
# Ecesis

California Society for Ecological Restoration *Quarterly Newsletter*

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# Rediscovering a Lost Grass in San Diego County

*by Margie Mulligan*[1]

Grasses, though members of a large and important family, are often overlooked, either obscured in the vegetation or deemed difficult to identify. Botanists recently rediscovered a small, indistinct grass species thought to be extinct, right in our own backyard. The native grass, *Sphenopholis interrupta* subsp. *californica* (Baja California oatgrass), was known from only two voucher specimens collected in the state of Baja California, Mexico, in 1886 by Charles Orcutt.

Orcutt, a San Diegan, was a for-hire specimen collector, specializing in plants and shells. He was often in search of new records or new species to science, apparently in competition with others in his profession. In the spring of 1886, at just 20 years old, he and a companion left on a month-long collecting trip through northern Baja California. They crossed the border along the Tijuana River, passing the Old Wildcat Station, and entered Carisito Valley, west of Valle de Las Palmas. On April 1, 1886, somewhere along the route, he made his first collection of *S. interrupta* subsp. *californica* — the label listing the locality as "Northern Baja California, near the U.S. boundary." Riding a two-horse wagon, they made their way south, eventually reaching San Ramón Creek. Finding it swollen and uncrossable, they were forced to camp nine miles down the creek from the sea at the mouth of a large canyon. On April 19, along his return route to the coast, again following San Ramón Creek, Orcutt collected the grass once more with the label vaguely stating

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Above: From left, re-discoverers Jessie Vinje and Margie Mulligan at the *Sphenopholis* habitat.



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# Rediscovering a Lost Grass in San Diego County

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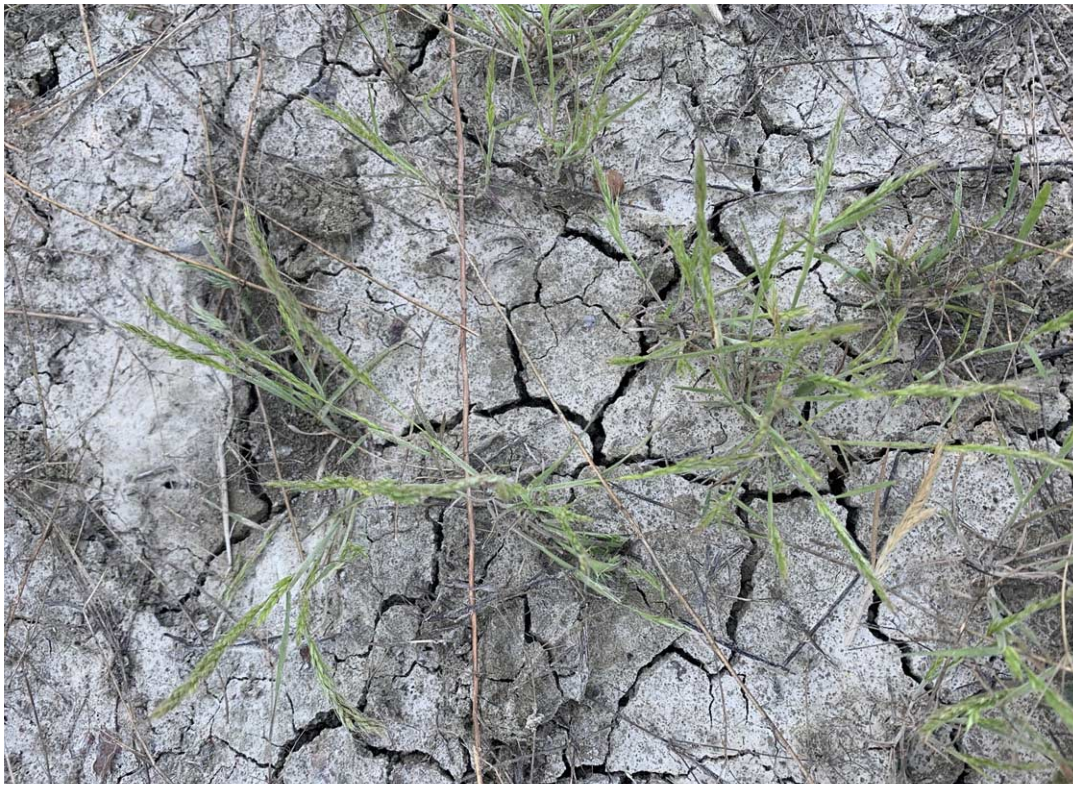

*Sphenopholis interrupta* subsp. *californica* in its "home turf" —clay lens soil.

"San Ramón." Orcutt left no written clues about the grass, despite detailing his adventures in his journal, *The West-American Scientist*, and his obsession with new records. Several voucher specimens were created and dispersed to herbaria across the globe, where they were stored away and immediately forgotten.

On April 23, 2020, 134 years later, botanists Margie Mulligan and Jessie Vinje rediscovered *S. interrupta* subsp. *californica* on two small clay lenses in central Carlsbad, CA. They were studying another rare species, the federally listed *Acanthomintha ilicifolia* (San Diego thornmint), and encountered an unusual grass growing in the same habitat that they could not identify with available grass keys. They enlisted the help of Dr. Jon Rebman, Curator of Botany at SDNHM, and he recognized it as one of the Baja California species on a list of lost plants that he had been searching for.

The San Diego locality not only represents a rediscovery of a presumed extinct grass last collected by Orcutt in the late 1800s, but also a new record for the United States. Recent botanical surveys by the Botany Department at the San Ramón area in Baja California were unsuccessful in relocating this taxon because very little natural habitat remains for this species. Areas near the original localities are heavily impacted by agriculture and urban development resulting in extreme habitat loss and fragmentation. Very little native habitat remains in the vicinity of the second Orcutt collection — "near the U.S. boundary"— which is likely within the eastern edge of present-day Tijuana. Surveys of the remaining clay lens habitats near the coast in western San Diego County and northwestern Baja California are proposed and could determine if additional populations of this taxon exist.

Locating native annual grasses in San Diego County is difficult due to the introduction and aggressive invasion of nonnative, annual grasses, such as *Brachypodium distachyon* (purple false brome) and *Bromus rubens* (red brome). Grass-specific herbicide, an important tool used to control nonnative annual grasses, is unfortunately also a threat to *S. interrupta* subsp. *californica*. It is important to consider conducting surveys for this and other native annual grasses prior to beginning any restoration project where grass-specific herbicide will be used.

It is important to consider conducting surveys for native annual grasses prior to beginning any restoration project where grass-specific herbicide will be used.

San Diego County is one of the most botanically diverse regions in the United States with nearly 2,800 plant taxa. Despite being a well-documented county, we continue to find new native records and new plants to science. This recent discovery shows that even in previously surveyed areas, an extinct grass (and a new U.S. record), can be hidden, waiting for the perfect environmental conditions to reveal itself.

**Acknowledgements**

Co-discoverer Jessie Vinje is a botanist with 21 years' professional experience in field biology, botany and land management throughout California with a strong background in coastal and desert ecology, and natural resource management and restoration. She works for Conservation Biology Institute and currently co-manages and co-leads a regional rare plant monitoring effort for the San Diego Management and Monitoring Program in San Diego County, California.

# San Diego County Clay Soils and Their Association with Sensitive Habitats and Species

*by Scott McMillan*[1]

Southern California and Northwest Baja California are home to numerous rare and endangered plant species, and many of these endemic plant species are closely associated with clay soils of one type or another. Clay soils can be found in a wide range of land forms throughout San Diego County, including the coastal mesas and canyons and the inland foothills and mountains.

Clay soils can form both at the surface or within lower soil horizons, and within a wide range of environments, including marine sediments, volcanic fields and deposits, or from weathering rock formations. Clay soils are defined by having material with small particle size, but they also have specific chemical compositions, layered structures, and other special physical and chemical characteristics. Most clay soils have an affinity for water, swelling as much as double in thickness when wet, and shrinking dramatically when dry. Most clays also have the ability to soak up ions (electrically charged atoms and molecules) from a solution and then release those ions later when conditions change.

Because of these factors, it can be difficult for many plants to extract the water and important minerals from the clay soil, and the seasonal swelling and shrinking of the clay can disrupt and damage the roots of many species. In San Diego County, areas where the soils are dominantly clay (especially at the surface), vegetation is often characterized by native grasslands habitats or by open soil areas. The open soil areas are sometimes defined by a "clay lens", where the boundary of the clay soils and the non-clay soils is very distinct at both the surface and in the lower soil horizons. These clay lenses support annual wildflower species, as well as perennial grasses, subshrubs, and

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# Meet the Contributor: **Margie Mulligan**

**Occupation:** Botanist

**County of residence or work:** San Diego County

**What is your specific discipline (or underlying education)?**

M.S. Botany. I specialize in the flora of San Diego County, especially the rare and overlooked plants. I also like to cross over to Baja California and enjoy looking for our "cross-border" species.

**What services do you provide for restoration in California?**

I have performed transects for projects post-restoration. I am an avid voucher specimen collector so I add to the flora of San Diego County which assists restoration work.

**How did you find your passion for what you do?**

I have always loved Botany. I grew up in the hardwood forests of Ohio and loved to go on wildflower hikes with my family. In College, I took a month-long spring botany/birding field class in northern Minnesota and have been hooked ever since. I even met my husband on the course, 25 years ago.

**What is your favorite California native species?**

*Choloropyron maritimum* ssp. *maritimum* (Orobanchaceae), salt marsh bird's-beak is my favorite CA Native. It is listed by the State of California as Endangered and by the Federal Government as Endangered and CNPS rank of 1B.2. It is a hemiparasitic annual that is distributed in salt marshes in CA to Baja California. The largest populations occur in the U.S..

**Any advice for colleagues in the field of restoration?**

Learn and use scientific names! They are standardized and universally accepted. It helps avoid confusion created by multiple common names especially with varieties and subspecies.

Above: Close-up of the once-elusive Baja California oatgrass.

# San Diego County Clay Soils and Their Association with Sensitive Habitats and Species *continued*

bulb species. In San Diego County, the clay lenses are often found intermixed in a matrix of coastal sage scrub or chaparral habitats, where the soils have less clay and the more woody shrubs are able to establish. When clay soils are found in flat areas in association with the hummocky landscape called mima mounds, the clay soils can keep the water table perched at the surface, forming vernal pool habitat.

The grassland, clay lenses, and vernal pool habitats that are associated with the clay soils often support native plant species that are endemic to these environments and have evolved to survive in these clay soils. This includes many that are considered rare, endangered, or sensitive in some way. In San Diego County this includes vernal pool species like Otay Mesa mint (*Pogogyne nudiuscula*) or San Diego button celery (*Eryngium aristulatum* spp. *parishii*), as well as native grassland and/or clay lens species like thread-leaf Brodiaea (*Brodiaea filifolia*), and San Diego thornmint (*Acanthomintha ilicifolia*). Perhaps the newly rediscovered species *Sphenopholis interrupta* ssp. *californica* is one of these rare and endangered clay lens specialists.

All of these clay endemic species have been impacted by disturbances that have led to a decline in their status and distribution. Disturbances and impacts include habitat loss from development and fragmentation, non-native plant invasion, recreation use, catastrophic fires, and potential climate change. Because many of these clay soil species are rare and endangered, our management of these clay soil habitats has been a priority for many years, with many of the earliest habitat restoration efforts in San Diego County history targeting these clay endemics and their habitats. These clay habitats and the unique species that occur in them are some of the most difficult habitats and species to restore, manage, and preserve. Restoration and management of these clay soil habitats requires a level of detail and patience unlike most other habitat restoration efforts.

Despite the challenges, there have been many successful habitat restoration efforts for these clay endemics over the last twenty five years in San Diego County and other areas of California. This restoration work has shown that not only can we stabilize and manage habitat for these rare and endangered clay endemics, we can also restore and re-establish them where they have been extirpated. In addition, the successful restoration of these clay habitats will often benefit multiple sensitive plant species, not to mention the rare and endangered wildlife that is found in these habitats, like the Quino checkerspot butterfly (*Euphydryas editha quino*). With an adequate program of habitat management and restoration, applied where and when it is needed, we can help ensure that these amazingly adapted species and the clay soil habitats that support them, will persist into the future.

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## Many thanks to our generous 2020 conference sponsors!

# A Letter from SERCAL President Allegra Bukojemsky

**Thank you** for your engagement, membership, and support during this challenging year. A couple years ago we decided to separate our conference planning from the presidential duties so that we could support our members and the practice of ecological restoration in California beyond our annual conference. With that separation of duties, we were beginning to take the time to look at our organization and consider opportunities and steps to take, then 2020 presented the continuous stream of challenges. We have been figuring out how to navigate these challenges and see a future full of opportunities. Here are some of the changes we are working on:

**Virtual connections.** I can't say enough about our conference planning team on the quick adaptation to a virtual conference. And of course a big thank you for all the speakers that stepped up to present virtually, and all of you who attended and sponsored. While a little painful initially, the transition to virtual has and will continue to enable us to reach out and connect to more students and young professionals from underserved communities and underrepresented identities. We are also planning to schedule virtual get togethers, like the fun and successful trivia night in July — stay tuned for more. And if you are on social media you can find us on LinkedIn, Facebook, and Instagram.

**Sponsorship and membership.** With the organization looking to broaden our work beyond conference implementation, we decided to change our sponsorship from just conference-focused to an annual support of the organization, aligning with membership renewal. The annual sponsorship (see page 17) will still provide conference benefits, but will now provide year-round recognition and benefits, while helping us better manage our annual budget and expand our member benefits. We hope this change, with the call for sponsorship beginning in Fall for the new year, will also help you better plan your sponsorship by coinciding better with your professional annual budget management. We recognize that the transition this year results in that call coming on the heels of the conference sponsorship. There will still be the opportunity to do some conference-specific sponsoring if you can't commit to an annual sponsorship.

**Diversity.** The Black Lives Matter movement made us look even harder at our lack of diversity and cultural stratification in our organization and the California restoration industry. We have started having some uncomfortable conversations, but also realize we need more diversity amongst those of us having these conversations. We are forming a diversity task force to help us better understand how we can better acknowledge and address this in our organization, as well as in the industry. Stay tuned for a survey, shared insights, and meaningful change.

**Student engagement.** How many of us actually were exposed to the idea that there was an ecological restoration industry while we were in school? And did you have any idea about how many different disciplines are and can be involved: engineers, landscape architects, ecologists, planners, contractors, landscapers…? At SERCAL we would like to change that. We are slowly thinking of how to better outreach to and engage a more diverse and younger generation. We made an extra effort to reach out to student and youth groups for our conference this year, thank all of you who sponsored student attendees. Do you have ideas or connections, would you like to be involved in this effort? If so please reach out directly to me.

**The future** is full of opportunities, and I hope you will help us grow to be even more of a resource to you and the California restoration industry. We always have a need and interest in our members contributing or being directly involved in the organization. Your involvement and voice is important to us. We are always interested in content for our newsletter, webpage, or social media. Do you have project experience or research to share? Would you be interested in being involved in a committee, specific focus group, or on the Board of Directors? Please reach out to us with any thoughts, ideas or interest. I look forward to our continued collaboration.

Sincerely

Allegra Bukojemsky

# Remembering John Anderson

Founder of Hedgerow Farms who shed the light on so many lives and careers in the ecological restoration of native California habitats.

John was the first recipient, *and the reason we began awarding*, SERCAL's Lifetime Achievement Award —presented to him at the SERCAL 2017 conference by Harry Oakes.

*We will miss him.*

John Anderson, veterinarian and pioneer in the restoration of native California grasslands, died on August 19 at the age of 77. He's considered by many in the conservation community to be a visionary who developed methods for turning barren, weedchoked land into flourishing native habitats.

Since he was a teenager, Anderson had a passionate connection to the natural world and was at ease handling every kind of wild creature, from skunks to rattlesnakes. He decided to pursue a career as a veterinarian and in 1970 he graduated UC Davis with his Doctorate in Veterinary Medicine. He became a specialist in primate medicine and worked for seventeen years at the UC Davis California Primate Research Center. In 1980 he spent three months consulting at a primate center in Tigoni, Kenya. That was where he first came to appreciate the hedgerows that surrounded properties in the Kenyan highlands.

While working as a "monkey doctor," as the local farmers liked to call him, Anderson and his wife Marsha purchased a fifty-acre farm in Winters, CA. He was struck by the absence of wildlife in what was a rural area and he observed that the farming practice of keeping field edges bare and weed-free contributed to this lack of wildlife. Anderson theorized that planting hedgerows of native plants and grasses around the fields would not only create corridors for wildlife but it could benefit the crops by bringing in beneficial insects and reduce the need to spray for pests and invasive weeds.

While serving on the board of the Yolo County Resource Conservation District he promoted the practice of bringing farm edges back to life. He introduced a rich variety of native trees and shrubs and plants — wild roses, elderberries, cottonwoods, valley oaks, and willows to the hedgerows on his own farm. He collected native grass and wildflower seed and sowed, propagated, and planted them on the edges of the fields, the sides of roads, and irrigation ditches.

The experiment worked. Species of birds that hadn't been seen in decades started coming back as well as snakes, deer, fox, cottontails, wild turkey — even a bear or two started making an appearance. Anderson didn't stop there.

By the early nineties the farm had expanded to 520 acres. He retired from veterinary medicine and established Hedgerow Farms. The farm is still one of the most important growers of California native grass and wildflower seed in northern California. He became a full-time farmer and an advocate for habitat restoration using the farm as a teaching site. He convinced farmers and land managers of the value in planting native species and was a generous, wise, and tireless mentor for countless people who sought him out to learn his conservation methods.

He was a founder of the California Native Grasslands Association and served on the boards of the National Audubon Society, Audubon California, Wildlife Heritage Foundation, and Yolo Basin Foundation. He received numerous awards for his visionary work, including Cal-IPC's Ryan Jones Catalyst Award, Cal-IPC's Jake Sigg Award for Vision and Dedicated Service, the 2014 Sacramento Tree Foundation's C.K. McClatchy Award, and SERCAL's first ever Lifetime Achievement Award in 2017.

During his lifetime, Anderson spent every moment he could in his beloved outdoors. He enjoyed hunting, especially waterfowl and upland game birds, with his Labrador retriever or springer spaniel at his side. He trained Labrador retrievers and several of his dogs received Field and Amateur Field Champion titles. He also loved to fly fish with his family, either on the Henry's Fork of the Snake River in Idaho, where he introduced his daughters to fishing, or on other wild and remote rivers.

Anderson's cause of death was from complications of Lewy Body Dementia. When he was diagnosed with the disease six years ago, Anderson, ever the scientist, accepted that it was eventually going to take him down. But that didn't stop him from setting his sights on an over-grazed, weedy piece of land that was in need of restoration. He wouldn't give up. He wanted to leave this life knowing that he did everything he could to give the natural world that he loved so much a fighting chance…

*This is an excerpt of John Anderson's obituary that was first published in the Woodland Daily Democrat & the Sacramento Bee.*


An aerial view of North Campus Open Space in May 2020. *Photo credit Bill Dewey*

# Connecting Science and Practice:
## *The Restoration of North Campus Open Space*

*by Madeline Nolan[1] and Lisa Stratton[2]*

The importance of open communication between the theoretical science of restoration ecology and the hands-on practice of ecological restoration is key to solving our most pressing environmental issues (Dobson et al. 1997, Suding 2011, Shackelford et al. 2013, Perring et al. 2015, Suding et al. 2015). Scientific studies exploring basic ecological theory such as community assembly can help increase the effectiveness of restoration techniques, and ecological restoration, in turn, provides an excellent test for basic ecological theory. Frequent and open communication between the two disciplines is key for assessing restoration success and will help practitioners prepare for the inevitable effects of climate change. Too often, however, work in these two fields takes place apart from one another. More often than not, this is due to a simple lack of connection and existing networks between scientists and practitioners. But it can also stem from a disconnect between the slow pace and rigid controls of scientific research and the very real urgency often encountered when restoring ecosystems (Cabin 2007). Groups like the California Society for Ecological Restoration are helping to bridge this gap by connecting researchers and practitioners through workshops and annual conferences. However, collaborative projects between practitioners and scientists are still lacking. This is why the Cheadle Center for Biodiversity and Ecological Restoration (CCBER) is such a unique and exciting research center (https://www.ccber.ucsb.edu/).

> The acid test of our understanding is not whether we can take ecosystems to bits on paper, however scientifically, but whether we can put them together in practice and make them work. — *A.D. Bradshaw (1982)*

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## Many thanks to our generous 2020 conference sponsors!

# The Restoration of North Campus Open Space *continued from page 7*

Housed within the University of California Santa Barbara (UCSB), CCBER is an independent center that is responsible for the restoration and protection of native habitat on 340 acres across the campus. While functioning primarily as a restoration group, CCBER also functions as an environmental outreach and educational center for the campus community. In addition, the close proximity of the restoration sites to campus has facilitated numerous collaborative projects between the researchers at UCSB and the restoration staff. These collaborative projects provide excellent examples of how science can be seamlessly incorporated in the practice of restoration ecology.

Collaboration between CCBER and UCSB researchers has been happening since the center opened in 2005. However, research has picked up since 2013, when CCBER began a large-scale restoration project (North Campus Open Space) focusing on the restoration of the upper arms of the Devereux Slough (**https://www.openspace.vcadmin.ucsb.edu/overview**). North Campus Open Space (NCOS) was historically part of a large tidal estuary system, but it was fundamentally altered in 1965 when it was filled in to create Ocean Meadows golf course (Nolan et al. 2020). Since the beginning of this restoration project, students have been able to contribute in a meaningful way to the design and assessment of the project.

> The opportunity that restoration on campus lands provides for students to see their research used for meaningful change is inspiring, compelling, and makes the field of ecological research more accessible to a broader array of students.

In the beginning, CCBER wanted to evaluate the current state of the site and collaborated with several students to assess the seed bank and soil quality. The initial phase of the restoration project included moving extensive amounts of soil (350,000 cy) to restore what had been altered during construction of the golf course. However, little was known about what native species were still in the seed bank or how the soil had changed. To fill these knowledge gaps, the seedbank was surveyed in various locations to ensure that no unique seed bank would be buried. A rigorous assessment of the soil profile was also compiled to identify the depth of the original marsh soils, to assess the soil suitability for different plant palettes, and to characterize the soil texture in different areas (Daumal 2013). These projects found that there was little to no native seed bank and the soil was heavily degraded across the site, with high levels of salt and low levels of nitrogen in particular. This suggested that CCBER would have to 1) reintroduce species to the site, and 2) amend the soil to improve native species establishment. Amending the soil, however, was problematic due to the size and scope of the project (100 ac). To determine the effectiveness of different soil amendments and their impact on different species, a yearlong experiment was conducted onsite using standard restoration techniques. The hope was to identify a soil amendment that could alleviate the salinity problem and promote native species. Surprisingly, this study found that most of the native plants could tolerate the salty soil and that individual native species were promoted by different soil amendments (Nolan et al. 2020). All these projects helped CCBER target their design plan to account for how the site conditions varied and identify where soil amendment was necessary. Restoration at the site has now been underway since 2017 and the research collaborations with students and faculty in ecology, geology, geo-chemistry, microbial science, and entomology have continued. For example, there has been an ongoing comprehensive assessment of the terrestrial and aquatic insect fauna and bird communities across the site. This began before the restoration and will continue to assess

Students taking plant growth data in a pilot experiment exploring soil amendment impact on native plants before restoration began at North Campus Open Space. *Photo credit Madeline Nolan*

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A student and Cheadle Center for Biodiversity and Ecological Restoration staff member surveying for invertebrates at NCOS. *Photo credit CCBER*

# The Restoration of North Campus Open Space *continued*

how animal communities are changing over time. Preliminary results have already shown that diversity is higher in the restored areas. These projects will not only help CCBER in understanding how animals are responding to the restoration efforts at NCOS but help better understand how plant restoration affects the recovery of animals in general (Hilderbrand et al. 2005). There are also numerous research projects focused on understanding how restoration influences long-term processes such as soil development and biogeochemical cycling. For instance, there have been projects assessing how the soil amendments added to the site have affected carbon cycling and microbial activity. Moving soil releases carbon into the atmosphere, but salt marsh vegetation, perennial grasslands, and wetlands help to sequester carbon. One research project aims to assess whether the carbon additions and associated soil process can promote the growth of perennial bunch grass which play a large role in carbon sequestration.

The collaborations between the restoration staff and UCSB researchers at NCOS are excellent examples of how much can be accomplished when the science of restoration ecology and the practice of ecological restoration are combined. It is our hope that these examples demonstrate some ways science and practice can be effectively combined to promote restoration efforts and test ecological theories. The opportunity that restoration on campus lands provides for students to see their research used for meaningful change is inspiring, compelling, and makes the field of ecological research more accessible to a broader array of students. CCBER is looking to sustain these research opportunities by seeking funding for a permanent Research and Monitoring Coordinator because data management, student training, and mentorship are key components to providing relevant data and meaningful experiences for students and restoration practitioners.

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# Meet the Contributor: **Maddie Nolan**

**Occupation:** Doctoral candidate in the Department of Ecology, Evolution and Marine Biology at the University of California Santa Barbara.

**County of residence or work:** Santa Barbara County

**What is your specific discipline (or underlying education)?**

Restoration Ecology

**What services do you provide for restoration in California?**

My research has been exploring how climate change will impact the restoration and conservation of native grasslands in California. Through my research I have explored how plant establishment is affected by different grassland restoration techniques, how extreme drought influences the composition of a restored grassland community, and if *Stipa pulchra* displays adaptation to local climates. I have also worked extensively with the Cheadle Center for Biodiversity and Ecological Restoration (CCBER) and Sedgwick Reserve on restoration of native habitats. Ultimately, I hope to use my training as an ecologist in a land management career where I can help protect and conserve native species in California.

**How did you get into the field of ecological restoration?**

I did a study abroad with the School for Field Studies in Queensland Australia. It was my first real introduction to conservation and the diversity of careers within the field. I was especially drawn to invasive species, which are a huge problem in Australia, and how they can have such devasting impacts on native communities. This motivated me to get involved in restoration and the protection of native ecosystems.

**What is your favorite California native species?**

That would have to be Plantago erecta (*California plantain*). It is such a cute, understated little species, but once you start looking for it, it is everywhere!

**Any advice for others in the field of restoration?**

My best piece of advice is to never dismiss a restoration project, even if it fails to achieve your goals. These failed restoration projects have so much to teach us about what factors influence restoration success and can be used to help improve future projects. Unfortunately, when a project is not successful it is often discarded which is such a loss to the field.

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## The Restoration of North Campus Open Space *continued*


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Cheadle Center for Biodiversity and Ecological Restoration (CCBER) staff members in January 2019. *Photo credit CCBER*

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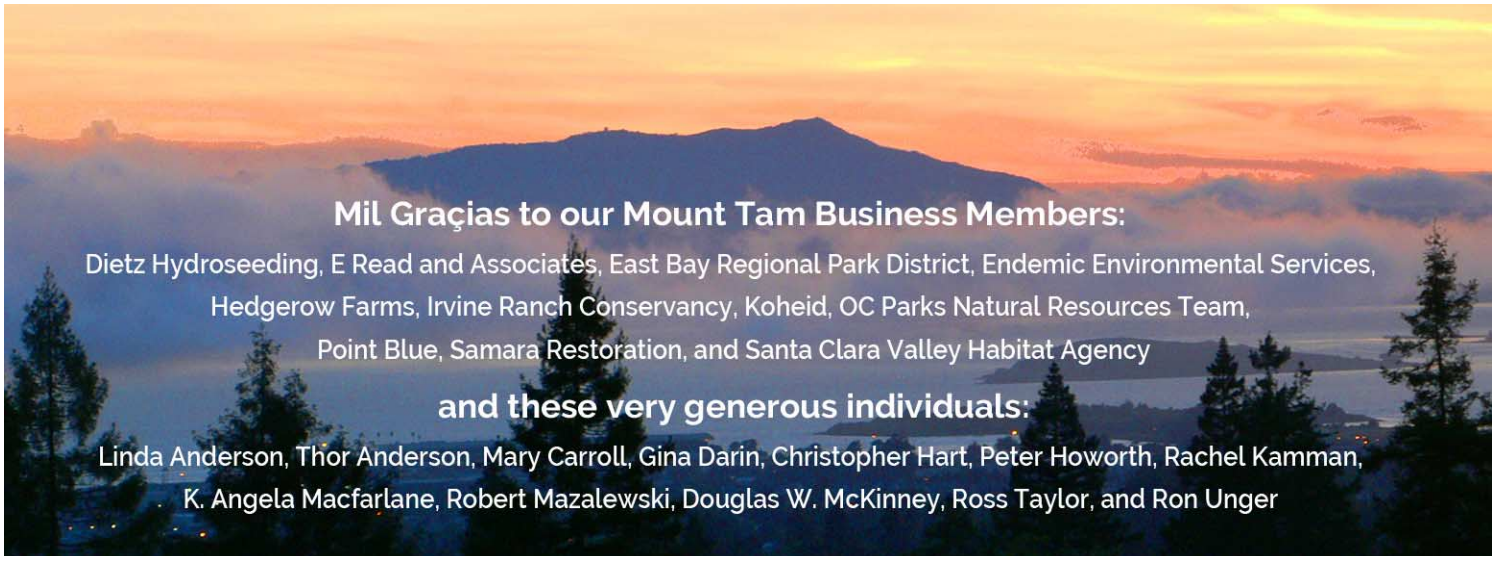

## Mil Graçias to our Mount Tam Business Members:

Dietz Hydroseeding, E Read and Associates, East Bay Regional Park District, Endemic Environmental Services, Hedgerow Farms, Irvine Ranch Conservancy, Koheid, OC Parks Natural Resources Team, Point Blue, Samara Restoration, and Santa Clara Valley Habitat Agency

## and these very generous individuals:

Linda Anderson, Thor Anderson, Mary Carroll, Gina Darin, Christopher Hart, Peter Howorth, Rachel Kamman, K. Angela Macfarlane, Robert Mazalewski, Douglas W. McKinney, Ross Taylor, and Ron Unger


Stump still burning two months after fire, Big Basin State Park. *Photo: Steve Singer* Boundary of the burn area as shown on a map of the Santa Cruz Mountains Bioregion. *Mapped by Pease Press Cartography (peasepress.com) for SCMBC.*

# Redwood Forest Impacts of the CZU Lightning Fire Complex: *Climate Change Hits Home with Catastrophic Results*

*by Santa Cruz Mountains Bioregional Council*[1] *Republished with permission:* ***scmbc.org****.*

*The CZU Lightning Complex fire was an unprecedented fire event throughout all of recorded history for the Santa Cruz Mountains. Here we will report what happened, why it happened, and what it means. Although the fire burned many vegetation types, we will focus here on the redwood forest which comprised the bulk of the burn area.*

[1]The Santa Cruz Mountains Bioregional Council encourages the preservation and enhancement of regional biodiversity over time through education, the dissemination of accurate scientific information, and assistance in the planning, coordination, and implementation of conservation efforts.

Many local land conservancies and conservation groups that focus on redwoods have down-played the seriousness of this fire. They've told the public that redwoods need fire to reproduce or that redwood forests are well adapted to fire. Neither is true. Redwoods are adapted to fire, but their forest associates are not.

Prior to the arrival of Europeans, fires in the redwood forest were mainly low to moderate intensity ground fires that burned the litter layer, forest floor vegetation, shrubs, and small trees, but seldom entered the canopy of the dominant redwoods and Douglas-firs. Lightning was the primary source of ignition, but lightning was a rare event in the Santa Cruz Mountains. Fire frequency increased during the Aboriginal

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# Redwood Forest Impacts of the CZU Lightning Fire Complex *continued*

period (11,000 BP–1792 AD) to a value between 17 and 82 years apart as fires set by indigenous people to promote and retain grasslands sometimes spread into the redwood forest. During the early Anglo-American period (1848–1929) the fire return interval was 20–50 years as much of the forest was clearcut and fire was used as a tool to clear brush and debris and ease the extraction of downed trees. In recent times, at least up until the 2000s, fires in the redwood forest have been suppressed, and fire frequency lowered to about one fire every 130 years according to a study by Greenlee and Langenheim (1990). Fire suppression has likely led to an increase in highly flammable fuels which has been aggravated over the last 20 years by the deaths of many tan oak (*Notholithocarpus densiflorus*) trees in the understory layer due to arrival and persistence of the Sudden Oak Death pathogen.

Until the recent period, most fires would stay low and burn with much less severity than the CZU fire. Only rarely would they enter the redwood and Douglas-fir tree crowns. They would blacken the thick outer bark of the old-growth Douglas-firs but not kill the trees. They would scorch the large down logs on the forest floor but not devour them. They would burn up the litter layer but not be so hot as to completely sterilize the organic soil layer below. Most importantly, they served to reduce the fuel build-up on the forest floor and remove ladder-fuels that, if allowed to persist, could carry fire into the tree canopies. These fires would typically skip over areas thereby leaving behind a mosaic of burned and unburned patches. The unburned areas along with the unburned down logs would serve as refuges from the fire for small animals, invertebrates and mycorrhizal fungi. Consequently, these types of fires did not have serious long-term adverse impacts on the redwood forest biotic community.

Redwoods themselves are resistant to death by fire, having the ability to send up sprouts from the root collar. Mature trees also have a thick bark layer that protects the cambium layer inside the trunk so that even a crown fire that burned all the branches off the trunk would not kill the tree. Dormant buds beneath the bark survive and send out new branches so that a new, (albeit thinner) live crown would form. On the other hand, old-growth Douglas-firs will likely succumb to the fire and their falling may knock down other trees including redwoods. A severely burned forest releases large amounts of stored carbon from its branches, understory vegetation, litter layer, and soil. Furthermore the growth in height of a tree and its ability to sequester new carbon as wood is temporarily impaired until it has recovered from the fire, typically requiring multiple years if not decades.

The CZU Lightning Complex Fire was not a typical redwood fire. It started in the early morning of August 16, 2020 when the remnants of Tropical Storm Elida swept across Central California and generated nearly 11,000 dry lightning strikes. This was a super-spreader lightning fire event without precedent in recent history. As UCLA climate scientist Daniel Swain blogged, "I'm essentially at a loss for words to describe the scope of the lightning-sparked fire outbreak that has rapidly evolved in Northern California…. It's truly astonishing."

A number of those strikes hit the Santa Cruz Mountains setting off about 22 small fires. Out of these 22 fires, five persisted and slowly spread through the forest. Three were located in difficult-to-access areas of the Butano Creek Watershed. On the night of August 18 a dry northeast wind began to blow strongly with gusts of up to 74 miles per hour. These new conditions caused the fires to explode, merge with each other, and spread with, as Dr. Swain noted, "astonishing speed". Over the next two days they burned over 40,000 acres.

> Many local land conservancies and conservation groups that focus on redwoods have down-played the seriousness of this fire. They've told the public that redwoods need fire to reproduce or that redwood forests are well adapted to fire. Neither is true. Redwoods are adapted to fire, but their forest associates are not.

The rapid spread was accompanied with high intensity heat and burning away of the live crowns. It was during this period of rapid spread with high intensity burning that the old-growth forests of Big Basin Redwoods State Park burned. After the fire, experienced local fire boss Portia Halbert visited the park. Viewing the old-growth trees near park headquarters (now burned to the ground), she described the scene this way, "It looks like a bomb went off here." Dr. Daniel Swain described the fire in Big Basin as "particularly intense." Mark Hylkema, Supervisor of Cultural Resources for State Parks, visited Big Basin after the fire and said, "I've never had to deal with anything of this totality."

On the night of August 20, the weather changed for the better. The winds died down and their direction gradually changed from easterly to westerly. Humidity went up as a layer of marine air began to penetrate the fire area. The growth of the fire then slowed dramatically and fire fighters were able to make good progress. The fire wasn't fully contained until September 22, having burned 86,500 acres and destroying 925 homes in the wildland-urban interface. It was the biggest fire in the Santa Cruz Mountains Bioregion since at least 1940, the first year with accurate records of fire size.

Damage to several rural residential areas was extensive. In addition to burning down structures, much of the infrastructure that provided energy, water, communications, and waste removal was destroyed. Recovery will be a slow and expensive process. Our hearts go out to those who lost their homes and their belongings in this unprecedented event. Tragically, there was one fatality.

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# CNPS Fire Recovery Guide Available for Download

"Trustworthy, helpful information is a healing balm at a time when our communities are trying to put our lives back together and stay safe," said Calli-Jane DeAnda, executive director of Butte Fire Safe Council. Butte County's North Valley Community Foundation helped fund the statewide guide along with the Giles W. And Elise G. Mead Foundation, U.S. Fish and Wildlife Service, Marin and Mount Lassen chapters of CNPS, and individual CNPS donors.

"We're incredibly grateful to the authors, scientists, and funders who gave us the chance to do something helpful for our friends and neighbors in California," CNPS Executive Director Dan Gluesenkamp said. "Thanks to them, we've been able to provide something of great value that should never have a price tag."

The California Native Plant Society Fire Recovery Guide (2019) is available for download at **cnps.org/fire-recovery**.

## Redwood Forest Impacts of the CZU Lightning Fire Complex *continued*

We also grieve for losses to the redwood forest community. The fire hit our remaining old-growth forests particularly hard. Over half of the remaining old-growth stands in the Bioregion were burned and most, such as those in Big Basin, were severely burned. The full extent of the damage has yet to be determined, but whatever the damage, salvage logging of redwoods should not be considered.

In addition to the redwoods themselves, the redwood forest community includes the understory and forest floor vegetation, wildlife (birds, mammals, amphibians, reptiles, invertebrates), insects and other invertebrates, microscopic soil fauna, and last, but not least, fungi — including the mycorrhizal fungal network that is essential for the health of redwood trees. The fire in Big Basin seems to have left few refuges for these species so most must have perished in the flames. As a consequence, there are few "seed source" areas for re-colonization of the burned stands and recovering the native biodiversity.

The marbled murrelet (*Brachyramphus marmoratus*), an endangered species of seabird that nests only in old-growth trees, was also impacted greatly by the fire. The timing of the fire, about one month before the normal end of the nesting season, means that some young and flightless murrelets likely were still in the nest when the fire hit. Since the total population of this bird is believed to be only 400–600 individuals, the loss of even a few birds to the fire is significant.

The fire also reduced the available murrelet nesting habitat for future seasons. As a crown fire, it burned away redwood tree branches including the large diameter branches high in the canopy that murrelets use for nesting. New branches will form in redwoods, but these fire-sprouted branches remain smaller than the original branches, and old-growth trees that survived the last major crown fire to burn a portion of the park, which was in 1904, still have not produced branches large enough to support a murrelet nest. Superposition of the CZU fire perimeter map on the map of murrelet nesting areas in the Santa Cruz Mountains shows that 62% of the known nesting acreage was burned by this fire, posing the question, will murrelets now find enough suitable nesting habitat?

The CZU fire was like two different fires wrapped up into one event. From the sixth day on it was a typical redwood fire spreading slowly and burning with low intensity within the forest. This was very fortunate for people who live in Boulder Creek, Ben Lomond, Felton, and Scotts Valley who had been evacuated from their homes because of the fire. It was a different fire during the two days between August 18 and 20 when it burned with a speed and intensity similar to that which destroyed the town of Paradise. For that period of time it was a true mega-fire.

Mega-fires are caused by global warming and are on the increase in California. A recent study from climate scientists at Stanford University has found that autumn days with extreme fire weather have more than doubled in California since the early 1980s due to climate change. As co-author Dr. Daniel Swain explained, "climate change has increased fire risk by increasing vegetation aridity — what's known as fuel moisture — over time; meaning vegetation becomes more flammable. Increasingly, dry vegetation burns more intensely, creates more intense and larger fires, which spread more quickly and are harder to fight." The senior author, Dr. Noah Diffenbaugh, warns that, "the same research that shows global warming has increased the frequency of extreme weather historically also suggests that continued global warming will intensify these conditions further." Climate change wildfires may become the new normal.

While coast redwood trees are renowned for their resistance to fire and their seemingly indomitable resilience, the severity of this fire should

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# Redwood Forest Impacts of the CZU Lightning Fire Complex *continued*

not be discounted. The CZU Lightning Complex fire was very damaging to our old-growth redwood forests and their associated flora and fauna. Unlike its cousin, the giant sequoia (Sequoiadendron giganteum), coast redwood (Sequoia sempervirens) is not dependent on fire, and it is quite possible that this coast redwood forest will not rebound as fully as we hope.

*The CZU Lightning Complex fire is a foreteller of things to come unless we as a society start to take global warming more seriously. Efforts to stop climate change must begin in every household, must be fully embraced by our nation, and must be pursued vigorously by every country in the world. Whatever efforts we have begun already need to be intensified now.*

UPDATE (October 26, 2020): Bioregional Council director and murrelet expert Steve Singer visited the Big Basin Park headquarters area on October 21 to check on the status of the big branches high in the canopy that the marbled murrelet uses for nesting. He was pleased to note that most of the trees in that part of the park retained their branches, and that these branches may survive over the long term, thus continuing to provide nesting habitat. It appears that only a minority of the old-growth stands in the park had their canopies completely burned away. So there is some hope for murrelets.

SER CAL

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# SERCAL is Ringing in 2021 With New Benefits for our Sponsoring Members

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The SERCAL Board has been re-evaluating processes and programs to make sure that our organization is responsive to our members' needs as well as fulfilling our mission at increased capacity and with flexibility to meet new challenges.

This is why we are moving our sponsorships from the conference to an annual membership which INCLUDES sponsorship benefits at the conference as well as additional benefits.

Take a look and let us know what you think! And by the way, all other memberships will remain as is. We'll be sending out renewal notices this month. Please renew promptly if you can! And thank you so much for your membership.

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*In terms of Booth space, in the event of another virtual (vs. in-person) conference, we will do our best to be creative in offering comparable alternatives! Our Session Host idea for the virtual SERCAL 2020 conference got good reviews!

## Many thanks to our generous 2020 conference sponsors!



# Ecesis

Have you considered writing an article about a project you're working on? Or on a topic that's been top-of-your-mind? Or what about a photo essay of before and after? Take a look at the articles in this or past issues and you'll get a good idea of the spectrum of topics we cover.

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| Publish | Due Date* | Guest Editor |
|---|---|---|
| Jan 2021 | Dec 15 | Cindy Thompson |
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*Contact Julie or the Guest Editor (see all contacts, p. 19) early to secure your spot. Find guidelines at www.sercal.org/newsletter

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*Calandrinia breweri*

Just like our floral first responders, SERCAL members make California's ecological systems healthy and whole again. In the almost 3 decades since SERCAL was founded, so much — almost everything — has changed. Yet one thing remains constant: The exceptional power we have when we work together. We are grateful for all our members and want to recognize these individuals and businesses for their generous support in 2020:

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# The Last Word: *Persistence*

"Dripping water hollows out stone, not through force but through persistence." — Ovid

There have been days this year, for many of us, when it has been an act of bravery to get out of bed in the morning. Or to sit at the computer, or respond to emails…whatever. As I write this, it is Election Day and even by the time I send out the Mailchimp with a link to this newsletter, we may not yet know the final results. Yet I am heartened that a steady stream of engaged voters have already voted before today's polls, and like so many drops of water, are carving out the path our country will follow for at least the next four years.

Persistence is also the hallmark of habitat restoration. Right? You accept the challenge to re-connect the dots that make an ecosystem function and become healthy again. You study the landscape, do your best to perceive and plan for all the variables that might work for you or against you, you create partnerships in order to ensure the best possible outcomes, and you wait. And watch.

Sometimes you nail it; sometimes, like this year, a virus prevents you from getting the crews out in the field the way you'd planned for, or an Act of Dog, like a wildfire or flood, mudslides or drought, intervenes in catastropic ways. But still… you find a way.

You find a way to make it work as best you can. And *that* is success.

Take good care, be safe, and I hope to see you soon — *Julie St. John*

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