

Colorado Natural Heritage Program

2006/2007 Project Abstracts



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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.

Cover photo: T. Wright Dickinson (Moffat County rancher), Geoff Blakeslee (The Nature Conservancy), and Renée Rondeau (CNHP) contemplate the life history strategy and impacts from grazing for the rare and elusive narrow-leaf evening primrose (*Oenothera acutissima*).

From the Director:

The worst of winter seems to be behind us, but I believe the effects will be with us for quite sometime - especially in SE Colorado, where one of the worst blizzards in history killed thousands of cattle and left ranchers wondering if they could survive the event. Here in Fort Collins we had one of the coldest winters in decades, with snow staying on the ground for a near record number of days. Is this a sign of global climate change? Does the weather pattern just keep getting weirder and weirder? One of CNHP's staff calls global warming "global weirdness." He may have hit the nail on the head. In addition to thinking about global climate change, we are forced to realize that by the year 2030, Colorado's population will likely increase by about 50%. In response to these expected changes in our environment, we are working on improving ways to prioritize conservation action and measure success. The recipe goes something like this: understand the location and viability of our rare species and plant communities as well as common or major ecosystems. Now add predictive modeling to help anticipate what may happen to our landscapes in the next 30 to 50 years; define indicators that can help monitor changes; and review the big picture. This is what we call our "Measuring Colorado's Biodiversity Health and Conservation Success" project, a partnership project with The Nature Conservancy. Much of the information needed for this project exists in our centralized conservation database, but additional data gathering and analysis are also needed. Some of this new information was gathered from the other 40 projects described in this booklet.



CNHP's projects over the past year ranged from on-the-ground inventories and monitoring of our rarest species and plant communities, to developing management plans for new open space lands, to modeling potential habitat for rare species and more. These projects were done in consultation and collaboration with many partners, including federal, state, and local governments, land trusts, and private landowners. Our work was so diverse last year that it is extremely hard to touch on all of the highlights, but I'll throw out the following tidbits to wet your appetite. Our inventory projects discovered a new wetland plant species for Colorado, flatleaf bladderwort (*Utricularia intermedia*), in the San Juan Mountains, and a rare dragonfly, the bleached skimmer, in southeast Colorado, only known from 15 other places in the world. We discovered new occurrences of small mammals not seen for over 20 years, over 30 new locations of Arkansas Valley rare plants, and three new boreal toad breeding sites. One of our small, but favorite projects was joining hands with local ranchers to locate the rare and elusive narrow-leaf evening primrose (*Oenothera acutissima*). The local ranchers in Moffat County invited us to help them understand more about this rare plant so that they might be able to protect it and thus keep it off the Endangered Species list. It is this type of communication and collaboration that brings us hope that through inventory, planning, research, monitoring, and working together to put knowledge into action, we can adjust our lifestyles in ways that will benefit our natural heritage. The results of our 40 projects can also be seen in our database, as we now have 19,800 (almost 4,000 new!) mapped locations of rare elements and over 1,900 potential conservation areas.

As always, please stop by if you are near our office—we have a new look!

A handwritten signature in cursive script that reads "Renée J. Rondeau".

Renée J. Rondeau
April 11, 2007

Colorado Natural Heritage Program 2006/2007 Project Abstracts

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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.

2006/2007 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.

Narrow-leaf evening primrose
(*Oenothera acutissima*), a globally
imperiled plant surveyed during 2006 in
Moffat County in NW Colorado.

Primary Funders (in alphabetical order)

City of Fort Collins



Bell's Twinpod Monitoring in Larimer County
Soapstone Prairie Natural Area Management Planning

Colorado Department of Natural Resources



Survey of Critical Wetland Resources in Hinsdale County
CO Floristic Quality Assessment
Vegetation Index of Biotic Integrity for CO Wetlands

Colorado Department of Transportation



CDOT Conservation Easement Monitoring

Colorado Division of Wildlife



Bat Survey in Jackson County
Boreal Toad Monitoring and Survey
Colorado Comprehensive Wildlife Strategy
CO Small Mammal Survey
A Conservation Blueprint for Neotropical Migratory Birds in Colorado
Cheatgrass Control Study in Dry Creek Basin
Vegetation Index of Biotic Integrity for Colorado Wetlands
Survey of Critical Wetland Resources in Hinsdale County
CO Floristic Quality Assessment

Colorado Natural Areas Program



Bug-shaped Boatseed Survey in Jackson County
Rare Plant Survey of the Arkansas River Valley

Colorado State Board of Land Commissioners



Lowry Range Biological Survey and Conservation Plan

Colorado State Parks



Rare Plant Survey of the Arkansas River Valley

Denver Water



Pawnee Montane Skipper Post-fire Habitat Assessment Survey

Mountain Studies Institute



GLORIA – Global Observation Research Initiative in Alpine Environments

National Fish and Wildlife Foundation



Pagosa Skyrocket Conservation Planning and Inventory

National Park Service



Vegetation and Mapping of Great Sand Dunes National Park and Preserve
Vegetation and Mapping of Bents's Old Fort and Sand Creek Massacre National Historic Sites
Rare Species Survey of Sand Creek Massacre NHS
NPS Databases



NatureServe
CNHP Environmental Review and Data Distribution Projects

The Nature Conservancy



Measuring Colorado's Biodiversity Health
Central Shortgrass Prairie Ecoregional Assessment
Narrow-leaf Evening Primrose Survey in Moffat County
Bug-shaped Boatseed Survey in Jackson County
General Support from TNC
San Juan Biodiversity Planning

CDOT Conservation Easement
Monitoring
Rare Plant Conservation Initiative
Conservation Learning Network
Workshops

Rocky Mountain Bird Observatory



A Conservation Blueprint for Neotropical Migratory Birds in Colorado

U.S. Bureau of Land Management



Home Range and Habitat Use of the Long-nosed Leopard Lizard in Canyons of the Ancients

Rare Plant Survey of the Arkansas River Valley

Plant Inventory and Monitoring in Gunnison Gorge NCA

Rare Plant Survey of San Juan Public Lands

BLM Data Processing and Statewide Dataset

Narrow-leaf Evening Primrose Survey in Moffat County

Survey of Critical Wetland Resources in Hinsdale County

San Juan Biodiversity Planning

U.S. Department of Defense

Rare Plant Surveys of Fort Carson and Piñon Canyon Maneuver Site

Buckley AFB Wildlife Management Plan



Central Shortgrass Prairie Ecoregional Assessment

Triploid Colorado Checkered Whiptail Survey of Piñon Canyon Maneuver Site

Noxious Weed Monitoring at the U.S. Air Force Academy

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

Front Range EcoRegional Partnership Project – Invasive Species Strategic Plan

Ecological Monitoring Program Assessment for Fort Carson and Piñon Canyon Maneuver Site

U.S. Environmental Protection Agency



Survey of Critical Wetland Resources in Hinsdale County

Vegetation Index of Biotic Integrity for CO Wetlands

Colorado Floristic Quality Assessment

U.S. Fish and Wildlife Service

A Conservation Blueprint for Neotropical Migratory Birds in Colorado

Pawnee Montane Skipper Post-fire Habitat Assessment Survey



Threatened and Endangered Plant Species Data Development and Element Distribution Modeling

Pagosa Skyrocket Conservation Planning and Inventory

Noxious Weed Monitoring at the U.S. Air Force Academy

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

U.S. Forest Service

Rare Plant Survey of San Juan Public Lands

Rare Plant Survey of White River National Forest

Survey of Critical Wetland Resources in Hinsdale County



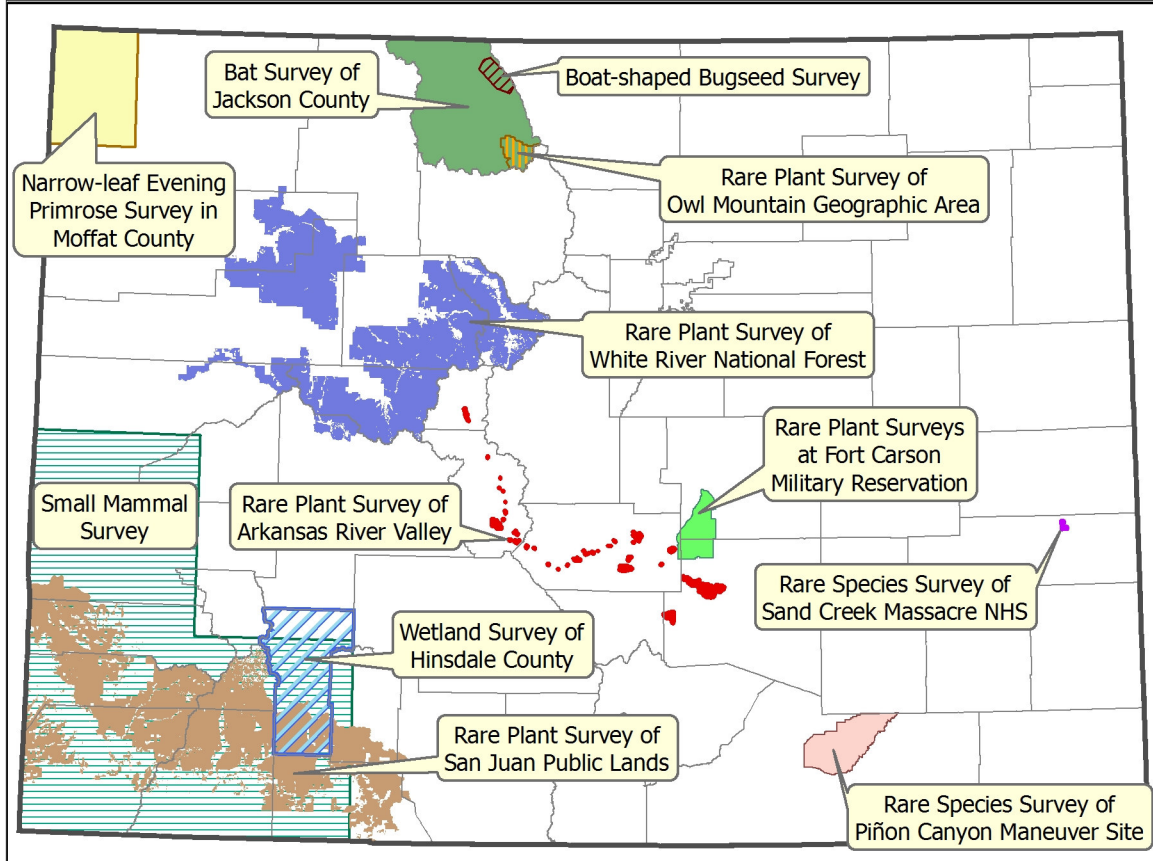
Rare Plant Survey of Owl Mountain Geographic Area

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

Pawnee Montane Skipper Post-fire Habitat Assessment Survey

U.S. Forest Service Region 2 Technical Conservation Assessments and Updates

Inventory



Bat Survey in Jackson County

Rob Schorr, Bobby Weidmann, and Jeremy Siemers

In 1876, U.S. Army Captain Elliott Coues was conducting biological surveys for the U.S. Geological Survey when he found a silver-haired bat (*Lasiurus noctivagans*) in the Walden area. Shockingly, after 130 years no other bat species had been documented from Jackson County. Because of this information gap in a wildlife-rich area of Colorado and the lack of information on bats in general, the Colorado Division of Wildlife funded CNHP to conduct a bat inventory of Jackson County during August 2006. Four new bat species were recorded for Jackson County, including the little brown bat (*Myotis lucifugus*), the hoary bat (*Lasiurus cinereus*), the long-legged myotis (*Myotis volans*), and the long-eared myotis (*Myotis evotis*). With support from the U.S. Forest Service, CNHP hopes to return in 2007 to conduct follow-up surveys in the southwestern section of Jackson County.



Long-eared myotis in Jackson County.

Triploid Colorado Checkered Whiptail Survey and Distributional Modeling at Piñon Canyon Maneuver Site

John Sovell and Jodie Bell

To actively protect or enhance a given species at risk, spatially explicit data of their distribution must first be available to the conservation community. The Department of Defense funded CNHP to perform a survey for the triploid Colorado checkered whiptail (*Aspidoscelis neotesselata*), a rare lizard, at the Piñon Canyon Maneuver Site (PCMS) during the summer of 2006. Data collected included population and habitat information



A triploid Colorado checkered whiptail peers out from beneath a juniper tree.

that will assist with management of the species. A total of 45 locations within PCMS were intensely surveyed and whiptails were recorded at 20 (44%) of these locations. Environmental data from the sites surveyed are being used to develop a species distribution model that will help identify the boundaries of suitable habitat for this whiptail within its entire range of southeast Colorado. Multiple spatial statistical methodologies (e.g., GLM, GAM, CART) in the software programs R and ArcGIS are being used to develop this model. Species distribution

models using environmental covariates will allow CNHP to extrapolate the highest probability areas where the whiptail may occur within its current known range, which should boost the efficiency of inventories in unsearched areas of the species range. By identifying likely areas of suitable habitat for this species, the distribution model will also assist with the conservation and management of this rare species.

Rare Plant Survey of White River National Forest

Peggy Lyon, Janis Huggins and Georgia Doyle

The White River National Forest contracted with CNHP to perform a survey of rare plants, with emphasis on those species that are considered sensitive on the forest. As demands for recreation and resource extraction increase, updating known occurrences of sensitive species – especially historical and imprecise (general) records – and surveying new areas is of amplified importance. Formerly “sensitive” species are sometimes found to be more widely distributed or abundant than previously determined, surveys may produce new species for concern as well as species previously unknown in the area, and often provide more exact location, size and condition data. These actions provide more accurate information for management and planning and help



Sea pink along the Continental Divide near Webster Pass, Summit County.

assess actual rarity and need for concern. Species lists of areas surveyed further characterize plant associations and communities and are an aid in future searches for sensitive plants.

Field work for this project was begun in late April 2006, at the lowest elevations on the forest, where the primary target was Debeque phacelia (*Phacelia submutica*), an annual plant, which failed to appear in 2006 in known locations. In June, we continued up in elevation to the Flat Tops, and beginning on July 4, concentrated on alpine areas along the Continental Divide. We documented 61 new or updated occurrences of 27 species, and prepared species lists for 40 sites.

Of special interest are a number of plants that occur only in the Central Rockies, or are disjunct from much more northern locations. For instance, *Armeria maritima* ssp. *siberica*, or “sea pink” is known in the Continental U.S. only from two locations on the White River National Forest, and otherwise occurs in Canada and Greenland.

Narrow-leaf Evening Primrose Survey in Moffat County

Renée Rondeau, David G. Anderson, and Denise R. Culver

In June 2006, CNHP was funded by the Bureau of Land Management, The Nature Conservancy, and an in-kind contribution by a local rancher, to update element occurrences for the narrow-leaf evening primrose (*Oenothera acutissima*) primarily in Moffat County, Colorado. The narrow-leaf evening primrose is a globally imperiled (G2 S2) species that is endemic to northwest Colorado and northeast Utah. It occurs on two distinct geologic formations: Uinta Mountain Group quartzite derived from the Precambrian Age, and Browns Park Formation derived from sedimentary rocks of Tertiary Age. The plant is situated in either rock crevices, rock “reefs” or narrow ephemeral drainages that are able to retain moisture from precipitation or melting snow.



Narrow-leaf evening primrose.

This project was a result of a field trip led by Renée Rondeau, CNHP’s Director and Chief Scientist, and Dave Anderson, CNHP’s Botany Team Leader, with concerned public and private land managers. The field trip was prompted by a petition for Federal Listing of the narrow-leaf evening primrose. Following the field trip, CNHP visited 19 narrow-leaf evening primrose occurrences that had not been visited in over 20 years. The species was documented at six of the 19 occurrences, with an estimated total abundance of 2,200 individuals. A continuation of this project is proposed for 2007. This project is an excellent example of partners pooling resources to obtain current data for making conservation decisions.

Boat-shaped Bugseed Survey in Jackson County

David G. Anderson



TNC's Paula Guenther-Gloss with the boat-shaped bugseed at the East Sand Hills, where surveys were conducted under inclement weather conditions.

Prior to the summer of 2006, the boat-shaped bugseed (*Corispermum navicula*) had been known only from two specimens collected in the North Sand Hills of Jackson County. This area receives heavy usage from off-road vehicle (ORV) recreation, and there has been much concern about the current status and viability of this plant. This project was undertaken to assess the current status and threats to this species, and to attempt to find other occurrences. With a biologist from The Nature Conservancy (Paula Guenther-Gloss), CNHP visited the North Sand Hills and confirmed the presence of this species there, mapping and assessing the population. The boat-shaped

bugseed had not previously been known from another dune complex, the East Sand Hills, which are approximately eight miles southeast of the North Sand Hills. The East Sand Hills are included within a State Natural Area and are off limits to ORV recreation. With the help of Frank Weston, the Volunteer Steward of this State Natural Area, we found the boat-shaped bugseed at this location as well. We have sent specimens to the world's expert on this genus, Dr. Sergei Mosyakin, in the Ukraine for verification. Information from this project will be valuable to land managers with the Bureau of Land Management, Colorado State Parks, and the Colorado Natural Areas Program, and will help in developing management plans to ensure the continued viability of this species.

Colorado Small Mammal Survey

Jeremy Siemers

In 2001, The Colorado Division of Wildlife (CDOW) contracted with CNHP to develop a protocol for a statewide small mammal survey. The primary objective of this 10-year project is to expand knowledge of the distribution of lesser-known mammals in the orders Insectivora, Chiroptera, and Rodentia. CNHP biologists, in consultation with CDOW, developed a list of priority species for inventory. In addition, to better evaluate the presence of small mammals in habitats throughout Colorado, CNHP biologists identified major ecological systems within each area to survey.



Jeremy Siemers mistnetting for bats on the Dolores River.

CNHP surveyed southwestern Colorado during the 2006 field season. Efforts focused on Stephen's woodrat (*Neotoma stephensi*), pocket mice (*Perognathus* spp.), the dwarf shrew (*Sorex nanus*), and Allen's big-eared bat (*Idionycteris phyllotis*), which is expected, but has yet to be documented in Colorado. We located multiple occurrences of a state historic pocket mouse subspecies (*Perognathus flavus hopiensis*) as well as new locations for the pallid bat (*Antrozous pallidus*), California myotis (*Myotis californicus*), fringed myotis (*M. thysanodes*), and Yuma myotis (*M. yumanensis*). Additional survey work will continue in western Colorado in 2007.

Rare Species Survey of Sand Creek Massacre National Historic Site

John Sovell and Jodie Bell

Sand Creek Massacre National Historic Site (SAND), established in 2000, encompasses approximately 2,400 acres in Kiowa County. The National Park Service was interested in increasing their understanding of which species inhabit SAND and where they are located to assist in management planning for this National Historic Site. They funded CNHP to perform a two-year biological inventory to search for nine species of conservation priority that were potential for the site.



A bleached skimmer perches on a shrub at the edge of one of Sand Creek's ponds.

Data were collected on the location, quality, and abundance or density of the three species of interest found on the site: black-tailed prairie dog towns (*Cynomys ludovicianus*), which occupy approximately 247 acres of the SAND property, burrowing owls (*Athene cunicularia*) and mountain plover (*Charadrius montanus*), which inhabit these prairie dog towns. The remaining priority species (swift fox, Texas horned lizard, ferruginous hawk, lesser prairie chicken, Arkansas darter, and plains ambrosia) were not located on the property in 2006, but will be looked for again in 2007.

Numerous carnivore dens as well as additional species of conservation concern were recorded, including northern harrier (*Circus cyaneus*), northern leopard frog (*Rana pipiens*), loggerhead shrike (*Lanius ludovicianus*), red-headed woodpecker (*Melanerpes erythrocephalus*), scaled quail (*Callipepla squamata*), Swainson's hawk (*Buteo swainsoni*), and white-faced ibis (*Plegadis chilis*). One unexpected find was that of a dragonfly, the bleached skimmer (*Libellula composita*), which is known only from approximately 15 total locations in the United States. The field inventory will be completed during the summer of 2007.

Rare Plant Surveys of Fort Carson and Piñon Canyon Manuever Site

Jill Handwerk, Georgia Doyle, David G. Anderson, Stephanie Neid, Dina Clark, and Ron Abbott

In 2006, CNHP began a two-year rare plant survey, funded by the U.S. Department of Defense, at Fort Carson Military Reservation (FCMR) and Piñon Canyon Manuever Site (PCMS). The information gathered during this project will facilitate natural resource planning and military training operations at the two installations. It will also inform rare



Jill Handwerk documenting Pueblo goldenweed at the Fort Carson Military Reservation.

plant protection in the Arkansas River Valley, which has a high concentration of rare plant species; there are 48 plant species of concern in this region, several of which are endemic to the area.

Targeted plant species were dwarf milkweed (*Asclepias uncialis* ssp. *uncialis*; G3G4T2T3/S2), alpine feverfew (*Bolophyta tetraeuris*; G3/S3), Arkansas Valley evening primrose (*Oenothera harringtonii*; G2/S2), Pueblo goldenweed (*Oonopsis puebloensis*; G2/S2), round-leaf four o'clock (*Mirabilis rotundifolius*; G2/S2), and rayless goldenweed (*Oonopsis foliosa* var. *monocephala*; G2G3T2/S2). Rocky Mountain bladderpod (*Lesquerella calcicola*; G2/S2), gold blazing star (*Mentzelia chrysantha*; G2/S2), Fendler's Townsend-daisy (*Townsendia fendleri*; G2/S1), and Texas greasebush (*Glossopetalon [=Forsellesia] planitierum*; G4/S1) were also documented during the survey.

Approximately 3,700 acres at FCMR and 685 acres at PCMS were surveyed. Twenty-four element occurrence records were processed during this effort, including ten new records. 2007 field work will begin in late April or early May.

Rare Plant Survey of the Arkansas River Valley

Stephanie Neid, Dina Clark, and Ron Abbott

In 2006, CNHP performed rare plant surveys in the Arkansas River Valley with funds from the Colorado Natural Areas Program and the Bureau of Land Management (BLM). The Arkansas River Valley has a high concentration of rare plant species; there are 48 species of concern in this region, several of which are endemic. The Arkansas River is also among the most popular recreation areas in the United States for river-rafting, fishing, wildlife viewing, and rock hounding. Rare plant surveys were performed on



Round-leaf four o'clock, one of the shale barren endemics in the Arkansas River Canyon.

six identified and designated Natural Areas, eight locations identified by the BLM, and 23 Arkansas Headwaters Recreation Area (AHRA) river-access areas that are managed jointly by the BLM and the Colorado Division of Parks and Outdoor Recreation.

AHRA parcels were surveyed to aid in preparation of a resource stewardship plan as part of a comprehensive resource planning process. Several Natural Areas in the Arkansas River Valley contain globally imperiled plant species and are managed by the BLM, a major land manager in the region. A total of 36 element occurrence records were processed during this effort, including 12 new records.

Survey of Critical Wetland Resources in Hinsdale County

Stephanie Neid, Jennifer Jones, and 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 (BLM), U.S. Forest Service (USFS) and the Colorado Division of Wildlife (CDOW), sixty percent of the 138 targeted inventory areas were assessed during the summer of 2006. In total, 21 new occurrences of globally vulnerable or globally imperiled wetland natural communities were assessed, several of



Fen wetland, Hurricane Basin.

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 1990s were re-visited and re-assessed. One new rare wetland plant population of the globally vulnerable (G4?T3T4) Altai cottongrass (*Eriophorum altaicum* var. *neogaeum*) was discovered during the 2006 field season and another known occurrence was revisited.

The final report will document 26 wetland and riparian Potential Conservation Areas (PCAs), 22 of which are new and four are updates, which highlight biologically sensitive wetlands. These PCAs can guide planning efforts to conserve unique areas of wetland biodiversity within Hinsdale County. Data will also facilitate conservation action planning implemented by the Lake Fork Watershed Stakeholders.

Rare Plant Survey of Owl Mountain Geographic Area, Medicine Bow-Routt National Forest

Denise R. Culver

During the summer of 2006, CNHP surveyed the Owl Mountain Geographic Area for rare and sensitive plants. The results confirm that this portion of the Medicine Bow-Routt National Forest contains areas with high biological significance and a diverse array of habitats that support a wide variety of plants, animals, and plant associations. Of the nine targeted areas that were surveyed, four were determined to be Potential Conservation Areas (PCA) of biodiversity significance. Two PCAs, Horse Park and South Fork of Michigan River at Silver Creek, support good occurrences of the globally vulnerable (G3 S3) wolf willow/mesic forb (*Salix wolfii*/mesic forb) community. The Lily Lake at Calamity Pass PCA supports several occurrences of state rare and Forest Service sensitive wetland-dependent plants, including slender cottongrass (*Eriophorum gracile*), mud sedge (*Carex limosa*), livid sedge (*Carex livida*), buckbean (*Menyanthes trifoliata*), thread rush (*Juncus filiformis*), and purple cinquefoil (*Comarum palustre*). Several new and updated moonwort (*Botrychium* spp.) occurrences were documented during the field survey at Cameron Pass PCA and Parika Peak. Results are already being used by Forest Service personnel when reviewing 2007 timber sale requests.



Overview of the Lily Lake fen at Calamity Pass, Jackson County.

Rare Plant Survey of San Juan Public Lands

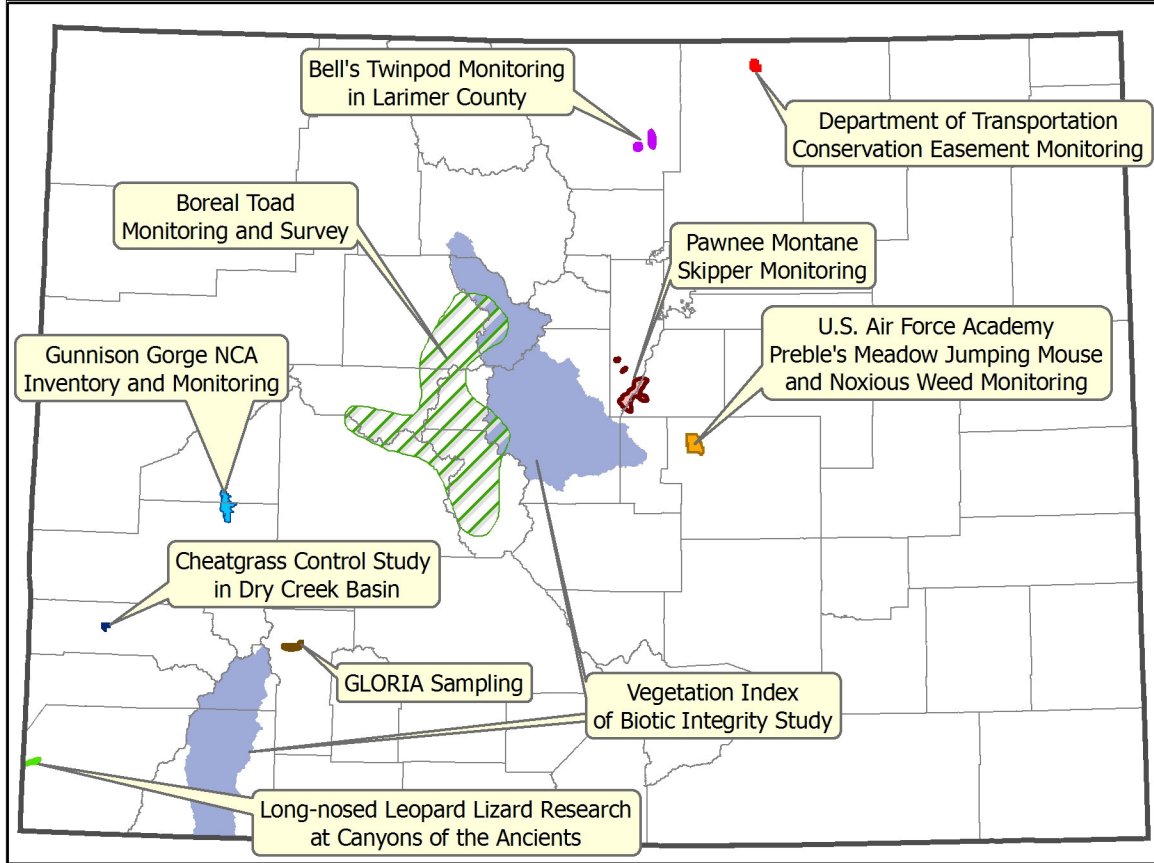
Peggy Lyon and Marian Rohman

This survey was a continuation of several years of work on San Juan Public Lands. In 2006 we concentrated on describing the vegetation of fens on the San Juan National Forest. A fen is a special kind of wetland with an accumulation of peat, and may have taken thousands of years to develop. The San Juan National Forest began conducting an inventory of fens in 2005. Staff and volunteers visited potential fens that were identified from maps and aerial photos, determined whether or not they were indeed fens, and recorded abiotic data. In 2006, CNHP visited 92 fens and prepared a list of species present in each. Two hundred twenty-three species were documented, including several rare species, one of which – *Utricularia intermedia* – an aquatic carnivorous plant, is new to Colorado. This project was funded by the U.S. Forest Service and the Bureau of Land Management.



Marian Rohman at fen with sinkhole.

Monitoring and Research



Home Range and Habitat Use of the Longnose Leopard Lizard in Canyons of the Ancients

Brad Lambert, Rob Schorr, Bobby Weidmann, Chris Gaughan, and Jeremy Siemers



Radio-telemetered long-nosed leopard lizard at Canyons of the Ancients.

The longnose leopard lizard (*Gambelia wislizenii*) is one of the largest lizards found in the major desert systems of North America. It inhabits xeric shrublands from eastern Oregon to western Colorado and from southern Idaho to northern Mexico. Studies of longnose leopard lizard movement and microhabitat use have found lizards use several hectares of sparsely-covered shrublands with minimal grass cover. However, there is limited information on longnose leopard lizard movement and habitat use in western Colorado, where populations may be declining. To study longnose leopard lizard habitat use and movement in the eastern part of its range, with

funding from the Bureau of Land Management (BLM), CNHP radio-collared seven lizards on the Cannon Ball Mesa in the BLM Canyons of the Ancients National

Monument, Montezuma County, Colorado. We found longnose leopard lizards' mean home range size was 20 ha, and lizards used habitats with medium cover of one-seeded juniper and Mormon tea, and little grass cover. Because longnose leopard lizards occupy relatively large parcels of xeric shrublands with minimal grass cover, populations may be more and more isolated as shrublands are cleared and invaded by exotic grasses. It is possible that longnose leopard lizards act as indicators of healthy, undisturbed shrublands in the arid Southwest.

Bell's Twinpod Monitoring in Larimer County

David G. Anderson and Amy Lavender

Bell's twinpod (*Physaria bellii*) is a rare, herbaceous, perennial plant species which is a member of the mustard family (Brassicaceae). Its global distribution is limited to hogbacks in the northern Front Range of Colorado in Larimer, Boulder, and Jefferson counties. Four occurrences, or about 15% of the known occurrences of this species, are found on City of Fort Collins Natural Areas. In 2006 CNHP (with Crystal Strouse, Natural Areas Technician with City of Fort Collins) established monitoring plots at Bobcat, Coyote Ridge, Pine Ridge, and Cathy Fromme Prairie Natural Areas, and obtained baseline data at these plots. These plots will be re-



A very large Bell's twinpod in fruit at the Bobcat Ridge Natural Area.

sampled periodically (once a year if possible) by City of Fort Collins staff. These plots can provide data on population trends under different management and human use scenarios, providing feedback useful for the management of this species and its habitat. On City of Fort Collins lands, recreational use and invasion of exotic species are the primary threats since these lands are protected from development. Monitoring may help establish whether any causal links exist between threats and population trends.

In another component of this study, CNHP measured plant density at randomly selected points throughout the known occurrences of Bell's twinpod on City of Fort Collins Natural Areas. These data were used to develop a population estimate of 412,000 individuals within the study area. The population density data will be used to determine where the density of this species is highest, which will be useful in supporting management decisions within element occurrences of this species. CNHP also identified additional locations of Bell's twinpod during this project.

Boreal Toad Monitoring and Survey

Brad Lambert, Chris Gaughan, and Georgia Doyle

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*). 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. CNHP has continued this work yearly with a contract in place to extend this project through 2008.



Pit-tagging and measurements of boreal toad in Cottonwood Creek drainage.

In 2006, CNHP monitored 22 known breeding sites in Chaffee, Eagle, Pitkin and Summit counties. Monitoring consists of making repeated visits to breeding sites to collect baseline information on high counts and breeding success. In addition, 65 sites throughout Colorado were surveyed for boreal toads, which resulted in the discovery of three new breeding sites. One new breeding site found this year in Chaffee County is at 12,040 ft., which is a new elevation record for highest documented breeding site for this species.

CNHP also continued a mark-recapture study in the Cottonwood Creek drainage in Chaffee County. The study was set up in 1999 to look at demographic variables in a large metapopulation of boreal toads. Over 1,000 adult toads have been tagged between 1999 and 2006. CNHP is currently analyzing these mark-recapture data to increase understanding of estimated population size, survival, site fidelity, and movement between breeding sites. The data set is also being used for species distribution modeling to help guide future survey efforts.

GLORIA— Global Observation Research Initiative in Alpine Environments

Peggy Lyon and Julie Crawford



Peggy Lyon documents species and cover on an unnamed peak in the San Juans.

GLORIA is an international program that aims to document changes in vegetation that may result from global climate change. The GLORIA network, conceived by an international group of ecologists in 1996, includes over 30 sites in the world's highest mountain ranges, including the Alps (Switzerland and France), Urals (Russia), Southern Andes (Chile), Mt. Burns (New Zealand), and Caucasus (Georgia). A new site was established in the San Juan Mountains in 2006 by the Mountain Studies Institute (MSI). MSI's site is one of only a handful in the United States – others are located in Glacier National Park (Montana), the Sierra Nevada (California), and the White/Inyo Mountains (California).

In 2006, the MSI team set up study plots on four high peaks in the San Juan Mountains near Lake City. They collected detailed vegetation data, and installed sensors to monitor soil temperature. The plots will be revisited for new data collection every two to five years. The botany team was composed of botanist Peggy Lyon of the Colorado Natural Heritage Program and Julie Crawford, plant ecologist with Grand Canyon National Park and doctoral student from the University of Pavia, Italy (now with CNHP).

Gunnison Gorge National Conservation Area Inventory and Monitoring of Sensitive Plants and Plant Communities

Peggy Lyon, Julia Hanson, and Janet Coles

One of the most under-appreciated and threatened ecosystems in Colorado is the adobe hills area east of Montrose. The semi-desert shrublands of the Gunnison Gorge National Conservation Area harbor several rare plants, including the federally listed (endangered) clay-loving wild buckwheat (*Eriogonum pelinophilum*), and the Delta lomatium (*Lomatium concinnum*).

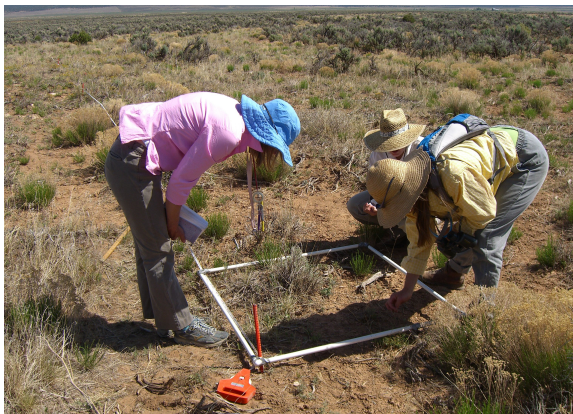


Clay-loving wild buckwheat.

In 2005 and 2006, CNHP designed and implemented long-term monitoring for these species. In addition, more inventory was done to better quantify the extent of these species on BLM lands. Additional tasks included mapping the extent of the sensitive native plant communities within the Native Plant Area of Critical Environmental Concern on the south rim of the Gunnison Gorge, and conducting inventory for rare plants in a newly acquired property east of Delta.

Cheatgrass Control Study in Dry Creek Basin

Peggy Lyon, Dr. William Baker (University of Wyoming), Emily Sherman, Julia Hanson, and Denise Culver



CNHP botany technicians Julia Hanson and Emily Sherman, and volunteer Leigh Robertson document vegetation prior to herbicide treatment at Dry Creek Basin.

In an effort to improve wildlife habitat in Dry Creek Basin, the Colorado Division of Wildlife (CDOW) mowed and seeded patches of sagebrush in 2004. In 2006, it was found necessary to treat these patches with an herbicide to control the invasion of cheatgrass (*Bromus tectorum*). Dr. Baker proposed that the effectiveness of this herbicide and its effects on existing vegetation be tested before applying the herbicide to large areas by aerial spraying. CNHP contracted with the CDOW to set up permanent plots to monitor all vegetation in advance of treatment in the fall of 2006. Baseline data was collected

in 2006 on 13 patches and an equal number of control areas. The plots will be read again in 2007. Results of this research will help managers determine the most appropriate course for future weed control.

U.S. Air Force Academy Noxious Weed Monitoring

David G. Anderson and Amy Lavender

In 2002, CNHP botanists mapped the distribution of 14 species of noxious weeds at the U.S. Air Force Academy (USAFA) and the Farish Outdoor Recreation Area in El Paso County. A total of 3,936 occurrences of weeds were mapped in this project throughout approximately 19,000 acres within the two study sites. This extensive dataset has great utility for the management of the targeted species. 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.



Myrtle spurge (*Euphorbia myrsinites*) at the US Air Force Academy. Monitoring for this species was begun in 2006.

In 2005, CNHP established monitoring plots at the USAFA in infestations of 13 species of noxious weeds. 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. In 2006, monitoring plots were added for myrtle spurge (*Euphorbia myrsinites*), a species that was recently discovered at USAFA. This species has spread rapidly in Colorado.

A combination of quadrats, belt transects, photoplots, and photopoints were used to establish baseline conditions in 2005. These plots were resampled in 2006, and will be sampled again in 2007. Data from these plots will have practical benefits to the management of noxious weeds at the USAFA. Inferences will be possible regarding the effects of management practices and annual climatic variation on the population trends of noxious weed species at the USAFA.

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

Rob Schorr and John Sovell

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 9th year, this long-term study has provided invaluable estimates of PMJM movement, survival, and abundance.

Rob Schorr is submitting a manuscript to the *Journal of Mammalogy* on over-summer and over-winter survival rates of PMJM. The analysis of six years of mark-recapture data suggest that the severity of



Preble's meadow jumping mouse at Air Force Academy.

winter influences over-winter survival, and that weasel abundance, precipitation, and body mass play a role in over-summer survival. In 2006, CNHP zoologists trapped four sets of transects along Monument Creek. Trapping events took place over six nights in early June and again in early September. In early June there were 64 captures of 32 PMJM, and in September there were 49 captures of 24 PMJM. Based on preliminary survival analyses, PMJM overwinter survival rates are higher than oversummer survival rates, and estimates of survival from the Academy are higher than in other parts of the range.

In the future, CNHP will be conducting an occupancy study of PMJM to assess the proportion of riparian habitats PMJM occupy at USAFA.

Pawnee Montane Skipper Post-fire Habitat Assessment Survey

John Sovell

The Hayman and Schoonover forest fires burned across approximately 40% of the Pawnee montane skipper butterfly (*Hesperia leonardus montana*) habitat during the summer of 2002. The U.S. Forest Service, the U.S. Fish and Wildlife Service, and Denver Water have funded a five-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



Research Scientists record data on the Pawnee montane skipper at a burned plot within the Hayman Fire area.

have remained the same throughout all five 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 will impact the conservation status of this species in the South Platte River drainage, where skipper numbers are at levels nearly five times less than they were in the 1980s. Why Pawnee montane skippers have not yet reoccupied severely burned areas is unknown. It may be that a healthy forest overstory is essential for butterfly survival and reproduction. Skipper numbers were also positively correlated to precipitation within the study area; precipitation from spring through summer in 2006 was below normal, which would predict further declines in Pawnee montane skippers in 2007. CNHP hopes to continue monitoring this threatened species in future years.

Vegetation Index of Biotic Integrity for Colorado Wetlands: Phase 3

Joe Rocchio

The U.S. Environmental Protection Agency and Colorado Division of Wildlife have 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



High Creek Fen, Park County.

Ecoregion. The objective is to develop a bioassessment monitoring tool by sampling various attributes of wetland vegetation across a human-induced disturbance gradient (e.g., pristine to heavily disturbed). Those attributes that show a predictable response to increasing human disturbance are chosen as metrics to be incorporated into the VIBI. The resulting VIBI provides a numerical value which can be used to evaluate biotic integrity of a specific wetland over time or used to compare quality of wetlands of a similar type (i.e., same HGM class). Thus, the VIBI value can be used for

(1) monitoring and evaluating wetland protection, restoration, enhancement, and creation projects, (2) monitoring and evaluating the effectiveness of wetland management practices, (3) prioritizing wetland restoration and protection projects, and (4) identifying reference conditions for specific wetland types.

During the summer of 2006, 26 wetlands were sampled in the Blue River, South Platte River Headwater, and Colorado Headwaters. Wetland vegetation was sampled using a 20 x 50 m releve-type plot. Presence/absence and cover were recorded for all plant species. The level of disturbance was rated according to multiple categorical ranking forms. Data analysis is almost complete and the VIBI models will be available in early 2007. The VIBI models will be calibrated and validated on an independent dataset during the summer of 2007.

Colorado Floristic Quality Assessment

Joe Rocchio

The U.S. Environmental Protection Agency provided funding for development of a Floristic Quality Assessment (FQA) for Colorado. The FQA applies vegetative community indices, which are based on the presence of conservative plant species, to assess the degree of “naturalness” of an area. Conservative plants are those which show strong affinity to high-quality natural areas (areas representing “pre-settlement conditions”). The proportion of



Monkshood (*Aconitum columbianum*)
C-value = 8.

conservative plants at a site is expected to decrease with increasing human disturbance. The FQA indices represent the amount of conservative plants remaining in an ecological

community and thus are reflective of the amount of human-induced disturbance impacting a site.

The FQA can be used for a variety of applications such as:

- Setting priorities for conservation, management, and acquisition actions
- Facilitating comparison of quality between sites
- Long-term monitoring of natural areas
- Monitoring management and/or restoration activities of natural areas
- Wetland mitigation monitoring/performance criteria

In order to develop the FQA indices, each plant species that occurs in Colorado is assigned a coefficient representing its conservatism ranging from 0 (not conservative) to 10 (highly conservative). This was accomplished by a panel of experts who are most familiar with the Colorado flora. The Colorado Floristic Quality Assessment Panel assigned coefficients to approximately 80% of Colorado's flora.

In order to validate the effectiveness of the indices in discerning floristic integrity or naturalness, 76 wetlands exposed to various degrees of human impact were sampled. Preliminary results suggest that the FQA indices were successful in discerning degradation in wetland floristic integrity. Data analysis is almost complete and a final report will be released in early 2007.

Department of Transportation Conservation Easement Monitoring Georgia Doyle and Renée Rondeau

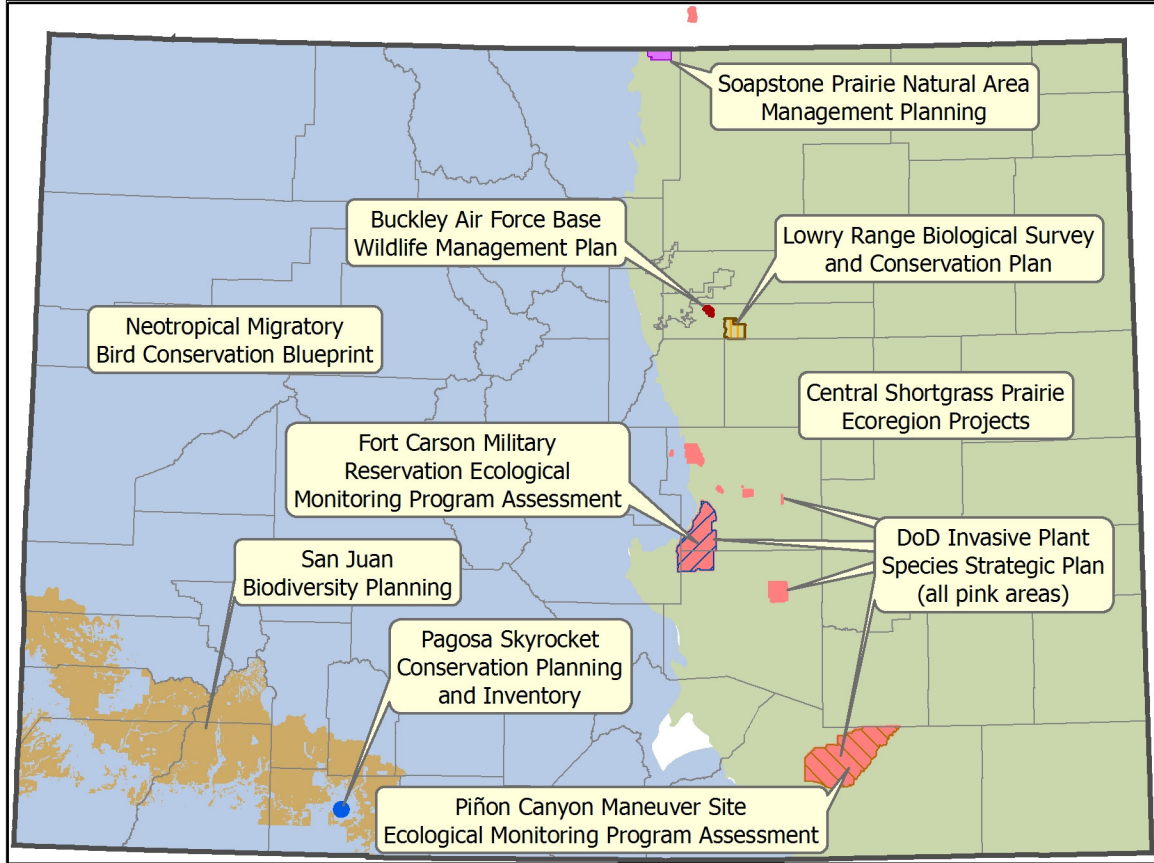
The second year of monitoring was conducted at a recently established conservation easement in Weld County. The easement is held by The Nature Conservancy and was funded by the Colorado Department of Transportation as part of CDOT's Shortgrass Prairie Initiative. The easement was established on this private ranch to protect McCown's Longspur, a shortgrass prairie endemic bird. The purpose of the monitoring was to document current vegetation conditions at the easement and provide a means to assess its long-term viability.



Renée Rondeau with Robel pole at private ranch in Weld County.

Desirable nesting habitat for McCown's Longspur is shortgrass prairie with very short vegetation and a high percentage of bare ground. 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. Habitat conditions on the easement were excellent in 2006, and McCown's Longspur were present.

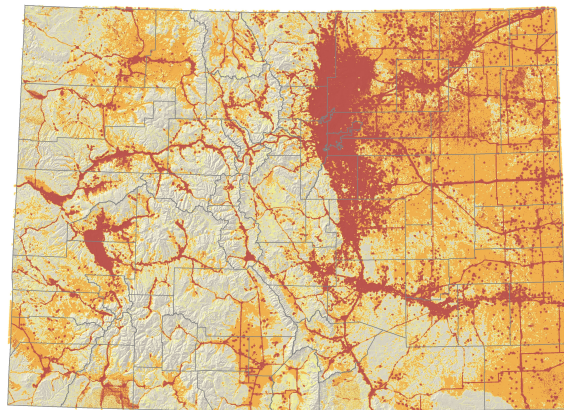
Conservation Planning



Measuring Colorado's Biodiversity Health

Renée Rondeau, Georgia Doyle, Karin Decker, Chris Gaughn, 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 assist conservation planners, land managers, and politicians with understanding the status of Colorado’s biodiversity today as well as measure trends. Through this approach we score species and ecological systems on their abundance, quality, threats, and protection. Have we succeeded in protecting enough large patches of ponderosa pine that



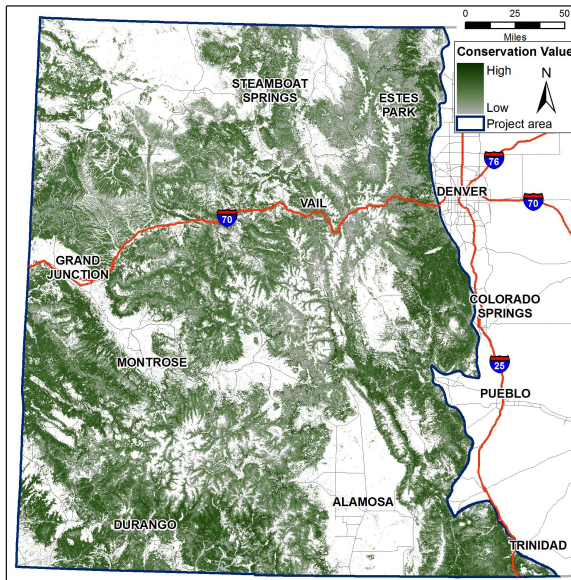
Landscape Integrity in Colorado: A distance-decay model representing cumulative impacts from oil and gas wells, urban development, surface mines, agriculture, and roads.

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.

A Conservation Blueprint for Neotropical Migratory Birds in Colorado

John Sovell, Michelle Fink, and Renée Rondeau

Coniferous and aspen forests support large numbers of Neotropical migratory and resident bird populations that have been identified as conservation priorities. Threats to these habitats continue to increase with increasing human population densities and



Conservation value of forested bird habitats of western Colorado (darker is higher value).

opportunities for, as well as the greatest threats to, conservation of Neotropical migratory birds in forested habitats in western Colorado. Resources available for conservation actions can then be targeted to areas which represent the greatest conservation benefits and cost-effectiveness. The project began in early 2006 and will be completed by mid-2007.

natural resource exploitation. Complex land use decisions must be made to meet conservation objectives while recognizing the needs and rights of private landowners, the mandates of public land management agencies, and the realities of changing landscapes. CNHP is working together with the Rocky Mountain Bird Observatory and the Colorado Division of Wildlife, with funding from the U.S. Fish and Wildlife Service, to address these concerns.

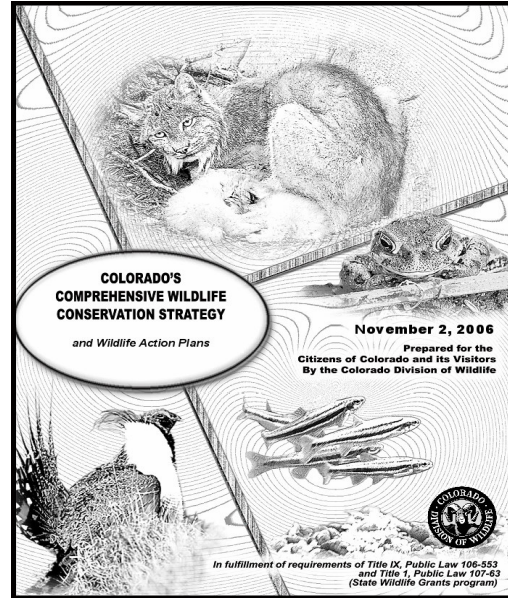
This project uses the decision support software, NatureServe Vista, to incorporate policy, land use, and biological information to define areas representing the most important

Colorado's Comprehensive Wildlife Conservation Strategy

Lee Grunau, Michelle Fink, Chris Gaughan, Renée Rondeau, Jeremy Siemers, John Sovell, and Karin Decker

In 2005, the Colorado Division of Wildlife (CDOW) submitted Colorado's Comprehensive Wildlife Conservation Strategy to the U.S. Fish and Wildlife Service (USFWS) in fulfillment of requirements of the State Wildlife Grants Program. In

December 2005, the USFWS National Advisory Acceptance Team conditionally approved Colorado's strategy, but found that it needed to include prioritized conservation actions to address threats to habitats and species of greatest conservation need (SGCN). With funding from the CDOW, CNHP collaborated with CDOW biologists to create an Access database that links SGCN threats, habitats, and conservation actions. Contents of the database include habitat associations for each SGCN; priority ratings for SGCNs and habitats; population status, trend, and distribution; general and specific threats; and general and specific conservation actions. CNHP revised the existing CWCS to incorporate this new information, providing improved links between species, habitats, threats, and actions. The enhanced document clearly identifies Colorado's wildlife conservation priorities, and can be used by a variety of conservation partners to improve the focus, efficiency, and effectiveness of their work. In January 2007, the U.S. Fish and Wildlife Service approved Colorado's revised Strategy.



Report available at www.wildlife.state.co.us

Colorado Rare Plant Conservation Initiative

David G. Anderson, Susan Spackman Panjabi, Jill Handwerk, Georgia Doyle, 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.

Conservation Learning Network Workshops

Renée Rondeau

The Conservation Learning Network is a cooperative effort among the Bureau of Land Management (BLM), The Nature Conservancy, the Idaho Department of Fish and Game and CNHP. The Learning Network was developed to respond to a recognized need by BLM for better documentation of biological resource analysis in Resource Management Plans (RMPs), as demonstrated by litigation regarding special status species. The network is designed to assist BLM planning teams to incorporate information for special status and other priority species and their habitats into RMPs. With funding from The Nature Conservancy, CNHP has been serving as a technical advisor for this project since its inception in 2006.

The network uses existing biological information and proven landscape-planning methods to develop strategies for priority species, identify restoration opportunities for important habitats, and provide a monitoring framework for key indicators of species condition and community health for the RMP. Information and training is shared in a series of three workshops, two of which have been completed.

Soapstone Prairie Natural Area Management Planning

Lee Grunau, Stephanie Neid, Renée Rondeau, and Chris Gaughan



Soapstone Hills in the Soapstone Prairie Natural Area.

In 2004, the City of Fort Collins purchased the Colorado portion of the Soapstone Ranch property, now known as the Soapstone Prairie Natural Area. The property contains significant cultural and natural resources, including a federally listed plant, globally rare foothills plant communities, several declining prairie species, and abundant big game herds. The Soapstone property has a long history of agricultural production, and also offers prime recreation opportunities. Maintaining an appropriate balance

between traditional ranching uses, introduced public access and recreation, and protection of natural and cultural values requires careful planning and management. CNHP collaborated with City of Fort Collins Natural Areas Program staff on a preliminary management planning process that was grounded in conservation science. Significant components of the planning process included: identifying resources that warranted focused conservation attention; evaluating the biological integrity of ecological systems and species of concern, as well as potential impacts from anticipated future uses; and delineating draft geographic zones that describe where conservation, recreation, and/or production uses are most compatible and appropriate. In January 2007, CNHP provided a draft outline/summary of these issues to the City for use in development of a detailed management plan.

Central Shortgrass Prairie Ecoregional Assessment and Partnership Initiative

Renée Rondeau, Lee Grunau, David G. Anderson, John Sovell, Melissa Landon, Amy Lavender, Karin Decker, Michelle Fink, and Chris Gaughan

In 2005 and 2006, the Colorado Natural Heritage Program (CNHP) assisted The Nature Conservancy (TNC), the U.S. Department of Defense (DoD), and numerous other partners, on an ecoregional assessment for the Central Shortgrass Prairie (CSP) ecoregion. The CSP ecoregion covers portions of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, Texas, and Wyoming. The final report, completed in December 2006, highlights conservation targets, significant threats, and strategies for future conservation of the full suite of native shortgrass prairie species, and also identifies high priority places to work. CNHP scientists and planners will continue working with the CSP Partnership through 2007 on implementing the strategies proposed in the 2006 assessment. On-going work focuses primarily on developing predicted occurrence models for a sub-set of priority species, and developing (in coordination with the Partnership) a strategic implementation plan for future conservation projects in the ecoregion. This work is being accomplished with funding provided by the DoD.

Buckley Air Force Base Wildlife Management Plan

Lee Grunau and Rob Schorr

Colorado Natural Heritage Program (CNHP) continues to coordinate with Buckley Air Force Base (BAFB), the U.S. Fish and Wildlife Service (USFWS), and the Colorado Division of Wildlife (CDOW), to prepare a Wildlife Management Plan for Buckley. Project goals include development of management strategies that are based on a holistic ecosystem approach, enhancing Buckley's role in ecosystem function at local and regional levels, contributing to conservation of wildlife resources within the constraints of the military mission, and minimizing risk to human health and flight safety from wildlife. Significant planning issues include Bird Aircraft Strike Hazard (BASH), management of black-tailed prairie dogs and burrowing owls (especially within the flight zone), protection of migratory birds, and future development plans within and around the Base. CNHP has proposed management practices that balance the need for reduction of significant risks relative to BASH, with the need for species conservation in the context of encroaching urban development. The draft Wildlife Management Plan, submitted to Buckley AFB for review in 2005, is awaiting public review and final revisions. The final plan is scheduled for completion in 2007. This project was funded by the U.S. Department of Defense.

Pagosa Skyrocket Conservation Planning and Inventory

Peggy Lyon

The Pagosa skyrocket (*Ipomopsis polyantha*) is known only from a small area around Pagosa Springs, and is one of the most threatened plants in Colorado. Following the initial conservation planning and inventory that was begun in 2005, CNHP and the U.S. Fish and Wildlife Service



Ellen Mayo of the USFWS photographs Pagosa skyrocket.

conducted additional surveys in 2006, and worked with La Plata Electric Company and Archuleta County to protect plants that were growing on a highway right of way and along a new power line. We also located excellent new populations on private land. This work will continue in 2007, when we will begin a transplant project, moving plants from a large population that is threatened by development to a protected site on the San Juan National Forest. We appreciate all of the help and support that we received from the Colorado Native Plant Society, Pagosa Springs Parks Department, La Plata Electric Company, U. S. Forest Service, Colorado Department of Transportation and many others in protecting this rare species. This work is being funded by the U.S. Fish and Wildlife Service and the National Fish and Wildlife Foundation.

San Juan Biodiversity Planning, Phase II

Peggy Lyon and Renée Rondeau

In 2006, CNHP continued working with The Nature Conservancy (TNC) to provide technical information to the San Juan Public Lands, in order to inform the revision of their management plan. In Phase II of this project, CNHP provided additional descriptions and profiles of species, natural communities and ecological systems. We also participated in a series of workshops with San Juan Public Lands planners and biologists to determine and prioritize monitoring of critical indicators for each ecological system in the planning area. We are continuing to work with the planners in 2007 to further identify and refine monitoring objectives and identify thresholds for adaptive management. Future efforts will be directed toward implementation of monitoring. This project is a pilot which is expected to serve as a model for similar projects on other public lands.

Front Range EcoRegional Partnership Invasive Plant Species Strategic Plan and Webpage

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

With funding from the U.S. Department of Defense (DoD), CNHP is producing 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, Piñon 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). Preliminary results suggest 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 of 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. Following completion of the strategic plan, CNHP will develop and host an EcoRegional Partnership webpage including the final strategic plan, other useful resources, and links to pertinent websites.

Lowry Range Biological Survey and Conservation Plan

Lee Grunau, John Sovell, Renée Rondeau, Michael Menefee, and Georgia Doyle



Shortgrass prairie at the Lowry Range.

The Lowry Range, managed for the State of Colorado by the Colorado State Board of Land Commissioners (SBLC), is an approximately 26,000-acre property located at the southeastern edge of greater metropolitan Denver. In 2005, CNHP worked with the SBLC to identify significant biological resources on the Range, and to evaluate potential conservation easement and development scenarios within a framework of biodiversity conservation. Results of the field survey confirmed that numerous species of

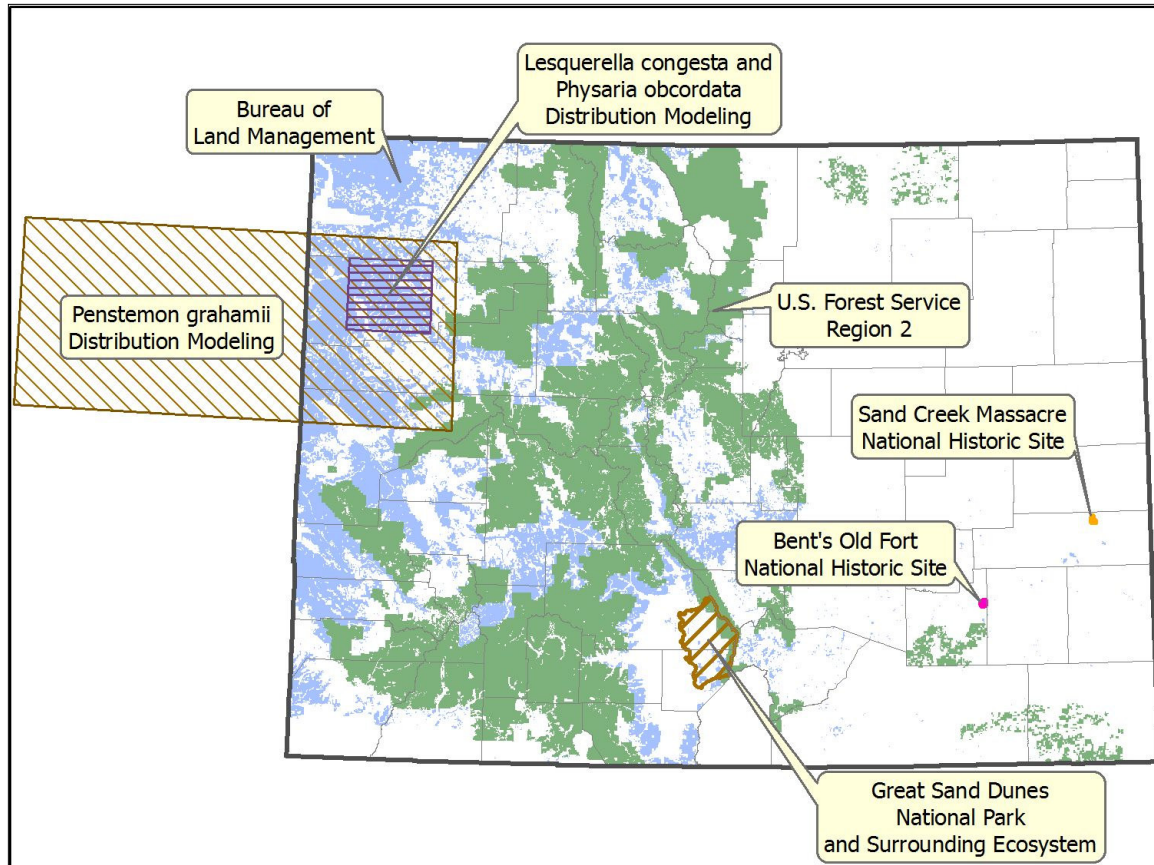
conservation priority inhabit the range, and that the ecological systems are in fair to good condition. Using this information, CNHP collaborated with SBLC staff to assess viability of high priority species and ecological systems (i.e., conservation “targets”), as well as existing and potential future impacts to biological diversity. The final report, completed in June 2006, included detailed information on the complex relationships that exist among conservation targets, potential threats, and proposed future management. It also provided strategies for on-site management and regional collaboration to maintain the viability of significant biological resources and abate threats.

Ecological Monitoring Program Assessment for Fort Carson and Piñon Canyon Maneuver Site

Stephanie Neid, Lee Grunau, and Renée Rondeau

Fort Carson and Piñon Canon Maneuver Site, two large U.S. Army installations situated on the eastern plains of Colorado, harbor a wealth of significant biological resources. These installations represent some of the largest contiguous examples of prairie ecosystems remaining in the Central Shortgrass Prairie ecoregion, and support occurrences of a number of species of conservation concern. Existing ecological monitoring programs for Fort Carson and Piñon Canon Maneuver Site are currently split between two different departments. Overlapping responsibilities and conflicting goals make integration of these disparate programs difficult, and the functioning of the ecological monitoring programs has not been as effective as it might be. CNHP coordinated with the U.S. Department of Defense and the U.S. Fish and Wildlife Service to conduct an analysis of existing programs, and to provide strategic guidance on how to design an ecological monitoring and management approach that will more effectively conserve the significant biological resources on these installations. The assessment was completed in June 2006.

Vegetation Classification, Heritage Methodology, and Data Exchange



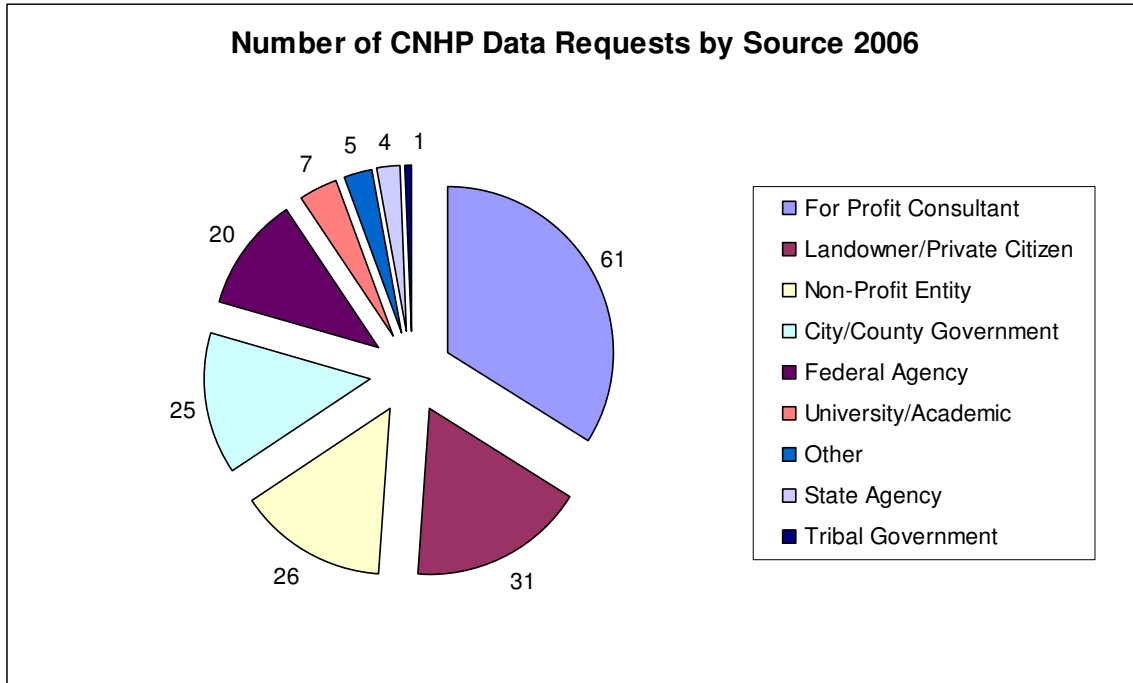
CNHP Data Distribution and Environmental Review Projects

Melissa Landon and Michael Menefee

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 2006, CNHP responded to approximately 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 one third of all data requests (see chart), with land owner/private citizen, non-profit entity, and city/county government requests making up the next largest sources for data inquiries.



U.S. Forest Service Region 2 Technical Conservation Assessments

David G. Anderson, Karin Decker, Susan Spackman Panjabi, Stephanie Neid, and Joe Rocchio



Golden blazing star (*Mentzelia chrysantha*, G2 S2), a species for which a Technical Conservation Assessment was completed by CNHP in 2006.

Between 2003 and 2007, CNHP botanists completed 42 Technical Conservation Assessments for the Region 2 Forest Service Species Conservation Project, making CNHP the single greatest contributor for this project. Writing each of these assessments involved a rigorous compilation of the existing knowledge for each species, which had not been done for most of these species prior to this project. The assessments are peer reviewed and published on the web. For a complete list of Technical Conservation Assessments written by CNHP authors, see the list on page 35. This project has been an unprecedented opportunity to amass information on the targeted species, and has contributed greatly to our

understanding of their distribution, abundance, habitat, rarity, threats, and research priorities. Research conducted for this project resulted in changes to conservation status ranks for several species including *Festuca hallii* (SH changed to S1), *Botrychium echo* (S2 to S3), *B. simplex* (S2 to S3), and *Thelypodopsis juniperorum* (G1 to G2).

Numerous new element occurrences have also been identified by our searches of herbaria and conversations with experts.

U.S. Forest Service Region 2 Technical Conservation Assessments Updates

David G. Anderson, Susan Spackman Panjabi, Karin Decker, John Sovell, and Brad Lambert

With partners at the Wyoming Natural Diversity Database, CNHP completed a pilot project to update technical conservation assessments in 2006. In this project we developed a method for compiling additional information that became available since the publication of the Technical Conservation Assessment for a given species. We then applied these methods to 16 species (eight plants, six vertebrates, and two invertebrates) for which Technical Conservation Assessments had been written between 2003 and 2005. These updates will serve as a companion to the lengthier Technical Conservation Assessment for each species, providing users with a distillation of any new information and implications for management and interpretation of the original assessment.



James' false saxifrage (*Telesonix jamesii*, G2 S2), a species for which the Technical Conservation Assessment was updated in 2006 by CNHP.

We hope to continue this project, updating a subset of the published Technical Conservation Assessments each year. In this way, they may continue to remain the most up-to-date source of information for these species and support conservation and management efforts on National Forest System land and elsewhere.

Threatened and Endangered Plant Species Data Development and Species Distribution Modeling

Jill Handwerk, David G. Anderson, Amy Lavender, and Karin Decker



Lesquerella congesta

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 2006, element occurrence data for *Botrychium lineare* (C), *Gaura neomexicana* ssp. *coloradensis* (LT), *Lesquerella congesta* (LT), *Pediocactus knowltonii* (LE), *Phacelia formulosa* (LE), and *Physaria obcordata* (LT) were updated. 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.

Species distribution models were generated for *Lesquerella congesta*, *Physaria obcordata*, and *Penstemon grahamii*. Species Distribution Modeling is a process that uses a sample of known locations to build a model of suitable environmental conditions, and maps that model across a study area. Potential distribution maps were generated for the three species using two different modeling approaches. All of the model results indicate that there may be additional tracts of suitable habitat beyond the known occupied habitat for these species. However, these hypotheses should be further evaluated by field survey and by expert opinion of botanists familiar with the species.

Additional USFWS Section 6 funding has been proposed for a fifth 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.

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

Joe Stevens, Kelsey Forrest, and 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 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, montane forests, playa lakes on the basin floor, and everything in between. Work began in the late spring of 2005 and will continue through summer of 2009. To date, CNHP field crews have completed collecting initial plot data. These data are now being analyzed to classify and describe the plant associations of the project area and to inform the photo-interpretation process used in creating the map. Final products 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.



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

Vegetation Classification and Mapping of Bent's Old Fort and Sand Creek Massacre National Historic Sites

Joe Stevens, Stephanie Neid, Dina Clark, Jodie Bell, and Kelsey Forrest

Funded by the National Park Service, this project classified, described, and mapped the vegetation of the Bent's Old Fort and Sand Creek Massacre National Historic Sites. It is part of a national program to gather baseline data for all national park units in order to meet specific information needs identified by each park unit.



A Sand Sagebrush / Blue Grama Shrubland (*Artemisia filifolia* / *Bouteloua gracilis*) plot at the Sand Creek Massacre National Historic Site.

Bent's Old Fort was first built in the 1830's on the banks of the Arkansas River as a trading post near what is now La Junta, CO. The Historic Site now occupies approximately 800 acres that have seen intensive human use since the early 1800s. The Sand Creek Massacre Historic Site was founded in 2005. This Historic Site currently occupies approximately 2,400 acres of rolling plains of sand sage and shortgrass prairie traversed by the cottonwood gallery along Big Sandy Creek in Kiowa County.

Vegetation plot data were collected from both parks in late summer 2005. From these plots, the vegetation classification and preliminary maps were produced in early 2006. During the summer of 2006, field crews collected accuracy assessment plots to provide a measure of accuracy for the final maps. The final reports for these projects were submitted in January of 2007. The National Park Service will use the maps and vegetation descriptions to inform land management practices within these parks.

National Park Service Databases

Michelle Fink, Fagan Johnson, Melissa Landon, Alison Loar, Katie Neuhaus, and Marwan Obeidat

ESA (Endangered Species Act) Database

CNHP is in the seventh 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) develop and maintain a database that contains information on the status and presence of T&E species in all NPS units; 2) develop and maintain 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.

Species of Management Concern (SOMC) and Invasive Animals (INVA) Databases

CNHP is entering the third year of an on-going partnership with NPS to develop and maintain nationwide databases on Species of Management Concern (SOMC) and Invasive Animals (INVA) on NPS lands. This project consists of three main tasks: 1) maintain two relational databases to house information on the presence, status, condition,

source, and expenditures for SOMC and Invasive Animals by NPS unit; 2) update databases 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

CNHP is in the second year of an on-going 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 encompasses 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

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

In 2005, CNHP re-established a formalized 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 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. The dataset is provided 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

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

CNHP is in the 14th year of 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 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. The dataset is provided 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.

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 in the initial stages of providing 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

- Dreitz, V.** 2006. Issues in species recovery: an example based on the Wyoming Toad. *Bioscience* 56(9) 765-771.
- Muths, E, R.D. Scherer, P.S. Corn, and **B.A. Lambert.** 2006. Estimation of temporary emigration in male toads. *Ecology* 87(4):1048-1056.
- 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 Animal Ecology.* In prep.
- Schorr, R.A.** and P.M. Lukacs. 2007. Seasonal survival of Preble's meadow jumping mouse (*Zapus hudsonius preblei*). *Journal of Mammalogy.* In prep.
- Schorr, R.A., B. Lambert, C.M. Gaughan, and J.L. Siemers.** 2007. Home range and habitat use of the longnose leopard lizard (*Gambelia wislizenii*) in southwestern Colorado. *Journal of Herpetology.* In review.
- Schorr, R.A., J.L. Siemers,** P.M. Lukacs, J.P. Gionfriddo, **J.R. Sovell, R.J. Rondeau,** and M.B. Wunder. 2007. Using prairie rodent survival to assess habitat quality. *Southwestern Naturalist.* In press.
- Siemers, J.L., Y.R. Chen,** K.M. Canestorp, **J.R. Sovell,** and K.L. Cornelisse. 2006. Range expansion of the least shrew (*Cryptotis parva*) in Colorado. *Southwestern Naturalist* 51(2). In press.
- Taylor, H.L., **R.J. Rondeau,** and **J. Sovell.** 2006. Alternative ontogenetic pathways to Color Pattern Class B in a newly discovered population of parthenogenetic *Aspidoscelis neotesselata* (Squamata: Teiidae). *Herpetological Review* 37(1):40-44.

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 rupincola* Osterhout (rock cinquefoil)
- Anderson, D.G. (2004, October 5). *Thelypodopsis juniperorum* (Payson) Rydberg (juniper tumbledustard)
- 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 (silkyleaf 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 myrtilifolia* 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

2007 Documents and Reports

- 2006 Rare Plant Surveys on Select Areas of the Arkansas Headwaters Recreation Area – Neid, S. (in progress)
- 2006 Rare Plant Surveys on Select Natural Areas in the Arkansas River Valley– Neid, S. (in progress)
- Assessing Wetland Condition in the Southern Rocky Mountains of Colorado Using a Vegetation Index of Biotic Integrity – Rocchio, J. (in progress)
- Bent's Old Fort National Historic Site Vegetation Classification and Mapping – Stevens, J., S. Neid, K. Forrest, and M. Fink (in progress)
- Buckley Air Force Base Wildlife Management Plan – Grunau, L. and R. Schorr
- Distributional Survey of Rare Small Mammals (Orders Insectivora, Chiroptera and Rodentia) in Colorado: Year Three – Siemers, J.L.
- Floristic Quality Assessment for Colorado Plant Communities – Rocchio, J. (in progress)
- Front Range Eco-regional Partnership Invasive Plant Species Strategic Plan –Spackman Panjabi, S. and K. Decker

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

Pawnee Montane Skipper Post-fire Habitat Assessment Survey – Sovell, J. (in progress)

Population Monitoring and Status Survey of Bell's Twinpod (*Physaria bellii*) in City of Fort Collins Natural Areas – Anderson, D.G. and A. Lavender

Rare Plant Survey of Select Bureau of Land Management Lands in the Arkansas Canyon – Neid, S. and S. Spackman Panjabi (in progress)

Sand Creek Massacre National Historic Site Vegetation Classification and Mapping – Neid, S., J. Stevens, K. Forrest, and M. Fink (in progress)

Survey for Snow Willow (*Salix reticulata*) in the White River National Forest – Lyon, P. and J. Huggins (in progress)

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

Survey of Old Growth Pinyon-juniper Woodlands on BLM land in San Juan Resource Area – Lyon, P. (in progress)

Survey of Pinon Canyon Maneuver Site for *Aspidoscelis neotesselata* – J. Sovell and J. Bell (in progress)

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

Pawnee Montane Skipper Post-fire Habitat Assessment Survey – Sovell, J. and B. Drummond (in progress)

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.

Ecological Systems of Colorado (Website) – CNHP

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 2005 – 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

Botrychium echo W.H. Wagner (reflected grapefern): A Technical Conservation Assessment– Anderson, D.G. and D. Cariveau

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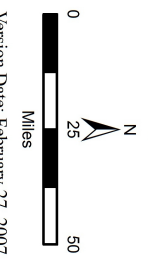
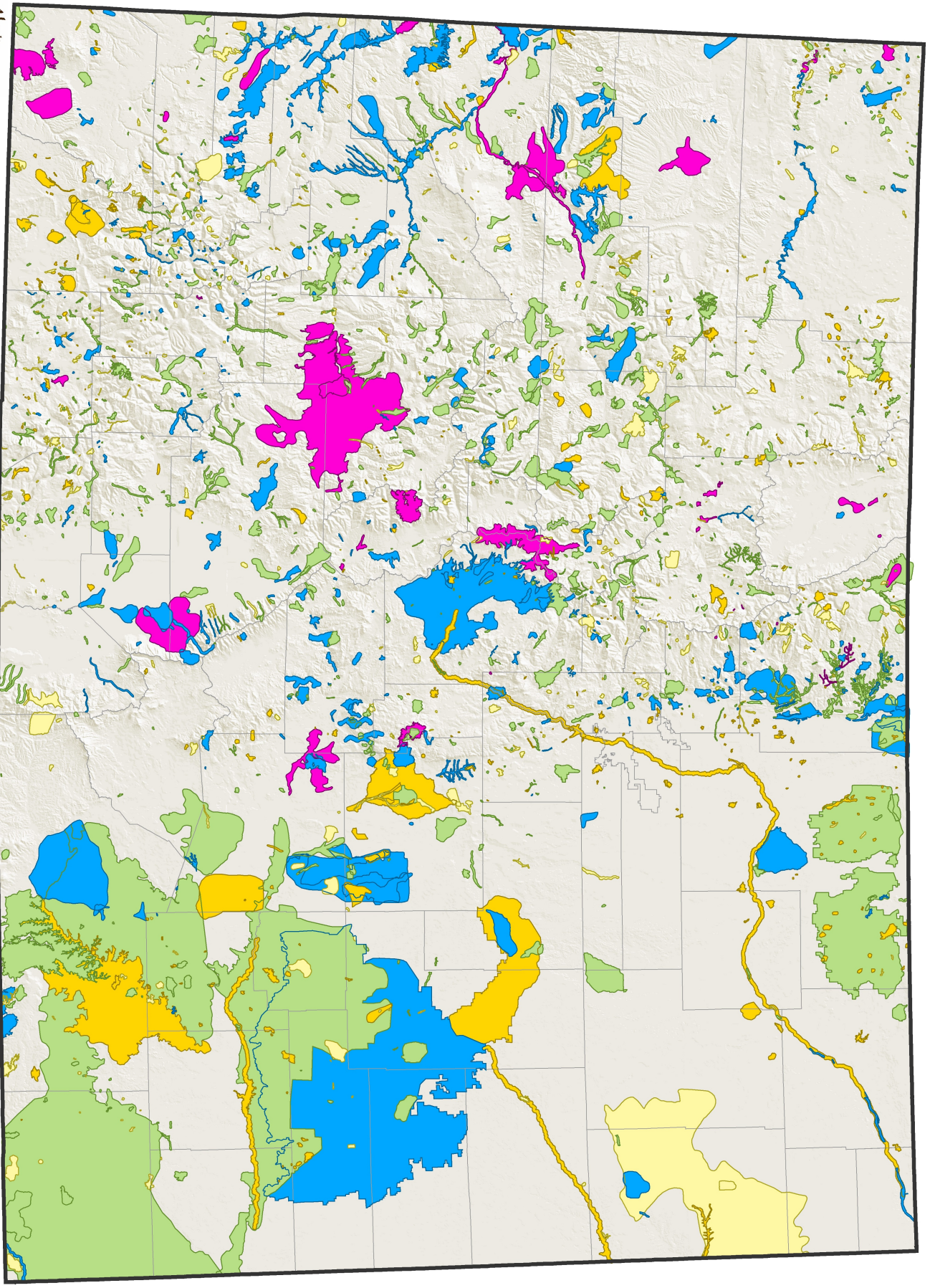
Mission Statement

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





Potential Conservation Areas



- Biodiversity Significance Rank**
- B1: Outstanding Biodiversity Significance (Magenta)
 - B2: Very High Biodiversity Significance (Blue)
 - B3: High Biodiversity Significance (Light Green)
 - B4: Moderate Biodiversity Significance (Yellow)
 - B5: General Biodiversity Interest (Light Yellow)

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