



## Symposium Program

### 51st Annual Southern California Botanists Symposium

*Birds, Bees, Flies, and Seeds: Pollination Biology and Seed Dispersal*

Saturday, November 1, 2025

Pomona College—Seaver Auditorium  
645 N College Ave, Claremont, CA 91711

8:00-9:00 am. **Registration**

9:00-9:10 am. **Annual SCB Business Meeting**

9:10-9:15 am. **Opening Remarks**

9:15-9:40 am. ✧ **Pollinator Shifts and Invasive Species: Implications for the Reproductive Ecology of the Endangered *Chloropyron maritimum* subsp. *maritimum*** – Sarah Cusser, Ph.D., Terrestrial Invertebrate Conservation Ecologist, Santa Barbara Botanic Garden

9:40-10:05 am. ✧ **The Conservation of Bees is the Conservation of Native Plants, and Involves the Reintegration of Native Plants Back into Landscapes of All Kinds** – Sam Droege, Wildlife Biologist, USGS Eastern Ecological Science Center

10:05-10:35 am. **BREAK**

10:35-10:40 - (*Plant Pronunciations Battle* – Joe DeWolf)

10:40-11:05 am. † **How Plants Fly** – Dwight Whitaker, Ph.D., Professor of Physics, Pomona College

11:05 am -11:50 am. ✧ **Effects of super-abundant non-native honey bees on plants and pollinators in a biodiversity hotspot** – Joshua Kohn, Ph.D., Emeritus Professor in Department of Ecology, Behavior, and Evolution, University of California San Diego; Dillon Travis, Ph.D., Senior Biologist and Pollinator Specialist, Environmental Science Associates

11:50 -1:25 pm. **LUNCH**

1:25-1:30 - (*Plant Pronunciations Battle* – Joe DeWolf)

1:30-1:55 pm. ✧ **The Underdog(fly) of the I.E.** – Michael Viramontes, Stewardship Manager, Rivers & Lands Conservancy

1:55-2:20 pm. † **Seed dispersal in the limestone endemic monkeyflowers** – James Sobel, Ph.D., Associate Professor and Chair of the Department of Biological Sciences, Binghamton University (SUNY)

† = Seed Dispersal

✧ = Pollinator

2:20-2:45 pm. †**The many functions of sticky seeds and sticky fruit** – Eric LoPresti, Ph.D., Professor, University of South Carolina

2:45-3:15 pm. **BREAK**

3:15-3:20 - (*Plant Pronunciations Battle* – Joe DeWolf)

3:20-3:45 pm. †**Scatter-hoarding rodents, *Arctostaphylos*, dispersal dynamics, and the path to evolutionary innovation** – Tom Parker, Ph.D., Emeritus Professor of Biology, San Francisco State University

3:45-4:30 pm. ✧**The ABCs of California Native Bees** – Krystle Hickman, National Geographic Explorer and Community Scientist

4:30-4:45 pm. **Closing Remarks**

*Evening events continue at California Botanic Gardens*

Location: 1500 N College Avenue, Claremont CA 91711

5:00-6:30 pm **Poster Session and Mixer**: Forest Pavillion (Open to symposium attendees)

6:30-8:30 pm **Reception**: Forest Pavillion (Add-on ticket required)

6:30-8:00 pm **Dinner Service**: Just Vegana Catering

7:30-8:30 pm **Sage Against the Machine**: Forest Pavillion

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## **Presentation Abstracts and Speaker Bios**

### ✧ **Pollinator Shifts and Invasive Species: Implications for the Reproductive Ecology of the Endangered *Chloropyron maritimum* subsp. *maritimum***

Sarah Cusser, Ph.D., Terrestrial Invertebrate Conservation Ecologist, Santa Barbara Botanic Garden

*Chloropyron maritimum* subsp. *maritimum* (salt marsh bird's beak) is a federally listed endangered annual native to southern California's coastal salt marshes. Its persistence may depend on insect pollination, yet both pollinator availability and habitat quality are threatened by invasive species and long-term ecological change. We present results from two complementary studies examining the plant's reproductive ecology across two coastal marshes. At Naval Base Ventura County, we repeated a 1984 pollinator survey after 33 years and found similar pollinator abundance and richness, but a striking shift in community composition, pollinators in 2017 had significantly smaller body sizes, which may influence pollination effectiveness and seed set.

At Carpinteria Salt Marsh, we investigated the influence of the invasive *Limonium duriusculum* on *C. maritimum* pollination using observational surveys, network analysis, and a small-scale removal experiment. We found *C. maritimum* was visited only by native bees, and visitation rates were low. In contrast, *L. duriusculum* attracted abundant non-native insects (*Apis mellifera* and *Eristalinus aeneus*), which did not visit *C. maritimum*. While removal of *L. duriusculum* did not increase visitation to *C. maritimum*, it improved pollination network structure, increasing nestedness and specialization.

These findings highlight how shifts in pollinator identity and invasive plant presence can subtly but meaningfully affect rare plant ecology. Ongoing conservation of *Chloropyron maritimum* subsp. *maritimum* will benefit from managing invasive species and enhancing habitat conditions to support native pollinator communities in southern California's coastal wetlands.

Sarah Cusser, Ph.D. is a terrestrial invertebrate conservation ecologist at the Santa Barbara Botanic Garden, where she focuses on understanding, conserving, and restoring insect communities and the vital ecosystem services they support across natural, agricultural, and urban landscapes. Her work integrates research and restoration to enhance biodiversity and ecosystem function.

Sarah has studied pollination and decomposition services in diverse regions, including Texas, Michigan, New Jersey, and Pennsylvania, and has contributed to habitat restoration projects in California, Vermont, and Ohio. She earned her Ph.D. in Ecology, Evolution, and Behavior from the University of Texas at Austin, her M.S. in Evolution, Ecology, and Organismal Biology from The Ohio State University, and a B.A. in Biology from Pomona College.

Research interests: landscape ecology, restoration ecology, insect conservation,

ecosystem services, pollination ecology

✧ **The Conservation of Bees is the Conservation of Native Plants, and Involves the Reintegration of Native Plants Back into Landscapes of All Kinds**

Sam Droege, Wildlife Biologist, USGS Eastern Ecological Science Center

There is a reason that there are roughly 1,000 species of bees in the state of California. They do different things. Those different things revolve around their choices of the pollen to feed their young. Those choices are broad, covering many plant families and species. And those choices are often narrow. Many bee species gather pollen from a single family (44% meet this definition in California, see [Pollen Specialist Bees of the Western United States](#)) and some only from a single plant species (16 species gather pollen only from creosote bush (*Larrea tridentata*) for example).

There is confusion when it comes to bee conservation. A major problem is that the average citizen believes that honey bees are native, in trouble, and need to be fostered on their landscapes rather than within industrial agriculture or for cultural honey production. This fact blends into the second problem. That additional problem is that many of the introduced weeds and ornamentals also attract honey bees as well as a subset of native bees. Not necessarily a bad thing, but those species do little to conserve the uncommon and rare species of bees which rarely visit those plantings. A useful way to understand this is to use a more approachable bird analogy. If you want to conserve birds in California, would you do that by setting up bird feeders? Do bird feeders help any of the rare and endangered California birds? No. You simply get more of the common birds. Again, not a bad thing, but not helpful for bird conservation either. Same things with bees, weeds and ornamental help the starling and sparrow bees, not the ones in trouble.

So, with many examples and discussion of patterns in the talk it all comes down to an easy approach for landowners: plant and favor the native plants that would have occurred on your land prior to colonization. You can choose species like those listed in the above link or you can follow the following general rules without worry about the details: plant local blooming natives (annuals to shrubs), shoot for bloom throughout the year, favor the uncommon plants of the region, replace lawns, use a range of flower colors, remove invasives, and encourage your neighbors and municipalities to follow suit.

Sam Droege grew up in Hyattsville, Maryland, and has always been interested in Nature. He has worked at USGS Patuxent Wildlife Research Center since 1978 and now works to support research on native bees and stem some of the losses to wild things that come with population growth, wealth, and disconnection from Nature.

✦ **How Plants Fly**

Dwight Whitaker, Ph.D., Professor of Earth Sciences, University of Southern California.

Without the ability to move, plants have evolved to have a number of novel mechanisms to disperse seeds and spores over considerable distances. Using high-speed video analysis and computer modeling, our group studies the aerodynamics of

✦ = Seed Dispersal

✧ = Pollinator

propagules traveling through the air. In this talk, I will present how using gyroscopic stabilization to reduce drag in the flight of seeds of *Ruellia ciliatiflora* and *Hura crepitans* has convergently evolved to enhance the dispersal distance of ballistically launched seeds. I will also present results from our work on the unique dispersal of Sphagnum moss, which launches its spores with vortex rings to carry the dust-like spores to a height where they can be carried by the wind.

Dwight Whitaker is a Professor of Physics at Pomona College. He received his PhD from Brown University and did his post-doc at JILA in Boulder Colorado studying Bose-Einstein condensation. More recently, Dwight has shifted his research focus to study the biomechanics of seed and spore dispersal with a focus on the aerodynamics of propagules in flight.

### ✧ **Effects of super-abundant non-native honey bees on plants and pollinators in a biodiversity hotspot**

Joshua Kohn, Ph.D., Emeritus Professor in Department of Ecology, Behavior, and Evolution, University of California San Diego

Dillon Travis, Ph.D., Senior Biologist and Pollinator Specialist, Environmental Science Associates

Feral, non-native, honey bees make up 84% of all floral visitors to native plants in western San Diego County. This is worrying given the county is home to the largest number of plant taxa (2400) of any county in the USA and is also home to >700 species of native bees. For three common native plants (*Salvia apiana*, *S. mellifera*, and *Phacelia distans*) we showed that, because honey bees forage methodically, moving from one flower to another on the same plant over and over before moving to another plant, the flowers they pollinate are primarily self-fertilized which can lead to large loss of fitness through inbreeding depression. Offspring resulting from pollination from native insects, which visit fewer flowers per plant before moving on, are 2 to 5 times more fit than those resulting from honey bee pollination, as measured in greenhouse studies of germination, survival, growth and flower production. To examine the potential for resource competition between honey bees and native bees, we estimated that ratio of honey bee biomass to the biomass of all native bees in the community is currently 50:1. If food limits native bee populations and if resources currently used to make honey bees were instead used by native bees, we might expect a 50-fold rise in native bee populations. We also found that honey bees remove approximately 80% of the pollen from each of the plant species mentioned above on the first day that flowers open. Using literature estimates of the amount of pollen needed to provision offspring of bees of different sizes, we estimate that the pollen removed from these plants is enough to provision dozens to thousands of native bees per hectare per day. Despite that the public views honey bees as helpful, they may have negative effects on natural systems similar to other invasive species.

Dr. Kohn recently retired after 32 years as a professor in the Department of Ecology, Behavior, and Evolution at UC San Diego. His research areas include plant mating system evolution, pollination ecology, and the evolution of floral traits. Before becoming a professor, he worked in the kitchen of Chez Panisse with Jeremiah Tower and Alice Waters, graduated from Reed College, studied high Sierra bird communities and the

foraging ecology of endangered Hawaiian honeycreepers. Being a sub-par birder drove him to botany and graduate work at the University of Pennsylvania. He has published scientific papers on the evolution of separate sexes from hermaphroditism, drivers of the evolution of self-fertilization from outcrossing, and the evolution and consequences of self-incompatibility whereby plants recognize and reject their own pollen in favor of mating with others. His lab began studying non-native honey bees locally because they are overwhelmingly the most frequent visitors to native plants in our area.

Dillon Travis received his Ph.D. in Ecology, Behavior, and Evolution in 2023 from University of California San Diego. His dissertation work focused on the effects of non-native honey bees on plant reproduction and fitness as well as their impact on the diverse communities of pollinators in Southern California. Dillon now serves as a senior biologist and pollinator specialist at an environmental consulting firm in San Diego.

#### ✧**The Underdog(fly) of the I.E.**

Michael Viramontes, Stewardship Manager, Rivers & Lands Conservancy

The Inland Empire is home to an often overlooked federally endangered pollinator. The Delhi Sands flower-loving fly (*Rhaphiomidas terminatus abdominalis*) is an uncharismatic underdog, and the first fly added to the endangered species list. It can only live in a rare habitat called the Delhi sand dunes, a dwindling dynamic community of native plants and pollinators. This presentation highlights Rivers & Lands Conservancy's efforts to conserve and restore this habitat while also attempting to educate and build support for its unloved mascot.

Michael Viramontes found his love for native plant restoration during his time at San Jose State University while completing a Bachelor of Science in Environmental Studies. After working for 10 years in non-profit conservation and environmental education in both the San Francisco Bay Area and in Southern California, Michael is currently the Stewardship Manager at Rivers & Lands Conservancy, based in Riverside, CA. Michael devotes much of his time and energy at Rivers & Lands Conservancy figuring out how to protect and restore habitat for an endangered sandfly.

✦**Seed dispersal in the limestone endemic monkeyflowers** – James Sobel, Ph.D., Associate Professor and Chair of the Department of Biological Sciences, Binghamton University (SUNY)

Although adaptation to different habitats is often considered an important first step in the process of speciation, not all forms of reproductive isolation that result are carefully considered in the literature. Indeed, edaphic endemics often experience sharp boundaries between habitats, and local adaptation can therefore produce the kind of discontinuous result that we often associate with divergence between species. However, traits like flowering time, floral morphology, pollen/pistil interactions, and intrinsic crossing barriers are more often characterized than the traits directly involved in habitat isolation. For example, species that colonize rock crevices often exhibit specialized traits, such as reduced dispersal, that are not found in other nearby habitats. The limestone endemic monkeyflowers exhibit several interesting examples of

reduced dispersability, often involving a shift in phototropic responses. In this talk, I will describe the diversity of monkeyflower species exhibiting this unique trait, discuss implications for reproductive isolation between diverging lineages, show some results from genetic analyses, and provide some future directions that these charismatic species can provide.

Jay is an Associate Professor and Chair of the Department of Biological Sciences at Binghamton University (SUNY). Jay earned my PhD in Plant Biology and EEBB at Michigan State University back in 2010 with Doug Schemske, and then spent 3 years at the University of Oregon with Matt Streisfeld for my postdoctoral work. Jay is an integrative evolutionary biologist and focuses his studies on the earliest stages of speciation across the wide diversity of species in the monkeyflower system.

#### ✦ **The many functions of sticky seeds and sticky fruit**

Eric LoPresti, Ph.D., Professor, University of South Carolina

As anyone who has walked through a California grassland in the late summer knows: lots of plants have sticky seeds. From the "sock destroyer" fruit of *Torilis* to the sticky cypselae of tarweeds, and through all manner of glandular manzanitas and mucilaginous *Salvias*, California's flora is sticky, goopy, viscid, and clingy. I'll discuss some of my lab's research on sticky seeds as a dispersal agent and a defense, mostly focusing on the most common form of stickiness: seed mucilage.

Eric grew up in New England fascinated by bugs and plants, continuing this through college - working on ferns and their insect herbivores. After a couple year break, Eric headed west to UC-Davis where he studied sticky plants for my dissertation, then did a postdoc on sand verbena evolution at Michigan State, a short professor gig at Oklahoma State, and now he's in the southeast at the University of South Carolina.

#### ✦ **Scatter-hoarding rodents, *Arctostaphylos*, dispersal dynamics, and the path to evolutionary innovation**

Tom Parker, Ph.D., Emeritus Professor of Biology, San Francisco State University, Editor-in-Chief, *Madroño*

*Arctostaphylos* (manzanitas) has over a hundred different taxa. In contrast to the other members of the Ericaceous subfamily *Arbutoideae*, *Arctostaphylos* presents dormant seed, persistent seed banks, and obligate seeding species, among other traits. Scatter-hoarding rodents are likely one of the stimuli to that diversification. This talk will focus on that hypothesis, starting with research that establishes seed banks resulting from rodent caching of fruit, and the implications of that for taxa living in arid, canopy fire regions. Because soil seed banks are so critical to the success of this genus, I develop a model of seed bank dynamics, and the role rodents play in managing them. Consequently, there are not only evolutionary implications, but insights for those managing chaparral with *Arctostaphylos* species.

Tom Parker is an evolutionary plant ecologist focusing on community and evolutionary ecology, with a focus on chaparral and tidal wetlands; evolutionary ecology of *Arctostaphylos* (Ericaceae) and *Ceanothus* (Rhamnaceae); public engagement on

ecological/conservation issues. He stumbled into the systematics and ecology of *Arctostaphylos* species and has focused much of his research on that group (co-author of treatments for Flora of North America [2009] and Jepson Manual: Higher Plants of California [2012]). Research on dispersal, seed banks, seedling establishment, mycorrhizae, and other aspects of ecology and evolution in a variety of California vegetation types, especially chaparral and tidal wetlands. Over 100 peer-reviewed articles and book chapters; 3 edited books, 1 co-authored Field Guide to Manzanitas. Currently Editor-in-Chief of *Madroño*. B.A., University of Texas, Austin; M.A., Ph.D., University of California, Santa Barbara.

Link to Field Guide to Manzanitas, 2<sup>nd</sup> Edition:

<https://backcountrypress.com/book/field-guide-to-manzanitas/>

### ✧**The ABCs of California Native Bees**

Krystle Hickman, National Geographic Explorer and Community Scientist

There are nearly 3,000 bee species native to western North America, and over 1,600 of them reside in California—one of the most biodiverse regions in the world for bees. Native bees—as distinct from honey bees—are at risk of extinction due to climate change and habitat loss. They may be native to an area as small as a zip code or as large as an entire nation, though wherever they reside, they are integral to their surrounding ecosystems. The number of species native to California dwarfs the variety to be found in whole countries, such as France or Argentina, and rivals the biodiversity of the entire continent of Australia. This natural abundance of bees makes the Golden State significant terrain for entomologists. And since bees are an indicator species—whose absence or decline in population are often a first signal of ecosystem collapse—the study of bees is significant terrain for environmentalists writ large. In this talk, National Geographic Explorer and bee expert Krystle Hickman profiles a handful of the species that underpin the ecologies of the Golden State, exploring the reciprocal connections between distinct species and native plant life, and how community science can support their conservation.

Krystle Hickman is a National Geographic Explorer and community scientist based in Los Angeles and the author of [The ABCs of California's Native Bees](#). With a passion for nature and an eye for artful photography, Hickman strives to elevate awareness of the decline of native bee species and shed light on their intricate and biodiverse ecosystems. Hickman's commitment to conservation takes her across the globe, documenting rare native bees without resorting to any form of lethal collecting. Hickman's influence extends beyond the lens: She has graced multiple television and online broadcasts, been interviewed on podcasts such as *Ologies*, presented at the 2024 United Nations Biodiversity Conference (COP16) in Colombia, and lectured at colleges such as Harvard, UC Irvine, UCLA, and more. Learn more about her work at [beesip.com](https://beesip.com).

## Poster Abstracts

### **Native Bee Diversity in the Californian High Desert**

Atlas Ayres, Leah Carillo, Lezly Albro, Patch Hays and Mer Thich, Claudia Sellers, and Guck Ooi, Cerro Coso Community College

This study examines native bee diversity and their floral host associations in the unique high desert ecosystem of the Eastern Sierra. As pollinators continue to decline, understanding how different plant types (native, non-native, and cultivated) in both natural and human-influenced landscapes affect bee populations can inform community-based conservation strategies aimed at increasing native bee diversity. From 2023 to 2025, we collected native bees using standard netting methods across the Cerro Coso Community College campus and surrounding desert. Over 450 bees representing 43 genera from all six known bee families were identified using taxonomic keys. The Apidae and Megachilidae families were the most abundant and showed the highest species richness. A key finding is the complementary role of both native and non-native flora in supporting pollinator communities. Native plants supported slightly higher bee species diversity, while non-native plants contributed significantly to overall bee abundance. This suggests that a diverse mix of floral resources is critical to sustaining pollinator populations. However, increasing native plant diversity remains a preferred strategy, as it is more strongly associated with greater bee diversity. We also observed notable year-to-year fluctuations in bee populations and the appearance of unique genera each year, highlighting the dynamic nature of desert ecosystems and the importance of long-term monitoring. Most bees collected were ground-nesting, emphasizing the need to protect soil integrity and preserve native vegetation. Our study indicated that communities could play a vital role in pollinator conservation by enhancing local habitats with native flowering plants and maintaining natural habitats.

### **Two new species of *Plagiobothrys* (Boraginaceae) for California based on morphometric and phylogenomic analyses**

Ethan C. Dizon<sup>1,\*</sup>, Ryan C. Dizon<sup>1,\*</sup>, Zachary C. Dizon<sup>1,\*</sup>, Ronald B. Kelley<sup>2</sup>, Kristen E. Hasenstab-Lehman<sup>1</sup>, Jennifer Whipple<sup>3</sup> and C. Matt Williams<sup>1</sup>

<sup>1</sup> Department of Conservation and Research, Santa Barbara Botanic Garden

<sup>2</sup> Department of Chemistry, Eastern Oregon University

<sup>3</sup> Yellowstone National Park, retired

\* These authors contributed equally

*Plagiobothrys* (Boraginaceae) is a diverse genus with centers of taxonomic richness in western North America, western South American, and Australia. The majority of the genus (ca. 60 taxa) occurs in North America, where members occupy a wide variety of ecological niches, including both wetland and upland habitats. Recent research has identified two distinctive new morphological forms in California. They are both plants of upland settings, with one widespread in low to middle elevations (hereafter the widespread form) and the other restricted to Scott Valley in Siskiyou County (hereafter the valley form). Existing specimens of the widespread form have often been identified as either *Plagiobothrys fulvus* var. *campestris* or *P. shastensis* in herbaria. To our knowledge, the valley form has not been previously collected. Here we use

✦ = Seed Dispersal

✧ = Pollinator

morphometric and phylogenomic analyses to assess if these two forms are distinct from other *Plagiobothrys*. Comparative morphological study suggests that the forms are similar to each other and different from other taxa in possessing a star-shaped set of ridges on the adaxial nutlet surface and an excavated attachment scar. Our quantitative analyses show that the valley form has nutlets that strongly differ from morphologically similar taxa (including the widespread form). Phylogenomic analyses reveal that the forms are reciprocally monophyletic and sister to each other, forming a clade with strong support. This clade is isolated on a relatively long branch among lineages of other upland *Plagiobothrys* taxa. Based on the overall evidence, these two forms appear to be distinct and likely deserve taxonomic recognition.

### **Examining the effects of digestion by *Phainopepla nitens* on *Phoradendron californicum* seed morphology**

Makayla E. Finn, William J. Hoese and Joshua P. Der, California State University, Fullerton

Desert mistletoe (*Phoradendron californicum*) is a hemiparasitic shrub that attacks legumes in the desert southwest. *Phainopepla* (*Phainopepla nitens*) gorge themselves on mistletoe fruits and disperse seeds. Seeds may be scarified during digestion, which then must germinate and establish a parasitic connection with their host using a modified root structure called a haustorium. The degree to which mistletoe relies on scarification for germination is unknown. We compared excreted and uneaten seeds to determine if there is a difference in the seed coat and viability. We hypothesized that passing through the digestive tract would facilitate mistletoe seed success. We sampled in the Palm Springs area and collected uneaten fruits from mistletoes parasitizing catclaw acacia (*Senegalia gregii*) and nearby excreted seeds where acacia was the only suitable host. The seeds were cleaned to expose the endocarp and imaged under a dissecting microscope. We assessed the germination rate, viability, seed coat color, size, and shape of each seed (uneaten: n = 80; excreted: n = 80). Fewer uneaten seeds showed signs of germination, and more excreted seeds had a haustorium greater than 1.5 mm. There were fewer excreted seeds that were viable than uneaten seeds. Excreted and uneaten seeds had a similar distribution in seed coat color and shape. Uneaten seeds were also smaller than excreted seeds. The higher germination rate in the excreted, compared with the uneaten seeds, supports our hypothesis; however, since the age of excreted seeds is unknown, the difference observed in uneaten seeds may diminish with time.

### **First-Year Findings on the *Ericameria parryi* Complex: Field Collections and Morphological Comparisons**

Samantha Ingram, Carrie Kiel and Naomi Fraga, California Botanic Garden

The *Ericameria parryi* complex (Asteraceae) represents a taxonomically challenging group of shrubs distributed across semi-arid and montane habitats across the western United States, including several endemic varieties to California. Despite the ecological importance across *Ericameria* species (providing pollinator resources, stabilizing soils, and contributing to post-fire regeneration) varietal boundaries within this complex remain unresolved. This project combines herbarium research, fieldwork, and molecular phylogenomics to investigate morphological and genetic diversity across the 12 recognized varieties of *E. parryi*. The presented research will focus on preliminary results

from the first year of collections conducted across California from June-September of 2025. Ultimately, this study will result in a robust phylogenetic framework to test the validity of current taxonomic treatments, and provide data to help evaluate conservation status and rarity across infraspecific taxa. Broader impacts include conservation recommendations, undergraduate research training, and community education workshops.

### **An integrative study examining the disjunct distribution of *Salvia funerea* M.E. Jones (Death Valley Sage, Lamiaceae)**

Mia Manfredi, Carrie Kiel, California Botanic Garden

Restricted to carbonate, *Salvia funerea* M.E. Jones (Death Valley Sage, Lamiaceae) occurs in two disjunct regions within the Mojave Desert that are separated by ca. 80 mi/130 km. In the larger, northern portion of its range, *S. funerea* occurs primarily inside Death Valley National Park with a few known occurrences just outside of the park including four in Nye County, Nevada. In the much smaller southern region, *S. funerea* occurs in the Bristol, Marble, and Ship mountains near Amboy, California. Though considered rare in both California (California Rare Plant Rank [CRPR] 4.3) and Nevada (NatureServe Rank S1), and likely threatened by intense climate change throughout its range, no previous population-level studies have been conducted on this species. This integrative study incorporates population genomics, species distribution modeling, field observations, and morphometric analyses to investigate population dynamics and identify possible differences between the two disjunct regions of occurrence. The results of this study will be utilized to update current conservation rankings and to make recommendations for future conservation and management practices.

### **Plant-animal mutualisms of manzanitas (*Arctostaphylos* Adans.)**

Chris Moore, California State University, Northridge

Manzanitas are iconic members of the California flora for a number of reasons, including but not limited to their diversity, commonness, and aesthetics. I have previously studied seed dispersal in greenleaf manzanita (*Arctostaphylos patula* Greene) specifically and fruit characteristics broadly across *Arctostaphylos*. Greenleaf manzanita had an ambiguous seed dispersal syndrome, as a few years of radiolabeled seed tracking, baiting stations, and germination ecology determined that greenleaf manzanita is dispersed by scatter-hoarding rodents who bury the seeds away from the parent plant and in microsites suitable for germination following fires. I further compared fruit and seed characteristics to determine dispersal syndromes among the variable diaspore characteristics of several manzanita species that was largely inconclusive. After dispersing myself from the west for just over a decade, I have returned to work on manzanita mutualisms, including seed dispersal and pollination. In my 3-month-old lab, we are planning to investigate the communities of insects that visit manzanita flowers, the biomechanics of pollination, the functional morphology of manzanita flowers, flowering phenology, pollen ecology, the flower microbiome ecology, and further investigate seed dispersal syndromes in manzanita.

### **Floristics on the Frontlines: A Flora of the Amargosa River Headwaters, Nye and Esmeralda Counties, Nevada**

✦ = Seed Dispersal

✧ = Pollinator

Chloe Novak, Naomi Fraga, California Botanic Garden

Like most political boundaries, the California state line is permeable to biogeography, abiotic factors, and anthropogenic impacts. Our understanding of and ability to protect California's extraordinarily diverse flora is greatly enhanced by an improved understanding of the floras with which it is contiguous and for which comparatively little data is currently available. Preliminary results from an in-progress floristic inventory of one such neighboring area, the Amargosa River headwaters in Nye and Esmeralda counties, Nevada, demonstrate the importance and urgency of filling botanical knowledge gaps in a context of rapid industrialization that threatens intact desert ecosystems along and beyond California's eastern border. From its source in the xeric uplands of Pahute Mesa through its terminus in Death Valley's Badwater Basin, the Amargosa River supports rich biodiversity, unique habitats, and endemism hotspots in North America's most challenging desert ecoregion. My research will contribute the first comprehensive vascular flora of its headwaters to directly inform land management and conservation efforts while providing novel insights into the biodiversity and biogeography of the Mojave-Great Basin transition zone. Relevant findings to date include Nevada state records of plants previously thought endemic to California, new occurrences of regionally endemic rare plants, and the addition of over 100 minimum-rank taxa to the documented flora. Further, through collaborative efforts with diverse stakeholders, this study has also yielded substantive conservation actions for California rare plants, including a federal Endangered Species Act petition for a critically imperiled taxon known from just six occurrences in CA and NV (*Astragalus lentiginosus* var. *sesquimetralis*).

### **Now That's Metal! Towards Understanding the Pollination Biology of *Fritillaria falcata* and Other Rare, Unprotected Geophytes**

Nicholas Rocha, California State University, Long Beach

*Fritillaria falcata* (Jeps.) D.E. Beetle, the talus fritillary, is a rare (California Rare Plant Rank 1B.2) bulb endemic to three regions of serpentine talus in the Central California Coast Ranges. *Fritillaria falcata* is notable among North American members of the genus for its upturned perianth, but the pollination biology of this species remains a mystery. This mystery persists because of a number of factors relating to the species' rarity: a short blooming period, lengthy generations, and inaccessible, delicate habitat. Preliminary field and citizen science observations of *F. falcata* and the morphologically similar *F. pinetorum* Davidson suggest that *F. falcata* is adapted for pollination by large flying insects (*Vespula*, calyptrate muscoids), but more investigation *in* and *ex situ* is required to fully characterize the pollination syndrome. Given that the California Rare Plant Ranking of this species grants no legal protection under the California Endangered Species Act or Native Plant Protection Act, researchers are obliged to follow only their own ethical guidelines when studying *F. falcata* and many other rare, but legally insignificant species. The purpose of this poster is to present preliminary data about the pollination biology of *F. falcata*, to identify the difficulties intrinsic to the study of rare geophytes in California, and to suggest best practices for overcoming such difficulties and minimizing the impact of *in situ* research.

### **Decline of native milkweed populations (*Asclepias eriocarpa*) in an isolated California**

✦ = Seed Dispersal

✧ = Pollinator

### **sage scrub fragment: conservation implications**

Carmen Velazquez, Belinda Diaz, C. Velazquez, W. M. Meyer III, and J. Moore, Pomona College

Recent observations of loss of one population and fewer stalks, low flowering rates, and low seedpod densities at the two remaining populations of Indian Milkweed (*Asclepias eriocarpa*) at the Robert J. Bernard Field Station (BFS) in Claremont, California have raised concerns about the possibility of inbreeding depression and the potential of local extinction. As plant populations at the BFS, an isolated fragment of endangered California sage scrub, are likely impacted by reduced gene flow, we compared BFS populations to those in Johnson's Pasture, a contiguous natural area in the San Gabriel Foothills a few miles from the BFS. Examination of five polymorphic microsatellites found individuals in each BFS population to be clones of each other. Conversely, populations in Johnson's Pasture were composed of individuals with diverse allelic variation, though levels of heterogeneity were similar between the BFS and Johnson's Pasture populations. We also found that seeds from the BFS are smaller and have less mass than seeds from Johnson's Pasture. None of the seeds from the BFS germinated. Germination at Johnson's Pasture was very low with only the largest seeds germinating despite following recommended germination procedures. We welcome creative ideas about how to increase the likelihood of persistence of milkweed at the BFS. Currently, we are collecting and weighing seeds in anticipation of additional germination experiments and developing a cross-pollination experiment to initiate the "rescue-effect".