

Colorado Natural Heritage Program

2007/2008 Project Abstracts



**Colorado
State**
University

Knowledge to Go Places

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Knowledge to Go Places

The Colorado Natural Heritage Program is within the Warner College of Natural Resources Fish, Wildlife, and Conservation Biology Department at Colorado State University. CNHP is a nonprofit organization externally funded through grants and contracts.

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Cover photo: Carolyn Aspelin and Chris West, of Colorado Cattlemen's Agricultural Land Trust, identifying grasses in southeast Colorado.

From the Director:

As I bask in April's deliciously warm sunshine, I'm reminded of the power of the sun to warm us and recharge our batteries. Our scientific and political communities are rapidly finding solutions to global climate change by embracing the power of the sun, wind, water, and geothermal, yet we are still faced with a loss of biodiversity. As Colorado becomes a major producer of energy, there is increasing potential for conflicts between energy development (renewable and non-renewable alike) and the conservation of Colorado's well known biodiversity. Solutions to this dilemma require facts, compromise, and planning. The Colorado Natural Heritage Program (CNHP) is actively working on solutions; sound biological information on the status and location of Colorado's most imperiled species and plant communities is more important now than ever before. We have amassed over 27,000 mapped locations of species and communities of concern and added value to the locations by designing nearly 2,000 biological planning boundaries (Potential Conservation Areas) that can provide managers and developers with valuable insight and sound planning tools.



In this year's project summaries you will read about our inventories, monitoring, conservation planning and data exchange projects. Our staff of 27 has gone above and beyond the call of duty, working on more than 40 projects funded by 26 partners. This year we worked directly with oil and gas companies while we completed our biological inventory of Rio Blanco County, an energy- and biodiversity-rich area. The energy companies voluntarily granted CNHP biologists permission to survey for rare species, enabling us to identify potential conflicts in discrete areas that are easily avoided with proactive planning. These partnerships generate optimism for avoiding conflicts between development and biodiversity by developing on-the-ground relationships. We hope to follow the Rio Blanco County model with all renewable and non-renewable energy companies throughout Colorado. Our inventory projects are also at the heart of CSU's extension mission. In southeast Colorado we developed working relationships with nearly 50 ranchers as we discovered the biological wealth and beauty of one of Colorado's least studied landscapes. This area contains our state's largest and most intact, privately-owned working landscape. Ongoing monitoring efforts include the Pawnee Montane Skipper (6th year), Boreal Toad (9th year), and Prebles Meadow Jumping Mouse (10th year), three species that are imperiled but tenuously holding on.

All of the work described here is brought together in our biological conservation databases - a library that is valued at nearly \$20 million. Species profiles, range maps, imperilment ranks, occurrence status, location, and conservation boundaries are at the core of our state's conservation knowledge base. The increased use of this library suggests the ever-growing power of a comprehensive and fully integrated repository.

My five years as Director have been some of the most rewarding years of my life, but it is time to move into a new role as CNHP's Conservation Planning Team Leader. It is with great honor that I pass the Director baton to Dave Anderson. Dave has been with CNHP since 1999 and brings a new vitality and wealth of knowledge to Colorado conservation leadership. I predict a rich future for our program with Dave at the helm.

A handwritten signature in cursive script, reading "Renée J. Rondeau".

Renée J. Rondeau - April 7, 2008

Colorado Natural Heritage Program 2007/2008 Project Abstracts

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CNHP Staff

NatureServe and the Colorado Natural Heritage Program

It is often said that a little knowledge is a dangerous thing. The right knowledge, however, when properly applied, can be a very powerful thing. Access to reliable information about species and ecosystems helps people and organizations to make better decisions and do their best to protect natural resources, even while pursuing other business goals.

The work of the Colorado Natural Heritage Program (CNHP) is a great model for this approach. The CNHP is a member of NatureServe, a non-profit organization dedicated to providing the scientific basis for effective conservation action. The NatureServe network is a public-private partnership comprising 80 independent member programs, including one in every state. Together, all of our member programs seek to bring high-quality, consistent, and objective information about species and habitats to the forefront whenever people make decisions about how to best use or conserve natural resources.

Over the past year I visited with many of our partners, including Coloradans, listening to their concerns and learning about their challenges. It seems every community, no matter how large or small, is seeking ways to grow while sustaining the health and quality of life of its citizens. Farmers and ranchers working the grasslands of the Great Plains, for example, grapple with reconciling their deep love for the land with changing land use, unfamiliar climatic patterns, and economic uncertainty. As a long-time resident of Colorado myself, this challenge affects people, and a landscape, that I know and love.

We have learned from experience that it is not enough to just create good information. Open space is being lost at the alarming rate of 2 million acres annually in the U.S. In the 20 years between 1982 and 2001, an area the size of the state of Illinois was converted from open space to development. Too much will be lost if we do not rally together, embracing cooperation and the sharing of knowledge that will help communities learn about their precious natural heritage, and investing in its conservation as an essential part of maintaining a high quality of life.

The Colorado Natural Heritage Program is a leader in our network, setting an example for how to bring the best science to bear on important natural resource issues, while working in a spirit of collaboration with their partners and local communities. On behalf of NatureServe, our thanks go out to the many partners and funders whose support help make CNHP's work a success each year.

Sincerely,



Mary Klein
President and CEO, NatureServe
www.natureserve.org



NatureServe is a membership organization that governs CNHP and a network of similar programs operating in all 50 U.S. states, in 11 Canadian provinces and territories, and in many countries and territories of Latin America and the Caribbean.

2007/2008 Projects

With over 40 projects simultaneously occurring in one year, CNHP has the opportunity to work in all of Colorado's habitats including high and low elevations, wet and dry habitats, and all four corners of the state. Along with the varied terrain, we also work with a variety of subjects that include all major taxonomic groups and ecological communities. The common thread that ties all of these inventory, monitoring, and planning projects together is our commitment to providing quality conservation science.

Throughout all of our projects we aim to answer one or more of the following questions:

1. What species and ecological communities exist in Colorado?
2. Which are at greatest risk of extinction?
3. What are their biological and ecological characteristics?
4. Where are they found?
5. What is their condition at those locations?
6. What processes or activities are sustaining or threatening them?
7. Where are the most important sites to protect?
8. What actions are needed for the protection of those sites?

These basic questions are important to carrying out biodiversity conservation efforts, and are at the core of all Natural Heritage Programs. As you read through these abstracts you will see this foundation in all of our projects.

Pearly Canyon slickrock pools in southeast Colorado.

Primary Funders (in alphabetical order)



Boulder County Parks and Open Space

Assessment of Critical Biological Resources in Boulder County

City of Boulder Open Space and Mountain Parks

Assessment of Critical Biological Resources in Boulder County

Ecological Integrity Assessments for Ecological Systems in Boulder County



City of Fort Collins

Survey of Soapstone Open Space for Rare Butterfly and Fish Species

Colorado Cattlemen's Agricultural Land Trust

Southeast Colorado Biological Inventory



Colorado Department of Natural Resources

Survey of Critical Biological Resources in Rio Blanco County

Survey of Critical Wetlands and Riparian Areas in Hinsdale County

Colorado Department of Transportation

Department of Transportation Conservation Easement Monitoring



Colorado Division of Wildlife

A Conservation Blueprint for Neotropical Migratory Birds in Colorado

Boreal Toad Monitoring and Survey Project

Southeast Colorado Biological Inventory

Survey of Critical Wetlands and Riparian Areas in Hinsdale County

Vegetation Index of Biotic Integrity for Colorado Wetlands: Phase 3

Field Testing of Wetland Ecological Integrity Assessment Scorecards



Colorado Natural Areas Program

Pagosa Skyrocket Inventory, Monitoring and Conservation



Colorado State Land Board

Southeast Colorado Biological Inventory

Denver Botanic Gardens

Distribution of *Frankenia jamesii* in Colorado



Denver Water

Pawnee Montane Skipper Post-fire Habitat Assessment Survey

Federal Highway Administration

Geospatial Environmental & Community Analysis for Pueblo & El Paso Counties



Gateway Canyons Resort

Rare Plant Survey on BLM Lands, Gateway, Mesa County

Great Outdoors Colorado (GOCO)

Assessment of Critical Biological Resources in Boulder County

Survey of Critical Biological Resources in Rio Blanco County

Southeast Colorado Biological Inventory



National Fish and Wildlife Foundation

Rare Plant Conservation Initiative
Pagosa Skyrocket Inventory, Monitoring and Conservation



National Park Service

Plant Species Vouchering for Great Sand Dunes National Park and Preserve
Vegetation Classification & Mapping of Great Sand Dunes National Park and Preserve
Rare Species Inventory of Sand Creek Massacre National Historic Site
Review and Evaluation of Proposed National Natural Landmarks
National Park Service Data Management Support
Editing assistance for NPS vegetation mapping reports

NatureServe

CNHP Environmental Review and Data Distribution Projects
LandScope America: The Conservation Guide to America's Natural Places



The Nature Conservancy

Department of Transportation Conservation Easement Monitoring
Rare Plant Conservation Initiative
Measuring Colorado's Biodiversity Health
General support from The Nature Conservancy

Rio Blanco County

Survey of Critical Biological Resources in Rio Blanco County



Rocky Mountain Bird Observatory

A Conservation Blueprint for Neotropical Migratory Birds in Colorado
Southeast Colorado Biological Inventory

U.S. Bureau of Land Management

Survey of Critical Wetlands and Riparian Areas in Hinsdale County
Survey of Critical Biological Resources in Rio Blanco County
Rare Plant Survey on BLM Lands, Gateway, Mesa County
Bureau of Land Management Data Processing and Statewide Dataset



U.S. Department of Defense

Central Shortgrass Prairie Ecoregional Assessment and Partnership Initiative
Front Range EcoRegional Partnership
US Air Force Academy Noxious Weed Mapping & Monitoring
Preble's Meadow Jumping Mouse Populations at the U.S. Air Force Academy
Rare Plant Surveys on Fort Carson Military Reservation & Pinon Canyon Manuever Site

U.S. Environmental Protection Agency

Survey of Critical Wetland Resources in Boulder County
Survey of Critical Biological Resources in Rio Blanco County
Vegetation Index of Biotic Integrity for Colorado Wetlands: Phase 3
Field Testing of Wetland Ecological Integrity Assessment Scorecards



U.S. Fish and Wildlife Service

Pagosa Skyrocket Inventory, Monitoring and Conservation
Pawnee Montane Skipper Post-fire Habitat Assessment Survey
Cushion Bladderpod Status Assessment
Threatened and Endangered Plant Species Data Development and Field Surveys

U.S. Forest Service

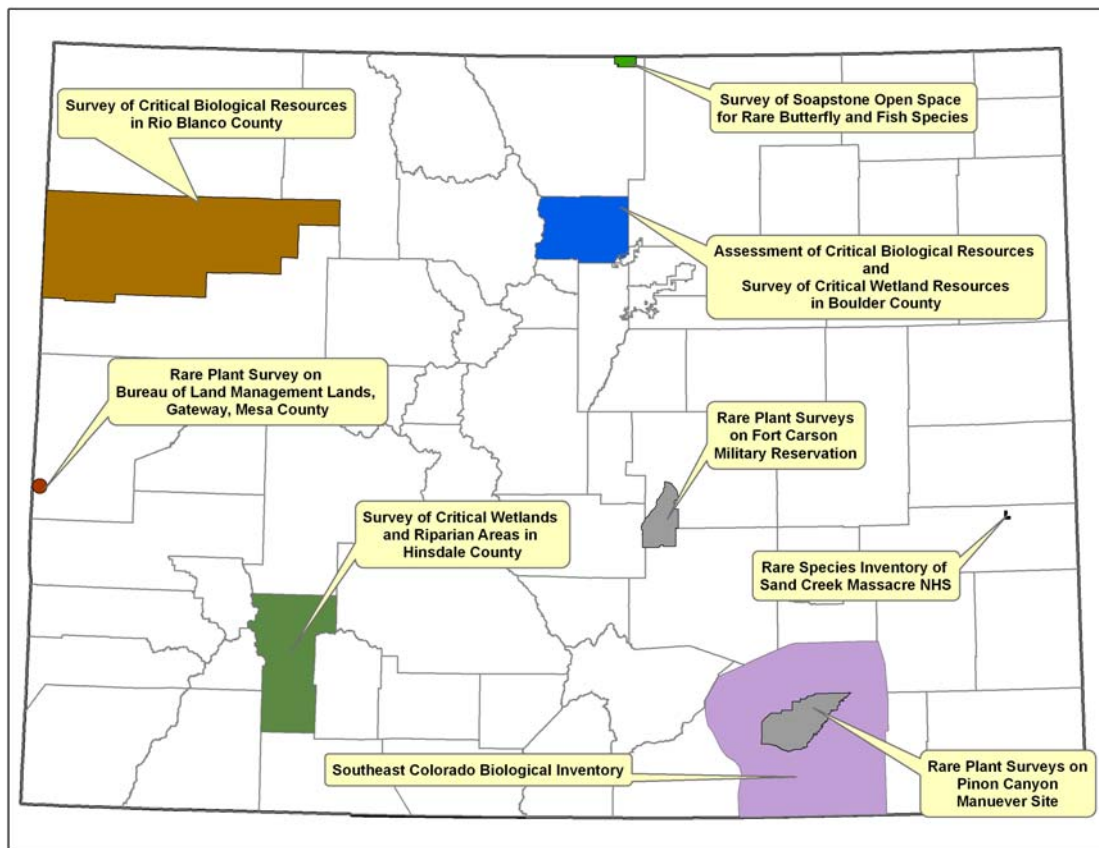
Rare Plant Monitoring on San Juan National Forest
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U.S. Forest Service Region 2 Data Processing and Statewide Dataset



West Hill Foundation for Nature

LandScope America: The Conservation Guide to America's Natural Places

Inventory



Survey of Critical Biological Resources, Southeast Colorado

Joe Stevens, Kelsey Forrest, Jodie Bell, Renée Rondeau, John Sovell, Jeremy Siemers, Jill Handwerk, Chris Gaughan, Brad Lambert, Dina Clark, RMBO, Larval Fish Lab

In southeast Colorado, the Purgatory River has cut an intricate network of deep sandstone canyons into the expansive shortgrass prairie. This unique and understudied area includes Colorado's largest remaining expanses of shortgrass prairie as well as the most extensive juniper woodland-savanna in the western Great Plains. The canyon complex itself is also the largest such system in the ecoregion. The area has recently received unprecedented attention due to the proposed expansion of the Department of Defense Pinon Canyon Maneuver Site (PCMS). The study area for the survey includes over 2 million acres of land surrounding PCMS, much of which is privately owned ranch land. Working directly with the Colorado Cattlemen's Agricultural Land Trust, Great Outdoors Colorado, and other funders, we are conducting inventory on approximately 800,000 acres of this diverse area in order to document the rare plants, animals, and natural communities for which these ranches provide vital habitat.

The number of Element Occurrences we have collected on the surveyed ranches (120 animal, 71 plant, and 8 natural community occurrence locations) confirms that the Southeast Colorado project area is biologically diverse and supports a high quality and

well functioning ecosystem. Among the unexpected and exciting observations made during the inventory are occurrences of the James' penstemon (*Penstemon jamesii*), a species not observed from the area since the 1940's; numerous occurrences for the wheel milkweed (*Asclepias uncialis* ssp. *uncialis*), occurring in small colonies scattered along the eastern edge of the southern Rocky Mountains; many new locations of the triploid checkered whiptail (*Cnemidophorus neotesselatus*), a state species of special concern; as well as many others.



The canyon of the Purgatory in southeastern Colorado

The project will provide land owners with descriptions of the elements observed as well as the potential conservation areas recommended for their long term survival. The survey was begun in January 2007 and was concluded in May 2008. A pending proposal will continue this survey through May 2009.

Assessment of Critical Biological Resources in Boulder County

Stephanie Neid, Susan Spackman Panjabi, Rob Schorr, Chris Gaughan, David G. Anderson

Boulder County has a wealth of biodiversity and is unique within the Front Range. It spans the range of elevation from plains and foothills to montane, subalpine, and alpine zones within a contracted area. Boulder County is known for perhaps the highest plant diversity in the state – 1500 species, or fully half of the species known from Colorado.



Field work in Boulder County

Although Boulder County has been studied by many eminent biologists through numerous research endeavors, a countywide survey for rare elements of biodiversity had never been done. The available biodiversity information is in many cases incomplete, outdated, and stored in many disparate sources, which complicates the many planning efforts that occur in the county. To address this problem, Boulder County Parks and Open Space, with support from the City of Boulder Open Space and Mountain Parks, funded a comprehensive county-wide biological survey. In addition to performing field inventory, this project collated existing information into a common data standard. A single, comprehensive database will inform planning and stewardship efforts and will guide the acquisition and management of open space.

In addition to documenting large expanses of intact ecological systems at all elevations within the county, dozens of locations of globally rare species were found and updated. Globally rare plant highlights include updates on Bell's twinpod (*Physaria bellii*) and updates and new locations for Larimer aletes (*Aletes humilis*) and Rocky Mountain cinquefoil (*Potentilla rupicola*). Locations for Townsend's big-eared bat (*Plecotus townsendii pallescens*), northern leopard frog (*Rana pipiens*), and Preble's meadow jumping mouse (*Zapus hudsonius preblei*) were also documented. A second field season will occur in 2008.

Survey of Critical Wetland Resources in Boulder County

Joanna Lemly, Stephanie Neid, Denise Culver, Chris Gaughan, Brad Lambert

Boulder County contains numerous wetlands with high ecological value for both the county and the state. Because of its position on the Front Range, the county supports a wide range of wetland types, from lower montane riparian woodlands and relictual tall grass prairie wet meadows on the plains surrounding the county's major cities, to pristine high elevation fens in the Indian Peaks Wilderness. Through a grant from the EPA, Boulder County funded a survey of these important habitats.

One highlight of the summer survey was Todd Gulch Fen, a quaking, floating mat fen dominated by lesser panicled sedge (*Carex diandra*), a state rare species (G5 S1) and a significant population of wool-fruit sedge (*Carex lasiocarpa*) (G5S1). Additionally, CNHP was able to survey several pristine fens in the high subalpine of Boulder County, including one site located on a private in-holding within the Indian Peaks Wilderness, and several fens within the City of Boulder Watershed.



Todd Gulch Fen, Boulder County

These wetlands contain a number of important plant communities, some of which are common and some of which are uncommon and not well understood. The Ute ladies' tresses (*Spiranthes diluvialis*) (G2S2LT) was a target wetland species, especially along South Boulder Creek. Boulder County contains some of the most important habitat for this species in the Colorado. Nineteen new Potential Conservation Areas with Biodiversity Significance ranks (B Ranks) were documented during 2007: one Very High Significance (B2), 16 High Significance (B3) and two Moderate Significance (B4).

Survey of Critical Biological Resources in Rio Blanco County

Denise Culver, Peggy Lyon and Janis Huggins

In 2006, CNHP received unanimous approval from the Rio Blanco County Commissioners to submit a planning grant application to Great Outdoors Colorado. The award was received in December 2006, and was coupled with a wetland grant and BLM

funds to survey the County for the most critical biological resources, thus leveraging staff and resources for both projects. We concentrated on private lands, and were successful in obtaining permission to survey from all but one of the major oil and gas companies and several large ranches. CNHP documented several new occurrences of the Dudley Bluffs Bladderpod (*Lesquerella congesta*, G1S1 LT) and the Piceance Twinpod (*Physaria obcordata*, G1G2S1S2 LT), and updated many of the known occurrences. Several of the new occurrences fell within the predicted habitat derived from the potential distribution models developed for the US Fish and Wildlife Service. Another outcome of the survey was the documentation of new occurrences for several plants that were previously thought to be rare, enabling us to lower their rarity rank. These included willow hawthorn (*Crataegus saligna*), narrow-stem gilia (*Gilia stenothyrsa*), and Barneby's thistle (*Cirsium barnebyi*).



Cathedral Bluffs in Rio Blanco County

The survey results highlight the importance of Rio Blanco County for rare plant conservation in Colorado. The project identified a total of 28 Potential Conservation Areas: one Outstanding Biodiversity Significance (B1), six Very High Biodiversity Significance (B2) and 21 High Biodiversity Significance (B3). These sites provide a prioritized list of areas in the County noted for important biological resources to be considered for protection of globally rare plants, wetlands, or for open space and wildlife habitat. A follow-up stakeholder meeting

is planned in May 2008 to present the results, and to assist local interests with integrating the biological assessment data into on-going County planning initiatives as well as private land use activities. Implementation strategies developed through this meeting will help to achieve on-the-ground conservation of the County's highest priority natural areas.

Rare Plant Survey on Bureau of Land Management Lands, Gateway, Mesa County Peggy Lyon

Increased development and recreational use of the Gateway area (Mesa County, Colorado) prompted the Grand Junction Field Office of the Bureau of Land Management (BLM) and Gateway Canyons Resort to contract with CNHP to survey the area for rare plants. The primary target species were the globally imperiled Dolores River skeltonplant (*Lygodesmia doloresensis*, G1QS1) Fisher milkvetch (*Astragalus piscator*,



BLM land along the Dolores River south of Gateway.

G2G3S1) and Gypsum Valley cateye (*Oreocarya gypsophila*, G1S1). Seven areas of concern were identified by BLM. Five of these were surveyed by CNHP in 2007: Palisade (lower slopes); Lumsden Canyon; Sinbad Valley; and three sections along the Dolores River south of Gateway. Surveys of Lost Horse Basin and West Side Uncompahgre Plateau are planned for 2008:

Fourteen element occurrences were located and documented in the CNHP data system. Of these, two - Dolores River skeltonplant and Fisher milkvetch - were updates of known occurrences. A large, new occurrence was documented for the Fisher milkvetch. New Colorado locations for Elizabeth's milkvetch (*Astragalus equisolensis*, G5T1S1) and dwarf sand verbena (*Abronia nana*, G4S1) were documented. Additionally, a significant increase in occupied habitat for Fisher milkvetch and documentation of Gypsum Valley cateye in Sinbad Valley were highlights of the survey.

Rare Plant Surveys on Fort Carson Military Reservation and Pinon Canyon Manuever Site

Jill Handwerk, David G. Anderson, Stephanie Neid, Dina Clark, Jodie Bell, Kelsey Forrest, and Michael Menefee

In 2007, CNHP completed a two-year rare plant survey at Fort Carson and the Pinon Canyon Manuever Site (PCMS) funded by the Department of Defense. Targeted plant species were dwarf milkweed (*Asclepias uncialis* ssp. *uncialis*, G3?S1S2), alpine feverfew (*Bolophyta tetraneuris*, G3S1), Arkansas Valley evening primrose (*Oenothera harringtonii*, G2S2), Pueblo goldenweed (*Oonopsis puebloensis*, G1G2S1S2), round-leaf four o'clock (*Mirabilis rotundifolius*, G2S2), and rayless goldenweed (*Oonopsis foliosa* var. *monocephala*, G2G3T2S2). This information will facilitate natural resource planning at the two installations and inform rare plant protection in the Arkansas River Valley, which has a high concentration of rare plant species.



Round-leaf four-o'clock on a Fort Carson ridgeline.

At Fort Carson 17 seventeen new occurrences were found and 29 previously documented occurrences were updated, while at PCMS eleven new occurrences of the target species were found and nine occurrences were updated. Rocky Mountain bladderpod (*Lesquerella calcicola*, G2S2), gold blazing star (*Mentzelia chrysantha*, G1G2S1S2), Fendler's Townsend-daisy (*Townsendia fendleri*, G2S1), and Texas Greasebush (*Glossopetalon [=Forsellesia] planitierum*, G4S1) were also observed on site during the survey work. Fort Carson and PCMS contain significant known range-wide acreage of the target species and the management of these species on the installations will be important for the overall survival of these species. Species for which Fort Carson has significant management responsibility and potential for impact include

Round-leaf four-o'clock and Arkansas River feverfew; Fort Carson contains more than 40 percent of the known occupied acres of these species. PCMS has significant management responsibility and potential for impact for dwarf milkweed with 24% of the known occupied acres.

Rare Species Inventory of Sand Creek Massacre National Historic Site

John Sovell and Chris Gaughan

Sand Creek Massacre National Historic Site (SAND) in Kiowa County was authorized in 2000 and has a current established boundary encompassing approximately 2,400 acres. The National Park Service funded CNHP to evaluate the history and status of the current prairie dog population at SAND. The objectives of this project are to recommend management options for keeping the prairie dog towns intact, preventing the towns from expanding onto the adjoining private land, and long-term management of the prairie dog towns, with the associated ecological values and habitat diversity.

CNHP will be documenting the status and history of prairie dogs at the site, including discussions with private ranchers whose lands adjoin the site and contain portions of the prairie dog towns. CNHP will identify population densities appropriate for the acreage of suitable prairie dog habitat at SAND, together with proposed control strategies that have proven to be effective in managing prairie dogs elsewhere. The project will also address the potential future impacts resulting from the use of the identified control strategies, such as future changes in prairie dog population sizes, future expansion dynamics of prairie dogs, and changes to local plant community structure within the confined prairie dog towns. Monitoring protocols required to define future impacts resulting from prairie dog control will be determined.



A badger pokes its head out of a prairie dog hole at Sand Creek Massacre National Historic Site.

Survey of Critical Wetlands and Riparian Areas in Hinsdale County, Colorado

Stephanie Neid, Dee Malone, Jennifer Jones, Jennifer Davin

In 2005, CNHP was awarded funds from the Colorado Department of Natural Resources via a grant from the Environmental Protection Agency, Region 8, to survey critical wetlands and riparian areas in Hinsdale County, Colorado. With additional assistance from the Bureau of Land Management, U.S. Forest Service and the Colorado Division of Wildlife, sixty percent of the 138 targeted inventory areas were assessed during the summer of 2006. A second field season in 2007 was funded by the BLM in which 55 additional sites of seeps and springs were evaluated. In total twenty-one new occurrences of globally vulnerable or globally imperiled wetland natural communities were assessed, several of which are unique iron fens. There are concentrations of rare fen wetlands in Hinsdale County due to its relatively high elevation. Nine known natural community

occurrences documented in the mid- to late 1990's were re-visited and re-assessed. One new rare wetland plant population, of the globally vulnerable Altai cottongrass (*Eriophorum altaicum* var. *neogaeum*) was discovered during the 2006 field season and another known occurrence was revisited.

The final report will document twenty-six wetland and riparian Potential Conservation Areas, twenty-one of which are new and four are updates, which highlight biologically sensitive wetlands. These areas can guide planning efforts and identify unique areas of wetland biodiversity within Hinsdale County. Data will also facilitate conservation action planning implemented by the Lake Fork Watershed Stakeholders.



Fen wetland, American Basin near the Continental Divide in Hinsdale County

Survey of Soapstone Open Space for Rare Butterfly and Fish Species

John Sovell



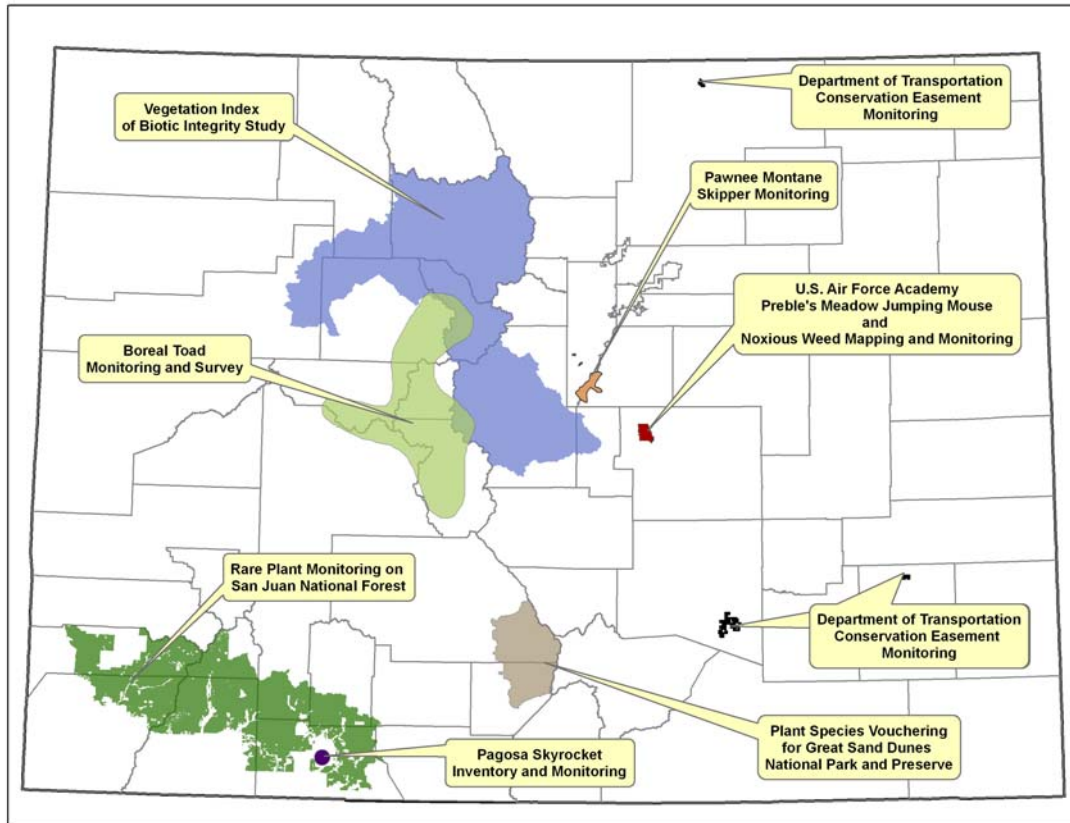
A researcher samples a water hole in Spottlewood Creek for rare fish.

The Colorado Natural Heritage Program performed a survey for rare butterfly and fish species in the City of Fort Collins, Soapstone Open Space in Larimer County during the summer of 2007. Field data was collected on the population status, habitat condition, and management needs of the species. A survey of the fish population in Spottlewood Creek in the 1980s recorded the presence of the fathead minnow (*Pimephales promelas*, G5S5), Iowa darter (*Etheostoma exile*, G5S3, listed by the State of Colorado as a species of special concern), and the state threatened brassy

minnow (*Hybognathus hankinsoni*, G5S3). The focus of this survey was to determine if either the Iowa darter or brassy minnow currently inhabited Spottlewood Creek within the Soapstone Natural Area. No fish were recorded from the Soapstone Open Space; however, adequate habitat for small plains stream fishes offering potential opportunities for reintroduction of plains fishes was observed.

A total of 1093 butterflies were collected from the Soapstone Open Space from June to August of 2007. A total of 52 different species were recorded from those 1093 samples. The most striking discovery was the collection of the “globally vulnerable” Colorado blue (*Euphilotes rita coloradensis*, G3G4T2T3S2). Data on the Colorado blue butterfly will be used to develop a Potential Conservation Area, which is the theoretical area requiring conservation for continued viability of the rare species and its populations.

Monitoring and Research



U.S. Air Force Academy Noxious Weed Mapping and Monitoring

David G. Anderson, Amy Lavender, Michelle Washebek

In 2007, CNHP botanists re-mapped the extent of 14 species of noxious weeds originally mapped in 2002 throughout the U.S. Air Force Academy (USAFA) and the Farish Outdoor Recreation Area (Farish) in El Paso County. A total of approximately 5,200 infestations were mapped in this project throughout approximately 19,000 acres within the two study sites. This extensive dataset has great utility for management of the targeted species, and, together with the monitoring data detailed below will provide insights into the effectiveness of management over the last five years, allowing managers to focus control efforts on the most urgent weed management needs. The updated information will help to focus weed control efforts, and multiple years of comprehensive observations allows us to draw inferences regarding trends in population and distribution. Some species, notably leafy spurge, have spread considerably in the past five years.

In 2003 and 2004, USAFA developed a management plan for noxious weeds, which included a monitoring component to measure the effectiveness of weed management activities. In 2005, CNHP established monitoring plots at the USAFA in infestations of 13 species of noxious weeds. In 2006, monitoring plots were added for myrtle spurge (*Euphorbia myrsinites*), a rapidly spreading species that was recently discovered at

USAFA. The targeted species are those most in need of weed management actions due to their status as noxious weeds in Colorado, invasiveness, distribution, potential to negatively impact natural resources, and potential to require costly future management actions.

A combination of quadrats, belt transects, photoplots, and photopoints were used to establish baseline conditions in 2005, and targets were resampled in 2006 and 2007. Management appears to have resulted in reductions in the target species at 12 of the 15 treated plots. Many species showed decreased density and percent cover in 2006, probably due to the exceptional spring drought conditions, but rebounded in 2007. The monitoring program will continue in 2008, with adjustments to improve efficiency and keep the project in step with management needs.



Preble's Meadow Jumping Mouse Populations at the U.S. Air Force Academy

Rob Schorr

CNHP has been working with the United States Air Force Academy (USAFA) since 1997 to understand the distribution, movement patterns, and population parameters of Preble's meadow jumping mice (PMJM). Currently in its 10th year, this long-term study has provided invaluable estimates of PMJM movement, survival, and abundance.

In 2007, CNHP began the first attempt to model PMJM occupancy in appropriate riparian habitats at USAFA. Unfortunately, this was a year in which capture success was extremely low. Even on the population monitoring sites along Monument Creek, which have been trapped every year since 2000, PMJM were found on only 2 of the 4 sets of transects. This is the first time PMJM have not been found on at least 3 transect sets. Of the 16 randomly selected survey locations for the occupancy study PMJM were trapped at only 5 locations. Although occupancy was estimated relatively high, probability of



Preble's meadow jumping mouse along Monument Creek.

detection was quite low and both parameters had large variance estimates. In 2008, CNHP will continue the population monitoring along Monument Creek and the occupancy study hoping for greater trapping success.

Boreal Toad Monitoring and Survey

Brad Lambert and Chris Gaughan

CNHP formed a partnership with the Colorado Division of Wildlife (CDOW) in 1999 to monitor known breeding sites and to survey locations throughout Colorado for new populations of the state endangered boreal toad (*Bufo boreas*, G4T1QS1). The data collected have been used by the Boreal Toad Recovery Team to assess the status of the boreal toad in Colorado, and by the U.S. Fish and Wildlife Service to assess the status for potential federal listing as an endangered species.



Boreal toad

In 2007, CNHP monitored 24 known breeding sites in Chaffee, Eagle, Park and Summit Counties. Monitoring consists of making repeated visits to breeding sites to collect baseline information on high counts and breeding success. In addition, 82 sites in nine counties throughout Colorado were surveyed for boreal toads, which resulted in the discovery of one new breeding site in Gunnison County.

CNHP also continued a mark-recapture study in the Cottonwood Creek drainage in Chaffee County. The study was set up in 1998 by the CDOW to look at demographic variables in a large metapopulation of boreal toads. A total of 1,624 adult toads have been tagged between 1998 and 2007. CNHP is currently analyzing this mark-recapture dataset focusing on population size, survival, site fidelity, and movement between breeding sites.

Pagosa skyrocket Inventory, Monitoring and Conservation

Peggy Lyon and Jill Handwerk



Pagosa skyrocket

CNHP, the Colorado Natural Areas Program, and the U.S. Fish and Wildlife Service initiated a partnership in 2006 to monitor the status of known populations of *Ipomopsis polyantha* (Pagosa skyrocket), inventory areas of potential habitat, and assess threats to the species.

Ipomopsis polyantha is an extremely narrow endemic known from three populations in the vicinity of Pagosa Springs, Colorado. It is ranked “globally critically imperiled” (G1S1) by NatureServe and the Colorado

Natural Heritage Program. *Ipomopsis polyantha* is a sensitive species in Region 2 of the USDA Forest Service and is included on the Bureau of Land Management Colorado State

Sensitive Species List. Its habitat is sparsely vegetated or barren Mancos Shale, often where there has been some natural or anthropogenic disturbance. Nearly all known sites are either on state highway or county road right-of-ways or on private land. They are threatened by development, road construction and maintenance, and utility additions and improvements.

Data from this study will provide the basis for population viability analyses, determine the role of disturbance, and assess the severity of threats to the species. These data will also provide the U.S. Fish and Wildlife Service with the information necessary to determine whether the Pagosa skyrocket warrants listing under the ESA.

Rare Plant Monitoring on San Juan National Forest

Peggy Lyon and Janis Huggins



Peggy Lyon flags individual plants of Colorado tansy aster (*Machaeranthera coloradoensis*) at a monitoring site near Molas Pass.

This project is an outgrowth of the rare plant survey work that CNHP has conducted on the San Juan National Forest since 2001. CNHP was contracted to establish permanent monitoring plots for Forest Service Sensitive species. Known locations of sensitive plants were visited, and a specific monitoring plan was created for each site. Methods needed to be flexible, because most occurrences are small and patchy. Fifteen separate rare plant sites, with seven rare plant different species, were included in 2007. In addition, general vegetation

transects and a wetland survey were completed at Glade Lake and Ferris Reservoir. This will enable the Forest Service to quantitatively assess trends at these sites. The project will be continued in 2008.

Plant Species Vouchering for Great Sand Dunes National Park and Preserve

Joe Stevens, Kelsey Forrest, Jodie Bell, Susan Spackman Panjabi, Elin Franzen

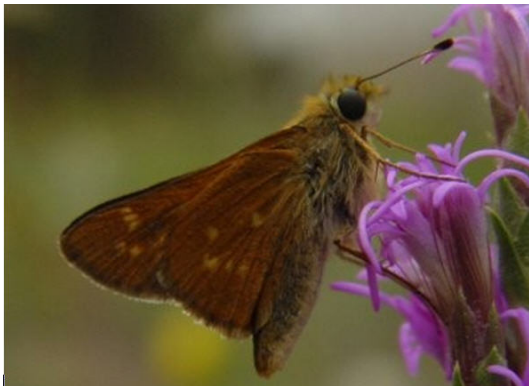
Previous plant inventory projects at Great Sand Dunes National Park and Preserve (GRSA) have identified a total of 111 species in the Park and identified the need for continued inventory. Recent expansion of the Park boundaries has further increased the need for additional plant species inventory. Species lists generated from Vegetation Classification (VC) data collected by CNHP in 2005 identified 191 vascular plants not previously documented in GRSA.

During summer 2008, selected plot locations identified during the VC project will be searched to acquire specimens for which no voucher currently exists. The specimens will be dry-pressed and identified by a qualified botanist. They will then be mounted and

labeled per NPS requirements for plant specimen preservation, documentation will be made in the NPSpecies database, and they will be deposited at the GRSA herbarium. Element Occurrence Records (EOR's) will be written for any species listed by CNHP as Critically Imperiled (G1S1), Imperiled (G2S2), or Vulnerable (G3S3). Specimens for these species will only be collected provided the population available is sufficient to not be impacted. This project will address the Biological Inventory Program objectives of documenting 90% the biodiversity of the Park, and provide GRSA with a lasting record of the plant biodiversity existing in the Park.

Pawnee Montane Skipper Post-fire Habitat Assessment Survey - 2007 Monitoring

John Sovell



A Pawnee montane skipper butterfly nectars at a pairie gayfeather flower.

The Hayman and Schoonover forest fires burned across approximately 40% of the Pawnee montane skipper butterfly (*Hesperia leonardus montana*) habitat in the Pike National Forest during the summer of 2002. The U.S. Forest Service, the U.S. Fish and Wildlife Service, and Denver Water have funded a six-year post-fire monitoring study within the range of this federally listed Threatened species to estimate how the fires have affected skipper occupancy rates in burned habitat. The trend in the numbers of Pawnee montane skippers have remained the

same throughout all six years of monitoring with skippers being most numerous on unburned plots, slightly less numerous on low severity burn plots, and with considerably fewer skippers on severely burn plots. Skipper numbers are at levels over five times less on severely burned plots and the proximity of burned areas to unburned suitable skipper habitat positively influences the probability of recording skippers from a burned plot. The lack of reoccupation of severely burned plots witnessed in the first three post burn years has been followed by increased counts of skippers in 2006 and 2007 at severely burned plots. However, most of these severely burned plots are still devoid of skippers and skipper numbers in reoccupied severely burned plots are still very low (0.12/acre in 2006). Pawnee montane skipper numbers in the South Platte River drainage are at levels nearly five times less than they were in the 1980s. Skipper numbers were also positively correlated to spring and summer precipitation of the previous year.

Vegetation Index of Biotic Integrity for Colorado Wetlands: Phase 3

Joe Rocchio, Joanna Lemly

The U.S. Environmental Protection Agency and Colorado Division of Wildlife provided CNHP with funds for a multi-year project to develop a Vegetation Index of Biotic Integrity (VIBI) for Colorado wetlands in the Southern Rocky Mountain Ecoregion (western Colorado). VIBI is a bioassessment monitoring tool that uses various attributes of wetland vegetation to determine wetland condition across a human-induced

disturbance gradient (from pristine to heavily disturbed). Attributes that show a predictable response to increasing human disturbance are combined into one multi-metric index, a number between 0–100, that can be used to evaluate biotic integrity of a specific wetland. The tool can be used to monitor change in condition over time, or to compare the various wetlands within a geographic area. Thus, the VIBI can be used for (1) monitoring wetland protection, restoration, enhancement, and creation projects; (2) monitoring the effectiveness of wetland management practices; (3) prioritizing wetland restoration and protection projects; and (4) identifying reference conditions for specific wetland types.

This project has been developed in three phases between 2004–2008. Based on initial data collection in 75 wetlands in the Blue River, South Platte River Headwaters, and Colorado River Headwater, five separate VIBI models were developed for five different Southern Rocky Mountain wetland types: Riparian Shrublands, Slope Wet Meadows, Riverine Wet Meadows, Extremely Rich Fens, and Intermediate Fens. In Phase 3 (summer 2007), data were collected in an additional 40 plots to calibrate and validate the VIBI models to assure that they accurately depict wetland condition. Model calibration is currently underway and the final VIBI models will be available as an Access database by summer 2008.



Collecting VIBI data in a subalpine wetland

Field Testing of Wetland Ecological Integrity Assessment Scorecards

Joe Rocchio, Joanna Lemly

CNHP has been working with our partner organization, NatureServe, on a project funded by the U.S. Environmental Protection Agency (US EPA) to create a set of Ecological Integrity Assessment (EIA) Scorecards for several wetland types in the Southern Rocky Mountain Ecoregion. The EIA Scorecards are multi-metric indices designed to be employed as either a rapid or intensive assessment of ecological condition. Practical and ecologically meaningful biotic and abiotic metrics are selected to measure the integrity of key ecological attributes. These indicators are rated and then aggregated into an overall score for four major ecological categories: (1) Landscape Context; (2) Biotic Condition; (3) Abiotic Condition; and (4) Size. The rating for these four categories can be combined into an overall Ecological Integrity Score for each site. The scores can be used to compare various wetlands or to track change in wetland condition over time.

Initial development of the EIA Scorecards was completed in 2006. In 2007, the US EPA provided additional funding to field test the Riparian Shrubland EIA Scorecard to determine its accuracy and effectiveness. Specific objectives of the study were to determine if (1) the existing metrics are comprehensive and appropriate, (2) the Scorecard is able to distinguish between reference and highly disturbed wetlands, (3) the Scorecard provides repeatable scores at different wetlands of a similar disturbance class, and (4) the scores are consistent



Joe Rocchio identifying plants in a riparian shrubland

between several different users. Field data were collected at 40 different wetlands, including a subset of wetlands that were sampled by 6 different ecologists. Analysis is ongoing and a report will be available by summer 2008.

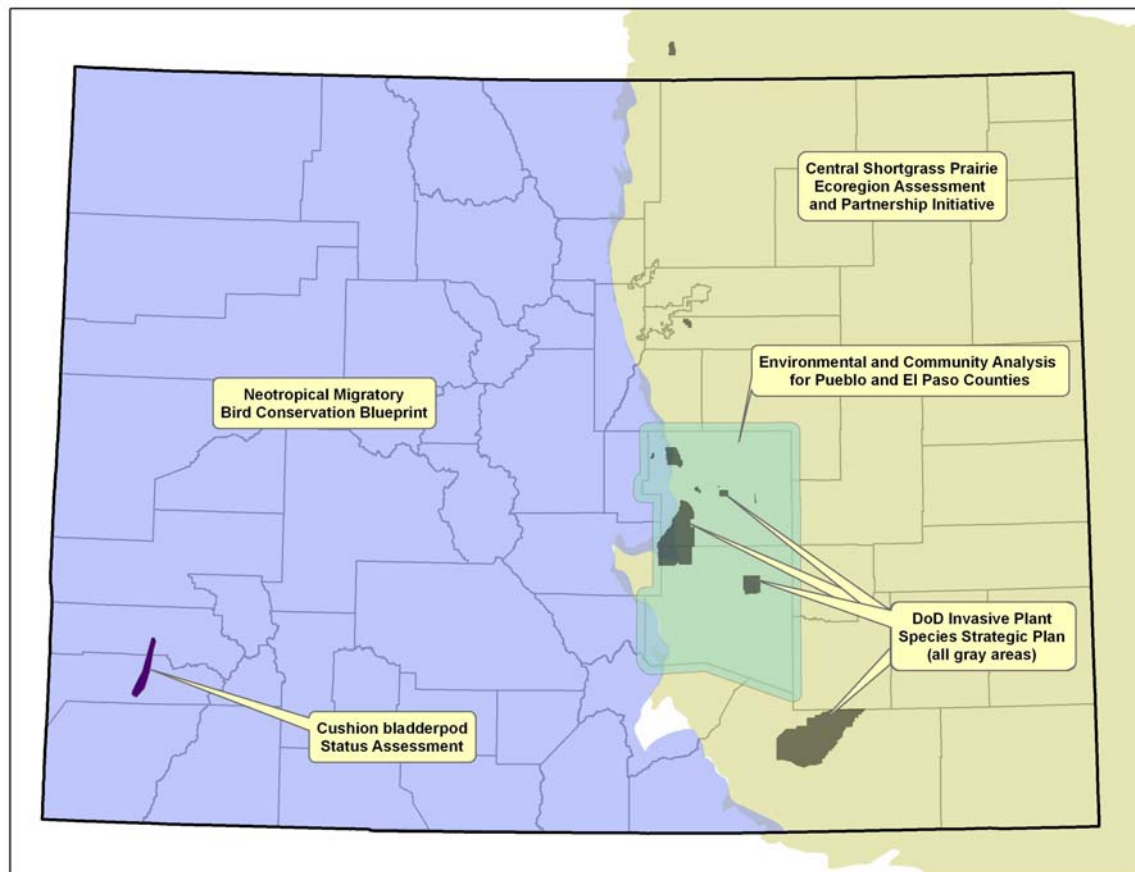
Department of Transportation Conservation Easement Monitoring

Renée Rondeau, Georgia Doyle, Lee Grunau, and Karin Decker

The third year of monitoring was conducted at a recently established conservation easement in Weld County, as well as first year monitoring for two additional easements in southeastern Colorado. The easements are held by The Nature Conservancy and were funded by the Colorado Department of Transportation as part of CDOT's Shortgrass Prairie Initiative. These easements were established on private ranches to protect habitat for a suite of declining prairie species. Target species include McCowans longspur, box turtle, bald eagle, burrowing owl, Cassin's sparrow, ferruginous hawk, lark bunting, loggerhead shrike, long-billed curlew, mountain plover, black-tailed prairie dog, massasauga, and Texas horned lizard.

The purpose of the monitoring was to document current vegetation conditions on the easements, and to provide means for assessing long-term viability of the habitats. Suitable habitat for targeted prairie species includes a variety of conditions based on percent of bare ground cover, vegetation height, and presence or absence of shrubs. Therefore, the monitoring included microplot measurements to estimate the percentage of bare ground and a visual obstruction method to measure vegetation height. Additionally, photo monitoring points were established at multiple locations. Annual monitoring within the easements will allow variation over time to be documented and will be used to help guide land management decisions.

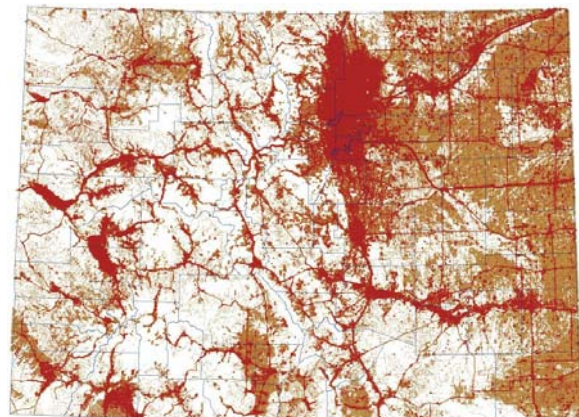
Conservation Planning



Measuring Colorado's Biodiversity Health

Renée Rondeau, Karin Decker, Chris Gaughan, Michelle Fink, Jill Handwerk, and Amy Lavender

How well is Colorado doing at maintaining and conserving functioning ecological systems that provide the foundation for our biodiversity? Which systems and species are most imperiled and what primary threats should we take action on if we want to be proactive. To answer the above questions The Nature Conservancy and CNHP have developed a “scorecard” approach that can help conservation planners, land managers, and politicians to understand the status of Colorado’s biodiversity today as well as measure trends. Through this approach we score species and ecological systems on



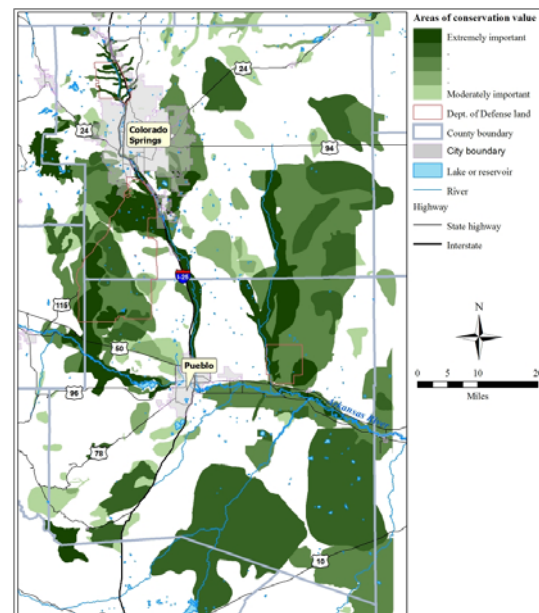
Landscape Integrity in Colorado: A distance-decay model representing cumulative impacts from oil and gas wells, urban development, surface mines, agriculture, and roads.

their abundance, quality, threats, and protection. Have we succeeded in protecting enough large patches of ponderosa pine that will ensure biodiversity success? Can we abate the primary threats to our large ecological systems? Did we succeed in conserving Colorado's rare or endemic plants and animals? Are the conservation status trends stable, upwards or downwards? These questions and many more can be answered through this scorecard approach. Colorado's economy relies on maintaining our natural heritage in a healthy and functioning state and we believe this scorecard approach will assist our planners and managers in assessing their actions. In addition to answering numerous conservation questions, this approach can also be used to assist with prioritizing future conservation efforts.

Geospatial Environmental and Community Analysis for Pueblo and El Paso Counties

Melissa Landon, Michelle Fink, Lee Grunau

The Federal Highway Administration selected Pueblo and El Paso Counties in Colorado as a test case for its Planning and Environment Linkages (PEL) initiative. The PEL initiative promotes conservation planning early in the planning stages of transportation decision-making as well as throughout the life of the project. CNHP, together with NatureServe and Placeways, LLC, were contracted to work on the first stage of this project. CNHP provided ecological data and expertise, NatureServe used the decision-support software, NatureServe Vista, to conduct initial conservation planning iteratively with growth, and development scenarios created via Placeways' community planning software, CommunityViz. This project began in June 2007 and was completed in January 2008.



Areas of important conservation value in Pueblo and El Paso Counties.

Central Shortgrass Prairie Ecoregional Assessment and Partnership Initiative

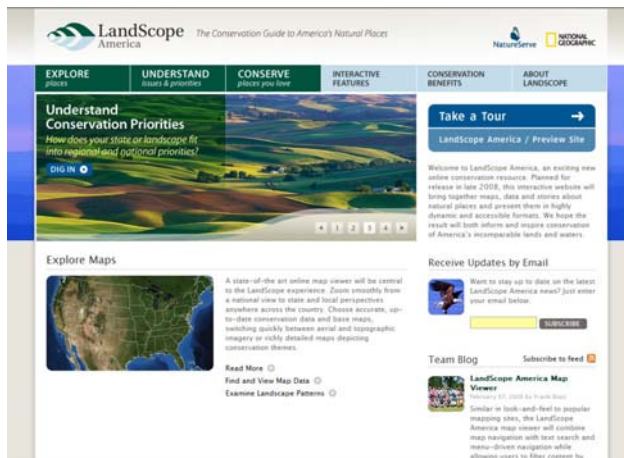
Renée Rondeau, Lee Grunau, Karin Decker, Michelle Fink, Chris Gaughan, John Sovell, Scott Schneider

Since 2004, CNHP has been working with the U.S. Department of Defense, Fort Carson, The Nature Conservancy, and the numerous other organizations and private landowners which make up the Shortgrass Prairie Partnership, on comprehensive and proactive conservation in the Central Shortgrass Prairie (CSP) ecoregion. Work accomplished in 2006-2007 includes development of the Partnership's Strategic Plan, as well as field inventory and predicted occurrence models for a sub-set of priority species. During 2007-2008, the Partnership will be developing and piloting a multi-species conservation

program that will address both long-term and temporary impacts to select species at risk. This program will be voluntary and incentive-based, and will potentially be modeled after mitigation banking, recovery credit systems, or other conservation implementation agreements. Supporting components of this work will include an in-depth threat analysis, identification of priority potential mitigation areas, and measures of success “scorecards.”

LandScape America: The Conservation Guide to America’s Natural Places

Melissa Landon, Lee Grunau, and Michael Menefee



LandScape website

LandScape America is an online conservation and educational guide for the land protection community and the public. LandScape America is a collaborative effort between NatureServe and the National Geographic Society is designed to increase the pace and effectiveness of land-protection investments in every state by offering a website that informs and inspires collaborative place-based conservation.

CNHP was selected as one of the pilot states to assist with implementation of

LandScape America. The LandScape Colorado sub-site will let the public immerse themselves in stories about Colorado’s lands told through a state-of-the-art map viewer that integrates detailed maps, text, photos, statistics, audio, and video about America’s natural places. The website will be a valuable resource for anyone carrying out land protection, including land trusts, state and local governments and natural resource agencies, and private landowners. It will provide providing a set of useful online tools for conservation planning and priority-setting by integrating, mapping, and viewing conservation priorities identified through multiple initiatives, at local, regional, and national scales.

The preview is available at <http://landscape.org>. The official site launch is scheduled for November 2008.

Rare Plant Conservation Initiative: Saving Colorado’s Wildflowers

Susan Spackman Panjabi, Jill Handwerk, Renée Rondeau, and Peggy Lyon

The Colorado Natural Heritage Program botany team is working with numerous partners to boost rare plant conservation successes across Colorado. The project vision is to conserve Colorado’s most vulnerable native plant species, and to secure a long-term funding source to facilitate conservation, education, and research (e.g., inventory, monitoring) for these vulnerable species. With at least 215 species currently considered vulnerable to extinction in Colorado, and soaring human population growth and

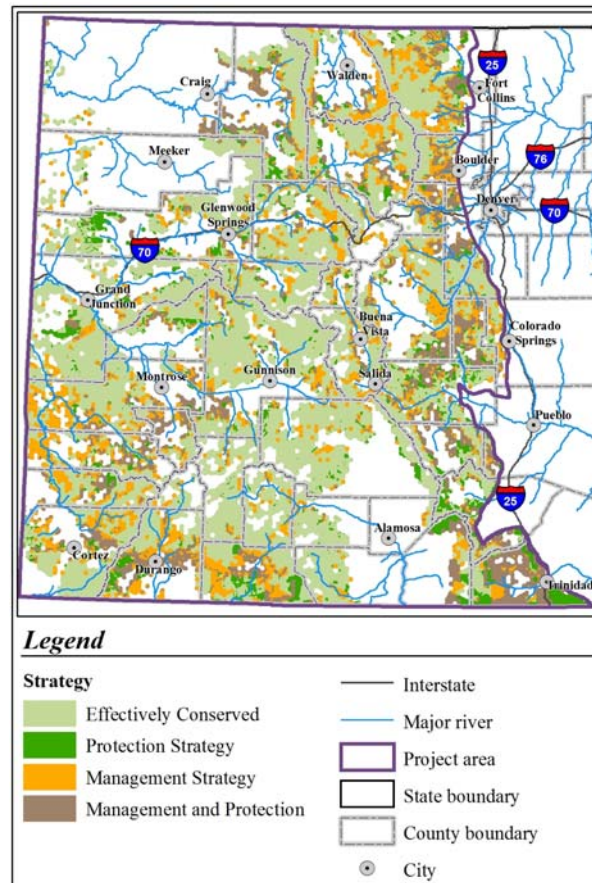
associated developments, Colorado's plants need attention. Although 13 species are federally listed as threatened or endangered, there is no legal protection for plants on the state level in Colorado. Our overall approach includes: 1) securing on-the-ground protection for plant species and their habitats by prioritizing species, developing appropriate strategies, and taking conservation action on both private and public lands; and 2) developing an overall statewide strategy for long-term conservation of native plants in Colorado including potential legislative initiatives and appropriations. This effort has grown out of the work of the Colorado Rare Plant Technical Committee, a statewide group consisting of professionals with expertise about Colorado's rare plants and representing a variety of federal and state agencies, universities, and non-governmental organizations.

A Conservation Blueprint for Neotropical Migratory Birds in Colorado

John Sovell, Michelle Fink, and Renée Rondeau

The purpose of this project was to incorporate land use, policy, and biological inputs to define areas representing the most important opportunities for conservation of Neotropical migratory birds in coniferous and aspen forest habitats in Western Colorado and to understand the current status and requirements for maintaining viable populations of these birds within the project area. We used NatureServe Vista, a decision-support software, and SPOT, a conservation portfolio optimization software, to analyze information about bird distribution, abundance, conservation priorities, quantitative conservation goals, threats to ecosystem stability, and current landscape integrity in order to identify conservation needs for these bird species.

Twenty-two forest-based bird species were used as conservation targets. Multi-year survey data from the Rocky Mountain Bird Observatory was combined with data from the CNHP's Biodiversity Tracking and Conservation System (BIOTICS) database for the target species. We used available statewide spatial data to determine general landscape integrity, current and future predicted land use, and policy mandated protection status. This information was then input in NatureServe Vista



Priority areas to target for conservation of forest birds in Western Colorado, classified by conservation strategy.

and SPOT projects and evaluated against varying conservation goal sets for the target species. Over 50,000 square kilometers (57%) of the resulting conservation portfolio was regarded as effectively conserved. The remaining portfolio area was divided among three conservation strategies based on habitat integrity and land status.

Results indicate that most of the birds that use coniferous and aspen forests in western Colorado have viable populations in high quality habitat with some level of policy-mandated protection. Those birds needing the most conservation action are Band-tailed Pigeon, Grace's Warbler, Gray Vireo, Lewis' Woodpecker, Northern Goshawk, and Olive-sided flycatcher. Suggested conservation strategies to assist with maintaining or increasing bird populations include identifying areas that are high quality but unprotected (either because of private ownership with no conservation easements or because of high levels of oil and gas development of public lands) or areas that are currently under some level of protection but require management for habitat improvement.

Cushion Bladderpod Status Report

Karin Decker, Peggy Lyon, Julie Crawford



CNHP staff surveying a population of cushion bladderpod

Physaria pulvinata (cushion bladderpod, G1S1) is newly described species endemic to the vicinity of the San Miguel Mountains in southwestern Colorado, in the upper drainages of the Dolores and San Miguel Rivers, where it is known from just three locations. In May of 2007, Colorado Natural Heritage Program staff surveyed portions of two known populations, revising the mapping of subpopulations, estimating numbers of individuals wherever possible, and establishing a permanent monitoring plot at one population. In response to a petition to list *P. pulvinata* under the

provisions of the Endangered Species Act, the US Fish and Wildlife Service contracted with CNHP to produce a status assessment of the species in order to determine whether listing was appropriate. *Physaria pulvinata* is apparently restricted to shale outcrops that are highly susceptible to impacts from soil disturbance. Ongoing sources of disturbance include recreational use, domestic livestock grazing, and road maintenance activities. These activities have had observable impacts on individual plants and their habitat, but have not yet become widespread throughout the known occupied area. Our assessment concluded that current information about the species is not sufficient to develop a proposed listing rule.

Front Range EcoRegional Partnership

Melissa Landon, Susan Spackman Panjabi, Karin Decker, and Fagan Johnson

Invasive Plant Species Strategic Plan

CNHP produced an Invasive Plant Species Strategic Plan that details a strategy for control of invasive plants found at nine military installations located along the Front Range of Colorado and Wyoming: Buckley Air Force Base, Cheyenne Mountain Air Force Station, Fort Carson Military Reservation, Francis E. Warren Air Force Base, Peterson Air Force Base, Pinon Canyon Maneuver Site, Pueblo Chemical Depot, Schriever Air Force Base, and the U.S. Air Force Academy. We reviewed noxious weed and other natural resource information available for all nine installations, and considered: invasiveness of the weed species, severity of the infestation, feasibility of control, and location of the infestation (e.g., proximity to significant natural resources). Results revealed that all of the highest priority weed infestations are found in areas that support important natural resources. It is therefore extremely important that weeds are controlled with careful consideration given to the natural systems present at the weed locations; the DoD will need to look beyond the goal of weed control per se, to the goal of restoring natural communities and native plant and animal populations. A sustained, long-term effort consisting of several complementary approaches will be necessary to abate the threat of noxious weed invasions to the natural resources managed by the DoD.

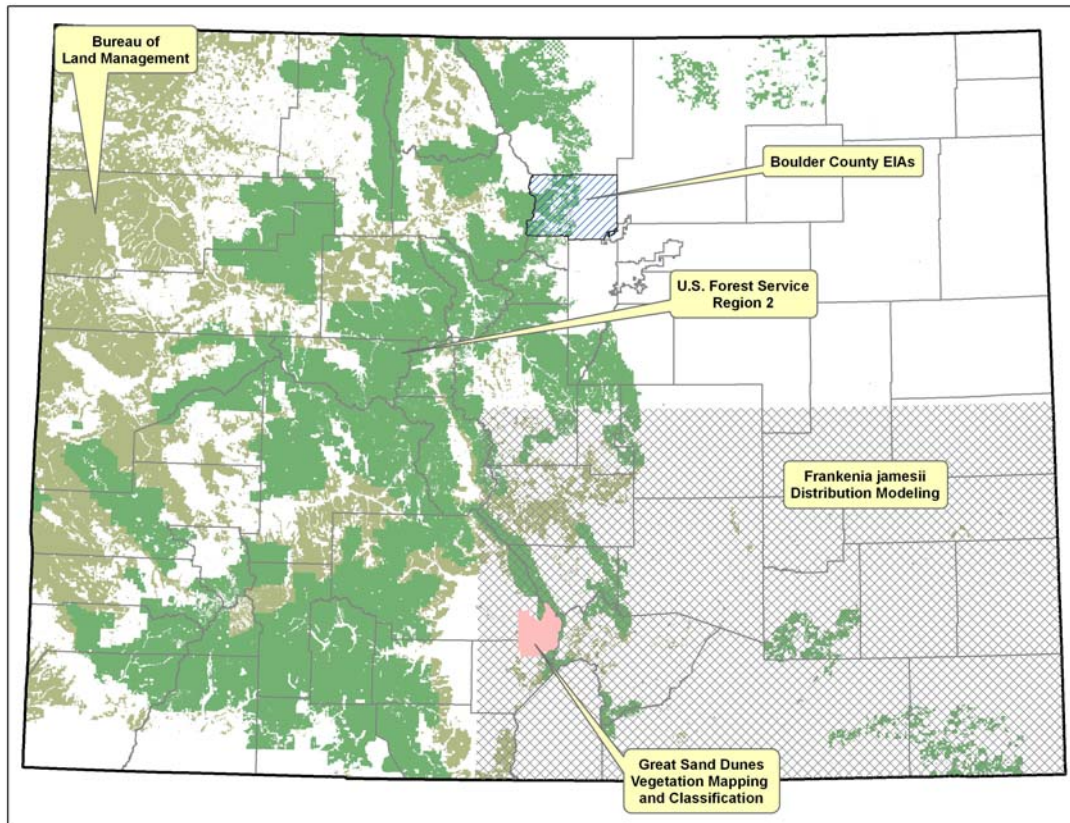
Partnership Website

Following completion of the strategic plan, CNHP has developed and currently hosts an EcoRegional Partnership webpage to assist with communication and collaboration among partners which includes the final strategic plan, other useful resources, and links to other pertinent websites.



Partnership Website

Vegetation Classification, Heritage Methodology, and Data Exchange



Vegetation Classification and Mapping of Great Sand Dunes National Park and Preserve

Joe Stevens, Kelsey Forrest, Jodie Bell

In September 2004, the Great Sand Dunes National Park and Preserve was created from the former Great Sand Dunes National Monument, expanding from about 39,000 acres to about 150,000 acres. Whereas the National Monument primarily protected the dune field, the expanded acreage protects the watershed critical to the ecological processes shaping the dune field. This project, funded by the National Park Service, is a multi-year effort to classify and map the diverse vegetation of the new Great Sand Dunes National Park and Preserve and its surrounding ecosystem. The project area boundary incorporates an ecological planning perspective and encompasses 413,000 acres, including alpine tundra, sub alpine and montane forests, lakes and wetlands on the basin floor, and everything in between.



View of the dune field from near the summit of Mt. Zwischen.

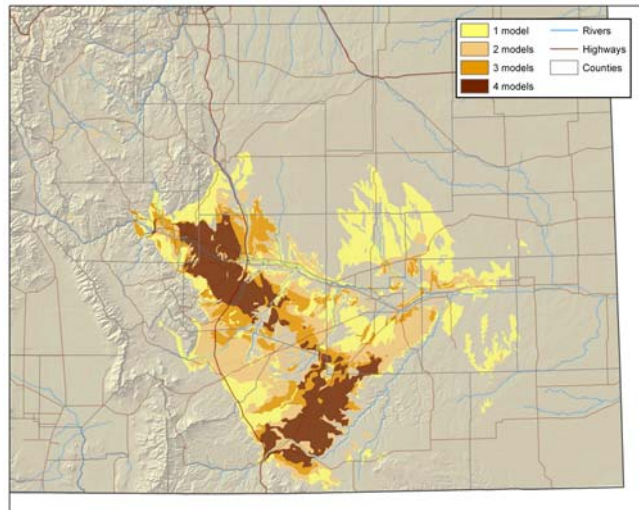
The project began in the late spring of 2005 and will continue through summer of 2009. To date, CNHP biologists have collected and classified field data to define the plant associations of the project area and to inform the photo-interpretation process used in creating the map. During the summer of 2008, CNHP field crews will use a field key and descriptions of the plant associations to collect accuracy assessment data to verify map accuracy. The final products from this project will be used in Park management and biological conservation efforts. Partners on the project include the National Park Service, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Bureau of Reclamation, U.S. Geological Service, NatureServe, and The Nature Conservancy.

Distribution of *Frankenia jamesii* in Colorado

Karin Decker, Michael Menefee

Frankenia jamesii is a perennial shrub of gypsiferous soils and alkaline shales that occurs in Colorado both in the Four Corners area, and in the southeastern quarter of the state. In support of a Denver Botanic Gardens (DBG) project investigating the potential for a biocontrol used to control invasive Tamarix to threaten *Frankenia jamesii* populations, CNHP provided DBG with information on known locations of *F. jamesii* in Colorado, and used this information to develop a range map of potential suitable habitat for *F. jamesii*.

Classification and regression tree analysis was used to produce several different models of potential habitat. Important factors in predicting presence or absence of the species were surface geology or soil type, and average precipitation in various months. The predicted range of *Frankenia jamesii* roughly follows the mapping of the Niobrara formation in southeastern Colorado. Primary formations are the Niobrara (Kn, Kns, and Knf), Carlile Shale, Greenhorn Limestone, and Graneros Shale (Kcg) and the Pierre Shale (Kp, Kpu, Kpm, Kpl). The most common soils corresponding to *F. jamesii* occurrences include the Manzanola, Limon, Kim, and Midway series, which are all slightly to strongly alkaline, well drained soils derived from shale, sandstone, or clay.



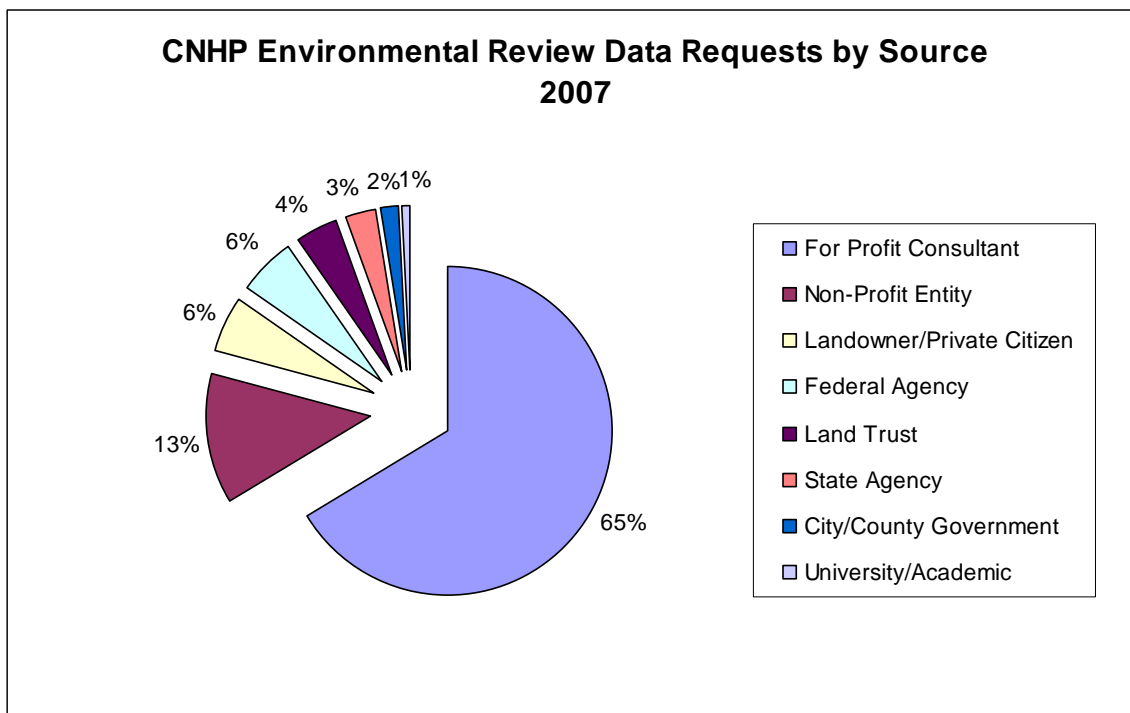
CNHP Data Distribution and Environmental Review Projects

Melissa Landon and Michael Menefee

Environmental Review

CNHP maintains the most comprehensive spatial database of element occurrence locations for sensitive species and natural communities for the state of Colorado. CNHP also maintains an extensive library of publications available for distribution, with subjects ranging from county biological inventories to rare plant field guides. For a nominal fee, CNHP will conduct a spatial search of our Biodiversity Tracking and Conservation System (BIOTICS) database for documented records of rare species, natural communities and critical conservation sites near or in a given project site. CNHP furnishes our clients with life history and habitat information for all tracked species and communities, as well as their legal protection status with various federal and state agencies. CNHP also supplies conservation site reports, custom mapping, spatial data and supporting tabular data for a wide variety of environmental review projects each year. Our information serves as a vital resource for a variety of planning, natural science, and information technology professionals.

During 2007, CNHP handled about 180 data requests (paid and non-paid) for a variety of projects in both the public and private sector. For example, CNHP provided critical data for a number of species assessments completed by federal and state agencies. In terms of total requests, for-profit consultants made up approximately two thirds of all data requests (see chart), with non-profit entity requests making up the next largest sources for data inquiries.



Threatened and Endangered Plant Species Data Development and Field Surveys

Jill Handwerk, Peggy Lyon and Julie Crawford

CNHP, the Colorado Natural Areas Program (CNAP), and the U.S. Fish and Wildlife Service (USFWS) initiated a partnership in 2003 to manage biological and conservation data on federally listed Threatened (LT), Endangered (LE), and Candidate (C) plant species occurring in Colorado. In 2007, element occurrence data for *Cryptantha gypsophila*, *Physaria pulvinata*, and *Sclerocactus glaucus* (LT) were updated. Field surveys were conducted for *Astragalus debequaeus*, *Astragalus equisolensis*, *Cryptantha gypsophila*, *Physaria pulvinata*, and *Phacelia submutica* (C). The data were provided to the USFWS and CNAP with an Arc Map Hyperlink Tool which links a GIS shape to its associated .pdf file containing tabular data for that particular element occurrence.

Additional USFWS Section 6 funding has been proposed for a sixth year of this project. The development of these data supports the management and conservation of these species by integrating all element occurrence data into a single comprehensive source.

Review and Evaluation of the National Park Service's Proposed National Natural Landmarks

Joe Stevens, Karin Decker

The National Park Service established the National Natural Landmarks program in 1962 to document and encourage preservation of sites possessing the best remaining examples of the biological and geological features of America's natural landscape. The NNL program is the only natural areas program recognizing outstanding examples of biological and geological features in both public and private ownership. Since its inception, the NNL program has designated as National Natural Landmarks over 600 sites across 48 U.S. States, 3 Territories, and the Commonwealth of Puerto.

The objective of this project is to evaluate the list of proposed NNL sites that have been nominated in Colorado and several other western States and to identify those sites that represent the most outstanding example of the features for which the site was nominated. CNHP scientists will work with the NPS and other geological and biological scientists to produce an evaluation report for the most significant of the proposed sites. The purpose of the evaluation report is to provide NPS decision makers with an assessment of whether a proposed site meets the national significance criteria for designation as an NNL. Over 150 sites in Colorado have been proposed as NNL's and will be evaluated over the course of the project. The project began in January 2008 and will conclude in 2012.

Ecological Integrity Assessments for selected Ecological Systems in Boulder County, Colorado.

Karin Decker

A fundamental requirement for conservation and management of natural landscapes is information about the composition and condition of the landscape. The ecological system is a practical working unit for both land managers and conservation professionals.

Assessing the current ecological condition or integrity of an ecosystem requires measuring the structure, composition, and function of that ecosystem in comparison to a reference or benchmark ecosystem operating within the bounds of natural or historic disturbance regimes. The City of Boulder contracted with CNHP to develop EIA scorecard documents for ten ecological systems managed by the city's Open Space and Mountain Parks department. Using an approach developed by NatureServe and the U.S. EPA for Ecological Integrity Assessment (EIA) of wetland ecosystem types, descriptive information for the selected systems was compiled from CNHP data and the scientific literature, and draft scorecard metrics were developed for five systems. These documents are intended to clarify the composition, distribution, and key ecological attributes of these systems as they appear in Colorado, and to assist with land management and conservation planning for the maintenance of these landscape level elements.

National Park Service Data Management Support

Melissa Landon, Michelle Fink, Fagan Johnson, Alison Loar, Marwan Obeidat

Species-related GPRA (Government Performance and Results Act) Goals

CNHP completed our eighth year of an on-going partnership with the National Park Service (NPS) to maintain and enhance a nationwide ESA Database (formerly called the T&E or Threatened and Endangered species database). This project consists of three main tasks: 1) development and maintenance of a database that contains information on the status and presence of T&E species in all NPS units; 2) development and maintenance of summary sheets describing the recovery plan requirements for listed T&E species; and 3) provide support and training to NPS personnel to utilize the data and summary statistics to comply with annual reporting requirements.

CNHP completed our fourth year of an on-going partnership with NPS to develop and maintain nationwide information on Species of Management Concern (SOMC) and Invasive Animals (INVA) on NPS lands. This project consists of three main tasks: 1) maintain current and past information on the presence, status, condition, source, and expenditures for SOMC and Invasive Animals by NPS unit; 2) update dataset yearly with input from parks and NPS regional personnel; and 3) provide support and training to NPS personnel to utilize the data and summary statistics to comply with annual reporting requirements.

NPSpecies Database

NPSpecies database

CNHP completed our third and final year of a partnership with NPS to maintain NPS biodiversity database system, NPSpecies, which stores, manages, and disseminates biological inventory and biodiversity information for all NPS units. This project encompassed five main tasks involving research, design, development, and implementation of: 1) tools to share biological inventory and biodiversity data in the internet NPSpecies database; 2) a

desktop NPSpecies application for data delivery to and from the internet NPSpecies application; 3) improvements to master reference datasets currently used in NPSpecies, including ITIS Taxonomic information, Parks information, Federal & State T&E Information, and NatureServe Global and State Rank Information; 4) tools to convert, manipulate, and upload data to the online NPSpecies database; and 5) tools and material to provide end-user training for NPSpecies.

Bureau of Land Management Data Processing and Statewide Dataset

Melissa Landon, Jodie Bell, Chris Gaughan, Jill Handwerk, Fagan Johnson, Amy Lavender, and Jeremy Siemers

CNHP completed our third year of our partnership with Colorado BLM to manage biological and conservation data on Threatened, Endangered, and BLM Sensitive/Special Status Species, and other rare or imperiled species on BLM lands. BLM personnel and botanists across the state submit field inventory data to CNHP annually. Our scientists and information managers incorporate these raw data into CNHP's BIOTICS (Biodiversity Tracking and Conservation System) database. Element occurrences are digitized in GIS, and supporting data are uploaded into associated tabular databases. BIOTICS serves as BLM's primary database for species of conservation concern. We provide BLM personnel with a comprehensive dataset for all BLM, U.S. Forest Service, and National Park Service lands within Colorado once per year in the form of a pre-packaged ArcGIS hyperlinked map document in which each Element Occurrence, Potential Conservation Area, and Network of Conservation Areas polygon is hyperlinked to its respective tabular report in PDF format. As part of this partnership, we also provide data and expertise on revisions to the BLM Sensitive/Special Status Species list, comment on the potential impacts of BLM projects and management plans, and work with the BLM to continually improve data management and distribution methods and tools.

U.S. Forest Service Region 2 Data Processing and Statewide Dataset

Melissa Landon, Jodie Bell, Chris Gaughan, Jill Handwerk, Fagan Johnson, Amy Lavender, and Jeremy Siemers

CNHP completed our 15th year an on-going partnership with Region 2 of the U.S. Forest Service (USFS) to manage biological and conservation data on Threatened, Endangered, Forest Service Sensitive, and other rare or imperiled species on USFS lands. Forest Service wildlife biologists and botanists across the state submit field inventory data to CNHP annually. Our scientists and information managers incorporate these raw data into CNHP's BIOTICS (Biodiversity Tracking and Conservation System) database. Element occurrences are digitized in GIS, and supporting data are uploaded into associated tabular databases. BIOTICS serves as the USFS's primary database for species of conservation concern. We provide each National Forest and Ranger District office with a comprehensive dataset for all USFS, Bureau of Land Management, and National Park Service lands within Colorado once per year in the form of a pre-packaged ArcGIS hyperlinked map document in which each Element Occurrence, Potential Conservation Area, and Network of Conservation Areas polygon is hyperlinked to its respective tabular

report in PDF format. As part of this on-going partnership, we also provide data and expertise on revisions to the USFS Sensitive Species list, comment on the potential impacts of USFS projects and management plans, and work with the USFS to continually improve data management and distribution methods and tools.

Editing assistance for NPS vegetation mapping reports

Karin Decker

The National Park Service (NPS), in cooperation with the Biological Resources Discipline of the US Geological Survey, is currently completing a multi-year process to map the vegetation of the National Parks. The Vegetation Mapping Program brings together resource managers, planners, and administrators from the parks with photo-interpretation specialists, ecologists, and data managers from other Federal agencies, State Natural Heritage Programs, and non-governmental organizations. The Northern Colorado Plateau Inventory and Monitoring Network of the NPS consists of 16 NPS units in Arizona, Colorado, Utah, and Wyoming. CNHP will provide technical writing and editing towards the completion of 14 final report documents to be produced under this process. NPS units included in this multi-year project are: Arches National Park, Black Canyon of the Gunnison National Park, Bryce Canyon National Park, Canyonlands National Park, Capital Reef National Park, Cedar Breaks National Monument, Curecanti National Recreation Area, Dinosaur National Monument, Fossil Butte National Monument, Golden Spike National Historic Site, Hovenweep National Monument, Natural Bridges National Monument, Pipe Spring National Monument, and Timpanogos Cave National Monument.

General Support from The Nature Conservancy

Renée Rondeau

Natural Heritage Programs and Natural Heritage Methodology began in the office of The Nature Conservancy (TNC) in the 1970's. Development of the biological conservation database and its associated methodology was so successful that Natural Heritage Programs were established in every state. At first, all Natural Heritage Programs were part of TNC, but over time they realized that the best placement for these effective conservation programs was within state entities. Although the Colorado Natural Heritage Program has been part of Colorado State University since 1994, TNC has maintained close ties. The continuing support of The Nature Conservancy through our General Support agreement allows this conservation partnership to flourish. CNHP has been extremely active with TNC's ecoregional assessment effort, measures of success, and local scale conservation planning. This year we are finalizing the framework for a State of the State for Colorado's Biodiversity. This biodiversity scorecard will be a living document that can measure the success of conservation action (see "Measuring Colorado's Biodiversity Health" abstract for more detail).

Recent Journal Publications by Colorado Natural Heritage Program Staff

Scherer, R. D., E. Muths, and **B.A. Lambert**. 2007. The effect of weather on survival in populations of boreal toads in Colorado, U.S.A. *Journal of Herpetology*. In Press.

Schorr, R.A., J.L. Siemers, P.M. Lukacs, J.P. Gionfriddo, **J.R. Sovell, R.J. Rondeau**, and M.B. Wunder. 2007. Using survival of rodents to assess quality of prairie habitats. *Southwestern Naturalist*. 52(4):552-563.

Schorr, R.A., P.M. Lukacs, and G.L. Florant. Body mass and winter severity as predictors of overwinter survival in a small hibernator, the Preble's meadow jumping mouse (*Zapus hudsonius preblei*). Accepted by *Journal of Mammalogy*.

Schorr, R.A., B.A. Lambert, C.R. Gaughan, J.L. Siemers, and E. Freels. Habitat use and home range of longnose leopard lizards (*Gambelia wislizenii*) on Cannonball Mesa, Canyons of the Ancients National Monument, Colorado. Submitted to *Herpetological Conservation and Biology*.

Schorr, R.A., C.A. Meaney, C.M. Hansen, and M.E. Bakeman. Co-occurrence of *Zapus hudsonius* and *Zapus princeps* in Colorado. Submitted to *Southwestern Naturalist*.

Online Web Projects

www.cnhp.colostate.edu/reports.html

Colorado Rare Plant Field Guide

Colorado Rare Plant Field Guide 2002 Update Spackman, S. and D. Anderson

Ecological Systems of Colorado

Front Range Ecoregional Management Partnership (FREPP)

Internet-based Biodiversity Database Workshop: an assessment of needs and tools, April 24 - 27, 2000

NSF-NatureServe Internet Data Delivery Workshop

U.S. Forest Service Technical Conservation Assessments by Colorado Natural Heritage Program authors

available at

www.cnhp.colostate.edu/reports.html or
www.fs.fed.us/r2/projects/scp/assessments/index.shtml

Anderson, D.G. (2004, August 9). *Gilia sedifolia* Brandeg. (stonecrop gilia)

Anderson, D.G. (2004, September 28). *Potentilla rupicola* Osterhout (rock cinquefoil)

Anderson, D.G. (2004, October 5). *Thelypodopsis juniperorum* (Payson) Rydberg (juniper tumblemustard)

Anderson, D.G. (2004, October 14). *Eriogonum coloradense* Small (Colorado buckwheat)

Anderson, D.G. (2004, November 8). *Neoparrya lithophila* Mathias (Bill's neoparrya)

Anderson, D.G. (2004, December 21). *Ipomopsis polyantha* (Rydberg) V. Grant (Pagosa ipomopsis)

Anderson, D.G. (2005, November 29). *Botrychium multifidum* (Gmel.) Rupr. (leathery grapefern)

Anderson, D.G. (2006, January 27). *Eriogonum exilifolium* Reveal (dropleaf buckwheat)

Anderson, D.G. (2006, February 27). *Eriogonum brandegeei* Rydberg (Brandegee's buckwheat)

Anderson, D.G. (2006, May 22). *Botrychium simplex* E. Hitchcock (little grapefern)

Anderson, D.G. (2006, June 12). *Potentilla ambigens* E. Greene (silky leaf cinquefoil)

Anderson, D.G. (2006, July 3). *Mentzelia chrysantha* Engelman ex Brandegee (golden blazing star)

Anderson, D.G. (2006, August 29). *Lesquerella pruinosa* Greene (Pagosa bladderpod)

Anderson, D.G. (2006, November 15). *Festuca hallii* (Vasey) Piper (Hall's fescue)

Anderson, D.G. (2006, November 30). *Festuca campestris* Rydberg (rough fescue)

Anderson, D.G. (2006, December 5). *Malaxis brachypoda* (A. Gray) Fernald (white adder's-mouth orchid)

Anderson, D.G. and D. Cariveau (2003, November 18). *Botrychium campestre* W.H. Wagner & Farrar (Iowa moonwort)

Anderson, D.G. and D. Cariveau (2004, April 12). *Botrychium hesperium* (Maxon & Clausen) W.H. Wagner & Lellinger (western moonwort)

Anderson, D.G. and D. Cariveau (2004, July 22). *Botrychium echo* W.H. Wagner (reflected grapefern)

Anderson, D.G., S. Neid, and K. Decker (2006, October 30). *Primula egaliksensis* Wormskjold ex Hornemann (Greenland primrose)

Decker, K. (2005, September 7). *Astragalus proximus* (Rydberg) Wootton & Standley (Aztec milkvetch)

Decker, K. (2005, December 20). *Astragalus wetherillii* Jones (Wetherill's milkvetch)

Decker, K. (2006, March 9). *Salix serissima* (Bailey) Fern. (autumn willow)

Decker, K. (2006, April 20). *Salix arizonica* Dorn (Arizona willow)

Decker, K. (2006, April 24). *Asclepias uncialis* Greene (wheel milkweed)

Decker, K. (2006, July 13). *Astragalus missouriensis* Nutt. var. *humistratus* Isely (Missouri milkvetch)

Decker, K. (2006, July 31). *Draba weberi* Price & Rollins (Weber's draba)

Decker, K. (2006, September 18). *Salix candida* Flueggé ex Wild. (sageleaf willow)

Decker, K. and D.G. Anderson. (2004, April 21). *Astragalus anisus* M.E. Jones (Gunnison milkvetch)

Decker, K., D.R. Culver, and D.G. Anderson. (2006, January 25). *Eriophorum chamissonis* C.A. Mey. (Chamisso's cottongrass)

Decker, K., D.R. Culver, and D.G. Anderson. (2006, February 6). *Eriophorum gracile* W. D. J. Koch (slender cottongrass)

Decker, K., D.R. Culver, and D.G. Anderson. (2006, March 22). *Kobresia simpliciuscula* (Wahlenberg) Mackenzie (simple bog sedge)

Neid, S.L. (2006, May 15). *Utricularia minor* L. (lesser bladderwort)

Neid, S.L., K. Decker, and D.G. Anderson. (2006, June 29). *Salix myrtillofolia* Anderss. (blueberry willow)

Panjabi, S.S. and D.G. Anderson (2004, August 31). *Cirsium perplexans* (Rydb.) Petrak (Rocky Mountain thistle)

Panjabi, S.S. and D.G. Anderson (2005, March 15). *Ipomopsis globularis* (Brand) W.A. Weber (Hoosier Pass ipomopsis)

Panjabi, S.S. and D.G. Anderson. (2006, April 5). *Ranunculus karelinii* Czern. (ice cold buttercup)

Panjabi, S.S. and D.G. Anderson. (2006, June 30). *Penstemon harringtonii* Penland (Harrington's beardtongue)

Panjabi, S.S. and D.G. Anderson. (2006, July 24). *Calochortus flexuosus* S. Watson (winding mariposa lily)

Panjabi, S.S. and D.G. Anderson. (2007, January 4). *Thalictrum heliophilum* Wilken & DeMott (Cathedral Bluff meadow-rue)

Panjabi, S.S. and D.G. Anderson. (2007, January 17). *Parnassia kotzebuei* Cham. ex Spreng. (Kotzebue's grass of parnassus)

Rocchio, J., M. March, and D.G. Anderson. (2006, March 20). *Epipactis gigantea* Dougl. ex Hook. (stream orchid)

Other Colorado Natural Heritage Program Documents and Reports Available on the Web

www.cnhp.colostate.edu/reports.html

2008 Documents and Reports

Geospatial Environmental and Community Analysis in Pueblo and El Paso Counties, Colorado - Landon, M., M. Fink, N. Gibson, and L. Scharf

Noxious Weed Survey of the U.S. Air Force Academy and Farish Outdoor Recreation Area-2007. Anderson, D.G. and A. Lavender (in progress)

Noxious Weed Monitoring at the US Air Force Academy - Year 3 Results – Anderson, D.G. and A. Lavender

Southeastern Colorado Survey of Critical Biological Resources 2007– Stevens, J., J.Sovell, D. Culver, K. Decker, L. Grunau, A. Lavender, C. Gaughan (in progress)

Survey of Critical Biological Resources Rio Blanco County, Colorado - Culver, D. P. Lyon, and J. Huggins

Survey of Critical Wetlands and Riparian Areas in Hinsdale County – Neid, S. and J. Jones (in progress)

Survey of Seeps and Springs on Bureau of Land Management lands in northern Hinsdale County 2006-2007 – Neid, S., D. Malone, and J. Jones

Survey of Selected Wetlands within the Bureau of Land Management White River Resource Area (Rio Blanco, Garfield, and Moffat Counties, CO) – Culver, D.

2007 Documents and Reports

A Conservation Blueprint for Neotropical Migratory Birds in Western Colorado – Fink, M. D.Hanni, D. Klute, J. Sovell, and R.Rondeau .

Assessing Wetland Condition in the Southern Rocky Mountains of Colorado Using a Vegetation Index of Biotic Integrity – Rocchio, J.

Bent's Old Fort National Historic Site Vegetation Classification and Mapping, A Report for the Southern Plains Network, Natural Resource Technical Report NPS/SOPN/NRTR—2007/049 – Stevens, J., K. Forrest, S.Neid, and M. Fink

Colorado Natural Heritage Program 2006/2007 Project Abstracts – Rondeau, R. et al.

Distributional Survey of Rare Small Mammals (Orders Insectivora, Chiroptera and Rodentia) in Colorado: Year Three – Siemers, J.L. and R.A. Schorr

Ecological Integrity Assessments for selected Ecological Systems in Boulder County, Colorado. – Decker, K.

Floristic Quality Assessment for Colorado Plant Communities – Rocchio, J.

Life-History and Ecology of the Greenback Cutthroat Trout – Coleman, M.A.

Noxious Weed Monitoring at the US Air Force Academy - Year 2 Results – Anderson, D.G. and A. Lavender

Pawnee Montane Skipper Post-fire Habitat Assessment Survey – September 2006 Sovell, J.

Rare Plant Surveys on Fort Carson 2006-2007 – Neid, S., and J. Handwerk

Rare Plant Survey of BLM Lands Gateway, Colorado – Lyon, P

Rare Plant Surveys on the Pinon Canyon Maneuver Site 2006-2007 – Neid, S., J. Handwerk, and S. Spackman Panjabi

Rare Plant Survey of Select Bureau of Land Management Lands in the Arkansas Canyon – Neid, S.

Sand Creek Massacre National Historic Site Vegetation Classification and Mapping, A Report for the Southern Plains Network, Natural Resource Technical Report NPS/SOPN/NRTR—2007/050 – S. Neid, J. Stevens, K. Forrest, and M. Fink

San Juan National Forest Botanical Survey of Fens – Lyon, P., M. Rohman, and J. Crawford

The Potential Distribution and Landscape Integrity of *Frankenia jamesii* (James' seaheath) in Southeastern Colorado – Decker, K.

White River National Forest Rare Plant Survey 2006 – Lyon, P., J. Huggins, and G. Doyle

2006 Documents and Reports

A Database for Tracking Populations of Endangered, Threatened, Proposed and Candidate Species in National Parks - Poster Presentation. Presented at the 20th Annual Meeting of the Society for Conservation Biology in San Jose, California June 24-28, 2006– Johnson, F., P. Dratch and L. Mehrhoff

Assessment of Conservation Targets, Viability, and Impacts to Biological Diversity on the Lowry Range – Grunau, L., J. Sovell, and R. Rondeau

Baca Grande Biological Assessment – Sovell, J.

Central Shortgrass Prairie Ecoregional Assessment and Partnership Initiative – The Nature Conservancy of Colorado and the Shortgrass Prairie Partnership: Neely, B., S. Kettler, J. Horsman, C. Pague, R. Rondeau, R. Smith, L. Grunau, P. Comer, G. Belew, F. Pusateri, B. Rosenlund, D. Runner, K. Sochi, J. Sovell, D. Anderson, T. Jackson and M. Klavetter.

Colorado Natural Heritage Program 2005/2006 Project Abstracts – Rondeau, R. et al.

Distributional Survey of Rare Small Mammals (Orders Insectivora, Chiroptera and Rodentia) in Colorado: Year Two – Siemers, J.L. and R.A. Schorr

Ecological Integrity Assessment and EPA Performance Measures for Wetland Mitigation – Faber-Langendoen, D., J. Rocchio, M. Schafale, C. Nordman, M. Pyne, J. Teague, T. Foti, and P. Comer

Grasshopper Monitoring on Pueblo Chemical Depot (2001-2003) – Sovell, J.R.

Issues in species recovery: an example based on the Wyoming Toad. *Bioscience* 56(9) 765-771 – Dreitz, V.

Longnose Leopard Lizard (*Gambelia wislizenii*) Home Range and Habitat Use on Cannonball Mesa, Colorado – Schorr, R.A. and B. Lambert

Lowry Range Biological Survey – Sovell, J., L. Grunau, M. Menefee, G. Doyle, and R. Rondeau

Modeling the Potential Distribution of Three Endemic Plants of the Northern Piceance and Uinta Basins –Decker, K., A. Lavender, J. Handwerk, and D.G. Anderson

Monitoring Low Density Avian Populations: An Example Using Mountain Plovers – Dreitz, V.J., P. Lukacs, and F. Knopf

Nest Success of Mountain Plovers Relative to Anthropogenic Edges in Eastern Colorado – Mettenbrink, C.W., V.J. Dreitz, and F.L. Knopf

Noxious Weed Monitoring at the US Air Force Academy - Year 1 Results – Anderson, D.G. and A. Lavender

Survey for Bats in Jackson County, Colorado – Schorr, R.A.

Survey of Critical Biological Resources in Grand County – Culver, D. and J. Jones

Survey of Critical Wetlands and Riparian Areas in Archuleta County – Freeman, K., M. March, and D. Culver

Survey of Critical Wetlands and Riparian Areas in Fremont County, Colorado – Neid, S.

Survey of Selected Wetlands within the Bureau of Land Management Kremmling Field Office Management Area (Grand County, Colorado) – Jones, J. and D. Culver

The Third Annual Rare Plant Symposium – CNHP et al.

Vegetation Index of Biotic Integrity for Southern Rocky Mountain Fens, Wet Meadows, and Riparian Shrublands: Phase 1 – Rocchio, J.

2005 Documents and Reports

Botanical Survey of Winter Park Resort, Arapaho National Forest, Grand County, Colorado – Anderson, D.G. and J.E. Handwerk

Bureau of Land Management San Luis Valley Forest Fuel Reduction Monitoring Project – Stevens, J.

Colorado Natural Heritage Program 2004 Abstracts – Rondeau, R., et al.

Fraser Valley Parkway Boreal Toad Habitat Inventory – Gaughan, C. and L. Grunau

Modeling the potential distribution of *Phacelia scopulina* var. *submutica* (Debeque phacelia) and *Astragalus debequaeus* (Debeque milkvetch) in western Colorado – Decker, K., A. Lavender, J. Handwerk, and D.G. Anderson.

NSF-NatureServe Internet Data Delivery Workshop (Website) – Johnson, F. and M. Landon

Pawnee Montane Skipper Post-fire Habitat Assessment Survey, September 2004 – J. Sovell

Rare Plant Survey of San Juan Public Lands – Lyon, P. and J. Hanson

Resolving Conflicts Of Mountain Plovers (*Charadrius montanus*) Breeding On Agricultural Lands In Colorado – Dreitz, V.

Survey of Critical Biological Resources, Larimer County, Colorado – Doyle, G., S. Neid, and R. Rondeau

Survey of Critical Wetlands and Riparian Areas in Dolores County – March, M., D. Culver, P. Lyon, J. Hanson, and S. Eastin

Survey of Rare Plants, San Juan Public Lands in Dolores and Montezuma Counties, Colorado – Lyon, P. and J. Hanson

The Second Annual Rare Plant Symposium – CNHP, et al.

Vegetation Monitoring at Pueblo Chemical Depot, 1998-2003: 2003 Update – Rondeau, R.

2004 Documents and Reports

2004 Rare Plant Symposium - Presentation – Spackman Panjabi, S.

2004 Rare Plant Symposium - Meeting Minutes – CNHP, et al.

Assessment of Critical Biological Resources, La Plata County, Colorado – Lyon, P., J. Huggins, J. Lucht, D. Culver, M. March, and J. Hanson

Biological Inventory of the Colorado Canyons National Conservation Area – Stevens, J.

Black-Tailed Prairie Dog Surveys of BLM Lands in Eastern Colorado – Assal, T.J. and J.R. Sovell

Canyon of the Ancients National Monument Amphibian and Reptile Inventory – Lambert, B.

CDOT Noxious Weed Mapping Project, Final Report by the Colorado Natural Heritage Program, July 2000 to June 2004 – Johnson, F.

Colorado Natural Heritage Program 2003 Project Abstracts – Rondeau, R., et al.

Conservation and Management Plan for Colorado Butterfly Plant and Preble's Meadow Jumping Mouse on F.E. Warren Air Force Base – Grunau, L., R. Schorr, and J. Handwerk

Great Sand Dunes National Monument and Preserve 2003 Vascular Plant Inventory – Spackman Panjabi, S., K. Decker, G. Doyle, and D.G. Anderson

Montane Mollusk and Crustacean Survey of Western Colorado, 2003 Annual Report – Sovell, J.R. and R. Guralnick

Natural Heritage Inventory of Rare Plants, Animals and Plant Communities on Peterson Air Force Base, Colorado Springs, Colorado, Update to Final Report 1997 – Schorr, R. and R. Abbott

Pawnee Montane Skipper Post-fire Habitat Assessment Survey, September 2004 – CNHP

Population Parameters and Fat Composition of Small Mammals on Pueblo Chemical Depot (2000-2003) – Sovell, J.R., B.A. Wunder, P.M. Lukacs, J.P. Gionfriddo, and J.L. Siemers

Population Status Survey of Schmoll's Milkvetch (*Astragalus schmollii* C.L. Porter) – Anderson, D.G.

Survey and Assessment of the "Alamosa Marshes" area, San Luis Valley, Colorado – Rocchio, J.

Survey of Critical Wetlands, Bureau of Land Management Lands, South Park, Park County, Colorado 2003-2004 – Culver, D.

Survey of Critical Wetlands and Riparian Areas in La Plata County, Colorado – March, M., P. Lyon, D. Culver, and J. Huggins

Survey of Critical Wetlands and Riparian Areas in Southern Alamosa and Costilla Counties, San Luis Valley, Colorado – Rocchio, J.

Visiting Insect Diversity and Visitation Rates for Seven Globally - Imperiled Plant Species In Colorado's Middle Arkansas Valley – Spackman Panjabi, S.

Wetland Classification of Blanca Wetlands, San Luis Valley, Colorado – Rocchio, J.

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Assessment of Riparian and Wetland Areas within the Buffalo-Stillwater-Gilsonite Allotment Analysis Area, Arapaho National Forest, Grand County, Colorado – Rocchio, J., Doyle, G., and R. Rondeau

Black-Tailed Prairie Dog Surveys in Crowley, Otero, Pueblo and Eastern Huerfano Counties, Colorado – Sovell, J.

Distributional Survey of Rare Small Mammals (Orders Insectivora, Chiroptera and Rodentia) in Colorado: Year One – Siemers, J.L., R.A. Schorr, and A.C. Rinker

Field Guide to the Wetland and Riparian Plant Associations of Colorado – Carsey, K., G. Kittel, K. Decker, D.J. Cooper, and D. Culver

Florissant Fossil Beds National Monument Vascular Plant Inventory – Spackman Panjabi, S. and S. Anderson

Meadow Jumping Mice (*Zapus hudsonius preblei*) on the U.S. Air Force Academy El Paso County, Colorado: Populations, Movement and Habitat from 2000-2002 – Schorr, R.

Noxious Weed Survey of Peterson Air Force Base – Anderson, D.G., A. Lavender, and R. Abbott

Noxious Weed Survey of the U.S. Air Force Academy and Farish Outdoor Recreation Area – Anderson, D.G., A. Lavender, and R. Abbott

Potential Habitat for Mountain Plovers on Colorado Springs Utilities Property – Margulies, M. and J.R. Sovell

San Juan County Biological Assessment – Lyon P., D. Culver, M. March, and L. Hall

Statewide Wetlands Classification and Characterization, Final Report, April 2003 – Carsey, K., G. Kittel, K. Decker, D.J. Cooper, and D. Culver

Survey of Bent's Old Fort National Historic Site for Breeding Birds and Anurans, May 2002 – Gionfriddo, J., and J. Stevens

Survey of Critical Wetlands and Riparian Areas in Gunnison County – Rocchio, J., G. Doyle, and R. Rondeau

Survey of Critical Biological Resources of Pueblo County, Colorado – Spackman Panjabi, S., J. Sovell, G. Doyle, D. Culver, and L. Grunau

Survey of Selected Seeps and Springs within the Bureau of Land Management's Gunnison Field Office Management Area (Gunnison and Saguache Counties, Colorado) – Doyle, G.

Surveys for Boreal Toads (*Bufo boreas boreas*) in and near the Northern Portion of the Powderhorn Wilderness, Gunnison and Hinsdale Counties, Colorado: Summer 2002 – Gionfriddo, J.P. and B. Lambert

Upper San Juan Basin Biological Assessment – Sovell, J., P. Lyon, and L. Grunau

Vegetation Monitoring at Pueblo Chemical Depot: 1998-2002 – Rondeau, R.

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Great Sand Dunes National Monument and Preserve Vascular Plant Inventory (2002 report) – Spackman Panjabi, S. and K. Decker

Monument Creek Watershed Landscape Assessment – Armstrong, J. and J. Stevens

Pueblo Chemical Depot Grasshopper Monitoring: 2002 Results – Sovell, J.R. and S. Schneider

Rare Plant Survey, San Juan National Forest – Lyon, P. and M. Denslow

Survey of Critical Wetlands and Riparian Areas in Mesa County – Rocchio, J., G. Doyle, P. Lyon, and D. Culver

Survey of Seeps and Springs within the Bureau of Land Management's Grand Junction Field Office Management Area (Mesa County, Colorado) – Doyle, G., J. Rocchio, and D. Culver

2001 Documents and Reports

Conservation Assessment for Mountain Plover (*Charadrius montanus*) in South Park, Colorado – Grunau, L. and M. Wunder

Ecological System Viability Specifications for Southern Rocky Mountain Ecoregion, 1st edition – Rondeau, R.

Gunnison Gorge National Conservation Area Survey of Impacts on Rare Plants – Lyon, P. and M. Denslow

Inventory and Status Report of American Ground Nut (*Apios americana* Medicus) in Colorado – Anderson, D.G. and S. Spackman

Meadow Jumping Mice (*Zapus hudsonius preblei*) on the U.S. Air Force Academy, El Paso County, Colorado – Schorr, R.

Park County Inventory of Critical Biological Resources – Spackman, S., D. Culver, and J. Sanderson

Pueblo Chemical Depot Grasshopper Monitoring: 2001 Results – Sovell, J.R., and S. Schneider

Statewide Wetlands Classification and Characterization: Wetland Plant Associations of Colorado. Preliminary Report 1999-2001 – Carsey, K., D. Cooper, K. Decker, D. Culver, and G. Kittel

Survey of Critical Biological Resources, El Paso County, Colorado – Doyle, G., J. Armstrong, J. Gionfriddo, D.G. Anderson, J. Stevens, and R. Schorr

Survey of Critical Biological Resources, Garfield County, Colorado, Volume I – Lyon, P., J. Sovell, and J. Rocchio

Survey of Critical Biological Resources of Garfield County, Colorado, Volume II: Survey of Critical Wetlands and Riparian Areas in Garfield County – Rocchio, J., J. Sovell, and P. Lyon

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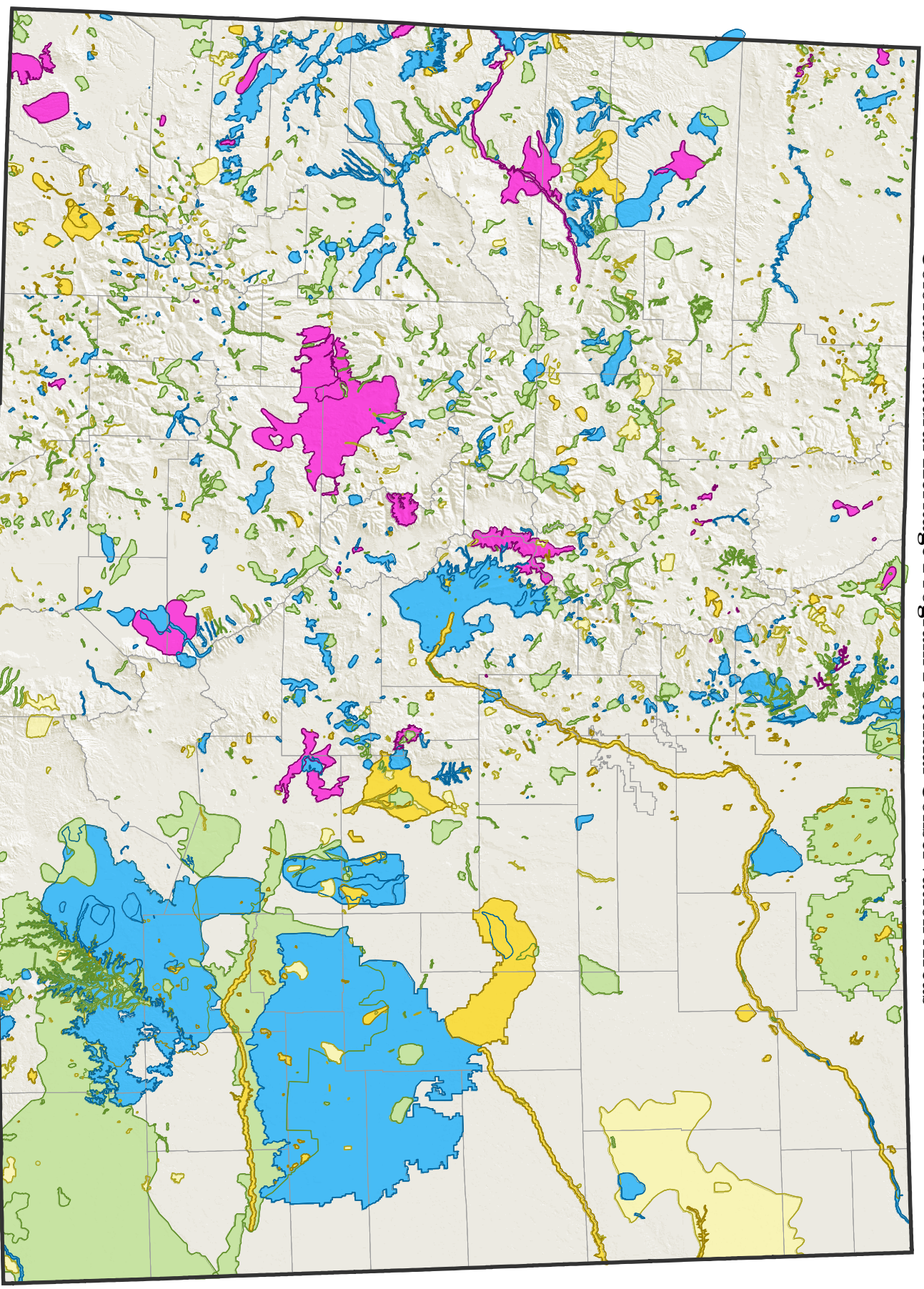
Colorado Natural Heritage Program

Mission Statement

To preserve the natural diversity of life
by contributing the scientific foundation that leads
to lasting conservation of Colorado's biological wealth.



Colorado Natural Heritage Program Potential Conservation Areas



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Miles
Version Date: May 6, 2008

Biodiversity Significance Rank

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