

Colorado Natural Heritage Program Projects 2010-2012



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WARNER COLLEGE OF NATURAL RESOURCES

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

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From the Director:

CNHP's mission is to provide the scientific foundation to support the conservation of Colorado's natural heritage- the wealth of nature that we have inherited as citizens of our state. Although our work is focused on the animals, plants, habitats, and ecosystems of Colorado, it is really our connections to people that make all of that matter. Since 1979 we have been creating and maintaining a comprehensive map of Colorado's conservation priorities. Our expertise and information have supported some of Colorado's biggest conservation successes over the last 30 years- including major projects like the additions to the Great Sand Dunes National Park and Preserve, Larimer County's Mountains-to-Plains Project, and 36 county-wide surveys that have led to countless new parks and open spaces, as well as opportunities for private land owners to secure funds for conservation on their land. CNHP plays a significant role in conservation through partnerships.



CNHP's most recent County Biological Inventory was a survey of Jefferson County. Twenty years ago, this was the first county that CNHP surveyed, and we identified 84 potential natural areas for the fledgling Open Space Program. Over the next 17 years, Jefferson County Open Space conserved 65% of these areas, using the conservation sites identified by CNHP as a guide. Jefferson County Open Space is now one of our country's most successful and ambitious open space programs. Our recent resurvey will benefit everyone in the County by creating opportunities for private land owners, Jefferson County's Open Space program, and the citizens of Colorado and beyond, to preserve and enjoy Colorado's splendors.

We continue to work with ranchers, producers, citizens, planners, managers, scientists, educators, students, and leaders to shape the future of Colorado's natural areas. We have a staff that knows the biology of Colorado and who always amaze me in their ability to find and identify our rarest and most spectacular treasures. And we are leaders when it comes to putting cutting edge technology to work to develop conservation plans, models, and maps to guide conservation. We have recently begun to contribute information in support of voluntary, market-based programs and incentives for ecosystem service banking, adding a new dimension to our role in conservation leadership. This is all part of our vision for Colorado's future, in which we retain the richness of animals, plants, and habitats that make our state wonderful, while making life better for everyone.

I hope you enjoy reading about CNHP's recent accomplishments, and I'd love to talk with you any time.

Dave Anderson



Primary funders (in alphabetical order)



Colorado Division of Reclamation, Mining and Safety

Surveying mines for bats

Colorado Division of Transportation

Department of Transportation Conservation Easement Monitoring

Colorado Natural Areas Program

Shape Replacement for Selected Element Occurrences
Analysis of Sclerocactus mesa-verdae monitoring.
Dinosaur National Monument Rare Plant Surveys

Colorado Parks and Wildlife

Surveying mines for bats
North Platte River Basin Wetland Profile and Condition Assessment
Boreal Toad Monitoring and Survey Project
Statewide Strategies in Protecting and Restoring Colorado's Wetland Resource
Tools for Colorado Wetlands

Colorado Springs Utilities

Biodiversity Study of the South Slope of Pikes Peak

Colorado State Land Board

Survey of Natural Values - CSLB Inventories of Stewardship Trust Lands

Dolores Public Lands Office

Bat surveying at Spud Patch management area, Egnar, Colorado

Great Outdoors Colorado (GOCO)

Survey of Critical Biological Resources in Teller County

Jefferson County

Survey of Critical Biological Resources Jefferson County

National Academy of Science Transportation Research Board

Analyses to Support Pikes Peak Area 2011 Long Range Transportation Plan
Pilot Test Ecological Approaches to Environmental Protection

National Fish and Wildlife Foundation

Rare Plant Conservation Initiative

National Park Service

National Park Service Inventory & Monitoring Network Support
Review and Evaluation of the NPS Potential National Natural Landmarks
Dinosaur National Monument Rare Plant Surveys
Accuracy Assessment of Vegetation Mapping at Fort Union
Survey of Rare Plant Species in Black Canyon of the Gunnison National Park
GLORIA, Lichen Species Diversity, Yellowstone National Park GLORIA Site
Natural Resource Condition Assessment for Great Sand Dunes National Park
Vegetation Inventory of Bighorn Canyon National Recreation Area

NatureServe

CNHP Environmental Review and Data Distribution Projects

The Nature Conservancy

Department of Transportation Conservation Easement Monitoring
Rare Plant Conservation Initiative
The State of Colorado's Biodiversity
Colorado Wildlife Action Plan: Proposed Rare Plant Addendum

U.S. Bureau of Land Management

Rare Plant Surveys on Bureau of Land Management Lands

U.S. Department of Defense

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

U.S. Environmental Protection Agency

Survey of Critical Biological Resources in Teller County
Tools for Colorado Wetlands
The Rocky Mountain REMAP Project
Survey of Critical Biological Resources Jefferson County
Survey of Critical Wetlands and Riparian Areas in Gilpin County
North Platte River Basin Wetland Profile and Condition Assessment
Setting Mitigation in the Watershed Context
National Wetland Condition Assessment (NWCA)

U.S. Fish and Wildlife Service

Threatened and Endangered Plant Species Data Development and Field Surveys

U.S. Forest Service

Wetland Mapping and Fen Survey in the White River National Forest
National Forest Zoology Surveys
Boreal Toad and Northern Leopard Frog Surveys and Habitat Evaluations



NatureServe



Survey of Critical Biological Resources in Teller County

Denise Culver

In 2010, Teller County contracted with Colorado State University and the Colorado Natural Heritage Program (CNHP) to survey for critical biological resources in Teller County with funding provided by Teller County, Great Outdoors Colorado, U.S. Environmental Protection Agency, Region 8, Wetland Program Grants, Bureau of Land Management, and the Coalition for the Upper South Platte. The purpose of this project was to provide a scientific data resource for managers, planners, and the citizens of Teller County for conducting proactive landscape planning. The goal of the project was to systematically identify the locations of rare species and significant habitats. The landscape of Teller County is characteristic of Colorado. Montane grasslands and ponderosa pine woodlands outline the hillsides. Steep, rugged, and narrow canyons, high peaks, and hoodoo-like monoliths are interspersed with the undulating green lines of willow shrublands in the valley bottoms.

CNHP identified 51 Potential Conservation Areas (PCAs) in Teller County. These PCAs represent the best examples of targeted species and plant communities and their ecological processes observed on the private and public lands that were visited. This project's significant species findings include: several new sub occurrences documented for one of the world's rarest plants, Pikes Peak spring parsley (*Oreoxis humilus*) (G1S1), the best known occurrence of the montane population of the Gunnison Prairie Dog (*Cynomys gunnisoni*) (G5S5), re-discovery of a historical occurrence of the spiny-spored quillwort (*Isoetes setacea* ssp. *muricata*) (G5? T5?S2) not seen since 1902, and several new locations of fens, a type of peatland that is groundwater fed and has accumulated at least 16 inches of organic soil or peat.



National Wetland Condition Assessment (NWCA)

Joanna Lemly

In the summer of 2011, the U.S. Environmental Protection Agency (EPA) and its state, tribal, and federal partners—including CNHP—conducted field sampling for the first-ever national survey on the condition of the nation's wetlands. The National Wetland Condition Assessment (NWCA) was designed to provide regional and national estimates of wetland ecological integrity and rank the stressors most commonly associated with poor conditions. A consistent field assessment procedure was used to ensure that the results can be compared across the country.

CNHP was responsible for sampling all selected wetlands in both Colorado and Wyoming. This included twelve randomly selected sites in Colorado and nine in Wyoming. Of these sites, two in each state were visited twice throughout the summer to quantify intra-annual variation. In addition to the random sites, the CNHP crew sampled six hand-picked, high quality reference sites that will help EPA establish thresholds associated with good condition. Sampling for NWCA took the CNHP crew all the way from Las Animas County in southern Colorado to the backcountry of Yellowstone National Park. Data analysis for the project is currently underway, conducted primarily by EPA. Once complete, the NWCA will inform decision-making on how to better protect, maintain, and restore water quality to the nation's aquatic resources.

Wetland Mapping and Fen Survey in the White River National Forest

Dee Malone, Erick Carlson, Gabrielle Smith, Denise Culver, and Joanna Lemly

In January 2011, CNHP contracted with the White River National Forest (WRNF) to complete wetland mapping and fen field surveys within the WRNF. Since, 2008, CNHP has been working with the U.S. Fish and Wildlife Service's National Wetland Inventory (NWI) Program and numerous funding partners to create a comprehensive digital map of wetlands for the state of Colorado by 2015. The digitizing and mapping of the wetlands within the WRNF is integral to CNHP's goal to determine the extent and location of wetlands across the state. In addition to the digitizing of the 124 NWI maps, a subset of mapped wetlands consisting of 39 fens were field surveyed during 2011.

The WRNF covers 2.3 million acres within the State and ranges from 7,000 ft. to 14,265 ft. in elevation. The Forest includes a portion of the headwaters of two major river basins in Colorado; the White River and the Roaring Fork River. The diverse geography of the WRNF creates a template for an equally diverse set of wetlands. Though the acreage of wetlands across the WRNF is extensive and the services they provide are vital, prior to this project, comprehensive digital wetland mapping did not exist for the Forest.



Fens, a unique type of peatland, were prioritized during both the mapping and field survey. Fens are an irreplaceable resource; the U.S. Forest Service, Region 2 has determined that fens are a sensitive plant habitat and they will be managed for conservation and restoration. In the Southern Rockies fen wetlands are defined as a peat accumulating wetland that are fed by mineral rich surface water or groundwater and usually supports sedge and grass-like vegetation.



Natural Resource Condition Assessment for Great Sand Dunes National Park and Preserve

Karin Decker, Michelle Fink

CNHP is cooperating with NPS Network and Park staff to produce a Natural Resource Condition Assessment for Great Sand Dunes National Park. The assessment is a spatially explicit multi-disciplinary synthesis of existing scientific data and knowledge from multiple sources to help answer the question: what are current conditions for important park natural resources?

Natural processes, together with stressors such as hydrologic modification, exotic species invasion, adjacent land use, energy development, and climate change are being evaluated for current status along with important and characteristic species of the Park. Methods are designed to use existing data in novel analytical approaches. Sources include geospatial, inventory and monitoring, and research data, as well as input from Park staff and regional experts. CNHP will also produce the final report document, pulling together contributions from all cooperators.



Statewide Strategies to Improve Effectiveness in Protecting and Restoring Colorado's Wetland Resource, including the Rio Grande Headwaters Pilot Wetland Profile and Condition Assessment

Joanna Lemly, Laurie Gilligan

Colorado Parks and Wildlife (CPW)'s Wetland Wildlife Conservation Program funds wetland restoration projects on public and private land for the benefit of wetland-dependent wildlife. In 2007, CPW identified a need for strategic planning based on increased information about Colorado's wetland resources. To accomplish this goal, CPW and CNHP launched a multi-year effort to determine the types, abundance, distribution, threats to, and level of protection currently provided to Colorado's wetlands and to assess their ecological condition. The effort was initiated through a U.S. Environmental Protection Agency. The four project objectives were to: 1) compile existing geospatial data regarding the location and type of wetlands in Colorado; 2) assess the ecological condition of wetland types in one river basin pilot (Rio Grande Headwaters); 3) develop statewide strategies for setting wetland restoration priorities; and 4) develop an interactive online mapping tool to transfer this information to local and statewide partners in wetlands conservation.



To facilitate the transfer of this information to many different partners across the state, CPW and CNHP developed the Colorado Wetlands Inventory website, through which viewers can see the status of selected mapping efforts

and the actual mapped polygons themselves. In addition to the mapping, CNHP Ecologists surveyed 137 randomly selected wetlands in the Rio Grande Headwaters River Basin to assess their condition. Results indicate that the condition of wetlands varies by type and location within the basin. Marshes and saline wetlands, found more commonly at lower elevations, had lower condition scores in general. Fens and riparian shrublands, found more commonly at higher elevations, have higher condition scores. Wet meadows were the most common wetland type surveyed and span both the geographic range of the study area and the condition gradient.



Tools for Colorado Wetlands

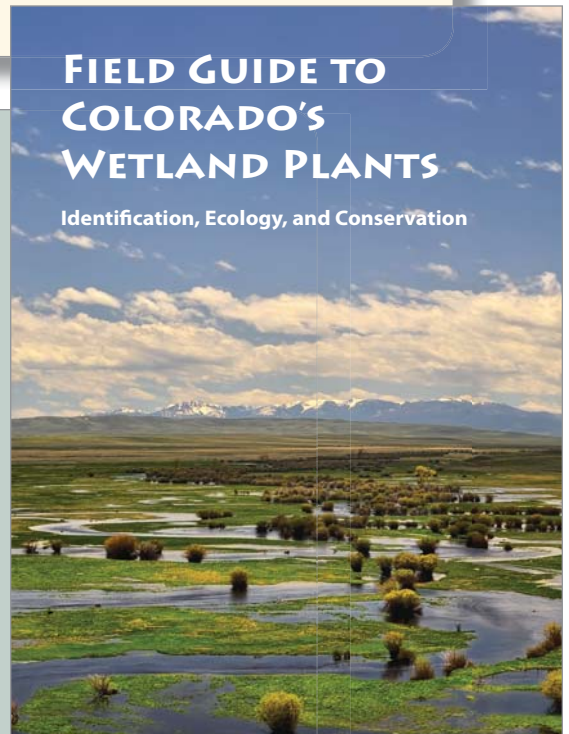
Denise Culver, Joanna Lemly

CNHP has been working on the **Tools for Colorado Wetlands: Essential Information for Identification, Assessment, and Conservation**, that includes a 700 page field guide to wetland plants, funded by U.S. EPA Region 8. The Wetland Field Guide will contain botanical descriptions of over 600 wetland plants as well as information on priority wildlife species and other wetland-dependent animals, wildlife and vegetation ecology, and rare and/or sensitive plants. The Guide will serve as an important resource to determine a wetland plant's identity, wetland indicator status, coefficient of conservation, rarity, and ecology.

The project will also develop an easily accessible Colorado Wetland Website that will present information on wetland ecosystems and their conservation status, a database to calculate the overall conservatism of species present in a wetland and reports on Colorado wetland and wetland assessment tools.

FIELD GUIDE TO COLORADO'S WETLAND PLANTS

Identification, Ecology, and Conservation



Biodiversity Study of the South Slope of Pikes Peak

Denise Culver

CNHP was contracted by Colorado Springs Utilities (CSU) to conduct a survey and assessment of wetlands and their associated plants and animals on the South Slope of Pike's Peak.

During the survey, CNHP botanists and Dr. Tass Kelso from Colorado College re-discovered a population of the spiny-spore quillwort (*Isoetes setacea* ssp. *muricata*) (G5? T5?S2) in a pond just below McReynolds Reservoir that had not been seen since 1902. In addition, a population of the state rare mud sedge (*Carex limosa*) (G5S2) was documented in a fen above Mason Reservoir (Sackett Fen).

During the 2011 survey of Sackett Fen by CNHP and Dr. Kelso, additional wetland elements were discovered: simple bog sedge (*Kobresia simpliciuscula*) (G5S2), slender cottongrass (*Eriophorum gracile*) (G5S3), and lesser bladderwort (*Utricularia minor*) (G5S2). CNHP documented slender cottongrass throughout the study area. Mud sedge and lesser bladderwort were also documented at the inlet of Lake Moraine. While surveying wetlands, CNHP and CSU staff documented several new populations of James' teleonix (*Telesonix jamesii*) (G2S2), a regional endemic plant that occupies granite outcrops. Roundtip twinpod (*Physaria vitulifera*) (G3S3), a terrestrial plant was found growing along the levee at Lake Moraine. CNHP staff did visual surveys for birds and amphibians.

Results from the 2010 and 2011 surveys confirm that the South Slope of Pikes Peak supports a network of contiguous, highly functioning wetlands that contain numerous global and state rare plants. The South Slope of Pikes Peak is truly unique for this part of Colorado and the Southern Rocky Mountains with its concentration of fens providing habitat for global and state rare plants.



Biological Inventory of the U.S. Air Force Academy

Jeremy Siemers, Dave Anderson, Rob Schorr, Renee Rondeau

CNHP began a two-year inventory of biological resources on the U.S. Air Force Academy in 2010. New locations of plants, animals and natural communities of concern were found and previously documented occurrences were updated. We documented new locations of the hops-feeding azure (*Celastrina humulus*), northern leopard frog (*Lithobates pipiens*), Preble's meadow jumping mouse (*Zapus hudsonius preblei*), Front Range alum-root (*Heuchera hallii*), and frostweed (*Crocianthemum*

bicknellii). Occurrences of Porter's feathergrass (*Ptilagrostis porteri*) and a rare montane grassland (*Danthonia parryi* Herbaceous Vegetation) were revisited and updated. In addition, we completed a population study of the breeding birds found on the Academy and a 20-year plant community change analysis by revisiting plots from 1991.



GLORIA

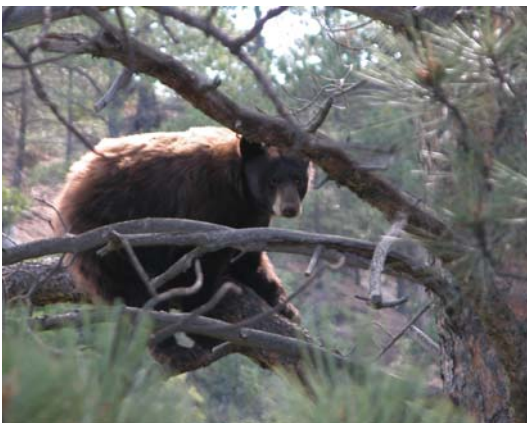
Joe Stevens, Bernadette Kuhn

In 2011 CNHP established an alpine vegetation monitoring site at Yellowstone National Park, following guidance from the Global Observation Research Initiative in Alpine Environments [GLORIA]. As a result of this project, the Park became part of an international effort to monitor the effects of climate change on alpine biodiversity. GLORIA sentinel sites were established at four unnamed peaks in the upper Lamar River area, northeast of Lamar Mountain. The peaks ranged in elevation from 3,195 to 3,122 meters.

The biodiversity, water resources, and scenic beauty found in alpine ecosystems are extremely valuable to Park visitors. However, these areas above treeline are particularly vulnerable to climate change, and thus are important monitoring targets for the



National Park Service. CNHP biologists provided NPS with the first round of GLORIA monitoring data on vegetation composition, structure, and soils in the alpine of Yellowstone National Park in 2011. A total of 98 species of vascular plants were identified from the four peaks, including grasses, forbs, sedges, shrubs, and two tree species. In addition, 22 species of lichens were identified between the four GLORIA peaks. The peaks are generally characterized by volcanic soils, low vegetation cover, low exotic species cover, and minimal human and herbivore disturbance. Data generated from the project will be used to examine climate-induced changes of vegetation cover, species composition, and species migration. In 2012 CNHP biologists plan to establish and sample a GLORIA site in Grand Teton National Park.



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

Rob Schorr, Jeremy Siemers, Adam Wagner

CNHP has sampled the Preble's meadow jumping mouse (PMJM) population along the Air Force Academy's Monument Creek since 1999, and this year Rob Schorr saw populations rebound from several years of low capture success. Compared to previous years, when captures had dipped to less than 20, these past 2 years

have produced greater than 70 captures and 130 captures, respectively. During these years, a black bear investigated some of the traps, cleaning out the contents and leaving them flattened. We were able to identify the culprit this year, as it waited patiently for us to finish our traplines. CNHP has begun a comprehensive survey of all appropriate PMJM habitat on the Academy, and thus far PMJM have been captured along most of the major drainages at the Academy. We are partnering with USGS to investigate how habitat isolation may impact genetic diversity of some PMJM populations on and off the Academy.



Lichen Species Diversity, Yellowstone National Park GLORIA Site

Bernadette Kuhn

Alpine ecosystems are important monitoring targets for examining climate-induced changes of vegetation cover, species composition, and species migration. In 2011, we installed alpine monitoring sites in Yellowstone National Park for the Rocky Mountain Inventory and Monitoring Network. The site was established using the protocol developed by the Global Observation Research Initiative in Alpine Environments [GLORIA].



We found 21 unique taxa of lichens collected at four alpine sites in the Absaroka Range, Yellowstone National Park. Of these, six are new to the documented lichen flora of Yellowstone.

Boreal Toad Monitoring and Survey Project

Brad Lambert

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 2012.



In 2011, CNHP monitored 28 known breeding sites in Chaffee, Eagle, and Park 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 and five new locations were documented.

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 2,000 adult toads have been tagged between 1999 and 2011. CNHP is currently analyzing these mark-recapture data to increase understanding of estimated population size, survival, site fidelity, and movement between breeding sites.

Setting Mitigation in the Watershed Context: Developing a Multi-tiered Approach to Improve Compensatory Mitigation

Joanna Lemly, Erick Carlson, Laurie Gilligan



In a comprehensive evaluation of wetland mitigation through the 1990s, the National Research Council concluded that “the goal of no net loss of wetlands is not being met for wetland functions” by the U.S. Army Corps of Engineers (ACOE) and U.S. Environmental Protection Agency (EPA)’s current mitigation program. Acknowledging this conclusion, the ACOE and EPA issued a federal rule in April 2008 to increase the effectiveness of compensatory mitigation under Section 404 of the Clean Water Act (CWA). One key aspect of this rule was for compensatory mitigation decisions to be made using a “watershed approach,” however, the implementation of a water approach was left to states and ACOE District Offices. Funded through an EPA Region 8 Wetland Program Development Grant, CNHP and Dr. Brad Johnson of the CSU Biology Department are developing protocols for applying the watershed approach to wetland mitigation in Colorado. The protocols are specifically being

tested within a demonstration pilot area that includes the rapidly developing northern Front Range I-25 corridor.

Using the wetland profiling approach, the project team has tracked changes in the abundance of wetland types in the pilot study area by digitizing 1980s National Wetland Inventory maps and comparing them to new mapping based on the most recent aerial photography available. Also within the pilot study area, the condition of a statistically-significant sample of wetland sites was evaluated using two assessment methods: the Functional Assessment of Colorado Wetlands (FACWet) and Ecological Integrity Assessment (EIA) methodologies. Assessment data is being incorporated into the wetland profile to characterize the condition of remaining wetlands to aid in future regulatory decisions. This project began in 2010 and will be finish at the end of 2012. The products of this project will be: 1) a rational framework for developing wetland profiles throughout Colorado for mitigation purposes; 2) mapping and trend analysis of wetland cumulative impacts, along with characterization of current wetland condition, within the pilot study area; and 3) a general framework for placing mitigation in the landscape context in Colorado.

Vegetation Inventory of Bighorn Canyon National Recreation Area

Joe Stevens

The Bighorn Canyon National Recreation Area (BICA) is part of the Greater Yellowstone Inventory and Monitoring Network and is located on the border of Montana and Wyoming. The BICA was created in 1966 when the Yellowtail Dam was constructed and straddles the Bighorn River for approximately 70 miles. Land within the legislatively approved BICA Administrative Boundary is owned by the National Park Service, the Bureau of Land Management, and the Crow Nation.

CNHP researchers together with researchers from CSU’s The Center for Environmental Management of Military Lands (CEMML) are completing a vegetation Inventory of the lands surrounding BICA. The four year vegetation inventory project will classify park vegetation to the Association level of the US National Vegetation Classification and map the vegetation to the finest level possible; typically map classes will be created at the Alliance or Group level.

As of the summer of 2012, a draft classification containing 53 associations was completed and draft map linework was approximately 50% completed. In 2012, researchers from CEMML have conducted one verification field trip to assess map line work and verify image interpretation. Accuracy assessment field work is scheduled to occur in 2013, with final products being provided to the NPS in 2014.



Accuracy Assessment of Vegetation Mapping at Fort Union National Monument, New Mexico

Joe Stevens, Kat Sever

The Fort Union National Monument (FOUN) is located on the western high plains of north central New Mexico along a portion of the historic Santa Fe Trail. Between 1851 and 1891 the site was a welcome resting point for travelers along the Santa Fe Trail and at its peak provided housing and facilities for six full military companies and associated livestock. The third and largest of three successive forts built at the site served as a military garrison, a territorial arsenal, and a military supply depot for much of the southwest. With this project, the Colorado Natural Heritage Program conducted an accuracy assessment of the 2004 vegetation map of the site for the National Park Service, and compiled the vegetation mapping report and accuracy assessment report into a NPS compliant Vegetation inventory final product.

The final map legend created in 2004 included 19 map classes that described the vegetation based partly on its composition and partly on its past land use. The initial overall accuracy of the map was assessed to be 44% using the NPS Accuracy Assessment guidelines for vegetation inventory projects. Review of the class accuracy for each map class identified map classes with low accuracy and confusion between classes. Classes with low accuracy and high levels of confusion were aggregated in an effort to increase the overall map accuracy. Following the aggregation, the overall and classwise accuracies were recalculated. Overall map accuracy rose from 44% for the original map legend to 78.7% for the new legend with the aggregated classes.



Pilot Test Ecological Approaches to Environmental Protection

Lee Grunau, Dave Anderson, Michelle Fink, Karin Decker, Joanna Lemly, Erick Carlson, Gabrielle Smith, Dr. Catherine Keske, and Dr. Joshua Goldstein

Modernized, integrated concepts of transportation planning are the focus of research being supported through the Transportation Research Board's Strategic Highways Research Program. A significant advancement in this field is the development of the proposed Integrated EcoLogical Framework – a comprehensive planning approach that has been developed through TRB funding to better integrate early and effective natural resource conservation into planning, implementation, and mitigation for transportation and other infrastructure development projects.

This approach represents a major paradigm shift for transportation planning, and before it can be embraced by the planning community it requires testing.

During 2011-2012, we tested select steps in the Framework, focusing on Highway 285 through South Park, to evaluate the operational feasibility of implementing this proposed Framework. We collaborated with the Colorado Department of Transportation and resource agency partners to develop potential habitat models for target species, map wetlands, develop a conservation value summary for the study area, analyze existing impacts, identify potential mitigation sites and strategies using a Marxan computer model, and explore the potential for banking and market crediting strategies within the study area.



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

Dee Malone, Joe Stevens, and Denise Culver

The Survey of Critical Wetlands and Riparian Areas in Gilpin County was conducted to identify the locations and condition of vulnerable riparian and geographically isolated wetland resources within the county. Funding for the project was provided by Region 8 of the U.S. Environmental Protection Agency. The main outcome of the project was a map and assessment of the condition of wetlands in the South Platte watershed within Gilpin County. The assessment of wetlands in this project identified the highest quality and most threatened wetland resources for protection. Ancillary to this process, the survey efforts also identified those wetlands in need of restoration to improve wetland condition. Federal, state, local, and private, and non-profit partners can use these assessments to target protection and/or restoration efforts.



Results were interpreted and disseminated to parties that can implement conservation of critical wetland resources into countywide heritage and land-use planning efforts. Additionally, data collected was used for calibration and validation of the Vegetation Index of Biotic Integrity and Ecological Integrity Scorecards.

The Gilpin County survey documented 14 Potential Conservation Areas (PCA) with significant wetland or riparian resources. There is one PCA ranked with a Very High Biodiversity Significance (B2); five PCA's are ranked with High Biodiversity Significance (B3); while the remaining eight PCA's are ranked with Moderate Biodiversity Significance (B4). The Mammoth Gulch PCA is ranked Very High Biodiversity Significance (B2) due to the presence of a good quality occurrence of a rare iron fen (*Picea engelmannii* / *Betula nana* / *Carex aquatilis* - *Sphagnum angustifolium* Woodland).

Gunnison Basin Climate Change Vulnerability Assessment

Renee Rondeau, Bernadette Kuhn, Jeremy Siemers, Lee Grunau, Karin Decker

Climate change is already changing ecosystems and affecting people in the southwestern United States. Rising temperatures have contributed to large-scale ecological impacts, affecting both ecosystems and people. The climate of the Gunnison Basin, Colorado, is projected to get warmer over the next few decades as part of a larger pattern of warming in the western United States. The goals of this vulnerability assessment were to identify which species and ecosystems of the Gunnison Basin are likely to be most at risk to projected climatic changes and why they are likely to be vulnerable.

This project focused on exposure and sensitivity to describe ecosystem and species vulnerability. We evaluated the relative vulnerability of 24 ecosystems and 73 species of conservation concern, using methods developed by Manomet Center for Conservation Science and NatureServe. Five ecosystems (mesic alpine, xeric alpine, bristlecone pine, Douglas-fir, and low-elevation riparian) were rated highly vulnerable to climate change. Five additional ecosystems (spruce-fir, lodgepole pine, aspen forests, mid-elevation riparian, and irrigated hay meadows) were rated moderately vulnerable. Key factors contributing to the vulnerability of terrestrial ecosystems include increased pest attacks, increased invasive species, barriers to dispersal ability, fire and drought. For species, seventy-four percent (54 out of 73) of the species analyzed were rated vulnerable to projected climate change in the Gunnison Basin: 43 (of 50) plants and 11 (of 23) animals. Most of the species rated as vulnerable occur within the freshwater, alpine, spruce-fir and sagebrush ecosystems. The most vulnerable groups are plants, amphibians, fish, and insects; the least vulnerable groups are mammals and birds.





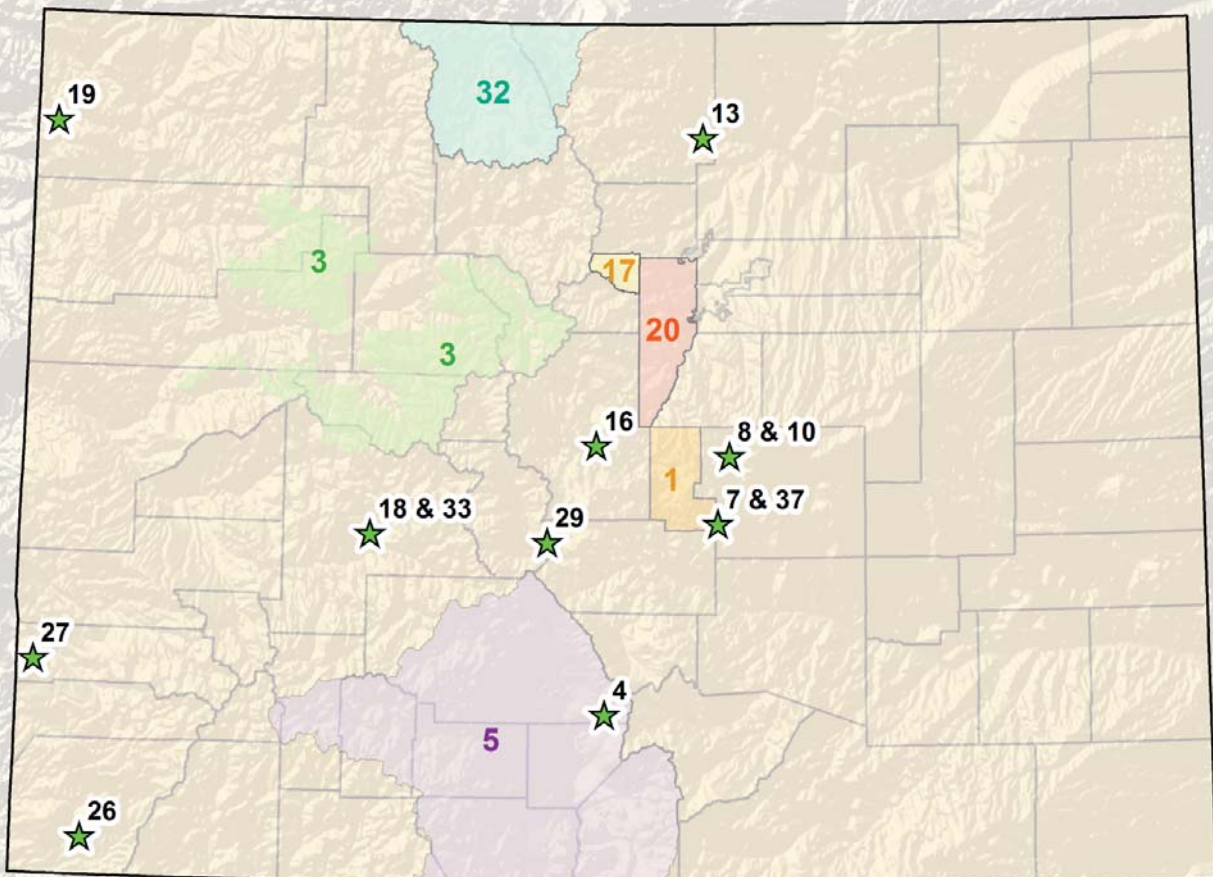
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Projects

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6. Tools for Colorado Wetlands
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23. The State of Colorado's Biodiversity
24. National Forest Zoology Surveys
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26. Mesa Verde National Park Rare Plant Monitoring and Surveys
27. Bat surveying at Spud Patch management area, Egnar, Colorado
28. Surveying Mines for Bats
29. Boreal Toad and Northern Leopard Frog Surveys and Habitat Evaluations on Grazing Allotments Managed by the Salida Ranger District, San Isabel-Pike National Forest
30. Threatened and Endangered Plant Species Data Development and Field Surveys
31. Review and Evaluation of the National Park Service's Potential National Natural Landmarks
32. North Platte River Basin Wetland Profile and Condition Assessment
33. Survey of Rare Plant Species in Black Canyon of the Gunnison National Park and Curecanti National Recreation Area
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36. Wetland Mapping Projects, 2010-2012
37. Conservation Analyses to Support Pikes Peak Area Council of Governments' Transportation Plan
38. National Park Service Inventory & Monitoring Network Support
39. Colorado Wildlife Action Plan: Proposed Rare Plant Addendum

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Project Locations



Statewide: 2, 12, 6, 21, 22, 23, 24, 25, 28, 30, 31, 34, 35, 36, 38, 39
Outside of Colorado: 9, 11, 14, 15, 21

Dinosaur National Monument Rare Plant Surveys

Peggy Lyon, Jill Handwerk, Janis Huggins, Dee Malone

Dinosaur National Monument (DINO) contains one of the largest concentrations of rare plants in the state of Colorado, however, the majority of rare plant studies in the monument were completed from 1987 to 1989, and are now considered “historical” by CNHP. Therefore, in 2011 The State of Colorado and the National Park Service contracted with the Colorado Natural Heritage Program to update information on these species and make existing data available in more contemporary data formats.



The results of this research project will provide DINO and CNHP with up-to-date information on the location, population size, habitat, and threats to rare plants found within DINO. This data set is needed for DINO staff to adequately manage, monitor and protect these globally-imperiled plant species. A complete data set is also required to predict species distributions, and to enable monitoring of population trends. Location specific data are extremely valuable for assessing range and abundance, and for identifying areas of important habitat.

In 2011, seventeen sites within five major areas were surveyed. Ninety-two sub-populations of rare plants representing 16 species were documented within these five areas. All but two of the targeted species were documented in 2011. Additional surveys are planned for 2012.

Survey of Critical Biological Resources Jefferson County, CO 2010-2011

John Sovell, Pam Smith, Denise Culver, Susan Panjabi and Joe Stevens

In the spring of 2010, CNHP identified 92 potential survey areas for significant plants, animals, wetland, and upland habitats. Summer field surveys were conducted within 57% of the TIAs and those areas found to contain significant elements were delineated as PCAs.



CNHP identified 46 PCAs in Jefferson County. Thirty-nine of these 46 PCAs are either new or updated. The two PCAs ranked with Outstanding Biodiversity Significance (B1) include the South Platte River Valley and Hankins Gulch PCAs, which achieve B1 ranks due to the presence of globally critically imperiled (G1) element occurrences that are in excellent (A ranked) condition. These elements are the Pawnee montane skipper butterfly (*Hesperia leonardus montana*) and Rocky Mountain monkeyflower (*Mimulus gemmiparus*), respectively.

Rare plant and animal records from the original 1992-1993 survey included 8 rare animals, 10 rare plants and 16 rare plant communities. At the conclusion of the 2010-2011 survey there are 35 rare or imperiled plant species, 11 rare or imperiled animal species, 1 fungus, and 29 wetland and upland plant communities of concern now documented in Jefferson County. During this survey, two plants and one fungus were documented that are State records. They are the only known locations in the State for these elements, the openfield sedge (*Carex conoidea*) from the Turkey Creek at Aspen Park PCA (B4), the hybrid twinpod (*Physaria* x1) from the Ken Caryl Hogbacks PCA (B2), and a new subspecies of an earthstar fungus (*Mycenastrum corium* ssp. *ferrugineum*) from the Prospect Park PCA (B2). Both the twinpod and the earthstar are new species. A total of four federally listed threatened species (two plants and two animals): the Pawnee montane skipper (*Hesperia leonardus montanus*), Preble’s meadow jumping mouse (*Zapus hudsonius preblei*), Ute ladies’ tresses (*Spiranthes diluvialis*), and Colorado butterfly plant (*Oenothera coloradensis* ssp. *coloradensis*) were observed during the survey. The *Oenothera coloradensis* ssp. *coloradensis* site is a new occurrence and was reported by the US Fish and Wildlife Service to CNHP. The other three species were already known to occur in the County.

Assessing the Natural Range of Variability in Minimally Disturbed Wetlands across the Rocky Mountains: the Rocky Mountain REMAP Project

Joanna Lemly

In the Rocky Mountain regions of Montana, Wyoming, Colorado and Utah, extremes of mountain climate, high elevations and characteristic geology produce a large range of natural variability within wetland ecological systems. Even under minimal human disturbance, environmental gradients can result in a range of wetland types and vegetation composition. Documenting the range of variability found under minimally disturbed conditions can help distinguish signal from noise when assessing more altered occurrences. Funded by the U.S. Environmental Protection Agency (EPA)'s Regional Environmental Monitoring and Assessment Program (REMAP), the Rocky Mountain REMAP Project was a collaboration between CNHP, the Montana Natural Heritage Program (MTNHP) and the Wyoming Natural Diversity Database (WYNDD) to assess the natural range of variability in minimally disturbed wetlands across the Rocky Mountains.



The project had three objectives: 1) identify reference standard wetlands of four different types (fens, wet meadow, riparian shrublands, and marshes) across the four Rocky Mountain states, 2) assess the range of variability within these wetland types, and 3) produce a regionally standardized method for assessing and monitoring wetland condition. The project took place between 2009 and 2011, including field sampling of 105 wetlands across the four states during the summers of 2009 and 2010. The results have helped all three Heritage Program refine their wetland assessment methods. A final report describing the project was released by MTNHP in spring 2012 and is available on the CNHP website.

Rare Plant Conservation Initiative: Saving Colorado's Wildflowers

Susan Spackman Panjabi, Jill Handwerk, Peggy Lyon, Bernadette Kuhn

The Colorado Natural Heritage Program botany team is working with the Rare Plant Conservation Initiative to boost rare plant conservation successes across Colorado. The project vision is to conserve Colorado's most imperiled native plant species, and to secure a long-term funding source to facilitate conservation, education, and research (e.g., inventory, monitoring) for these imperiled species. With 121 species currently considered globally imperiled and vulnerable to extinction in Colorado, and soaring human population growth and associated developments, Colorado's plants need attention. Although 16 species are federally listed as threatened or endangered, there is no legal protection for plants at the state level in Colorado. A state-wide Rare Plant Conservation Strategy was produced in 2008. 2010-2011 accomplishments include:

- Developed Conservation Action Plans for three Priority Action Areas (Big Gypsum Valley, Plateau Creek, and Gateway) supporting seven imperiled plant species.
- Worked with several local land trusts and identified priority tracts for on-the-ground protection action
- Conducted climate change vulnerability assessments for imperiled plants
- Presented and distributed Recommended Best Management Practices developed to reduce the impacts of oil and gas development to plants of concern (BMPs) at two meetings with Colorado Oil and Gas Association and Western Energy Alliance.
- CNHP Botanist Susan Spackman-Panjabi received a USFWS 2011 Partners-in-Mission Recovery Champion award for conserving endangered and threatened Colorado plants as a member of the Colorado Rare Plants Conservation Initiative.

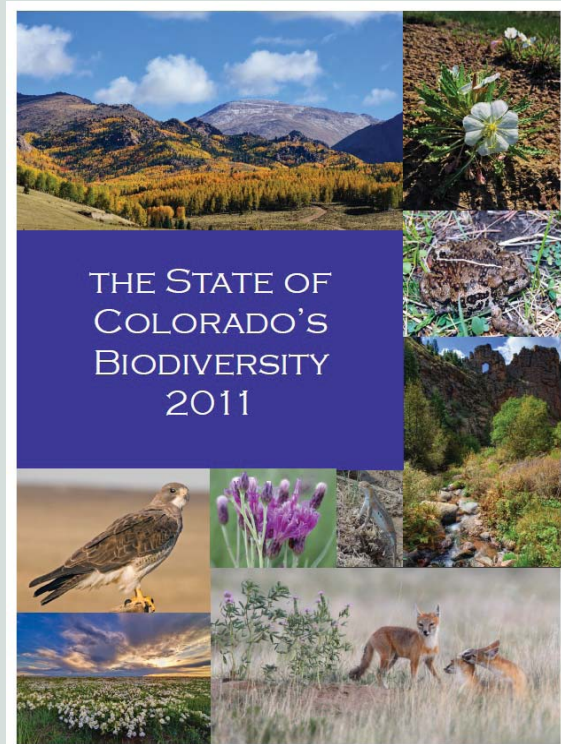
COLORADO RARE PLANT
CONSERVATION STRATEGY



The State of Colorado's Biodiversity

CNHP completed a multi-year analysis of the status of Colorado's Biodiversity. We evaluated the status of 103 rare plants, 113 animal species of concern, and 18 ecosystem types under three broad categories: 1) Biodiversity Status – including abundance and quality, 2) Threat status – current and potential future impacts, and 3) Protection/Land management Status. Plants, animals, and ecological systems can only be considered effectively conserved when their biodiversity status is viable, threats have been abated, and land management/protection is sufficient to ensure the longterm persistence of the element.

The good news is that Colorado is blessed with a relatively intact natural landscape that still supports the majority of our native biological diversity. This means that we still have many options for conserving and protecting our at-risk species and ecological systems. About 80% of our species are doing well, with the exception of fish and amphibians, and we hope that with continued conservation action we can improve these scores. Wetlands and other aquatic habitats, grasslands, shrublands, and barren landscapes are high priority habitats for immediate conservation attention, including protection, restoration, and management. On-going maintenance of our forest and alpine systems is also needed, especially in the face of climate change.



National Forest Zoology Surveys

Jeremy Siemers, Brad Lambert, Rob Schorr

CNHP will conduct surveys for focal animals on different national forests throughout Colorado. Objectives include documenting new occurrences of rare species, monitoring of species at particular habitat features, and forest-wide monitoring of taxonomic groups.



Projects include:

- Pygmy Shrew (*Sorex hoyi*) Survey on the Routt and White River National Forests
- Cave Bat Survey on the White River National Forest
- Amphibian Occupancy on the Routt-Medicine Bow National Forest (in collaboration with the Wyoming Natural Diversity Database)

Rob Schorr, CNHP Zoologist, was awarded the Colorado Chapter of The Wildlife Society's (CCTWS) Chapter Service Award during the 2012 the chapter's Annual Meeting in Grand Junction, Colorado.



Department of Transportation Conservation Easement Monitoring
Renée Rondeau, Lee Grunau, and Karin Decker

In 2011, CNHP completed a baseline period of annual monitoring for several conservation easements in eastern Colorado. The easements are held by The Nature Conservancy and were funded by the Colorado Department of Transportation as part of CDOT's Shortgrass Prairie Initiative.

These easements were established on private ranches to protect habitat for a suite of declining prairie species. Target species include McCowans longspur, box turtle, bald eagle, burrowing owl, Cassin's sparrow, ferruginous hawk, lark bunting, loggerhead shrike, long-billed curlew, mountain plover, black-tailed prairie dog, massasauga, and Texas horned lizard.



Mesa Verde National Park Rare Plant Monitoring and Surveys
Bernadette Kuhn, Peggy Lyon and David Anderson

Astragalus schmolliae (Schmoll's milkvetch) is an herbaceous perennial in the legume family. Among Colorado's rarest plant species, its global distribution is constrained almost entirely to Chapin Mesa within Mesa Verde National Park. In 2010, *A. schmolliae* was added to the list of candidates for listing under the Endangered Species Act by the US Fish and Wildlife Service. In 2011, with support from the Colorado Natural Areas Program and Mesa Verde National Park, we studied the effects of fire, *Bromus tectorum* (cheatgrass), herbicide use, and native grass seeding on *A. schmolliae*, and investigated demographic trends in the plant population.

In 2011, the Colorado Natural Heritage Program also conducted rare plant field surveys in Mesa Verde National Park. Two rare plant species were identified as priorities for surveys: Cliff palace milkvetch (*Astragalus deterior*) and Mesa Verde stickseed (*Hackelia gracilentia*). Our field work resulted in five new or updated element occurrence records (EORs) for *A. deterior*. For *H. gracilentia*, we documented two new occurrences. Additionally, two new EORs were documented for alkali pepperweed (*Lepidium crenatum*) and MacDougal's aletes (*Aletes macdougalii* ssp. *multiradiatus*). Finally, the EOR for Schmoll's milkvetch (*Astragalus schmolliae*) was updated with new information regarding density and population status.



Bat surveying at Spud Patch management area, Egnar, Colorado

Rob Schorr, Jeremy Siemers

In 2010, CNHP returned to Egnar, Colorado, to help the Dolores Public Lands Office document bat use of areas treated by hydromowing of juniper. Rob Schorr and Jeremy Siemers visited an area known as Spud Patch to record bat vocalizations and capture bats that were using the area.



In 2008, Rob and Jeremy documented 3 different bat species at Spud Patch, including the big brown bat, the little brown bat and the silver-haired bat. This year, surveying produced 3 new species: the fringed myotis, the long-eared bat (pictured left), and the hoary bat.

Boreal Toad and Northern Leopard Frog Surveys and Habitat Evaluations on Grazing Allotments Managed by the Salida Ranger District, San Isabel-Pike National Forest

Brad Lambert



In 2008 the United States Forest Service contracted the Colorado Natural Heritage Program to conduct boreal toad and northern leopard frog surveys and to evaluate potential habitat in selected grazing allotments on the Salida Ranger District. Surveys were conducted predominately in Chaffee County with a few sites in Fremont, Park and Saguache Counties. For year three in 2010, surveys continued at 109 sites identified as suitable habitat in 2008 and 2009. No new boreal toad or northern leopard frog sites were found. Two breeding populations of boreal toads are present on grazing allotments in Chaffee County and are monitored by the Colorado Natural Heritage Program and the Colorado Division of Wildlife.

Over 700 acres of suitable habitat for these species has been identified on seven grazing allotments from this project, which will serve as a valuable resource for biologists in future management of these grazing allotments.



Survey of Natural Values - Colorado State Land Board Inventories of Stewardship Trust and State Trust Lands.

John Sovell, Renee Rondeau

This project is a comprehensive, five-year project to survey and inventory natural values on Colorado State Land Board (SLB) trust lands designated into the Stewardship Trust. The SLB is the State's second largest landowner, owning and managing approximately 3 million surface acres of land in Colorado, collectively referred to as State Trust Land. This project between CNHP and the SLB was implemented to assist the Land Board with accomplishing the following objectives:

- Develop a comprehensive management plan to promote stewardship of natural values on Stewardship Trust lands.
- Enhance stewardship of all lands through an increased use of sustainable practices in land management for the long-term protection of the lands' natural and economic values.
- Develop creative and diverse ways to produce income from conservation and conservation services.

The project is currently in its second year with over 35 parcels having been surveyed. Biological resources of conservation priority have been identified at a number of the visited Stewardship Trust properties.

Surveying mines for bats

Rob Schorr, Jeremy Siemers

In Colorado there are thousands of historic mines. Often, these mines pose human health hazards. In an effort to prevent human access to these sites the Division of Reclamation, Mining and Safety (DRMS) closes mine openings. For over 20 years, DRMS has contracted with the Colorado Division of Wildlife to survey mines for bats and bat habitat. This year CNHP was asked to conduct internal mine surveys for DRMS.



Rob Schorr and Jeremy Siemers visited over 80 mines in four counties throughout Colorado.

Evidence of bat use (guano and culled insect parts) was found in multiple mines, and one Townsend's big-eared bat was located in a mine near Schofield Pass, Gunnison County, Colorado.



Threatened and Endangered Plant Species Data Development and Field Surveys

Jill Handwerk, Janis Huggins, Bernadette Kuhn, Peggy Lyon, and Dee Malone

This on-going partnership between CNHP, the U.S. Fish and Wildlife Service, and the Colorado Natural Areas Program focuses on the development biological and conservation data for federally-listed Threatened (LT), Endangered (LE), and Candidate (C) plant species occurring in Colorado, and served as the state's central repository for all listed plant species data.

Data development conducted during 2011 resulted in the addition of 166 new mapped locations for 45 occurrences of T, E, C, petitioned species, and other plant species of concern in Colorado. Nine new occurrences, representing three listed and one candidate species were also added to the CNHP BIOTICS database. In 2010, element occurrence data for *Eutrema penlandii* (LT), *Sclerocactus glaucus* (LT), and candidate species *Ipomopsis polyantha*, *Penstemon debilis*, and *Phacelia submutica* were updated.



Field work conducted in 2011, from April to September, focused on six target species: *Astragalus microcymbus*, *Eriogonum pelinophilum*, *Eutrema penlandii*, *Phacelia formulosa*, *Penstemon penlandii*, and *Sclerocactus glaucus*. Surveys yielded 14 Element Occurrence Records (EORs) for the target species (3 new and 11 updates), and 3 occurrences of other rare plant species tracked by CNHP. In 2010, field surveys were conducted for both listed and candidate species including *Astragalus debequaeus*, *Draba weberi*, *Eriogonum pelinophilum* (LE), *Eutrema penlandii* (LT), *Phacelia submutica*, and *Sclerocactus glaucus* (LT). Data were provided to the USFWS and CNAP via an ArcMap Hyperlink Tool which links a GIS shape to its associated text file containing tabular data for that particular element occurrence.

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

Karin Decker, Bernadette Kuhn

The National Park Service established the National Natural Landmarks program in 1962 to document and encourage preservation of sites possessing the best remaining examples of the biological and geological features of America's natural landscape. There are currently 12 designated Landmarks in Colorado, and CNHP is assisting the NPS to increase this number.

The Hanging Lake NNL was designated in 2011 as a result of these efforts, and two additional sites are currently in review: an expansion of the Garden Park Fossil Area near Cañon City, Colorado, and the Big Spring Creek site at Great Sand Dunes National Park and Preserve.

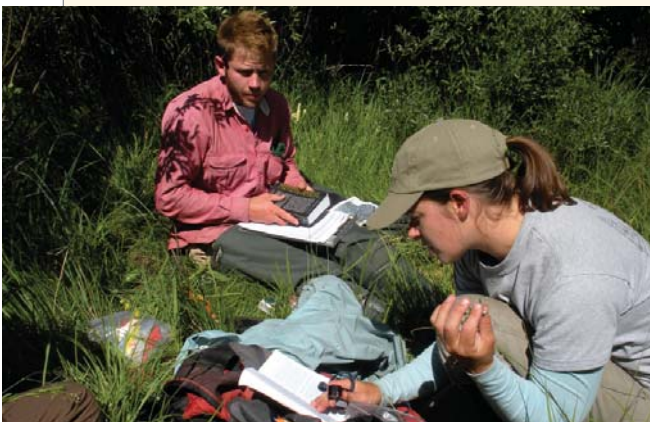
Garden Park Fossil Area remains one of the most important excavation sites for fossils of the Triassic-Cretaceous period, and has unique historical significance in the story of American paleontology. Big Spring Creek represents a spring-fed, gaining stream formed by groundwater discharging from an unconfined aquifer. The stream flows out over an eolian sand sheet, forming emergent wetlands that support a diversity of rare species and plant communities in an otherwise arid landscape.



North Platte River Basin Wetland Profile and Condition Assessment

Joanna Lemly, Laurie Gilligan

The North Platte River Basin Wetland Profile and Condition Assessment took place between 2009 and 2012. This project was the second in a series of river basin-scale wetland assessments undertaken by CNHP in partnership with Colorado Parks and Wildlife (CPW) and funded through U.S. Environmental Protection Agency Region 8 Wetland Program Development Grants. The project's four objectives were to: 1) compile existing spatial data on wetlands in the North Platte River Basin; 2) conduct a statistically valid, field-based survey of wetland condition in the basin; 3) model the distribution of wetland condition throughout the basin using collected field data and additional spatial data on potential stressors; and 4) determine metrics for measuring key habitat features for priority waterfowl species. To start, digital wetland mapping was created for the entire basin and these data were used to summarize wetland acreage in a number of different ways. To assess condition of wetlands in the basin, 95 randomly selected wetland sites were visited in the field and scored on landscape context, biotic condition, hydrologic condition, and physiochemical condition.



A predictive model of wetland condition was also developed to predict the condition of wetlands not visited in the field. The results of this project document that over 10% of the basin is mapped as wetlands and that nearly 60% of all wetland acres are also mapped as irrigated lands. This indicates that irrigation exerts a major influence on the basin's wetlands and likely expands the total acreage. Field surveys focused on non-irrigated wetlands, which were overwhelmingly (83%) in excellent or good condition. The project provides a baseline assessment of wetland quantity and condition and will inform conservation and watershed protection. A final report describing the project is available on the CNHP website.

Survey of Rare Plant Species in Black Canyon of the Gunnison National Park and Curecanti National Recreation Area

Bernadette Kuhn

In 2011, the Colorado Natural Heritage Program conducted rare plant field surveys in Black Canyon National Park (BLCA) and Curecanti National Recreation Area (CURE). The following five species were identified as targets: Gunnison milkvetch (*Astragalus anisus*), adobe thistle (*Cirsium perplexans*), Black Canyon gilia (*Gilia penstemonoides*), Hanging Garden sullivania (*Sullivantia hapemanii* var. *purpusii*), and juniper tumble mustard (*Thelypodopsis juniperorum*). All five target species are endemic to Colorado.

Field surveys resulted in 13 new or updated element occurrence records (EORs). Rock climbing techniques were employed for the first time in surveys for *G. penstemonoides*. This novel approach proved extremely advantageous for locating individuals on the cliff faces of the Black Canyon. The EORs resulting from this project will provide NPS natural resource managers with the most current information on the location, population size, habitat, and threats to the target species. This information is critical for land management decisions regarding rare plant conservation on BLCA and CURE lands.



Rare Plant Surveys on Bureau of Land Management Lands

Peggy Lyon, Bernadette Kuhn, Dee Malone, and Dawson White

In response to increased development and recreation use on BLM lands on the Western Slope CNHP has been conducting rare plant field surveys for the Grand Junction Field Office of the BLM. For the BLM to adequately manage the lands in its resource area, it is important to have up to date information on the location of species of concern.

In 2009 and 2010, CNHP surveyed the recently designated Dominguez-Escalante Wilderness and NCA in western Colorado. Rare plants documented there included the Colorado hookless cactus (*Sclerocactus glaucus*) and Grand Junction milkvetch (*Astragalus linifolius*). In 2010, we also conducted rare plant surveys in Atwell Gulch, located south of DeBeque, in Mesa County. This project resulted in 64 new or updated mapped rare plant locations, of DeBeque milkvetch (*Astragalus debequaeus*), Naturita milkvetch (*A. naturitensis*), Wetherill's milkvetch (*A. wetherillii*), Colorado hookless cactus (*Sclerocactus glaucus*), DeBeque Phacelia (*Phacelia submutica*) and long-flowered cat's-eye (*Oreocarya longiflora*).



In 2011, we surveyed South Shale Ridge, a proposed ACEC (Area of Critical Environmental Concern), to aid in verifying that the area meets the relevance and importance criteria needed to be considered for designation in the next Grand Junction Field Office Resource Management Plan. We documented twenty-six new or updated mapped locations for the six targeted species; *Astragalus debequaeus*, *Astragalus naturitensis*, *Cirsium perplexans*, *Oreocarya longiflora*, *Phacelia submutica*, and *Sclerocactus glaucus*, indicating that the area supports a diversity of globally imperiled and vulnerable plants.

Upper Missouri River Vegetation Inventory

Joe Stevens

In collaboration with Colorado State University's Center for Environmental Management of Military Lands, the Colorado Natural Heritage Program received federal stimulus funds to work on a series of ecological inventories for the Army Corps of Engineers along the Upper Missouri River. This project developed vegetation maps for the six large flood control reservoirs on the main stem of the Missouri River. This project will assist the Corps with conservation and restoration efforts by providing vegetation inventory and mapping on eight lake projects in Nebraska, South Dakota, North Dakota and Montana

The methodology used approved Corps Level I vegetation classification and quantification guidelines. Level I vegetation maps are developed primarily using existing information and imagery interpretation in an office setting. During the 18-month project, vegetation communities were classified and mapped at the physiognomic Sub-Class level using multi-band satellite imagery. In 2012 an accuracy assessment will be completed to quantify accuracy of the vegetation maps.

The final product of the project will be a Level II vegetation classification consisting of validation, refinement, and accuracy assessment of the Level I maps. The final vegetation maps produced: 1) provide a baseline for each water resource project and facilitate upward reporting of vegetation acreage and condition; 2) use standardized and documented protocols to enable periodic monitoring to document and detect changes in the extent, distribution, and condition of vegetation types over time; 3) assist in evaluating specific areas for habitat and wetland restoration potential; 4) support survey, habitat suitability and other modeling efforts for species of interest; and 5) help communicate and plan public access and recreation.



Rare Plant Surveys for the Colorado Natural Areas Program 2009-2010

Peggy Lyon, Jill Handwerk, Janis Huggins, Bernadette Kuhn, and Dee Malone

Three years of rare plant surveys funded by the Colorado Natural Areas Program took us all over the state, from the Piceance Basin in Rio Blanco

County to Lone Mesa State Park in Dolores County,

and the White River National Forest in Summit County. Our focus was on globally critically imperiled (G1) or globally imperiled (G2) species occurring on State Natural Areas, Division of Wildlife, and State Land Board lands.

Priority targeted species included *Physaria pulvinata*, *Puccinellia parishii*, *Gutierrezia elegans*, *Cryptantha gypsophila* in 2009; and *Penstemon fremontii*, *Astragalus naturitensis*, *Astragalus wetherillii*, *Sclerocactus glaucus*, *Astragalus debequaeus*, *Lupinus crassus*, *Astragalus anisus*, *Physaria parviflora*, *Phacelia submutica*, *Sullivantia hapemannii*, and *Pediomelum aromaticum* in 2010.



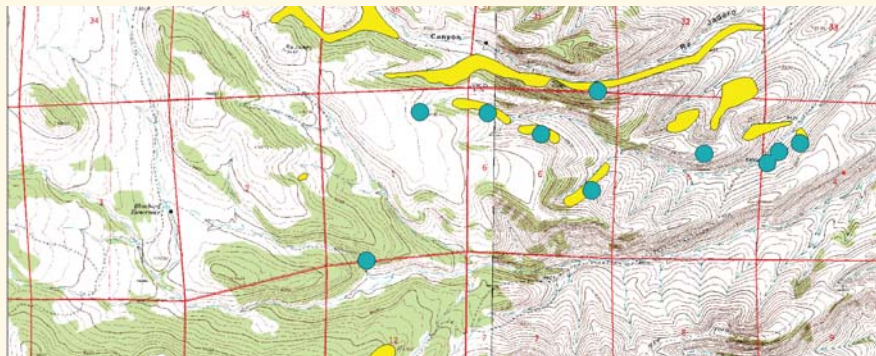
Shape Replacement for Selected G1-G3 Element Occurrences on State Owned or Managed Lands

Jill Handwerk, Jeremy Siemers, Jodie Bell, and John Nunnali

As part of an on-going partnership between CNHP and the Colorado Natural Areas Program (CNAP) selected G1-G3 element occurrence locational data were transferred from paper maps to an Oracle/ArcView 3.3 database (BIOTICS Mapper). The locational data were then assembled into existing element occurrence records using CNHP's standardized methodology.

All of the element occurrence records (EOR's) selected for shape replacement occurred on state owned or managed lands. A total of 195 EOR's were reviewed, 132 of which were converted to the new methodology, and 63 were combined with other nearby occurrences.

The improved resolution and accuracy of these data will enhance CNAP's ability to guide on-the-ground management needs such as fencing, grazing, and trail development, as well as research needs such as monitoring and modeling.



Blue dots before shape replacement, yellow polygons after.

Wetland Mapping Projects, 2010 - 2012

Joanna Lemly, Erick Carlson, Gabrielle Smith

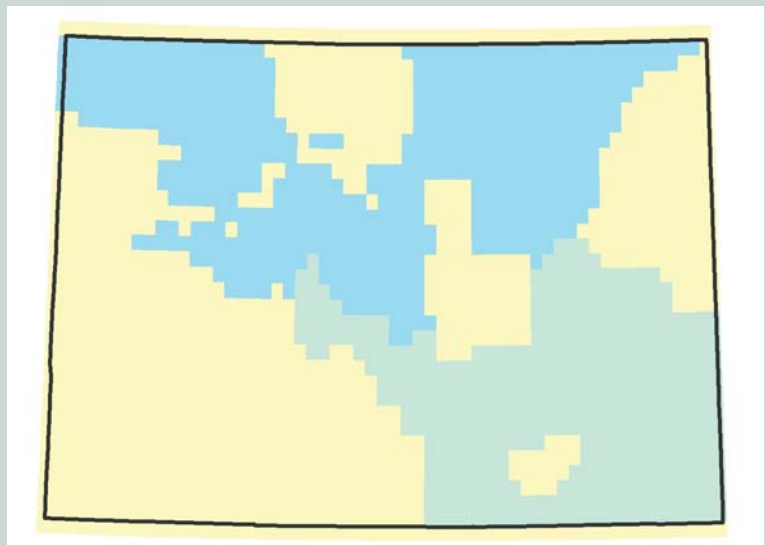
In 2008 CNHP set a goal of having digital National Wetland Inventory (NWI) data available across the entire state.

The 2010-2012 period saw significant progress towards that goal: working with a variety of partners (EPA, CPW, BLM, USFS) CNHP has contributed 543 7.5" quadrangles of data to the NWI.

NWI data was created in the 1970s/1980s for the entire country, but in Colorado most of this data was available only as scanned images of paper maps. CNHP has digitized 481 quads of original NWI data, and has photo-interpreted using 2009 color infrared imagery an additional 90 quads. Some areas of the state have received both treatments, allowing analysts to perform change-over-time analyses.

2010-2012 wetland mapping project areas:

- Gilpin, Jefferson, Teller counties
- South Platte basin
- White River and Medicine-Bow Routt National Forests
- Park County
- Front Range northern corridor



Blue - CNHP contribution to NWI
Green - Planned for 2013

Conservation Analyses to Support Pikes Peak Area Council of Governments' 2011 Long Range Transportation Plan

Michelle Fink, Michael Menefee, and Lee Grunau

In support of the Pikes Peak Area Council of Governments (PPACG) Long Range Transportation Plan, the Colorado Natural Heritage Program, in collaboration with NatureServe, used three conservation planning software programs (NatureServe Vista, Marxan and N-SPECT) to analyze the ecological impacts of various transportation scenarios and to assist PPACG in developing their preferred future development scenario. NatureServe Vista identifies spatially explicit biodiversity values, impacts from development, and mitigation opportunities within



a specified geographic area. Marxan is a conservation prioritization program that identifies the most efficient areas for conservation (areas that contribute most toward conservation goals at the least cost). N-SPECT examined the relationships between land cover, soil characteristics, topography, and precipitation data to model non-point source water pollution. Results help estimates the contribution (negative or positive) to water quality from alternative land use scenarios. This work was funded by the National Academy of Science's Transportation Research Board as part of their Strategic Highway Research Program.

National Park Service Inventory & Monitoring Network Support

Karin Decker

CNHP has provided technical writing and editing assistance for the production of final vegetation mapping project reports for both the Northern Colorado Plateau Network, and the Rocky Mountain Network. After more than ten years of effort on the project, the last of the sixteen NCPN units (Canyonlands National Park) was completed in 2012. CNHP also compiled a series of Resource Briefs addressing the potential effects of changing climate for NPS units in the Rocky Mountain Network.

Colorado Wildlife Action Plan: Proposed Rare Plant Addendum

Lee Grunau, Jill Handwerk, Susan Spackman-Panjabi, Peggy Lyon, Michelle Fink

CNHP planners and botanists collaborated with the Colorado Natural Areas Program, The Nature Conservancy, and the Rare Plant Conservation Initiative (RPCI) partners to develop a proposed Addendum to Colorado's State Wildlife Action Plan. The purpose was to expand the reach of the RPCI Conservation Strategy originally developed in 2009 and to increase focus and funding for rare plant conservation in Colorado. This Addendum, and the Colorado Rare Plant Conservation Strategy upon which it is based, represent a collective vision for plant conservation in Colorado, emphasizing a proactive approach to ensure the long-term stewardship and viability of Colorado's rarest plants. It defines 121 Plants of Greatest Conservation Need and eight key habitats. The most significant habitats for Colorado's rarest plants are barrens and shrublands, followed by pinyon-juniper woodlands and alpine.

Most of Colorado's imperiled plants are naturally rare, primarily because they are restricted to very specific, narrowly distributed habitats. However, because these species occupy such small areas, planning is necessary to avoid placing these species at further risk from human activities. Degradation, fragmentation, and loss of habitat are major reasons that some plant species and their habitats are imperiled or vulnerable in Colorado. The primary contributors to habitat degradation for imperiled plants are **energy development, motorized recreation, residential development, and road construction and maintenance**. However, one of the biggest issues is a **lack of awareness** and information regarding the presence, distribution, and precarious status of Colorado's native and imperiled plant species. It is our hope that the next iteration of Colorado's wildlife action plan will be expanded to include rare plants and the information in this document.

Colorado Wildlife Action Plan: Proposed Rare Plant Addendum



Conservation Data Services and other Support Projects

Amy Lavender, Michael Menefee, Michelle Fink, Kirstin Holfelder, and Gabe Scott

Data Management Support:

CNHP had an on-going partnership with the Bureau of Land Management (BLM) to develop and maintain national databases for threatened and endangered species and Species of Management Concern occurring on BLM lands, with 2011 being the fourth and final year of this project. CNHP also provides support and training to BLM personnel to utilize the data and summary statistics to comply with annual reporting requirements.

We also designed and developed a completely revised version of the National Park Service's (NPS) Vegetation Mapping Program "Plots" database, which is used to complete vegetation characterization of over 280 national park units across the United States. Plots version 3.0 was completed in September 2009, version 3.2 was completed in March 2011. Further support and updates to the database are planned in 2012.

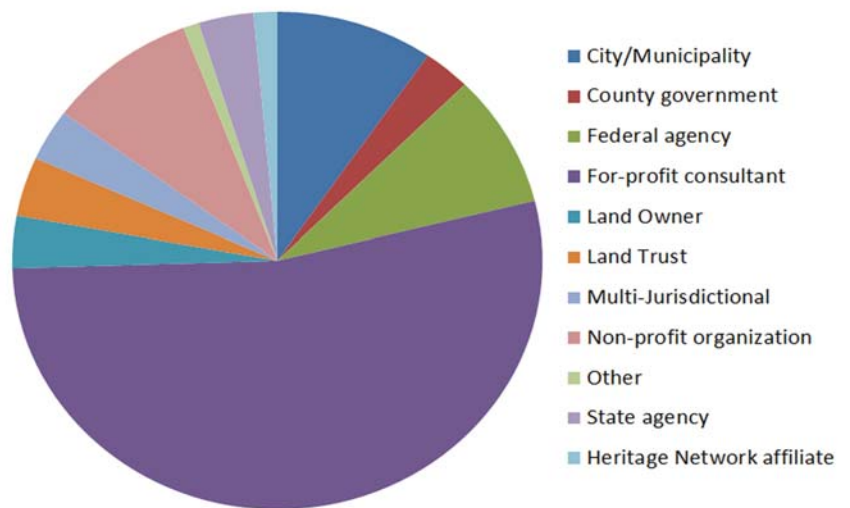
Data Processing and Statewide Datasets:

We continue to provide US Forest Service personnel with a comprehensive dataset for public lands within Colorado on an annual basis. As part of this partnership, we also provide data and expertise on revisions to the USFS Sensitive Species list as well as the BLM Sensitive/Special Status Species list. We also provide expertise and datasets for public lands to various divisions within Colorado's Department of Natural Resources.

CNHP Data Distribution and Environmental Review Projects:

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.

2010-2011 Total Paid Requests



During 2011, CNHP handled about 65 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 oil and gas projects to assist with impact avoidance and project management. In terms of total requests, for-profit consultants made up approximately two thirds of all data requests (see chart), with governmental requests making up the next largest sources for data inquiries.

CNHP Web Presence:

The year 2009 saw the birth of the CNHP Blog, and by the end of 2011 we had posted 227 articles and announcements there. In 2010, the CNHP blog had over 3,800 visits, nearly doubling to over 6,600 visits in 2011. Shortly after the blog debuted, we completely revamped our website, improving navigation, appearance, and depth of content. We continue to add new website features and content on an ongoing basis. Our website receives an average of 2,000 visits a month. CNHP also joined the ranks of Facebook and Twitter in 2010.



Colorado Natural Heritage Program

Connecting Conservation and Science

With numerous projects every 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 try to answer 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.