Aquilegia

Newsletter of the Colorado Native Plant Society

". . . dedicated to the appreciation and conservation of the Colorado native flora"

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Rare Plant, Rare Fly?

Ronald Abbott

After more than a decade's wait, the identity of a principal protagonist in the life history of a rare Colorado alpine plant has finally been revealed.

Saussurea weberi Hultén (Asteraceae) is one of a suite of rare calciphilic alpine plants found in Colorado in association with the Leadville and Manitou dolomites and dolomitic limestones. CoNPS members have had the opportunity to observe *S. weberi* on past field trips to Hoosier Ridge (1994) and Horseshoe Cirque (1992).

As early as the 1980's, botanists had noted a high rate of predation within inflorescences of *S. weberi* by maggots of a then-unknown species of fly (Peterson et. al. 1981). During one study of the pollination biology of the plant at Horseshoe Cirque in the 1990's, 70% of fruit and seeds was found to have been destroyed in that population while still in the flowering head (Abbott, 1998). Such a high rate of pre-dispersal predation raised fears at that time that the rate of sexual reproduction within populations of *S. weberi* might become so depressed as to jeopardize population continuance. While quantitative measurement of the phenomenon has not been made at Horseshoe Cirque since 1994, maggot predation of fruit and seeds seems to have fallen dramatically there the last three growing seasons (...perhaps because of natural fly population fluctuation?).

As an adjunct to the previously mentioned pollination study, 121 maggots were collected from inflorescences of *S. weberi* for rearing to adulthood (Abbott, 2002). The resulting five adult male and seven adult female specimens were submitted in 1996 to the pre-eminent Canadian dipterist Dr. Graham C. D. Griffiths (now professor emeritus) at University of Alberta, Edmonton. Dr. Griffiths (pers. com.) immediately identified the fly as belonging to genus *Botanophila* in Anthomyiidae, a family closely allied to house and stable flies (Muscidae). This determination was something of a surprise, as a fruit fly (Tephritidae) was considered a more likely candidate at first.

In the mid 1990's Dr. Griffiths began a revision of Anthomyiidae, and by late 2004 had finally proceeded to *Botanophila* and the Horseshoe Cirque specimens. After inspecting some 15,000 Canadian specimens of the genus, and basing identification largely upon male terminalia morphology, Dr. Griffiths (pers. comm.) determined the fly predator of *Saussurea weberi* to be *Botanophila furcula* (Huckett), a species based upon a single male specimen collected by H.C. Huckett near Baker Lake, Nunavut, Canada, some 1800 miles distant from Colorado. In his characteristically reserved manner, Dr. Griffiths depicts *B. furcula* as "apparently little-collected" - an understatement, as the Horseshoe Cirque specimens, purposely reared in captivity, represent the only other known specimens in the world. While he cautions that he has yet to view thousands of U.S. anthomyiid specimens as part of his revision of the family, he believes his determination will remain valid, although understanding of the rarity and geographic distribution of the fly may change. Dr. Griffiths will be publishing his findings on *B. furcula* as part of the continuation of his revision Flies of the Nearctic Region: Anthomyiidae, in 2006 or later.

The long-coming identification of *Botanophila furcula* as the fly predator of *Saussurea weberi* raises tantalizing questions about both fly and plant. For instance, insect larvae often exibit taxon-specific food requirements. How narrow are the food reqirements of maggots of *B. furcula*? Do maggots prey exclusively upon the fruit and seeds of *S. weberi*? (Such specificity would suggest a

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long-standing, tightly co-evolved relationship between fly and plant.) If exclusive, is *S. weberi* then also found around Baker Lake, Nunavut? Or do maggots feed upon fruit and seeds of any *Saussurea* species, even upon other Asteraceae as well? (A distribution map in Hultén (1968) suggests that *S. angustifolia* may be found in the region of Baker Lake.) What precisely is the impact of *B.furcula* maggot predation upon the population dynamics of *S. weberi* in Colorado, and throughout its geographic range; and conversely, how does the rare alpine calciphile affect the population dynamics of the fly? Is prey swamping of fly maggot predators one of the driving forces of the almost flawless biennial fluctuation in flowering shoot production in *S. weberi* at Horseshoe Cirque? Perhaps an ambitious young graduate student or other researcher will someday pursue answers to these and other such queries.

One fully expects to discover ecological relationships between rare species within the riotous biodiversity of the tropical rainforest. The predatory association between *Botanophila furcula* and *Saussurea weberi*, however, may illustrate that relationships between rare species might also be found within the sparing biodiversity of the Colorado alpine.

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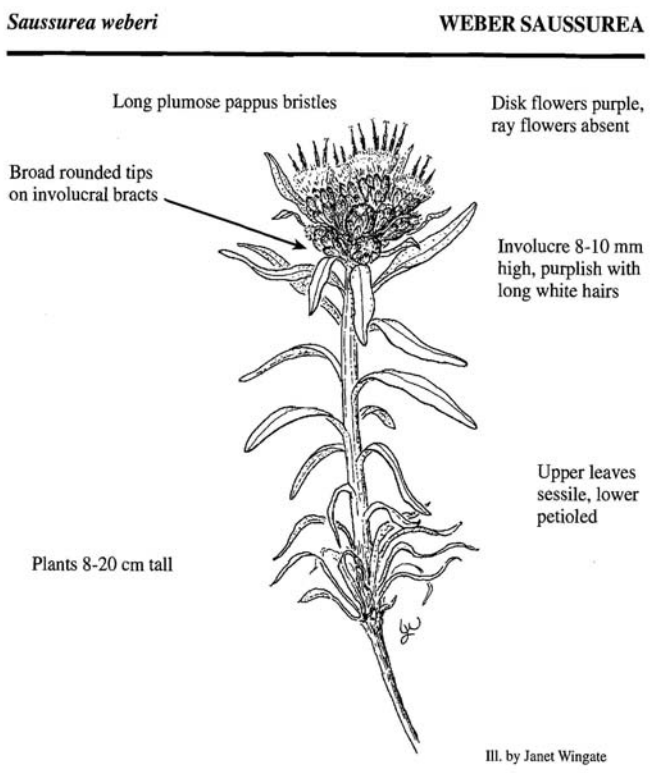


Ring in the New, The Year in Review

Leo Bruederle

During the past year, CoNPS has witnessed several extremely dedicated members handing over their societal responsibilities to enthusiastic volunteers who are in the process of moving the Society in new directions, while building upon our considerable strengths and past successes. Herein, I would like to acknowledge the contributions of some of these individuals.

Just as incoming Treasurer Denise Culver and longtime Vice President Dave Anderson were helping to negotiate the exciting purchase of new dissecting microscopes for CoNPS workshops, Dave handed over his executive responsibilities to Alice Guthrie, who will now oversee Society awards, elections, and planning the annual meeting. And just as Alice stepped in as Vice President, the baton was handed to Kim Regier who is our new Editor of *Aquilegia*. It is our goal to move *Aquilegia* in a new direction, from newsletter to magazine format. This is only possible due to the efforts of Al Schneider, webmaster extraordinaire, who has built a website that is timely, informative, and attractive.

In order to accommodate Kim in her new position as Editor, the Board recently split the position of Secretary, in which Kim has ably served for several years, into two executive positions: Corresponding Secretary and Recording Secretary. Fortunately, Kim has agreed to continue in her role as Corresponding Secretary, answering correspondence and communicating to the board and membership. Denise Wilson is not only stepping into the new executive position of Recording Secretary, but is also co-chairing Sales along with Mary Ellen Ford. Denise and May Ellen are stepping into the hard-to-fill shoes of former Sales Chair April Wasson. In a short period of time, the Sales Committee has streamlined the stock, emphasizing books showcasing Colorado natives, while Sue Kamal has been working with Al Schneider to facilitate the process whereby members and other visitors to our website can purchase books and other merchandise through Amazon.com, thereby providing an additional source of revenue to the Society.

More recently, the Southeast Chapter set a new standard with the Annual Meeting held in conjunction with the Rare Plant Technical Committee Symposium on the CU Colorado Springs Campus. This effort, spearheaded by Liz Klein, was undoubtedly one of the most well attended meetings in CoNPS history. Others — too many to mention — have contributed their time and efforts to advance the mission of the Society. Many thanks to all of our past and present Board members, executive officers, committee chairs, and chapter presidents (see page 11).

When I eagerly agreed to lead the Society, I did so with an eye toward further solidifying support for the benefits of membership — informative workshops, diverse field trips, discounted book sales, grants-in-aid-of-research, and an exciting annual meeting — while increasing membership, a goal the Society set for itself several years ago following strategic planning. Unfortunately, while the population of Colorado soars, our rolls have not. In fact, they have declined. As such, I would like to challenge each of you to identify one new member and encourage them to join the Society in 2007. Or give a gift of membership. Heaven knows there are budding young botanists, dedicated biology teachers, and `wildflower enthusiasts who would enjoy the many benefits of membership in the Society.

Who's In That Name?
Biographies of Colorado Botanists
Al Scheider

Charles Christopher Parry
Primula parryi, Lomatium parryi, Oreochrysum parryi, Pedicularis parryi, Pneumonanthe parryi, Trifolium parryi, Campanula parryi, Arnica parryi

Charles Christopher Parry, 1823-1890, was a highly respected and loved doctor, explorer, and naturalist; the first botanist in the United States Department of Agriculture (1869-1871); and an acclaimed botanical collector and taxonomist in the mid-west, Colorado, and many other western states for forty-eight years. Parry collected not only for his own pleasure and the advancement of science but also to encourage horticulture and the settling of the new lands he had explored.

Parry was born in England, came to the United States in 1832, earned a medical degree at Columbia, and practiced medicine in Davenport, Iowa, where he had moved with his family in 1846. His love of plants and travel led him just a few years later to join the Mexican Boundary Survey as both surgeon and botanist and for the rest of his life, Parry avidly botanized in the West. He died in Davenport, where he had maintained a home with his first wife, Sarah, who died in child birth after five years of marriage, and with his second wife, Emily, from 1859 until his death in 1890.

Parry was at the forefront of 19th century botany and maintained relationships with many great botanists: In 1845 at college, Parry studied under John Torrey, the foremost American botanist of his time. In 1848 Parry spent time with George Engelmann learning the botanical trade. (Engelmann was an eminent doctor, botanist, and teacher, and the founding botanist of the Missouri Botanical Garden). In 1870 in England he met Sir Joseph Dalton Hooker, Director of the Royal Botanic Gardens, Kew. (It was Hooker who in 1878 called Parry, "King of Colorado Botany".) In 1872 he led Asa Gray (John Torrey's student and the second giant of 19th century American botany) to the top of Gray's Peak to formalize the name Parry had given it.

Parry's joy in botanical collecting actually began in the Davenport area soon after he arrived there; but it was in 1861 that he found his foremost love: the alpine flora of Colorado. He devoted all of the summer of 1861 to collecting in Colorado, amassing a collection of over 417 species. In the summer of 1862 he led eastern farmers and sometimes collectors, Elihu Hall and J. P. Harbour, on a Colorado collecting expedition which gathered ten sets of over 700 species. This remains, according to William Weber, "the largest [collection ever] made in Colorado in a single season". Asa Gray, who described the collection, said, "[it] is full, excellent, and of great interest".

Parry was "the first resident Colorado botanist" (Weber's words). On and off for twenty years Parry collected voraciously from his summer cabin at the base of Gray and Torrey's peaks, which he named - along with many other peaks, including Mount Eva Peak (for his wife), Mount Engelmann, James Peak, Mount Guyot, Mount Flora, and Parry's Peak. Weber says, "Through the distribution of his botanical collections he introduced the Colorado flora to the world".

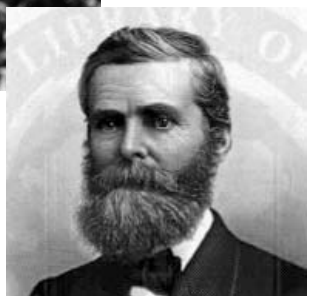
As was true of many in his time, Parry was a believer in Manifest Destiny. He wanted his discoveries to be put to practical use in the continuing westward expansion. He wanted his discoveries of the beauties of Colorado to entice others to come to Colorado and "build a mountain empire". Many other explorers (for example, John Fremont), politicians (for example, Senator Thomas Hart Benton -- whose daughter married Fremont), and ordinary American citizens unwaveringly accepted the doctrine of Manifest Destiny. To further this doctrine, Parry wrote of his travels and discoveries not only in scientific publications but even more often in newspapers and popular magazines.

Parry's personal collection of over 18,000 specimens came from numerous trips: early and later years in the north-central U.S., many years in California, railroad surveys, Utah and Wyoming expeditions, trips along the U.S.-Mexican border, and, of course, numerous trips collecting in Colorado. His collection is now housed in the Ada Hayden Herbarium at Iowa State University which also houses his papers.
See http://www.lib.iastate.edu/spcl/manuscripts/MS290.html

Parry collected over 30,000 specimens during his lifetime; he authored numerous articles, and he provided important material for Watson, Brewer, and Gray's Botany of California, the first such scientific botanical endeavor for that state. In Colorado, Parry collected about one hundred species new to science. Seventeen of these species are shown on the Colorado Native Plant Society web page, www.conps.org/botanical_slide_shows.html . Dozens of species outside of Colorado and seventy-six species in Colorado were named for the King.

Information in this article comes from numerous on-line sources and William Weber's King of Colorado Botany, Charles Christopher Parry. A special thank you to Dr. Weber for reviewing this article.

Pneumonanthe parryi
Parry's Gentian



CONSERVATION CORNER
Dudley Bluffs Bladderpod
Lesquerella congesta

Sarada Krishnan

The Dudley Bluffs Bladderpod, *Lesquerella congesta*, belonging to the mustard family (Brassicaceae) is endemic to the Piceance Basin in Rio Blanco County, Colorado. This species was listed as threatened under the Endangered Species Act on February 6, 1990 (Federal Register 55 F.R. 4152). They inhabit barren, white, oil shale outcrops of the Eocene Green River and Uinta Formations at elevations of 6,000 - 7,000 feet. A global ranking of G1 and state ranking of S1 (both critically imperiled) has been attributed to this species by the Colorado Natural Heritage Program (CNHP).

Lesquerella congesta is an herbaceous perennial with bright yellow flowers that bloom in April and May in a dense cluster. The plants are typically 1 - 3 cm across forming a small cushion and are hard to see. The cushion growth habit is an adaptation to exposed, erosive badland soils. A very long, thin taproot supports a single tight crown. The leaves are spatulate and hairy. Semi-spherical fruits form in late May or June.

The populations of this species are naturally limited to small existing areas of suitable habitat and only five known occurrences are reported in the USFWS 1993 Recovery Plan for this species, all of them within a 16 km range. Major threats include surface disturbances, mining and potential development in their natural range. This species' pattern of rarity (locally abundant on small areas of specialized habitat) makes them vulnerable particularly to surface disturbances.

In the Recovery Plan, the recommended actions for the recovery of this species are:

1. Inventory any remaining potential habitat.
2. Establish formal land management designations to main tain and protect existing populations on public land.
3. Protect sites on private land with land exchanges and/or conservation easements.
4. Conduct life history/ecology research and soil analysis.
5. Monitor trend of existing populations with permanent plots.

As part of these recommendations, two sites have been designated as Areas of Critical Environmental Concern (ACEC) by the Bureau of Land Management (BLM) and two populations are being monitored by the Colorado Natural Areas Program (CNAP) and the BLM since 1996. These populations occur at Duck Creek Area of Critical Environmental Concern owned by the BLM and registered as a State Natural Area by CNAP. Designation of ACEC means that the BLM develop habitat management plan, which provides priority management for *Lesquerella congesta*.

To determine if populations are increasing or decreasing over a ten-year period, the two populations were sampled in 1996, 1998, 1999, 2000, 2002, and 2006. Sampling was done within 520 sq. meter and 750 sq. meter macroplots for population 1 and population 2 respectively. The macroplots were subdivided into quadrats of 1.0 sq. meter and 0.5 sq. meter for population 1 and population 2 respectively. Volunteers from Colorado Native Plant Society (CoNPS) helped with recording population data in May 2006.

Initial findings of this study indicate a trend towards declining populations. At this time the causes of this decline is not conclusive. Researchers involved in this study recommend continued sampling of each population for at least another five more years to get more conclusive data on the threats to this species. They recommend adding additional populations in each management area to make comparisons between management prescriptions. One of the populations is located near a 2-track road and the recommendation is to set up a macroplot in this location to monitor the effects on plant density in the road. Future research needs include understanding this species reproductive biology and ecology, habitat requirements for all life stages and population dynamics.

Continued monitoring of this species will be very important in determining if the decline in populations from 2002 to 2006 were due mainly to climatic conditions or due to other factors. Participation by CoNPS volunteers will be vital in helping CNAP and BLM monitor this rare, native, endemic species.

Acknowledgements: Thanks to Brian Kurzel and Marcia Rickey of Colorado Natural Areas Program for providing information on the population monitoring project.

BOOK REVIEWS

Gardening with Altitude: Cultivating a New Western Style

Jan Loechell Turner

The staff of the Denver Botanic Gardens (DBG) is to be commended for this fine book, each chapter written by a different horticulturist, featuring gardens that each one created or designed. This is not a "how to" gardening book, but is the story of the recent years at the DBG and the evolution of a western high plains garden style. In the introduction, homage is paid to George Kelly and his classic book, Rocky Mountain Horticulture. Gardening with Altitude is a different kind of book, a collection of essays, in contrast to Kelly's hefty book that lists plants and where they are suited to grow, with cultural information about the plants.

In the 1980's, there were abundant peonies and roses at DBG and the structure seemed somewhat linear and formal. It reminded me of gardens in the Chicago area. Although beginning to work on its regional identity, DBG hadn't fully developed it. Things have changed! In recent years, DBG has incorporated native plants and drought-tolerant plants from other regions and has developed many new and innovative gardens. These gardens are celebrated in Gardening with Altitude: Cultivating a New Western Style.

Panayoti Kelaides has written the first chapter, giving an overview of the evolution of the different gardens and styles at DBG, highlighting their triumphs and the successful introduction of a number of regionally adapted plants into the local or national gardening scene. "Going Native in the Gardens", the chapter by Dan Johnson, is an informative, well written discussion of native plants in DBG. Other chapters include a discussion of the tundra gardens at Mt. Goliath and at the Gardens by Mark Fusco, a chapter featuring the water gardens by Joe Tomocik, "Gardens under Glass" (the tropical conservatory) by Nick Snakenberg, and "Versailles on the Platte" (Centennial Gardens) by Margaret Foderaro and Panayoti Kalaides. The book ends with a chapter by Tom Grant and Anna Sher, "The Public Garden as Science," which deals with the role of the botanic garden and the importance of research, public education, and ecological restoration. The book was edited by Holly Shrewsbury the Public Relations Manager of the Gardens. Photographs are by Scott Dressel-Martin.

For more information on drought-tolerant plants appropriate for the Denver area or other areas of Colorado, the following books are useful:

Native Plants for the High Elevation Western Gardens by Janice Busco and Nancy Morin serves as a guide to perennials and some shrubs, native to the region, that are appropriate for gardens in the Denver area. Although the book is from the Flagstaff (Arizona) Arboretum, you will recognize many of our local native plants in this excellent book.

Xeriscape Garden Guide, produced by the Denver Water Board, features a plant on each page with descriptions, photos, art work, and cultural information.

The Xeriscape Flower Gardener and Waterwise Landscaping with Trees, Shrubs, & Vines, both by Jim Knopf, contain a wealth of information about appropriate plants for this region and also have some photographs of yards that incorporate native and xeric plants in attractive ways.

Xeriscape Colorado by Connie Ellefson and David Winger is filled with landscaping ideas for Colorado homeowners.

Wild at Heart

Jan Loechell Turner

Huggins, Janis Lindsey. Wild at Heart: A Natural History Guide Dedicated to Snowmass, Aspen, and the Maroon Bells. Published by The Town of Snowmass Village, CO, 2004.

Thoroughly researched, Wild at Heart is an encyclopedic natural history guide to the Snowmass area. It is obvious that the author spent countless hours researching this impressive guide. She drew on the expertise of numerous scientists including Ron Hartman, John Emerick, and William Weber. Hartman served as one of the technical editors of the book. Nearly 500 pages long, the book, filled with color photos, includes sections on trails, geology, ecology, plants, birds, and mammals.

Many little treasures are contained in the book such as a list of trails detailing plants and birds that may be encountered there, a map of elk seasonal ranges, photos of mountains in the area with their names and elevations, a plant community map, and little side boxes containing fascinating information (for example, "How old are they" which gives maximum tree ages, such as Rocky Mountain juniper -1,889 years, Gambel oak- 401 years). In this book, you will learn the identity of the only native North American animal that has ever been domesticated (turkey). Also included is a discussion of the threat of noxious weeds and a weed list for Pitkin County.

Huggins emphasizes plant family characteristics. Plants are arranged by family, with descriptions of plant family traits followed by entries on species in that family. Preceding this is a gallery of plant thumbnail photos arranged by color. Rather than giving the species name, the family and page number are given below each plant photo. Following the photo gallery, is a key to plant families. Within families, plants are arranged by a common name (usually taken from the Flora of North America). The scientific name for each plant is from Ron Hartman's Checklist of the Vascular Plants of Colorado (www.rmh.uwyo.edu). These may be followed, in brackets, by alternative scientific names from Weber & Wittmann's Catalog of the Colorado Flora. Plant entries include color photographs, lifezone/ecosystem, flowering dates, fruit types, and descriptive information to supplement the photograph, folklore, uses, and recent research. Non-natives are indicated by an asterisk or a special symbol for plants on the Pitkin County weed list.

Following the arrangement in The Sibley Guide to Bird Life and Behavior, the bird section includes habitat and feeding, field identification traits, and breeding and nesting information as well as a photograph of each bird. Another section of the book is on the mammals of the area. Appendices include endnotes, an illustrated glossary, references, and lists of conservation and research organizations and selected websites.

Huggins moved to the Aspen/Snowmass area in 1970. She has worked as a freelance botanist/naturalist in the Snowmass area and has degrees in natural science and clinical herbal therapy. She has produced an excellent guide that will be of value to anyone interested in the natural history of the Snowmass area.

Tales from the Field

John Giordenango

I once knew a lonely field worker who, while studying willows on horseback in the Bighorn Mountains of Wyoming, came across an outfitter camp that was thoroughly destroyed by a bear(s). Dead silence followed his trembling "hello there?", though given the state of the camp he would have been thoroughly surprised to hear any reply. The bear fence was torn through like gauze in front of a semi truck. Shredded food bags, broken coolers, and dirty pots littered the shrubbery surrounding the campsite.

Although the red hairs standing up on the back of his freckled neck cautioned him to leave the scene promptly and find help, he instead dismounted to investigate the incident on foot. Fortunately, he was accompanied by his trusty sidearm. As soon as he got within 10 feet of the rotten-smelling tent. . .

TO BE CONTINUED

Welcome to "Tales from the Field", where CoNPS members are encouraged to share their most unbelievable tales from their field days. The hilarious and astonishing stories that I continue to hear from long-time field workers, or just unlucky novices, never cease to amaze and entertain me. My philosophy is "no good story should go untold, no matter how outlandish or embellished it may be". So, help sustain the lighter side of Aquilegia and send your funny, gruesome, unbelievable, embellished, terrifying-but-hilarious-in-hindsight, or otherwise entertaining tales from the field to John Giordanengo at john@bluemountain1.net. Photos are welcome, but be advised that the column is limited to 500 words. I look forward to hearing your tales soon.

2006 Donations

The total donations to the Marr Fund, Steinkamp Fund and General Fund was $807, $2,120, and $1,721, respectively. This made the grand total $4,648!

We would like to thank all of those who donated to CONPS this year: Suzanne Wuerthele, Eleanor Von Bargen, Sue Martin, Dina Clark, Sandy Righter, Charlotte Briber, Donald Parker, Janice Appelbaum, Vicki Ray, Randall Lentz, Susan Harris, Merle Moore, Timothy Hogan, Patrick Murphy, Megan Bowes and Billy Schweiger, Janet Potter, Gay Austin, Elizabeth Hall, Eric Rechel, Annette and Paul Miller, Sue Kamal, Elizabeth Otto, Joan Sapp, Ann Young, Beverly Baker, Richard Beidleman, Janet Klemperer, David and Sandra Buckner, Aqua-Hab, Karen Vail, Kirsten Heckmann, Neal Osborn, Cheryl and John Giordanengo, Dick and Marty Fisher, Rebecca Siegle and Matthew Schweich, Melissa Landon and Denise Culver, Steven & Kenna Yarbrough, Emily Hartman, Elaine Hill, Jim Brink, Peter Williams and Tamara Naumann, Ronald Abbott, Moras and Ernie Shubert, Susan Halabrin, Mike Renth Family, Leo Bruederle, Carol and Jeffrey Dawson, Ted Beegle, Jean Dietemann, Peter Root, Sue Ellen Alishouse, Subler Family, Janice Forbes, Edith Davis, Edward Haenlin & Ann Litke, Priscilla Spears, J. T. Verbeck, Ed Haas, Fantasy Orchid, Hazel Tuttle, Jennifer Ramp-Neale, Lee Curtis, Sarada Krishnan, Denise Larson, Lorraine Seger, D Langdon, John Bridges, Josh Pollock, Olin Webb, Terence Ryan, Ronald Abbott, Erica Smith, Randy Tatroe, Priscilla Spears, Western Native Seed, and Pawnee Buttes Seed. Additionally, there were two anonymous donors.

New Members

CONPS would like to welcome the following new members: Louise Adler, Pat Aiken, Keith and Jean Anderson, Crystal Andrews, Sheryl & John Atkinson, Karen Baud, Carlton Begeal and Cindy Trujillo, Lisa Boary, Jeff Carter, Emily Coll, Barbara Congdon, Terrence H Dunn, Cara Gildar, Joann Hess, Matt Johnson, Cindy Lawrence, Michael Mancusi, Lisa McDonald, Lenore Mitchell, Donna Norton, Karl Paxton, Phil Phelan, Gail Phillips, Josh Pollock, Holly Postmus, Gary D Redinger, Carol Roberts, Lorraine Seger, Barbara Spagnuolo, Dale Swenarton, Dian Torphy, and Ann Wickman.

A Few of My Favorite Things (Sing to the song of the same name from The Sound of Music)

Dave Anderson

Salix and *Carex* and *Plagiobothrys*
Primula, *Pinus*, and one *Ptilagrostis*
Rhus and *Claytonia* blooming in spring
These are a few of my favorite things

Digital cameras with big macro lenses
Keying out plants with a few of my friends-es
A 16 X loupe on a piece of red string
These are a few of my favorite things

When the tick bites
When the bee stings
When I've lost my hat
I simply remember my favorite things, and then I don't feel so bad!

Weber and Wittmann and Harrington's Manual
Cronquist and Holmgren and F. Potter Daniels
Some of these books are too heavy to bring
But these are a few of my favorite things

Wingate's small brown book and Barkworth's great big one
Coulter and Nelson and Gray's 8th Edition
Rydberg wrote quite a few good offerings
These are a few of my favorite things

When my water
Leaks all over
And I'm soaked and mad
I simply remember my favorite things, and then I don't feel so bad!

JOHN MARR FUND RECIPIENT

Prairie Dogs and Harvester Ants as Ecosystem Engineers on the Colorado Shortgrass Steppe

Chrissy Alba-Lynn
Colorado State University, Department of Biology

What do black-tailed prairie dogs (*Cynomys ludovicianus*) and western harvester ants (*Pogonomyrmex occidentalis*) have in common? Cursorily, one might assume "nothing at all": comparing furry, burrowing mammals to centimeter-sized insects (whose skeletons aren't even located inside their bodies) is like comparing apples to oranges, right? Not if both species act as ecosystem engineers.

Ecosystem engineers are organisms that, by creating a disturbance, alter the resources available to other plants or animals living in the same area (Jones et al. 1997). A great example of an ecosystem engineer is the oft-described "industrious" beaver. By actively modifying habitat to meet their needs, they alter community composition, structure, and function, and they maintain these changes over time. Similarly, prairie dogs and harvester ants actively engineer and maintain their dwellings, and in the process alter certain aspects of the plant and animal community.

Prairie dogs and harvester ants are conspicuous denizens of the Colorado shortgrass steppe ecosystem. Prairie dog colonies can be expansive, and the vegetation growing on colonies is often different from the surrounding, uncolonized grassland (Whicker and Detling 1988). Through their continual grazing, prairie dogs directly affect vegetation by creating closely cropped "lawns." Depending on colony age, changes in the plant community include replacement of mid-height grasses by grazing-tolerant shortgrasses; greater species richness of flowering dicots (forbs); and lower grass biomass and diversity. (As a result of these changes, competition for forage between prairie dogs and cattle has been the catalyst of much debate.) At the sub-colony scale, mound-shaped entrances to prairie dog burrows dot the landscape, and they are a good example of how disturbances create patchy (heterogeneous) habitat. During burrow excavation, prairie dogs churn up soil from deeper horizons. They subsequently pack down and maintain this unearthed soil, resulting in the highly disturbed, often denuded, mounds. Such microhabitat creates niche variety, which is essential to maintaining diverse communities over time.

Through casual observation, I noticed that prairie dog mounds and harvester ant nests might similarly contribute to habitat heterogeneity. Harvester ant nests are typically composed of a central cone of pebbly soil surrounded by a distinct disk of cleared vegetation. The soil and vegetation of nests are highly disturbed because ants, like prairie dogs, excavate underground living quarters and keep the entrances to their subterranean dwellings mostly cleared of vegetation.

Harvester ants' can indirectly affect vegetation growing beyond the perimeter of nests because they are seed predators. These generalist foragers gather many types of seeds from the soil surface and return them to the nest for immediate consumption or to be stored in granaries. Seeds are significantly less abundant in heavily foraged areas surrounding nests, and *P. occidentalis* can remove up to 100% of the seed set of preferred species (Crist and MacMahon 1992). In other ecosystems (e.g., deserts and serpentine grasslands), harvester ant seed removal has been shown to affect plant community composition (Davidson et al. 1984, Hobbs 1985); however, there is little information available about how *P. occidentalis*' seed harvesting affects shortgrass steppe vegetation at scales beyond their highly disturbed nests.

I measured certain mound and nest characteristics, as well as the characteristics of associated vegetation, to determine whether these superficially comparable disturbances indeed similarly contribute to habitat patchiness. My research addressed 1) whether prairie dog colonies provide suitable habitat for harvester ants, 2) how mounds and nests are dispersed on the landscape, 3) whether mounds and nests are similar habitat in terms of bare ground and vegetation characteristics, and 4) whether, beyond mounds and nests, harvester ants alter vegetation at the sub-colony scale in a manner distinct from prairie dog-induced changes at the colony scale.

With much-welcomed partial support from the John Marr Fund, I collected data during the summer of 2005 on the Shortgrass Steppe Long-Term Ecological Research Site located about 60 km northeast of Fort Collins. I found several lines of evidence indicating that prairie dog colonies provide suitable habitat for *P. occidentalis*, despite possible differences in on-colony versus off-colony vegetation. Nest densities were the same on and off colonies (25 nests/hectare on and off colonies; Figure 1a), suggesting that *P. occidentalis* populations on the shortgrass steppe achieve similar sizes in both habitat types. In addition, on-colony nests were significantly larger in area than off-colony nests (Figure 1b). This size difference might result in part from prairie dog-induced changes to colony vegetation. Low-growing grazing lawns maintained by prairie dogs, as well as highly disturbed and loosened soil on and around mounds, could facilitate ants' clipping of vegetation surrounding their nests. Addtionally, despite all of the prairie dog activity that occurs on and around mounds, 22% of harvester ant nests located on colonies directly overlapped prairie dog mounds. This is rather striking considering that mounds only covered ~1.2% of the study area, and suggests that harvester ants might preferentially colonize mounds. Newly mated ant queens look for previously disturbed bare ground in which to begin excavating new nests (Terranella et al. 1999).

"**Prairie dogs and**..." continued on page 8

"**Prairie dogs and** ..." continued from page 7

Highly denuded prairie dog mounds could serve as a visual cue, attracting queens that prefer to excavate disturbed soil.

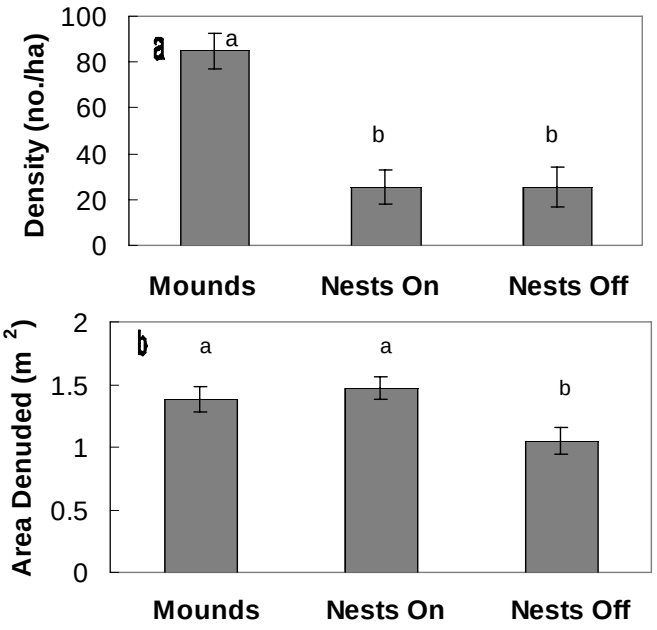


Figure 1. Summary statistics of prairie dog mound and harvester ant nest density and size. (a) Mean number (± SE) of mounds and nests per hectare. "Nests on" refers to nests located on colonies; "nests off" refers to nests located off colonies. (b) Mean area (± SE) denuded of vegetation by individual mounds and nests; mound and nest size is equivalent to the area denuded of vegetation.

Because prairie dog mounds and harvester ant nests can last on the order of decades (Carlson and White 1987, Coffin and Lauenroth 1990), it is of interest to understand how these long-lasting microhabitats are dispersed relative to one another. Nearest neighbor analyses (Clark and Evans 1954), which are used to describe the dispersion of points on a landscape, showed that mounds and nests occur significantly closer to one another than is expected based on chance. This highlights the fact that where populations of prairie dogs and harvester ants co-occur, the spatial attributes of heterogeneity are altered (versus where each species occurs singly). This could have implications for many organisms that exploit bare ground (e.g., ovipositing insects or weedy plants).

Conversely, nests were uniformly dispersed in relation to other nests (i.e., nests occur farther from other nests than is expected by chance), a pattern that has been found previously for harvester ant nests (e.g., Ryti and Case 1986). This overdispersion results in part from territoriality and intraspecific competition for resources, most notably seeds. There was no difference in the dispersion pattern of nests located on versus off prairie dog colonies, which indicates that the factors contributing to nest spacing (e.g., resource competition) did not differ across habitat types.

Ants on colonies remove ~36 m2/ha of vegetation, approaching 30% of the total area denuded by prairie dogs (~118 m2/ha). Taken together, ants and prairie dogs denuded 153 m2/ha on colonies (~1.5% of vegetation in the sampled area) versus 26.5 m2/ha (~0.27% of vegetation) denuded by ants off colonies. Ant nests (both on and off colonies) had significantly less intact vegetation than did mounds. Mounds supported greater plant species richness and diversity than on-colony nests, but not off-colony nests. Two plants species significantly contributed to the relatively high vegetation cover on mounds: the native perennial forb, scarlet globemallow, and the exotic perennial forb, Russian thistle. The greater cover of Russian thistle on mounds versus nests (both on and off colonies) suggests that mound disturbances in particular allow establishment of this weedy exotic, possibly by releasing it from competition with native perennial grasses. And although scarlet globemallow is a preferred forage item of prairie dogs, the plants seem to be relatively tolerant of prairie dog activity on and near mounds. In some cases, scarlet globemallow forms near monocultures in areas highly disturbed by prairie dogs. In general, prairie dogs maintain less meticulously denuded patches of soil than do ants, and of the three patch types (mounds, and nests on and off colonies) on-colony nests support the lowest richness and diversity of plants.

Beyond the perimeter of mounds and nests, prairie dogs are the main agent of vegetation change on colonies. Harvester ants' contribution to vegetation heterogeneity was minimal and restricted to nests, which cover only ~1/3 of 1% of the study area. Vegetation sampled beyond the perimeter of mounds and on-colony nests was similar in height, cover, richness, and diversity. Thus, there is no evidence that ants alter vegetation in a manner that is distinct from the changes brought about by prairie dogs, except where ants are clipping nest vegetation. In contrast, there were several differences in vegetation sampled on versus off colonies, which supports the findings of previous researchers that prairie dog grazing induces changes in the plant community. The data gathered in this study show that prairie dogs create heterogeneity at both the colony (via grazing) and sub-colony scales (via mound-building), while harvester ants' contribute additional heterogeneity at the nest scale.

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ANNOUNCEMENTS

www.conps.org

The newest addition to the Colorado Native Plant Society web site is "Colorado Botanical News". Check this web page for daily news about endangered species, recent botanical research, federal and state botanical actions, conferences, jobs, botanical garden happenings, books…. You will also find links to dozens of web sites for more botanical news. On the CoNPS web site you can also keep in touch with chapter and Society activities. Workshops and chapter programs are listed on-line now and 2007 field trips will soon be posted. Browse through the new slide shows on the Botrychiums and Orchids of Colorado. Send your suggestions for the website to webmaster@conps.org

CONPS Plant Lists

Colorado Native Plant Society members often keep lists of plants observed on the Society field trips; these lists are now available on the Society's web site at http://www.conps.org/plant_lists.html. The lists are in easily printed PDF format. Scroll through the list to find the plant list you are interested in and then click on the number in either the family or genus column to obtain the plant list alphabetized by family or by genus . We hope you use the list to learn about and enjoy the plants of Colorado. Please email additions to these plant lists and your new plant lists to Loraine Yeatts (lyeatts1@earthlink.net) or send the lists to her by regular mail: 1395 Nile Street, Golden, Colorado 80401.

Aquilegia via Email

Aquilegia is available via email as an Adobe document. File size is typically 2-3 MB and fast internet connections are needed to download or view it. Send your email address to Eric Lane, eric.lane@ag.state.co.us.

Save the Date for CONPS 2007 Annual Meeting!

When: Weekend of September 7th to 9th
Where: University of Colorado, Boulder Campus
What: Botany Goes Buggy in Boulder: Plants and Insects!

The Boulder Chapter is pleased to host the 2007 Annual Meeting to explore the interactions between plants and insects. The schedule will follow the traditional format with warm-up events on Friday evening, speakers on Saturday, and field trips on Sunday. Come get BUGGY with BOTANY in BOULDER!

Wild Buckwheat Conservation Fund

Sarada Krishnan

The clay-loving wild buckwheat (Eriogonum pelinophilum) is a rare wildflower endemic to the adobe hills of western Colorado growing in less than 500 acres in Montrose and Delta counties. The buckwheat has been protected under the Endangered Species Act since 1984, but threats to this species continue to grow due to increased urban development and recreational use, leading to habitat destruction.

The Center for Native Ecosystems has partnered with the Colorado Natural Areas Program, The Nature Conservancy, Colorado Natural Heritage Program, Friends of Colorado Natural Areas and Colorado Native Plant Society to protect wild buckwheat habitat by purchasing a private land parcel that is currently for sale. This property is home to one of the largest surviving clay-loving wild buckwheat populations in the world.

CoNPS had initially committed to the conservation of this species by matching funds donated by CoNPS members 2 to 1 up to a total of $5,000. This has now been increased to $10,000 made possible by a generous donor to be applied to the CoNPS match. Thanks to many CoNPS members who have generously contributed to this fund. If you have not already done so, please send your check immediately and help us meet the challenge of raising $5,000 for conservation of one of our native plants and its habitat!

More information and contribution form are available at the CoNPS website under Botanical News:
http://www.conps.org/pdf/Botanical%20News/Eriogonum%20Pelinophilum%20Fund%20CoNPS_contrib%20form.pdf

Society Awards

The Board of Directors of the Colorado Native Plant Society desires to honor contributions to Colorado botany and the Society with the following types of awards. Nominations may be made at the chapter or state level and submitted to Vice President Alice Guthrie .

Recognition Gifts: non-members who provide a one-time service to the society.

Certificate of Appreciation: members and non-members who provide occasional services to the society.

Certificate of Merit: members who have made a significant contribution to the Society in a short period of time (less than five years).

Special Merit Award: non-members for short-term contributions to Colorado botany and/or significant contributions to the Society¹s goals.

Honorary Lifetime Membership: CONPS member for long-term, high quality service to the Society (over ten years).

Lifetime Achievement Award: members and non-members for long-term (30+ years) contributions to Colorado botany.

FIELD TRIPS

Fairview Natural Area
May 5, 2007
Leader: Amanda Clement, BLM

Fairview Natural Area is located between Montrose and Delta, adjoining the Wacker property. *Eriogonum pelinophilum* will not be blooming but many other plants will. We will meet at the old City Market in Montrose located South of Main on Townsend at 10 AM. Bring lunch,sunscreen, bug repelent etc. Easy to moderate hike of 2-3 miles at low elevation. Contact Jeanne at 970-256-9227 or emali STWEANDJAW@ACSOL.NET. Or call Amanda at work 970-240-5306.

Glade Reservoir Plant Survey
May 19 and August 18, 2007
Leaders: Denise Culver and Mark Easter

Rare Plant Survey and Species List in the proposed areas for the Glade Reservoir project. We will be looking for Bell's twinpod (*Physaria bellii*), Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradoensis*) and Ute ladies' tresses (*Spiranthes diluvialis*) north of Ted's Place and the Environmental Learning Center. For more information on the Glade Reservoir project see www.savethepoudre.org. If interested in the field trip contact Denise Culver Denise.Culver@colostate.edu or (970) 491-2998.

NE Colorado Sandhills & Sandstone Bluffs Flora
June 19, 2007
Leader: Bruce Bosley

This field trip will be conducted in the wide open spaces of eastern Yuma County, so there will be an overnight option. This summer will likely be a fantastic wildflower show based on the snows (and accompanying moisture). Carpooling will be arranged from Ft. Collins. For more infomration contact Denise Culver (970-491-2998) or Bruce Bosley (970-842-2120 or Bruce.Bosley@colostate.edu).

More fieldtrips will be listed in the next issue of *Aquilegia*.

WORKSHOPS

Most workshops are full or nearly full so if you are hoping to register for any of the following, please check our website to see the status of the workshops. You can also call or email Mary Ellen to verify that there is space available. For those who need to cancel at the last minute, we appreciate your $20 contribution to CONPS and ask that you call or email Mary Ellen (303-449-7334 or Fordmaryel@aol.com) so she has the opportunity to fill your spot. The registration form is available from the website link and prior newsletter issues.

Potentillas of Colorado
February 10-11 2007
This workshop is FULL.

Euphorbiaceae in Colorado
March 17-18 2007
This workshop is FULL.

Vegetation Zones and Rare Plants of the Colorado Front Range
Leader: Steve Popovich
Location: Arapaho-Roosevelt N.F. Office, Ft. Collins
First Session: April 21, 2007
Second Session: April 22, 2007
Time: 9 a.m. to 2 p.m.

Back by popular demand, Steve Popovich, Botanist for the Arapaho-Roosevelt National Forests and Pawnee National Grassland has agreed to lead this workshop again. Participants will learn why and how plant life changes as we go from the prairie to the peaks. Through photos and discussion, Steve will introduce you to the basic plant communities found in the major life zones of the Front Range, from the shortgrass prairie to the montane forest, subalpine forest and alpine tundra. Learn about floristically important places like Mt. Evans. Steve will also discuss specialized plant communities that harbor some of Colorado's rarest plants and will review the "new species" discovered in the mountains west of Denver and Boulder! Class finishes with an optional short field trip on a bike path to see a rare plant in early rosette in Fort Collins open space.

Trees and Shrubs of Colorado
May 19, 2007
Leader: Jack L. Carter
Location: Colorado College, Co. Sprgs.
Time: 9 a.m. to 3 p.m.

Using the recently revised and expanded edition of Jack Carter's Trees & Shrubs of Colorado, participants will learn to identify many of the nearly 300 woody species in Colorado. From the book's wonderful illustrations, color photographs, clear keys, and helpful descriptions, attendees will be provided an opportunity to put their identification skills to work with plant material on hand at the workshop. Please Note: The Second Session, May 20, 2007 is FULL.

How to Identify Wildflowers
An Introductory Workshop
February 10, 2007
Time: 9am-1pm
Leaders: Al Schneider and Dick Moseley
Location: San Juan Public Lands Center, Durango

Are you a wildflower lover who gets frustrated year after year at not being able to identify (or remember!) the gorgeous plants you see each summer? Come to a wildflower workshop presented by the Colorado Native Plant Society and sponsored by the San Juan Mountains Association and Durango Nature Studies. Learn different methods to use in identifying plants, how to use a number of different plant keys, and characteristics of major plant families.

Cost: $25 ($20 for members of the Colorado Native Plant Society, San Juan Mountains Association, Durango Nature Studies, or Forest Service) (The fee includes a year membership in the Colorado Native Plant Society for new members.) Make check to SJMA, indicate that it is for the Wildflower Workshop, include your phone number and email address, and send your check to:

SJMA
P.O. Box 2261, Durango, Colorado 81302
Attention: Gabrielle Morey, Wildflower Workshop

For more information see http://www.conps.org/southwest.html , or call or email Al: (970-882-4647) webmaster@conps.org

Colorado Native Plant Society

Aquilegia

The Colorado Native Plant Society is a non-profit organization dedicated to the appreciation and conservation of the Colorado native flora. Membership is open to all with an interest in our native plants, and is composed of plant enthusiasts both professional and non-professional.

Please join us in helping to encourage interest in enjoying and protecting Colorado's native plants. The Society sponsors field trips, workshops, and other activities through local chapters and statewide. Contact the Society, a chapter representative, or committee chair for more information.

Schedule of Membership Fees

Life	$250
Supporting	$50
Organization or Corporate	$30
Family or Dual	$20
Individual	$15
Student or Senior	$8

Membership Renewal/Information

Please direct all membership applications, renewals and address changes to Eric Lane, Chair of Membership, Colorado Native Plant Society, P.O. Box 200, Fort Collins, CO 80522. Please direct all other inquiries regarding the Society to the Secretary at the same address.

Aquilegia is published four or more times per year by the Colorado Native Plant Society. This newsletter is available to members of the Society and to others with an interest in native plants. Articles for *Aquilegia* may be used by other native plant societies or non-profit groups, if fully cited to author and attributed to *Aquilegia.*

Articles from 500 to 1500 words in length, such as unusual information about a plant, are welcome. Previously published articles submitted for reprinting require permission. Digital photographs or line drawings are also solicited. Please include author's name and address, although anonymity may be requested. Articles must be submitted electronically.

Please direct all contributions to the newsletter to:
Kim Regier
E-Mail: kimberly.regier@cudenver.edu

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MEMBERSHIP APPLICATION AND RENEWAL FORM

Name(s) _____

Address _____

(Address) _____

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Phone _____ E-mail _____

MEMBERSHIP CLASS:
Dues cover a 12-month period.
___ Individual, $15.00
___ Family/dual, $20.00
___ Senior, $8.00
___ Student, $8.00
___ Corporate, $30.00
___ Supporting, $50.00
___ Lifetime, $250.00

Chapter (Circle one): Boulder Northern CO Metro Denver Plateau Southeast Southwest

In addition to my membership, I have included $_____ as a contribution to the John Marr Fund (endowment in support of small grants-in-aid of research), $_____ as a contribution to the Myrna P. Steinkamp Memorial Fund (endowment in support of small grants-in-aid of research), or $_____ as a general contribution to the Society.

CONPS IS A NON-PROFIT ORGANIZATION — DUES AND CONTRIBUTIONS ARE TAX-DEDUCTIBLE

Colorado Native Plant Society

CALENDAR 2006 - 2007

CHAPTER EVENTS

Boulder Chapter

February 8	Local Tallgrass Prairies
March 8	To be announced

Metro-Denver Chapter

February 27	Development of Conservation Planning Tools
March 27	To be announced
April 24	To be announced

Ft. Collins Chapter

February 7	CNAP and *Eriogonum pelinophilum*
March 8	Rare Plants, Plant Communities, and Birds of Soapstone Ranch
April 11	Ecology of Blue Grama - CO's State Grass

BOARD OF DIRECTORS MEETINGS

February 10	Golden, CO
April 14	Golden, CO

SOCIETY WORKSHOPS

February 10&11	*Potentillas* of Colorado
February 10	How to Identify Wildflowers
March 17 & 18	Euphorbiaceae in Colorado
April 21 & 22	Vegetation Zones and Rare Plants of the Front Range
May 19 & 20	Trees and Shrubs of Colorado

SOCIETY FIELDTRIPS

May 5	Fairview Natural Area
May 19	Glade Reservoir
June 19	NE CO Sandhills and Sandstone Bluffs
August 18	Glade Reservoir

TIME SENSITIVE MATERIAL

Colorado Native Plant Society
P.O. Box 200
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