

Distribution
Global Range: This species is found within the Uinta Basin in Duchesne and Uintah Counties, Utah, and Rio Blanco (Barneby 1964) and Moffat Counties, Colorado. It is a

Uintah Basin endemic (Welsh et al. 1993).

Colorado State Range: Only known from Rio Blanco and Moffat counties in Colorado.



Threats and Management Issues

Overgrazing, exotic species, gravel pit development and road disturbance are threatening this species.

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Version Date: 03/11/2008

State Name: *Astragalus duchesnensis* (Duchesne milkvetch)
Global Name: *Astragalus duchesnensis* (Duchesne Milk-vetch)

Taxonomy
Class: Dicotyledoneae
Order: Fabales
Family: Fabaceae

Taxonomic Comments: Synonymous with *Lonchophaca duchesnensis.* The species superficially resembles *A. convallarius* but has more developed leaflets and longer pods.

Ranks and Status
Global Rank: G3
State Rank: S1S2
Federal Protection Status: BLM Sensitive Species
State Protection Status: None

Description and Phenology
Perennial with delicate, wiry, slender stems that are spreading or prostrate to 40 cm tall from a branching caudex. Leaves 2 to 10 cm long, the leaflets 5 to 15. Flowers are less than 10 mm long and have white wings and reddish-purple banner. The pods are glabrous or appressed pubescent, 20 to 35 mm long and 3 to 5 mm wide, unilocular.

Look Alikes: Similar in appearance to *A. convallarius* which has shorter pods (10-12 mm in length) and flowers that are greenish white and tinged with purple. Also similar to *A. osterhoutii* which is taller (50-100 cm in height) and has creme colored flowers (pers. comm. Spackman and Minton 1994). May be distinguished by its declining pods, that are not inflated, and fewer than 5 mm thick, and usually more than 15 mm long. It also has free stipules.

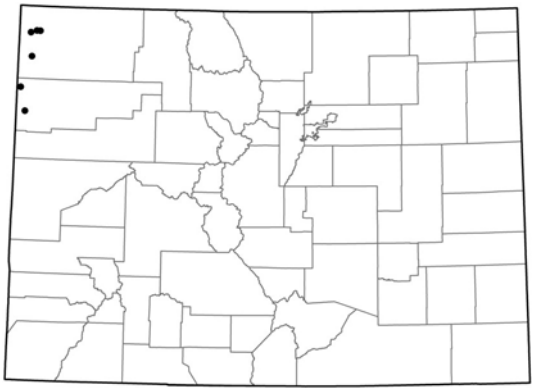
Phenology: Flowers late April through June.

Habitat
Found in salt desert shrub and pinon-juniper communities on sandy and gravelly pediments such as sandy mesas or around sandstone or shale outcrops (Goodrich 1986).

Elevation Range Feet: 4,600 - 6,400
Elevation Range Meters: 1,402 - 1,402

Distribution
Global Range: An Uinta Basin endemic, occurs in Daggett, Duchesne, and Uintah Counties in Utah and in Moffatt County, Colorado (Welsh et al. 1993, and Weber and Whitman 1996).

Colorado State Range: Populations occur in Moffat and Rio Blanco Counties.



Threats and Management Issues

Plants grow in a restricted habitat that may have potential for oil shale mining. Other direct disturbance from development such as roads and utilities, and inappropriate grazing are also potential threats.

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Version Date: 03/12/2008

State Name: *Bolophyta ligulata* (ligulate feverfew)
Global Name: *Parthenium ligulatum* (Ligulate Feverfew)

Taxonomy
Class: Dicotyledoneae
Order: Asterales
Family: Asteraceae

Taxonomic Comments: Synonymous with *Bolophyta ligulata* and *Parthenium alpinum* var. *ligulatum*.

Ranks and Status
Global Rank: G3
State Rank: S2
Federal Protection Status: BLM Sensitive Species
State Protection Status: None

Description and Phenology
Mound-forming herbaceous perennial to 3 cm in height from a taproot and heavily branched from the base. Persistent leaves and leaf bases cover the branch bases. Leaves are spatulate to oblanceolate, clothed in straight stiff hairs, and are 3-20 mm long and 1.5 to 4 mm wide. Ray flowers are white, 1 to 2 mm long, sessile, and solitary at the ends of branches. The oblong bracts are densely pubescent at the tip.

Look Alikes: Nothing is similar in the same habitat (pers. comm. Coles 1994).

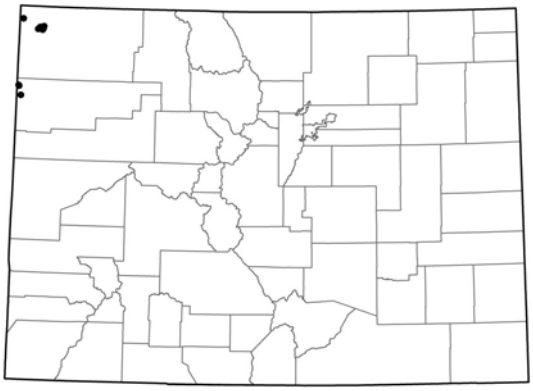
Phenology: Flowers early to late May; fruiting late May to early June.

Habitat
Small areas of qypseous shale or oil shale, white tuffaceous material, selenium rich soils, shale clayey soils, and white shale (Eberle 1980). Often on the summits of bare shale knolls (pers. comm. Coles 1994). Barren or semibarren calciferous or gypsiferous outcrops...in salt desert shrub, serviceberry, rabbitbush, Indian rice-grass, greasebrush, galleta, black sagebrush, pygmy sagebrush, and pinyon-juniper communities (Welsh et al. 1993).

Elevation Range Feet: 5,593 - 7,004
Elevation Range Meters: 1,705 - 1,705

Distribution
Global Range: Known from two counties in Colorado, six counties in Utah (Welsh et al. 1993) and Eureka County, Nevada. This species has been falsely reported from Wyoming (WYNHP 1998).

Colorado State Range: Known from Moffat and Rio Blanco Counties.



Threats and Management Issues
Information under review at this time.

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Version Date: 03/11/2008

State Name: *Ceanothus martinii* (Utah mountain lilac)
Global Name: *Ceanothus martinii* (Martin's Ceanothus)

Taxonomy
Class: Dicotyledoneae
Order: Rhamnales
Family: Rhamnaceae

Ranks and Status
Global Rank: G4
State Rank: S1
Federal Protection Status: None
State Protection Status: None

Description and Phenology
Deciduous, unarmed low shrub to one meter in height. The dark grey or brown stems are many branches and spreading with resinous patches. Leaves have 1 to 3 mm long petioles, palmately 3-veined, broadly ovate with a rounded tip, and arranged alternately. The leaves are green on both sides with the underside nearly glabrous; the veins occasionally pubescent. The leaf margins are either entire or finely toothed at the tip. The inflorescence is a cylindrical panicle 1 to 3.5 cm long consisting of 5 white tepals and 5 white spatulate petals 2 mm long. Fruits are 3 lobed casules that are fleshy and drupe-like when young, but dry at maturity.

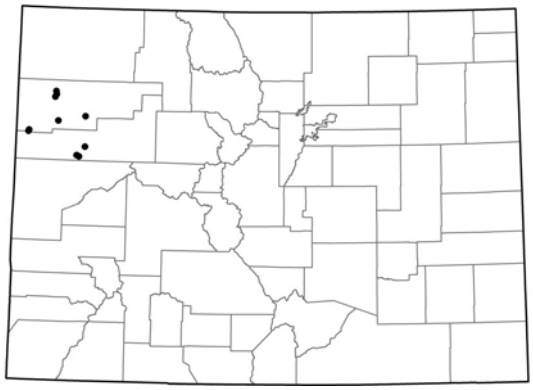
Phenology: This species is flowering from June through July (Rydberg 1922).

Habitat
C. martinii is found on mountain sides, associated with pinyon-juniper, mountain brush, sagebrush, ponderosa pine, douglas fir, aspen, bristlecone pine communities (Welsh et al. 1993) and Gambel oak. Occurs in dry, course shale or hard clay soils.

Elevation Range Feet: 7,600 - 8,080
Elevation Range Meters: 2,316 - 2,316

Distribution
Global Range: Occurs from eastern Nevada to southwest Wyoming south to northwest Arizona and northwest Colorado.

Colorado State Range: Known from Garfield and Rio Blanco Counties.



Threats and Management Issues

Oil and gas development is the primary threat; also threatened by habitat loss, off-road vehicles, and over-grazing. Two occurrences in Rio Blanco County are adjacent to well pads.

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Version Date: 03/06/2008

State Name: *Cirsium barnebyi* (Barneby's thistle)
Global Name: *Cirsium barnebyi* (Barneby's Thistle)

Taxonomy
Class: Dicotyledoneae
Order: Asterales
Family: Asteraceae

Taxonomic Comments: This species, which was described in 1981, is accepted by Cronquist (1994), Kartesz (1999), and recent state Floras.

Ranks and Status
Global Rank: G3G4
State Rank: S3
Federal Protection Status: None
State Protection Status: None

Description and Phenology
A woody, tap-rooted perennial from 30 to 50 cm in height with one to few grey-tomentose or glabrate stems. The caudex with black persistent leaf bases. The tomentose leaf blades oblong-elliptic and strongly undulate. The leaf margins with closely spaced paired lobes that are either coarsely spinose-dentate or cleft into spine-tipped division; the spines 3 to 5 mm long. Basal leaves are winged petioled, while the cauline are sessile and reduced. Lavender flowers are produced in corymbiform arrays and are born at branch tips. The heads are small, less than 2 cm long; the longest phyllary spines about 3 mm and reflexed or spreading.

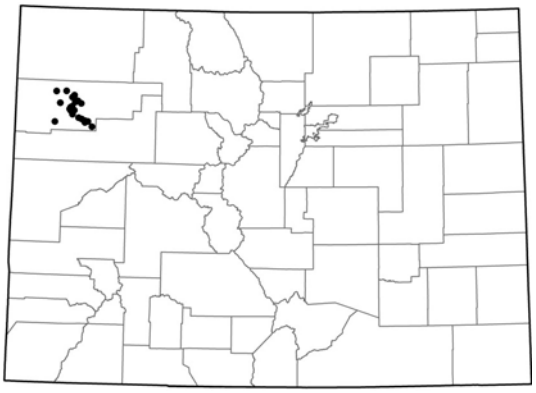
Phenology: This species flowers from June through September.

Habitat
This species is found on open shaley slopes [on limestone and sandstone] in the pinyon-juniper zone (Cronquist 1994) in sagebrush, juniper, *Cryptantha*, *Ephedra*, wildrye and rabbitbrush communities (Welsh et al. 1993).

Elevation Range Feet: 5,250 - 8,530
Elevation Range Meters: 1,600 - 1,600

Distribution
Global Range: Occurrences known from Utah and Colorado; it has not been confirmed whether this species is in Wyoming (NatureServe 2008). It is reported to be ubiquitous on shale, both Uinta and Green River Formations (Lyon pers com. 2008).

Colorado State Range: Known from Rio Blanco County in Colorado. It is found to be ubiquitous on shale, both Uinta and Green River Formations; range estimated to be 3500 sq. mi. (Lyon pers com. 2008). Previously the estimated range in Colorado was calculated to be 4 square kilometers (1 square miles) by drawing a minimum convex polygon around the known occurrences.



Threats and Management Issues

The primary threat at this time is considered to be *Cirsium* biocontrol. It is not known if all of the occurrences are or are not threatened by these activities.

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Version Date: 03/06/2008

State Name: *Cymopterus duchesnensis* (Uinta Basin spring-parsley)
Global Name: *Cymopterus duchesnensis* (Uinta Basin Spring-parsley)

Taxonomy
Class: Dicotyledoneae
Order: Apiales
Family: Apiaceae

Ranks and Status
Global Rank: G3
State Rank: S1
Federal Protection Status: BLM Sensitive Species
State Protection Status: None

Description and Phenology
Perennial herb to 30 cm tall from a bulbous taproot. Leaves glabrous and glaucous, grey in appearance, not aromatic, and mostly basal. Leaves pinnately compound with broad segments, the lateral primary leaflets deeply toothed to lobed. Bright yellow flowers develop and do not turn purple.

Look Alikes: Distinguished by its glaucous, pinnately compound leaves with two opposite pairs of lateral primary leaflets. The confluent portions of the leaf blades are relatively wide (6-25 mm) compared with other Uinta Basin *Cymopterus* species.

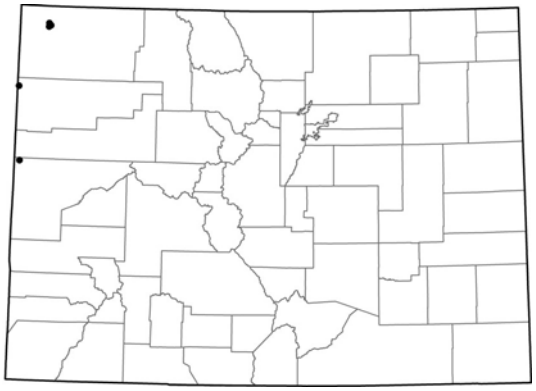
Phenology: Flowering occurs in late April to May; fruiting in late May to early July.

Habitat
Found in cold desert shrub, sagebrush, and juniper communities on sandy clay and clay semi-barrens of the Mancos and Morrison shales (Morrison, Uintah, Wasatch and Green River formations).

Elevation Range Feet: 4,700 - 6,800
Elevation Range Meters: 1,432 - 1,432

Distribution
Global Range: Known only from Duchesne and Uintah counties in northeastern Utah and in adjacent counties in northwestern Colorado (NatureServe 2008).

Colorado State Range: Known from Mesa, Moffat and Rio Blanco Counties, Colorado.



Threats and Management Issues
Potential threats include inappropriate grazing, oil and gas development, roads and ATV activity.

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Version Date: 03/11/2008

State Name: *Eriogonum ephedroides* (ephedra buckwheat)
Global Name: *Eriogonum ephedroides* (Ephedra Wild Buckwheat)

Taxonomy
Class: Dicotyledoneae
Order: Polygonales
Family: Polygonaceae

Taxonomic Comments: Treated as a species by Kartesz (1994); sometimes treated as a variety of *Eriogonum brevicaule*.

Ranks and Status
Global Rank: G3
State Rank: S1
Federal Protection Status: BLM Sensitive Species
State Protection Status: None

Description and Phenology
Erect perennial herbs to 35 cm tall. Stems spreading and dying to the base each year. Leaves lanceolate, all basal, and with petioles up to 4 cm long, pale yellow to cream colored flowers arranged in cymes; the inflorescence is branched from well below the middle of the plant height.

Look Alikes: Looks like *E. torryana* and *E. mormontea* (Emrich and Painter 1978). Welsh (1987) considers this a variety of *E. brevicaule* distinguished by its inflorescence which branches from below the middle of the plant.

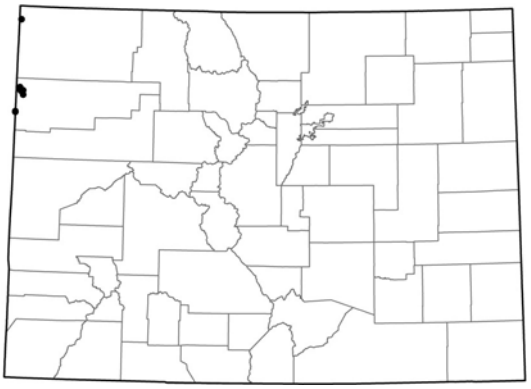
Phenology: Flowers occurs from June through October.

Habitat
Found in juniper and sagebrush-grass communities on white shale of the Green River Shale Formation.

Elevation Range Feet: 5,700 - 5,700
Elevation Range Meters: 1,737 - 1,737

Distribution
Global Range: Found in Rio Blanco and Moffat Counties, Colorado and adjacent Uintah County, Utah (Welsh et al. 1993).

Colorado State Range: Known from Moffat and Rio Blanco Counties. The species is restricted to white, loose clay and sandstone scree.



Threats and Management Issues
Threats include off-road vehicle use, recreation, oil development and road construction.

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Version Date: 03/06/2008

State Name: *Gentianella tortuosa* (Utah gentian)
Global Name: *Gentianella tortuosa* (Utah Gentian)

Taxonomy
Class: Dicotyledoneae
Order: Gentianales
Family: Gentianaceae

Taxonomic Comments: Synonymous with *Gentiana tortuosa*.

Ranks and Status
Global Rank: G3?
State Rank: S1
Federal Protection Status: BLM Sensitive Species
State Protection Status: None

Description and Phenology
Clump-forming annual to 10 cm tall. Stems much branched and spreading to erect. Basal leaves elliptic to spatulate 5 to 20 mm long and 2 to 5 mm wide. Cauline leaves elliptic, oblong, or lanceolate; to 35 mm long. Funnel-form to campanulate flowers are solitary in the leaf axils or on short axillary branches. Corolla yellowish white or blue 7 to 16 mm long; the corolla lobes as long as the tube and with a single row of hairs forming a fringe inside. Capsules contain 6 or fewer seeds.

Look Alikes: This species has similar flowers to *G. amarella* which occurs in montane and subalpine meadows and has a different flower size. It is also similar to *G. aurea* which does not occur in Colorado. It is distinguished from *G. amerella* by this species moister, montane meadow habitat and by the corolla lobes. It does not look like anything else within its habitat/range (pers. comm. Coles 1994). Unlike any other Colorado gentian, flowers are nearly buried in leaves (pers. comm. Jennings 1995).

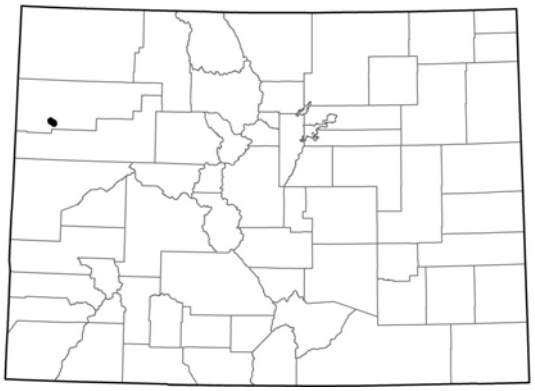
Phenology: Flowers form in July and August; capsules formed in August and September.

Habitat
Found in sagebrush through spruce-fir forests on shale outcrops of the Green River Formation. Associated species include *Hedysarum* sp., *Thalictrum heliophilum*, *Agropyron spicatum*, *Koeleria* sp., and *Cryptantha* sp. (Peterson and Baker 1983).

Elevation Range Feet: 8,500 - 10,800
Elevation Range Meters: 2,590 - 2,590

Distribution
Global Range: This species is found in Rio Blanco County, Colorado (CNHP 1998), central and southwest Utah and southern Nevada (Cronquist et al. 1984).

Colorado State Range: Only known from Rio Blanco County. Plant is restricted to shale outcrops, Piceance Basin (Weber and Wittmann 1996).



Threats and Management Issues

The Green River Formation habitat is threatened by oil and gas development throughout its range. The occurrence at Cathedral Bluffs that was updated in 2007 is close to the road and could suffer impacts from road maintenance.

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Version Date: 03/07/2008

State Name: *Gilia stenothyrsa* (narrow-stem gilia)
Global Name: *Gilia stenothyrsa* (Narrow-stem Gilia)

Taxonomy
Class: Dicotyledoneae
Order: Solanales
Family: Polemoniaceae

Taxonomic Comments: Synonymous with *Aliciella stenothyrsa* and *Ipomopsis stenothyrsa*.

Ranks and Status
Global Rank: G3
State Rank: S1
Federal Protection Status: BLM Sensitive Species
State Protection Status: None

Description and Phenology
Biennial or perennial herb from taproot and thick basal rosette; growing to 6 dm tall. Basal leaves 1 to 5 cm long and 3 to 12 mm wide, pinnately toothed, and slightly glandular below/stipitate-glandular above**.** Cauline leaves much reduced above. The stem is unbranched forming a dense spike-like panicle that comprises half or more of the plant height. White, lavender, or blue flowers over 1 cm in length and with exerted anthers. Capsules are formed.

Look Alikes: The rosettes are difficult to distinguish from other species of *Gilia* as well as *Ipomopsis aggregata* (pers. comm. Coles 1994). Occassional specimens of *G. stenothyrsa* may be difficult to distinguish from *G. pinnatifida* however, it differs in having the glands of the stem and leaves much more sparsely distributed (Cronquist et al. 1984).

Phenology: Flowering occurs in late May to June; fruiting is from late June to early July (Anderson et al. 1982).

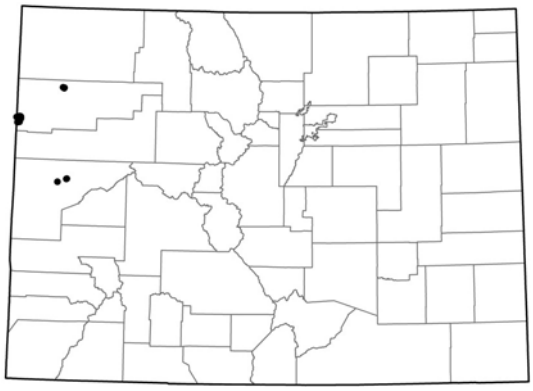
Habitat
Found in open places often in hills of pinyon-juniper, salt desert shrub, sagebrush, and mountain-mahogany communities. Co-occurring species include *Artemisia* sp., and *Sarcobatus* sp. Soils include silty to gravelly loams derived from the Green River or Uinta Formations as well as sandy or clay alkaline soils and shale or clay barrens.

Elevation Range Feet: 5,003 - 9,318
Elevation Range Meters: 1,524 - 1,524

Distribution
Global Range: It is known from Mesa and Rio Blanco counties, Colorado, and in

Carbon, Duchesne, Emery and Uintah counties, Utah (Welsh et al. 2003).

Colorado State Range: Known from Rio Blanco and Mesa counties in Colorado. Estimated range in Colorado is 676 square kilometers (261 square miles), calculated in GIS by drawing a minimum convex polygon around the known occurrences. According to Weber and Wittman (1996), rare or infrequent in clay hills of Mesa and Garfield counties.



Threats and Management Issues

The primary threat at this time is considered to be oil and gas development. It is not known if all of the occurrences are or are not threatened by these activities. Two of the areas are threatened by sheep grazing. Another area is threatened by its proximity to a 4-wheel drive road.

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Version Date: 03/13/2008

State Name: *Lesquerella congesta* (Dudley Bluffs bladderpod)
Global Name: *Lesquerella congesta* (Dudley Bluffs Bladderpod)

Taxonomy
Class: Dicotyledoneae
Order: Capparales
Family: Brassicaceae

Ranks and Status
Global Rank: G1
State Rank: S1
Federal Protection Status: Listed threatened
State Protection Status: None

Description and Phenology
Densely tufted perennial forming a tight and dense crown. Basal and cauline leaves similar, 1 to 5 mm wide with no distinction between the blade and the petiole. Flowers in umbelliform racemes that barely exceed the basal leaves in height; the pedicels curved or sigmoid. Stellate hair throughout including the semi-spherical fruits.

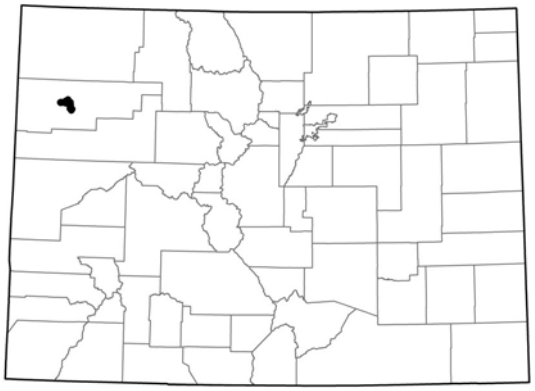
Look Alikes: The caudices of *Lesquerella congesta* are extremely short or non-existent; plants form a single tight and dense crown. The caudices of *L. alpina* are several; plants form a loose crown (pers. comm. Minton 94-11-09).

Phenology: Flowering begins in early April; fruiting begins in late May (pers. comm. Jennings 1995).

Habitat
Barren white shale outcrops of the Green River and Uinta Formations that have been exposed along drainages through erosion from downcutting of streams in the Piceance Basin. Grows on level surfaces at the points of ridges.

Elevation Range Feet: 6,003 - 6,692
Elevation Range Meters: 1,830 - 1,830

Distribution
Global Range: Known from Rio Blanco County, Colorado; it is found only along the Piceance and Yellow Creek drainages. Estimated range is 88 square kilometers (34 square miles), calculated in GIS by drawing a minimum convex polygon around the known occurrences.



Threats and Management Issues

Mining and oil and gas development are considered to be the primary threats to the species at this time. Mining of oil shale and/or nahcolite solution could impact up to 100% of the occupied habitat. A new nahcolite plant at Yankee Gulch, across from Dudley Bluffs was built in 2000. The lease may extend into Ryan Gulch. Additionally, a new drill pad was observed near Dudley Bluffs in 2000 (CNAP 2000). Other threats include livestock grazing and trampling by wild horses. ORV's can cause severe damage if access is allowed into *Lesquerella congesta* habitat.

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Version Date: 03/26/2008

State Name: *Lesquerella parviflora* (Piceance bladderpod)
Global Name: *Lesquerella parviflora* (Piceance Bladderpod)

Taxonomy
Class: Dicotyledoneae
Order: Capparales
Family: Brassicaceae

Ranks and Status
Global Rank: G2
State Rank: S2
Federal Protection Status: BLM Sensitive Species
State Protection Status: None

Description and Phenology
Annual or short-lived perennial herb with decumbent stems from low growing rosettes. Basal leaves flat and dentate to angular, covered in stellate hair giving a silver appearance. Golden yellow flowers are born on secund racemes; pendant siliques formed.

Look Alikes: The recurved siliques and pedicels are similar to *L. arenosa* and *L. ludoviciana*. The fundamental differences are in the ovule number and the position of the funiculi on the replum of the silique. The basal leaves are more similar to those of *L. ludoviciana*. (Rollins 1983; more details included). *L. parviflora* racemes are usually secund (one sided). Basal leaves are usully flat and generally dentate or somewhat angular. *L. ludoviciana* racemes are not secund. Basal leaves on this species are involute and usually entire (pers. comm Minton November 1994).

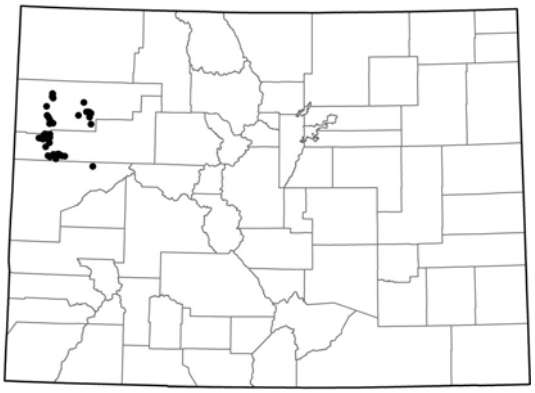
Phenology: Flowers in June through early July; fruits in July (Peterson and Baker 1982; pers. comm. Jennings 1995).

Habitat
Endemic to outcrops of the Green River Shale Formation in the Piceance Basin. It grows on ledges and slopes of canyons in open areas of pinon juniper communities. The soils are Torriorthent Rock outcrop complex (Peterson and Baker 1982). Frequently associated species include *Pinus edulis, Juniperus osteosperma, Eriogonum* sp., *Cirsium* sp., *Astragalus lutosus, Cercocarpus* sp., *Galium coloradense, Oryzopsis hymenoides, Penstemon* sp., *and Machaeranthera* sp.

Elevation Range Feet: 6,200 - 8,600
Elevation Range Meters: 1,889 - 1,889

Distribution
Global Range: Colorado endemic known from Rio Blanco, Garfield, and Mesa Counties. Estimated range is 4,165 square kilometers (1,608 square miles), calculated in

GIS by drawing a minimum convex polygon around the known occurrences.



Threats and Management Issues
Oil shale mining and oil and gas development are the primary threats. Off road vehicles, overgrazing and urban development are also potential threats.

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Version Date: 03/07/2008

State Name: *Nuttallia multicaulis* (many-stem stickleaf)
Global Name: *Mentzelia multicaulis* (Many-stem Stickleaf)

Taxonomy
Class: Dicotyledoneae
Order: Violales
Family: Loasaceae

Taxonomic Comments: Holmgren and Holmgren 2002 have split the full species into four varieties; *M. multicaulis* var. *uintahensis, M. multicaulis* var.*librina, M. multicaulis* var. *flumensevera,* and *M. multicaulis* var.*multicaulis.* Synonymous with *Nuttallia multicaulis.* Weber (2001) has split *Mentzelia* into *Acrolasia* for annuals and *Nuttallia* for perennial and biennial species.

Ranks and Status
Global Rank: G3
State Rank: S3
Federal Protection Status: None
State Protection Status: None

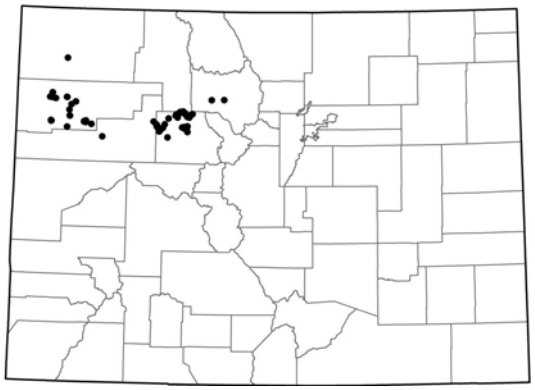
Description and Phenology
Plants are slender and much branched. Leaves are narrow, deeply pinnatisect. Flowers are glabrous, with 5 bright yellow petals and 5 petal-like staminodia. Petals and staminodia are broad, 6-9 mm wide and 9-10 mm long.

Habitat
Sagebrush, rabbitbrush and pinyon-juniper communities (Welsh et al. 1993). On nearly barren, harsh, calcareous substrates (Goodrich and Neese 1986).

Elevation Range Feet: 5,000 - 8,500
Elevation Range Meters: 1,524 - 1,524

Distribution
Global Range: Known from Uinta Basin, northeastern Utah (Welsh et al. 1993), New Mexico (NatureServe 2008) and in 9 counties in W-NW Colorado.

Colorado State Range: Found in Eagle, Summit, Grand, Mesa, Moffat, Rio Blanco, Montrose, Delta, and Garfield counties.



Threats and Management Issues
Threats include oil and gas development, roads, off road vehicles.

References

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Version Date: 03/11/2008

State Name: *Oreocarya rollinsii* (Rollins' cat's-eye)
Global Name: *Cryptantha rollinsii* (Rollins' Cat's-eye)

Taxonomy
Class: Dicotyledoneae
Order: Lamiales
Family: Boraginaceae

Taxonomic Comments: Synonymous with *Oreocarya rollinsii*. Weber (2001) has kept the annual species in genus *Cryptantha*, moving the biennial and perennial species to *Oreocarya*.

Ranks and Status
Global Rank: G3
State Rank: S2
Federal Protection Status: BLM Sensitive Species
State Protection Status: None

Description and Phenology
Biennial herb to 4.5 dm in height with one to several bristly stems. Leaves primarily basal with cauline reduced upward. Leaves are bristly, pustulate on both surfaces, and oblanceolate to spatulate; up to 5 cm long and 1.5 cm wide. Inflorescence of 3 to 6 flowered raceme. The white campanulate flowers have a corolla tube 7 to 9 mm long.

Look Alikes: Gross aspects of this species suggests *C. bradburniana*. The nutlets suggest *C. nubiegena* of the Sierras, but generally very distinct (Johnston 1939). No other species resembles *C. rollinsii* within its habitat (pers. comm. Coles 1994). Distinguished by its campanulate corolla, nearly smooth nutlets, noncaespitose habit, and single stem (Higgins 1971).

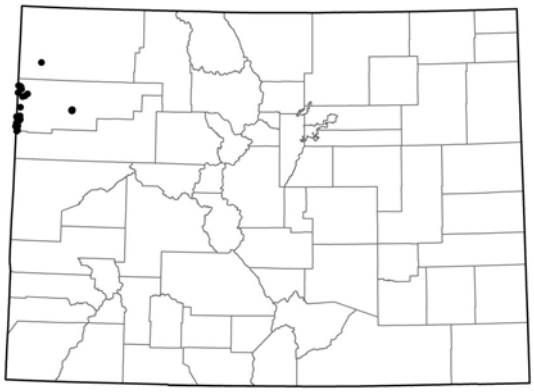
Phenology: Plant flowers late May through June (Cronquist et al. 1984). Jennings (pers. comm. 1995) observed this species in bud on May 1, and in full bloom May 25.

Habitat
Known from white shale slopes of the Green River Formation; in pinyon-juniper woodlands and cold desert shrubland communities. Found with *Eriogonum*, *Forsellesi*a, and *Agropyron* on alkaline clays or seldom sandy soils and shaley knolls (Galatowitsch 1985).

Elevation Range Feet: 5,300 - 5,800
Elevation Range Meters: 1,615 - 1,615

Distribution
Global Range: Known from SW Wyoming, central and NE Utah (Emery, Uintah, Duchesne, and Carbon counties) and NW Colorado (Moffat and Rio Blanco counties).

Colorado State Range: Known from Moffat and Rio Blanco Counties (mainly along the Utah border).



Threats and Management Issues

Potential threats include inappropriate grazing, oil and gas development, roads, and ATV activity.

References

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State Name: ***Penstemon fremontii*** **var.** ***glabrescens*** **(Fremont's beardtongue)**
Global Name: ***Penstemon fremontii*** **var.** ***glabrescens*** **(Fremont's Beardtongue)**

Taxonomy
Class: Dicotyledoneae
Order: Scrophulariales
Family: Scrophulariaceae

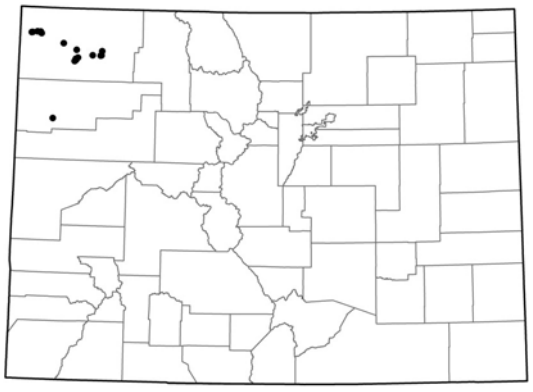
Ranks and Status
Global Rank: G3G4T2
State Rank: S2
Federal Protection Status: None
State Protection Status: None

Description and Phenology
Perennial herb with erect stout densely puberulent stems from 10 to 45 cm in height. Leaves oblong-lanceolate to 10 cm long and 2.5 cm wide with winged petioles. Blue to purple (rarely pink or white) flowers have pubescent anther sacs and anthers with short straight or sometimes flexuous hairs.

Habitat
Found on arid benches and slopes in sandy clay loams of the Uinta Formation in the sagebrush community.

Elevation Range Feet: 5,500 - 6,500
Elevation Range Meters: 1,676 - 1,676

Distribution
Global Range: Known from Rio Blanco County, Colorado. Estimated range is 992 square kilometers (383 square miles), calculated in GIS by drawing a minimum convex polygon around the known occurrences.



Threats and Management Issues
This species occurs within the Piceance Basin, an area of active gas and oil drilling. Some sites may also be threatened by off road vehicle use and inappropriate grazing.

References

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Version Date: 03/11/2008

State Name: *Penstemon grahamii* (Graham beardtongue)
Global Name: *Penstemon grahamii* (Graham's Beardtongue)

Taxonomy
Class: Dicotyledoneae
Order: Scrophulariales
Family: Scrophulariaceae

Ranks and Status
Global Rank: G2
State Rank: S1
Federal Protection Status: None
State Protection Status: None

Description and Phenology
Few-branched perennial herb to 2 dm in height from a tap-root. Leaves thick, entire, villous-glandular or glabrous, to 5 cm long and 18 mm wide. Basal leaves ovate spatulate or broadly oblanceolate, narrowed to a petiolar base. The opposite stem leaves lanceolate, sessile, and clasping. Flowers pinkish lavender with deep red guidelines in the throat. The inflorescence glandular-pubescent; the corolla 25 to 37 mm long; the golden yellow bearded staminode exserted.

Look Alikes: The leaves of *P. grahamii* are superficially similar to those of sympatric species of *Penstemon* (pers. comm. Coles 1994); the most distinctive features of *P. grahamii* are duplicated only in *P. miser*, which occurs from eastern Nevada westward (Graham 1937). *P. grahamii* generally has a better defined reddish cast to the margins of the leaves (pers. comm. Coles 1994).

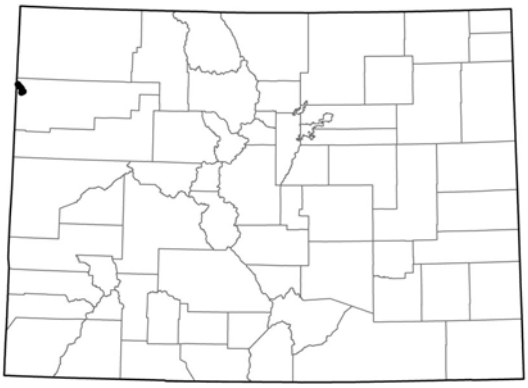
Phenology: Flowers from late May to early June (Galatowitsch 1985; pers. comm. Jennings 1995).

Habitat
In decomposed, exposed, raw oil shale and talus derived from Parachute Creek and Evacuation Creek members of the Green River Formation. On slopes and knolls, common associates include *Juniperus osteosperma*, *Chamaechaenactis*, *Eriogonum ephedroides*, *Cercocarpus montanum*, *Forsellesia meionandra*, *Parthenium ligulatum* among others (pers. comm. Coles 1994; pers. comm. Jennings 1995). Found from shadscale to pinyon-juniper communities.

Elevation Range Feet: 4,593 - 6,758
Elevation Range Meters: 1,400 - 1,400

Distribution
Global Range: The range of the species is about 60 miles from east to west, and 35 miles from north to south. Known from Colorado and Utah.

Colorado State Range: Known from Rio Blanco County in Colorado. Estimated range in Colorado is 24 square kilometers (9 square miles), calculated in GIS by drawing a minimum convex polygon around the known occurrences.



Threats and Management Issues
The primary threat at this time is considered to be oil and gas development (CNHP Scorecard 2006) leading to potential elimination of occurrences/subpopulations, habitat degradation and fragmentation. It is not known if all of the occurrences are or are not threatened by these activities. The known occurrences in Colorado are within the Raven Ridge BLM ACEC. The plants occur within an area of developed and expanding oil and gas fields with several wells and access roads; additional potential threats include off-road vehicle use, grazing, drought, low seed production, small population size, and noxious weeds.

References

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Center for Native Ecosystems. 2002. Graham's Penstemon. Petition for a Rule to List Graham's Penstemon (Penstemon grahamii) as Threatened or Endangered under the Endangered Species Act. In the Office of Endangered Species, U.S. Fish and Wildlife Service, United States Department of the Interior.

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Version Date: 03/12/2008

State Name: ***Penstemon scariosus*** **var.** ***albifluvis*** **(White River penstemon)**
Global Name: ***Penstemon scariosus*** **var.** ***albifluvis*** **(White River Beardtongue)**

Taxonomy
Class: Dicotyledoneae
Order: Scrophulariales
Family: Scrophulariaceae

Taxonomic Comments: Originally considered a species, now generally treated as a variety of *Penstemon scariosus*.

Ranks and Status
Global Rank: G4T1
State Rank: S1
Federal Protection Status: Candidate
State Protection Status: None

Description and Phenology
Herbaceous perennial to 5 dm in height with multiple stems from a woody caudex. The leaves are linear to linear-lanceolate and are typically less than 7 mm wide. The pale-blue to lavender corolla is prominently bilabiate, the lower lip larger than the upper. Corolla lobes are thin membranous-margined; the stamens exserted; the anthers white-bearded. Inflorescence a cyme of 2 to 5 flowers.

Look Alikes: Clearly a close relative to *Penstemon scariosus*. This variety differs from typical *P. scariosus* as the corolla and anther hairs tend to be shorter, and the basal leaf rosette is reduced; habitat also differs. Also closely related to *Penstemon strictus* and other members of the complex by a series of small morphological features: *P. scariosus* var. *albifluvis* has basal leaves that are lacking or poorly developed contrasting well-developed basal leaves of relatives; anther hairs are longer than widths in relatives; corolla lenth is 20-22 mm in *P. scariosus* var. *albifluvis*, 24-30 mm in relatives (Galatowitsch 1985). It is difficult to distinguish from these even under the best circumstances (pers. comm. Coles 1994).

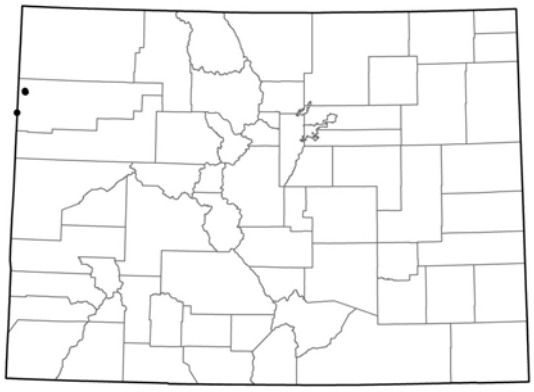
Phenology: Flowers from late May through June (England 1982), with seeds produced in late June.

Habitat
Found in mixed desert shrub and pinyon-juniper communities on sparsely vegetated white shale slopes. Occurs on fine-textured calcareous soils that are shallow, and usually mixed with fragmented shale. These soils are derived from oil shale barrens of the Parachute Creek Member, Green River Formation.

Elevation Range Feet: 5,000 - 7,200
Elevation Range Meters: 1,524 - 1,524

Distribution
Global Range: Endemic to Raven Ridge near the White River in Rio Blanco Co., Colorado, westward into Bonanza, southern Uintah Co., Utah, to the vicinity of Evacuation Creek, a distance of about 20 miles. 1994 data: Utah occurrences 1) are separated, at their greatest distance, by approximately 19 miles, 2) cover a total acreage of less than 200 acres, and 3) are endemic to east central Uinta County; occurs also in immediately adjacent Rio Blanco County, Colorado (Franklin 1995).

Colorado State Range: Known from Rio Blanco County in Colorado. Estimated range in Colorado is 22 square kilometers (8 square miles), calculated in GIS by drawing a minimum convex polygon around the known occurrences.



Threats and Management Issues
The primary threat at this time is considered to be oil and gas development (CNHP Scorecard 2006). 99% of the species total population occurs on substrates designated as a priority for oil shale and tar sand development; 100% of the population lies in an area with hydrocarbon resources. The two known populations are within the Raven Ridge BLM ACEC and on BLM with no special protection status. The plants occur within an area of developed and expanding oil and gas fields with several wells and access roads; additional potential threats include off-road vehicle use and grazing.

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Weber, W.A. and Ronald Wittmann. 1996. Colorado Flora: Western Slope. University Press of Colorado.

Version Date: 03/12/2008

State Name: *Physaria obcordata* (Piceance twinpod)
Global Name: *Physaria obcordata* (Piceance Twinpod)

Taxonomy
Class: Dicotyledoneae
Order: Capparales
Family: Brassicaceae

Ranks and Status
Global Rank: G1G2
State Rank: S1S2
Federal Protection Status: Listed threatened
State Protection Status: None

Description and Phenology
Perennial herb with stellate hairs covering the leaves, stems and fruits. The flowers are yellow, followed by unique heart-shaped inflated siliques that attach to the stalk at the pointed end.

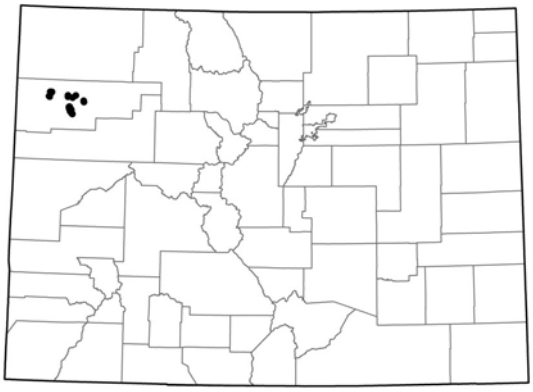
Look Alikes: Looks very similar to *Lesquerella parviflora*, however *P. obcordata* has heart-shaped fruits, while *L. parviflora* has oval/orbiculate fruits. Trichomes may be useful to distinguish non-flowering plants (pers. comm. Coles 1994).

Phenology: Vegetative growth likely begins in early May, flowering occurs from mid May through mid June. Fruit maturation through the end of July. Dehisence is from mid June through August (Okane 1987).

Habitat
Found in white oil-shale, Parachute Creek Member of the Green River Formation.

Elevation Range Feet: 5,900 - 7,500
Elevation Range Meters: 1,798 - 1,798

Distribution
Global Range: Endemic to Colorado; known from Rio Blanco County only along the Piceance and Yellow Creek drainages and at Clamity Ridge. Estimated range is 448 square kilometers (173 square miles), calculated in GIS by drawing a minimum convex polygon around the known occurrences.



Threats and Management Issues

Mining of oil shale and/or nahcolite solution could impact up to 100% of the occupied habitat. A new nahcolite plant at Yankee Gulch, across from Dudley Bluffs was built in 2000. The lease may extend into Ryan Gulch. Additionally, a new drill pad was observed near Dudley Bluffs in 2000 (CNAP 2000). Other threats include livestock grazing and trampling by wild horses. ORV's can cause severe damage if access is allowed into *Physaria obcordata* habitat.

References

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Coles, J. 1994. Personal communication about Rare Plant Guide Species.

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O'Kane, S. L. 1988. Colorado's Rare Flora. Great Basin Naturalist. 48(4):434-484.

O'Kane, S.L. 1987. Status report for *Physaria obcordata*. Unpublished report prepared for the Colorado Natural Areas Program, Denver, CO.

Version Date: 03/12/2008

State Name: *Seriphidium pygmaeum* (pygmy sagebrush)
Global Name: *Artemisia pygmaea* (Pygmy Sagebrush)

Taxonomy
Class: Dicotyledoneae
Order: Asterales
Family: Asteraceae

Taxonomic Comments: Synonymous with *Serephidium pygmaeum* Weber. The genus was moved from *Artemisia* to *Serephidium* by Weber (2001) and is said to be distinct, chemically and morphologically, from the herbaceous, true *Artemisia* species of America and Eurasia.

Ranks and Status
Global Rank: G4
State Rank: S1
Federal Protection Status: None
State Protection Status: None

Description and Phenology
The smallest of our woody sagebrushes, pygmy sage occupies some of the most harsh, dry sites in the state. Unlike the other sagebrushes in Rio Blanco County, which have 3-toothed leaves, pygmy sagebrush has crowded stiff linear leaves that are green and glandular. It has a massive root system, much larger than the above-ground parts. The main branches seldom stand over 5 cm, while the narrow, erect inflorescence rises above them to 20 cm.

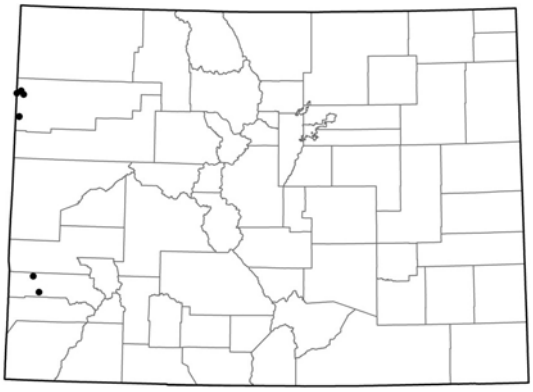
Look Alikes: This is a distinctive species, not to be confused with anything else (Cronquist et al.1994).

Phenology: Flowering August through September (Cronquist et al. 1994).

Habitat
Welsh et al. 1993: "This dwarf sagebrush occurs in peculiar edaphic situations on Green River Shale, in clay soils forming the matrix in igneous gravels, on calcareous gravels, and on dolomitic outcrops and gravels, where it is often the dominant species in local areas. It is often a component of communities that support rare plant species." In Rio Blanco County, it was found on the lower and Parachute members of the Green River Shale, and on the upper member of the Mesa Verde Formation.

Distribution
Global Range: Western United States, primarily in the Great Basin, in Arizona, Utah, Nevada, New Mexico, Colorado and the Navajo Nation.

Colorado State Range: Far western Colorado in Montezuma, San Miguel and Rio Blanco Counties. To be expected along the Utah border in other counties.



Threats and Management Issues

Primary threats are direct disturbance from roads, oil and gas development, and off road vehicles. The species is adapted to extremely dry situations, and would not tolerate irrigation.

References

Colorado Natural Heritage Program. 1996. Biological Conservation Datasystem: Element Occurrence Records.

Cronquist, A., A. H. Holmgren, N. H. Holmgren, J. L. Reveal, P. K. Holmgren. 1994. Intermountain Flora Vascular Plants of the Intermountain West, USA: Vol. 5. New York Botanical Garden, Bronx, NY.

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Weber, W.A. and Ronald Wittmann. 1996. Colorado Flora: Western Slope. University Press of Colorado.

Welsh, S.L., N.D. Atwood, S. Goodrich, and L.C. Higgins. (Eds.) 1993. A Utah flora. 2nd edition. Brigham Young Univ., Provo, Utah. 986 pp.

Version Date: 03/12/2008

State Name: ***Sullivantia hapemanii*** **var.** ***purpusii*** **(Hanging Garden sullivantia)**
Global Name: ***Sullivantia hapemanii*** **var.** ***purpusii*** **(Purpus' Sullivantia)**

Taxonomy
Class: Dicotyledoneae
Order: Rosales
Family: Saxifragaceae

Taxonomic Comments: Distinct variety, sometimes considered a distinct species (*Sullivantia purpusii*). The full species is listed as category 2 by USFWS Notice of Review (Sep. 1993); the var. *purpusii* had a '3C' USFWS status in 1985.

Ranks and Status
Global Rank: G3T3
State Rank: S3
Federal Protection Status: None
State Protection Status: None

Description and Phenology
Herbaceous perennial to 30 cm in height with slender, erect or ascending and somewhat glandular-puberulent stems. Basal leaves have petioles 2 to 4 times longer than the 2 to 3 cm long blades. Leaves are 9 to 12 lobed, the lobes irregularly and sharply dentate. Glandular open panicles with 5-lobed white flowers. Flower sepals are 3-nerved, the petals 2 to 4 mm long.

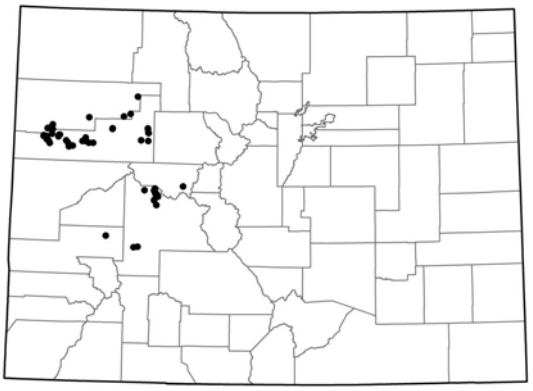
Look Alikes: Only species in this genus in Colorado. Not likely to be confused with other species in Saxifragaceae (pers. comm. Spackman 1994).

Phenology: Flowering period from mid June to late July; fruiting from July to August.

Habitat
Found in hanging gardens, seeps, and wet cliffs of various geology including lime-stone, shale, and quartzite.

Elevation Range Feet: 7,000 - 10,000
Elevation Range Meters: 2,133 - 2,133

Distribution
Global Range: Colorado endemic (Spackman et al. 1997) known from five counties in western Colorado.



Threats and Management Issues

This species is somewhat naturally protected by its inaccessible hanging garden habitat. However, rock climbing may disturb or destroy individuals. Intact hydrology is needed for the survival of this species.

References

Kartesz, J.T. 1994. A synonymized checklist of the vascular flora of the United States, Canada, and Greenland. 2nd edition. 2 vols. Timber Press, Portland, OR.

Scheck, C. 1994. Special Status Plants Handbook Glenwood Springs Resource Area. Unpublished report prepared for the Bureau of Land Management, Glenwood Springs, CO.

Spackman, S. 1994. Personal communication on rare plants (*Sullivantia hapemanii*).

Spackman, S., B. Jennings, J. Coles, C. Dawson, M. Minton, A. Kratz, and C. Spurrier. 1997. Colorado rare plant field guide. Prepared for Bureau of Land Management, U.S. Forest Service and U.S. Fish and Wildlife Service by Colorado Natural Heritage Program.

US Forest Service, Region 2 Regional Forester Sensitive Species List, 1993. Internet web site: http://roadless.fs.fed.us/documents/feis/data/sheets/summspd/tes_supp/r2_ssspecies.pdf [Accessed September 2002].

Utah Natural Heritage Program. May 1998. Element Occurrence Record Database, National Park subset. Salt Lake City, UT.

Weber, W.A. and Ronald Wittmann. 1996. Colorado Flora: Western Slope. University Press of Colorado.

Version Date: 03/12/2008

State Name: *Thalictrum heliophilum* (sun-loving meadowrue)
Global Name: *Thalictrum heliophilum* (Sun-loving Meadowrue)

Taxonomy
Class: Dicotyledoneae
Order: Ranunculales
Family: Ranunculaceae

Ranks and Status
Global Rank: G2
State Rank: S2
Federal Protection Status: USFS Sensitive Species
State Protection Status: None

Description and Phenology
Dioecious perennial with fibrous-rooted rhizomes and several stout divergent branches to 50 cm in height. Basal and cauline leaves petiolate with ternately compound glabrous, glaucous blades; the cauline ones reduced upward. The leathery leaflets are broadly obovate, 5 to 8 mm long and 4 to 5 mm wide, and apically 3-toothed. Many-flowered panicles of a-petalous flowers; nearly sessile achenes.

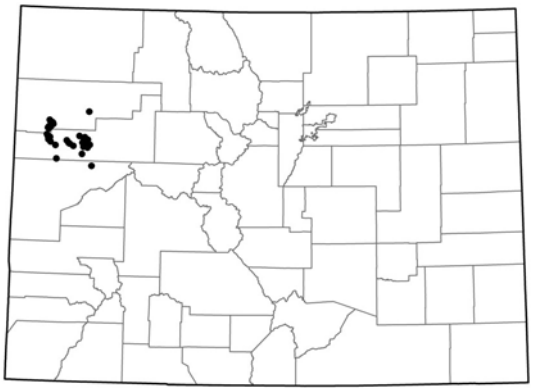
Look Alikes: *Thalictrum heliophilum* grows in open sunny sites (*heliophilum* = sun loving) while most other *Thalictrum* spp. prefer at least some shade. *Thalictrum fendleri* has larger leaflets (10-17 x 8-12 mm) that are not waxy (glaucus), more pistils per flower, and occurs in aspen groves and meadows (pers. comm. Minton 1994).

Phenology: Flowers from early June to the end of July (Scheck 1994); fruiting from July through August.

Habitat
Found in open sunny sites on sparesly vegetated, dry shale slopes. Soils usually consist of Green River Shale Formation. Associated vegetation is usually very sparse, but may consist of rabbitbrush, snowberry, *Astragalus lutosus*, *Mentzelia argillosa* and *Festuca dasyclada* (Scheck 1994).

Elevation Range Feet: 6,300 - 8,800
Elevation Range Meters: 1,920 - 1,920

Distribution
Global Range: The global distribution is limited to an approximately 32 by 40 mile (52 by 64 kilometer) range in the Colorado River drainage in northwestern Colorado in Garfield, Rio Blanco, and Mesa counties (Panjabi and Anderson 2007).



Threats and Management Issues

This species is threatened by oil shale mining, oil and gas development, exotic plant species invasions, small population size, grazing and trampling by wild ungulates, and climate change (Panjabi and Anderson 2007).

References

Kartesz, J.T. 1994. A synonymized checklist of the vascular flora of the United States, Canada, and Greenland. 2nd edition. 2 vols. Timber Press, Portland, OR.

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Version Date: 03/12/2008

NATURAL HISTORY INFORMATION FOR ANIMAL SPECIES ASSOCIATED WITH POTENTIAL CONSERVATION AREAS IN RIO BLANCO COUNTY

Townsend's Big-eared Bat (*Corynorhinus townsendii pallescens*)

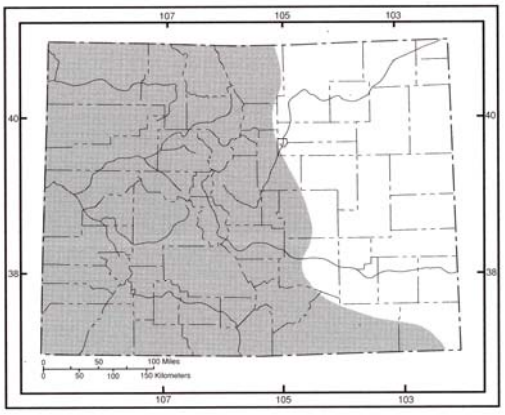
Taxonomy
Class: Mammalia
Order: Chiroptera
Family: Vespertilionidae
Genus: *Corynorhinus*

Taxonomic Comments: The generic name was recently changed from *Plecotus* to C*orynorhinus*.

CNHP Ranking: G4T4 S2

State/Federal Status: BLM sensitive; USFS sensitive; state species of undetermined status (Colorado).

Photo by J. Siemers, CNHP



Townsend's big-eared bat distribution in Colorado (from Fitzgerald et al. 1994)

Habitat Comments: Townsend's big-eared bats occur in a wide range of habitats including semi- desert shrublands, pinyon-juniper woodlands, and dry coniferous forest (Fitzgerald et al. 1994). Because they naturally roost (and hibernate) in caves, their presence is strongly correlated with the availability of caves or cave-like roosting sites (Pierson et al. 1999). Population densities are highest in areas with substantial surface exposures of cavity-forming rock (i.e., limestone, sandstone, gypsum, or volcanic) and in old mining areas (Pierson et al. 1999). Hibernacula generally are characterized by stable low temperatures and moderate airflow (Colorado Division of Wildlife 1984) and they are thought to be a population limiting factor for Townsend's big-eared bats (Fitzgerald et al. 1994).

Distribution: The two western subspecies of *C. townsendii* are widely distributed throughout western North America; in several northwestern states there are extensive zones of intergradation of the two subspecies (Pierson et. al 1999). *C. t. pallescens* occurs throughout Colorado except on the eastern plains, and is found in mines, caves, and human-made, cave-like structures at elevations up to 9,500 ft (2,930 m) (Colorado Division of Wildlife 1984). Only 11 maternity roosts and 30 hibernacula have been documented in Colorado (Pierson et. al 1999). Almost all known colonies in Colorado are very small (< 30 bats); known historical records of big-eared bats in Colorado include only about 350 individuals (Pierson et. al 1999). Available evidence suggests that

dramatic declines in the sizes of Colorado colonies of big-eared bats may have occurred historically (Pierson et. al 1999).

Important Life History Characteristics: Big-eared bats emerge from their daytime roosts after dark and feed on insects (especially moths) which they capture in flight or glean from foliage (Colorado Division of Wildlife 1984, Nowak 1999). Much of their feeding occurs over water or sagebrush, or along the edges of patches of vegetation (Fitzgerald et. al 1994). After the young are born in May or June (only one offspring per female) the females congregate in nursery colonies where they share metabolic heat; warm nursery sites are critical for the survival of the young (Humphrey and Kunz 1976). No long-distance migrations have been reported for *C. townsendii* (Barbour and Davis 1969, Clark and Stromberg 1987, Fitzgerald et. al 1994). Site fidelity is high: individual bats tend to return each year to the same hibernation (Humphrey and Kunz 1976) and nursery (Pearson et. al 1952) roosts. Nonetheless, during hibernation there is much movement of bats within a cave and among caves as environmental conditions fluctuate and the animals seek more favorable microclimatic conditions (Bee et. al 1981, Schwartz and Schwartz 1981, Fitzgerald et. al 1994).

Known Threats and Management Issues: Townsend's big-eared bats have very specific habitat requirements with regard to temperature and humidity levels at roosting sites; relatively few sites offer conditions appropriate for roosting by these bats (see refs. cited by Pierson et. al 1999). Moreover, *C. townsendii* is highly vulnerable to human disturbance (Colorado Division of Wildlife 1984, Clark and Stromberg 1987, Nowak 1999). Unlike many other species of bats, Townsend's big-eared bats do not seek shelter in protected crevices when roosting, but instead they cluster in highly visible locations (i.e., cave ceilings) where they are easily disturbed (Handley 1959, Barbour and Davis 1969). In Colorado, human visitation and disturbance rates at nursery and hibernation caves are very high (Pierson et. al 1999). In addition to human disturbance, other factors that threaten *C. townsendii* include the closure of abandoned mines (loss of roosting habitat), the impoundment of toxic materials (direct mortality), pesticide spraying (reduction of insect prey base), vegetation conversion and livestock grazing (loss of foraging habitat), and timber harvesting (loss of foraging and roosting habitats) (Pierson et. al 1999).

Greater Sage Grouse (*Centrocercus urophasianus*)

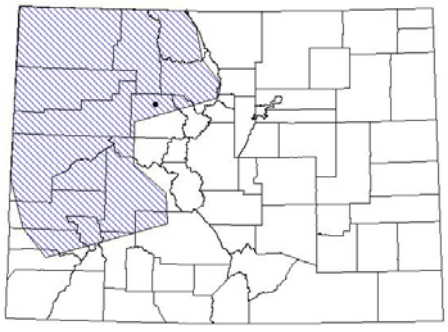
Taxonomy:
Class: Aves
Order: Galliformes
Family: Phasianidae
Genus: *Centrcercus*

Taxonomic Comments: Greater Sage Grouse are sagebrush obligates, depending upon big sagebrush as a primary food and as habitat for nesting, brood rearing, and roosting.

CNHP Ranking: G4, S4

State/Federal Status: State Special Concern Species/BLM Sensitive/FS Sensitive

Habitat Comments: Sage Grouse depend totally upon sagebrush-dominated habitats and prefer large contiguous patches on flat or gently rolling terrain (Colorado Breeding Bird Atlas 1998). They avoid very steep slopes and sagebrush intermixed with pinyon/juniper (Rogers 1964). Males require tall, mature sagebrush near their leks for day use (Rogers 1964). The presence of tall grass within the sagebrush communities also protects nests from predation (Colorado Breeding Bird Atlas 1998). They prefer shrub canopy cover averaging between 10% and 20% in brood rearing areas and between 20% and 30% in adult loafing areas. They require the higher percentages for winter habitat (Braun et al.1977). In northwestern Colorado these grouse most commonly reside between 2400 and 2900 m (7,900-9,500 ft) elevation.



Distribution: Sage Grouse range from the Canadian border southward through the intermountain west to central Nevada, Utah, and Colorado (Terres 1980). The original distribution of Sage Grouse in Colorado apparently extended to the southern border of the state with populations in at least 23 counties (Braun 1995). The largest populations of Northern Sage Grouse in Colorado inhabit Jackson, Moffat, Rio Blanco, and Routt counties with smaller populations (<500 birds) occurring in Larimer, Grand, Eagle, Garfield, and Mesa counties. Populations in Moffat, Routt, and Jackson counties are contiguous with populations in Utah and Wyoming.

Important Life History Characteristics: Sage-grouse nests are generally located within 2 mile radius around the strutting ground (Crawford et al. 2004, Apa 2005). Courtship activities begin in early April and the subsequent nesting and fledging of young is not completed until Early August (Colorado Breeding Bird Atlas 1998).

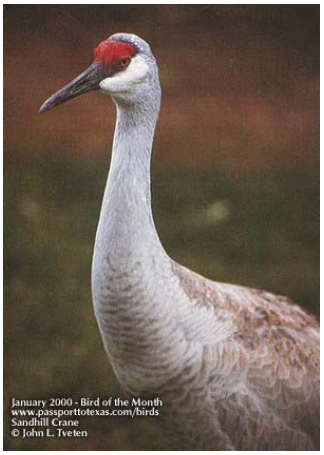
Males begin arriving on leking areas (strutting grounds) in March; hen attendance on leks peaks and mating occurs in early to mid April. Strutting grounds may have 50-100 males, although only a few dominant males perform the majority of copulations. Hens disperse up to 30 km (19 mi) for nesting, although most nest within 5 km (3 mi) of the lek where they mated. Except for summer, when insects and forbs predominate the diet, Sage Grouse depend upon the leaves of sagebrush for food.

Known Threats and Management Issues: Sage Grouse have been extirpated from four states and are considered at risk in six additional states--including Colorado--and two Canadian provinces. Long term data indicate Sage Grouse populations have declined by 33% range-wide since the mid-1980s, and show a 31% decline in Colorado. The loss of sagebrush habitats through burning, herbicide applications, and conversion to cropland present the greatest threat to Sage Grouse. Additionally, excessive livestock grazing is believed to have detrimental effects upon Sage Grouse nesting and brood-rearing habitat. Better than average grass cover is associated with better than average nest success. Livestock loafing areas around ponds and salting areas coinciding with leks during the spring months may remove the lek from use by grouse.

The viability of Greater sage-grouse depends on large, continuous blocks of viable sagebrush habitat (Braun et al. 1977). Sagebrush control by prescribed burning can be used to enhance sage-grouse habitat by reducing sagebrush canopy cover where dense sagebrush canopy cover limits understory forbs and grasses. Livestock grazing may positively or negatively affect sage-grouse and sage-grouse habitat, depending on the timing and intensity of grazing. Chemical and mechanical treatments intended to provide increased quantities of grass forage for livestock have indirectly reduced the acceptability of sagebrush rangelands (Beck and Mitchell 2000). Other sagebrush shrubland obligates include: Columbian Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*), Sage Sparrow (*Amphispiza belli*) and Brewer's Sparrow (*Spizella breweri*).

This species has a high conservation need locally and throughout its range. Data from state wildlife agencies have documented severe population declines and loss of sagebrush habitats range-wide. The BLM lists Sage Grouse as a Sensitive Species. This species is not on the national Watch List, but it would qualify based on its National Partners in Flight Database scores. This species is monitored by CDOW. Damage to stands of tall, mature sagebrush often leads to the abandonment of leks (Rogers 1964). Land management practices such as burning, herbicide spraying, and overgrazing fragment large contiguous areas of sagebrush and cause the Sage Grouse populations to decline (Colorado Breeding Bird Atlas 1998).

Greater Sandhill Crane (*Grus canadensis tabidia*)



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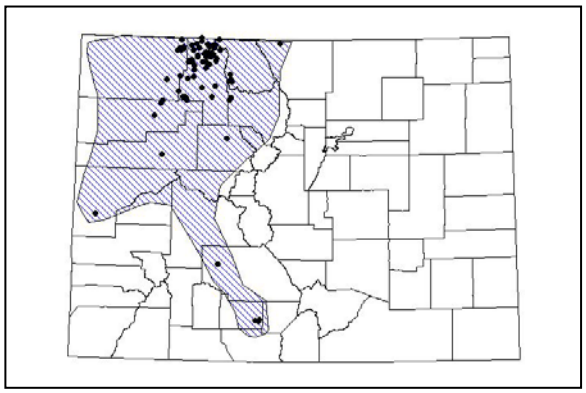
Taxonomy:
Class: Aves
Order: Gruiformes
Family: Gruidae
Genus: *Grus*

Taxonomic Comments: None

CHNP Ranking: G5T4, S2BS4N

State/Federal Status: None

Habitat Comments: Sandhill cranes have been found breeding in a variety of wetland habitats, particularly flooded fields and beaver ponds, marshes, and wet meadows (Colorado Breeding Bird Atlas 1998).



Distribution: The greater sandhill crane winters in southern North America and Central America and breeds in northern North America (National Geographic Society 2002). Sandhill cranes are abundant spring and fall migrants in the San Luis Valley and occasional to irregular migrants along river valleys of eastern plains, and valleys and parklands of the western mountains of Colorado (Andrews and Righter 1992).

Important Life History Characteristics: Sandhill cranes begin nesting in May, and fledge their young in June and July (Colorado Breeding Bird Atlas 1998). After the young reach the flight stage, Colorado's cranes use ranch hayfields as staging grounds for their southern migration.

Known Threats and Management Issues: Known threats include: drainage of and /or vegetative encroachment on preferred mud flats and sandbar habitats in river and meadow systems along migratory routes, in addition to the availability of spilled grains in adjacent agricultural areas are key conservation considerations for this species (Renner et al. 1991).

Bald Eagle (*Haliaeetus leucocephalus*)

Taxonomy:
Class: Aves
Order: Falconiformes
Family: Accipitridae
Genus: *Haliaeetus*

Taxonomic Comments: None.

CNHP Ranking: G4 S1B,S3N

State/Federal Status: Federally threatened

Habitat Comments: Bald Eagles that nest in Colorado use large, mature cottonwoods or pines, often along rivers, to hold their heavy nests (Colorado Breeding Bird Atlas 1998). Wintering populations will use major rivers, reservoirs, and prairie dog towns.

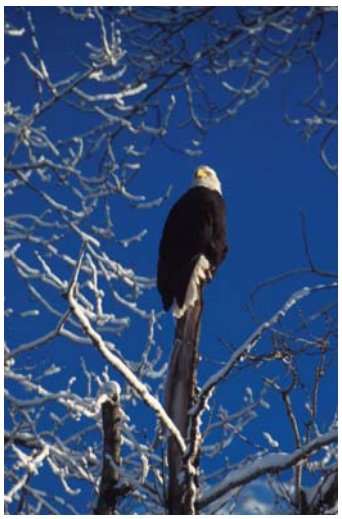
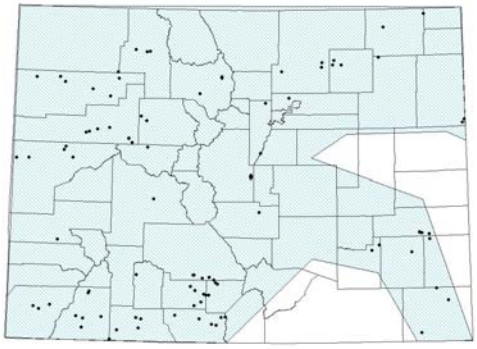


Photo by Mary Kiesling



Distribution: Bald Eagles live throughout North America - from Alaska to Newfoundland, and from the tip of Florida to southern California, and nest across Colorado (Colorado Breeding Bird Atlas 1998).

Important Life History Characteristics: Bald Eagles begin nesting in late February, and can often be observed feeding their young into late June (Colorado Breeding Bird Atlas 1998).

Known Threats and Management Issues: Continued threats to this species include high pesticide use, poisoning, poaching, and loss of nesting habitat due to the enduring popularity of waterfront development.

Colorado River Cutthroat Trout (*Oncorhynchus clarki pleuriticus*)

Taxonomy:
Class: Actinopterygii
Order: Salmoniformes
Family: Salmonidae
Genus: *Oncorhynchus*

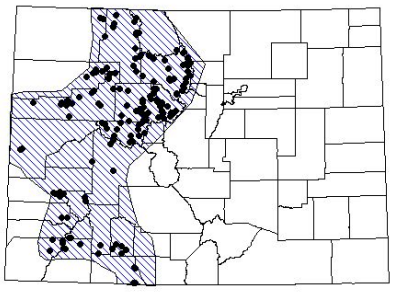
Taxonomic Comments:
Subclass – Neopterygii. The only trout species native to Colorado is the cutthroat (Sealing et al. 1992). Drainage histories have isolated four distinct subspecies of cutthroat trout in Colorado; the Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*), the Greenback cutthroat trout (*O. clarki stomias*), the Yellowfin cutthroat trout (*O. clarki macdonaldi*), and the Rio Grande cutthroat trout (*O. clarki virginalis*). Of these four, the Yellowfin cutthroat trout is extinct, and the distributions of the remaining three have been reduced to a fraction of their respective historic ranges (Behnke 1988; Sealing et al. 1992).

CNHP Ranking: G4T3, S3

State/Federal Status: State Species of Special Concern/FS Sensitive/BLM Sensitive

Habitat Comments: The historical habitat included most clearwater streams and rivers of western Colorado (Behnke 1992). Good stream conditions for Colorado River cutthroat trout include cold, clear-running water with high oxygen content, rocky substrates, fairly high stream gradients, and a pH ranging from 6 to 9 (Sealing et al. 1992).

Distribution: Historic distributions of the Colorado River cutthroat trout extended from the headwaters of the Colorado River basin downstream to the Dirty Devil River in Utah and to the San Juan River drainage in Colorado, New Mexico, and Arizona (Sealing et al. 1992). Refer to the following page for current distributions. The introduction of non-native trout species, dating to 1872 in Colorado, is considered a primary cause for the decline in numbers and genetic purity of Colorado River cutthroat trout (Sealing et al. 1992; Wiltzius 1985). Wernsman (1973) reported only three populations of relatively pure Colorado River cutthroat trout in Colorado. These were in Cunningham Creek (Pitkin County), Northwater Creek (Garfield County), and the headwater area of the Colorado River in Rocky Mountain National Park (Grand County).



Most of the remaining Colorado River cutthroat trout are found in small headwater streams or alpine lakes that have resisted colonization of non-native trout (Proebstel 1994).

Important Life History Characteristics: Competition and hybridization with non-native salmonids occurs. This trait has contributed to the current preferences of this native trout for lakes, beaver ponds, and small streams. Clean, cold water running over a boulder-cobble substrate marks the preferred habitat of this trout (Trotter 1987).

Spawning occurs from late spring through early summer (Behnke and Zarn 1976, Sealing et al. 1992). Sexual maturity is usually reached between the ages of 2 and 4 years (Martinez 1988; Sealing et al. 1992).

Known Threats and Management Issues: The Colorado River cutthroat trout is heavily managed and studied. Presently, there are 42 populations in Colorado judged to be genetically pure (Proebstel 1994). However, the primary reasons for conservation concern at the global and state levels are long-term trend prognoses and threats. Populations continue to decline in many streams (Young et al. 1996); hybridization between this species and non-native trout species Rainbow trout (*Onchorhynchus mykiss*) poses the greatest threat to the elimination of pure populations. Competition with non-native trout species and exotic fish diseases also pose threats, and declines have been hastened by loss of habitat to grazing, clearcutting, water diversions, and stream channelization (Trotter 1987).

Great Basin Spadefoot (*Spea intermontana*)

Taxonomy
Class: *Amphibia*
Order: *Anura*
Family: *Pelobatidae*

CNHP Ranking: G5 S3

State/Federal Status: State Special Concern Species; BLM Sensitive Species

Photo by Lauren Livo

Description and Phenology: This species has a vertically elongated pupil in bright light. It is distinguished from the New Mexico spadefoot (*Spea multiplicatus*) by the glandular lump on the top of the head directly between the eyes. It emerges from its burrow after heavy rains in the spring or summer. In Colorado they are known to be active from June through September. Although it is known that the Great Basin spadefoot uses pools that form in depressions after heavy rainstorms as breeding areas, very little else is known about the reproduction of this species (Hammerson 1999). As necessary, this species will also use shallow streams and slow flowing irrigation canals for reproduction (Stebbins 1985).

Habitat Comments: The Great Basin Spadefoot is found on dry rocky slopes and canyons vegetated by pinyon-juniper woodlands or sagebrush, saltbrush, and other semi-desert shrublands (Hammerson 1999). The species is a local migrant that may migrate up to several hundred meters between breeding pools and non-breeding terrestrial habitats.

Distribution/Abundance: The Great Basin spadefoot, as its name implies, is endemic to the Great Basin. Colorado defines the southeastern edge of this species' range (Stebbins 1985). In western Colorado, it occurs north of the Uncompahgre Plateau at elevations below 7000 ft (2133 m). There are about 30 locations totaling 3,000 to 10,000 individuals in four western Colorado counties north of the Uncompahgre Plateau (CNHP 2007).

Known Threats and Management Issues: This species is considered vulnerable (S3) because of its small range in Colorado and the limited number of known occurrences. Activities that impact the species burrows or disturb the depressions where the species breeds will have a negative effect on the species population.

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