

A Publication of the California Native Plant Society

# FLORA



CALIFORNIA'S PLANTS • PEOPLE • PLACES VOL 4 NO 1 FALL 2020

## Small Wonders

Sacred Pollinators | Save Conglomerate Mesa | Living with Bumble Bees



## CALIFORNIA NATIVE PLANT SOCIETY

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## A MESSAGE FROM CNPS DIRECTOR OF PLANT SCIENCE ANDREA WILLIAMS



### Perspectives and Connections

It's never been more apparent that everything is connected, as a pandemic and wildfires both strain and remind us of our connections with other people and the natural world. Those of us fortunate enough to have access to nature have an opportunity to connect with it in new ways, strengthening our understanding of the systems on which our survival and well-being depend.

The basis of understanding is making observations that can be tested, connected, and combined. Yet each

person's perspective colors how they interpret information and the questions they pursue. Seeing things exclusively through the lens of a single person, society or species can lead to a distorted picture of the world, a lesson exemplified by the story of the western honeybee (*Apis mellifera*).

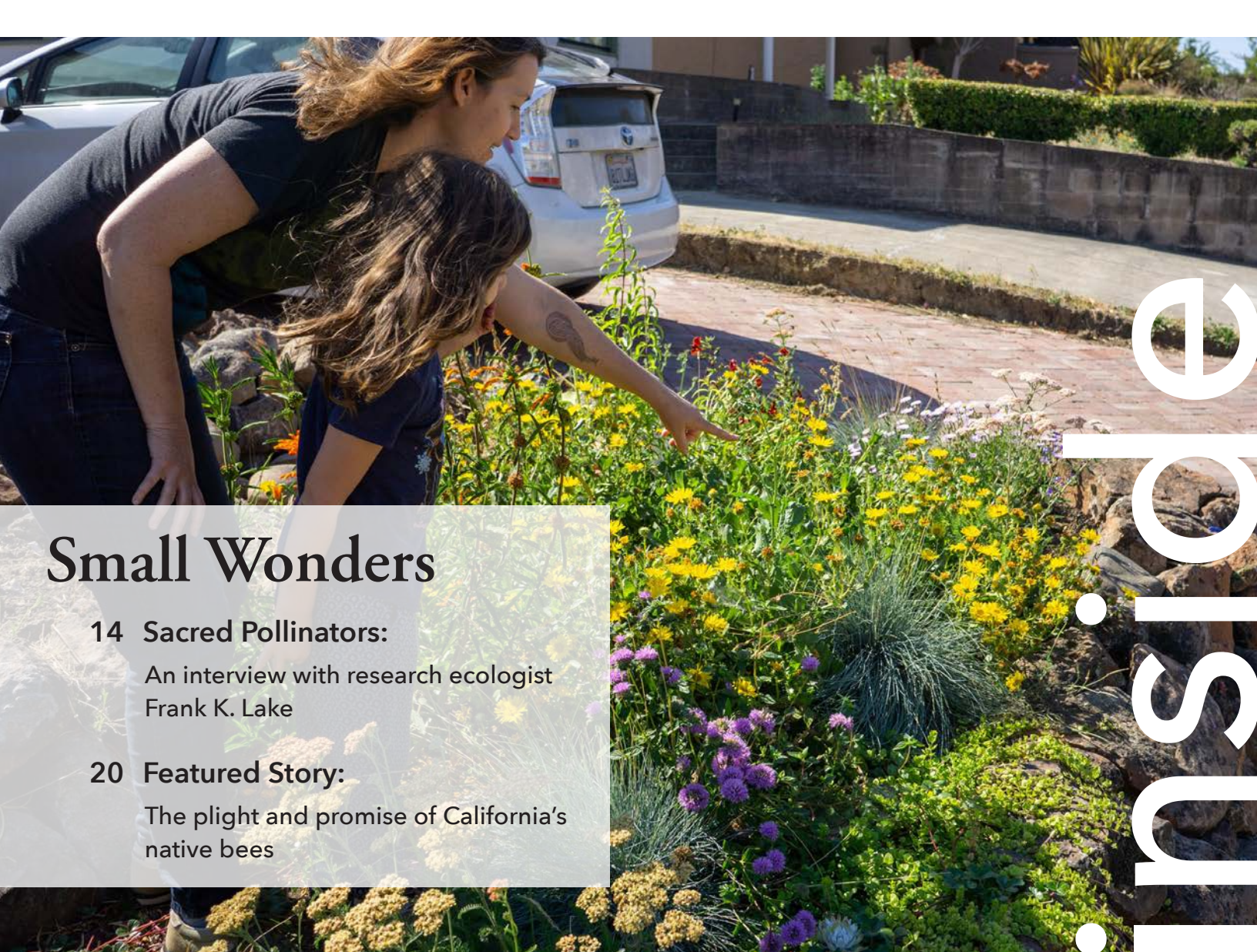
In his *History of Animals*, Aristotle conceived of the social honeybee hive as a monarchy with a king as its center, reflecting the human power structures of his time. Not until the late 1500s did observant apiarists grasp that the "king" was female, and that rather than spontaneously springing from rotting meat or flowers, a queen bee made more bees by laying eggs. Scholars still assumed the queen "ruled" when in fact workers make most of the decisions in a hive. Understanding of the complexity of honeybee society, communication, sight, and navigation came much later.

Similar shifts in scientific perspectives today lead us to question the role of honeybees in wild spaces, an issue explored in our feature story on page 20. Although many people assume that exhortations to "Save the Bees" means saving honeybees, many researchers now see *A. mellifera* as a form of domestic livestock, competing with native pollinators for resources. Shifting our perspective to include the rich variety of native bees allows us to explore new hypotheses about plant-pollinator interactions, competition, specialization, and the many other ways in which everything is connected.

Many pollinators have special cultural significance to Native Californians, which we discuss on page 14 in a featured interview with research ecologist Frank K. Lake. Underscoring the need to protect the natural systems that support us, on page 28 botany graduate student Maria Jesus makes an impassioned case for saving Conglomerate Mesa, a unique desert habitat, from proposed gold mining operations. Even small efforts can make a difference for pollinators, a point illustrated by John Whittlesey's photo essay on native bumble bees (8) and Hillary Sardiñas's tips for creating a pollinator-friendly garden (36). CNPS works to amplify and connect such efforts, fighting for the places we share and the living beings with whom we share them.

Andrea Williams





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**ON THE COVER:** A black-tailed bumble bee (*Bombus melanopygus*) on a shooting star (*Primula* sp.) in Yosemite National Park. Photo: Michelle Duennes

**ABOVE:** Wildlife biologist and entomologist Hillary Sardiñas with her daughter Nylea in her East Bay pollinator garden. Photo: Jamie Tibbetts





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Jeffrey pines (*Pinus jeffreyi*) on Pine Mountain in the Los Padres National Forest. Photo: Bryant Baker

# In the News

## Fast-Track Fuel Reduction

On May 8, the U.S. Forest Service proposed a fuels reduction project covering approximately 755 acres of the Los Padres National Forest in Ventura County. If implemented as planned, the project would reduce to chips more than 300 acres of mature chaparral and allow the removal of trees, in some cases for commercial sale. CNPS and other critics object that the project is moving forward too quickly, with little opportunity for public comment and insufficient analysis of environmental impacts.

The remote six-mile ridge, known as Pine Mountain, provides critical

habitat for the California condor. The Central Coast Heritage Protection Act (H.R. 2199), a bill that currently awaits a vote in the Senate, would officially designate 34 percent of the project site as federally protected wilderness.

Such projects are normally subject to extensive environmental assessment and public input. But the Forest Service claims that the Reyes Peak project qualifies for three different categorical exclusions (CE) because the project intends to reduce insect infestations and hazardous fuels. Projects that are categorically excluded do not

require an agency to prepare an environmental impact statement (EIS), which assesses the impacts a project will have and considers reasonable alternatives.

CNPS and other groups argue that the project should not be entitled to a categorical exclusion because it will have significant impacts on Pine Mountain. CNPS staff and volunteers from local chapters have provided comments on the project and urged the Forest Service to prepare an EIS to adequately analyze and mitigate the environmental effects with public input.





The project will impact many rare plants including the federally endangered Keck's checkerbloom (*Sidalcea keckii*, above), and two-carpellate western flax (*Hesperolinon bicarpellatum*, CRPR IB, below).  
Photos: Jake Ruygt

## Lake County Development Moves Forward

On July 21 the Lake County Board of Supervisors approved a mixed-use development project of unprecedented size in Lake County, despite opposition from environmental organizations including CNPS and the Center for Biological Diversity, and concerns raised by the Office of the Attorney General.

The proposed Guenoc Valley Mixed Use project is a resort and residential community on a 16,000-acre site, much of it on serpentine habitat that hosts a suite of rare and endangered plants. Botanical surveys have documented 131 special-status plant species in the vicinity, including numerous CNPS-ranked plants such as two-carpellate western flax (*Hesperolinon bicarpellatum*). Two of these plants, including Lake

County western flax (*Hesperolinon didymocarpum*) and Keck's checkerbloom (*Sidalcea keckii*), are protected under the state or federal Endangered Species Act.

The project applicant, Lotusland Investment Holdings, Inc., has proposed mitigation measures to minimize the project's negative impacts, but CNPS and others argue that they are too vague to ensure plants' protection. After reviewing the project's EIR, the CNPS state office and volunteers submitted a comment letter noting the proposal's shortcomings; in addition, the Office of the Attorney General of California has submitted two comment letters highlighting the county's failure to address the project's fire risk, despite being located in a fire-prone area.





## Petition to Protect Walker Ridge

As part of the Protect Walker Ridge Alliance, CNPS recently launched an online petition asking the Bureau of Land Management to permanently protect one of Northern California's rare serpentine habitats as an Area of Critical Environmental Concern. For the fourth time in 15 years, commercial wind energy developers are proposing to build an industrial scale wind farm where at least 27 rare plant species have been documented. Located at

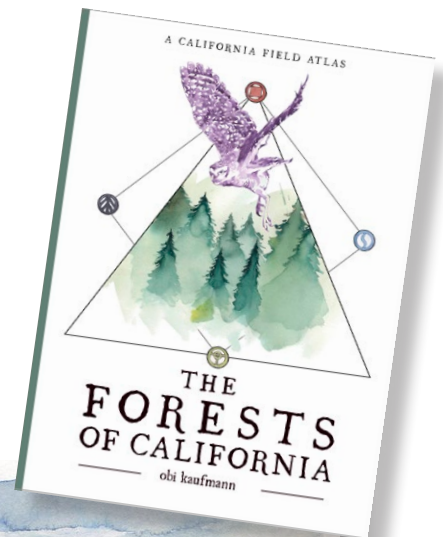
the junction of Lake and Colusa counties, Walker Ridge is known for its seasonal wildflower displays and varied plant associations, including one of the world's largest stands of the McNab cypress (*Hesperocyparis macnabiana*). To learn more and sign the petition, go to [cnps.org/ProtectWalkerRidge](https://cnps.org/ProtectWalkerRidge).

*Special thanks to the Rose Foundation for supporting this Rapid Response Campaign.*



### Artful Advocacy

Artist-naturalist Obi Kaufmann generously created the Walker Ridge campaign logo and suite of accompanying artwork to support advocacy efforts. He used his painting of the rare adobe lily (*Fritillaria pluriflora*) on a limited edition CNPS conservation patch to accompany sales of his new book, *The Forests of California*, available now at [heydaybooks.com](https://heydaybooks.com).





## AB 3279: A Better Bill

This summer CNPS joined over 100 organizations to oppose Assembly Bill 3279 (AB 3279), sponsored by Assemblymember Laura Friedman (D-Burbank). In its first iteration, the bill would have undermined the state's bedrock environmental law, the California Environmental Quality Act (CEQA), by making it costlier for organizations like CNPS to challenge environmentally destructive projects in court. But after successfully negotiating amendments to the bill, CNPS has withdrawn its concerns.

CEQA requires that developers disclose a project's environmental impacts in the form of an Environmental Impact Report (EIR). (An Environmental Impact

Statement, or EIS, is required for federal projects, while an EIR applies to state or local projects.) The process gives the public an opportunity to suggest meaningful changes to a project. In rare instances, when decision makers choose to greenlight a project without adequately disclosing or mitigating impacts, organizations like CNPS can choose to challenge the decision with a lawsuit.

AB 3279 is intended to streamline the CEQA litigation process. But in addition to other flaws, the first iteration of the bill could have encouraged judges to instruct lead agencies (e.g., a city or county) to fix errors in EIRs without rendering a final judgment, possibly leaving

CNPS and other organizations unable to recuperate their legal costs. In response, more than 100 groups joined forces on a comment letter in opposition to AB 3279.

By the end of July, the portions of the bill CNPS and others objected to had been amended. "This success serves as an example of what a large coalition can accomplish through the detailed analysis of proposed legislation and a unified effort to effect positive change," says CNPS lead conservation scientist Nick Jensen. Special thanks are due to Assemblymember Friedman for continuing to be a champion for California's biodiversity, he adds.



## Zooming for Ice Cream

In June the California Botanic Garden served up sweet relief from the sweltering heat: three flavors of native plant-flavored ice cream. Part of a virtual fundraiser called "Freeze Wild," the event invited 300 participants to join a Zoom taste-testing and discussion of native plants. Each participant received three pints of ice cream crafted by Claremont's Berts & Rocky's Cream Co.: Coyote Mint Chip, Coastal Sage Yum, and Cactus Cream (left).

Photo: David Bryant

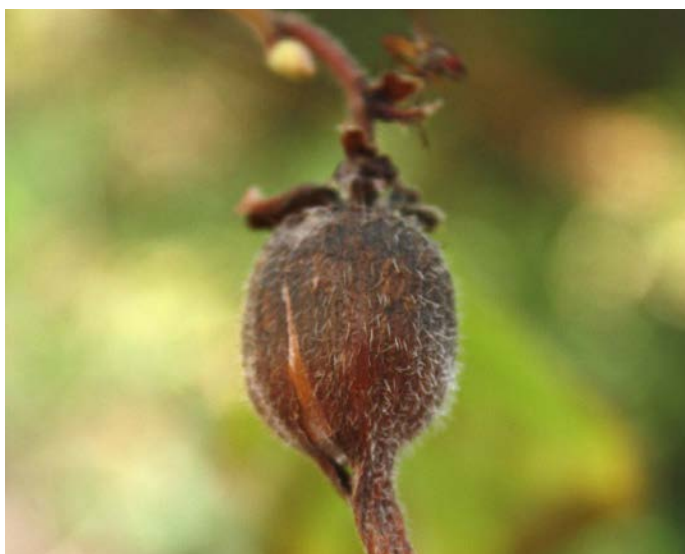




**Miner's lettuce** (*Claytonia perfoliata*)

**Habitat:** Moist, shady or disturbed sites

**Best in:** Salads and soups



**California hazel** (*Corylus cornuta* ssp. *californica*)

**Habitat:** Many habitats, especially moist, shady places

**Best in:** Nut butter or flour, raw or roasted



**Blue elderberry** (*Sambucus nigra* ssp. *caerulea*)

**Habitat:** Streambanks, forest clearings

**Best in:** Syrups, liqueurs, jams, and pies

Sources: NativeFoodsNursery.com; Nicholas Hummingbird @\_native\_hummingbird;  
Alicia Funk's *Living Wild* (available for purchase at store.cnps.org)

## COOL CALIFORNIA NATIVES

# Tastes of California

BY ELIZABETH KUBEY

"What are some edible native plants?" is a common question at CNPS events. Although wild foraging is popular, please keep in mind that:

1. Many Indigenous people of California hold sacred relationships with native plants and gather the plants for medicinal, culinary, and cultural use (more on this in our interview with Frank K. Lake on page 14).
2. Foraging on public or private lands requires special permission.
3. Wildlife need native plants too. Always leave plenty behind.
4. Never eat a plant you aren't sure you've identified correctly.

The best way for most of us to enjoy edible native plants is to grow them in our own gardens. Tending an edible native garden is a great way to explore the flavors of California, and fall is the perfect time to get your plants off to a healthy start.



**Thimbleberry** (*Rubus parviflorus*)

**Habitat:** Moist, partially shaded areas, especially woodlands

**Best in:** Snacks, jams, and fruit leather



**California bay laurel** (*Umbellularia californica*)

**Habitat:** Canyons, valleys, chaparral

**Best in:** Seasoning, ice cream, and baked goods



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# BUMBLE BEES

By John Whittlesey, owner of Canyon Creek Nursery & Design, and author of *The Plant Lover's Guide to Salvias*

**T**his year was a very successful year for bumble bees in our garden. By mid-March, five species of bumble bee queens had shown up, collecting nectar and pollen for the nests they used to start their colonies.

ALL PHOTOS BY JOHN WHITTLESEY

A California bumble bee (*Bombus californicus*) immerses itself in a California poppy (*Eschscholzia californica*).





In prior years, I have seen the ubiquitous **yellow-faced bumble bees** (*Bombus vosnesenskii*), **Van Dyke's bumble bees** (*Bombus vandykei*), **black-tailed bumble bees** (*Bombus melanopygus*), and occasionally the **California bumble bee** (*B. californicus*, opposite page).

This season I was excited to have **Crotch's bumble bee** (*B. crotchii*, right) join the mix. Her large size and deep, sonorous buzzing announced her presence in the flower-laden branches of our redbud tree (*Cercis occidentalis*).

In addition to her majestic size and coloration, Crotch's bumble bee was a welcome sight because it is thought to be declining, according to the Xerces Society for Invertebrate Conservation. In June 2019, the California Fish and Game Commission voted to make Crotch's bumble bee, along with **Franklin's** (*Bombus franklini*), **Suckley cuckoo** (*Bombus suckleyi*), and **western bumble bee** (*Bombus occidentalis occidentalis*), candidates for protection under the state Endangered Species Act. (See feature story on California's native bees, page 20).

These bumble bee species seem to like the landscape on my homestead, located at an elevation of 600 feet and nestled along a creek in a canyon of chaparral and blue oak grassland below Paradise, California. Here, bumble bee season stretches six to seven months, unfolding with the manzanita flowers and the appearance of black-tailed bumble bees in February, and extending into early August.



A Crotch's bumble bee (*B. crotchii*) queen visits our redbud tree (*Cercis occidentalis*).



A female black-tailed bumble bee (*B. melanopygus*) on cultivar Ray Hartman ceanothus (*Ceanothus* 'Ray Hartman').



While the canyon burned intensely in the 2018 Camp Fire, the bumble bees did not appear to be impacted. In fact, 18 months after the fire, there are more native flowering plants for them along the creek: Shortspike hedgenettle (*Stachys pycnantha*) has colonized many areas along with numerous California bee plants (*Scrophularia californica*).

As I write this in mid-July, the bumble bee season is drawing to a close. Not long ago, my partner Jennifer Jewell and I were counting nearly 130 male Van Dyke's bumble bees sleeping on various plants throughout the garden at dawn. A few weeks later, most of the Van Dyke males have died off, and yellow-faced bumble bee males have become the dominant species sleeping out under the stars.

**Below:** California bumble bees (*B. californicus*) are a long-tongued species, which allows them to access nectar at the base of the Cleveland sage's (*Salvia clevelandii*) tubular flower.



Two male Van Dyke's bumble bees (*B. vandykei*) awoken in the early morning light. Because male bees rarely return to the nest, they need a place to sleep at night. They often sleep tucked under the whorl of flowers of our Cleveland sage (*Salvia clevelandii*), or mountain coyote mint (*Monardella odoratissima*) plants. Here they are pictured on non-native lamb's ear (*Stachys byzantium*). Below: A large male Crotch's bumble bee on *Agastache* spp.



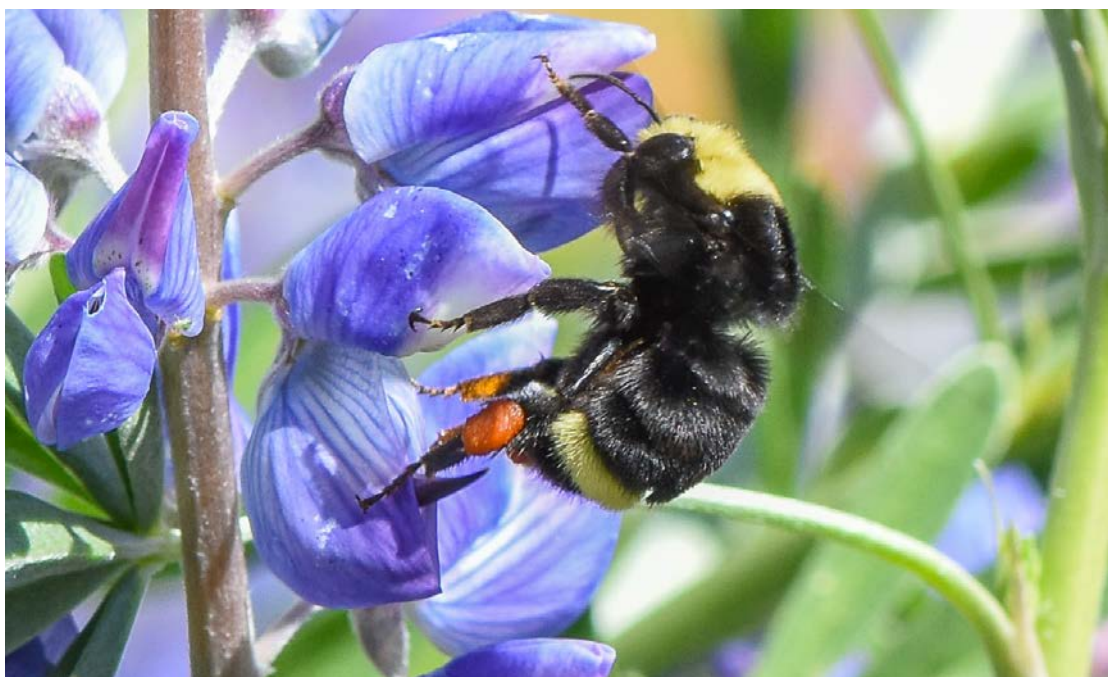


Every few days beginning in mid-July we see a new queen, confirmation that some colonies were successful. The new queens will winter underground and begin new colonies next year.

A large, handsome male Crotch's bumble bee has visited the same group of agastache plants in the nursery every morning for the past three weeks, and stays for much of the day. He shares the flowers with pipevine and western tiger swallowtails (*Battus philenor* and *Papilio rutulus*), increasing numbers of female carpenter bees, and the occasional snowberry clearwing moth (*Hemaris diffinis*), a striking bumble bee mimic.

But daily, the numbers of bumble bees are dwindling, and soon all members of the colony will die, with the exception of the new queens. I do miss them when they finish for the season. But I anticipate being surprised on an early, warm spring day when one of the new queens emerges after her long winter hibernation, cruising low over the grass searching for a nesting site to begin her own colony.

**Below:** The snowberry clearwing moth (*Hemaris diffinis*), a bumble bee mimic, on coyote mint (*Monardella* spp.).



A queen yellow-faced bumble bee (*B. vosnesenskii*) collects pollen from silver bush lupine (*Lupinus albifrons*). In the spring, one can often spot queens flying low to the ground, searching for suitable nest site. When a queen has found one, she provisions the nest with pollen, lays her eggs, then incubates them on the pollen mass. She will continue to build up a store of pollen and nectar until the first female workers are ready to go out and collect more. After that, the queen has no need to leave the nest.



A male California bumble bee (*B. californicus*) leaves the nest for the first time among dry grasses. Male bumble bees rarely return to their nests – instead of gathering pollen like the female workers, they spend their lives visiting flowers and waiting for the opportunity to mate with a new queen. The bee walks out slowly, working his way up and over the dry stems before pausing and taking flight. In contrast, female workers 'map' the site before they leave, making zig zags near the entrance so they can find their way back.






A black-tailed bumble bee (*B. melanopygus*) pollinates manzanita flowers (*Arctostaphylos densiflora* 'Howard McMinn'). Bumble bees are one of the few bees capable of sonication, also known as buzz pollination. They vibrate their flight muscles, shaking loose pollen which collects in the hairs on the abdomen, which they then brush and pack onto their pollen basket (corbicula) on the hind legs. Below: A yellow-faced bumble bee buzz-pollinates a nightshade (*Solanum* spp.) flower. On the right, a black-tailed bumble bee buzz-pollinates Henderson's shooting star (*Primula hendersonii*).







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# SACRED POLLINATORS

An interview with research ecologist Frank K. Lake

“

BY EMILY UNDERWOOD

You're acknowledging that it's not just in the past, like a museum, but that it's important today.”

— Frank K. Lake

**Above:** Ceanothus Silk Moth (*Hyalophora euryalus*). Photo: Marshal Hedín

Frank K. Lake has been immersed in the rich cultural and ecological heritage of California's northwestern Pacific coast since early childhood. Raised by a Yurok and Karuk family, he learned about the natural world through cultural practices that now inform his work as a research ecologist and fire scientist at the Forest Service Pacific Southwest Research Station.

Lake spoke with *Flora* about the importance of pollinators to the Yurok and Karuk Tribes and other Native Californians, as well as the challenges and opportunities of applying traditional ecological knowledge to forest restoration and management. As this issue went to print, he was out in the field, working on the Red Salmon Complex fire in the Trinity Alps Wilderness.



**How did your ancestry, culture and family affect your choice to become an ecologist?**

I'm part European-White, Mexican, Spanish and a descendant of several tribes of North America. I grew up in a Karuk-Yurok family and was raised with that culture. Growing up among the northwestern California tribes and as a child being involved in subsistence and spiritual practices was a big part of my upbringing and the culture I practice and participate in now. In particular, being taught and trained at many different sacred sites, which have high biodiversity, and learning the spiritual and cultural teachings and creation accounts related to those places and species influenced my decision to be an ecologist.

**Can you describe where you grew up, for people who might not be familiar with the area?**

It's rural and remote, but extremely beautiful and diverse. There's the Pacific Ocean, with different types of beaches and rocky intertidal coastlines, to oak woodlands and prairies, to the cedar-pine and mixed-conifer and hardwood forests, and the high true fir forests of the Klamath and Siskiyou mountains. Everything between the Pacific Ocean and Mount Shasta was my cultural teaching ground.

**How old were you when you started learning those cultural and spiritual teachings?**

Very young. There are pictures of me at Katimin, the Karuk Center of the World near Somes Bar on the Klamath River, helping make fishnets with

my grandpa and my dad when I was like three years old. My dad was one of the founding professors of the ethnic studies program here at Humboldt State University and taught spirituality and Native American studies. He started learning from elders about traditional healing, and that influenced his time with me and his teaching as a father to son. He was also very much involved with activism — there were the Yurok fishing wars, the struggle over Yurok subsistence fishing and conservation. I was a product of the environmental controversy over the G-O road, with the Forest Service wanting to build a logging road that went from Gasquet on the coast through the Siskiyou Mountains to Orleans. I remember being at a protest against that at the Eureka courthouse as a child. [Through those experiences] I learned the tension between Indigenous retained rights, conservation and environmental protection, and what would be or would not be sustainable management, both for forest resources and riverine systems.



Lake and his daughter Ada, then three, eating evergreen huckleberries in her hazel stick carrying basket in the fall of 2016. Photo: Dr. Colleen Rossier



**How did you learn to relate to the natural world in those teachings?**

A lot of it was being taught how to introduce myself to a natural place: a spring, a hillside full of wildflowers. Just sitting there with buzzing pollinators, watching the hummingbirds come up in the meadow in the morning sun. Being taught that every unique species is a different spirit that has a right to be acknowledged, that has its own life history requirements, what it needs to live. Learning that you have a responsibility to understand that, to know it, to reaffirm your responsibility for that, and to care for that as a human being.

**What did you learn about the process of pollination?**

[Laughs] The Indian version of the birds and the bees? It's like what I tell my daughter, when we come out in the springtime to the huckleberries in my yard and wild patches. I'll say, 'Come on, honey. Let's go in the morning light when it reaches the huckleberries and the dew starts to melt. You see how the bumble bees show up for some of the flowers, or the hummingbird comes for a visit? Do you see what they're doing? They're kissing the flowers. And when you kiss the flowers, it helps make the fruit.' That's what I tell my now seven-year-old daughter and my nine-year-old son, but it was that same kind of thing. There's a level of descriptive intimacy between the pollinator and flower and the outcome from that relationship, be it a fruit or a nut or other thing that we all depend upon for food as other animals and humans in this environment.



**Can you share some examples of pollinators that are particularly important to California tribes?**

My perspective is very much northwest California-influenced, but broadly across California Indian tribes and through the northwest those would be

A bee on a cat's ear (*Calochortus elegans*) flower, a bulb eaten by many California and Pacific Northwest tribes. Photo: Frank K. Lake

birds, particularly hummingbirds, and insects such as bumble bees, butterflies and moths that pollinate many of the food plants, like huckleberries and black cap raspberries, Indian potatoes (geophyte lilies), and iris for cordage and string. There's the silk moth — its little silver cocoons are used as rattles for the Pomo and the Miwok and the Maidu — and the green hornworm that eats wild tobacco, a very important crop amongst California tribes.

For us [Karuk-Yurok Tribes], there are several different species of hummingbirds that are associated with the World Renewal Dances, and other healing aspects of the culture. Bumble bees, too: I think about the hum in the meadows in the high country, the big bumble bee that's more yellow than black, the dark purple-black bees, and little ones that live in wood. So many bees, laden with pollen on their little legs and thighs.

There's quite a few different Indian names for girls that mean 'Butterfly,' or 'Hummingbird.' My half-sister Chay-gam-em, who is a Yurok Tribal member, her name is Hummingbird. Also, for the Hupa, Karuk and Yurok there's a girl's coming-of-age ceremony called the "Flower Dance," where the community and the families acknowledge the importance of women for the family and tribe, and her association with and knowledge of pollinators for many food and basketry plants of cultural importance. There's a lot of teaching from older women and even men in that ceremony, acknowledging the importance of that young woman and her role in the environment.

**What stories about pollinators are important to you?**

Some of my favorite stories as a kid were about hummingbirds: In one, all the birds get together to have a contest, to see who can fly highest. They make fun of Hummingbird because he/she is so small; some of the birds go a little higher, the hawks and eagles go higher. Then Condor steps up and says, 'I'm gonna fly the highest and show you all how it's done.'



A hazel stick basket with evergreen huckleberries (*Vaccinium ovatum*), which grow along California's northern and central coast. Photo: Frank K. Lake USFS/Karuk Tribe



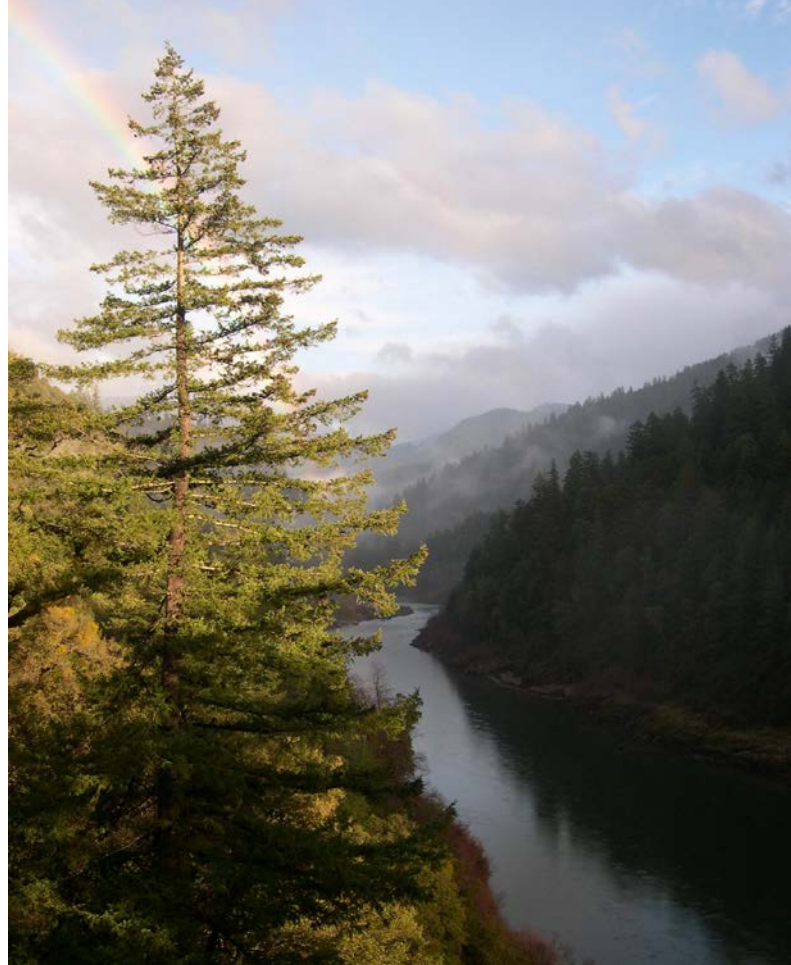
Without anyone knowing, Hummingbird gets on the neck of Condor. When Condor goes so far into the sky that they're almost out of sight and breaking the atmosphere, Hummingbird jumps out of Condor's neck feathers and collects starlight and sunlight. (The full name of Frank's sister translated from Yurok is 'Hummingbird from the sun.') Hummingbird gets it on her/his head and chin and feathers and then sneaks back onto Condor. Condor comes down, and the birds come around and say, 'Condor, Condor, you're the greatest bird! You'll be the one closest to the Creator!' Then Hummingbird crawls out of his shoulders and shows off the new starlight and sunlight on his/her feathers and says, 'Actually, I was the one who got the highest.' This story is meaningful to my family, and why I think my sister was named such.

**As someone trained in several traditions, what do you think is missing from the Western scientific understanding of how different animals and plants, including pollinators, are connected?**

I remember being up with my dad in the Siskiyou wilderness in a sacred meadow, when these biologists came by with butterfly nets. My dad goes, 'What are you guys doing here? You're interrupting our spiritual seclusion! Don't you know that these butterflies are some of the most sacred in the world?' And the guys are like, 'Well, actually, these are endemic butterflies and they're found nowhere else in the world.' And my dad's like, 'That's what I'm trying to tell you! They're a gift from the Creator!'

Seeing all this unfolding as a 10- or 11-year-old kid, that still resonates with me today. Like, we both appreciate and respect pollinators, but we have different ways in which we acknowledge them, and different ways of gaining information about what we should do to protect and conserve them. The biologists were trying to convince my dad that these butterflies are so rare and endemic and tied only to this area, these plants, and that they're special — to be known about and studied. And yet my dad was saying, 'Well, yes, if you sat here, and prayed, and introduced yourself, and watched them, you would learn about them. And you wouldn't have to do this type of sampling and pin [the butterfly] and take it as a specimen back to your lab.'

What we typically are taught in our Western education is the objectification of nature, as something separate from humans. [I would like to see] Western-trained scientists or biologists be open to and inclusive of Indigenous or tribal perspectives, and be open to those tribal teachings as another form of knowledge — maybe not one that they believe in, or



A rainbow over the Klamath River between Weitchpec and Orleans. Photo by Luna Latimer, Lake's wife and Mid Klamath Watershed Council Director.

were taught, but being accepting of that as another way of knowing.

It's a struggle. I see this in the peer-review aspects of journals, the colonial elitism of a Western-educated person saying, 'I have a PhD, what could a California Native elder teach me?' They often discount or discredit these alternative indigenous teachings and explanations, which can be kind of funny and informative. If you think about a Coyote story, it's funny, it has humor, it has ethical lessons about what you should and shouldn't do. It's a way of teaching you throughout your life. So many times I've had ecologists or biologists say, 'Oh, it's just storytelling, it doesn't really have any grounding and is not really applicable to me.' I think that they closed the door before they had a chance to learn something that could have been of value.

**Are there traditional methods of supporting pollinators that you would like to see adopted more widely?**

For me, it's reinstating tribal burning practices to recover more open habitat, to expand oak and hardwood forests, to recover and maintain prairies and meadows. It's restoring flowering shrubs and forbs that provide so much food, nuts, and berries with the help of pollinators. It's reestablishing tribal cultural fire regimes in partnerships with agencies,



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There are broader things that we can do to restore and manage these places with a keen eye toward what pollinators need.



Frank K. Lake on the Red Salmon Complex fire in August 2020.  
Photo: Michael Sanchez USFS

organizations, and tribal families to increase the diversity of habitats burned across the landscape. For example, burning to increase oak woodlands — which we could also call tribal acorn orchards since they have been managed for acorn production for thousands of years — and grassland prairies that can support food plants like geophytes/ Indian potatoes, trailing blackberries, tarweeds, as well as culturally important plants like mules ear for medicine, and beaked hazel for food and basketry materials.

**How can organizations like CNPS, agencies and others learn from and support traditional ecological knowledge in restoration efforts, without appropriating or co-opting those traditions?**

By being more holistic and more inclusive of [the tribal] perspective and of the sacredness of nature and pollinators. Also, by acknowledging that it's not a 'natural' state that we're trying to restore, but actually a cultural legacy in many areas, for particular habitats. It's about approaching tribes as research partners, understanding what their research or management needs are and desires are. It's using that indigenous knowledge or traditional ecological knowledge to formulate our study approaches: What are the metrics? What are the indicators to measure or evaluate? How can indigenous knowledge help us consider

the way we even analyze the data and interpret results?

As a non-tribal person, you can learn what you can do as a human to promote pollinators in the habitat they need, and not just look at the environment extractively, as an economic resource or as an ecosystem service that was produced for you. We can have pollinator campaigns and plant little gardens, but I think there are broader things that we can do to restore and manage these places with a keen eye toward what pollinators need.

**In a recent article in *Ecopsychology*, you and your coauthors (Jonathan W. Long, Ron W. Goode, and Benrita Mae Burnette) talk about the importance of using Indigenous place names. What is lost when those names are not used?**

Acknowledging tribal place names can be a form of reconciliation, repatriation and restoration for tribes recovering traditional knowledge and related subsistence or ceremonial practices that are otherwise mostly invisible to mainstream Californian and American society. Tribal place names give context, and can enrich the understanding and history and stories and teachings of a place and its people.

I think of a recent project for the Western Klamath Restoration Partnership in the Offield Mountain area. Offield is the colonial settler name, but the name of that mountain is Ma' and Sa'Tue'yee [upper and lower mountain peaks]. To have an environmental planner or the botanist be like, 'Oh, I can't say Sa'Tue'yee'... Challenge yourself. If you say you're inclusive, overcome the discomfort of saying the Indigenous name, even if you say it wrong. If you're working with tribal people who have asked you to call it this, and you say it's too hard, you're demonstrating your ability to give up.

Your attempts as a non-tribal person to say that tribal place name shows respect. It shows your ability to be a willing partner, to come through something uncomfortable. You may also support a form of healing, because of maybe that place being named after a white settler who led the local militia during the Civil War, who hunted down your tribal



colleague's great grandaunties and uncles and got bounties for them, whose village was burned, whose grandmothers were raped. If you keep calling it that name, it only furthers that trauma for those tribal descendants today.

### **What about names of plants? Should those be called by tribal names too?**

Every tribe is going to have a different name for different plants. One example of a common flower with lots of different names is *Dichelostemma capitatum*, or blue dicks. It's used as a food, the flowers are used as regalia in a girl's coming-of-age head wreath, and every tribe is going to have a different name for it. What you could do is, rather than saying 'This species was used by California tribes,' you could say 'This species is used and valued today by California Indian tribes.' That adds presence and relevance to it. You're acknowledging that it's not just in the past, like a museum, but that it's important today.

### **You have worked to show how traditional ecological knowledge can be incorporated into ecological restoration efforts. What are some of the big-picture challenges and daily obstacles to that? What would you like to see happen in the future?**

Often when we restore these places, it's kind of a showcase. So often the plaques say 'Stay out! This area has been restored! Stay on path! Stay on trail!' But if we're acknowledging that a site was part of a cultural landscape and a cultural practice over a long time, why wouldn't we facilitate access and opportunity for tribal reengagement? There could be another sign saying 'This area has been restored to promote tribal access, and subsistence and other important cultural practices. Be respectful of tribal people, while they gather and steward this place of significance to them.'

Then, when you see Indians out digging Indian potatoes with an iron crowbar or tire iron, you wouldn't stop and say, 'What are you doing?' Instead, it could be 'there's California Indian people tilling the soil, recovering this lily patch. They are going to feed themselves and be stewards.' So much of the California Indian experience is being questioned and asked what you're doing, being assumed to be doing something illegal when you're just trying to be Indian. We complain that we don't have the budgets to maintain [restored] sites. But we should be looking at stewardship models that would engage tribal families and urban communities.

I think about all the ways that elders or other practitioners have enriched my understanding, have helped me devise



A crab spider nabs a honeybee as it visits a huckleberry bush. Says Lake: "I was showing my daughter how the bees kiss the flowers, but that bee got caught!" Photo: Frank K. Lake

a new metric that was ecologically or culturally applicable for a study. When we write papers and we get published, that science, the body of research informing management that leads to implementation or restoration strategies on the ground, is more culturally inclusive and more directly applicable to tribal interests and values. Then tribal people become direct beneficiaries of their investment of knowledge. To me, that's a form of justice.

So much of the California landscape and ecosystems was perceived as a natural system, but really was a cultural relic. For tribes, when you [do cultural burning], you restore the oak woodland and prairie, the grasses and shrubs and flowers and forbs. Things come back and you increase the biodiversity, the per square meter unit rate of pollinator production. And you're also there with your granddaughter, digging Indian potatoes, teaching story and song, gathering hazelnuts, gathering acorns. Your uncles or your father are hunting deer and you have food, you have clothing, you have medicine, you have the revival of cultural stewardship practices and knowledge systems.

Than as a tribal person you name your daughter Butterfly, or Bumble Bee, and when she grows up she asks, 'Why did you name me Bumble Bee, Daddy?' And you say, 'It's here, see how this bumble bee kisses this flower? What are you going to do in your life as a woman to make sure that you, as that bumble bee, persist? And not only that your family has food, but that the bumble bees have food, and that hummingbird has what it needs? To me, that's the richness of recovering a cultural knowledge and practice that has been there for many generations and was interrupted.

#### **Further Reading:**

Anderson, Kat M, and Frank K Lake. "Beauty, Bounty, and Biodiversity: the Story of California Indian's Relationship with Edible Native Geophytes." *Fremontia* 44, no. 3, December 2016, 44-51.

Long, Jonathan W, Frank K Lake, Ron W Goode, and Benrita Mae Burnette. "How Traditional Tribal Perspectives Influence Ecosystem Restoration." *Ecopsychology*, June 2020, 71-82.





# Small Wonders

The plight and promise of California's native bees

BY EMILY UNDERWOOD

A black-tailed bumble bee (*Bombus melanopygus*) on a shooting star (*Primula* sp.) in Yosemite National Park. Photo: Michelle Duennes

In 2007, biologist Gretchen LeBuhn discovered an unusual winged visitor in one of San Francisco's city parks: a black bee with rust-colored fuzz and pale yellow stripes which she and her students identified as the California native wool carder bee, *Anthidium palliventre*.



The bee uses its bristled legs to dig a nest in sand dunes, then scrapes hairs from the leaves of coast buckwheat (*Erigeron latifolium*) to line its nest with soft fluff. Like many other dune-dwelling bees it was once a San Francisco local, sipping nectar from lupine and other coastal scrub wildflowers. But when developers paved over most of the dunes on the peninsula, the bees lost their homes. “They’re little representatives of the history of the land,” LeBuhn says, speculating that the few other wool carder bees she’s found may dig their nests in sandboxes.

The wool carder bee is just one of many “small wonders” that LeBuhn and her team at San Francisco State University have found in the city’s parks. Even a tiny one-acre park can attract as many as 30-40 native bee species if they have lots of flowers and good nesting spaces. Planting native wildflowers is particularly important to support the state’s specialist bees, which have evolved to prefer just one or a few types of plants, LeBuhn says: “People think [pollinator loss] is an awful and daunting issue, but I think we can all help.”

The roughly 100 or so native bee species that LeBuhn has documented within San Francisco is roughly half of what she would expect to find there, based on surveys in nearby Marin County and the East Bay area. Although the peninsula may historically have had fewer species, LeBuhn attributes at least some loss to development. “San Francisco has fewer bee species than it would if it was wild,” she says. “Nobody’s going to be surprised by that.”

A wool carder bee (*Anthidium palliventre*) photographed in a San Francisco city park by one of biologist Gretchen LeBuhn’s graduate students, Nevin Cullen.



Coast buckwheat (*Erigeron latifolium*) growing on the northwestern coast of the Point Reyes National Seashore. The wool carder bee uses fibers scraped from the buckwheat’s soft leaves to line its nest in sand dunes. Photo: Elizabeth Kubey





Like many pollinators, including bats, birds, butterflies, moths, flies, beetles and small mammals, a number of California's wild bee species are under threat. The best-studied declines are in bumble bees: In 2019, for example, the California Fish and Game Commission voted in favor of listing four species of California bumble bee under the California Endangered Species Act, including Crotch's bumble bee (*Bombus crotchii*), Franklin's bumble bee (*Bombus franklini*), Suckley cuckoo bumble bee (*Bombus suckleyi*), and the western bumble bee (*Bombus occidentalis occidentalis*).

For other native bee species, data are sparse or nonexistent. "We have no idea how many species are doing," says Hollis Woodard, an entomologist at UC Riverside who studies the life cycles of bumble bee queens. To start filling those data gaps, Woodard recently helped launch a scientific consortium called the National Native Bee Monitoring Network. Meanwhile, LeBuhn and her team at San Francisco State University are running a decades-long community science effort called The Great Sunflower Project, in which gardeners across the country record what bee species come to visit.

Of the roughly 20,000 bee species found throughout the world and 3,600 native bee species in North America, California is home to 1,600. It's hard to overstate the dazzling variety of wild bees in California, which CNPS

executive director Dan Gluesencamp describes as "the Amazon Basin of bee diversity." Some are tiny, like the fruit-fly-sized *Perdita minima*, which pollinates minute desert wildflowers such as whitemargin sandmat (*Chamaesyce albomarginata*). Others are big, like the male Valley carpenter bee (*Xylocopa varipuncta*), a fuzzy golden bee that some scientists refer to as a "teddy bear."

Unlike the social, non-native western honeybee (*Apis mellifera*), most of California's native bees live solitary lifestyles. Some bees nest in the ground in abandoned cavities; others, like the wool carder bee, dig or build their own nests. Some shelter inside trees, others in rock walls or even abandoned snail shells. There are red, black, and blue bees, and metallic green "sweat" bees that drink human perspiration.

Despite the kaleidoscopic array of native bees, western honeybees have long received the majority of public attention and research dollars because they are so important to agriculture, says LeBuhn. The United States Department of Agriculture (USDA) values the total annual contribution of honeybee products and pollination services at \$700 million. At least in the United States, however, the loss of honeybees "is an agricultural issue, not a conservation issue," says Woodard. "They're not native, and they're completely entangled with our agricultural system, many aspects of which are not sustainable."



Left to right: A turret-building chimney bee (*Diadasia* sp.) on chaparral mallow (*Malacothamnus fasciculatus*); mining bee (*Adrena* sp.) on Channel Islands tree poppy (*Dendromecon harfordii*); striped sweat bee (*Agapostemon* sp.) on Guadalupe Island globemallow (*Sphaeralcea sulphurea*). Photos: Kris Ethington. Above: The declining Suckley's cuckoo bumble bee. Photo: Hadel Go/CC BY 3.0



“

## California is the Amazon Basin of bee diversity.”

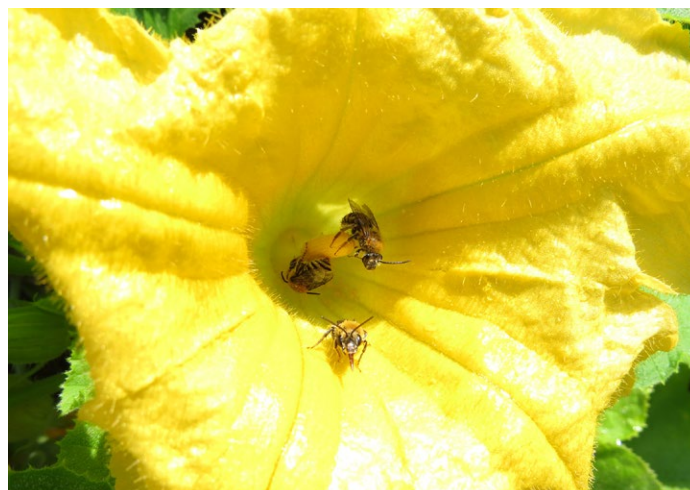
– CNPS Executive Director Dan Gluesencamp

In the early 2000s, scientists coined the term “colony collapse disorder” (CCD) for a mysterious syndrome that was decimating domesticated honeybee populations. Although scientists still aren’t sure what causes CCD, they think it arises from a combination of pests such as the varroa mite parasite, disease, poor nutrition, pesticide exposure and other stressors, such as being transported by truck from farm to farm. The syndrome still poses a major threat: From April 2019-2020, beekeepers lost more than 40 percent of their colonies to CCD, the USDA reports.

The plight of managed honeybees raised alarms that native bees might be facing similar challenges, says Neal Williams, a pollination ecologist at UC Davis. Although most native bees don’t live in colonies like honeybees do, they too are susceptible to poor diet and loss of habitat, he says.

Protecting native bees can be an important insurance policy against the loss of honeybees, Williams and his colleagues have found. In a 2002 article in the *Proceedings of the National Academy of Science*, for example, Williams, the late entomologist Robbin Thorp, and conservation biologist Claire Kremen found that for organic farms located close to native bee habitat, such as oak woodlands and chaparral, “free” pollination from native bees was sufficient to grow even demanding crops like watermelon, which requires up to 1000 grains of pollen to produce a single melon.

A number of other studies have shown that native bees can outperform honeybees in pollination. Bumble bees, for example, use a messy method called buzz pollination to vibrate the flower and shake more pollen loose. The technique which appears more effective than honeybee pollination for crops including tomatoes, peaches, and a number of native plants, among them



Native squash bees (*Peponapis pruinosa*) are highly effective pollinators for cultivated squash, melons, and other crops. Photo: Ilona Loser, CC-BY-SA-4.0

huckleberries and manzanitas. (See photos of bumble bees buzz-pollinating flowers on page 12).

The quality of pollination — how many grains of pollen get from the male to female parts of a flower — matters for the quality of food. Well-pollinated melons are bigger and firmer, apples rounder. Well-pollinated cultivated strawberries (descendants of California’s native beach strawberry, *Fragaria chiloensis*) are more perfectly formed and redder.

Our agricultural system threatens native and non-native bees alike, says Williams. In California, many small plots with flowering borders have been consolidated into large, homogeneous zones that provide poor bee forage and habitat. A good example is CA Route 99 through the Central Valley, with its large swathes of suburban development crops. “I wouldn’t want to be a bee there,” Williams says. Crops such as corn and wheat are not typically pollinated by bees, LeBuhn adds, so a conventional corn field doused in pesticides “is about as barren as you can get.”



Most people like the idea of supporting bees — the question is how to do it, says Williams. “I think that a grower, a conservation biologist, a commodity board member would all agree that we would like to support native bees, but that’s a pretty nebulous statement.”

At UC Davis and Hedgerow Farms, a native seed company in Winters, California, Williams and postdoc Uta Muller have been testing native wildflower mixes to see which are most attractive to native bees and other pollinators. The team has planted gridded plots with native wildflowers such as California poppy, phacelia, native sunflowers, and coyote mint. In a laborious process, they’re now counting and identifying the native bees that visit each plot once a week, for nine months. “We run through every plot once in the morning, take a quick break in the middle of the day, then repeat the whole thing,” Williams says.

Through this and previous experiments, Williams thinks he’s now got a pretty good grasp of what plants different species of bees prefer. But he’s still trying to suss out how much land a farmer needs to plant in order to make a real difference — “Is it five percent, 10 percent?”

Working with the Xerces Society, Hedgerow Farms, and other collaborators, Williams ultimately hopes to develop computer algorithms that will suggest the best seed mix for a given purpose, whether that’s supporting rare bee species, providing food for as many different bee species as possible throughout the year, or supplementing honeybee crop pollination. He’s also trying to get the cost of seed mixes down. At present, planting a pollinator mix purchased from the Natural Resources Conservation Service might cost a farmer \$500-700 an acre, and he wants to reduce the cost down to a third or a fifth of that, or even less, he says. One challenge is to create seed mixes that not only suit pollinators, but humans, he says. “People will say, ‘I want to support



The native wildflower pollinator seed mix trials at UC Davis Student Farm in April 2020. Photo: Williams Lab UC Davis.

pollinators, but I also want things that are red, blue and yellow blooming in all three seasons.”

Gardeners should use local wildflower seed mixes of known genetic origin, like those sold at Hedgerow Farms, notes CNPS Director of Plant Science Andrea Williams. When people plant non-local wildflowers, they run the risk of wiping out local species through hybridization. A good illustration of why local seeds are preferable is the iconic Texas bluebonnet (*Lupinus texensis*). By using bulk seed from out of state, Texas has “hybridized their state flower out of existence — they don’t have any local variation anymore,” Williams says. “We don’t want that to happen to our state flora.”

Unlike California’s native plants, which have been extensively mapped thanks to organizations like CNPS, there’s scant information about how many of California’s native bee species are distributed throughout the state, and thus how climate change, development and other factors are affecting them, LeBuhn says. “It’s amazing how much we don’t know.” One way people can help scientists is to participate in community science projects like the one she is running, the Great Sunflower Project ([greatsunflower.org](https://greatsunflower.org)). The project needs more volunteers, particularly in rural areas, she says. Gardeners can also find lists of bee-friendly plants on CNPS’s [Calscape.org](https://www.calscape.org) and on the Xerces Society website.



Habitat loss is only one of the many threats that bees face, Neal Williams notes. Neurotoxic pesticides like neonicotinoids may be interfering with bees' ability to forage, while pathogens like varroa mites and nosema disease, and environmental factors like drought exacerbate bees' susceptibility to disease. Just like in people, Williams says, "If we stress ourselves, then disease or parasites have a greater impact."

To better understand how California's bees are responding to pesticides, Williams is measuring pesticide residues in the pollen that bees collect, which he'll use to develop a map of exposure over space and time. At UC Riverside, Woodard is running lab experiments to study how pesticides affect the brains of bumble bee queens.

High in the Sierra Nevada, Woodard and her team are also studying what bumble bee queens need to thrive at different stages of their life cycle, in order to better understand how they'll respond to climate change and find ways of supporting the bees throughout the year. It's an



UC Riverside entomologist Hollis Woodard and her team are studying bumble bee queens in the Sierra Nevada. Photo courtesy of Hollis Woodard.

urgent question, as climate change appears to be driving many bumble bee species worldwide toward extinction: In a February 2020 *Science* study of 66 bumble bee species in North America and Europe, for example, researchers found that as temperatures have climbed, the chances of a bumble bee population surviving in any given location has dropped by an average of 30 percent.

Bumble bee queens spend much of their lives alone, wintering underground and emerging in the spring. In

## A manzanita wonderland

California is a hotspot for manzanita diversity, with roughly 100 species and subspecies of manzanita, 59 of which are so rare they only grow in one wild place. There's hardly a more Californian shrub, growing from coast to mountaintop, with many species' survival tied to fire, fog, and introduced pathogens. When planting manzanita to support native bees, it's a good idea to use local species, says CNPS Director of Plant Science Andrea Williams.



Left to right: Hoary manzanita (*Arctostaphylos canescens* ssp. *canescens*) Photo: Morgan Stickrod. The rare Santa Margarita manzanita (*Arctostaphylos pilosula*) Photo: garmonb0zia/iNaturalist CC0. Endangered Mount Diablo manzanita (*Arctostaphylos auriculata*) Photo: Al Kordesesch.



many areas of California, observers can spot the queens feeding on early-blooming native plants like manzanita (*Arctostaphylos* spp.) as early as February; by shivering their flight muscles the queens can raise their body temperatures in cold weather.

Once the queens have fattened up, they start flying low over the ground in a zigzag pattern, looking for a cavity to nest in. After making a thimble-sized pot of honey and a small mound of pollen as a food reserve, they start laying eggs and incubating them. When a larva hatches, a queen bumble bee will regurgitate food into its wax pot “like a mama bird,” Woodard says. About two weeks later, the larvae chew their way out and become the first workers.

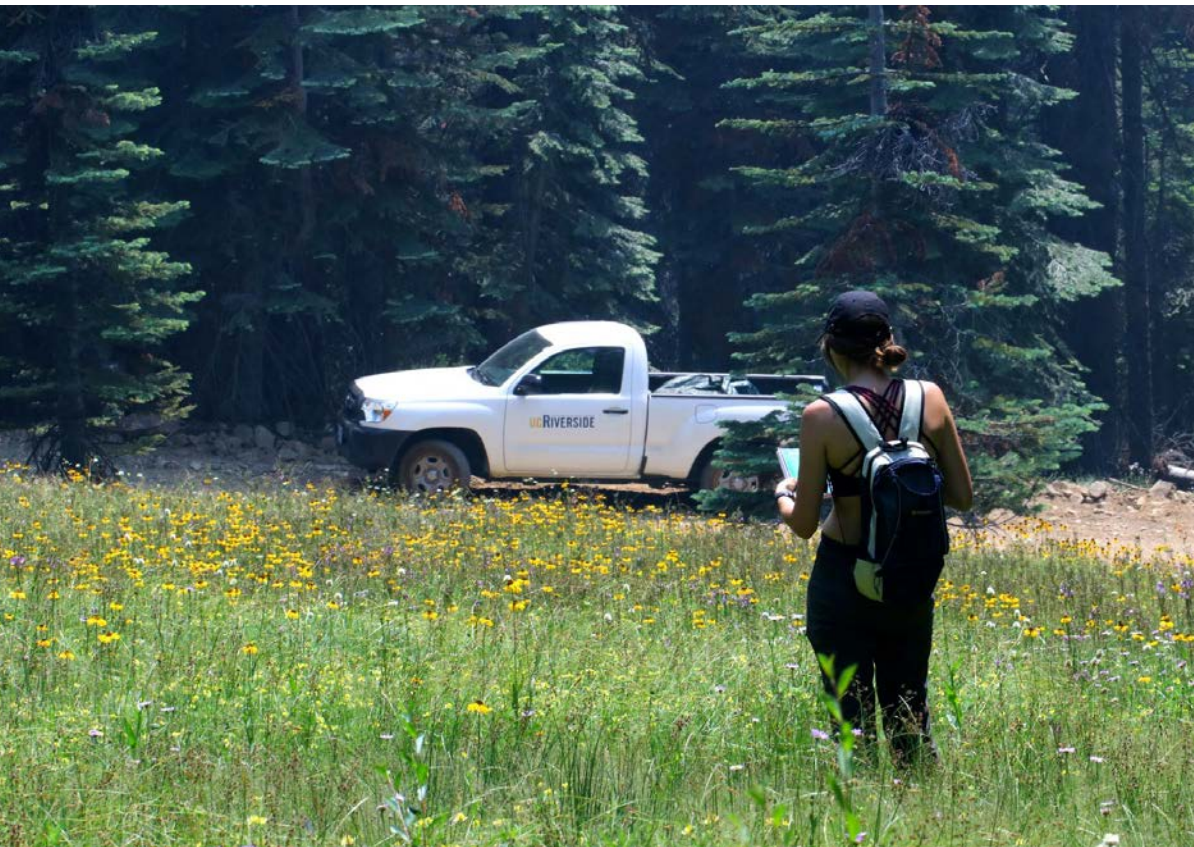
If solo bumble bee queens don’t get the food that they need in early spring, or can’t find a nest, they won’t be able to produce a colony. “It’s a really tenuous point in the life cycle,” Woodard says. She wants to know how these intrepid queens get by in parts of California where manzanita doesn’t grow, and how they handle the



A yellow-faced bumble bee (*Bombus vosnesenskii*) on manzanita (*Arctostaphylos* sp.) in Sierra National Forest. Photo: Erica Sarro

unpredictable weather of early spring, when there can be flowers in bloom one warm day, and snow the next.


Woodard’s and her team’s careful observations of queen bumble bees throughout the year underscore just how many different kinds of flowering plants are needed to support a colony, she says. “It’s not just early-blooming plants, but the full season that matters, all the way through the end.”



For gardeners and others who want to support native bee populations, increasing the number of flowering plants that are available starting in February and lasting all the way into the fall can provide critical support, she says. “When you scale that out to all the other pollinators, you think, ‘Oh my gosh, we need flowers everywhere.’”

UC Riverside PhD student Natalie Fisher in Yosemite National Park. Photo: Hollis Woodard





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– Karen Joy Fowler

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# SAVE THE MESA

## BIODIVERSITY IS WORTH MORE THAN GOLD

BY MARIA JESUS

**Above:** The arid landscape of Conglomerate Mesa is home to many rare and endemic species, as well as dense Joshua tree woodlands (*Yucca brevifolia*).

If you love California's unique native plants, then you should know about Conglomerate Mesa. Unusual plant habitats abound in this section of the Inyo Mountains, where the Mojave Desert and Great Basin ecoregions meet. The area includes at least 16 rare plants listed in the CNPS Inventory, five of which are globally rare and warrant California Rare Plant Rank (CRPR) 1B status. It may be the site of "Teufel Canyon," a trove of unusual species discovered by desert ecologist Edmund C. Jaeger, who gave the area a false name to protect his favorite haunts.





## Clearly, this is no place for a sprawling open-pit mine.

Despite its thriving botanical diversity, Conglomerate Mesa is under threat. A revived gold market has spurred the foreign mining company K2 Gold and its subsidiary “Mojave Precious Minerals” to ramp up operations. The companies have proposed a significant escalation of their operations plan, originally issued by the Bureau of Land Management (BLM) to a different foreign mining company in 2018.

The current plan stipulates that heavy equipment must be transported by helicopter in order to limit excessive impact to this roadless and ecologically intact landscape. While the original project will undoubtedly cause some impact, such as the destruction of CRPR 1B plants like the Inyo rock daisy (*Perityle inyoensis*), it pales in comparison to what K2 Gold is asking for today: permission from BLM to construct a road and drill up to 30 additional sites within Conglomerate Mesa.

According to K2 Gold’s website, the companies will begin drilling exploration wells between August and September 2020. Based on the information available at the time of this writing, several rare plant species are likely to be impacted by the proposed expansion. Several Inyo endemics such as Cima milkvetch (*Astragalus cimae* var. *sufflatus*), Jaeger’s hesperidanthus (*Hesperidanthus jaegeri*), and the aforementioned Inyo rockdaisy approach their southern range extent in this area. Range edge populations such as these often harbor unique genetic diversity and may contribute to the continued existence of the species as a whole.

This area appears to be a stronghold for Joshua tree (*Yucca brevifolia*), which is on the decline in other parts of its range. Also present in the project area is a species so new to science that it was not considered in the BLM’s initial Environmental Assessment. The Badger Flat threadplant (*Nemacladus inyoensis*) is a diminutive annual known primarily from the White-Inyo range, and several thousand individuals were observed in the project area in 2020.

The Desert Renewable Energy Conservation Plan (DRECP), signed into law in 2016, strengthened protections for places like Conglomerate Mesa, which represent

the very best of our California desert wildlands. Conglomerate Mesa is designated as a California Desert National Conservation Land and includes two previously designated Areas of Critical Environmental Concern. The DRECP directs the BLM to protect nationally significant cultural and natural values within these boundaries, through specific measures such as limiting ground disturbance and establishing setback distances. Such measures help conserve desert treasures that have persisted here for countless generations, like Joshua tree woodlands and rare plants. Clearly, this is no place for a sprawling open-pit mine. Yet that is precisely the threat that looms on the horizon.

What might happen if K2 Gold’s investment in mineral exploration yields profitable findings? The type of gold suspected to occur at Conglomerate Mesa is a low-grade ore that requires cyanide heap leaching – a practice banned in Montana, Wisconsin, Costa Rica, parts of Argentina, Germany, the Czech Republic, and Hungary. If extractive activities escalate, they could have devastating impacts on this fragile desert environment.

*Maria Jesus (below) is a graduate student at California Botanic Garden/Claremont Graduate University, where she is completing a flora of the southern Inyo Mountains.*







# The Richard Garvey Intermediate School Nature Garden

## A Los Angeles school garden shows the resilience of native plants

BY MAYA ARGAMAN AND EMILY UNDERWOOD

When Jesse Chang set out to create the Garvey Intermediate School Nature Garden in 2015, he faced some design challenges. The proposed location was a weedy 62 x 168-foot plot with drainage issues, framed by an outdoor covered hallway, two academic buildings, and an asphalt playground.

Five years later, Chang, a CNPS Garden Ambassador, and the school community have transformed the plot into a beautiful educational garden, complete with a vernal pool that hosts native fairy shrimp, flowering quillwort (*Triglochin scilloides*), and native sages that attract migrating painted lady butterflies (*Vanessa cardui*).

Above: Native meadow and wildflowers line the pathway in the nature garden (All photos courtesy of Jesse Chang.)





Chang used **Calscape.org**, CNPS's tool for finding native plants suitable for your location, to select plants that could thrive in the plot. To support the garden through the largely unattended long summer months, he incorporated more perennial evergreen plants and made educational signs explaining the native plants' survival strategies.



Colorful patch of spring madia (*Madia elegans*) thriving in the garden.





Above: Farewell to spring (*Clarkia amoena*) lights up the corridor along one of the main garden paths.

## Tips from Jesse:

- **Don't go it alone**

Before Chang launched the garden in 2015, he rallied support from his community: "I took the success of another school garden and presented it to the superintendent with some board members' support. With their approval, we also got active support from facilities, principal, and teachers and students to help with the building and planting of the garden. It was truly a team effort!"

- **Find creative ways to keep kids engaged**

"Everyone is excited when you build and finish a garden, but helping to continue to inspire and engage students and teachers when they have so many other things going on is a challenge," Chang says. To keep students engaged, the school invited local college students from a Cal State LA physiology course to do plant studies with the science classes in the garden.

Below: CSULA Plant Physiology college students who taught junior high science students. Last row (left to right): Amy Vasquez, Simone Benjamin, Felicia Libifani, Dr. Kirsten Fisher, Joseph Zailaa, Jose Cuba. Middle row (left to right): Ugbad Farah, Dr Christine Scoffoni, Kristen Joiner, Ileana Lucero. First row (left to right): Charlotte Monsour, Nicolette Guerrero, Amber Joly







Above: Garvey Intermediate School students noting plant characteristics of California brittlebush (*Encelia californica*).

Left: Blue elderberry (*Sambucus nigra* ssp. *caerulea*) near the entrance of the nature garden.



Favorite way to enjoy the garden:

“

After the kids leave, I like to linger in the garden when it's quiet, the sun is setting, and it's just the plants and the wildlife remaining. Nature therapy at its best.”



# In the Herbarium

## Using insects to save plants: the Randall Morgan Collections



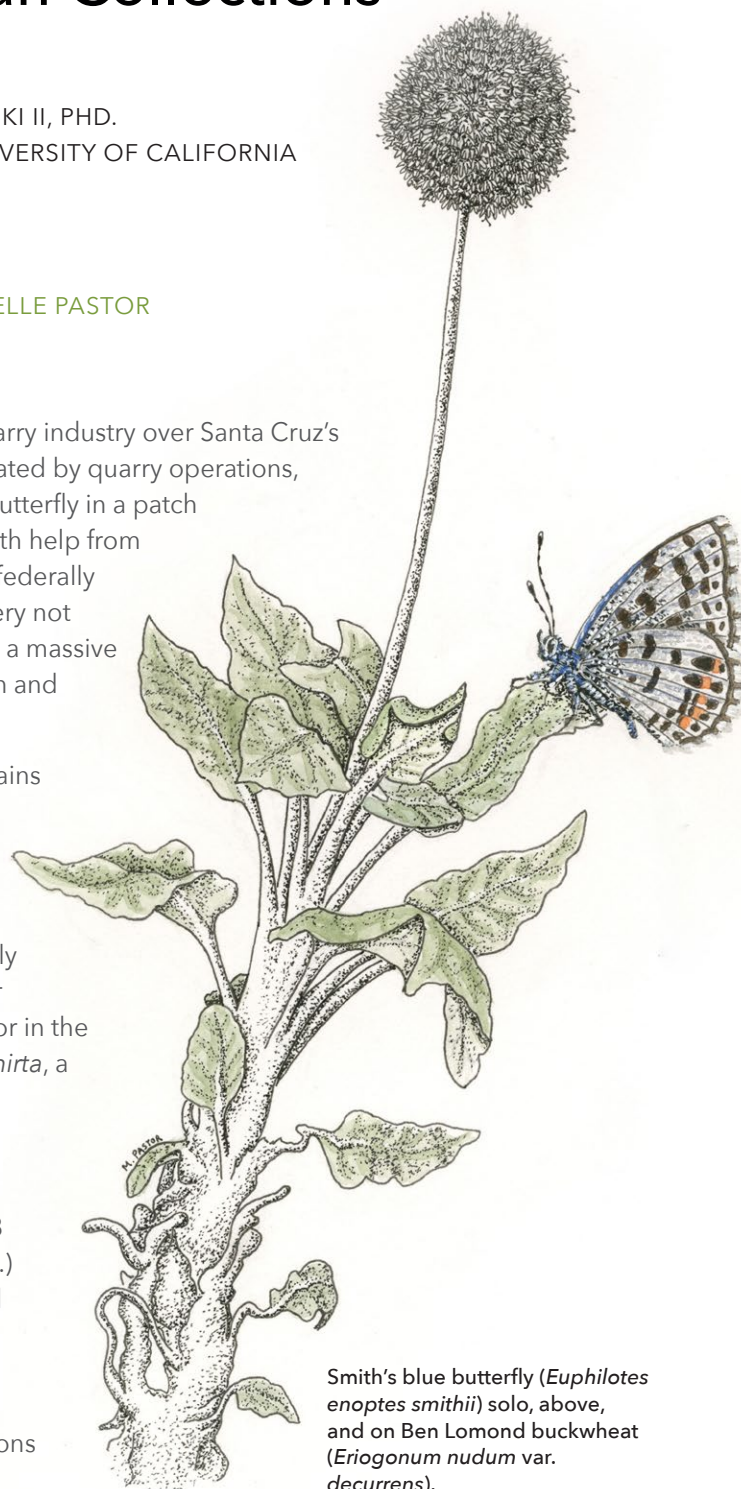
BY ANDY J. KULIKOWSKI II, PHD.  
LECTURER AT THE UNIVERSITY OF CALIFORNIA  
SANTA CRUZ

ALL IMAGES BY MICHELLE PASTOR

In the 1980s, a battle raged between conservationists and the quarry industry over Santa Cruz's unique sandhills habitat. While surveying a site previously decimated by quarry operations, botanist and CNPS fellow Randall Morgan found a peculiar blue butterfly in a patch of Ben Lomond buckwheat (*Eriogonum nudum* var. *decurrens*). With help from entomologists, Morgan confirmed that the tiny pollinator was the federally endangered Smith's blue (*Euphilotes enoptes smithii*). The discovery not only helped protect a large section of sandhills, but also catalyzed a massive effort by Morgan to use insect collections to promote conservation and protect habitat for native plants.

In 1989, Morgan began collecting insects from the highest mountains to the coastal dunes of Santa Cruz County. After 10 years of exhaustive surveys, his collection boasted over 70,000 insect specimens. First and foremost a botanist, Morgan also collected thousands of plant specimens and recorded detailed plant associations for each of his insects, making his collection a uniquely valuable record of species interactions at the community level. For example, Morgan's data revealed that the most abundant pollinator in the county wasn't a bee or butterfly, but instead the hover fly *Eristalis hirta*, a honey bee mimic that pollinated 83 plant species.

Morgan's collections are now housed at the Kenneth S. Norris Center for Natural History at UC Santa Cruz, where they drive important research on plants and pollinators. For instance, in 2018 undergraduate researchers found that bumble bees (*Bombus* spp.) pollinated a quarter of the plant community in coastal prairies and almost a third of plants in coastal dunes,\* an important finding given recent declines in bumble bee populations. Morgan also kept detailed notes of his study sites, which graduate researcher Angelita De la Luz later used to compare plant-pollinator interactions



Smith's blue butterfly (*Euphilotes enoptes smithii*) solo, above, and on Ben Lomond buckwheat (*Eriogonum nudum* var. *decurrens*).



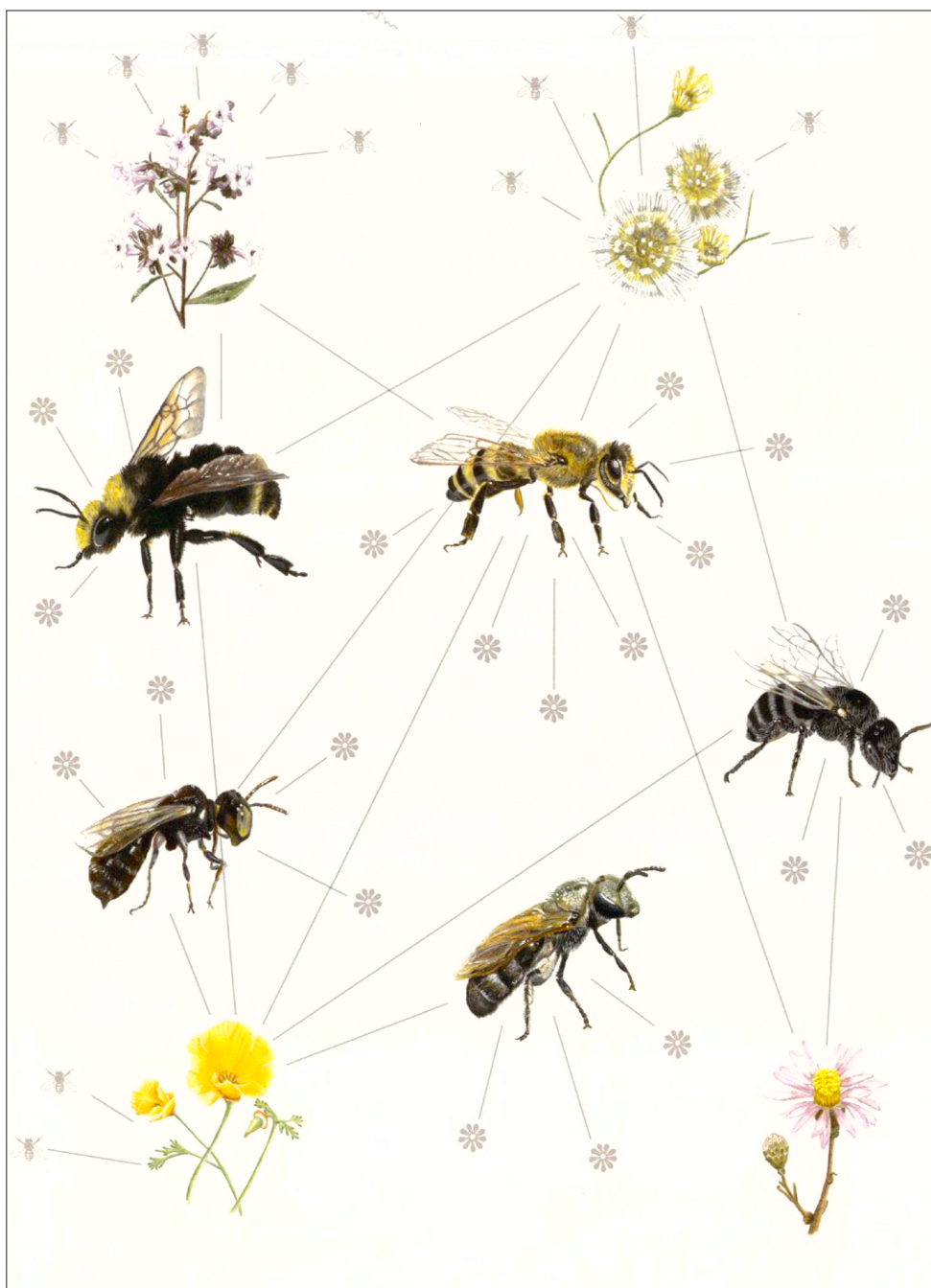


Ohlone Tiger Beetle  
(*Cicindela ohlone*)

from 2013-2015 to those in the 1990s. She found that interactions between native plants and their pollinators changed dramatically in coastal grasslands, with fewer species interacting today than 30 years ago. Angelita's work may help identify key species for conservation and slow the erosion of ecosystems.

Morgan's near obsessive collecting paid off in 1993 when he discovered a new species of beetle that exists in only a few pockets of coastal prairie. He named it the Ohlone tiger beetle (*Cicindela ohlone*) and championed its listing as a federally endangered species. Like the Smith's blue, Morgan's discovery aided in the protection of critical plant habitat such as the Mima Meadows on UCSC's campus and Glenwood Open Space Preserve in Scotts Valley. In fact, Morgan's fingerprints are on virtually every habitat conservation effort in Santa Cruz County over the last 40 years, including the 189-acre Randall Morgan Sandhills Preserve, named to honor his advocacy for the rare and diverse ecosystem.

Despite his death in 2017, Morgan's legacy continues through his collections. The Norris Center has recently made Morgan's extensive work on his beloved genus *Trifolium* available to fellow clover enthusiasts so they may continue the genus revision he started.\*\* And considering that only half of Morgan's insects are currently identified, many important pollinators such as beetles and wasps await the next wave of naturalists to carry on Morgan's spirit of conservation and discovery.



Artist's representation of plant-pollinator interactions in the sandhills from Morgan's 1990-93 data. Lines from insects represent pollination of specific plants. Lines from plants represent pollinators that visited those plants.

\*\*<https://randallmorganinitiative.ucsc.edu/data-and-research/research-projects.html>





# In the Garden

## No space too small: 10 tips for attracting pollinators to your garden

BY HILLARY SARDIÑAS

**P**ollinators are incredibly adept at seeking out resources, even in cities. I live in the East Bay, where I've seen a variety of pollinators find a single poppy growing from a crack in the sidewalk.

Even if you only have a small area, planting pollinator-attractive species is better than doing nothing at all. My garden is just five feet by 30 feet, and though I only planted it in fall 2019, this small strip already provides important resources for pollinators. Every time I go out, I see dozens of pollinators enjoying the flowers. In turn, I get to enjoy the feeling that I'm contributing to their conservation.

**When designing a pollinator garden, here are a few things to consider:**

### 1. Incorporate plants that bloom throughout the season

Depending on where you live in California, you can provide floral resources for pollinators

from February through October. Manzanita (*Acrostaphylos* sp.) is one of the earliest blooming plant species in the state and often provides critical sustenance for queen bumble bees as they start their colonies. In the fall, gumplant (*Grindelia* sp.), aster (*Symphyotrichum* sp.) and coyote brush (*Baccharis pilularis*) provide late-season blooms. A general rule is to have at least three species in bloom each season.

### 2. Include diverse flower types

Plant open flowers like clarkias (*Clarkia* sp.), as well as tubular corollas like beardtongue (*Penstemon* sp.). This ensures a variety of flower shapes for all the different pollinators likely to visit your garden. Some plant species, such as yarrow (*Achillea millefolium*),

**Above:** Sardiñas with daughter Nylea, 5, in her pollinator-friendly garden. Photo: Jamie Tibbetts

All photos courtesy of Hillary Sardiñas.





Coyote mint (*Monardella villosa*), monkey flower (*Mimulus* sp.), and California poppies (*Eschscholzia californica*) attract a variety of pollinators. Photo: Hillary Sardiñas

are only visited by flies and sweat bees. Hummingbirds are more likely to visit red flowers like California fuchsia (*Epilobium canum*) or columbine (*Aquilegia* sp.). If you don't already know what does well in your yard, including many different types of plants ensures some survive to continue supporting pollinators while you decide what to replant.

### 3. Go native

Dr. Gordon Frankie of UC Berkeley recorded bee visits to different plants and found that native bees prefer native plants. It makes sense, as native bees coevolved with native plant species. In my garden, I selected plants that are native to California, and whenever possible, were grown from seed collected in my East Bay watershed. Native plants are adapted to local climates and tend to thrive without as much care or water. I'm not a stickler, however, and included a few edibles such as lemon verbena and pomegranate.

### 4. Add annuals as your garden gets started

I mostly planted woody and herbaceous perennials such as coyote mint (*Monardella villosa*) and shrubby monkey flower (*Diplacus aurantiacus*). I recommend sprinkling in native annual wildflowers to help fill in the gaps until the larger plants get established. Lupines



Use CNPS's online tool [Calscape.org](https://www.calscape.org) to find the best native plants for pollinators in your area.

(*Lupinus* sp.) and Phacelia (*Phacelia* sp.) are highly attractive to pollinators. Most of these wildflowers will likely peter out over time, though some may continue re-seeding themselves. If you do add wildflower seeds, I recommend weeding only grasses and other known weeds so you don't inadvertently remove desirable species.

### 5. Select plants appropriate for each area of your yard

My house gets a lot of sun in the front, so all of the plants are listed as suitable for "full sun" unless they can grow in the understory of the shrubs. I also selected mostly locally-occurring native species. If you don't know what to plant, try going on a garden tour or attending plant sales at local native plant nurseries and asking what they recommend. Be prepared for some trial and error until you find what does best in your space. You may also find different areas of your garden are slower to fill in due to differences in soil texture or shade, but this is natural. Patience is key.

### 6. Provide nesting sites for ground-nesting bees

The majority of bee species nest in holes they dig in the soil, and require access to bare patches of ground for nesting. Mulch can cover nesting areas, so I avoid it, instead placing plants close together to outcompete weeds. You can also incorporate ground cover species such as strawberry (*Fragaria vesca*)

**Below:** Sardiñas started planting this narrow strip in 2019 and will expand to the upper terrace in winter 2020. She has left some ground bare, to encourage nesting pollinators.





and yerba buena (*Clinopodium douglasii*), or woody plants that lie close to the ground, like some manzanitas and ceanothus. These plants form mats but also contain spaces between their stems where bees can nest. Compared to mulching, this strategy requires more vigilance and weeding during the first year, but over time the larger perennials also help shade out weedy non-natives and reduce the need for weeding. If you do need to mulch, try to include bare patches in areas that are more hard-packed where weeds have a harder time establishing.

### 7. Protect habitats from pesticides

The Xerces Society for Invertebrate Conservation recently tested samples of milkweed from retail nurseries, nature preserves, working lands, and urban areas for pesticide residue. They found, on average, nine pesticides per sample even in environments where pesticides were not applied. Many nurseries also use neonicotinoids, a systemic pesticide that is expressed throughout a plant, including in its pollen and nectar, and is toxic to many pollinator species. Whenever possible, ensure that the plants you select for your garden are pesticide-free so you don't inadvertently harm the pollinators you're trying to attract. In addition, avoid using pesticides on plants when they're in bloom, and shelter them from pesticide drift using vegetative barriers composed of non-flowering species.

### 8. Plant with the rain

Planting during the rainy season means delayed gratification as the plants remain small until spring. The reward is that they develop their root systems and explode once the days lengthen. You also capitalize on naturally available water, minimizing irrigation. If you are using predominantly native plants in your yard, remember that they are adapted to winter rain and summer droughts. As time goes by, I plan to conserve water by weaning the plants off drip irrigation.

### 9. Creating habitat is a process

You don't have to create the perfect habitat all at once. Take your time and do it right, but also remember that it is a work in progress. I'm not finished planting and plan to continue adding another terrace of flowering native plants, drought-tolerant grasses and succulents this fall. If you time things right, you can achieve great results quickly. My garden has less than a season of growth but is already buzzing with bees, beetles, butterflies, and flower flies.

### 10. Educate your neighbors

Weeding and tending my garden provides the opportunity to talk to neighbors that walk by. They comment on the progress I've made, and I have the opportunity to educate them about drought-tolerant native pollinator gardens. It's a win-win.



*Hillary Sardiñas is an entomologist living in Albany, CA. When she isn't gardening with her children, nieces and nephews, she assists resource conservation districts throughout the state with their pollinator conservation programs on natural and working lands.*

**Sardiñas weeding with her three-year-old daughter Jada. Photo: Jamie Tibbetts**



# Fall is Planting Season!

Give your native garden a great head start by planting in time for winter rain.

Find the information you need with CNPS online.

## CNPS Online Resources for Gardeners

**Calscape.org**

Discover the right plants for your location.

**CNPS.org/  
planting-guides**

Design inspiration and plant lists from your local CNPS chapter.

**Calscape.org/  
nurseries**

Find a native plant nursery near you.



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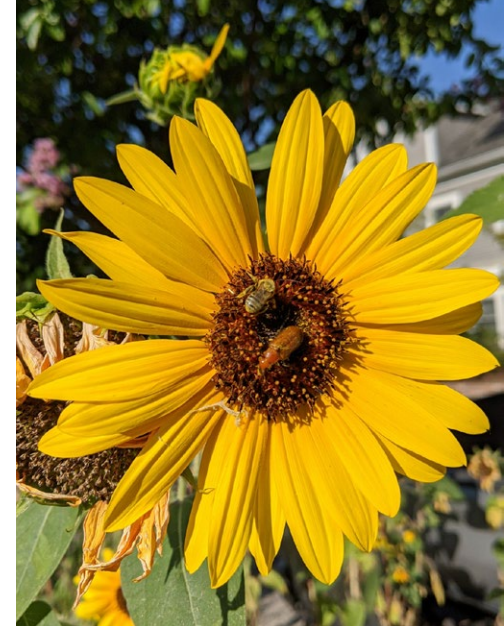
Elizabeth Kubey  
Photo: Jisoo Kim

# Pollinator party

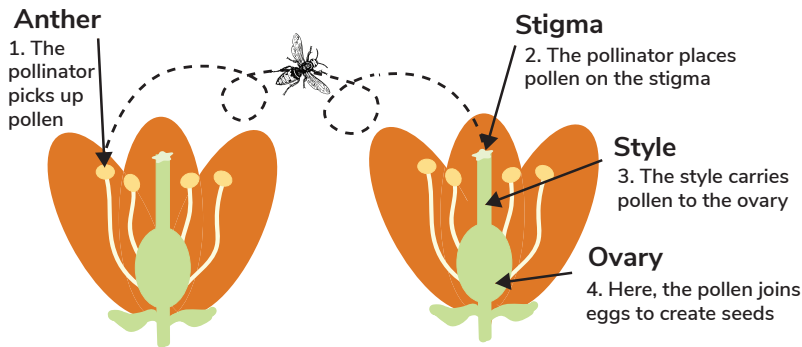
BY ELIZABETH KUBEY





On my neighborhood walk this week, I stopped to look at a patch of bright yellow sunflowers. Standing on the sidewalk, I forgot my urban surroundings as I focused on insects crawling around on the flowers, covered in fluffy yellow pollen.

If you asked me what pollinators were when I was a kid, I probably would have said just “bees” and “butterflies.” But I’ve learned that many creatures can be pollinators, including beetles, birds, bats, and more. Let’s get to know these lively creatures who help our native plants bloom.



Bee and beetle on sunflower  
(*Helianthus annuus*)



-  **Anther:** The part of flower that makes pollen.
-  **Stigma:** The sticky top of the style that receives pollen.
-  **Style:** The tube-like structure where pollen travels to the ovary.
-  **Ovary:** A structure at the bottom of the pistil that holds eggs (ovules) and makes seeds when joined with pollen.




## Pollinator Bingo Walk

Go on a walk around your neighborhood and try to find these plants and pollinators. Write down what you observe about how pollinators are interacting with the plants. Find as many of the items as you can. A “bingo” is five across in any direction!

*What surprised you on your walk?*

*Did you notice what plants pollinators like to visit?*

## New Words:

-  **Pollen:** A fine powdery substance full of microscopic grains that helps plants make fruits, nuts, and seeds. All flowering plants and conifers (plants that make cones) make pollen.
-  **Pollination:** When grains of pollen travel from a flower’s anther structure to the stigma, to create a seed (see figure to the left). Some plants need help from insects and animals to carry the pollen. For other plants, wind and water can do the trick. Some plants can pollinate themselves, while others must get pollen from another plant.
-  **Pollinator:** An insect or animal who helps move pollen.

B	I	N	G	O
Brown leaf	Insect with pollen on it	Garden sculpture	Pollinator flying	Fruit growing
Bee	Leaf with a hole	Red flower	Butterfly	Tree taller than you
Plant smaller than your thumbnail	Beetle	Free space	Seed pod	Yellow leaf
Hummingbird	Orange flower	Leaves blowing in the wind	2 Insects on one plant	Pollinator on the ground
Plant growing next to a sidewalk	A smelly plant	Seeds	An insect you don't know	Bird resting on a tree



## Host Plants and Their Butterflies

When you invite friends into your house and offer them snacks, you are being a good host. When plants provide insects and other pollinators with shelter and food, we call them "host plants."

Building off our summer adaptation lesson, we know that plant and animal species can change over long periods of time in order to survive and thrive in different habitats. Sometimes pollinators and plants coevolve, meaning they change because of each other. Some host plants and pollinators depend on each other to survive because of their long histories of working together.

Visit [Calscape.org](https://www.calscape.org) and click the butterfly tab to learn about three butterflies and their host-plants.

Butterfly name: \_\_\_\_\_

Latin name: \_\_\_\_\_

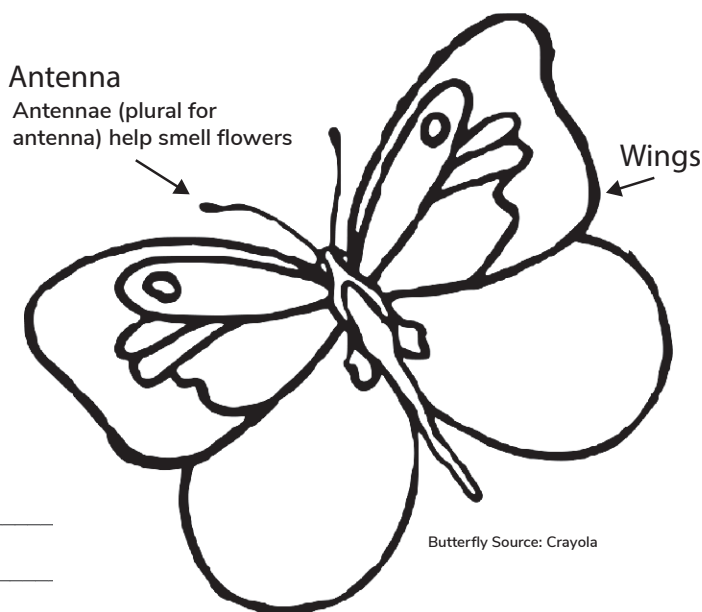
How many host plants do I have?: \_\_\_\_\_

Name 1-3 host plant(s): \_\_\_\_\_

Two observations of the butterfly: \_\_\_\_\_

Two observations of the host plants: \_\_\_\_\_

Color in this California dogface butterfly (*Zerene eurydice*), California's state insect.



Butterfly Source: Crayola

## Zine

Choose your favorite butterfly and tell its story by making a zine. A zine is a tiny do-it-yourself magazine that combines images and words. There are no rules. Be as creative as you want! You can make a couple and share them with your friends.

**Materials:** ✓ Paper (at least 8.5 x 11") ✓ Scissors ✓ Coloring supplies

**How to make a zine booklet:**

**Step 1:** Fold your sheet of paper in half. Fold it again into quarters, and one last time to make 8 sections.

**Step 2:** Open your paper so that it is folded in half. Cut halfway across the middle from the fold. When you open your paper there should be a slit in the middle.

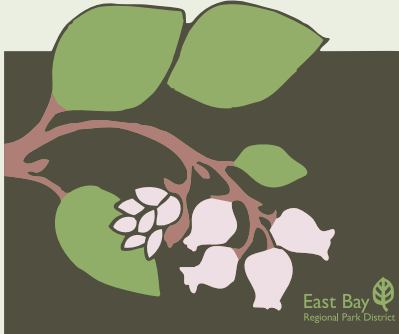
**Step 3:** Fold your paper lengthwise, along the fold that has the cut. Hold the paper at either end, then push the ends in toward each other to create an 8-page booklet.



If you play bingo or make a zine, take a picture and with the help of an adult post your images on social media and tag @californianativeplantsociety or email ekubey@cnp.org.



## REGIONAL PARKS



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# Upcoming Events | SEP 7 - NOV 12

Fall planting season is here! Pick up a few more plants and learn something new from a virtual talk. We'll be doing our best to keep you updated through social media, [cnps.org/events](https://cnps.org/events), and your local chapter website and newsletters.



## Featured Event

### Superbloom in the California Desert 2019

**SEPT 23**  
MT. LASSEN CHAPTER

A photographic journey to Anza Borrego State Park and Joshua Tree National Park during the Superbloom of 2019 with Dr. Gerald (Jerry) Meral, director of the California Water Program at the Natural Heritage Institute.

**Right:** Bigelow's monkey flower (*Diplacus bigelovii*) in Anza Borrego 2019 Photo: Elizabeth Kubey



## SEPT

**SEPT 7**

### California Biodiversity Day

*CNPS and Partner Organizations*

Proclaimed by Governor Edmund G. Brown, Jr., by Executive Order, in 2018, we celebrate California's biodiversity on September 7. CNPS and partner organizations like iNaturalist will have activities throughout the week.

**Right:** Monarch caterpillar on milkweed Photo: Tony Tubbs

**SEPT 8**

### Western Monarch Butterflies: Creating Habitat with Native Plants

*LA/SMM Chapter*

Theodore Payne Foundation Outreach Manager Erin Johnson will present on how to attract and support these iconic butterflies.



**SEPT 9**

### Mt. Rainier Wildflower Adventure

*Mt. Lassen Chapter*

Join Donna Wildearth on a journey to see the sub-alpine wildflowers on Mt. Rainier.

**OCT**

**OCT 7**

### Fire and Research Natural Areas in California: Restoring a Key Ecological Process to Reference Landscapes

*Mt. Lassen Chapter*

Join Hugh Safford and Michelle Coppoletta of the US Forest Service to learn about Research Natural Areas (RNAs).

**OCT 13**

### City of Los Angeles' Wildlife Pilot Study

*LA/SMM Chapter*

City of Los Angeles Urban Ecologist Kat Superfisky and City Planning Associate Lena Mik will talk about an area in the Santa Monica Mountains that is a mix of low-density residential lots and large natural areas.



## UPCOMING EVENTS

### Fall Native Plant Sales

CNPS chapters are offering online sales, shopping by appointment, and/or curbside pick-up. Visit chapter websites for details.

**Bristlecone Chapter** - Order August 16-20, pick up on August 22

**San Diego Chapter** - Order September 1-15, pick up October 31 and November 1

**Sac Valley Chapter** - Order September 21-24, pick up on September 25 and September 27; Order October 19-22, pick up on October 23 and October 25; Order November 3-5, pick up on November 6 and 8

**Monterey Bay Chapter** - September 25 - October 1, pick up on October 3

**South Coast Chapter** - September 26 - October 3, pick up on October 3

**North Coast Chapter** - By appointment September 26 and 27

**Willis Jepson Chapter** - Order October 1-8, pick up on October 10



Photo: Jim Wadsworth

**El Dorado Chapter** - Order October 1-7, pick up on October 17

**Riverside/San Bernardino Chapter** - Order October 8-20, pick up on November 7

**LA/SMM Chapter** - Order October 10-17, pick up on October 17

**Napa Valley Chapter** - Order October 4-10

**Milo Baker Chapter** - Order October 7-11, pick up on October 11 and 12

**Shasta Chapter** - Order October 18-29, pick up on October 24 and 31; Order November 6-12, pick up on November 14

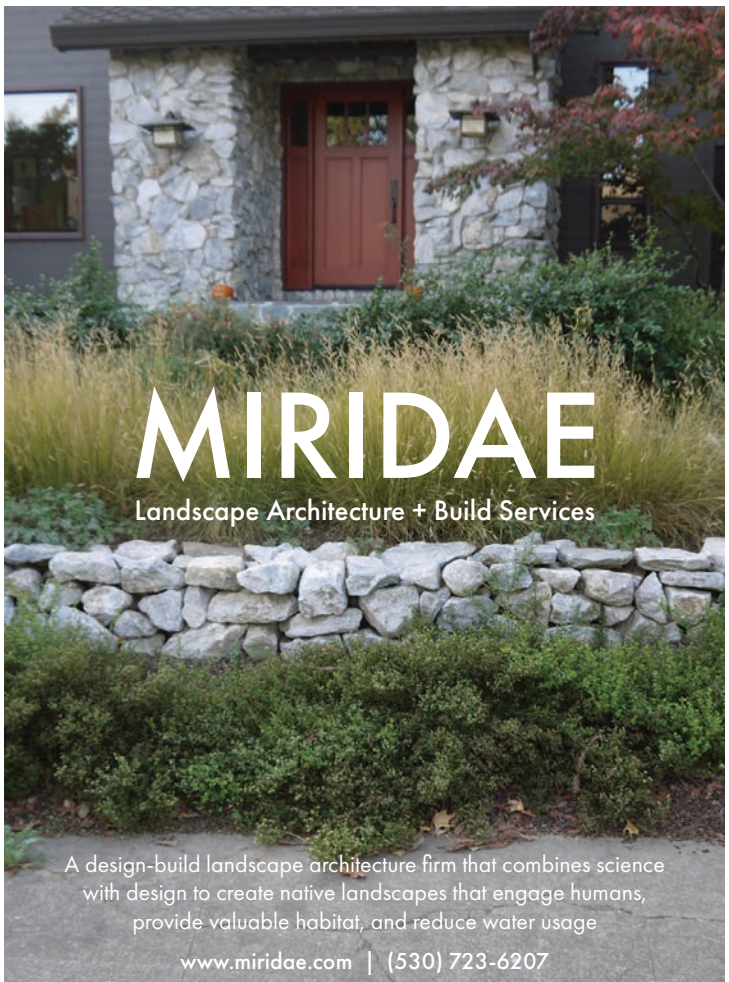
**San Gabriel Mountains Chapter** - Order October 24-31, pick up November 7

Don't know a chapter website? Look it up at [cnps.org/chapters](https://cnps.org/chapters).

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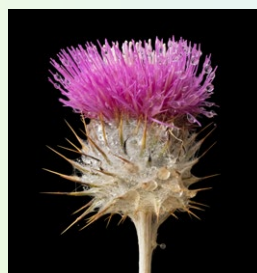
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# Calscape.org



Photo: Dennis Mudd

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