

Colorado Native Plant Society Annual Meeting, September 2009
Poster Abstracts

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Title: Comprehensive interactive plant keys for the Rocky Mountain Region

Abstract: Plant conservation and management for any given locality is a complex process which depends on reliable and continually updated information regarding what species are found and where. This critical data often requires time-consuming initial and ongoing plant surveys. Computerized interactive keys produced over the past 15 years by the author greatly facilitate plant surveys by reducing the time to key unknown species by 90% or more. At the same time, identifying plants can be a frustrating and off-putting experience for new plant enthusiasts. The software has built-in features to make keying a simpler and faster process which has helped many people with little technical background appreciate and quickly gain better understanding about the plants they enjoy. The keys include all known vascular plant species, both native and introduced, which grow outside of cultivation in 16 states and 4 Canadian provinces. Plant characteristics may be selected in any order, with no forced choices. Terms are defined and illustrated, extensive references are included, and color photos are provided for over 99% of species. Synonyms and menus of genera and families are provided to reduce problems of changing nomenclature. The software is continuously updated with name changes, new plant finds, and new photos, with free annual updates available for purchasers. The keys are available by state or larger region. In addition, one has been recently produced for all plant families worldwide, for inclusion in Contemporary Plant Systematics by Dennis W. Woodland. In most cases descriptive information is provided for separating subtaxa when present. The keys are a powerful, innovative tool designed to make keying plants accessible to the beginner while providing additional tools for experienced field botanists.

Brock Bowles and Mark Paschke

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Title: Development of a Sagebrush Steppe Plant Community 32 Years After Disturbance

Abstract: In 1976, the Successional Study on Surface Disturbed Soils (SSSDS) was initiated to examine the effects of seed mixes and fertilizer treatments on a sagebrush steppe plant community in northwestern Colorado following disturbances associated with mining activities. With renewed interest in oil shale development of western Colorado, the Piceance study site has become a unique and valuable source of long-term data for restoration practices of semiarid ecosystems. The experiment is a split-plot design consisting of 54, 9 X 18 m subplots, with six seed mixtures comprising the main plots and three fertilizer treatments comprising the subplots. Native and introduced grass, forb, and shrub species were used in the seed mixtures. Preliminary results after one year of data collection (2008) suggests that native seed mixes have the greatest species diversity while introduced seed mixes have the lowest species diversity. However, native species were outcompeted by introduced, mainly due to the persistence and invasive qualities of *Agropyron cristatum*. Introduced seed mixes had a lower presence of annual species, such as *Bromus tectorum*, compared to native seed mixes. The initial fertilizer treatments increased plant biomass and have lasting effects on species composition. This project shows that native seed mixtures create a more diversely rich pant community while the introduced seed mixtures produce more biomass with less plant diversity.

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Title: Annual Variation for Effective Pollination in *Penstemon degeneri* Crosswhite (Plantaginaceae), a Rare Colorado Endemic.

Abstract: Field research addressing pollination biology in *Penstemon degeneri* Crosswhite (Plantaginaceae), a rare Colorado endemic, was conducted at three sites over three field seasons characterized by extreme climate variation for precipitation. Although overall species diversity was similar each year, the visitor guild differed dramatically over this period, as did effective pollination. Two bumblebee species (Apidae) were determined to be highly effective pollinators in 2007, yet few bumblebees were observed in 2008 and these carried little body pollen and no scopal pollen. Mason bees (Megachilidae) were also determined to be effective pollinators in 2007, yet they occurred in relatively low numbers in 2007 and only at the high elevation site. Mason bees were most abundant at all three sites in 2008 and were 80% faithful to *P. degeneri* pollen, carrying copious amounts of body pollen. *Pseudomasaris vespoides*, a pollen wasp that has been described as being oligolectic for *Penstemon*, was encountered infrequently in 2007, yet it was one of the most frequent visitors in 2008. Furthermore, nine of the ten individuals captured in 2008 carried copious amounts of body pollen. These results suggest that seasonal precipitation can influence strongly the visitor guild, as well as effective pollination in *P. degeneri*.

Denise Larson

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Title: Transplanting moonworts on Guanella Pass – Success or Failure?

Abstract: As part of the Guanella Pass Road improvement project, FHWA commissioned ERO to transplant moonworts (*Botrychium spp.*) that were slated to be destroyed during construction of this project. Moonworts have an obligatory association with soil mycorrhizal fungi. Because of this obligate association, these tiny ferns are very difficult to transplant. Soil movement during the transplantation process may interrupt this mycorrhizal association, causing the moonworts to die. At Guanella Pass this problem is compounded because the soil at the moonwort site is decomposed granite, which crumbles easily when moved.

Based on previous studies and assistance from Steve Popovich (Forest Botanist, Arapaho and Roosevelt National Forests & Pawnee National Grassland) and Cindy Johnson-Groh (Professor at Gustavus Adolphus College), Denise Larson and other ecologists at ERO, designed a transplant methodology to mitigate for these conditions. This methodology consisted of carefully digging the soils around the moonworts, centering a spring-form baking over the plant. Then the pan bottom was gently slid under the pan to avoid soil movement. At the transplant site, a hole was dug, the pan containing the moonworts placed in the hole, and the pan bottom was carefully removed. 275 above-ground moonworts of 4 different species (*B. echo*, *B. lanceolatum*, *B. lunaria*, and *B. minganense*) were transplanted in 2003. Although about half of the moonworts (136) were present after the first year, by 2007 only 19 plants emerged and about the same number emerged in 2008 and 2009. This result is similar to another transplant study done in Minnesota by Cindy Johnson-Groh using a different transplant method.

Annette Miller, Andrea Lawrence, and Dave Ellis

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Title : Ex-situ Conservation of Colorado Flora at the USDA/ARS National Center for Genetic Resources Preservation

Abstract: The National Center for Genetic Resources Preservation (NCGRP) houses the base collection for the U.S. National Plant Germplasm System (NPGS) as well as other important global crop collections. The NCGRP is administered by the Agricultural Research Service (ARS), an agency within the USDA and is located on the Colorado State University Campus in Fort Collins, Colorado. Founded in 1958 as the National Seed Storage Laboratory, the name was changed in 1999 to reflect its larger role in housing the National Animal Germplasm Program (NAGP). The NCGRP now maintains for long term backup over 750,000 plant collections (seeds, meristems, dormant buds, pollen) and over 450,000 animal germplasm collections (eggs, sperm, embryos, red blood cells) in addition to microbes. To support this effort in the long-term preservation of genetic resources, the NCGRP conducts research related to storage and preservation of these live materials. The materials come from a wide range of government agencies and institutions both nationally and internationally. Included in the collections are 364 accessions of seeds from 169 plant taxa collected from the wild in Colorado. An additional 69 wild-collected taxa from Colorado are stored elsewhere in the National Plant Germplasm System.

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Title: Pollination ecology of prince's plume (*Stanleya pinnata*), a selenium hyperaccumulating plant

Abstract: Prince's plume (*Stanleya pinnata*) is a native Colorado (CO) perennial wildflower that grows on rocky shale and desert soils throughout the Western United States. It is famous for its striking yellow plume of flowers that blooms throughout the summer. What is more obscure about prince's plume is that it is a selenium (Se) hyperaccumulating plant. Hyperaccumulation is an intriguing phenomenon where plants accumulate an extremely large amount of a particular metal compared to other plants growing on the same soil. Selenium hyperaccumulation is a rare phenomenon, found in only seven plant families. Throughout the Rocky Mountain West, there are large deposits of Se that were left when seas retreated after the Cretaceous period, seventy million years ago. Multiple plant species throughout this area have evolved the ability to hyperaccumulate Se.

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Title: Vascular Flora of the Southern Rocky Mountain Region: A Twenty-Year Review Abstract: The Southern Rocky Mountain Region (SRMR) encompasses all of Colorado, nine counties in southern and central Wyoming, and northern New Mexico generally east of the San Juan River drainage. The SRMR covers ca. 459,698 km², or roughly 4.7% of the USA (including Alaska). Taxonomic numerical summaries will be provided for families (APGII-based), genera, species, and infraspecific taxa. Additional numerical summaries will summarize the most species-rich families and genera, and the richest families and genera in terms of endemic taxa. At least 14 new taxa have been described from 1989-2008, including several endemics, and 4 new taxa are known but not yet described. Numerical summaries will be presented for non-native taxa in terms of overall number, number by families, and as a percentage of the total flora. A conservative estimate suggests an average of at least 0.7 new collections per square kilometer from 1989-2008, which is based largely on the results of ca. 33 floristic surveys (listed by authors) and the collections of other workers active during this time. The WY portion of the SRMR is the most densely collected, followed by higher elevations in CO and NM. Areas in need of additional surveying include the eastern plains of CO and NM and portions of the western slope in CO. The SRMR faces many current and future threats to its native vegetation, including habitat conversion for development and housing, habitat degradation from many sources but particularly from invasive species, habitat loss at higher altitudes due to global climate disruption, and widespread forest dieback due to disease. The benefits of aligning regional herbaria nomenclaturally based on a single taxonomic standard at the family (*Mabberley's Plant Book*, 3rd ed.) and generic levels are discussed. Such benefits would include the facilitation of communication regionally and enhancement of metadata analysis by internet-based bioinformatics applications.

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Title: Pollination Biology of the stream orchid, *Epipactis gigantea*, (Dougl. Ex Hook) at three Colorado Elevations

An understanding of a species' breeding system is essential to the conservation of rare plants. This research characterized the breeding system, visitor guild, and effective pollinators for *Epipactis gigantea* Dougl. ex Hook (Orchidaceae) at three Colorado sites differing in elevation. Results from a breeding system experiment revealed statistically significant differences in success as measured by fruit set across treatment groups. *Epipactis gigantea* was observed to be protandrous and self-compatible, with 59% of all self-pollinations setting fruit. Out-crossing was most successful (72%) and differed from hand-pollinations involving donor pollen from another flower on the same plant or geitonogamy (63%) and the control (62%). The visitor guild comprised a variety of ants, flies, beetles, bees, and spiders. Although *E. gigantea* was visited most often by ants, specifically, *Formica neogagates*, six species of syrphid flies were found to be effective pollinators, the most frequent being *Sphaerophoria philanthus*. Time lapse photography further documented pollination by syrphid flies, which deposit pollen (not entire pollinium) on the stigmas of several flowers along the same raceme.