Colorado Natural Heritage Program

2003 Project Abstracts

Natural Heritage Program
COLORADO

Colorado State University
Knowledge to Go Places

Cover photo: A CNHP researcher collects freshwater specimens (*Pisidium* spp.) at Long Slough Reservoir on the Grand Mesa of Colorado's West Slope.

From the Director:

Typical conversations around our dinner table are often about the state of Colorado's biodiversity, what efforts are underway to maintain it, and why more biological information is needed. Inevitably we discuss the primary threats to some of Colorado's most imperiled species and plant communities, such as habitat fragmentation, exotic species invasion, urban and energy development, etc. On a good evening, we end on a positive note, and feel lucky that we have the opportunity to work in a field that is so relevant to future generations.

As the Colorado Natural Heritage Program continued our quest to fulfill our mission,

> *"To preserve the natural diversity of life by contributing the essential scientific foundation that leads to lasting conservation of Colorado's biological wealth,"*

we found ourselves developing stronger partnerships and working on over 40 projects throughout Colorado in 2003.

As Director of the Colorado Natural Heritage Program, I am proud to present our 2003 Project Abstracts. As you will see in the following pages, we were extremely active throughout the state on projects ranging from inventory to restoration. The main categories of studies were: inventory, monitoring, research, conservation planning, vegetation classification, heritage methodology, data exchange, restoration, and weed mapping.

All of these projects provided valuable conservation data to our primary funders that helped them make wise land-use decisions. The following report presents abstracts from our major projects of 2003. Some of these projects have been ongoing for several years, while others were short-term. Regardless of their duration, the primary biological information gathered in all of these projects resides in our constantly updated biological conservation database, with nearly 11,000 element occurrence records and over 1,700 Potential Conservation Areas. This large database is a primary source of biological information for conservation planners, developers, and researchers.

The staff at the Colorado Natural Heritage Program is extremely dedicated to gathering the best biological information for helping Colorado's citizens make wise land-use decisions. In the following report we share with you our commitment to collecting important information on Colorado's biota.

Renée J. Rondeau
March 6, 2004

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Colorado Department of Transportation Noxious Weed Mapping

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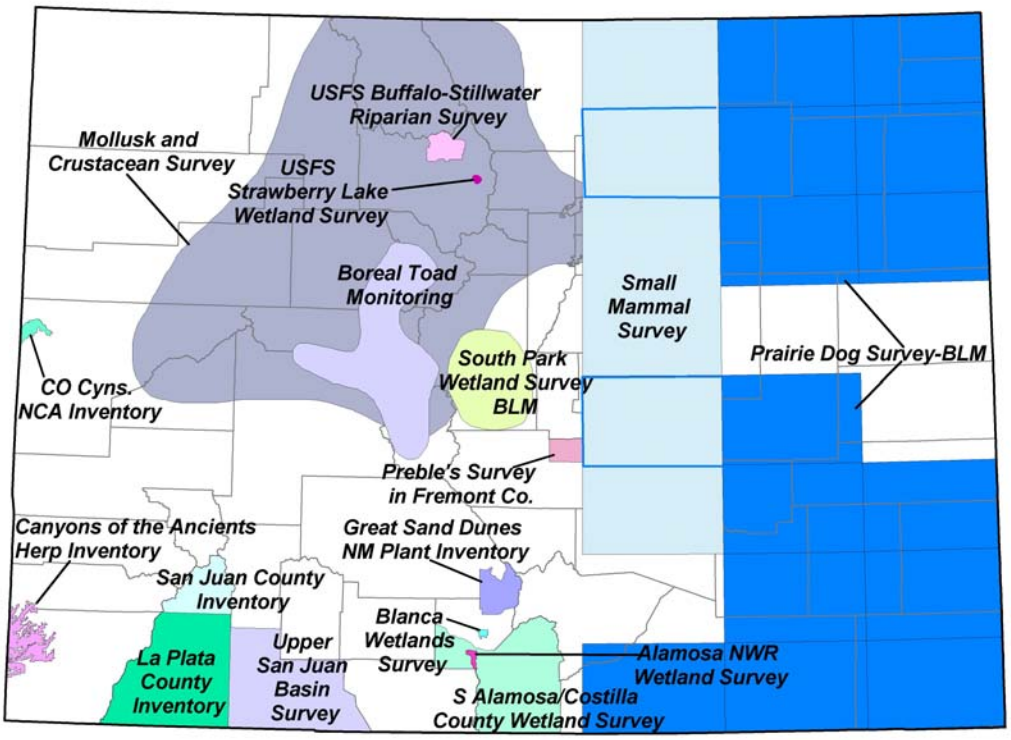
2003 Projects

Inventory



Boreal Toad Monitoring and Survey
Brad Lambert

The Colorado Natural Heritage Program (CNHP) formed a partnership with the U.S. Forest Service and Colorado Division of Wildlife (CDOW) in 1999 to monitor known boreal toad breeding sites, and to survey locations throughout Colorado for new boreal toad locations. On average, 22 breeding sites are monitored yearly. 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 status for potential federal listing. CNHP has continued this work yearly through 2003, and a new five-year contract is currently being formalized with CDOW to extend this project through 2008.


Boreal toad

CNHP's surveys of 536 sites between 1999 and 2003 resulted in discovery of 26 new locations for boreal toads. CNHP also implemented a mark-recapture study in the Cottonwood Creek drainage in Chaffee County in 1999 to track demographic variables in a large metapopulation of boreal toads. Over 1000 adults were tagged between 1999 and 2003. CNHP is currently analyzing these mark-recapture data to increase understanding of estimated population size, survival, site fidelity, and movement between breeding sites.

Colorado Small Mammal Survey
Jeremy Siemers

In 2001, 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.

CNHP surveyed the Front Range of Colorado during the 2002-2003 field seasons. In 2003, efforts focused on the northern pocket gopher (*Thomomys talpoides*), the valley pocket gopher (*Thomomys bottae*), and the olive-backed pocket mouse (*Perognathus fasciatus*). Our work greatly improved knowledge of the distribution of the northern pocket gopher, especially for the subspecies *Thomomys talpoides macrotis*. We documented this subspecies' occurrence in three Colorado counties and expanded its known distribution. We also recorded additional records of the valley pocket gopher and the olive-backed pocket mouse throughout their known range.

Montane Mollusk and Crustacean Surveys
John Sovell and Rob Guralnick

This three-year project, currently in its first year, is a collaborative effort between the University of Colorado Museum and CNHP to survey western Colorado for occurrences of montane mollusks and crustaceans. The project is funded by CDOW. Taxa that are currently tracked by CNHP will be targeted in the study; data will also be collected on all other commonly occurring mollusks and crustaceans.

Collecting freshwater specimens (*Lymnaea* and *Physa*) at Big Battlement Lake on the Grand Mesa of Colorado's West Slope.

For this project, we are using latitude and longitude (latilong) blocks (1^o latitude by 1^o longitude) to section western Colorado into northern and southern parts of approximately equal size. Each part contains eight latilong blocks. To ensure that sampling is representative of the study area, distribution records of western Colorado mollusks and crustaceans contained in CNHP's Biotics database and in CU's invertebrate collection database are being used to identify sampling locales in each of the latilong blocks. The study area includes 16 separate latilong blocks. During 2003, five of the blocks located in north-central Colorado were thoroughly sampled. In total, over 250 sites were sampled in 2003, generating well over 4000 individual specimens. Specimen identification and data analysis are ongoing.

Preble's Meadow Jumping Mouse Distribution in Fremont County
Rob Schorr

CNHP has been working with CDOW since 2001 to delineate the current distribution of Preble's meadow jumping mice (PMJM) in Colorado. During 2001 and 2002, CNHP conducted surveys in Larimer and Elbert counties in an attempt to locate new populations of PMJM. After exhausting landowner access opportunities, CNHP and CDOW decided to survey counties that possessed adequate riparian habitat, but were considered outside of the current distribution of PMJM. Researchers chose to target Fremont County in 2003.

CNHP conducted five trapping surveys on three streams in Fremont County during the 2003 field season. Two surveys at different elevations were conducted along each of the following creeks: Beaver Creek, Eightmile Creek, and Fourmile Creek. No jumping mice were captured at any of these survey areas. One jumping mouse was captured along Elkhorn Creek in Larimer County during training for the 2003 field season, but this animal is believed to be a western jumping mouse (*Zapus princeps*).

Canyons of the Ancients National Monument Amphibian and Reptile Inventory
Brad Lambert


Desert spiny lizard

The Bureau of Land Management (BLM) manages the 166,000-acre newly declared Canyons of the Ancients National Monument (CANM) in the southwest corner of Colorado. One of the important resources of the Monument is the rich herpetofauna that exists in this area. Many of these species are unique to the Colorado Plateau region. In 2003, the BLM contracted with CNHP to conduct an inventory of the herpetofauna on the

Monument as part of the CANM management planning process.

CNHP sampled sites that were representative of the various habitats occurring on the Monument and used visual encounter surveys along with funnel traps/drift fences to record the distribution of reptiles and amphibians on the CANM. The data collected will eventually be used to create a GIS data layer for the BLM which can be used to assist with land management decisions on the Monument.

Several species of interest were found during the study, including the desert spiny lizard (*Sceloporus magister*) and the long-nosed leopard lizard (*Gambelia wislizenii*), both of which are considered sensitive species by the BLM. CNHP recorded the distribution of four amphibian species, eight lizard species, and three snake species on the Monument. This was the first comprehensive inventory in this area since 1977. The success of this project has stimulated discussion on continuing cooperation between CNHP and the BLM to study the unique herpetofauna of this region.

Black-tailed Prairie Dogs on Bureau of Land Management Property in Colorado
John Sovell

During the 2002 and 2003 field seasons, CNHP cooperated with BLM to examine the distribution of black-tailed prairie dogs (*Cynomys ludovicianus*) on BLM property in eastern Colorado. During 2002, we surveyed Crowley, Otero, Pueblo and eastern Huerfano counties. The remaining BLM lands in eastern Colorado were surveyed in 2003. Although the project emphasized surveying BLM parcels in the study area, data were also collected on prairie dog colonies observed throughout the study area. In addition, colonies identified by EDAW (2000) were visited as time and resources allowed to evaluate the accuracy of those reported distributions.


Prairie dog

During 2002, 162 of the 171 BLM parcels identified within the study area were surveyed. We documented active prairie dog colonies on 19 BLM parcels and abandoned colonies on five additional BLM parcels.

The 2003 project targeted 102 sites and included over 8,000 miles of travel. Of the 102 BLM parcels surveyed, only seven contained active prairie dog colonies. Two other sites had what appeared to be abandoned colonies, but no live prairie dogs were found. In addition, occurrences were recorded for all other species tracked by CNHP. These data will be used to create spatial distribution map.

Biological Inventory of Colorado Canyons National Conservation Area
Joe Stevens and Peggy Lyon

The BLM contracted with CNHP to conduct biological inventories in the Rabbit Valley and Mack Ridge areas within the Colorado Canyons National Conservation Area (CCNCA). The objective was to identify the locations and status of rare plant, animal, and plant community occurrences. CNHP conducted the inventories during the summer of 2003, primarily relying on a Targeted Inventory Area (TIA) approach to direct inventory efforts.

Colorado River at Mack Ridge in Colorado Canyons National Conservation Area

CNHP identified approximately 40 TIAs in the Mack Ridge and Rabbit Valley areas. Precisely known element locations were incorporated so that where possible, they could be verified and updated. Other untargeted areas were opportunistically surveyed for rare species and plant communities. In searching targeted and non-targeted areas, CNHP identified 45 new or updated element occurrence records. The most significant of these include: Eastwood's evening primrose (*Camissonia eastwoodiae*), Ferron milkvetch (*Astragalus musiniensis*), Osterhout cat's eye (*Cryptantha osterhoutii*), Gardner's mat saltbush shrubland (*Atriplex gardneri/Leymus salinus* dwarf shrubland), and the mountain plover (*Charadrius montanus*).

CNHP is delineating Potential Conservation Areas (PCAs) for significant areas to assist the BLM in managing these species and plant communities and setting conservation priorities. The PCAs will represent our best estimate of the minimum area needed to ensure persistence of the species and plant communities. PCA boundaries will be based on a number of ecological processes, including: sufficient habitat for rare species,

protection of water quality and quantity, protection from potentially detrimental land uses, and maintenance of ecological processes necessary to perpetuate the viability of significant elements. The PCAs are not legal designations, but they are useful tools for guiding land use decisions.

Great Sand Dunes National Monument and Preserve Vascular Plant Inventory
Susan Spackman Panjabi, Karin Decker, and Georgia Doyle


Great Sand Dunes and Sangre de Cristo Mountains

As part of its biological inventory program, the National Park Service (NPS) contracted CNHP in 2001-2003 to conduct a field inventory of vascular plants of Great Sand Dunes National Monument and Preserve. The project objectively quantified inventory completeness for plants using a master list approach and by plotting number of species observed against survey effort. Surveys targeted rare and non-native plant species, and species for which the Monument lacked a voucher specimen.

As of December 2003, we have identified approximately 200 specimens that are new to the Monument Herbarium. Our results suggest that there are many more plant species to document. In 2002, 111 previously undocumented plant species were identified, and in 2003 at least 84 previously undocumented plant species were identified. Although specimen numbers have not been finalized, preliminary indications are that at least one more field season of collecting may be required to achieve a 90% documentation rate for vascular plant species in the Monument and Preserve.

Assessment of Critical Biological Resources, La Plata County
Peggy Lyon

CNHP has been systematically conducting county-based surveys for rare and imperiled species and significant plant communities since 1992. During the 2003 field season, we surveyed La Plata County with support from GOCO, La Plata County, San Juan National Forest, Bureau of Land Management, and the City of Durango. Companion projects

included a Rare Plant Survey of the San Juan National Forest and a wetland survey funded by the Colorado Department of Natural Resources.


Rothrock Townsend-daisy

At the beginning of this project, CNHP's database contained 130 element occurrence records for La Plata County. These records included 41 animals, 42 plant communities (mostly riparian and wetlands from CNHP's 1995 riparian survey), and 47 rare plants. As a result of this project, we were able to add 131 additional records, including 57 animals, 27 upland communities, and 47 rare plants, thus more than doubling the amount of data for the county. These results do not include the new wetland community occurrences documented during the wetland survey. High points of the survey included discovery of new occurrences of three globally imperiled (G2S2) plants: San Juan whitlow grass (*Draba graminea*), Rothrock Townsend-daisy (*Townsendia rothrockii*), and Colorado tansy-aster (*Machaeranthera coloradoensis*), all with excellent (grade "A") quality rankings.

Although the numbers may change slightly as we conclude data analysis, we expect the final results to include approximately 30 new Potential Conservation Areas (PCAs) based on plants and upland communities, and revision of approximately 35 existing PCAs. In addition, new PCAs will be drawn for many of the 57 new animal records.

Survey of Critical Wetlands in La Plata County
Maggie March and Denise Culver

In 2003, CNHP received funding from the Colorado Department of Natural Resources (DNR) through a grant from the U.S. Environmental Protection Agency (EPA), Region 8, to survey for critical wetlands within La Plata County. The goals of this project were to: 1) identify high-quality examples, and the corresponding natural heritage value, of all types of wetland/riparian areas in La Plata County (using CNHP's Comprehensive Statewide Wetland Classification); 2) coordinate efforts with the proposed La Plata County Biological Inventory; 3) evaluate the functions associated with each wetland type, 4) assess the restoration potential of each wetland type, and 5) to identify potential reference wetlands for the HGM program.

Results of the wetland and riparian survey confirm that La Plata County contains areas with high biological significance and a diverse array of wetlands that support a wide variety of plants, animals, and plant associations. At least 19 major wetland/riparian

plant communities from CNHP's Tracking List of plants, animals, and plant communities are known to occur in, or are associated with, wetlands in La Plata County. Twenty-nine wetland and riparian sites of biodiversity significance are profiled in the final report as Potential Conservation Areas (PCAs). These PCAs represent the best examples of 42 wetland and riparian communities observed on the private and public lands we visited. Of the 29 wetland and riparian PCAs, six are nearly irreplaceable in terms of biodiversity significance (B2), 10 are of high biodiversity significance (B3), and eight are of moderate biodiversity significance (B4).

Rare Plant Survey of San Juan National Forest
Peggy Lyon


Colorado tansy-aster

CNHP surveyed the San Juan National Forest for rare plants tracked by CNHP and Forest Service Sensitive Species. In addition, CNHP compiled species lists for selected sites surveyed. Over one hundred new or updated occurrences of plants, animals and plant communities were documented and evaluated. This information was used to identify 48 Potential Conservation Areas in San Juan County, including 11 of almost irreplaceable (B2 ranked) biodiversity significance.

This is part of an on-going project beginning with the Archuleta County survey in 2001, and extending to San Juan County in 2002, and La Plata County in 2003. This project will be continued in 2004 in Montezuma and Dolores counties.

Assessment of Critical Biological Resources, San Juan County
Peggy Lyon

CNHP conducted an inventory of biological resources in San Juan County during the 2002 field season with support from GOCO, San Juan National Forest, and the Bureau of Land Management. We surveyed approximately 75 areas, documented new occurrences of rare or imperiled plants, animals, and plant communities using GPS, and digitized occurrences in ArcView. At the beginning


San Juan whitlow grass

of this survey, the CNHP data system had only 87 records of plants, animals and plant communities in San Juan County. As a result of this survey, 104 new or updated records were added, including 71 rare plants, 9 animals, and 24 plant communities, more than doubling the available information on biological diversity of the county.

In addition, we identified 48 Potential Conservation Areas (PCAs) ranging from 15 acres to 2,769 acres based on the results of this inventory. We ranked each PCA on a scale of 1 to 5 for biodiversity significance, with the following results: 11 ranked B2 (Very High Significance), 22 ranked B3 (High Significance), 10 ranked B4 (Moderate Significance), and 6 ranked B5 (General Significance).

Upper San Juan Basin Biological Assessment
John Sovell and Peggy Lyon

In 2000, the Southwest Land Alliance (SLA) received a planning grant from GOCO and contracted with CNHP to perform a biological assessment of the Upper San Juan Basin, including Archuleta County and extreme southern Hinsdale County. The goals of the project were to systematically identify the locations of rare or imperiled species and significant plant communities, and to identify and prioritize Potential Conservation Areas of critical habitat for these species and communities.


Pagosa gilia

Field surveys began in April 2001 and continued through September 2002. Results of the survey confirmed that the Upper San Juan Basin contains areas with high biological significance. Several extremely rare plant and animal species depend on this area for their survival, including one plant, the Pagosa gilia (*Ipomopsis polyantha*), known from only three locations in the world, all of which are in Archuleta County. Altogether, 31 rare or imperiled plant species, 14 animal species, and 42 plant communities of concern have been documented for the Upper Basin. Of these, 10 plant species and two animal species were recorded for the first time in the CNHP database for the Upper San Juan Basin. Finally, 62 Potential Conservation Areas (PCAs), containing from one to 11 occurrences of rare or imperiled plants, animals, and natural communities were delineated for the study area.

Survey of Critical Wetlands in Southern Alamosa and Costilla Counties
Joe Rocchio


Rio Grande near the Pinon Hills

In 2003, CNHP received funding from the Colorado Department of Natural Resources through a grant from the U.S. Environmental Protection Agency, Region 8, to survey for critical wetlands within southern Alamosa and Costilla counties. This project completes baseline information regarding the location and status of wetland biodiversity in the San Luis Valley by supplementing CNHP's previous survey and assessment projects in Saguache, northern Alamosa, Rio Grande, and Conejos counties. The project may also assist participating landowners, agencies, and private conservation organizations in identifying key parcels for voluntary protection.

CNHP implemented the project in several steps, including: (1) locating wetlands to be included as "Target Inventory Areas" using aerial photos, National Wetland Inventory Maps, and input from the DOW Wetlands Program's San Luis Valley Wetlands Focus Area Committee; (2) contacting landowners to explain the project and purpose and to request permission to access sites on private land; (3) conducting field inventories to characterize Targeted Inventory Areas and to assess functions; and (4) preparing a final report and maps.

Data are still being analyzed. One significant discovery was a fen at the Alamosa National Wildlife Refuge. This fen is unusual in that it occurs at a relatively low elevation compared to most Colorado fens.

The final report and maps will be made available for use by Alamosa and Costilla counties, private landowners, the Colorado Division of Wildlife's Wetlands Program, the U.S. Environmental Protection Agency, Great Outdoors Colorado, The Nature Conservancy, Rio Grande Headwaters Land Trust, U.S. Fish and Wildlife Service-Alamosa National Wildlife Refuge, and other interested agencies, organizations, and individuals. Funding for this project was through the Colorado Department of Natural Resources.

Alamosa National Wildlife Refuge Wetland Survey
Joe Rocchio

The goals of this project were threefold: 1) Identify high-quality examples of all types of wetlands/riparian areas on private lands adjacent to the U.S. Fish and Wildlife Service Alamosa National Wildlife Refuge and assign the corresponding natural heritage value by using CNHP's *Comprehensive Statewide Wetland Classification and Characterization*; 2) Coordinate efforts with USFWS staff, the Division of Wildlife San Luis Valley Wetland Focus Area Committee, and the proposed Alamosa and Costilla Counties Wetland Survey and Assessment (proposal submitted to Colorado Department of Natural Resources); and 3) Evaluate the functions associated with each wetland type, and assess the restoration potential for each wetland type. Results are currently being compiled and analyzed.

Wetland Classification of Blanca Wetlands
Joe Rocchio


Blanca wetlands

The goal of this project was to classify approximately 200 ponds on the Bureau of Land Management's Blanca Wetlands complex according to CNHP's *Comprehensive Statewide Wetlands Classification and Characterization*. The information is intended to help wetland managers to understand vegetation dynamics and its correlation to management actions and wildlife use of the ponds. No new wetland communities were found, but this project was an interesting test of CNHP's comprehensive wetland classification. All of the ponds surveyed conformed to the characterization parameters in the classification. The data were summarized in the report and data forms and ArcView shape files were included on a CD-ROM. Community characterization abstracts for most of the plant associations found during the project are also found in the report.

Wetland Survey in South Park on Bureau of Land Management Property
Denise Culver


Playas at Park Gulch

CNHP began a prioritized survey and assessment for rare and imperiled plants and wetland plant communities on BLM lands in Park County during the summer 2003, and will complete fieldwork in 2004. This project will build upon the Mapping and Characterization of Mires and Fens in South Park project by Brad Johnson and Troy Gerhardt (2002). The project will classify wetlands, assess functions, and identify unique and/or rare wetland and riparian areas on BLM property in Park County. The final report, scheduled for completion in September 2004, will include maps, digital photographs, and descriptions of the wetlands as well as a GIS data layer of these sites.

During the field season of 2003, 10 wetlands totaling 212 acres were evaluated. Using the BLM Proper Functioning Condition rating system, four of the wetlands were rated as PFC (Proper Functioning Condition), two were FAR (Functioning at Risk) with a downward trend, and four were NF (Not Functioning).

Assessment of Riparian Areas within the Buffalo-Stillwater Allotment
Joe Rocchio, Renée Rondeau, and Georgia Doyle

In response to recently proposed management changes in the U.S. Forest Service Buffalo-Stillwater Allotment in Grand County, CNHP was contracted to document the conservation and biodiversity significance of the project area and make management recommendations. Project tasks included: 1) summarizing existing data; 2) conducting field surveys; and 3) evaluating the importance of the riparian systems within a watershed, state, and regional context.


Montane riparian willow shrubland along Willow Creek

Most of the riparian areas within the project area are in remarkably good condition. They provide high functional value for flood control, sediment retention, groundwater discharge/recharge, nutrient cycling, and production export and food chain support. The establishment of livestock grazing within the riparian areas would likely result in decreased functioning. Based on the results of this study, CNHP recommended to the U.S. Forest Service that the Buffalo-Stillwater Allotment Project Area continue to be managed for the protection and maintenance of its high-quality riparian areas, especially in the Willow Creek, Stillwater Creek and Whiskey Park areas.

Botanical Survey of Strawberry Lake Fen
Joe Rocchio and Joe Stevens

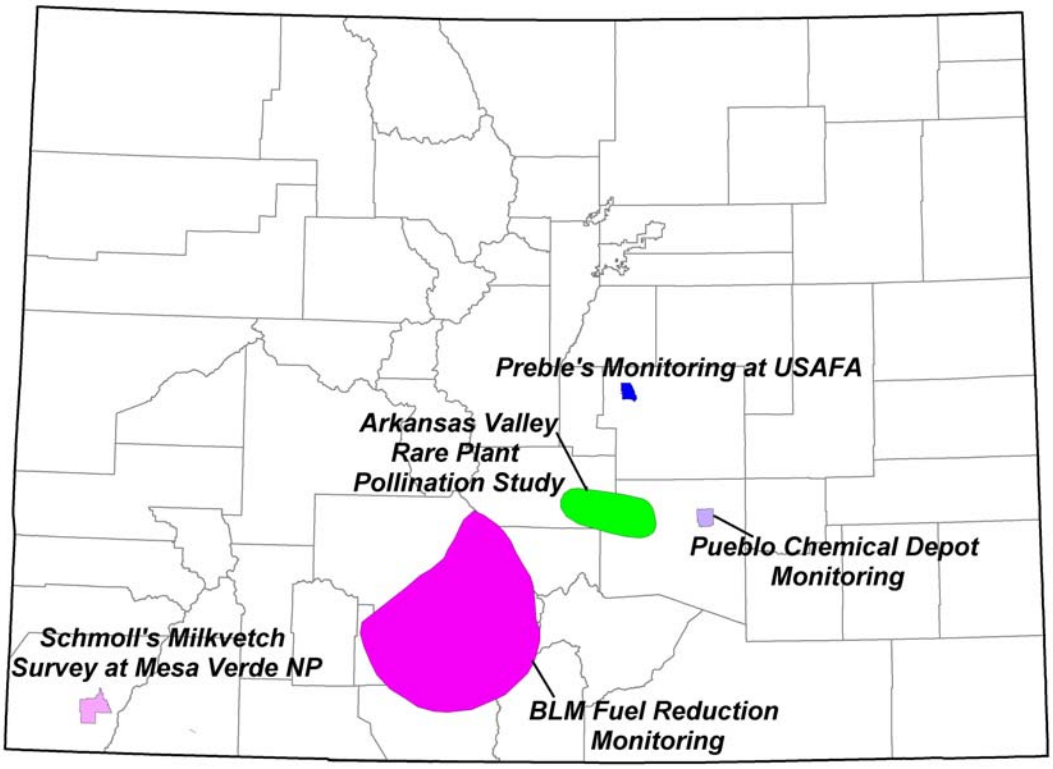
The U.S. Forest Service recently acquired the Strawberry Lake Fen in Grand County. In response to recently proposed activities in the project area, CNHP was contracted to: (1) conduct a botanical inventory of the Strawberry Lake project area; (2) discuss the importance of the fen; and 3) make management recommendations.

Approximately 100 plant species were observed during the site visits, including those in the fens, riparian areas, and kettle ponds. CNHP documented three state rare plants – slender sedge (*Carex lasiocarpa*), round-leaf sundew (*Drosera rotundifolia*), and marsh cinquefoil (*Comarum palustre*) – and two state rare plant associations – slender sedge and inflated sedge (*Carex vesicaria*) herbaceous wetlands. Based on these occurrences, CNHP has identified Strawberry Lake as a Potential Conservation Area of high biodiversity significance (B3 ranking). Very few non-native, invasive species were observed at the site.

CNHP recommended that the Strawberry Lake Fen be considered for Research Natural Area designation. This important area could benefit from some sort of protection from future human activities for the maintenance of its high-quality wetland areas and rare plant populations.


Strawberry Lake Fen

Monitoring and Research



Schmoll's milkvetch

Population Status Survey of Schmoll's Milkvetch
Dave Anderson

In 2001, Mesa Verde National Park contracted with CNHP to conduct a population status survey of Schmoll's milkvetch (*Astragalus schmolliae),* which is among the rarest of Colorado's endemic plant species. CNHP assessed the population extent and density of Schmoll's milkvetch on Chapin Mesa in 2001. The second year's survey work was postponed due to severe drought conditions that caused most plants to remain dormant. Then approximately half of the area occupied by *Astragalus schmolliae* in Mesa Verde National Park was burned in the Long Mesa fire. CNHP completed fieldwork in 2003 with the mapping of the Park Mesa and West Chapin Spur populations.

CNHP assessed fire impacts as well as status. Permanent demographic monitoring plots were established and sampled to obtain baseline data on seedling establishment and recruitment success. Plants in burned areas were vigorous and produced far more viable seed than plants in unburned sites, where most plants did not set seed and had abortive flowers. Seedlings were observed in abundance in 2003 in both burned and unburned sites. An analysis of demographic data from six plots is pending.

Monitoring Vegetation at Pueblo Chemical Depot: 1998-2003
Renée Rondeau

Prior to the Europeans settling the Great Plains, some 30 million bison and 80 million antelope roamed the unfragmented prairies. European settlement brought significant changes in the grazing pressures on the prairies, first the near elimination of bison and antelope, followed by the introduction of cattle, sheep, fencing, and farming. A unique situation at Pueblo Chemical Depot (PCD) has allowed CNHP to study the differences between areas that haven't been grazed by cattle since the 1940's with those areas that were continuously grazed by cattle up until 1998.


1998


2003 (same date and location as 1998 photo)

In addition to observing the differences between these two treatments, we also set up permanent monitoring plots to assess how rapidly or slowly the prairie responds to the cessation of all cattle grazing on the areas that were grazed up until 1998. Over 40 permanent plots were sampled for changes in vegetation, small mammals, and grasshoppers over the past six years (see below for grasshoppers and small mammal detail).

Differences in vegetation and the amount of bare ground have been documented for the shortgrass prairie, sandsage prairie, and greasewood shrublands. Six years of monitoring permanent plots has given us new insight into how the biotic community changes with the removal of cattle grazing. For example, while the amount of bare ground in recently grazed greasewood shrublands has diminished with the elimination of livestock, we have not seen this same trend in the shortgrass prairie. Since numerous vertebrates and invertebrates key in on the amount of bare ground available, we may also see this reflected in the fauna composition.

Monitoring Grasshoppers at Pueblo Chemical Depot
John Sovell

CNHP sampled grazed and ungrazed shortgrass prairie, sandsage, and greasewood scrub habitat types at the Pueblo Chemical Depot (PCD) in Pueblo County for changes in grasshopper (Orthoptera: Acrididae) communities. The grasshopper community was studied to investigate insect community associations across the various vegetation types and grazing regimes, and to monitor changes in insect community structure over time with changes in vegetation. By focusing on the grasshopper assemblage, this investigation emphasized a major herbivore guild that is also a food resource for some small mammals, thus, complementing both the vegetation and small mammal monitoring programs currently being conducted at PCD.

Obscure grasshopper (*Opeia obscura*) on rabbitbrush at PCD

Six sites for each of the 3 vegetation types and 2 grazing uses, for a total of 36 sites, were originally monitored. Two additional sites with active populations of black-tailed prairie dogs were added in an attempt to assess the impact of this species on orthopteran assemblages. Grasshopper density was monitored using hoop transects and composition was assessed through sweep net collections at every site. Sampling is complete for all years of this four-year study. Analysis has shown that communities differ significantly by habitat type. In 2001 species compositions on four plots currently grazed by cattle or prairie dogs differed significantly from other plots. In 2001, indicator species analysis suggested that grasshopper species have a slightly stronger relationship with grazed habitats. Six out of the nine species that were associated with a particular habitat were associated with grazed habitats. Researchers are currently working with Dr Marti Anderson at the Department of Statistics, University of Auckland, to develop a four factor (Habitat, Grazing, Years and Months {nested in Years}) repeated measures multivariate test of the data.

Monitoring Small Mammals at Pueblo Chemical Depot
John Sovell, Rob Schorr, and Jeremy Siemers

Ecological field surveys conducted at Pueblo Chemical Depot (PCD) during the period 1995-1998 compared differences in the characteristics of the vegetation and small mammals on areas grazed by livestock and on areas protected from livestock grazing since 1942. In 1998, the U.S. Fish and Wildlife Service contracted CNHP to investigate these floral and faunal differences further and to establish permanent programs to monitor the vegetation and small mammal communities on grazed and ungrazed areas at PCD.

Preliminary results of the small mammal population studies through 2003 indicate that at least 11 species representing 9 genera occupy the three major upland habitat types (shortgrass prairie, northern sandhill prairie, and greasewood scrub). Although responses to the removal of grazing varied among the small mammal species, many species were live-trapped at higher rates on ungrazed areas than on grazed areas within the northern sandhill prairie and/or within the greasewood scrub. However, analysis of capture-recapture data using a Cormark-Jolly-Seber model with group and individual covariates indicates that there is no evidence for a difference in apparent survival for any of the species associated with grazing regime. There is, however, interactive difference among species and vegetation types on apparent survival.

Preble's Meadow Jumping Mouse Populations and Upland Fire at the U.S. Air Force Academy
Rob Schorr and Joe Stevens

CNHP contracted with the U.S. Air Force Academy (the Academy) to assess the change in Preble's meadow jumping mouse (PMJM) populations following upland fire. Pre-existing vegetation conditions and PMJM capture success were assessed during the 2002 field season. The Academy's Natural Resources Branch set and managed four upland prescribed fires in March 2003. Each burn was initiated adjacent to a PMJM population monitoring transect, and then post-fire vegetation conditions and PMJM capture success were determined.


Preble's meadow jumping mouse

CNHP trapped four sets of transects along Monument Creek twice during the active 2003 season. Trapping events took place in late May/early June and again in late August/early September. Although many more PMJM were captured in riparian areas adjacent to burned areas than were captured in the same areas in 2002, capture effort was not

identical between years. More trapping was conducted in 2003 than was conducted in 2002, but capture success in areas adjacent to burns resembled capture success in areas adjacent to unburned areas. Multiple years of sampling may be required to adequately assess the impacts of upland burning. Upland fire did not preclude PMJM from the adjacent riparian areas, nor is it apparent that PMJM numbers increased in areas adjacent to fire.

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

CNHP has been working with the United States Air Force Academy (USAFA) since 1997 to understand the distribution, movement patterns, and population parameters of Preble's meadow jumping mice (PMJM). Currently in its 6th year, this long-term study has provided invaluable estimates of PMJM movement, survival, and abundance.

CNHP zoologists trapped eight sets of transects along Monument Creek twice during the 2003 season. Trapping events took place over five nights in late May/early June and again in late August/early September. Over 5 nights of trapping in early June, 47 PMJM were captured 90 times. Over 5 nights of trapping in early September, 18 PMJM were captured 20 times. Researchers withdrew blood from approximately 30 PMJM during sampling in both seasons, and determined relative lean-to-mass ratio. This information will be used to determine the value of fat reserves for over-winter survival of PMJM. The blood will also be analyzed to determine how saturated and unsaturated fatty acid composition influences over-winter survival.

Pollination Study for Globally-imperiled Plant Species in the Arkansas Valley
Susan Spackman Panjabi


Pueblo goldenweed

With funding from the National Fish and Wildlife Foundation, CNHP studied insect visitation rates for seven globally imperiled plant species that are only known from geographically restricted areas in the middle Arkansas Valley of Colorado. The species studied were Brandegee wild buckwheat (*Eriogonum brandegei)*, golden blazing star (*Nuttallia chrysantha*) Arkansas Canyon stickleaf (*Nuttallia densa*), Pueblo goldenweed (*Oonopsis puebloensis*), Arkansas Valley evening primrose (*Oenothera harringtonii*), round leaf four-o'clock (*Oxybaphus rotundifolius*), and Degener penstemon (*Penstemon degeneri*). These species were observed to determine the


Arkansas Valley evening primrose

diversity of insect visitors (potential pollinators) and approximate insect visitation rates. Rare, geographically restricted species are particularly susceptible to human disturbances that would reduce the frequency and/or diversity of potential pollinator visits. Appropriate management practices are difficult to determine because so little is known about the biology of the imperiled plant species. In particular, the reproductive biology of the plants is not understood, nor how these species are pollinated. Since viability is a key factor in the selection of conservation priorities and management strategies, an understanding of primary ecological and biological requirements is necessary.

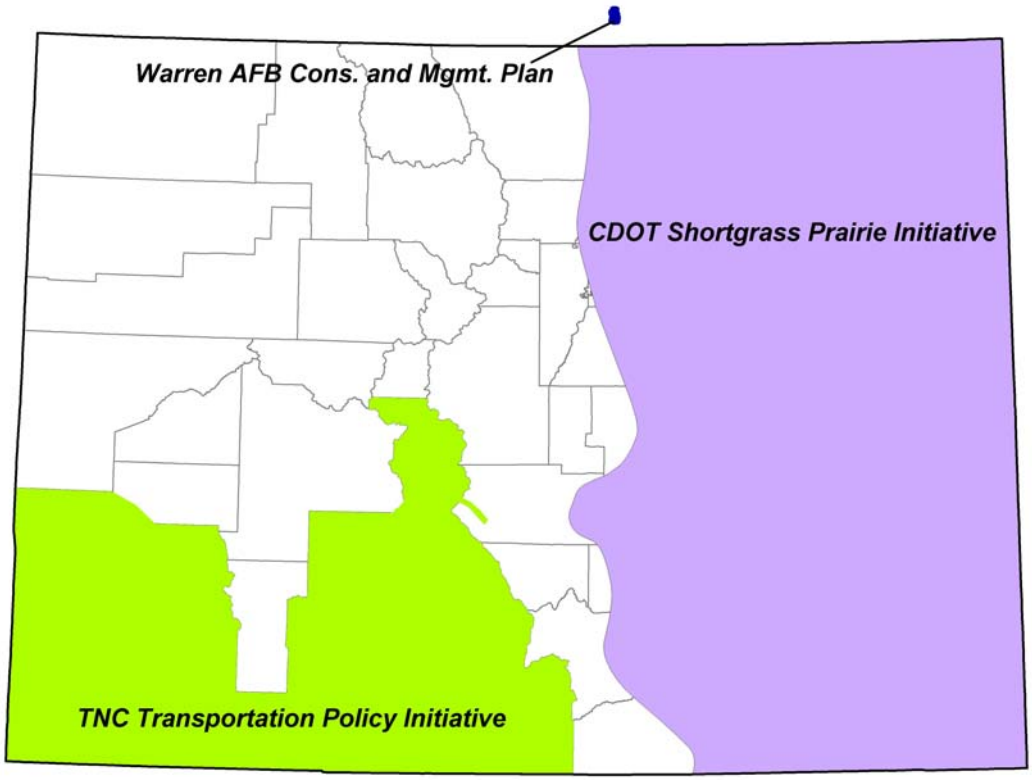
BLM Fuel Reduction Monitoring
Joe Stevens

The BLM Monte Vista Field Office contracted with CNHP to monitor several parcels of land where fuel reduction treatments were completed during the summer of 2003. The primary objective for the treatments was to reduce the density and cover of trees on the treatment areas by using a "hydro-axe." CNHP is in the first year of a multi-year monitoring plan to determine the degree of fuel reduction accomplished and the secondary effects the fuel reduction treatments have on the local terrestrial plant communities. BLM monitoring protocol requires subsequent monitoring in the first, third and fifth years after treatment.


Fuel monitoring plot location in the San Luis Valley

CHNP has set up permanent monitoring plots, randomly established, on each of the eight treatment areas. Using a criterion of one plot per 150 acres, a total of 40 plots will be placed on the eight treatment areas. Parameters monitored at the points are based on the objectives of the treatment project and include: density and cover of trees and tree saplings by species; understory cover by physiognomic type and species; frequency of understory species; percent cover of bare ground; percent cover of down litter; and plot appearance (photographs). The monitoring plan includes a combination of square quadrats, line transects, and photo points to measure the selected parameters.

Conservation Planning



Colorado Department of Transportation Shortgrass Prairie Initiative
Lee Grunau, Renée Rondeau, and Amy Lavender

CDOT undertook the Shortgrass Prairie Initiative in cooperation with CNHP, the U.S. Fish and Wildlife Service, the Nature Conservancy, the Colorado Division of Wildlife, and Colorado Department of Natural Resources. The project had three goals: 1) proactive conservation of declining species in Colorado's Central Shortgrass Prairie ecoregion; 2) advance compensation for potential impacts to these species from transportation improvements on the existing highway network; and 3) improved efficiency and effectiveness of environmental

Buffalograss/blue grama grassland in Baca County

assessments associated with CDOT projects over the next 20 years.

CNHP and partners identified 38 federally listed and non-listed but declining species that would be targeted for conservation action. The conservation strategy was based on a two-pronged approach: 1) off-site habitat protection to compensate for permanent habitat loss; and 2) on-site protection via use of Best Management Practices (BMPs) to offset more direct and localized impacts. The key to the conservation strategy is the purchase of real property interest(s) in selected sites from willing sellers, and management in perpetuity for the benefit of targeted species.

CNHP conducted a GIS-based impact analysis using the best available scientific data in conjunction with expert review. We mapped "presumed presence" based on potentially suitable habitat within known species range, and then calculated the acres of habitat for each species that could be permanently lost as a result of transportation improvement projects. We also conducted field surveys to evaluate high priority conservation areas, mapped existing habitat for each target species within the conservation areas, and developed a conservation strategy that would ensure compensation for all potential habitat loss for each target species. A programmatic biological assessment, conference report, and conservation strategy has been submitted to the USFWS, and CDOT has awarded the contract for conservation services to TNC. We expect the ultimate outcome of this project to be approximately 55,000 acres of high quality habitat permanently protected.

Juniper savanna in sandstone canyon country in southeast Colorado

Conservation and Management Plan for F.E. Warren Air Force Base
Lee Grunau, Rob Schorr, and Jill Handwerk

F.E. Warren Air Force Base (AFB), just west of Cheyenne, Wyoming, supports populations of two federally threatened sub-species: Preble's meadow jumping mouse (*Zapus hudsonius preblei*) and Colorado butterfly plant (*Gaura neomexicana coloradensis*). Both of these sub-species are restricted in range to riparian/wetland habitats, primarily along the eastern edge of the Rocky Mountains in Wyoming and Colorado.

CNHP is leading an effort, in cooperation with the Wyoming Natural Diversity Database and Warren AFB, to conduct a conservation assessment of these populations of Preble's meadow jumping mouse and Colorado butterfly plant, and to develop a conservation and management plan. This document will outline species' life history, habitat characteristics, potential threats and reasons for decline, and conservation/ management goals and objectives. The most significant planning issue is expected to be encroachment of four noxious weeds: Canada thistle, leafy spurge, common hound's tongue, and Dalmatian toadflax. Other potential planning issues are willow encroachment into Colorado butterfly plant habitat, water management and flood control, on-going development and maintenance of Warren AFB facilities, and future development of private lands upstream of Warren AFB. This project is currently in the early stages of analysis. The final conservation and management plan is scheduled for completion in June 2004.

The Nature Conservancy Transportation Policy Initiative
Lee Grunau

The Nature Conservancy (TNC) is partnering with CNHP to integrate ecological data into transportation planning processes, with funding provided by the Packard Foundation. As part of this initiative, CNHP is working with the Colorado Department of Transportation (CDOT) and the Federal Highway Administration (FHWA) on two projects:

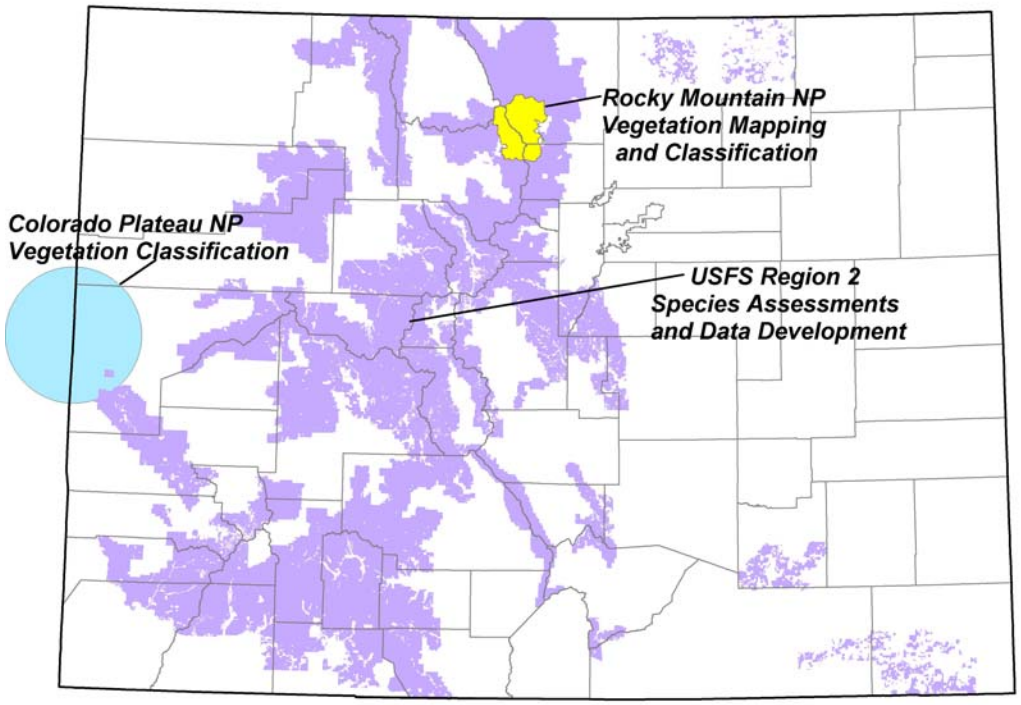
1. North Front Range Metropolitan Planning Organization (NFRMPO) Pilot Planning Process:

The leading partners are NFRMPO, CDOT, and FHWA, with numerous other stakeholder groups/agencies involved. CNHP's primary contribution will be in data delivery and interpretation assistance.

2. Statewide CDOT Planning Tool and Regional Case Study:

CNHP is developing two conservation planning tools for CDOT's regional environmental managers: 1) a statewide planning tool, and 2) a more in-depth regional case study for potential future replication in the remaining regions. The statewide planning tool will consist of a map and supporting documentation. The regional case study will also consist of a spatial dataset and will be accompanied by a handbook. The handbook will contain more detailed information on targets and key threats/opportunities, and possibly links to other sources of information (CDOW, riparian restoration guide, etc.). CNHP and TNC are working with Transportation Region 5 on the case study. The goal is to help CDOT staff to identify the questions they should be asking relative to biodiversity protection, and to give them some useful tools for formulating answers. Anticipated product delivery is March 2004.

Vegetation Classification, Heritage Methodology, and Data Exchange



Rocky Mountain National Park Vegetation Mapping and Classification
Joe Stevens and Joanna Lemly

The National Park Service is currently completing a multi-year vegetation classification and mapping program for all the National Parks. The objective of the individual projects is to provide each park with a list of all the plant associations in that park, a detailed description of each association as it occurs in the park, a field key to all the associations, and a map for the locations of the associations.


Dwarf clover (*Trifolium nanum*) herbaceous vegetation, overlooking the Never Summer Mountains

CNHP is completing the vegetation classification portions of the Vegetation Mapping and Classification project in Rocky Mountain National Park. CNHP is responsible for developing the preliminary classification of

Columbine and Colorado thistle (*Aquilegia coerulea-Cirsium scopulorum*) herbaceous vegetation near the base of Longs Peak

associations in the park, establishing permanent field plots to collect vegetation data, finalizing the classification based on the field data, writing local descriptions and a field key for all the associations, collecting data for accuracy assessment of the vegetation map and key, and contributing to the final report. In addition to the data collected for the classification and mapping, we have also collected data on the forest fuels at each of the plot locations and provided the park with over 3,000 digital plot photos of the plot locations.

Since the start of the project, we have collected the vegetation data and completed the vegetation classification. Currently, we are writing the local association descriptions and developing the field key. During the summer of 2004, we will collect data for the accuracy assessment portion of the project and start on the final report. The project is scheduled to conclude in June of 2005.

Vegetation Classification for Four National Parks of the Colorado Plateau
Karin Decker

Engineering-environmental Management, Inc. (e^2M) contracted with CNHP to produce preliminary vegetation classifications for four National Parks and National Monuments in Colorado and Utah. This project was a part of the National Park Service U.S. Geological Survey National Vegetation Mapping Program, which uses the National Vegetation Classification Standard to provide a uniform system of naming plant communities across the United States.

CNHP analyzed plot data from each park and assigned the data to new or previously known plant associations based on the results of the analyses. CNHP presented preliminary classification results to NPS, e^2M, and NatureServe personnel at a series of meetings in Colorado and Utah. Input from the classification was used to guide the photo interpretation and mapping efforts for each park.

This project resulted in the identification of 40-50 potential new plant associations for the National Vegetation Classification system, as well as providing additional data on many previously identified but poorly described types. The analysis of plots from the Colorado Plateau parks contributed additional weight to arguments for the reconsideration of how to characterize sparsely vegetated associations of the western U.S.

National Park Service Threatened and Endangered Species Database
Fagan Johnson and Joe Stevens

The National Park Service Threatened and Endangered (T&E) Species Database project consists of two main tasks: 1) development and integration of several existing databases that contain information on the status and presence of T&E species in the National Parks; and 2) development of summary sheets describing the recovery plan requirements for listed T&E species.

CNHP used four NPS data sources to create a single relational database to integrate and contain all of the status and occurrence data for T&E species in the parks. The data contained in the database include the species listed by the U.S. Fish and Wildlife Service as threatened or endangered, the inventory of T&E species identified as occurring on Park lands and their ranking status as defined by NatureServe Element Occurrence ranks, the suite of tasks assigned to individual parks for management of the species, and the designated critical habitat for each of the listed species. The T&E Species database has now been linked into the service-wide National Park Species database and will soon be served over the NPS intranet.

CNHP has also created summary sheets for each T&E Species listed on Park lands. The summary sheets provide the NPS and park managers with a concise account of the specific requirements for conservation of T&E species that occur in their parks. The summary sheets also provide appropriate conservation guidance for species lacking final recovery plans. CNHP has produced over 400 summary sheets and has developed a complete library of all of the available recovery plans including any subsequent updates or revisions.

U.S. Forest Service Region 2 Species Assessments
Dave Anderson and others

Five CNHP botanists are currently writing species assessments for the Region 2 Forest Service Species Conservation Project. Writing these assessments involves 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 species assessment reports are then peer reviewed and published on the web at http://www.fs.fed.us/r2/projects/scp/index.shtml.

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. As a result, we have changed global rarity ranks (G ranks) for *Botrychium echo, B. simplex*, and *Thelypodiopsis juniperorum* thus far. Numerous new element occurrences have also been identified by our searches of herbaria and conversations with experts.

Currently, one completed species assessment from CNHP (*Botrychium campestre*) is available on the web. We have completed drafts for 14 other species, including Brandegee wild buckwheat (*Eriogonum brandegei*). CNHP will ultimately complete 41 species assessments on rare plants in Region 2, making this organization the single greatest contributor of species assessments to the project.


Brandegee wild buckwheat

U.S. Forest Service Region 2 Data Development
Lee Grunau, Amy Lavender, Fagan Johnson, Jodie Bell, Jill Handwerk, Jeremy Siemers

CNHP is in the 11th 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 Forest Service lands. Forest Service wildlife biologists and botanists across the state submit field inventory data to CNHP annually. Our scientists and information managers incorporate these raw data into CNHP's BIOTICS (Biodiversity Tracking and Conservation System) data system. Element occurrences are digitized in GIS, and supporting data are uploaded into associated tabular databases. We provide each National Forest and Ranger District office with CDs containing the comprehensive dataset for all Forest Service lands within Colorado once per year. 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 Forest Service projects and management plans, and work with the USFS to continually improve data management and distribution methods and tools.

CNHP Element Occurrence Specifications and Element Occurrence Rank Specifications
Jill Handwerk and Karin Decker

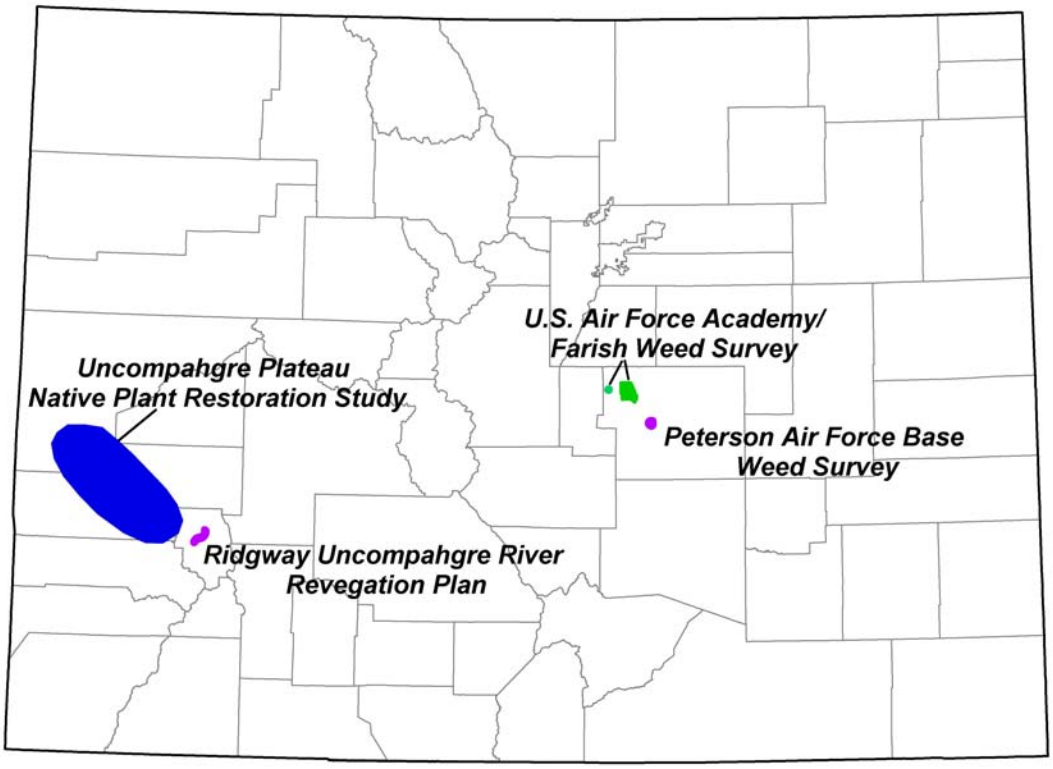
NatureServe contracted with CNHP to develop EO specs and EO rank specs for threatened and endangered plant species and other species of concern for the U.S. Fish and Wildlife Service. CNHP also reviewed and updated the global rarity rank justification fields (GREASONS and THREATS and TRENDS) for these species. The species reviewed were: *Astragalus humillimus, Eriogonum clavellatum, E. pelinophilum, Lesquerella congesta, Penstemon gibbensii, P. grahamii, P. scariosus var. albifluvis, Phacelia submutica, Physaria obcordata, Sclerocactus glaucus,* and *S. mesae-verdae*.

Uinta Basin hookless cactus (*Sclerocactus glaucus*)

General Support from The Nature Conservancy
Renée Rondeau

Natural Heritage Programs and 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 Heritage Programs were established in every state. At first, all 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 planning effort, measures of success, and local scale conservation planning.

Restoration and Weed Mapping



Analysis of Current Vegetation and Revegetation Plan for the Uncompahgre River
Peggy Lyon


Peggy Lyon with willow cuttings on the Uncompahgre River

CNHP provided a species list of existing vegetation and a list of recommended native species for revegetation as part of the restoration of the Uncompahgre River in Ridgway, Colorado. The project included research on planting methods, availability of seeds or nursery stock, recommendations on location and spacing, and a proposed budget for revegetation. The project involved volunteers from the community, including Ridgway-Ouray Community Council and Ridgway School. An educational

component in cooperation with the Ridgway Middle School was included. Hands-on work included the cutting of willow whips from nearby private land.

Native Plant Restoration Opportunities and Constraints
Peggy Lyon


A plot on the Uncompahgre Plateau

This cooperative project between CNHP and the University of Wyoming was funded by BLM's Native Plant Materials Development Program, in association with the Uncompahgre Project (UP). The goal of this study is to help determine when seeding should be done after disturbance (e.g., fire), and when natural succession should be allowed to take place; and if seeding is done, what species should be seeded at given sites. To accomplish this, 150 random points, stratified by geology, vegetation, slope, and aspect, were selected within the pinyon-juniper and sagebrush zones of BLM land on the Uncompahgre Plateau (about 600,000 acres). At each site, a 50 x 20 meter plot was established, and all plants within the plot were identified and given a percent cover estimate. A nearby "companion plot" in a different stratum (i.e., differing in vegetation, geology, slope or aspect) was also surveyed, increasing the total number of plots to 300. Results were entered into a GIS program by CNHP, and will be analyzed by UW. Meanwhile, the data provide a vivid picture of the distribution of individual plant species on the Uncompahgre Plateau. This project was begun in 2002, and will continue into 2004.

Colorado Department of Transportation Noxious Weed Mapping
Susan Spackman Panjabi, Dan Burkhart, Fagan Johnson, Jill Handwerk, and Lee Grunau

CNHP is in the fourth year of an on-going partnership with Colorado Department of Transportation (CDOT) to map noxious weeds along the right-of-ways (ROWs) of existing state and federal highways. We are working with CDOT to develop a GIS database, and to provide technical assistance to CDOT maintenance personnel. The primary objectives of this inventory/mapping effort are to accurately identify lands with populations of noxious weeds and unwanted plants, and to identify areas that are sensitive to spraying and mowing (e.g., rare plant habitat, etc.). CNHP provides training and technical support on the use of Global Positioning System (GPS), GIS mapping technology, and on the identification of noxious weeds, rare plants, and sensitive habitats. In addition, our GIS Specialists are assisting CDOT with detailed mapping of highways, off-ramps, maintenance yards, ROWs, and other physical features of the existing

highway network. CNHP botanists are developing noxious weed brochures to assist CDOT personnel in the identification of high priority weed species.


Hoary cress (*Cardaria draba*), a top ten noxious weed in Colorado

Noxious Weed Survey of Peterson Air Force Base
Ron Abbott and Dave Anderson

CNHP mapped noxious weeds at Peterson Air Force Base (PAFB) east of Colorado Springs, Colorado, during the summer of 2003. The goal of this project was to provide the Peterson Air Force Base Natural Resources Manager with information needed to develop a formal Integrated Weed Management plan in order to comply with the PAFB Integrated Natural Resources Management Plans, federal and state noxious weed laws, and Executive Order 13112.

CNHP mapped eleven species of weeds. Three of these species are included among the top ten prioritized weed species listed in the Colorado Noxious Weed Act, and all but one are on the State Noxious Weed List. CNHP prioritized each species and made suggestions for their management based on the size of the infested area, invasiveness, and difficulty of management. CNHP also made management recommendations for particular problem areas of the base. No rare species or significant plant communities were found at PAFB during weed mapping.

Noxious Weed Survey of the U.S. Air Force Academy and Farish Outdoor Recreation Area
Dave Anderson and Ron Abbott

The U.S. Air Force Academy contracted with CNHP to map selected weeds on the Academy and the Farish Outdoor Recreation area during the summer of 2002. The results will serve as the basis for a formal Integrated Weed Management plan for the Academy properties.

CNHP mapped 14 targeted weed species using Arcpad software (ESRI 2000) installed on a handheld mobile device with a GPS unit. The targeted species are widespread at the Academy and Farish. CNHP ranked species as either a high or moderate management

Yellow toadflax (*Linaria vulgaris*), a top ten noxious weed in Colorado

priority based on invasiveness, size of infested area, and difficulty of management. CNHP also identified communities and substrates where yellow toadflax is unlikely to occur as well as plant communities that are less likely to be infested by weeds. Two occurrences of rare plants, Rocky Mountain cinquefoil (*Potentilla ambigens*) and Rocky Mountain gayfeather (*Liatris ligulistylis*), were assessed for threats from noxious weeds.