

## CONTRIBUTED POSTERS

Titles, authors, presenting author in bold with their affiliation and email contact  
Arranged alphabetically by first and/or presenting author

### SEED DISPERSAL METHODS OF PLANTS NATIVE TO CALIFORNIA

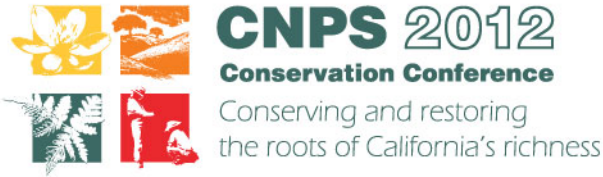
**Zoya Akulova-Barlow**, Clint Kellner, LSA Associates, Inc., [zakulova@yahoo.com](mailto:zakulova@yahoo.com)

This poster features the variety of seed dispersal methods of California's native plants and highlights unique combinations of dispersal methods. Seed dispersal methods are important for colonizing new areas, species survival, and competing with non-native species. Knowledge of these methods is useful for conservation of native plants. A study of seed dispersal methods was conducted for five years by field observations and taking photos in the field or through a microscope. The fruit and seeds of the majority of plants are dispersed by wind. They evolved feathery awns, wings, scales, and inflated balloon-like structures. Wetland plant seeds evolved net-like and sack-like structures for dispersal by water and less frequently by wind. Seeds and fruit dispersed by animals evolved hooks, barbs, or adhesive mucus (epizoochory). Seeds and fruit, used as food by animals, have evolved seed coats resistant to the digestive tract of animals (endozoochory). In addition, caches of seeds forgotten by rodents and birds results in dispersal. Seeds dispersed by ants (myrmecochory) have special appendages called elaiosomes. Some California plant species have multiple methods of seed dispersal. Seeds of *Dendromecon rigida* are spread as the fruit dehiscs and flings the seeds away from the plant (autochory) and also by myrmecochory. Seeds of *Lasthenia conjugens* are dispersed by water, wind, and animals. An unusual example of autochory (peduncle recurves and "plants" the capsule into the soil) in conjunction with myrmecochory, is a unique combination of seed dispersal methods that occurs in the California endemic *Scolyopus bigelovii*.

### CONTROLLING INVASIVE PLANTS IN DEVILS POSTPILE NATIONAL MONUMENT: A SUCCESS STORY IN THE MAKING

**Holly Alpert**, Inyo-Mono Integrated Regional Water Management Program, Bristlecone Chapter of CNPS, [holly.alpert@gmail.com](mailto:holly.alpert@gmail.com)

For almost a decade, there have been various efforts to find, map, control, and monitor invasive plant species at Devils Postpile National Monument near Mammoth Lakes, CA. Although not a heavily traveled part of the Sierra Nevada, Devils Postpile nevertheless faces pressure from visitors and packstock that bring in non-native species from the eastern Sierra and beyond. In the first few years of monitoring, *Cirsium vulgare* (bullthistle) was the most widespread and invasive non-native. Control efforts (mostly manual pulling) have resulted in the virtual extirpation of *C. vulgare* within the monument, though monitoring for this species continues. More recently, several infestations of *Bromus tectorum* (cheatgrass) have been found, and these areas have been targeted in 2010 and 2011 for control efforts. Infested areas that were controlled in 2010 showed either less dense *B. tectorum* recruitment in 2011 or a lack of recruitment altogether. The timing of control efforts seems to be paramount in dealing with this noxious species. Thus, it is apparent that vigilant attention to problem areas each year can help



to control the occurrence of non-natives within and around this small but significant National Park Service unit.

#### HABITAT SUITABILITY MODELS AS A TOOL FOR THE AERIAL EXTENT MAPPING OF RARE CHAPARRAL SPECIES, MONTEREY SPINEFLOWER (*CHORZANTHE PUNGENS PUNGENS*)

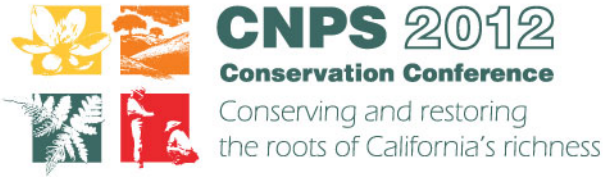
**Rose Ashbach**, BLM, California State University Monterey Bay, [rashbach@csumb.edu](mailto:rashbach@csumb.edu)

This study assesses habitat suitability models as a tool for the aerial extent mapping portion of the Habitat Conservation Plan (HCP) monitoring programs for threatened species Monterey spine flower (*Chorzanthe pungens pungens*). Under the Endangered Species Act (ESA), the former military base at Fort Ord was required to create a Habitat Conservation Plan (HCP) to address the impacts of planned development scenarios on multiple rare species. The mitigation and monitoring outlined in the HCP includes both aerial extent mapping and quantitative sampling techniques. Aerial extent mapping is the delineation of species observations or "habitat patches" using meandering transects and a hand held GPS throughout the conservation area. In order to identify placement of meandering transects, we created a habitat suitability model for one herbaceous chaparral plant, Monterey spineflower. We used historic GPS observation data to identify species affinity to different habitat attributes. We reclassified desired habitat attributes in ArcGIS to predict the probable habitat locations. Our preliminary results suggest that habitat suitability models are useful in the prediction of location for Monterey spineflower.

#### MARITIME SUCCULENT SCRUB COMMUNITY RESTORATION AND MANAGEMENT BENEFITS BOTH SENSITIVE ANIMALS AND PLANTS

Anna Bennett, **Mark Dodero**, RECON Environmental, Inc., [mdodero@reconenvironmental.com](mailto:mdodero@reconenvironmental.com)

Natural community management, focused on sensitive animal species, can also benefit native plant populations when the project is designed using a multi-species framework. A nine acre maritime succulent scrub restoration and enhancement project, intended to benefit coastal cactus wrens, has been implemented over the past two years in the 1,350 acre Central City Preserve in Chula Vista, CA. The primary goal of the program is to manage habitat for the declining wren populations which nest in coast cholla (*Cylindropuntia prolifera*) thickets. The coastal cactus wren is in decline due to massive fires and competition with large shrubs that can outcompete and eliminate the cholla patches over time. The project includes implementation of a five-year weed control program, selected shrub thinning around cholla patches to reduce competition and potential loss from fire. Thousands of cholla cuttings have been planted in sites formerly dominated by weeds. The Preserve also supports MSCP covered plant species that benefit from the weeding and enhancement program, including the narrow endemic snake cholla (*C. californica* var. *californica*), coast barrel cactus (*Ferocactus viridescens*), and CNPS list species such as south coast saltscale (*Atriplex pacifica*), California boxthorn (*Lycium californicum*) and disjunct desert species that grow in this arid coastal habitat, including linear-leaved stillingia (*Stillingia linearifolia*) and Greene groundcherry (*Physalis crassifolia*). In shrub thinning areas, native annuals have grown in densities often seen in a post fire situation. To



date, coastal cactus wrens have begun to nest in treatment areas that were not occupied prior to the project implementation.

#### INVASIVE AQUATIC AND RIPARIAN WEEDS AND MOSQUITOES; CHALLENGES, SUCCESSES, AND IMPORTANCE OF ON-GOING STUDIES

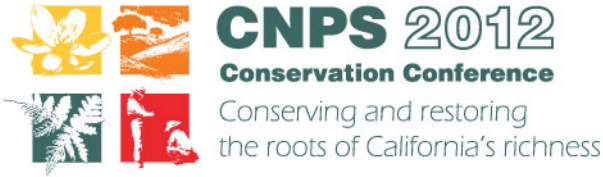
**Charles Blair**, Trustee, Mosquito and Vector Management District of Santa Barbara County, [blairce@verizon.net](mailto:blairce@verizon.net)

The adverse effects of invasive aquatic and riparian weeds on water quality; hydrology, native plant communities, and wildlife habitat and their consequences for mosquito control efforts, public health and nuisance problems, have been often implied, but could be better articulated. This presentation will present some of these relationships and highlight collaborative activities among vector and weed control agencies. Invasive aquatic and riparian weeds result in several adverse changes in these settings. Displacement of native flora degrades habitat for fauna that feed on mosquito larvae and pupae. The use of biorational larvicides, some derived from bacterial sources that do not harm this fauna supplements the effectiveness of their predation, which can reduce or eliminate the necessity of aerial adulticide application. There are situations where the density of invasive flora has been shown to interfere with application of these agents. Mosquito breed in standing water, which can include still-water natural areas, such as ponds, and small lakes and also moving water areas streams and tidal areas with changing levels which leave isolated standing water areas. Manmade sources include landscaping, irrigation canals, ponds, storm drain holding areas, and wastewater recharge basins. Examples of specific problems in particular settings will be described: for still-water, *Ludwigia* spp ; for estuarine; *Spartina* spp.; and riparian, *Arundo donax*. Successful projects that can be applied elsewhere; lessons that can be learned from unsuccessful activities; and the need for continuing investigations will be discussed.

#### NON-TOXIC CONTROL OPTIONS FOR HIGH ELEVATION POPULATIONS OF *BROMUS TECTORUM* L. IN THE EASTERN SIERRA NEVADA, CA

**Amy Concilio**, Michael Loik, University of California- Santa Cruz, [aconcili@ucsc.edu](mailto:aconcili@ucsc.edu)

Cheatgrass (*Bromus tectorum* L.) is an invasive annual grass that has spread through much of the Great Basin Desert, but remains patchy at high elevation. This research seeks to evaluate control options for cheatgrass at high elevation in the eastern Sierra Nevada, CA. We tested the effect of manual pulling, sheet mulching, and soil solarization followed by two different methods of seeding native forbs and grasses (broadcast and seedball) on the dominance of cheatgrass between the spring of 2009 and 2011. Cheatgrass cover and density decreased with all treatments, but the most successful included soil solarization and sheet mulching, where density decreased by 99% in both cases. Density decreased by 30% after 1 year of manual pulling, and by 90% after 2 years. Germination of native seeds was low with both broadcast and seedball seeding. Our results suggest that soil solarization, mulching, and manual pulling can each substantially decrease cheatgrass cover and could be used on small outlier patches to reduce new sources for upward spread.



## ACTIVE MANAGEMENT HELPS TO BRING ENDEMIC SPECIES POPULATION BACK FROM EXTINCTION

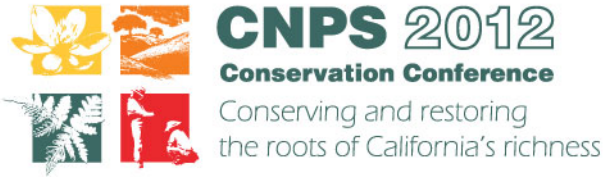
**Kara Doolin**, Tony Nelson, Milo Baker Chapter, Sonoma Land Trust,  
[kara@sonomalandtrust.org](mailto:kara@sonomalandtrust.org)

Sonoma Land Trust's Pitkin Marsh property encompasses 27.26 acres of one of the most valuable complexes of mixed riparian woodland, freshwater coastal fen, wet meadow, oak woodland and grassland in Sonoma County. The complex interaction of surface water, ground water, and scattered seeps and springs creates unusual hydrologic conditions that promote a rare assemblage of plant species endemic to California. Residential and agricultural water use has increased dramatically in the watershed, creating episodic increases in sediment deposition and heavy nutrient loading; posing huge threats to acidic, low-nutrient wetlands by increasing productivity and biomass of nutrient-limited, mostly invasive species to the detriment of obligate and facultative natives. The property hosts the only known extant population of federally listed *Carex albida* (white sedge). In 2008, Peter Warner found approximately 100 individuals in six distinct patches across the property. In 2009 the Lower Pitkin Marsh Monitoring Plan (Warner) was implemented with the goal of increasing the abundance of all known patches, and to maintain or increase the spatial extent of the patches. Comparing 2010 to 2011 the property saw culms production increased from 237 to 950. Management practices consisting of hand pulling treatments of non-native grasses occurred within select patches on a conservative, small scale. In areas where these practices were applied there was an overall increase in the number of flowering culms by as much as 2240%. These results may indicate a positive interaction with between the species and hand removal treatments.

## MODELING HABITAT FOR *ASTRAGALUS TRICARINATUS* (FABACEAE)

**Naomi Fraga**, Rancho Santa Ana Botanic Garden, [nfraga@rsabg.org](mailto:nfraga@rsabg.org)

*Astragalus tricarinatus* (triple-ribbed milkvetch) is short-lived perennial of limited distribution: it is known from the transition zone of the Mojave and Sonoran Deserts in Riverside and San Bernardino Counties, California. This species was listed by the USFWS as endangered in 1998 based on threats to occurrences with small population size. At the time of listing, occurrences of this species were located at the bottoms of canyons and in washes and were composed of few individuals. These previously known occurrences have since been identified as waifs with more recent documentation of larger source populations on upland slopes and ridges. In addition, plants of *A. tricarinatus* appear to occur on a distinctive substrate that has been identified as distressed granite. Since the original listing, our knowledge of this species has greatly expanded. However, at present information is still incomplete because suitable habitat for this species is remote and difficult to access. Surveys conducted in 2010 by botanists at RSABG found seven previously undocumented occurrences; three of these are source populations for previously identified waif populations. Potential habitat was identified by examining aerial imagery for the distinctive soil type in the Whitewater Canyon, Mission Creek, and Big Morongo watersheds. Survey areas were refined by ground-truthing. Using all available occurrence data, a model of potential habitat will be developed and informed by climate data, interpreted soils



from aerial imagery, slope and aspect, and associated vegetation. This model will further our understanding of the distribution of *A. tricarinatus*.

#### WHEN BEING UNDER WATER IS A GOOD THING: DOES INUNDATION REGIME EXPLAIN ENDEMIC PLANT COMMUNITY DISTRIBUTION IN VERNAL POOLS?

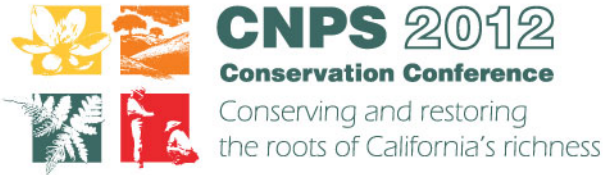
**Merideth Gosejohan**, University of Nevada at Reno, [meredithgo@hotmail.com](mailto:meredithgo@hotmail.com)

Vernal pools are exceptional hotspots of biodiversity that provide habitat for many highly specialized plant and animal species, some of which are trending toward extinction. One of these is *Orcuttia tenuis* (slender Orcutt grass), an annual grass federally listed as threatened and state listed as endangered. In its northern range on the Modoc Plateau, livestock use and changes in vernal pool hydrology are considered primary threats to *O. tenuis* conservation, although little is known of the interactive effects of these processes. In 2009 and 2010, we collected data in paired exclosure and control plots to determine the effects of grazing on vernal pool plant communities; however statistical analyses found that grazing alone did not explain species diversity or *O. tenuis* density and seed production. Therefore, an evaluation of vernal pool hydrology was conducted in 2011 by utilizing remote photography in combination with geodetic surveys to quantify hydroperiod. Pool hydrology was related to vegetation patterns from landscape-scale floristic surveys. Our research examined the effects of livestock use and hydrology in vernal pools by evaluating interactions among: 1) pool inundation length and maximum depth; 2) livestock use legacy effects; 3) plant community distribution; and 4) population dynamics and seed distribution of *O. tenuis*. We found that spatial distribution of *O. tenuis* and other wetland indicator species can be explained by the hydroperiod of each location within the vernal pool. Our research provides insight for the recovery of *O. tenuis* and recommendations for hydrological restoration to promote habitat for specialized vernal pool species.

#### EVALUATING THE SPECIES STATUS OF *SISYRINCHIUM HITCHCOCKII*: A RARE BLUE-EYED GRASS OF OREGON AND NORTHERN CALIFORNIA

**Matt Groberg**, Stephen Meyers, Oregon State University, [grobergm@onid.orst.edu](mailto:grobergm@onid.orst.edu)

Difficulty in the identification of blue-flowered *Sisyrinchium* species in western Oregon and northern California, due to frequent sympatry and similar morphology, has promoted speculation that *Sisyrinchium hitchcockii* may not constitute a valid species. Lack of well-preserved herbarium specimens has hampered the identification of putative *S. hitchcockii* populations, and also led to an imprecise determination of the current range of this species. In addition, polyploidy in the group has led to the speculation that *S. hitchcockii* may be a octoploid derivative of *S. idahoense* var. *idahoense* or *S. bellum*. We used a combination of morphometric, molecular, and cytological analyses to determine that *S. hitchcockii* is a recognizable species. We accomplished this using principle components analysis of morphological traits, DNA sequencing to create a phylogenetic tree, and flow cytometry to estimate chromosome numbers. Our work has resulted in a taxonomic key that distinguishes *S. hitchcockii* from other blue-eyed grasses in the field. We have determined, based on site visitations, that this species is restricted to Douglas, Lane, and Benton counties in Oregon. In



California, there have been sightings of *S. hitchcockii* (with an herbarium voucher) from Humboldt County. Due to strong evidence that *S. hitchcockii* is indeed a valid species with a restricted range, we recommend that it be given conservation priority by state and federal agencies. We also recommend that the distribution and status of *S. hitchcockii* populations in California be further investigated in order to document the full range of this little-known species.

#### A MORPHOMETRIC ANALYSIS OF THE PRICKLY-NUTLETED POPCORN FLOWERS (*PLAGIOBOTHRYIS*, BORAGINACEAE), WITH AN EMPHASIS ON THE DISTINCTIVENESS OF THE RARE PLANT, *P. HYSTRICULUS*

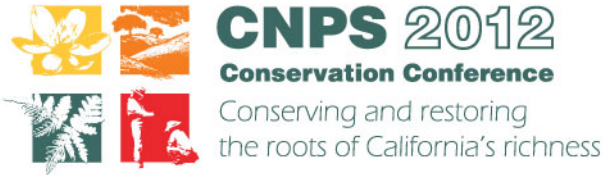
Matt Guilliams, **Daniel Lee**, Department of Integrative Biology & UC/JEPS Herbaria, University of California, Berkeley, [danielee@berkeley.edu](mailto:danielee@berkeley.edu)

*Plagiobothrys* (Boraginaceae) is a predominantly New World genus of approximately 85 annual and perennial plants. Nutlet morphology has received considerable attention from taxonomists and has historically informed species circumscription. Recent molecular work suggests that North American species of *Plagiobothrys* section *Allocarya* possessing relatively large nutlets with stout prickles (e.g., *P. acanthocarpus*, *P. austinae*, *P. greenei*, *P. hystriculus*) form a monophyletic group. This clade is widely distributed in the California Floristic Province in vernal pool ecosystems and other ephemerally inundated settings. One extremely rare member of this group, *P. hystriculus* (CNPS list 1B.1, formerly CNPS list 1A), was thought to be extinct until populations were rediscovered by Schafer and colleagues in 2005. Here we present the preliminary results of a morphometric analysis of the prickly-nutleted members of *Plagiobothrys* section *Allocarya*, with an emphasis on evaluating the distinctiveness of *P. hystriculus*, as well as comparing recent collections with historical collections upon which this putative taxon is based. Our preliminary analyses show many statistically significant differences between the morphologically similar *P. greenei* and *P. hystriculus* for a number of continuous quantitative morphological features when species groupings are taken a priori, but in many cases no clear morphological break exists between these taxa when species assignments are ignored. Importantly, most recent collections are assignable to *P. hystriculus* in our analyses. Continued work will allow us to more rigorously examine species circumscriptions in this clade and make a more definitive statement regarding the distinctiveness of *P. hystriculus*.

#### IS FLORAL WATER BALANCE AN IMPORTANT DRIVER OF ANGIOSPERM EVOLUTION?

Matt Guilliams, **Jessica Farmer**, Department of Integrative Biology & UC/JEPS Herbaria, University of California, Berkeley, [j.m.farmer@berkeley.edu](mailto:j.m.farmer@berkeley.edu)

Since the first flowering plants appeared in the understories of wet, tropical forests over 100 million years ago, they have diversified and spread to dominate ecosystems globally. While their success has been attributed largely to specialized plant-pollinator interactions and to higher water transport rates, recent evidence suggests that innovations in floral physiology may have led to more efficient pollinator attraction and thus to expansion from everwet environments into hotter and drier climates. Here we present results of a survey of flower and leaf traits associated with plant water balance. We have sampled two traits associated with water supply (Huber value, vein density) and two traits associated with water loss (stomatal pore area index



and cuticular conductance). To date, we have sampled 122 species from 48 families focused primarily on Californian lineages, with intense sampling of a few genera (*Dudleya*, *Salvia*, *Brodiaea*, *Triteleia*, *Clarkia*). Our preliminary analyses suggest that there is substantial variation in traits across all species sampled. Within specific groups, however, there is much less variation in floral trait values, suggesting that major physiological changes occur deep in the angiosperm phylogeny. Comparisons of leaves and flowers show that angiosperm evolution has produced highly efficient flowers that require very little water to produce their turgid displays. Furthermore, flowers of basal lineages have traits much more similar to their leaves than do flowers of more recently derived lineages. This work represents one of the first attempts at examining the water relations of flowers, particularly in comparison to leaves.

#### PROTECTING A RARE *POTENTILLA* IN LASSEN COUNTY, CALIFORNIA: A CONSERVATION ASSESSMENT FOR *POTENTILLA BASALTICA* (ROSACEAE)

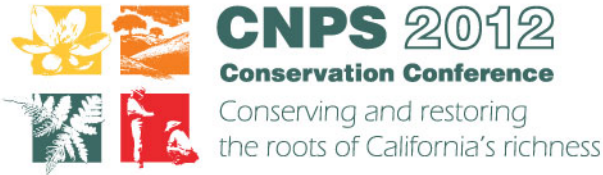
**Matt Guilliams**, Judy Perkins, Barbara Ertter, Department of Integrative Biology & UC/JEPS Herbaria, University of California, Berkeley, [matt\\_g@berkeley.edu](mailto:matt_g@berkeley.edu)

*Potentilla basaltica* (Rosaceae) is a rare species known only from Ash Valley, California and Soldier Meadows, Nevada. Originally described from collections in Nevada, subsequent exploration of the adjacent regions of the Modoc Plateau in California resulted in the discovery of additional occurrences of this taxon in the botanically-rich Ash Valley region. As these occurrences are near Forest Service lands, the Pacific Southwest Region, USDA Forest Service, sponsored the preparation of a Conservation Assessment for the species. As part of this Conservation Assessment, existing biological data were gathered to guide surveys for the species in potentially-suitable habitat in California on Forest Service lands. In California, *P. basaltica* is associated with the margin of the floodplain of Ash Creek, where several small subpopulations occur. Many potentially-suitable wetland locations were surveyed throughout northeastern California without locating additional populations of the species. Despite not locating populations on National Forest lands, this document provides an important baseline for future surveys for the species in California. As a separate but related goal of this project, a molecular phylogenetic study was initiated to determine if *P. basaltica* was correctly placed in the genus *Potentilla*, section *Multijugae*. Our results strongly support the placement of *P. basaltica* in section *Multijugae* as described, confirming a previously reported phylogenetic hypothesis by Bayesdorfer and Ertter.

#### SYSTEMATICS AND EVOLUTION OF *JOHNSTONELLA*: INSIGHTS INTO ENDEMISM IN DESERT HERBS

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In a recent study of the large, and taxonomically difficult genus *Cryptantha* (Boraginaceae), the taxon was found to be paraphyletic. One of the clades inferred in this analysis corresponded to a previously recognized genus, *Johnstonella*. Hasenstab and Simpson greatly expanded the generic concept of *Johnstonella* to encompass 13 species, with 15 taxa. Two of the species are restricted to South America; however, the main species diversity is represented in a species radiation that is restricted largely to the deserts of the southwestern US and the Baja peninsula.



*Johnstonella* is of conservation concern, with two species, *J. holoptera* and *J. costata*, listed with a CNPS ranking of 4.3, and an additional five taxa that are endemic to Baja California. Endemic and geographically restricted taxa, such as those in *Johnstonella*, are especially vulnerable to pressures such as habitat loss and climate change, so comprehensive understanding and ongoing monitoring of these species is essential to their survival. This study uses both nrITS data as well as non-coding chloroplast loci to test the monophyly of *Johnstonella*, and resolves species level relationships within the genus. The phylogeny is used to test character evolution in *Johnstonella*, especially characters that have been used in traditional taxonomic delimitation such as nutlet heteromorphism. The study also assesses adaptive traits within the genus, such as the evolution of perennial habit and nutlet heteromorphism to understand the restricted nature of taxa within the genus.

#### WIDE PHENOTYPIC VARIABILITY AND POSSIBLE HYBRIDIZATION IN *ERYTHRONIUM CALIFORNICUM* ON GREEN DIAMOND RESOURCE COMPANY (GDRCO) PROPERTY

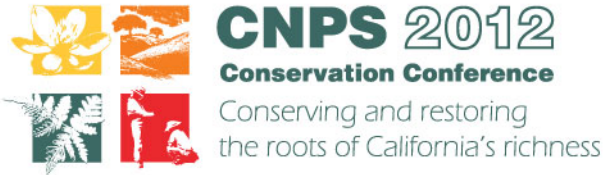
**Bianca Hayashi**, Green Diamond Resource Company, [BHayashi@GreenDiamond.com](mailto:BHayashi@GreenDiamond.com)

There are occurrences of *Erythronium revolutum*, *Erythronium oregonum* and *Erythronium californicum* on Green Diamond Resource Company (GDRCo) property. Populations of these species exhibit variable morphology that is not always consistent with their current formal descriptions. *E. californicum*, a northern California endemic, particularly appears to demonstrate a wide range of phenotypic variability. Despite this, the widened filaments observed in some individuals of *E. californicum*, is not a trait associated with that taxon. The characteristic of widened filaments is associated with both *E. revolutum* and *E. oregonum*. Individuals of *E. californicum* with widened filaments occur in areas where there are mixed, co-occurring populations of both *E. californicum* and *E. revolutum*. Hybridization between the two species could explain the combination of characteristics present in these individuals and may also contribute to the wide range of phenotypic variability in general. Because of the considerable morphologic variability exhibited by *E. californicum*, there is sometimes uncertainty regarding identification. GDRCo botanists collected flower and leaf samples from fifteen *Erythronium* populations in 2011. Flowers were disassembled and used to conduct a morphometric analysis focused on diagnostic characters, following methods used by others investigating *Erythronium* species. Leaf samples were dried in silica and will be used in a complimentary genetic analysis. It is the hope of GDRCo botanists that the morphometric analysis in conjunction with the genetic analysis will clarify any hybridization, and the extent to which it has occurred, in all *Erythronium* species on company property.

#### DEMOGRAPHY OF THE RARE DESERT CYMPTERUS AT FORT IRWIN, CALIFORNIA.

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The desert cymopterus, *Cymopterus deserticola* Bdg., is a rare, perennial member of the Apiaceae from the western Mojave Desert. The species has limited protection from the CDFG, CNPS, and BLM, and is not nationally or state listed. A large population of the cymopterus was discovered in the Superior Valley of San Bernardino County in 2000, and is now under the



management of the U.S. Army at Fort Irwin, CA. The population was surveyed in 2004, and a 140 ha protected area for the plant has been monitored annually since 2005. During the period 2004-2007, the population declined, consistent with reports of vegetation loss in the Mojave Desert due to drought. However, during the period 2008-2011, the population has increased. Decline in density was associated with the factors drought, low precipitation, extremely high precipitation, and unexplained differences among study plots. Monitoring supports the view of a long-lived plant at equilibrium with demographic factors survival, mortality, recruitment, dormancy, and resprouting. During the last three years, mortality averaged 5.6%; and in the last two years recruitment and resprouting averaged 13% and 6.2%, respectively. In 2011, all plants in two study plots were tagged to more accurately measure recruitment and resprouting. In addition, several far-field control plots were located and censused near Harper Dry Lake.

#### A DESCRIPTIVE STUDY OF PRIMARY OLD-GROWTH COAST REDWOOD GROWTH FORM AND CANOPY STRUCTURE ON A PYGMY FOREST ECOTONE IN MENDOCINO COUNTY

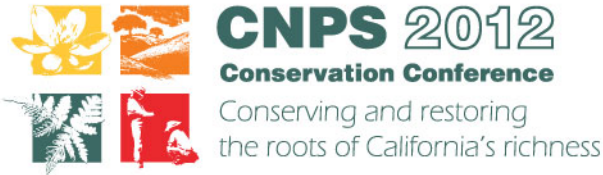
**Zuhayl Lambert**, San Jose State University, [zuhaylrlambert@gmail.com](mailto:zuhaylrlambert@gmail.com)

The coast redwood, *Sequoia sempervirens*, is the tallest tree in the world. In Mendocino County California, stunted redwood trees have been observed within the pygmy soil formation. Characterization of *S. sempervirens* structure has been researched thoroughly in highly productive stands; it has not been studied in proximity to the pygmy forest. This study describes the growth form and canopy structure of coast redwoods across an ecotone from pygmy to primary redwood forest. The total height, diameter at breast height of individual trees, soil pH, and presence of old growth features (trunk reiterations, epiphytes, arboreal soils, and fire hollows) were recorded. Climbing arborists style methods were used to access the canopy of taller redwoods. In the extreme pygmy vegetation, redwoods were found growing in tight scattered groves, or crowded on root boles, and rarely grew alone. One grove of 37 redwoods with an average total height of .93m occupied an area of approximately 7.09m<sup>2</sup>. Moving away from the center of the pygmy formation redwoods increased in height and obvious root boles were absent. On the edge of the primary redwood forest redwoods were more scattered, fire hollows and epiphytes (*Vaccinium ovatum* and *Polypodium scolieri*) were more prominent, and canopy structure was more complex. The objective of the study was to advance the definition of old-growth characteristics, in order to further inform conservation efforts and demonstrate the heterogeneity of *S. sempervirens* to various abiotic conditions.

#### EXTENT AND TIMING OF CONIFER ENCROACHMENT INTO SUBALPINE MEADOWS IN THE CENTRAL SIERRA NEVADA

**Kaitlin Lubetkin**, Lara Kueppers, Anthony Westerling, University of California, Merced Environmental Systems Graduate Group, [klubetkin@ucmerced.edu](mailto:klubetkin@ucmerced.edu)

Many grassland ecosystems worldwide are experiencing woody plant encroachment, including high-elevation meadows in the Sierra Nevada. Conversion of meadows to forest may result in loss of important ecosystem services they provide, such as water storage and release. This ongoing study aims to determine the extent and severity of conifer encroachment in subalpine



meadows, identify factors limiting/facilitating encroachment, and examine ecohydrologic consequences of encroachment with the goal of informing meadow management and restoration. Here we present the extent and timing of conifer encroachment, determined from observational surveys, and from demographic and dendroecological data on encroaching lodgepole pines. We conducted detailed surveys of 32 subalpine (above 9000 ft) meadows in Yosemite National Park and rapid assessments of 36 meadows on the western side of the central Sierra Nevada. 2009 and 2010 field surveys in Yosemite National Park indicate that encroachment is ubiquitous up to the krumholtz vegetation zone, and rapid assessments outside Yosemite indicate that this pattern occurs throughout the central Sierra Nevada. Trees appear to be encroaching synchronously, with a strong increase in encroachment 1940-1975, a decrease in the 1980s, and an increase since the early 1990s. Re-visitation of young (<10 years) encroachers indicates that establishment is a key stage of encroachment, and that continuing survival rates are high once a seedling passes the critical 2-3 year threshold. This data regarding extent and timing of encroachment gives us a better understanding of key processes related to vegetation change at high elevations, in a system important to the region's hydrology.

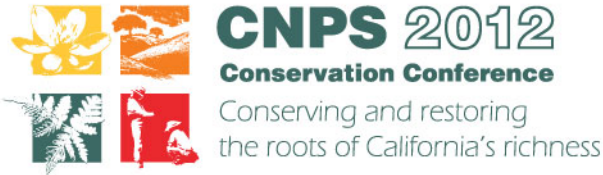
#### SEARCHING FOR A SILVER BULLET: REDUCING THE INVASIVE SAHARA MUSTARD WHILE PRESERVING NATIVE WILDFLOWERS

**Chris McDonald**, University of California Cooperative Extension, [cjmcdonald@ucdavis.edu](mailto:cjmcdonald@ucdavis.edu)

Sahara mustard (*Brassica tournefortii*) is invading deserts and semi-arid landscapes across the southwest United States and northern Mexico. This species is becoming the dominant herbaceous vegetation in many areas that were formerly dominated by annual spring wildflowers. This invasion also threatens the ecotourism of several communities that are located in landscapes with abundant wildflowers. In addition, research on diverse control methods for Sahara mustard is lacking. Hand pulling can be effective, but because it is labor-intensive large areas cannot be treated, which reduces wildflowers and potentially ecotourism. The goal of this research is to determine the most effective means of reducing Sahara mustard over large-scales, while preserving native wildflower populations. We tested the efficacy of four different herbicides (glyphosate, triclopyr, chlorsulfuron and pelargonic acid) each at two application rates (high and low). We measured the effectiveness of these herbicides against hand-weeded plots. Sites in Borrego Springs and Palm Desert, California were chosen as these sites formerly had significant wildflower populations and now have high densities of Sahara mustard. We found that all four herbicides were very effective at reducing Sahara mustard populations, especially at high application rates. In addition, while two herbicides (triclopyr and chlorsulfuron) reduced the population of Sahara mustard they also reduced the population of native wildflowers. The low rate of pelargonic acid was not effective at reducing Sahara mustard. Glyphosate was the most successful treatment as it reduced the abundance of Sahara mustard and invasive annual grasses, while preserving the most native wildflowers.

#### EARL'S GARDEN: CREATING A STUDENT-RUN NATIVE PLANT GARDEN ON THE UNIVERSITY OF CALIFORNIA AT SAN DIEGO CAMPUS

Jason Pearson, **Tate Perrine**, San Diego chapter of CNPS, [teatreebayoz@gmail.com](mailto:teatreebayoz@gmail.com)



Earl's Garden serves as an educational template for expanding awareness of the environmental, economic, and social benefits of planting southern California native plants in a university setting. Located in the center of an Earl Warren College residence hall at the University of California at San Diego, the garden is an accessible, attractive, and accommodating space to all surrounding residents and the greater university community. One goal of this project was to integrate native and edible plants in a design pattern that facilitated group learning, social interaction, and ecological growth. Upon assessing how incorporating native and edible plants appealed to a wider group of students, community outreach efforts were geared towards gathering interested volunteers. Efforts focused on promoting the sustainable aspects of growing native plants in a community garden such as: water conservation and pollinator attraction. By distributing informational brochures, fliers, and attending tabling events, gardeners were drawn to the space, and Earl's Garden was launched into the sustainable movement of the university. Ultimately to serve as a model for other gardens on campus, as well as in the San Diego community, the garden pushes to inspire other student groups to focus on the conservation qualities of native plants in a university setting.

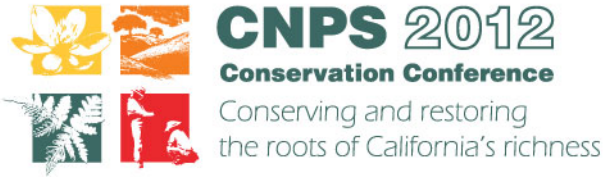
#### CONSERVATION OF RANK 1B.2 *AGROSTIS BLASDALEI* DISCOVERED ON CALIFORNIA COASTAL NATIONAL MONUMENT ISLAND

**Barbara Rice**, Diane Hichwa, James Weigand, The Sea Ranch California Coastal National Monument Stewardship Task Force, [woodviolet@gmail.com](mailto:woodviolet@gmail.com)

*Agrostis blasdalei* is a poorly understood CNPS Rank 1B.2 native grass occurring on coastal bluffs, dunes and gravelly areas less than 100m elevation, ranging from Santa Cruz County north to Mendocino County. In 2008, several specimens were noted on Shell Beach Island (SBI), part of the California Coastal National Monument, in northern Sonoma County, comprising the first offshore occurrence. Threats to the island population from foot traffic at low tide make the continued existence of *A. blasdalei* tenuous on SBI. Local botanists are approaching conservation of the island population in the context of the status of the mainland populations. Mapping efforts by members of The Sea Ranch California Coastal National Monument Stewardship Task Force, in partnership with BLM ecologists and the Dorothy King Young Chapter of CNPS, now show the actual extent of the local mainland populations persisting on windward eroding bluff slopes where competition with non-native vegetation is minimal. Current directions of conservation work include elimination of non-native plants from *A. blasdalei* habitat, building a seed supply, propagation trials, and experimental reintroduction of *A. blasdalei* into plots where non-native plants are excluded. With expansion of the reproductive population of the species on the mainland, natural seeding from the mainland can sustain populations on offshore islands subject to more severe disturbances and intermittent extinctions.

#### POST-RESTORATION PLANT COMMUNITY FORMATION ON THE GIACOMINI WETLAND RESTORATION PROJECT

**Amelia Ryan**, Lorraine Parsons, Point Reyes National Seashore, [Amelia\\_Byrd\\_Ryan@nps.gov](mailto:Amelia_Byrd_Ryan@nps.gov)



The 600-acre Giacomini Wetland Restoration Project, completed in 2008, offers an opportunity to examine the way in which plant communities form after restoration. In some portions of the project area pre-restoration plant communities completely died when they became subject to tidal action (die-off zone). These areas offer a chance to examine the way plant communities form or "assemble". In other areas, restoration did not eradicate existing species, but the changed conditions shifted plant community dominants. We compared the project area plant communities assembling in the die-off zone to reference sites to evaluate its trajectory towards a "desired" future condition. In the die-off zone, overall species diversity is still much lower than the reference site, but it has increased significantly since year one, with species richness approaching that of the reference site. We also looked at how broader measures of plant community function differed before and after restoration throughout the project area, including diversity, biomass, and nativity. We found a loss of diversity in the die-off zone/low elevation areas, but little change in higher areas, and no change in biomass production. Plant communities changed from being dominated by non-native grassland species to native salt marsh species.

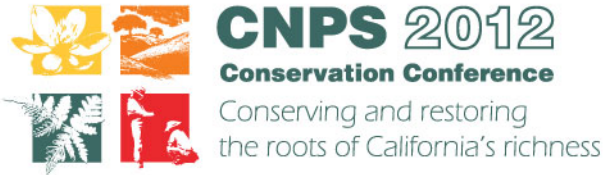
#### POPULATION DYNAMICS OF DESERT ELKWEED (*FRASERA ALBOMARGINATA* S. WATSON) GENTIANACEAE IN MOJAVE NATIONAL PRESERVE.

**Tom Schweich**, UC/JEPS, California Botanical Society, [tomas@schweich.com](mailto:tomas@schweich.com)

*Frasera albomarginata* S. Watson Gentianaceae, commonly called Desert Elkweed, is a pretty little plant which is found occasionally on rocky, poor limestone soils on open slopes in Pinyon-Juniper woodlands of the montane southwestern United States. In Mojave National Preserve, *Frasera albomarginata* is found in the Providence Mountains, on the north face of Wild Horse Mesa and on the south face of Pinto Mountain, and in Caruthers and Keystone Canyons of the New York Mountains. To understand population dynamics and reproduction ecology, experimental plots were established at two sites near Wild Horse Mesa and Pinto Mountain. Each individual of *F. albomarginata* in the experimental plots is located and marked with a numbered stake. Data collected annually include plant dimensions, number of basal leaves, and life stage. The population and reproduction data are compared with temperature and precipitation data from Mitchell Caverns, about 15 km to the southwest of the plots. With sixteen years of data, current results show that the population and reproductive success of *Frasera albomarginata* is highly variable, and highly correlated with precipitation. Only about ¼ of individuals successfully reproduce, the most common age of death is in the first year of life, and the most common age of reproduction is 3 years, although ages of 2 and 4 years are also common.

#### COMPARATIVE ECOPHYSIOLOGY OF LANE MOUNTAIN MILKVETCH (*ASTRAGLAUS JAEGERIANUS* MUNZ), AN ENDANGERED SPECIES, UNDER FIELD AND CONTROLLED GREENHOUSE CONDITIONS.

**Rasoul Sharifi**, Barry Prigge, Thomas Huggins, Philip Rundel, Dept. of Ecology and Evolutionary Biology, University of California, Los Angeles, [Sharifi@biology.ucla.edu](mailto:Sharifi@biology.ucla.edu)

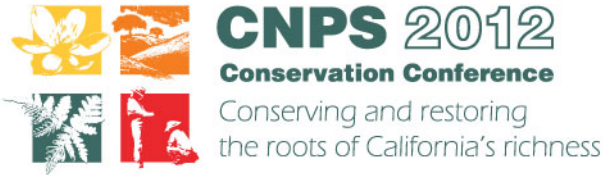


The Lane Mountain milkvetch is an endangered perennial herb, with a highly restricted distribution in the central Mojave Desert. For the past 11 years, we have conducted field surveys and demographical studies of the Lane Mountain milkvetch (LMMV) on several permanent plots. Since 1999, LMMV populations have undergone alarming population contractions and are now less than 14% of their previous size with no recruitment observed in last 11 years. Our results of the field studies suggest that this extreme decline in population size is caused by several years of below average precipitation in the Mojave Desert. Our objective in this study was to determine if LMMV has narrow physiological tolerances to soil water, a major limiting growth factor for desert plants. To test this hypothesis photosynthetic performance of the field grown LMMV plants were compared to the greenhouse grown LMMV plants. The greenhouse grown LMMV plants received optimal soil water supply. Gas exchange measurements provide the most sensitive method available to assess the physiological activity of a plant under different environmental conditions. We used a LI6400 portable gas exchange system to measure photosynthetic CO<sub>2</sub> uptake, respiration, stomatal conductance, water-use efficiency, light, and CO<sub>2</sub> response curves. There were no significant differences in photosynthetic capacity, light and CO<sub>2</sub> response curves between the LMMV plants grown under greenhouse and field conditions. Thus no significant differences were found that could account for the narrow physiological tolerances to soil water supply under field conditions.

#### THE EFFECT OF SEASONALITY ON CRAM SCORES FOR VERNAL POOLS IN EASTERN SACRAMENTO COUNTY

**Debra Sykes**, Eric Stitt, Tara Collins, Daria Snider, Peter Balfour, ECORP Consulting, Inc., [dsykes@ecorpconsulting.com](mailto:dsykes@ecorpconsulting.com)

The California Rapid Assessment Methodology (CRAM) is used to collect repeatable measurements of a wetland or wetland system over time. CRAM data are used to monitor changes in wetland function at a restoration site or to detect changes in wetlands due to changes in nearby land use. CRAM assesses four attributes shared among all wetlands: buffer and landscape context, hydrology, physical structure, and biotic structure. These attributes are important determinants of wetland function, giving insight into water storage capacity, groundwater discharge and flow, dissipation of energy, and nutrient cycling, among other parameters. In order to accurately score biotic structure, CRAM assessments are timed to occur during the peak of the floristic bloom period, which is typically April or May for vernal pools in the Sacramento Valley. The limited timeline within which surveys are recommended poses a significant constraint to researchers and planners. However, if it is determined that CRAM assessment scores do not vary significantly between early- and late-season surveys, CRAM assessments can be performed within a longer timeframe and need not conflict with other time-sensitive surveys or planning efforts. To determine whether seasonality affects vernal pool CRAM scores, we conducted a CRAM assessment on 60 randomly selected pools in the spring (peak flowering period) and in the late summer (post-bloom period). We compared overall CRAM scores and individual attribute scores to determine whether any significant difference exists between seasons and whether late summer vernal pool CRAM assessments provide defensible data to planning and agency personnel.



## PROGRESS IN THE RESTORATION OF THE HABITAT OF FOUNTAIN THISTLE (*CIRSIUM FONTINALE*) INVADED BY JUBATAGRASS (*CORTADERIA JUBATA*)

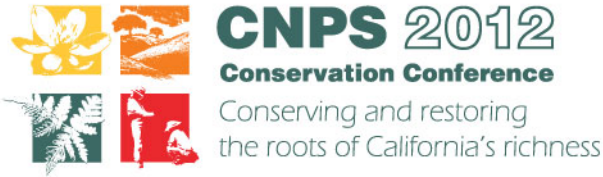
**Don Thomas**, San Francisco Public Utilities Commission, [dethomas@sfgwater.gov](mailto:dethomas@sfgwater.gov)

Fountain thistle (*Cirsium fontinale*) is a rare native thistle endemic to the San Francisco Peninsula that is listed as a federal and state endangered species. Two of the populations have been heavily invaded by jubatagrass, which displaced fountain thistle from much of the habitat. One population occurring on Caltrans property was reduced to fewer than 100 plants after invasion by jubatagrass. Through the efforts of Jacob Sigg, volunteers of the California Native Plant Society, Caltrans and others, all of the jubatagrass has been removed, and the population is recovering to a level of several thousand plants. In a study of the efficacy of establishing the native bunchgrass California hairgrass (*Deschampsia cespitosa*) to restore fountain thistle habitat and prevent re-invasion of non-native plants, 1,000 hairgrass plugs were planted in 2009 and were individually marked with metal tags. Based upon the retrieval of metal tags from plants failing to grow, it is estimated that approximately 50 per cent of the plants have become established. Another fountain thistle population invaded by jubatagrass occurs in the watershed of the San Francisco Public Utilities Commission (SFPUC), and almost all of the jubatagrass has been removed by SFPUC staff. An annual monitoring study of the population employing permanent transects has been conducted to track the progress of re-colonization of the invaded habitat. The study revealed that the population expanded by an average distance along its outer edge of 13.2 feet between 2007 and 2011, or an average of 3.3 feet per year.

## TRIBAL AND AGENCY CONSERVATION OF TRADITIONAL GATHERING AREAS AT MONO LAKE, CALIFORNIA

**Dean Tonenna**, Botanist, [dtonenna@blm.gov](mailto:dtonenna@blm.gov)

Mono Lake, California, renowned for its natural beauty and biodiversity, is home to the Kootzatukadu, a Native tribal people who traditionally use many of the natural resources found in the area. The Native lifeways were dramatically altered with the arrival of settlers who exploited the area in an unsustainable fashion. Bodie, California, 20 miles to the north was an area of extensive mining, employing people in the Mono Basin to supply timber for the mining industry. Timber was harvested from an area immediately east of the Mono Craters which supported a large stand of Jeffrey pine. This area was also an important site for the Kootzatukadu who harvested peage; a caterpillar that was collected from the Jeffrey pine trees, and served as an important nutritious food source. Long after the Bodie mines closed, the U.S. Forest Service continued harvesting timber from the area. The Kootzatukadu, faced with the continued loss of Jeffrey pine trees, voiced concern over agency management of the area and began working with the agency to protect against over harvesting of the forest. The end result was the creation of a preserve which protects cultural and natural resources and also provides a place of interpretation where the public may visit and learn more about the Kootzatukadu lifeways and natural history of the area. The Kootzatukadu are thus ensured that cultural practices can continue now and into the future. This partnership between the Native American community and federal agency provides an excellent example of conflict resolution and conservation.



## FIELD GUIDE TO THE CAREX SEDGES OF CALIFORNIA (PLANNED)

**Barbara Wilson**, Richard Brainerd, Nick Otting, Peter Zika, Carex Working Group LLC, [bwilson@peak.org](mailto:bwilson@peak.org)

*Carex* is one of the most diverse genera in California. Its members include community dominants in diverse habitats as well as listed rare species. Identification of species can be difficult. We have begun writing a field guide to California's *Carex*. The book will include an identification key as well as species accounts and photographs of each species. Before the guide can be written, what appear to be five undescribed species of *Carex* must be studied, written up, and published.

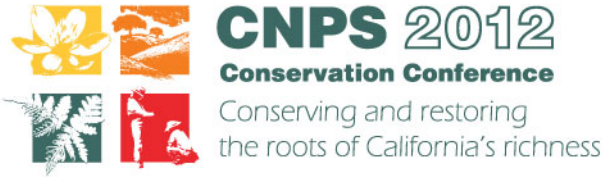
## SEED GERMINATION AND POLLINATION OF THE ENDANGERED CALIFORNIA REDWOOD FOREST ENDEMIC ASTRAGALUS AGNICIDUS (FABACEAE); PRELIMINARY RESULTS

**Courtney Wilson**, Oregon State University, [wilscour@science.oregonstate.edu](mailto:wilscour@science.oregonstate.edu)

Old growth redwood forests have been a focus of California conservation for decades. Less well-known but equally important are the early seral species associated with these unique coastal habitats. *Astragalus agnicidus*, an endangered California endemic, emerges in disturbance-related gaps and vanishes as habitats revegetate through succession. Thought extinct for the thirty years between 1957 and 1987, it was re-discovered in apparent response to disturbance. Considered endemic to Humboldt and Mendocino Counties, this milkvetch is primarily found on commercial timberland. Understanding the factors that influence reproduction is important in managing a species that depends upon seed banks to survive lengthy intervals between germination events. As reported previously, both scarification and stratification are needed to achieve high germination rates, although once scarified, seeds germinate at a lower rate without additional treatments. The self-compatible flowers require insect visitation to achieve fertilization, so pollination studies on four populations were conducted, finding two bee genera, *Osmia* and *Bombus*, to be the predominant floral visitors. SEM micrographs of pollen from *Bombus corbiculi* revealed nearly pure *A. agnicidus* pollen loads, confirming the importance of bumblebees as pollinators. However, pollen loads from the most common floral visitor, *Osmia*, were mixed, with pollen from plants other than *A. agnicidus* predominating. Bumblebees may play an important role in long-distance pollen transfer, particularly as milkvetch populations decline and patch sizes are reduced. *Osmia*, on the other hand, may contribute more to seed production via geitonogamy, considering their higher visitation rate combined with a more localized foraging strategy.

## THE CALIFORNIA FIRE SCIENCE CONSORTIUM-A NEW TOOL FOR COLLABORATION BETWEEN FIRE SCIENTISTS AND FIRE MANAGERS

**Marti Wittier**, Chris Malleck, Tim Kline, National Park Service, [mwitter@gmail.com](mailto:mwitter@gmail.com)



The California Fire Science Consortium, along with a number of other regional groups across the United States, has received multi-year funding from the Joint Fire Science Program to improve the quality and timeliness of the two-way movement of fire science information between scientists, land managers, and stakeholders in the state's fire community. Our primary goals as a consortium are twofold: 1, to become a clearinghouse for all fire science resources relevant to the regions within the state of California, and 2, to encourage collaboration between fire researchers and land managers and other stakeholders. Our goal is to make the California Fire Science Consortium the primary resource to both access and better understand fire science, to open new channels of communication and to encourage new science applicable to fire management. Our planned activities include listing and describing existing research with new syntheses; assessing the quality of research and applicability to land management; demonstrating research in the field; identifying research needs and information gaps; and identifying means to validate the effectiveness of fire management practices needed by managers and stakeholders for their projects. A new website will be the hub of these activities: <http://www.cafiresci.org>. Already available on the website are webinars, science briefs, reviews, management guides, links to other fire websites, current papers related to management topics, and a preliminary bibliography. There are also links to regional areas with products related specifically to the individual regions, including the Sierra Nevada, Mojave and Sonoran Desert, Northern California, Central and Southern California and the Wildland-Urban Interface.