Inventory of Critical Biological Resources in the Upper Arkansas Watershed 1999 Final Report

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The Nature Conservancy

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Colorado State University

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INTRODUCTION

In January of 1996, the Colorado Natural Heritage Program (CNHP), in cooperation with The Nature Conservancy and the Environmental Protection Agency (EPA), started a project which has subsequently led to major improvements in the quality and quantity of information about the biological resources of the Upper Arkansas River Watershed.

This watershed consists of a landscape that is managed and impacted by federal and state agencies, local governments, and communities of private landowners. Each of these groups influences the composition and quality of the natural resources in the watershed: from acid mine drainage in the headwaters near Leadville, to the increased solids from agriculture surrounding La Junta, and the urban sprawl of the Front Range cities of Pueblo and Colorado Springs. Population growth rates by county within the watershed are among the fastest in Colorado, placing severe strain on the ecosystem. Even rural counties like Bent and Las Animas are experiencing growth rates approaching 15%, which is changing the nature of the local communities, and their relationship to the environment.

The Upper Arkansas watershed also possesses numerous biological values. With so many opportunities available, it is not surprising that there are conflicting proposals for land and water use. Thus, any tool that can synthesize information for the purposes of proactively planning for conflict-resolution is an asset. Agencies, local governments and private landowners will benefit from access to this information by being able to make informed land-use decisions, reducing potential conflicts and overall impacts to the watershed. In fact, data developed by the Colorado Natural Heritage Program and The Nature Conservancy under this project has already led to significant environmental protection efforts in 2 key areas:

The Nature Conservancy is working closely with landowners in the Chico Basin to address long-term conservation of biological resources that were identified in the first two phases of this project in cooperation with their Central Shortgrass Prairie Ecoregional Planning program.

The Colorado Division of Wildlife is pursuing long-term protection of key, biologically significant parcels in the Purgatoire Basin as part of a Great Outdoors Colorado Legacy project. The Colorado Natural Heritage Program through the initial phases of this project also first identified the critical biological resources of this area.

The Goal of this project is to improve the quality, quantity and accessibility of information available on the critical biological resources of the Upper Arkansas watershed. To that end, we have completed Objectives 1 through 4 (below), and have submitted a proposal to the EPA for a final phase of funding that will allow us to complete Objective 5.

Objective 1: compile existing data into a single data system
Objective 2: standardize data formats
Objective 3: subject the data to a strict quality control process
Objective 4: digitize information into an ArcView GIS
Objective 5: verify the information with fieldwork

Building on the EPA's Watershed Protection Approach and using The Nature Conservancy's Biological and Conservation Database System, CNHP cataloged occurrences of threatened, endangered and candidate species, as well as species of special concern. Information on populations of wetland, riparian, aquatic and terrestrial species was assembled from as many existing sources of data as possible, and used to determine species and ecological community occurrences and overall quality of biological diversity in the Upper Arkansas watershed.

This information was spatially analyzed to determine the boundaries of Potential Conservation Areas that encompass the ecological processes affecting the survival of one or more occurrences of species and ecological communities of concern.

The resulting GIS databases, served on the Internet and in this report, are an important information resource for EPA and land managers whose decisions may potentially affect critical biological resources. In addition, these products are fully available to the public, enhancing the resource conservation programs of numerous other organizations and agencies including, but not limited to:

The Nature Conservancy, Colorado Field Office
El Paso County
Pueblo County
Custer County
Landowners in Chico Basin
Landowners in Purgatoire Basin
San Isabel Foundation
Pike-San Isabel National Forest
Comanche National Grassland
Bureau of Land Management
Colorado College
CO Dept. of Natural Resources
Great Outdoors Colorado
Colorado Division of Wildlife
Colorado State University
City of Colorado Springs
US Fish & Wildlife Service
US Park Service
US Air Force Academy
Pueblo Army Depot
Fort Carson Army Base
Pike's Peak Community College

Data that are aggregated in the Natural Heritage databases are sought and valued by a wide variety of users. The Colorado Natural Heritage Program responds to over 1,500 requests for biological data annually. Information is provided to a wide variety of users including landowners, state, federal and local governments, private citizens, environmental consulting companies and academic institutions. This project fills an important knowledge gap in EPA Region VIII's Watershed Inventory and community-based protection strategy.

BACKGROUND

The Natural Heritage Network and Biodiversity

Colorado is well known for its rich diversity of geography, wildlife, plants, and plant communities. However, like many other states, it is experiencing a loss of much of its flora and fauna. This decline in biodiversity is a global trend resulting from human population growth, land development, and subsequent habitat loss. Globally, the loss in species diversity has become so rapid and severe that Wilson (1988) has compared the phenomenon to the great natural catastrophes at the end of the Paleozoic and Mesozoic eras.

The need to address this loss in biodiversity has been recognized for decades in the scientific community. However, many conservation efforts made in this country were not based upon preserving biodiversity; instead, they primarily focused on preserving game animals, striking scenery, and locally favorite open spaces. To address the absence of a methodical, scientifically based approach to preserving biodiversity, Robert Jenkins, in association with The Nature Conservancy, developed the Natural Heritage Methodology in 1978.

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

Natural Heritage Programs exist throughout North, Central, and South America, forming an international database network use the Natural Heritage Methodology. This network enables scientists to monitor the status of species from a state, national, and global perspective. It also enables conservationists and natural resource managers to make informed, objective decisions in prioritizing and focusing conservation efforts.

What is Biological Diversity?

Protecting biological diversity has become an important management issue for many natural resource professionals. Biological diversity at its most basic level includes the full range of species on Earth, from species such as bacteria, and protists, through multicellular kingdoms of plants, animals, and fungi. At finer levels of organization, biological diversity includes the genetic variation within species, both among

geographically separated populations and among individuals within a single population. On a wider scale, diversity includes variations in the biological communities in which species live, the ecosystems in which communities exist, and the interactions among these levels. All levels are necessary for the continued survival of species and plant communities, and all are important for the well being of humans. It stands to reason that biological diversity should be of concern to all people.

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

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

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

3. **Community Diversity** -- the variety of plant communities within an area that represent the range of species relationships and inter-dependence. These communities may be diagnostic or even endemic to an area. It is within communities that all life dwells.

4. **Landscape Diversity** -- the type, condition, pattern, and connectedness of plant communities. A landscape consisting of a mosaic of plant communities may contain one multifaceted ecosystem, such as a wetland ecosystem. A landscape also may contain several distinct ecosystems, such as a riparian corridor meandering through shortgrass prairie. Fragmentation of landscapes, loss of connections and migratory corridors, and loss of natural communities all result in a loss of biological diversity for a region. Humans and the results of their activities are integral parts of most landscapes.

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

Colorado's Natural Heritage Program

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

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

The multi-disciplinary team of scientists and bioinformatics experts gather comprehensive information on rare, threatened, and endangered species and significant plant communities of Colorado. Life history, status, and locational data are incorporated into a continually updated data system. Sources include published and unpublished literature, museum and herbaria labels, and field surveys conducted by knowledgeable naturalists, experts, agency personnel, and our own staff of botanists, ecologists, and zoologists. Bioinformatics staff carefully plot the data on 1:24,000 scale U.S.G.S. maps and enter it into the Biological and Conservation Data System. The Potential Conservation data are also stored in a geographic information system (Arc/INFO and ArcView GIS). The Element Occurrence database can be queried by a variety of angles, including taxonomic group, global and state rarity rank, federal and state legal status, source, observation date, county, quadrangle map, watershed, management area, township, range, and section, precision, and conservation unit.

CNHP is part of an international network of conservation data centers that use the Biological and Conservation Data System (BCD) developed by The Nature Conservancy. CNHP has effective relationships with several state and federal agencies, including the Colorado Natural Areas Program, Colorado Department of Natural Resources and the Colorado Division of Wildlife, the U.S. Environmental Protection Agency, and the U.S. Forest Service. Numerous local governments and private entities also work closely with CNHP. Use of the data by many different individuals and organizations, including Great Outdoors Colorado, encourages a proactive approach to development and conservation thereby reducing the potential for conflict. Information collected by the Natural Heritage Programs around the globe provides a means to protect species before the need for legal endangerment status arises.

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

The Natural Heritage Ranking System

Information is gathered by CNHP on Colorado's plants, animals, and plant communities. Each of these species and plant communities is considered an **element of natural diversity**, or simply an **element**. Each element is assigned a rank that indicates its relative degree of imperilment on a five-point scale (e.g., 1 = extremely rare/imperiled, 5 = abundant/secure). The primary criterion for ranking elements is the number of occurrences, i.e., the number of known distinct localities or populations. This factor is weighted more heavily because an element found in one place is more imperiled than something found in twenty-one places. Also of importance are the size of the geographic range, the number of individuals, trends in both population and distribution, identifiable threats, and the number of already protected occurrences.

Element imperilment ranks are assigned both in terms of the element's degree of imperilment within Colorado (its State or S-rank) and the element's imperilment over its entire range (its Global or G-rank). Taken together, these two ranks give an instant picture of the degree of imperilment of an element. For example, the lynx, which is thought to be secure in northern North America but is known from less than 5 current locations in Colorado, is ranked G5S1. The Rocky Mountain Columbine which is known only from Colorado, from about 30 locations, is ranked a G3S3. Further, a tiger beetle that is only known from one location in the world at the Great Sand Dunes National Monument is ranked G1S1. CNHP actively collects, maps, and electronically processes specific occurrence information for elements considered extremely imperiled to vulnerable (S1 - S3). Those with a ranking of S3S4 are "watchlisted," meaning that specific occurrence data are collected and periodically analyzed to determine whether more active tracking is warranted. A complete description of each of the Natural Heritage ranks is provided in Table 1.

This single rank system works readily for all species except those that are migratory. Those animals that migrate may spend only a portion of their life cycles within the state. In these cases, it is necessary to distinguish between breeding, non-breeding, and resident species. As noted in Table 1, ranks followed by a "B", e.g., S1B, indicate that the rank applies only to the status of breeding occurrences. Similarly, ranks followed by an "N", e.g., S4N, refer to non-breeding status, typically during migration and winter. Elements without this notation are believed to be year-round residents within the state.

Table1. Definition of Colorado Natural Heritage Imperilment Ranks.

Global imperilment ranks are based on the range-wide status of a species. State imperilment ranks are based on the status of a species in an individual state. State and Global ranks are denoted, respectively, with an "S" or a "G" followed by a character.

G/S1	Critically imperiled globally/state because of rarity (5 or fewer occurrences in the world/state; or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction.
G/S2	Imperiled globally/state because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extinction throughout its range.
G/S3	Vulnerable through its range or found locally in a restricted range (21 to 100 occurrences).
G/S4	Apparently secure globally/state, though it might be quite rare in parts of its range, especially at the periphery.
G/S5	Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
GX	Presumed extinct.
G#?	Indicates uncertainty about an assigned global rank.
G/SU	Unable to assign rank due to lack of available information.
GQ	Indicates uncertainty about taxonomic status.
G/SH	Historically known, but not verified for an extended period, usually.
G#T#	Trinomial rank (T) is used for subspecies or varieties. These species or subspecies are ranked on the same criteria as G1-G5.
S#B	Refers to the breeding season imperilment of elements that are not permanent residents.
S#N	Refers to the non-breeding season imperilment of elements that are not permanent residents. Where no consistent location can be discerned for migrants or non-breeding populations, a rank of SZN is used
SZ	Migrant whose occurrences are too irregular, transitory, and/or dispersed to be reliable identified, mapped, and protected.
SA	Accidental in the state.
SR	Reported to occur in the state, but unverified.
S?	Unranked. Some evidence that species may be imperiled, but awaiting formal rarity ranking.

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

Legal Designations

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

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

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

Table 2. Federal and State Agency Special Designations.

Federal Status:

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

LE Endangered; species or subspecies formally listed as endangered.

E(S/A) Endangered due to similarity of appearance with listed species.

LT Threatened; species or subspecies formally listed as threatened.

P Proposed Endangered or Threatened; species or subspecies formally proposed for listing as endangered or threatened.

C Candidate: species or subspecies for which the Service has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened.

U.S. Forest Service (Forest Service Manual 2670.5) (noted by the Forest Service as "S")

FS Sensitive: those plant and animal species identified by the Regional Forester for which population viability is a concern as evidenced by:

a. Significant current or predicted downward trends in population numbers or density.

b. Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Bureau of Land Management (BLM Manual 6840.06D) (noted by BLM as "S")

BLM Sensitive: those species found on public lands, designated by a State Director, that could easily become endangered or extinct in a state. The protection provided for sensitive species is the same as that provided for C (candidate) species.

State Status:

Colorado Division of Wildlife

E Endangered

T Threatened

SC Special Concern

Element Occurrence Ranking

Actual locations of elements, whether they be single organisms, populations, or plant communities, are referred to as element occurrences. The element occurrence is considered the most fundamental unit of conservation interest and is at the heart of the Natural Heritage Methodology. In order to prioritize element occurrences for a given species, an element occurrence rank (EO-Rank) is assigned according to the estimated viability or probability of persistence (whenever sufficient information is available). This ranking system is designed to indicate which occurrences are the healthiest and ecologically the most viable, thus focusing conservation efforts where they will be most successful. The EO-Rank is based on 3 factors:

> **Size** – a quantitative measure of the area and/or abundance of an occurrence such as area of occupancy, population abundance, population density, or population fluctuation.
>
> **Condition** – an integrated measure of the quality of biotic and abiotic factors, structures, and processes within the occurrence, and the degree to which they affect the continued existence of the occurrence. Components may include reproduction and health, development/maturity for communities, ecological processes, species composition and structure, and abiotic physical or chemical factors.
>
> **Landscape Context** – an integrated measure of the quality of biotic and abiotic factors, and processes surrounding the occurrence, and the degree to which they affect the continued existence of the occurrence. Components may include landscape structure and extent, genetic connectivity, and condition of the surrounding landscape.

Each of these factors is rated on a scale of A through D, with A representing an excellent grade and D representing a poor grade. These grades are then averaged to determine an appropriate EO-Rank for the occurrence. If there is insufficient information available to rank an element occurrence, an EO-Rank is not assigned. Possible EO-Ranks and their appropriate definitions are as follows:

> **A** Excellent estimated viability.
> **B** Good estimated viability.
> **C** Fair estimated viability.
> **D** Poor estimated viability.
> **E** **V**iability has not been assessed.
> **H** Historically known, but not verified for an extended period of time.

Proposed Conservation Areas

In order to successfully protect populations or occurrences, it is necessary to delineate conservation areas. These conservation areas focus on capturing the ecological processes

that are necessary to support the continued existence of a particular element occurrence of natural heritage significance. Conservation areas may include a single occurrence of a rare element or a suite of rare element occurrences or significant features.

The goal of the process is to identify a land area that can provide the habitat and ecological processes upon which a particular element occurrence or suite of element occurrences depends for its continued existence. The best available knowledge of each species' life history is used in conjunction with information about topographic, geomorphic, and hydrologic features, vegetative cover, as well as current and potential land uses. **The proposed boundary does not automatically exclude all activity.** It is hypothesized that some activities will prove degrading to the element or the process on which they depend, while others will not. Consideration of specific activities or land use changes proposed within or adjacent to the preliminary conservation planning boundary should be carefully considered and evaluated for their consequences to the element on which the conservation unit is based.

Proposed Conservation Area Boundaries

Once the presence of rare or imperiled species or significant plant communities has been confirmed, the first step toward their protection is the delineation of a **preliminary** conservation planning boundary. In general, the proposed conservation area boundary is our best estimate of the primary area supporting the long-term survival of targeted species and plant communities. In developing such boundaries, CNHP staff consider a number of factors that include, but are not limited to:

- the extent of current and potential habitat for the elements present, considering the ecological processes necessary to maintain or improve existing conditions;
- species movement and migration corridors;
- maintenance of surface water quality within the site and the surrounding watershed;
- maintenance of the hydrologic integrity of the groundwater, e.g., by protecting recharge zones;
- land intended to buffer the site against future changes in the use of surrounding lands;
- exclusion or control of invasive exotic species;
- land necessary for management or monitoring activities.

As the label "conservation planning" indicates, the boundaries presented here are for planning purposes. They delineate ecologically sensitive areas where land-use practices should be carefully planned and managed to ensure that they are compatible with

protection goals for natural heritage resources and sensitive species. Please note that these boundaries are based primarily on our understanding of the ecological systems. A thorough analysis of the human context and potential stresses was not conducted. All land within the conservation planning boundary should be considered an integral part of a complex economic, social, and ecological landscape that requires wise land-use planning at all levels.

Off-Site Considerations

It is often the case that all relevant ecological processes cannot be contained within a site of reasonable size. Taken to the extreme, the threat of ozone depletion could expand every site to include the whole globe. The boundaries illustrated in this report signify the immediate, and therefore most important, area in need of protection. Continued landscape level conservation efforts are needed. This will involve county-wide efforts as well as coordination and cooperation with private landowners, neighboring land planners, and state and federal agencies.

Ranking of Conservation Areas

One of the strongest ways that the CNHP uses element and element occurrence ranks is to assess the overall biodiversity significance of a site, which may include one or many element occurrences. If an element occurrence is unranked due to a lack of information the element occurrence rank is considered a C rank. Similarly, if an element is a GU or G? it is treated as a G4. Based on these ranks, each site is assigned a **biodiversity** (or B-) **rank**:

B1 Outstanding Significance: only site known for an element or an excellent occurrence of a G1 element.

B2 Very High Significance: one of the best examples of a community type, good occurrence of a G1 species, or excellent occurrence of a G2 or G3 species.

B3 High Significance: excellent example of any community type, good occurrence of a G3 species, or a large concentration of good occurrences of state rare species.

B4 Moderate or Regional Significance: good example of a community type, excellent or good occurrence of state-rare species.

B5 General or State-wide Biodiversity Significance: good or marginal occurrence of a community type, S1, or S2 species.

Protection Urgency Ranks

Protection urgency ranks (P-ranks) refer to the time frame in which conservation protection must occur. In most cases, this rank refers to the need for a major change of protective status (e.g., agency special area designations or ownership). The urgency for protection rating reflects the need to take legal, political, or other administrative measures to alleviate threats that are related to land ownership or designation. The following codes are used to indicate the rating which best describes the urgency to **protect** the area:

P1 Immediately threatened by severely destructive forces, within 1 year of rank date; protect now or never!
P2 Threat expected within 5 years.
P3 Definable threat but not in the next 5 years.
P4 No threat known for foreseeable future.
P5 Land protection complete or adequate reasons exists not to protect the site; do not act on this site.

A protection action involves increasing the current level of legal protection accorded one or more tracts of 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, i.e., any action requiring stewardship intervention. Threats that may require a protection action are as follows:

1) Anthropogenic forces that threaten the existence of one or more element occurrences at a site; e.g., development that would destroy, degrade or seriously compromise the long-term viability of an element occurrence and timber, range, recreational, or hydrologic management that is incompatible with an element occurrence's existence;
2) The inability to undertake a management action in the absence of a protection action; e.g., obtaining a management agreement;
3) In extraordinary circumstances, a prospective change in ownership management that will make future protection actions more difficult.

Management Urgency Ranks

Management urgency ranks (M-ranks) indicate the time frame in which a change in management of the element or site must occur. Using best scientific estimates, this rank refers to the need for management in contrast to protection (e.g., increased fire frequency, decreased herbivory, weed control, etc.). The urgency for management rating focuses on land use management or land stewardship action required to maintain element occurrences at the potential conservation area.

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

include legal, political, or administrative measures taken to protect a potential conservation area. The following codes are used to indicate the action needed to be taken at the area:

M1 Management action required immediately or element occurrences could be lost or irretrievably degraded within one year.
M2 New management action will be needed within 5 years to prevent the loss of element occurrences.
M3 New management action will be needed within 5 years to maintain current quality of element occurrences.
M4 Although not currently threatened, management may be needed in the future to maintain the current quality of element occurrences.
M5 No serious management needs known or anticipated at the site.

METHODS

The methods for assessing and prioritizing conservation needs over a large area are necessarily diverse. The Colorado Natural Heritage Program follows a general method which is continuously being developed specifically for this purpose. The Inventory of Critical Biological Resources for the Upper Arkansas Watershed was conducted in several steps summarized below.

Collect Available Information

CNHP databases were updated with information regarding the known locations of species and significant plant communities within the Upper Arkansas Watershed. A variety of information sources were searched for this information, such as herbaria and museums as well as local experts. Thirty-seven individuals or organizations were contacted. Responses were received from 22 of these 37 contacts (see Table 3). Both general and specific literature sources were incorporated into CNHP databases, in the form of either locational information or as biological data pertaining to a species in general. Such information covers basic species and community biology including range, habitat, phenology (reproductive timing), food sources, and substrates. This information was entered into CNHP databases.

Table 3: Upper Arkansas Watershed Data contacts and Usefulness Evaluation

Contact Name and Address	Usefulness Comments
SIGRID MEIRIS, 2204 CONSTELLATION DR., COLORADO SPRINGS, CO 80906	Previous CNHP contact. Recommended as possible Upper Arkansas Watershed information source. Sent letter of request. Responded, unable to be of any help.
KIRK NAVO, COLORADO DIVISION OF WILDLIFE, 0722 S. ROAD 1E, MONTE VISTA, CO 81144	Previous CNHP contact. Recommended as possible Upper Arkansas Watershed information source. CNHP requested data under 1995 GOCO Data Enhancement Project.
TOM NESLER, AQUATIC NONGAME, COLORADO DIVISION OF WILDLIFE, 6060 BROADWAY, DENVER, CO 80216	Source for native fish information obtained through Northeastern and Central Regional Offices of CDOW. CNHP requested data under 1995 GOCO Data Enhancement Project.
PAUL OPLER, NATIONAL BIOLOGICAL SERVICE, 4512 MCMURRAY AVE., FORT COLLINS, CO 80525	Chief of publications; information on lepidoptera. Sent letter of request for EPA/Upper Arkansas project. No reply.

continued Table 3: Upper Arkansas Watershed Data contacts and Usefulness Evaluation

Contact Name	Usefulness Comments
NEAL OSBORN, CURATOR, UNIVERSITY OF SOUTHERN COLORADO HERBARIUM, 2200 BONFORTE BLVD., UNIVERSITY OF SOUTHERN COLORADO, PUEBLO, CO 81001-4901	Rich source of information. Received most data in 1995. Will contact for any new/updated data. Sent letter of request for EPA/Upper Arkansas project. No reply.
KENNETH A. PALS, EL PASO COUNTY PARKS, 2002 CREEK CROSSING, COLORADO SPRINGS, CO 80906	Received most data to date from pre 1996 field season. Will contact to add any new information. Sent letter of request for EPA/Upper Arkansas project. Provided new information on species observed at El Paso County Regional Parks in 1996.
FRANCES PANNEBAKER, BENT'S OLD FORT NATURAL HISTORIC SITE, 35110 HIGHWAY 194 EAST, LA JUNTA, CO 81050-9523	Sent letter of request. Provided information on birds observed at Bent's Old Fort National Historic Site.
KATHY PETERSON, US DEPT OF AGRICULTURE, HIGH PLAINS GRASSLAND RESEARCH STATION	Applied research; seedling establishment, mine reclamation, sewage sludge effects, and grazing studies. Will contact to see if any research being done that can help identify species that fall in the Upper Arkansas River Watershed. Sent letter of request. No reply.
CHUCK PRESTON, DENVER MUSEUM OF NATURAL HISTORY, 2001 COLORADO BOULEVARD, DENVER, CO 80205-5798	Source of information regarding birds on Comanche National Grasslands.
CINDY RAMOTNIK, NBS, DEPARTMENT OF BIIOLOGY, UNIVERSITY OF NEW MEXICO, ALBUQUERQUE, NM 87131	Recommended as possible Upper Arkansas Watershed information source. Have received data to date (December, 1996).
MARSHA RAUS, WHITE RIVER NATIONAL FOREST, 9TH AND GRAND, GLENWOOD SPRINGS, CO 81602	Previous CNHP contact. Recommended as possible Upper Arkansas Watershed information source. Unable to contact by phone or letter.
ROBERT RIGHTER, 2358 S. FILMORE, DENVER, CO 80210	Previous CNHP contact. Recommended as possible Upper Arkansas Watershed information source. Sent letter of request. No reply.
BRUCE ROSENLUND, US FISH AND WILDLIFE SERVICE, P.O. BOX 25486, DENVER FEDERAL CENTER, DENVER, CO 80225	Data on greenback cutthroat trout (historic and current) and Arkansas darter. CNHP requested data under 1995 GOCO Data Enhancement Project.

continued Table 3: Upper Arkansas Watershed Data contacts and Usefulness Evaluation

Contact Name	Usefulness Comments
LANCE RUSSELL, THE E-QUEST CORPORATION, 26 SOUTH TEJON, SUITE 208, COLORADO SPRINGS, CO 80903	Previous CNHP contact. Recommended as possible Upper Arkansas Watershed information source.
STEVE SANCHEZ, 1 REMINGTON COURT, PUEBLO, CO 81008	Previous CNHP contact. Recommended as possible Upper Arkansas Watershed information source. Sent letter of request. No reply.
ANDY SCHLOSBERG, COLORADO STATE FORSEST, WOODLAND PARK DISTRICT, P.O. BOX 9024, WOODLAND PARK, CO 80866	Previous CNHP contact. Recommended as possible Upper Arkansas Watershed information source. Sent letter of request. No reply.
KRISTA SCHRAMM-GRAD STUDENT, UNIVERSITY OF SOUTHERN COLORADO, LIFE SCIENCE BUILDING-BIOLOGY DEPT., PUEBLO, CO 81001	Previous CNHP contact. Recommended as possible Upper Arkansas Watershed information source. Sent letter of request. No reply.
CHRIS SCHULTZ, SAN JUAN-RIO GRANDE NATIONAL FOREST, 15 BURNETT CT., DURANGO, CO 81301	CNHP will request data under 1996 USFS Pike San Isabel/ San Juan Biodiversity Project. Data received and processed.
KEITH SCHULZ, CEMML, COLORADO STATE UNIVERSITY, COLLEGE OF NATURAL RESOURCES, FORT COLLINS, CO 80523	Source of information regarding communities. Will also contact to obtain report on Natural Communities at Pinyon Canyon Manouver Site. Sent letter of request for EPA/Upper Arkansas project. Provided the name of an additional contact.
MIKE SCOTT, RIPARIAN ECOLOGIST, NATIONAL BIOLOGICAL SERVICE, 4512 MCMURRAY, FORT COLLINS, CO 80525-3400	Endangered species coordinator for Great Plains National Grasslands. Sent letter of request for EPA/Upper Arkansas project. No information available.
JENNY SLATER, CDOW, 6060 BROADWAY, DENVER, CO 80216	CNHP requested data under 1995 GOCO Data Enhancement Project. CNHP will request data under 1996 USFS Pike San Isabel/San Juan Biodiversity Project. Data received and processed.
MIKE SMITH, PIKE-SAN ISABEL NATIONAL FOREST, U.S. FOREST SERVICE, 3170 E. MAIN STREET, CANON CITY, CO 81212-9326	CNHP will request data under 1996 USFS Pike San Isabel/San Juan Biodiversity Project. Data received and processed.
CAROL SPURRIER, BOTANIST, BLM-COLORADO STATE OFFICE, 2850 YOUNGFIELD STREET, LAKEWOOD, CO 80215	Member of the technical committee for Rare Plants of Colorado. Sent letter of request for EPA/Upper Arkansas project. No reply.

continued Table 3: Upper Arkansas Watershed Data contacts and Usefulness Evaluation

Contact Name	Usefulness Comments
RAY STANFORD, 720 FAIRFAX, DENVER, CO 80820	CNHP requested data under 1995 GOCO Data Enhancement Project.
MIKE SURBER, SALIDA RANGER DISTRICT, U.S. FOREST SERVICE, 325 W. RAINBOW BLVD., SALIDA, CO 81201	CNHP will request data under 1996 USFS Pike San Isabel/San Juan Biodiversity Project.
STEVE TAPIA, PIKES PEAK RANGER DISTRICT, 232 COUNTY ROAD 79, COLORADO SPRINGS, CO 80903	CNHP will request data under 1996 USFS Pike San Isabel/San Juan Biodiversity Project. Data received and processed.
LESLIE THOMAS, THOMAS AND THOMAS, 614 NORTH TEJON, COLORADO SPRINGS, CO 80903	Previous CNHP contact. Recommended as possible Upper Arkansas Watershed information source. Sent letter of request. No reply.
JIM TOWNSEND, U.S. CORPS OF ENGINEERS, 720 N. MAIN, RM. 205, PUEBLO, CO. 81003	Previous CNHP contact. Recommended as possible Upper Arkansas Watershed information source. Sent letter of request. No reply.
JON VERNER, WILDLIFE BIOLOGIST, PIKE/SAN ISABEL NATIONAL FORESTS, CIMARRON AND COMANCHE NATIONAL GRASSLANDS, 1920 VALLEY DRIVE, PUEBLO, CO 81008	CNHP will request data under 1996 USFS Pike San Isabel/San Juan Biodiversity Project.
JIM VOH LOH, COMPUTER DATA SYSTEMS, INC., 165 S. UNION BLVD., SUITE 280, LAKEWOOD, CO 80228	Sent letter of request. Responded stating that recent work done in Pueblo State Park. Inventory data has been incorporated into CNHP system. Also provided the names of additional contacts for EPA/Upper Arkansas project.
DAVE WEBER, COLORADO DIVISION OF WILDLIFE, 6060 BROADWAY, DENVER, CO 80216	CNHP requested data under 1995 GOCO Data Enhancement Project. Recommended as possible Upper Arkansas Watershed information source.
DR. DIETER H. WILKEN, CURATOR, HERBARIUM, COLORADO STATE UNIVERSITY, DEPARTMENT OF BOTANY, FORT COLLINS, CO 80523	Member of the 1993 technical committee for rare plants of Colorado. Previous CNHP contact. Recommended as possible Upper Arkansas Watershed information source. Sent letter of request. No reply.

continued Table 3: Upper Arkansas Watershed Data contacts and Usefulness Evaluation

Contact Name	Usefulness Comments
DAVE WINTERS, PIKE AND SAN ISABEL NATIONAL FOREST, 1920 VALLEY DRIVE, PUEBLO, CO 81008	CNHP will request data under 1996 USFS Pike San Isabel/San Juan Biodiversity Project. Data received and processed.
JOHN WOODLING, COLORADO DIVISION OF WILDLIFE, 6060 BROADWAY, DENVER, CO 80216	Previous CNHP contact. Recommended as possible Upper Arkansas Watershed information source. Sent letter of request. No reply.
SHI KUEI WU, CURATOR, UNIVERSITY OF COLORADO NATURAL HISTORY MUSEUM, HENDERSON BLDG. BOX 218, BOULDER, CO 80309-0218	Previous CNHP contact regarding mollusk species of special concern. Recommended as possible source of information. Sent letter of request for EPA/Upper Arkansas project. No reply.
DR. BRUCE WUNDER, DEPT. OF BIOLOGY, COLORADO STATE UNIVERSITY, E209A ANATOMY-ZOOLOGY, FT. COLLINS, CO 80523	Previous CNHP contact. Recommended as possible Upper Arkansas Watershed information source. Sent letter of request. No reply.
ANN YOUNG, BROADMOOR GARDEN CLUB, 13 UPLAND ROAD, COLORADO SPRINGS, CO 80906	Previous CNHP contact. Recommended as possible Upper Arkansas Watershed information source. Sent letter of request. No reply.

Identify Priority Element Occurrences to be Field Verified

Survey sites were chosen based known locations so that they could be verified and updated. Many locations were not precisely known due to ambiguities in the original data, i.e., "headwaters of Cataract Creek." In such cases, survey sites for that element were chosen in likely areas in the general vicinity. Because of the overwhelming number of potential sites and limited resources, surveys for all elements were prioritized by the degree of imperilment. For example, all species with Natural Heritage ranks of G1-G3 were the primary target of our inventory efforts. Although species with lower Natural Heritage ranks were not the main focus of inventory efforts, many of these species occupy similar habitats as the targeted species, and were searched for and documented as they were encountered. The second factor used in choosing survey sites was the last observation date of the element occurrence location. Locations which had been field visited more recently than 1990 were typically not visited for this project. An exception to this were specific areas with extremely high threats such as development and which support critically imperiled species (G1 or G2).

Contact Landowners

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

Conduct Field Surveys

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

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

Amphibians: visual or with aquatic nets
Mammals: shrews only, pit fall traps
Birds: visual or by song/call, evidence of breeding sought
Insects: aerial net
Plant communities: visual, collect qualitative or quantitative composition data

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

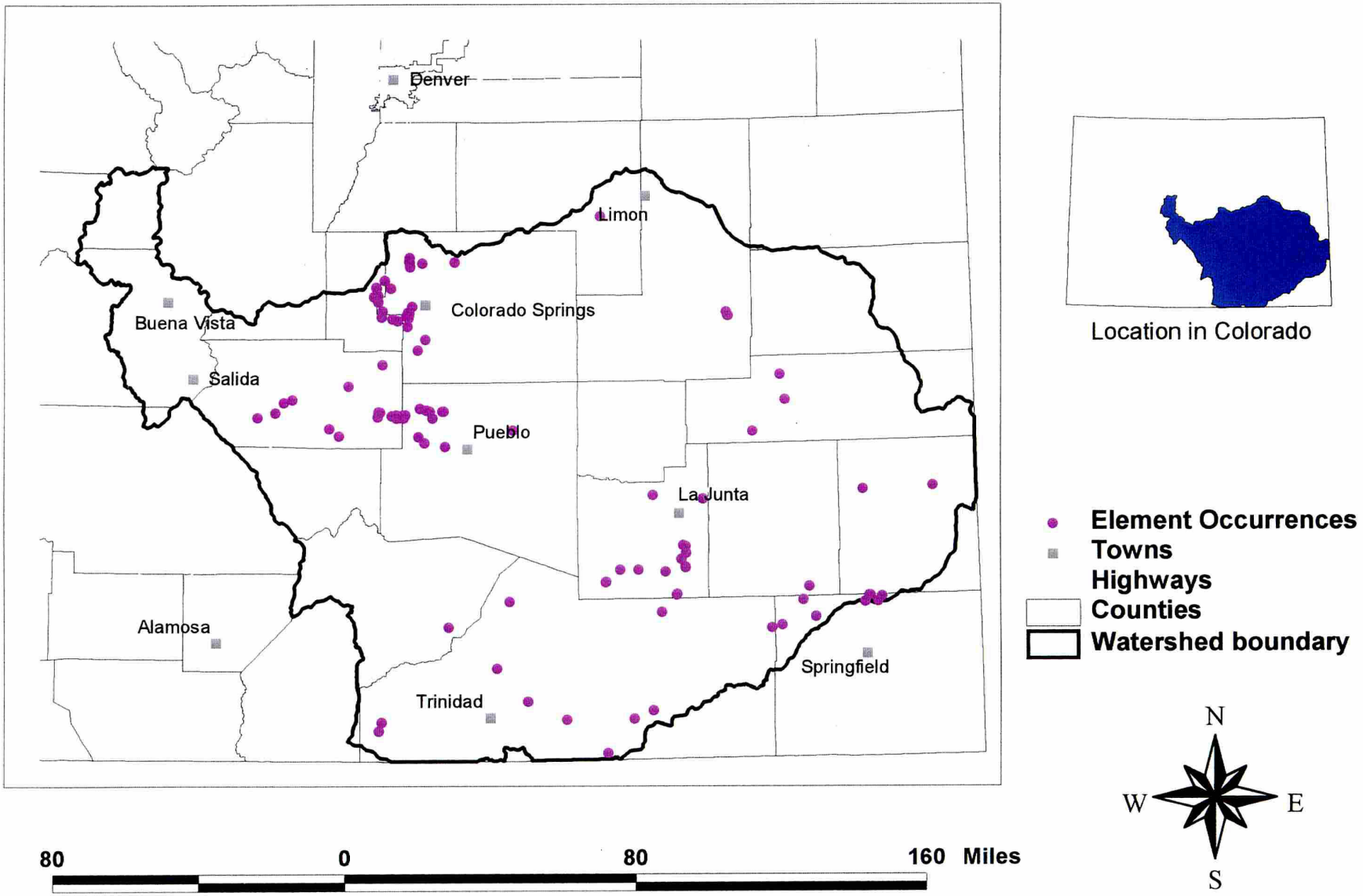
When a rare species or significant plant community was discovered its precise location and known extent was recorded on 1:24,000 scale topographic maps. Other data recorded at each occurrence included numbers observed, breeding status, habitat description, disturbance features, observable threats, and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

The field work phase of this project provided 104 element occurrence updates (see Figure 1) and 27 Potential Conservation Area updates.

Delineate Proposed Conservation Area Boundaries

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

Figure 1: Element Occurrence Records Visited in 1998



RESULTS

Element Occurrence Record Status

Prior to this project CNHP had a total of 817 element occurrence records (EOR) in the database for the Upper Arkansas Watershed. This number was significantly increased by gathering new records from outside sources and by several years of overlapping field work by CNHP. The total number of records to date is nearly double at 1524 (see Figure 2).

Potential Conservation Area Status

The Potential Conservation Areas (PCA) coverage which existed prior to this project included 167 records. It now stands at 224 records. This study area includes many significant and unique elements and areas. B1, or sites with Outstanding Biodiveristy Signficance, are based on excellant occurrences of species which are globally imperiled and/or areas which the natural diversity cannot be duplicated anywhere else in the world. The Upper Arkansas Watershed includes 10 of the Colorado's 41 B1 PCA's. These are the most important areas to protect in the state (see Figure 3).

Table 4. Tally of the significance of the Potential Conservation Areas of the Upper Arkansas Watershed

B1 Outstanding Biodiversity Significance	10
B2 Very High Biodiversity Significance	63
B3 High Biodiversity Significance	69
B4 Moderate Biodiversity Significance	36
B5 General Biodiversity Significance	46
TOTAL	224

Firgure 2: Element Occurrence Distribution in the Upper Arkansas Watershed

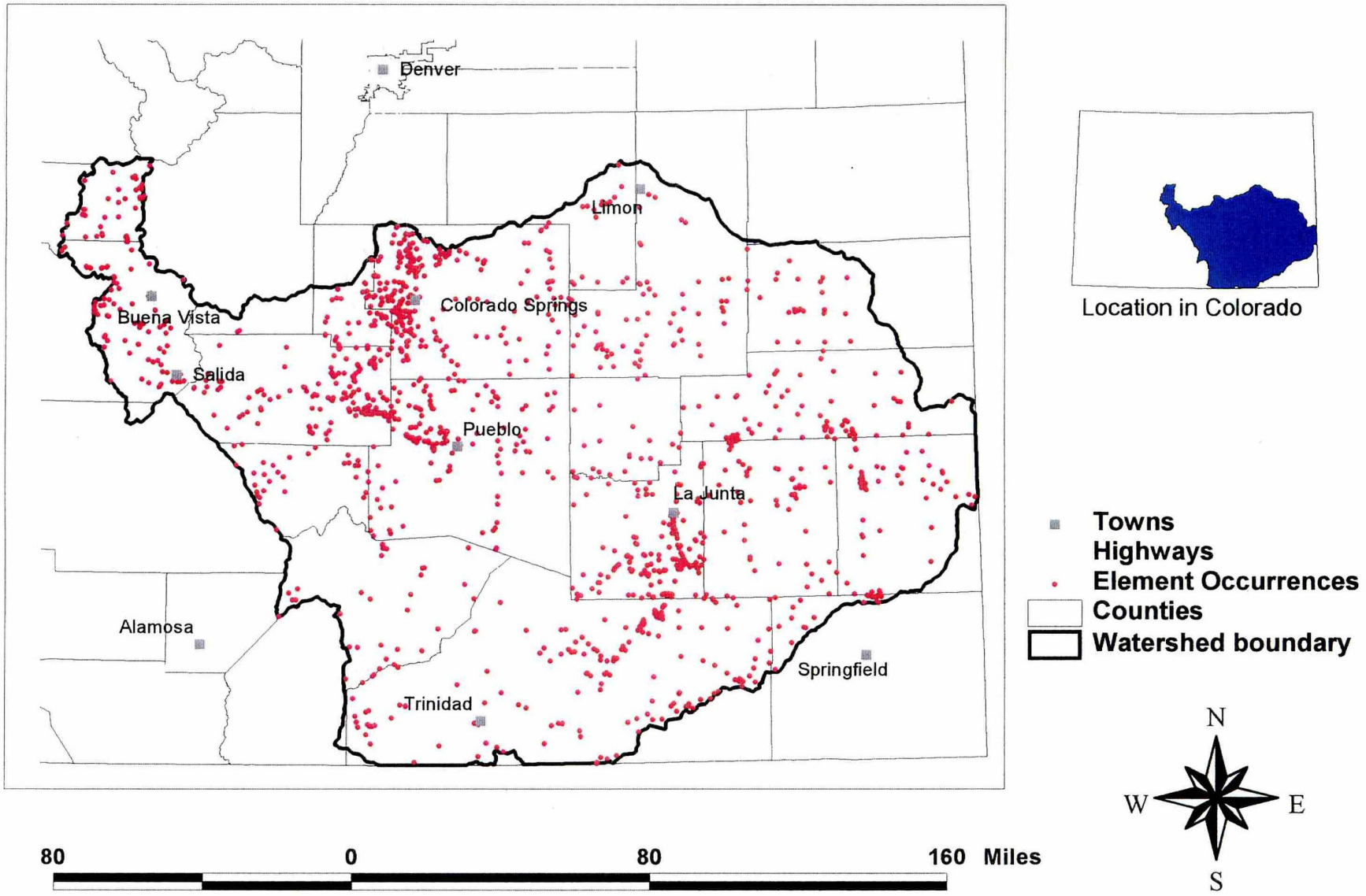
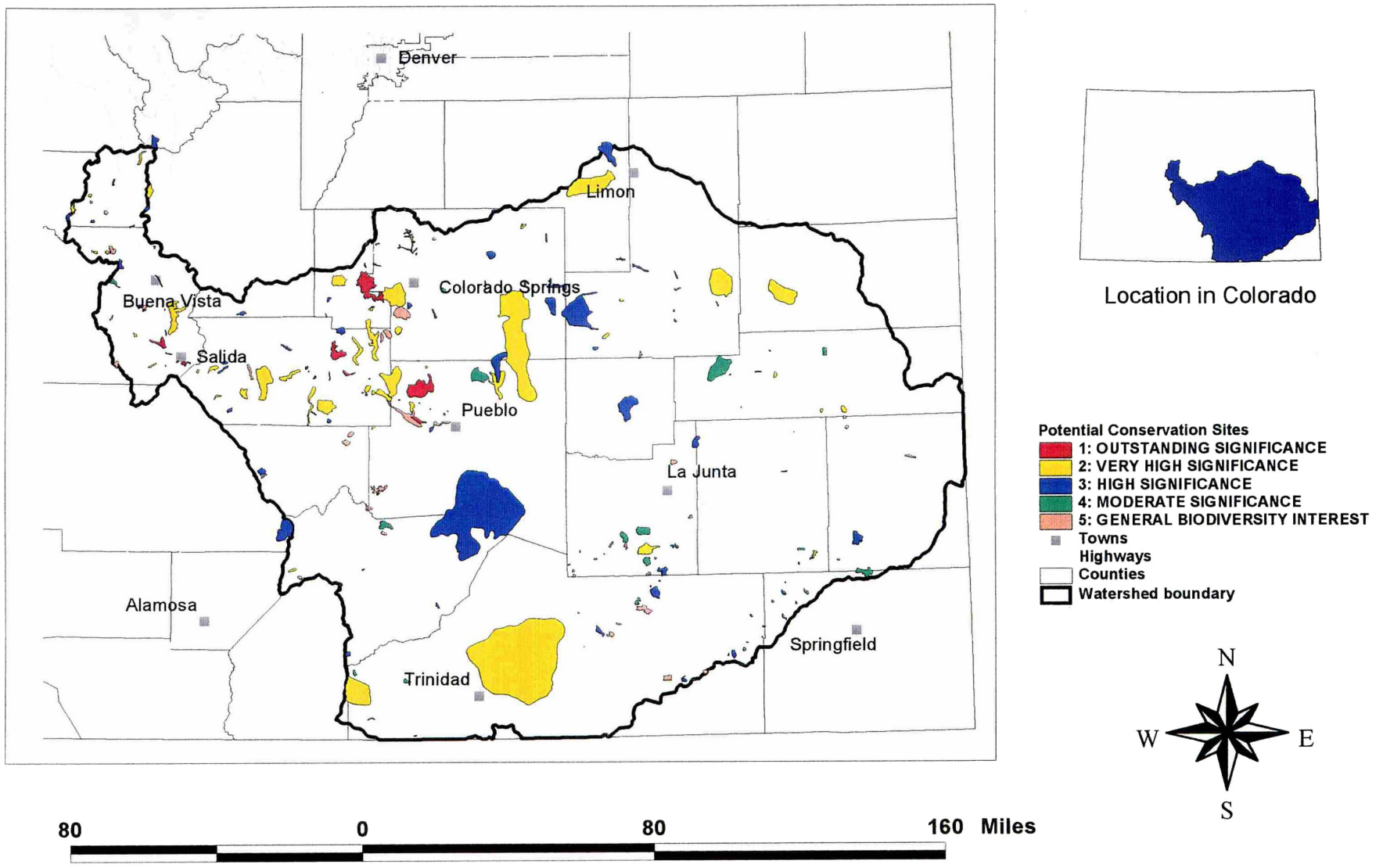


Figure 3: Potential Conservation Areas in the Upper Arkansas Watershed



Rare and Imperiled plants, animals and significant natural communities

As more information is included in CNHP datasystem the list and priority of species changes. There are currently 323 rare and imperiled plants, animals and natural communities which are documented in this watershed.

Table 5. Vertebrates of Global or State-wide Concern which Occur in the Upper Arkansas Watershed.

Scientific Name	Common Name	Global Rank	State Rank	Federal/ State Status
Amphibians				
BUFO BOREAS POP *1*	BOREAL TOAD (SOUTHERN ROCKY MOUNTAIN POPULATION)	G4T1Q	S1	FS
BUFO DEBILIS	GREEN TOAD	G5	S2	
RANA BLAIRI	PLAINS LEOPARD FROG	G5	S3	
RANA PIPIENS	NORTHERN LEOPARD FROG	G5	S3	FS/BLM
SCAPHIOPUS COUCHII	COUCH'S SPADEFOOT	G5	S1	
Birds				
ACCIPITER GENTILIS	NORTHERN GOSHAWK	G5	S3B,SZN	FS/BLM
AIMOPHILA RUFICEPS	RUFOUS-CROWNED SPARROW	G5	S2	
AMPHISPIZA BILINEATA	BLACK-THROATED SPARROW	G5	S3B,SZN	
ARDEA HERODIAS	GREAT BLUE HERON	G5	S3B,SZN	
BARTRAMIA LONGICAUDA	UPLAND SANDPIPER	G5	S3B,SZN	FS
BUTEO REGALIS	FERRUGINOUS HAWK	G4	S3B,S4N	FS/BLM
BUTORIDES VIRESCENS	GREEN HERON	G5	S3B,SZN	
CHARADRIUS ALEXANDRINUS NIVOSUS	WESTERN SNOWY PLOVER	G4T3	S1B,SZN	FS/BLM
CHARADRIUS MELODUS	PIPING PLOVER	G3	S1B,SZN	
CHARADRIUS MONTANUS	MOUNTAIN PLOVER	G2	S2B,SZN	FS/BLM
CIRCUS CYANEUS	NORTHERN HARRIER	G5	S3B,SZN	
COCCYZUS AMERICANUS AMERICANUS	G5T5	S2B,SZN		
COCCYZUS ERYTHROPTHALMUS	BLACK-BILLED CUCKOO	G5	S2B,SZN	
DENDROICA GRACIAE	GRACE'S WARBLER	G5	S3B,SZN	
DENDROICA PENSYLVANICA	CHESTNUT-SIDED WARBLER	G5	S2B,SZN	
DOLICHONYX ORYZIVORUS	BOBOLINK	G5	S3B,SZN	
FALCO PEREGRINUS ANATUM	AMERICAN PEREGRINE FALCON	G4T3	S2B,SZN	
GRUS AMERICANA	WHOOPING CRANE	G1	SAN	
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	G4	S1B,S3N	
ICTERUS PARISORUM	SCOTT'S ORIOLE	G5	S1B,SZN	
ICTINIA MISSISSIPPIENSIS	MISSISSIPPI KITE	G5	S1S2B,SZN	
IXOBRYCHUS EXILIS	LEAST BITTERN	G5	S2B,SZN	
MELANERPES ERYTHROCEPHALUS	RED-HEADED WOODPECKER	G5	S3B,SZN	
NUMENIUS AMERICANUS	LONG-BILLED CURLEW	G5	S2B,SZN	FS/BLM
NYCTANASSA VIOLACEA	YELLOW-CROWNED NIGHT-HERON	G5	S1B,SZN	
NYCTICORAX NYCTICORAX	BLACK-CROWNED NIGHT-HERON	G5	S3B,SZN	
PICOIDES SCALARIS	LADDER-BACKED WOODPECKER	G5	S3	

continued Table 5. Vertebrates of Global or State-wide Concern which Occur in the Upper Arkansas Watershed.

Scientific Name	Common Name	Global Rank	State Rank	Federal/ State Status
PIRANGA FLAVA	HEPATIC TANAGER	G5	S1B,SZN	
PODICEPS NIGRICOLLIS	EARED GREBE	G5	S3B,SZN	
PROGNE SUBIS	PURPLE MARTIN	G5	S3B,SZN	FS
SAYORNIS PHOEBE	EASTERN PHOEBE	G5	S3B,SZN	
SEIURUS AUROCAPILLUS	OVENBIRD	G5	S2B,SZN	
SIALIA SIALIS	EASTERN BLUEBIRD	G5	S2B,SZN	
SPIZA AMERICANA	DICKCISSEL	G5	S3B,SZN	
STERNA ANTILLARUM ATHALASSOS	INTERIOR LEAST TERN	G4T2Q	S1B,SZN	
STERNA CASPIA	CASPIAN TERN	G5	SUB,SZN	
STRIX OCCIDENTALIS LUCIDA	MEXICAN SPOTTED OWL	G3T3	S1B,SUN	
TYMPANUCHUS PALLIDICINCTUS	LESSER PRAIRIE-CHICKEN	G3	S2	FS
TYMPANUCHUS PHASIANELLUS JAMESI	PLAINS SHARP-TAILED GROUSE	G4T4	S1	
TYRANNUS FORFICATUS	SCISSOR-TAILED FLYCATCHER	G5	S1B,SZN	
VIREO BELLII	BELL'S VIREO	G5	S1B	
VIREO OLIVACEUS	RED-EYED VIREO	G5	S3B,SZN	
VIREO VICINIOR	GRAY VIREO	G4	S2B,SZN	
Fish				
ETHEOSTOMA CRAGINI	ARKANSAS DARTER	G3	S2	FS
HYBOGNATHUS PLACITUS	PLAINS MINNOW	G5	SH	
ONCORHYNCHUS CLARKI STOMIAS	GREENBACK CUTTHROAT TROUT	G4T2T3	S2S3	
ONCORHYNCHUS CLARKI VIRGINALIS	RIO GRANDE CUTTHROAT TROUT	G4T3	S3	FS/BLM
PHENACOBIUS MIRABILIS	SUCKERMOUTH MINNOW	G5	S2?	
PHOXINUS ERYTHROGASTER	SOUTHERN REDBELLY DACE	G5	S1	FS
Mammals				
CANIS LUPUS	GRAY WOLF	G4	SX	
CONEPATUS LEUCONOTUS	HOG-NOSED SKUNK	G4	SH	
CORYNORHINUS TOWNSENDII PALLESCENS	PALE LUMP-NOSED BAT	G4T4	S2	BLM
CYNOMYS GUNNISONI GUNNISONI	GUNNISON'S PRAIRIE DOG	G5T3	S3	
DIPODOMYS ORDII MONTANUS		G5T3	S3	
GULO GULO	WOLVERINE	G4	S1	FS
LASIURUS BOREALIS	EASTERN RED BAT	G5	S2B	
LYNX CANADENSIS	LYNX	G5	S1	FS
MUSTELA NIGRIPES	BLACK-FOOTED FERRET	G1	SH	
MYOTIS YUMANENSIS	YUMA MYOTIS	G5	S3	BLM
NEOTOMA MICROPUS	SOUTHERN PLAINS WOODRAT	G5	S3	
NOTIOSOREX CRAWFORDI	DESERT SHREW	G5	S3	
SOREX MERRIAMI	MERRIAM'S SHREW	G5	S3	
SOREX NANUS	DWARF SHREW	G4	S2S3	FS
SPILOGALE PUTORIUS	EASTERN SPOTTED SKUNK	G5	S2	
TADARIDA BRASILIENSIS	BRAZILIAN FREE-TAILED BAT	G5	S1	
THOMOMYS BOTTAE CULTELLUS	BOTTA'S POCKET GOPHER	G5T3Q	S3	
THOMOMYS BOTTAE RUBIDUS		G5T1	S1	
URSUS ARCTOS	GRIZZLY OR BROWN BEAR	G4	SX	

continued Table 5. Vertebrates of Global or State-wide Concern which Occur in the Upper Arkansas Watershed.

Scientific Name	Common Name	Global Rank	State Rank	Federal/ State Status
VULPES VELOX	SWIFT FOX	G3	S3	FS
ZAPUS HUDSONIUS PREBLEI	MEADOW JUMPING MOUSE	G5T2	S1	FS
Reptiles				
CNEMIDOPHORUS NEOTESSELATUS	TRIPLOID COLORADO CHECKERED WHIPTAIL	G2Q	S2	
DIADOPHIS PUNCTATUS	RINGNECK SNAKE	G5	S2	
EUMECES MULTIVIRGATUS GAIGEAE	VARIABLE SKINK	G5T5	S3	
KINOSTERNON FLAVESCENS	YELLOW MUD TURTLE	G5	S1	FS
LAMPROPELTIS GETULA	COMMON KINGSNAKE	G5	S1	BLM
LEPTOTYPHLOPS DULCIS	TEXAS BLIND SNAKE	G5	S1	FS
PHRYNOSOMA CORNUTUM	TEXAS HORNED LIZARD	G4G5	S3	FS/BLM
RHINOCHEILUS LECONTEI	LONGNOSE SNAKE	G5	S1?	
SISTRURUS CATENATUS	MASSASAUGA	G3G4	S2	BLM
SONORA SEMIANNULATA	GROUND SNAKE	G5	S3	
THAMNOPHIS CYRTOPSIS	BLACKNECK GARTER SNAKE	G5	S2?	

Table 6. Invertebrates of Global or State-wide Concern which Occur in the Upper Arkansas Watershed.

Scientific Name	Common Name	Global Rank	State Rank	Federal/ State Status
AMBLYSCIRTES SIMIUS	SIMIUS ROADSIDE SKIPPER	G4	S3	
ARGIA APICALIS	BLUE-FRONTED DANCER	G5	S3?	
ATRYTONOPSIS HIANNA	DUSTED SKIPPER	G4G5	S2	
BOLORIA SELENE SABULOCOLLIS	KOHLER'S FRITILLARY	G5T2	S1S2	
CELASTRINA HUMULUS		G2	S2	
CICINDELA CIRCUMPICTA JOHNSONII	A TIGER BEETLE	G5T5	S3	
CICINDELA DUODECIMGUTTATA	A TIGER BEETLE	G5	S3?	
CICINDELA LENGI VERSUTA	A TIGER BEETLE	G5T5	S2?	
CICINDELA LEPIDA	LITTLE WHITE TIGER BEETLE	G4	S3	
CICINDELA MARUTHA	A TIGER BEETLE	G5	S3?	
CICINDELA SPLENDIDA SPLENDIDA	A TIGER BEETLE	G5T5	S1?	
CICINDELA TOGATA GLOBICOLLIS	A TIGER BEETLE	G5T5	S2?	
ERPETOGOMPHUS DESIGNATUS	EASTERN RINGTAIL	G5	S2	
EUPHILOTES RITA COLORADENSIS		G4T2T3	S2	
FERRISSIA WALKERI	CLOCHE ANCYLID	G?	S3	
GOMPHUS EXTERNUS	PLAINS CLUBTAIL	G5	S2	
GOMPHUS MILITARIS	SULPHUR-TIPPED CLUBTAIL	G5	S2	
HEMILEUCA DIANA		G?	S2	
INCISALIA MOSSI SCHRYVERI		G4T3	S2S3	
LIBELLULA COMPOSITA	BLEACHED SKIMMER	G3	SU	
LIBELLULA SATURATA	FLAME SKIMMER	G5	S1	
LYCAEIDES IDAS SUBLIVENS	DARK BLUE	G5T?	S2S3	
LYMNAEA STAGNALIS	SWAMP LYMNAEA	G5	S2	

continued Table 6. Invertebrates of Global or State-wide Concern which Occur in the Upper Arkansas Watershed.

Scientific Name	Common Name	Global Rank	State Rank	Federal/ State Status
OARISMA EDWARDSII	EDWARDS' SKIPPERLING	G4	S3	
OCHLODES SNOWI	SNOW'S SKIPPER	G4	S3	
OENEIS POLIXENES	POLIXENES ARCTIC	G5	S3	
OENEIS TAYGETE	WHITE-VEINED ARCTIC	G5?	S3	
POANES HOBOMOK WETONA	HOBOMOK SKIPPER	G5T3?	S2	
POLITES ORIGENES	CROSSLINE SKIPPER	G5	S3	
PYGANODON GRANDIS	GIANT FLOATER	G5	S1	
SAGENOSOMA ELSA		G?	S1?	
VALVATA SINCERA	MOSSY VALVATA	G?	S3	
YVRETTA RHESUS	RHESUS SKIPPER	G4	S2S3	

Table 7. Plant Communities which Occur in the Upper Arkansas Watershed.

Scientific Name	Common Name	Global Rank	State Rank	Federal/ State Status
ABIES LASIOCARPA-PICEA ENGELMANNII/SALIX DRUMMONDIANA	MONTANE RIPARIAN FOREST	G5	S4	
ALNUS INCANA/MESIC GRAMINOID	MONTANE RIPARIAN SHRUBLAND	G5Q	S3	
ALNUS INCANA-CORNUS SERICEA	THINLEAF ALDER-RED-OISER DOGWOOD	G3G4	S3	
ANDROPOGON GERARDII-CALAMOVILFA LONGIFOLIA		G3	S2	
ANDROPOGON GERARDII-SCHIZACHYRIUM SCOPARIUM		G2	S2	
ANDROPOGON GERARDII-SPOROBOLUS HETEROLEPIS		G2	S1S2	
ANDROPOGON HALLII-CALAMOVILFA LONGIFOLIA		G5	S2	
ANDROPOGON HALLII-STIPA COMATA		G3	S1	
ARTEMISIA BIGELOVII/ ORYZOPSIS HYMENOIDES		G3	S3?	
ARTEMISIA FILIFOLIA/ ANDROPOGON HALLII		G3	S2	
ATRIPLEX CANESCENS/ SPOROBOLUS AIROIDES		G5Q	SU	
BETULA OCCIDENTALIS/ MESIC FORB	FOOTHILLS RIPARIAN SHRUBLAND	G3	S2	
BOUTELOUA GRACILIS-BUCHLOE DACTYLOIDES		G2?	S2?	
BOUTELOUA GRACILIS-HILARIA JAMESII		G3G4	S3	
CARDAMINE CORDIFOLIA-MERTENSIA CILIATA-SENECIO TRIANGULARIS		G4	S4	
CAREX AQUATILIS		G5	S4	
CAREX UTRICULATA	BEAKED SEDGE MONTANE WET MEADOWS	G5	S4	
CERCOCARPUS MONTANUS/ STIPA COMATA		G2	S2	
CERCOCARPUS MONTANUS/ STIPA NEOMEXICANA	FOOTHILLS SHRUBLAND	G2G3	S2S3	

continued Table 7. Plant Communities which Occur in the Upper Arkansas Watershed.

Scientific Name	Common Name	Global Rank	State Rank	Federal/ State Status
CERCOCARPUS MONTANUS-RHUS TRILOBATA/ ANDROPOGON GERARDII		G2G3	S2S3	
CORYLUS CORNUTA		G3	S1	
DANTHONIA PARRYI		G3	S3	
DISTICHLIS SPICATA		G5	S3	
ELEOCHARIS PALUSTRIS		G5	S4	
FRANKENIA JAMESII/ ORYZOPSIS HYMENOIDES		GU	SU	
JUNIPERUS MONOSPERMA-(PINUS EDULIS) / CERCOCARPUS MONTANUS/ SCHIZACHYRIUM SCOPARIUM		GU	SU	
JUNIPERUS MONOSPERMA/ BOUTELOUA CURTIPENDULA		G5	S3S4	
JUNIPERUS MONOSPERMA/ BOUTELOUA ERIOPODA		GU	S2S3	
JUNIPERUS MONOSPERMA/ BOUTELOUA GRACILIS		G5	S3S4	
JUNIPERUS MONOSPERMA/ BOUTELOUA GRACILIS PHASE STIPA NEOMEXIC		GU	SU	
JUNIPERUS MONOSPERMA/ STIPA NEOMEXICANA		GU	S3	
JUNIPERUS SCOPULORUM	RIPARIAN WOODLAND	GU	S3S4	
JUNIPERUS SCOPULORUM/ CERCOCARPUS MONTANUS-RHUS TRILOBATA	SCARP WOODLANDS	GU	SU	
MUHLENBERGIA ASPERIFOLIA		GU	S?	
MUHLENBERGIA TORREYI		GU	SU	
OPUNTIA IMBRICATA/ HILARIA JAMESII		GU	S3	
PANICUM OBTUSUM-BUCHLOE DACTYLOIDES	VINE MESQUITE-BUFFALO GRASS	G?Q	S1S2Q	
PASCOPYRUM SMITHII		G3G5Q	S2	
PASCOPYRUM SMITHII-NASSELLA VIRIDULA	GREAT PLAINS MIXED GRASS PRAIRIE	G4	S2	
PHRAGMITES AUSTRALIS		G4	S3	
PICEA PUNGENS/ EQUISETUM ARVENSE	MONTANE RIPARIAN FOREST	G3?	S2?	
PINUS ARISTATA/ FESTUCA ARIZONICA		G4	S3	
PINUS ARISTATA/ FESTUCA THURBERI		G3	S2	
PINUS ARISTATA/ RIBES MONTIGENUM		G2G4	S1	
PINUS ARISTATA/ TRIFOLIUM DASYPHYLLUM		G2	S2	
PINUS ARISTATA/ VACCINUM MYRTILLUS		GU	SU	
PINUS EDULIS/ LEYMUS AMBIGUUS		GU	SU	
PINUS EDULIS/ QUERCUS GAMBELII		G5	S5	
PINUS EDULIS/ QUERCUS X PAUCILOBA		G5	S2	
PINUS EDULIS/ STIPA SCRIBNERI		G3	S1?	
PINUS PONDEROSA/ BOUTELOUA GRACILIS		G5	S4	

continued Table 7. Plant Communities which Occur in the Upper Arkansas Watershed.

Scientific Name	Common Name	Global Rank	State Rank	Federal/ State Status
PINUS PONDEROSA/ CAREX INOPS		G3	S2	
PINUS PONDEROSA/ CERCOCARPUS MONTANUS/ ANDROPOGON GERARDII		G2	S2?	
PINUS PONDEROSA/ FESTUCA ARIZONICA		G4G5	S4	
PINUS PONDEROSA/ LEUCOPOA KINGII		G3	S3	
PINUS PONDEROSA/ QUERCUS GAMBELII		G5	S4	
POPULUS ACUMINATA	MONTANE RIPARIAN FOREST	GU	SU	
POPULUS ANGUSTIFOLIA/ ALNUS INCANA		G3?	S3	
POPULUS ANGUSTIFOLIA/ BETULA OCCIDENTALIS		G3?	S2	
POPULUS ANGUSTIFOLIA/ PASCOPYRUM SMITHII	NARROWLEAF COTTONWOOD/WESTERN WHEATGRASS	G1Q	S1Q	
POPULUS ANGUSTIFOLIA/ PRUNUS VIRGINIANA		G2G3	S1	
POPULUS ANGUSTIFOLIA/ SALIX EXIGUA	NARROWLEAF COTTONWOOD RIPARIAN FOREST	G4	S4	
POPULUS ANGUSTIFOLIA/ SALIX IRRORATA	FOOTHILLS RIPARIAN WOODLAND	G2?	S2	
POPULUS ANGUSTIFOLIA-JUNIPERUS SCOPULORUM		G2G3	S2	
POPULUS ANGUSTIFOLIA-PSEUDOTSUGA MENZIESII	MONTANE RIPARIAN FOREST	G2?	S2	
POPULUS DELTOIDES SSP. *MONILIFERA-(SALIX AMYGDALOIDES)/ SALIX EXIGUA*	PLAINS COTTONWOOD RIPARIAN WOODLAND	G4?	S3	
POPULUS DELTOIDES SSP. *MONILIFERA/ PANICUM VIRGATUM*		G1G2	S1	
POPULUS DELTOIDES SSP. *MONILIFERA/ SYMPHORICARPOS OCCIDENTALIS*	PLAINS COTTONWOOD RIPARIAN WOODLAND	G2G3	S2	
POPULUS DELTOIDES/ PASCOPYRUM SMITHII-PANICUM OBTUSUM	PLAINS COTTONWOOD/ WESTERN WHEATGRASS-VINE MESQUITE	G1G2Q	S1S2Q	
POPULUS DELTOIDES/ SPOROBOLUS AIROIDES	PLAINS COTTONWOOD/ ALKALI SACATON	G2Q	S2Q	
POPULUS DELTOIDES/SPOROBOLUS CRYPTANDRUS	PLAINS COTTONWOOD/ SAND DROPSEED	G1G2Q	S1S2Q	
POPULUS TREMULOIDES/ JUNIPERUS COMMUNIS		G4	S4	
PSEUDOTSUGA MENZIESII/ BETULA OCCIDENTALIS	MONTANE RIPARIAN FOREST	G3?	S3	
PSEUDOTSUGA MENZIESII/ QUERCUS GAMBELII		G5	S4	
QUERCUS GAMBELII/ CAREX INOPS		GU	SU	
QUERCUS GAMBELII-CERCOCARPUS MONTANUS/ MUHLENBERGIA MONTANA		GU	SU	
RHUS TRILOBATA-PHILADELPHUS MICROPHYLLUS	SHRUBLAND	GU	S2	
SALIX DRUMMONDIANA/ MESIC FORB	DRUMMONDS WILLOW/ MESIC FORB	G4	S4	
SALIX ERIOCEPHALA VAR. *LIGULIFOLIA*	MONTANE WILLOW CARR	G2G3	S2S3	

continued Table 7. Plant Communities which Occur in the Upper Arkansas Watershed.

Scientific Name	Common Name	Global Rank	State Rank	Federal/ State Status
SALIX EXIGUA/ MESIC GRAMINOID	SANDBAR WILLOW/ MESIC GRAMINOID	G5	S5	
SALIX EXIGUA/ BARE GROUND	SANDBAR WILLOW/ BARE GROUND	G5	S5	
SALIX EXIGUA/ ELEOCHARIS PALUSTRIS	COYOTE WILLOW/ SPIKERUSH	GU	S2S4	
SALIX EXIGUA/ SCIRPUS PUNGENS	COYOTE WILLOW/ BULRUSH	GU	S2S4	
SALIX GEYERIANA/CAREX AQUATILIS	MONTANE WILLOW CARR	G3?	S3	
SALIX GEYERIANA-SALIX MONTICOLA/ MESIC FORB	GEYER'S WILLOW-ROCKY MOUNTAIN WILLOW/MESIC FORB	G3	S3	
SALIX MONTICOLA/ CAREX UTRICULATA		G3	S3	
SALIX PLANIFOLIA/ CALTHA LEPTOSEPALA		G4	S4	
SALIX PLANIFOLIA/ CAREX AQUATILIS		G5	S4	
SALIX WOLFII/ CAREX AQUATILIS	SUBALPINE RIPARIAN WILLOW CARR	G4	S3	
SARCOBATUS VERMICULATUS/ BOUTELOUA GRACILIS		GU	SU	
SARCOBATUS VERMICULATUS/ SPOROBOLUS AIROIDES		G3?	SU	
SCHIZACHYRIUM SCOPARIUM		G1?	S1?	
SCHIZACHYRIUM SCOPARIUM-BOUTELOUA CURTIPENDULA		G3	S2	
SCIRPUS PUNGENS	BULRUSH	G3G4	S3	
SPOROBOLUS AIROIDES		G3Q	S3	
STIPA COMATA - EAST		G2	S2	
STIPA COMATA-BOUTELOUA GRACILIS		G5	S2S3	
STIPA NEOMEXICANA		G3	S2	
SYMPHORICARPOS OCCIDENTALIS	SNOWBERRY SHRUBLAND	G4G5	S3	

Table 8. Plants of Global or State-wide significance which Occur in the Upper Arkansas Watershed.

Scientific Name	Common Name	Global Rank	State Rank	Federal/ State Status
AGASTACHE FOENICULUM	BLUE GIANT HYSSOP	G4G5	S1	
AMBROSIA LINEARIS	LINEAR-LEAF BURSAGE	G2	S2	FS
AMORPHA NANA	FRAGRANT INDIGOBUSH	G5	S2S3	
AQUILEGIA CHRYSANTHA VAR *RYDBERGII*	GOLDEN COLUMBINE	G4T1Q	S1	BLM
AQUILEGIA SAXIMONTANA	ROCKY MOUNTAIN COLUMBINE	G3	S3	
ASCLEPIAS UNCIALIS	GREENE MILKWEED	G3?	S1S2	FS/BLM
ASPLENIUM PLATYNEURON	EBONY SPLEENWORT	G5	S1	
ASPLENIUM RESILIENS	BLACK-STEM SPLEENWORT	G5	S1	
ASTRAGALUS BRANDEGEEI	BRANDEGEE MILK-VETCH	G3G4	S1S2	BLM
ASTRAGALUS MOLYBDENUS	MOLYBDENUM MILK-VETCH	G3	S2	FS
BOTRYCHIUM ECHO	REFLECTED MOONWORT	G2	S2	FS
BOTRYCHIUM HESPERIUM	WESTERN MOONWORT	G3	S2	

continued Table 8. Plants of Global or State-wide significance which Occur in the Upper Arkansas Watershed.

Scientific Name	Common Name	Global Rank	State Rank	Federal/ State Status
BOTRYCHIUM LANCEOLATUM VAR *LANCEOLATUM*	LANCE-LEAVED MOONWORT	G5T4	S2S3	
BOTRYCHIUM LINEARE	NARROWLEAF GRAPEFERN	G1	S1	FS
BOTRYCHIUM LUNARIA	MOONWORT GRAPE-FERN	G5	S2S3	
BOTRYCHIUM PALLIDUM	PALE MOONWORT	G2	S2	FS
BOTRYCHIUM SIMPLEX	LEAST GRAPE-FERN	G5	S1	
BOTRYCHIUM VIRGINIANUM	RATTLESNAKE FERN	G5	S1	
BOYKINIA JAMESII	JAMES SAXIFRAGE	G4	S2?	
BRAYA GLABELLA	SMOOTH ROCKCRESS	G5	S1	FS
BRAYA HUMILIS	LOW BRAYA	G4	S2	
CAREX CONCINNA	BEAUTIFUL SEDGE	G4G5	S1	BLM
CAREX CRAWEI	CRAWE SEDGE	G5	S1	
CAREX LEPTALEA	BRISTLY-STALK SEDGE	G5	S1	
CAREX OREOCHARIS	A SEDGE	G3	S1	
CAREX TORREYI	TORREY SEDGE	G4	S1	
CHEILANTHES EATONII	EATON LIPFERN	G5?	S2	
CHEILANTHES WOOTONII	WOOTON LACEFERN	G5	S1	
CHENOPODIUM CYCLOIDES	SANDHILL GOOSEFOOT	G3G4	S1	FS
COMMELINA DIANTHIFOLIA	BIRDBILL DAY-FLOWER	G5	S1?	
CREPIS NANA	DWARF ALPINE HAWKSBEARD	G5	S2	
CYPRIPEDIUM PUBESCENS	LARGE YELLOW LADY'S-SLIPPER	G5	S2	
CYSTOPTERIS MONTANA	MOUNTAIN BLADDER FERN	G5	S1	
DRABA CRASSA	THICK-LEAF WHITLOW-GRASS	G3	S3	
DRABA EXUNGUICULATA	CLAWLESS DRABA	G2	S2	
DRABA FLADNIZENSIS	WHITE ARCTIC WHITLOW-GRASS	G4	S2S3	
DRABA GLOBOSA	ROCKCRESS DRABA	G3	S1	
DRABA GRAYANA	GRAY'S PEAK WHITLOW-GRASS	G2	S2	
DRABA LONCHOCARPA VAR *LONCHOCARPA*	LANCE-POD WHITLOWGRASS	G4T4	S2	
DRABA OLIGOSPERMA	FEW-SEEDED WHITLOW-GRASS	G5	S2	
DRABA PORSILDII	PORSILD'S WHITLOW-GRASS	G3G4	S1	
DRABA RECTIFRUCTA	MOUNTAIN WHITLOW-GRASS	G3?	S2	
DRABA SMITHII	SMITH WHITLOW-GRASS	G2	S2	FS
DRABA STREPTOBRACHIA	COLORADO DIVIDE WHITLOW-GRASS	G3	S3	
DRABA VENTOSA	WIND RIVER WHITLOW-GRASS	G3	S1	
ECHINOCEREUS REICHENBACHII VAR *PERBELLUS*	LACE HEDGEHOG CACTUS	G5T?	S1	
EPIPACTIS GIGANTEA	GIANT HELLEBORINE	G4	S2	FS
ERIGERON LANATUS	WOOLLY FLEABANE	G3G4	S1	FS
ERIOGONUM BRANDEGEEI	BRANDEGEE WILD BUCKWHEAT	G1G2	S1S2	FS/BLM
ERIOPHORUM GRACILE	SLENDER COTTON-GRASS	G5	S2	
EUSTOMA RUSSELLIANUM	SHOWY PRAIRIE-GENTIAN	G5	S3	
FESTUCA CAMPESTRIS	BIG ROUGH FESCUE	G4?	SH	
FRASERA COLORADENSIS	COLORADO GENTIAN	G3	S3	FS

continued Table 8. Plants of Global or State-wide significance which Occur in the Upper Arkansas Watershed.

Scientific Name	Common Name	Global Rank	State Rank	Federal/ State Status
GOODYERA REPENS	DWARF RATTLESNAKE-PLANTAIN	G5	S3	
HEUCHERA RICHARDSONII	RICHARDSON ALUMROOT	G5	S1	
HYPOXIS HIRSUTA	EASTERN YELLOW STARGRASS	G5	SH	
ISOETES ECHINOSPORA	SPINY-SPORED QUILLWORT	G5	S2	
JUNCUS BRACHYCEPHALUS	SMALL-HEAD RUSH	G5	S1	
JUNCUS BREVICAUDATUS	NARROW-PANICLED RUSH	G5	S1	
LIATRIS LIGULISTYLIS	STRAP-STYLE GAY-FEATHER	G5?	S1S2	
LILIUM PHILADELPHICUM	WOOD LILY	G5	S3	
LISTERA BOREALIS	NORTHERN TWAYBLADE	G4	S2	BLM
LISTERA CONVALLARIOIDES	BROAD-LEAVED TWAYBLADE	G5	S2	
MACHAERANTHERA COLORADOENSIS	COLORADO TANSY-ASTER	G2?	S2	FS
MALAXIS BRACHYPODA	WHITE ADDER'S-MOUTH	G4Q	S1	FS
MENTZELIA CHRYSANTHA	GOLD BLAZING STAR	G1G2	S1S2	BLM
MENTZELIA DENSA	ROYAL GORGE STICKLEAF	G2	S2	BLM
MERTENSIA ALPINA	ALPINE BLUEBELLS	G4?	S1	
MIRABILIS ROTUNDIFOLIA	ROUND-LEAF FOUR-O'CLOCK	G2	S2	
NAMA DICHOTOMUM	LIVEMORE FIDDLELEAF	G4	S1	
NEOPARRYA LITHOPHILA	ROCK-LOVING ALETES	G2	S2	FS/BLM
NOTHOLAENA STANDLEYI	STAR CLOAK-FERN	G4	S1	
OENOTHERA HARRINGTONII	ARKANSAS VALLEY EVENING PRIMROSE	G2	S2	
OONOPSIS FOLIOSA VAR *MONOCEPHALA*	SINGLE-HEAD GOLDENWEED	G3G4T2	S2	
OONOPSIS SP 1		G1G2	S1S2	
OREOXIS HUMILIS	PIKES PEAK SPRING PARSLEY	G1	S1	
OXYTROPIS PARRYI	PARRY'S CRAZY-WEED	G5	S1	
PAPAVER RADICATUM SSP *KLUANENSE*	ALPINE POPPY	G5T3?	S3	
PARTHENIUM ALPINUM	ALPINE FEVER-FEW	G3	S1	FS
PARTHENIUM TETRANEURIS	BARNBEY'S FEVER-FEW	G3	S3	
PELLAEA ATROPURPUREA	PURPLE-STEM CLIFF-BRAKE	G5	S2S3	
PELLAEA GLABELLA SSP *SIMPLEX*	SMOOTH CLIFF-BRAKE	G5T4?	S2	
PELLAEA WRIGHTIANA	WRIGHT CLIFF-BRAKE	G5	S2	
PENSTEMON DEGENERI	DEGENER BEARDTONGUE	G2	S2	FS/BLM
PHYSARIA BELLII	BELL'S TWINPOD	G2	S2	
PORTULACA HALIMOIDES	DESERT PORTULACA	G4?	S1	
POTENTILLA AMBIGENS	SOUTHERN ROCKY MOUNTAIN CINQUEFOIL	G3	S1S2	
PTILAGROSTIS MONGHOLICA SSP *PORTERI*	PORTER FEATHERGRASS	G3G5T2	S2	FS
PYROLA PICTA	WHITE-VEIN WINTERGREEN	G4G5	S3	
RANUNCULUS KARELINII		G4G5	S2	
RIBES AMERICANUM	WILD BLACK CURRANT	G5	S1	
RIBES NIVEUM	SNOW GOOSEBERRY	G3?	S1	
SALIX SERISSIMA	AUTUMN WILLOW	G4	S1	FS
SARCOSTEMMA CRISPUM	WAVY-LEAF TWINEVINE	G4G5	S1	
SISYRINCHIUM PALLIDUM	PALE BLUE-EYE-GRASS	G2G3	S2	

continued Table 8. Plants of Global or State-wide significance which Occur in the Upper Arkansas Watershed.

Scientific Name	Common Name	Global Rank	State Rank	Federal/ State Status
SOLIDAGO PTARMICOIDES	PRAIRIE GOLDENROD	G5	S2S3	
SPIRANTHES DILUVIALIS	UTE LADIES' TRESSES	G2	S2	
STELLARIA IRRIGUA	ALTAI CHICKWEED	G4?	S2	
STIPA RICHARDSONII	CANADA MOUNTAIN RICEGRASS	G5	SU	
THAMNOSMA TEXANA	RUDA-OF-THE-MOUNTAINS	G5	SH	
TOWNSENDIA STRIGOSA	HAIRY TOWNSEND-DAISY	G4	S1	BLM
VIOLA PEDATIFIDA	PRAIRIE VIOLET	G5	S2	
VIOLA SELKIRKII	GREAT-SPURRED VIOLET	G5?	S1	FS
WOODSIA NEOMEXICANA	NEW MEXICO CLIFF FERN	G4?	S2	
WOODSIA PLUMMERAE	PLUMMER WOODSIA	G5	SU	

Final Product: Natural Diversity Information Source (www.ndis.nrel.colostste.edu)

To meet the needs of the EPA and other clients, CNHP recognized the importance of making this information available to the general public. Thus the data developed as part of this project are now available via the Internet through the Natural Diversity Information Source (NDIS).

The mission of the NDIS is to provide data and analysis needed to enhance decisions on land-use affecting Colorado's animals, plants, and natural communities.

To accomplish this mission partners are bringing together information from a variety of sources, including the Colorado Division of Wildlife, the Colorado Natural Heritage Program, local governments, and other conservation organizations. Our primary customers include citizens, professionals, and organizations interested in promoting informed land use planning and conservation. By creating a site on the World Wide Web, we offer easy access to biological, geopolitical, and demographic data needed to understand potential impacts of land use change on wildlife and natural communities. Although our primary mission is to support decisions, NDIS also serves as an important educational resource. Colorado citizens can use the system to learn about the biological requirements of wildlife and gain insight into the effects of people on biological systems.

To meet this vision, NDIS must be continuously updated and maintained. CNHP is committed to quality assurance in our data, and will update and refine the information offered by NDIS as new data are acquired and as new analytical techniques are developed.

Our work is being accomplished by the combined efforts of the Colorado Division of Wildlife (CDOW), the Colorado Department of Natural Resources (CDNR), the Colorado Natural Heritage Program (CHNP) and Colorado State University (CSU). The project is supported by generous funding from Great Outdoors Colorado and the Rocky

Mountain Elk Foundation with matching support from CDOW and CSU. The project is managed by a steering committee composed of representatives from CDOW, CDNR, CHNP and CSU. The committee has designed a system for distributing currently available information statewide.

The completed system contains two components. The first component is an application running under standard Internet browsers. It allows users to locate an area of interest anywhere in the state and find out about the wildlife, plants, and natural communities within that area. The system informs the user of concerns about potential impacts if the area is developed, and assesses the value of wildlife habitat within the area relative to its surroundings. A list of species with potentially suitable habitat within the area is provided and text describing each species and its requirements are available. If the area includes CHNP potential conservation areas then maps of those areas are displayed, and a profile describing them will be offered.

A second component includes a site allowing technically informed users to download data. This will permit GIS professionals from other agencies and consultants to obtain data directly.

Colorado is experiencing unprecedented population growth and development. The changes brought on by growth will, without doubt, affect the quality of life of our citizens now and in the future. A central challenge confronting Coloradans is how to arrive at a future of our own choosing, a future that accommodates growth while preserving the many natural amenities that enhance our quality of life. Giving ready access to information to as many people as want to participate in decision-making processes can enhance the wisdom of future land use decisions.