California Native Grasslands Association

GRASSLANDS

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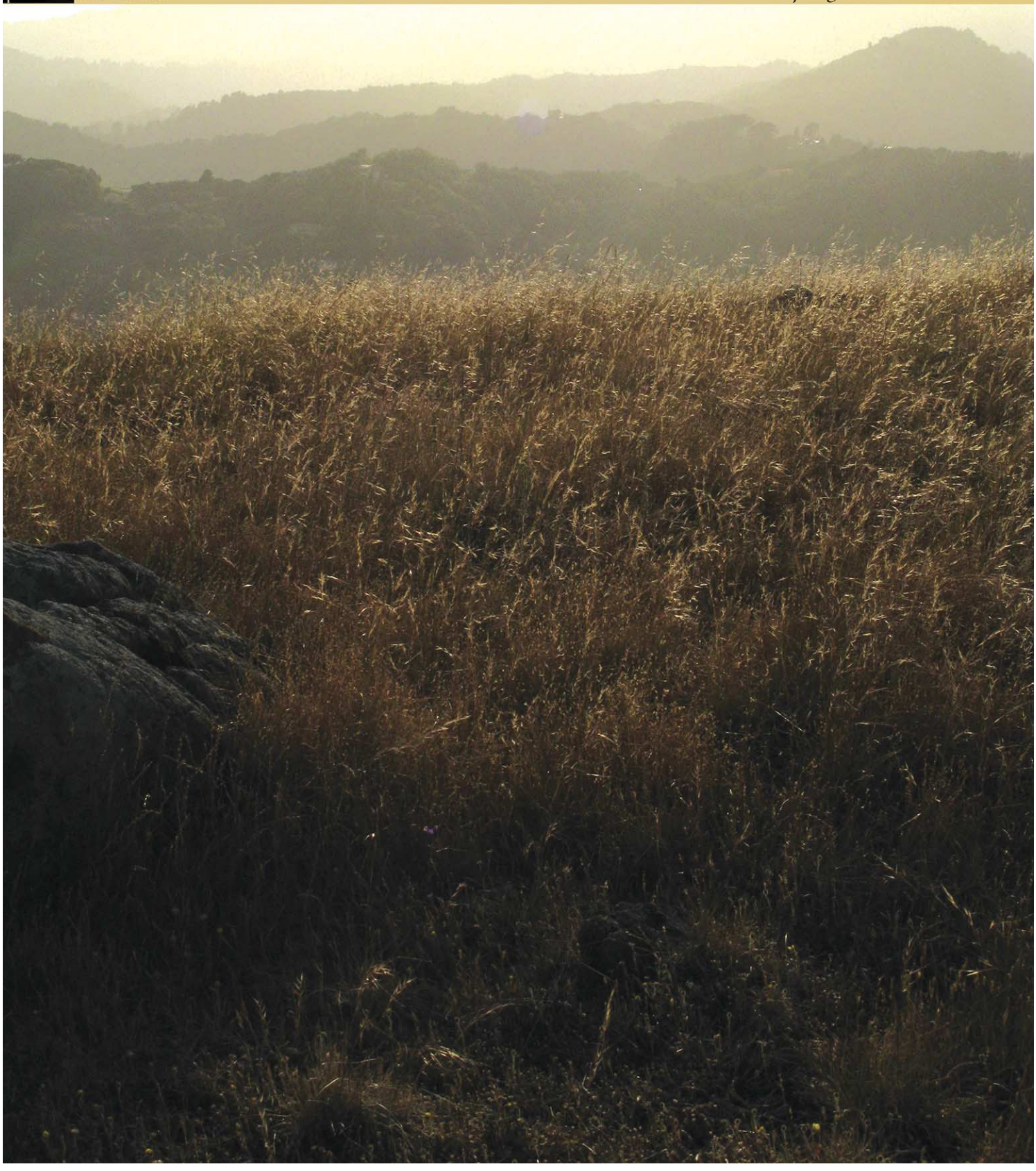
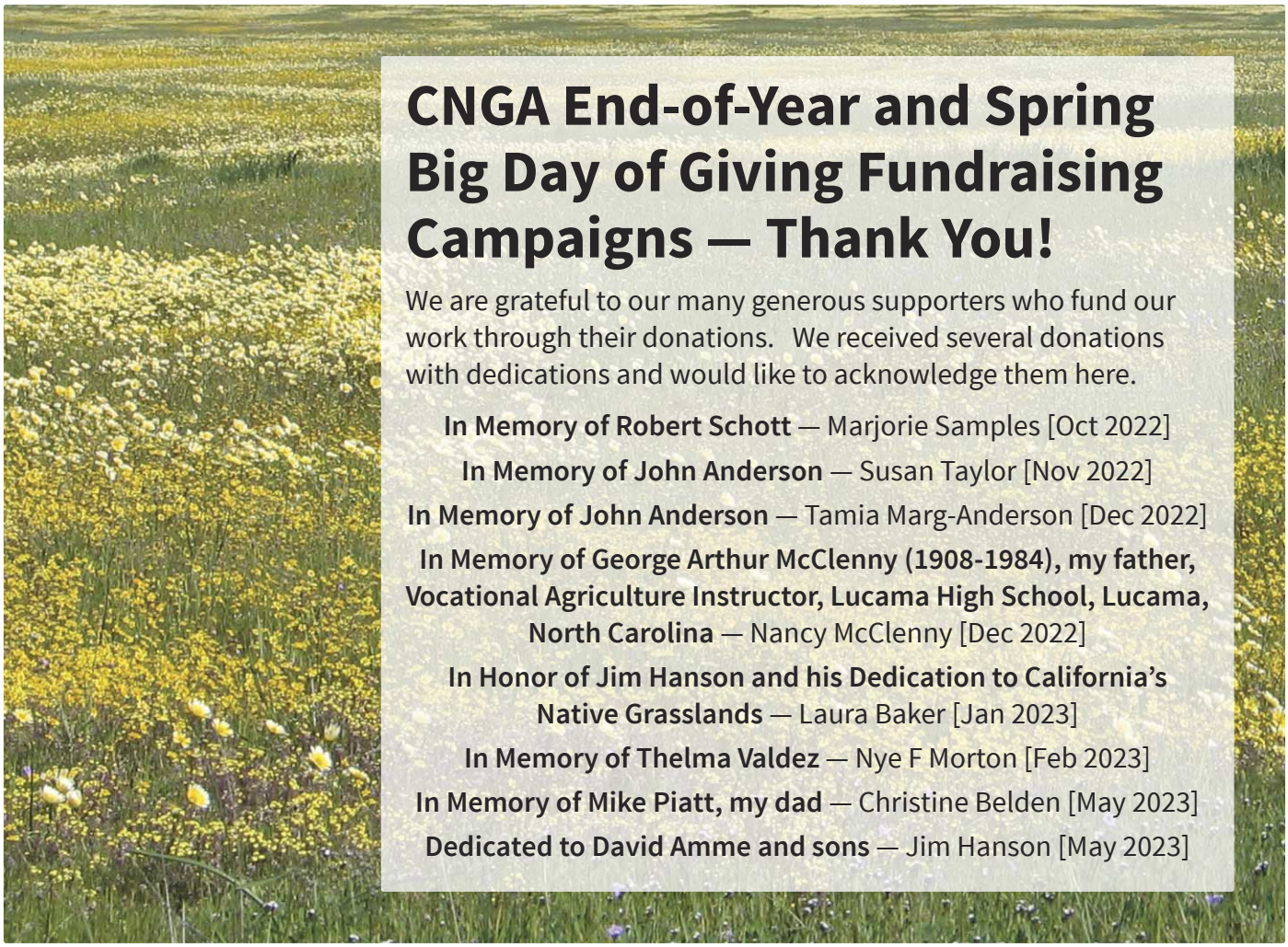




CNGA End-of-Year and Spring Big Day of Giving Fundraising Campaigns — Thank You!

We are grateful to our many generous supporters who fund our work through their donations. We received several donations with dedications and would like to acknowledge them here.

In Memory of Robert Schott — Marjorie Samples [Oct 2022]

In Memory of John Anderson — Susan Taylor [Nov 2022]

In Memory of John Anderson — Tamia Marg-Anderson [Dec 2022]

In Memory of George Arthur McClenny (1908-1984), my father, Vocational Agriculture Instructor, Lucama High School, Lucama, North Carolina — Nancy McClenny [Dec 2022]

In Honor of Jim Hanson and his Dedication to California's Native Grasslands — Laura Baker [Jan 2023]

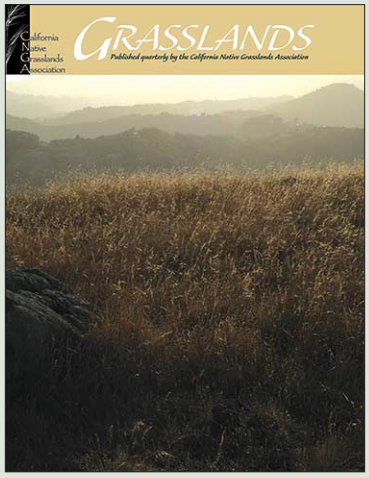
In Memory of Thelma Valdez — Nye F Morton [Feb 2023]

In Memory of Mike Piatt, my dad — Christine Belden [May 2023]

Dedicated to David Amme and sons — Jim Hanson [May 2023]

Grasslands Submission Guidelines

Send written submissions, as email attachments, to **grasslands@cnga.org**. All submissions are reviewed by the *Grasslands* Editorial Committee for suitability for publication. Written submissions include peer-reviewed research reports and non-refereed articles, such as progress reports, observations, field notes, interviews, book reviews, and opinions.



Also considered for publication are high-resolution color photographs. For each issue, the Editorial Committee votes on photos that will be featured on our full-color covers. Send photo submissions (at least 300 dpi resolution), as email attachments, to the Editor at **grasslands@cnga.org**. Include a caption and credited photographer's name.

Submission deadlines for articles:

Summer 2023: 15 May 2023 ❊ **Fall 2023**: 15 Aug 2023
Winter 2024 15 Nov 2023 ❊ **Spring 2024**: 15 Feb 2024

In this issue

California Native Grasslands Association

Mission Statement

The mission of the California Native Grasslands Association is to promote, preserve, and restore the diversity of California's native grasses and grassland ecosystems through education, advocacy, research, and stewardship.

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From the President's Keyboard

Dear Members, Sponsors, Supporters, and Friends,

I am writing this note after a couple of events CNGA just hosted:

Our 15th Annual Field Day at Hedgerow Farms. It was a beautiful day out on the farm, and we were all excited to see you in person. Thanks to all the organizers and volunteers, in particular the entire Hedgerow Farm crew and to all the passionate speakers and tour leaders, I believe it was another successful event. Thank you again for attending and we will see you next year!

We also just had a fantastic grass ID workshop at the Bodega Marin Lab. Great instructors and a beautiful setting on the California coast. Thank you to all who participated as instructors, helpers, and attendees. I hope you learned a lot from this workshop.

As I was driving around, I couldn't help but appreciate all the beautiful colors of our native forbs covering the landscape. It is another super bloom year that we can enjoy. Native grasses are also finally looking healthy again after sustaining a long and stressful drought. And yes, so are the weeds! I am always impressed by the resiliency of our natives. So, get your cameras and go hike and take pictures! If you have some cool ones to share, please send them in and you might see them printed in one of our *Grasslands* journals.

Thank you to all of you who have donated to CNGA during the BDOG and I encourage others to donate. There are a few large donation events throughout the year so please think about us! We appreciate your support very much.

Enjoy the outdoors and our beautiful landscapes,

JP Marié, Board President

CNGA Field Day at Hedgerow Farms, from left: Chad Aakre, CNGA Conservation Committee Chair; Sarah Gaffney, CNGA Secretary; JP Marié, CNGA President; Julia Michaels, CNGA Director, Restoration Ecologist, Hedgerow Farms; Jodie Sheffield, CNGA Treasurer; Justin Luong, CNGA Director; Diana Jeffery, CNGA Administrative Director. *Photo: Jock Hamilton*

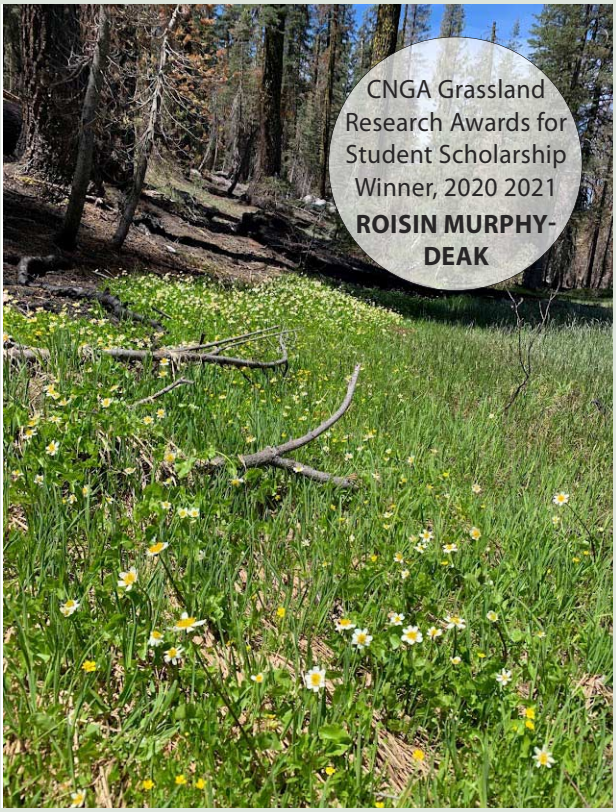

Figure 1: White marsh marigold (*Caltha leptosepala*) and common water plantain buttercup (*Ranunculus alismifolius*) along the chain of meadows leading to our study site.

Figure 2: Round-leaved sundew (*Drosera rotundifolia*) and bristle fruit sedge (*Carex echinata*) along the margins of the meadow, eight months after the Dixie fire was extinguished.

[1]Roisin Murphy-Deak, MS Biology from CalPoly SLO is a botanist with the Six Rivers National Forest and recipient of the Grassland Research Award Scholarship 2020 2021. She is working on developing remote sensing tools to identify meadows most in need of restoration. **rmurphyd90@gmail.com**

VISIT A GRASSLAND

Bucks Lake Wilderness: Observations from the Dixie Fire

by Roisin Murphy-Deak[1]

I want to share with all of you a place that isn't very accessible to the public but is fascinating and worthy of recognition. The Bucks Lake Wilderness is in the western half of the Plumas National Forest. With elevations ranging from 2,000 to 7,000 feet, this wilderness shows a wide representation of classic Sierran flora with brushy stands of Tobacco brush (*Ceanothus velutinus*) growing amongst mixed conifer stands escalating to impressive California red fir (*Abies magnifica*) stands higher up in elevation. The Pacific Crest Trail crosses through this wilderness promising views of Mt. Lassen on clear days. Approximately 75% of the 21,000-acre wilderness area burned in the 2021 Dixie Fire. The effects of the Dixie Fire were catastrophic in many areas, but wet montane meadows showed particular resilience to wildfire impacts.

In 2022, I was brought into this wilderness while working for the USFS Regional Meadow Monitoring Crew, which is a group out of the Regional Office that tracks long-term changes in meadows across California. Every five years the crew returns to permanent meadow plots to track fine-scale changes in vegetation. The 2022 trip would be the fifth visit to this site. We started at the Buck's Lake Wilderness trailhead and followed the trail for about one mile before splitting off the trail and heading up Right Hand Saw Log Creek. The journey to our destination took us through a mix of white (*Abies concolor*) and red fir forests. Small meadow patches appeared and increased in size as we progressed upwards along the creek; these patches were bordered by white marsh marigold (*Caltha leptosepala;* Figure 1) and common water plantain buttercup (*Ranunculus alismifolius*).

After about four miles, we eventually reached our destination: a large, very wet meadow, or technically a fen. Fens have acidic soils, a result of the high water table that prohibits regular aerobic decomposition by bacteria and fungi. Plants that thrive in these areas can tolerate low pH and/or are carnivorous, supplementing the lack of soil nutrients with digesting airborne insects. Our study meadow has both plant types: ericaceous shrubs that can withstand low pH blueberry (*Vaccinium uliginosum*), western azalea (*Rhododendron occidentale*), and western labrador tea (*R. columbianum*)] and carnivorous plants such as round leaved sundew (*Drosera rotundifolia*) bordering the fen. Other notable residents include shore sedge (*Carex limosa*), bristle fruit sedge (*C. echinata;* Figure 2), mountain sedge (*C. scopulorum*), and ladies' tresses (*Spiranthes romanzoffiana*). Less than one year after the fire, these plants were thriving.

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Bucks Lake Wilderness: Observations from the Dixie Fire *continued*

The Dixie Fire burned in and around the meadow, in some parts rather severely. Many of the lodgepole pine (*Pinus contorta*) surrounding the meadow were killed and had fallen into the fen resulting in water pooling around them (Figure 3). The bare ground in between the pools of water and the stream was dry, suggesting the water was passing through the fen, but rather than flowing overland, was seeping into the ground and percolating through the soil. The water traveled through the meadow and was released into the creek, which was crystal clear despite the obvious erosion and sediment loading in the surrounding burnt area. The fen was evidently acting as a sponge, absorbing and filtering water moving downslope through the burn area (Figure 4).

This fen demonstrates that these wet areas are resilient to, and may even benefit from, fire. Fires directly reduce competition from invading lodgepole pines and can indirectly facilitate more water entering meadow systems by reducing forest stand density in the surrounding watershed. In other words, with fewer trees in the uplands, there is less evaporative demand in the forest, releasing water into fens and creeks. Generally, meadows across the region have seen a reduction in wetland species due to drought, fires can play an important part in restoring water balance in these montane systems. The Regional Meadow Monitoring Crew will return to this site in 2027, providing an even better idea of how this meadow fares in the long term.

If you're not into hiking, there is another meadow affected by fire nearby. Just follow Jack's Meadow Road towards the Northeast edge of Silver Lake. The meadow is south of the road, and close to shore. It is an excellent example of a wet meadow with many of the same species described above.

Figure 3. Water pools around downed lodgepole pine (*Pinus contorta*) logs and burned patches within the study meadow.

Figure 4. A combination of ground and surface water filter through the meadow and enter the greater watershed.

Researcher taking a break in a field of frying pans (*Eschscholzia lobbii*).

Livestock grazing effects on the spatial patterns of vernal pool vegetation

by Julia Michaels, PhD[1]

If you are a regular reader of *Grasslands*, you are most likely familiar with the beauty and diversity of California's vernal pools. Almost every Californian has a vernal pool in their 'backyard' — just hop in the car (or if you're lucky, on a bike!) and you should be able to find one nearby. You also probably know that vernal pools are highly threatened by pressure from invasive species. In this article, I will share a little about the research I did for my PhD on the patterns and processes that shape plant diversity in vernal pools, and how understanding these patterns may help us to reduce biodiversity loss in these remarkable ecosystems.

Before we dive into plant biodiversity patterns in vernal pools, let's review what we know about the broader distribution of native plants across California grasslands. California grasslands are highly invaded by non-native grasses from Eurasia. A large portion of the remaining native plant species exist in many small patches across the landscape. These patches occur because of some environmental factor that filters out invasive grasses, providing a refuge for native plant species. Vernal pools are examples of these refuges. Because it is too wet for upland and too dry for wetland species, this ponding filters out many exotic grasses, allowing native species that have evolved special adaptations to survive the cycle of filling and drying.

Vernal pools are just one of the many ecosystems that we ecologists call 'patchy'. These patches can vary a lot in the species they support. Each individual patch may not contain very many species, but the high variation between the patches adds up to high diversity at the landscape level. Across the state, vernal pools host 200 species of native and endemic plants — and much of this biodiversity has to do with high variation both within and between the pools.

The plants that live within vernal pools are sensitive to small differences in the timing of rainfall. This can be observed visually as the pools dry down in stages, and different habitat zones emerge that host only certain species adapted to live in that specific set of conditions. These habitat zones can be divided into pool, transition, and upland areas. Vernal pools also vary in size, shape, soil type, and hydrology. This leads to high variation between pools across a pasture in the number and the identity of the plant species that each pool hosts.

So how do we understand and manage plant diversity in these spatially and temporally variable ecosystems? In a recent study I and my team published in the journal *Ecology* (Michaels et al. 2021),

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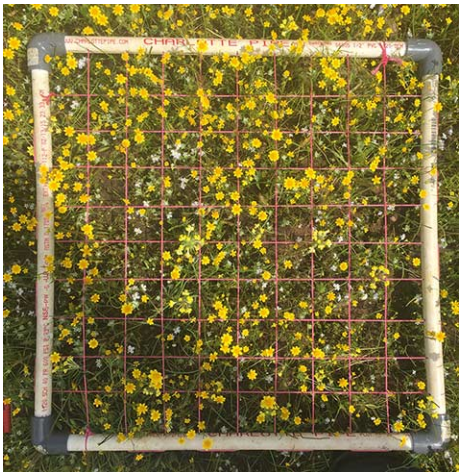
[1]Dr. Julia Michaels is the Restoration Ecologist at Hedgerow Farms and a CNGA Board member. She can be reached at **juliam@hedgerowfarms.com**.



From left: 50x50 cm quadrat divided into 100 smaller squares, used to measure the cover of vernal pool species. A cattle hoofprint in the vernal pool transition zone with water-dependent forb species Carter's buttercup (*Ranunculus bonariensis*) germinating inside the hoofprint. Aerial view of Rancho Seco Recereational area. The vernal pool preserve inside the red polygon included a mix of grazed and ungrazed pools.

Livestock grazing effects on the spatial patterns of vernal pool vegetation *continued*

we examined a common invasive species management strategy — livestock grazing, and how it impacts the unique spatial pattern in vernal pool plant communities.

Cattle grazing impacts on variation in vernal pool plant communities

Vernal pools in California are almost all grazed, either for ranching or non-native species control in the uplands. A small number of studies have found that livestock grazing can maintain plant diversity in vernal pools (Barry 1995, Marty 2005 and 2015), and this has led to widespread shifts in how people think about grazing as a conservation tool in vernal pools. However, no other studies to my knowledge have looked at how grazing affects the variation between the three habitat zones within pools or between pools.

This is important for vernal pool conservation because land managers need to know how grazing affects the distribution of endemic species. For example, we know from other studies that transition zones play an important role in hosting biodiversity (Gerhardt & Collinge 2003, Marty 2015). A land manager might want to know: *Are we losing the transition zones within vernal pools by allowing cattle to graze in them? Are cattle making the pools more similar to one another across the pasture? Does grazing add or subtract species from the overall landscape, or redistribute the same species around the landscape?*

Field Methods

The study site was located in Eastern Sacramento County on a vernal pool mitigation bank in Rancho Seco Recreational Area. A fence line around a large reservoir separated pools that had been continuously grazed from pools that had been removed from grazing for over 40 years. We studied 15 pools that had been removed from grazing (hereafter "ungrazed"), and 15 pools that were currently grazed at a stocking rate of 1 Animal Units per 6 hectares (a common conservation stocking rate). Due to high variation between pools, it was important to carefully pair and balance the two grazing treatments with similar sets of pool characteristics such as size, shape, soil type, and topography. Since we know from the literature that the habitat zones of pools are different from one another, we structured our sampling design and analyses to compare plant communities within zones separately. We sampled these pools for three years, from 2014–2017. We analyzed our data using three measures of plant diversity: species richness, or the raw number of both native and exotic species; evenness, which takes into account the relative abundance of different species; and total relative cover of native plants.

We studied the effects of livestock grazing on diversity at two spatial scales: (1) within each habitat zone (upland, transition, and pool zones) and (2) the variation between the zones. For each pool, we asked: *In this pool, how different is the transition zone from the upland and pool zones in terms of the type of species and the number of species it contains?* This allowed us to measure whether the unique habitat structure within the pool was being maintained with or without grazing. This is particularly important because the transition zone can host a high amount of plant diversity.

Next, we looked at the variation between the pools. This is important because a land manager may need to know: *How unique is each pool within a pasture, and is grazing maintaining or decreasing this uniqueness?* This could be helpful, if, for example, a manager had to decide whether some vernal pools could be converted for agricultural development without losing any species at the pasture level.

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Livestock grazing effects on the spatial patterns of vernal pool vegetation *continued*

Finally, we looked at the overall species identity and number for the whole pasture. This allowed us to ask: *Are differences in diversity between grazed and ungrazed pastures driven by species being added or subtracted to the landscape, or are these differences driven by a spatial redistribution of the same species within the landscape?*

Results

The results of this research were encouraging. We found that continuous livestock grazing decreased the abundance of locally dominant species, and increased the abundance of locally rare species, mostly vernal pool forbs (wildflowers). This is important because we are most often concerned about losing locally rare species as they are outcompeted by more dominant ones.

Similar to the literature, we found that the transition zone had the highest diversity out of all the habitat zones within vernal pools, and also responded the most to grazing. In our case, the bottoms of the pools were so inundated that the grazing did not have much influence on the plant community, since most dominant non-native grasses such as wild oats (*Avena fatua*), soft chess (*Bromus hordeaceous*), and foxtail barley (*Hordeum murium*) were already filtered out of the community by the standing water. In the uplands, the grasses dominated and exerted the strongest influence. But in the transition zones, both upland and pool species can survive and can be strongly influenced by grazing.

We then looked at the effects of grazing on the variation between the three habitat zones within the pools by asking: *How different is each habitat zone from one another?* We found that, despite increases in diversity within the zones, grazing did not change the variation between the zones. Most importantly, the transition zones were still compositionally distinct from the other two zones, even within the grazed pools.

Next, we asked: *How different are vernal pools from one another within a pasture?* We did see evidence that grazing made pools more similar to one another in species richness, and possibly also in composition. But this was because the grazed pools had consistently higher species richness, while the ungrazed pools varied more in species richness from pool to pool.

Finally, we asked: *Is grazing increasing diversity in the landscape?* We analyzed overall diversity at the whole pasture level and saw that, even though the grazed vernal pools had more species per pool, this did not mean that there were more species in the grazed pasture overall. Instead, each pool just got a larger sample of the species that were available at the landscape level.

Conclusions and Recommendations

We found that grazing supports high native vernal pool plant diversity within pools. Grazing also redistributes species at the

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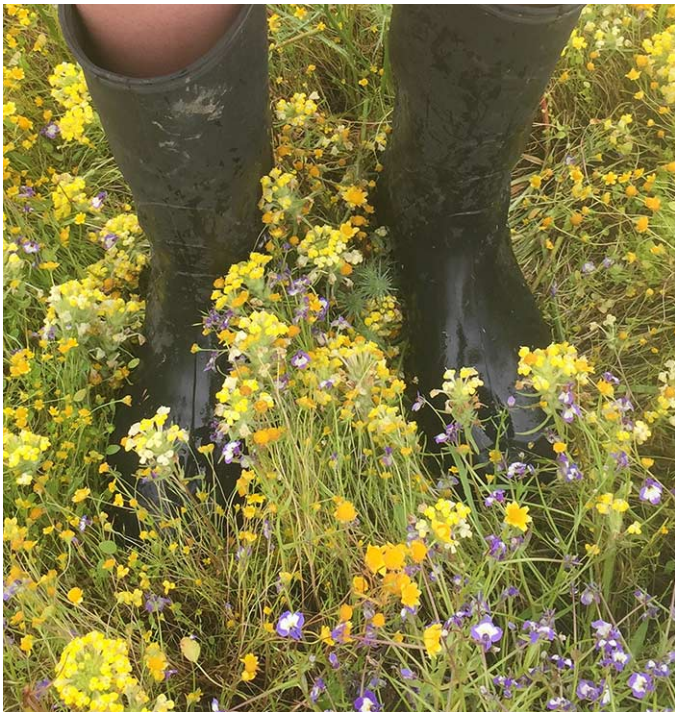

From left: Standing in a vernal pool basin in full bloom. 40+-year fenceline separating the grazed and ungrazed vernal pools.

Livestock grazing effects on the spatial patterns of vernal pool vegetation *continued*

pasture scale (compared to ungrazed pastures) without adding or subtracting species to the landscape. If we had only looked at the diversity within pools, instead of at the landscape level, we might have misinterpreted these results to indicate that grazing was adding new species to the landscape, when in fact, it wasn't. Instead, grazed pools were more similar, yet supported increased species richness relative to ungrazed pools. Whether this decreased variation between pools is a good or bad thing is likely relative to site-specific conservation and management goals. For example, if the species that are being widely distributed among pools are locally rare vernal pool species, it might be a priority to have more representation among pools – or having your eggs in more than one basket - since land can be developed quickly and pools can be lost.

As we know, disturbances such as fire, flooding, and anthropogenic influences are projected to continue increasing at a rapid pace over the next century. Based on our study, I would make the following recommendations to managers who are using grazing as a management tool in their vernal pool landscapes:

- Prioritize monitoring in vernal pool transition zones, which host a lot of diversity and are the most responsive to grazing
- Livestock grazing can have positive effects on diversity and native cover at the zone and pool level, but not necessarily at the pasture level
- Livestock grazing preserves the unique spatial structure within vernal pools, including the transition zones, while making pools slightly more similar in species richness
- Measuring the effects of grazing disturbance using multiple scales and metrics is important.

Read the full article published in the journal *Ecology*, here:

Michaels, J., E. Batzer, S. Harrison, V.T. Eviner. 2021. Grazing affects vegetation diversity and heterogeneity in California vernal pools. *Ecology* 102: e03295. https://doi.org/10.1002/ecy.3295.

Acknowledgements

As you can imagine, this project required a very large field endeavor. We are wholeheartedly grateful for the partnership between Sacramento City College and UC Davis undergraduates that participated in the project. Through their collaboration, many students of diverse backgrounds were given the unique opportunity to conduct ecological research for the first time.

Citations

Gerhardt, F., and S.K. Collinge. 2003. Exotic plant invasions of vernal pools in the Central Valley of California, USA: Exotic plant invasions of vernal pools. *Journal of Biogeography* 30:1043–1052.

Marty, J.T. 2005. Effects of cattle grazing on diversity in ephemeral wetlands. *Conservation Biology* 19:1626–1632.

Marty, J.T. 2015. Loss of biodiversity and hydrologic function in seasonal wetlands persists over 10 years of livestock grazing removal. *Restoration Ecology* 23:548–554.

MEET A GRASSLAND RESEARCHER

Pat Reynolds

Pat Reynolds is the General Manager of Heritage Growers where he produces source-identified native seed and plants to support habitat restoration in California. He can be reached at **preynolds@heritagegrowers.com**.

What is your study system?

Although I am not a research scientist, I do study the methods used to produce source-identified native seeds and plants for habitat restoration. This involves testing the many elements involved in amplifying wildland-collected seeds and growing native plants. At Heritage Growers, we are constantly looking for better ways to collect wildland stock seed, experimenting with different seeding methods and rates, trying to find more effective ways to control weeds in our fields, looking for more efficient means to irrigate our crops, and finding better means to clean the source-identified native seed that we produce. We are doing similar work with our native plug nursery by testing different treatments to improve seed germination, growing out new species, and using different container sizes to produce the best possible container plant.

Pat Reynolds assessing native grass stands while scouting for wildland stock seed collections.

What are your primary research goals?

We are trying to grow new species and/or taxa within certain ecotypes in the most efficient way possible. This involves testing wildland-collected seed for viability, including germination and dormancy, and then going on to trial promising material in our demonstration garden to determine how it performs in an agricultural setting before implementing production-level amplification. For all materials that we produce, we are always trying to improve the quality (as measured by seed purity and germination) and quantity (as measured by pounds of seed produced per acre) of the seed produced and doing so as cost-effectively as possible.

Who is your audience?

Our audience is restoration practitioners; native seed and plant producers; and anyone interested in using native seeds and plants to improve habitat values.

Who has inspired you, including your mentors?

I have been inspired and mentored by many high-quality individuals during my career. Dale Thornburg was my graduate advisor at Cal Poly Humboldt; he taught me the importance of patience and persistence in graduate school and the many functions of coarse woody debris in forest ecosystems. Tom Griggs was my boss when I was a restoration intern at The Nature Conservancy and served on my graduate advisory committee when I was studying valley oak riparian forest restoration at the Cosumnes River Preserve. Tom taught me the importance of natural processes in habitat restoration and what it means to be a restoration ecologist. Dan Stephens, my boss when I was a consulting restoration ecologist at H.T. Harvey & Associates, taught me the importance of organizational skills, how to write clearly and concisely, and how to be a natural resource professional. John Anderson, an advisor when I was the General Manager of Hedgerow Farms, taught me the importance of being curious, generous with your time, and kind to colleagues and collaborators. Now, as the General Manager of Heritage Growers (a program of River Partners), Julie Rentner, the president of River Partners, is teaching me how to think big and bold and how to inspire others to do the same.

How has or will your research align with the mission of CNGA "to promote, preserve, and restore the diversity of California's native grasses and grassland ecosystems through education, advocacy, research, and stewardship"?

My work is most directly related to the restoration of California's native grasses and grassland ecosystems. The more herbaceous species and ecotypes that we can produce cost-effectively, the more appropriate plant materials will be available for habitat restoration projects and the more likely these projects will be successful and sustainable.

Why do you love grasslands?

I love grasslands because of the many important ecosystem services they provide and the high level of plant and animal diversity that they support. I particularly love the flowers within grasslands and how they support beneficial insects including pollinators.

Meet the Class of 2023: Grassland Research Awards for Student Scholarship (GRASS) Recipients

One of CNGA's most important tasks is to enable the future of grassland conservation by training future generations of grassland managers and researchers. Since 2019, CNGA has offered competitive research funds to promote student research focused on understanding, preserving, and restoring California's native grassland ecosystems.

This year, we awarded scholarships to eleven outstanding graduate and undergraduate students who submitted quality research proposals to the GRASS Program. We congratulate and thank the GRASS Class of 2023 for their important work and are grateful to our members and donors who contribute to this program through their membership and donations.

Ava-Rose Beech, 2023 GRASS Recipient

UC Davis

Project Title: *Assessing compost application and grazing management in California rangelands: Impacts on soil microbial ecology and drought resistance*

I am a first year PhD Student in Ecology, studying under Leslie Roche in the UC Rangelands Lab. I am studying soil ecology and drought resilience in rangeland ecosystems. I am specifically excited about understanding how rangeland management practices can help ranchers cope with difficult challenges related to climate change including water scarcity, wildfire, increased temperature, and invasive species. I am currently studying how compost applications in rangelands impact soil microbial diversity, and drought resilience. I am passionate about engaging in applied research that is directly impactful to ranchers, and I love engaging in science education and community outreach.

Natan Euol, 2023 GRASS Recipient

UC Davis

Project Title: *The new home for native plants and pollinators: The social and environmental impacts of green roofs on urban communities*

Hello! My name is Natan Euol, and I am a 3rd year Community & Regional Development major at UC Davis. My research studies the social and ecological benefits of California Native Grassland Green Roofs and their overall environmental success. The results of which can inform future decisions regarding seed mixes, types of irrigation, and methods of data collection, both for our green roof and other urban green spaces. I aspire to be an urban planner, with the goal of understanding the intersectionality between sustainability and our built environment. A fun fact about me is that I am an LA native and a die-hard Celtics fan; if you ask why, it'll make less sense.

Meet the Class of 2023: GRASS Recipients *continued*

Deborah Nardo-Ayala, 2023 GRASS Recipient

Texas A & M

Project Title: *Improved salt tolerant perennial grass development at Salton Sea*

Deborah Nardo-Ayala is an Environmental Scientist. She is a Doctoral Candidate at Texas A&M in Soil and Crop Sciences, researching improved salt-tolerant perennial grass development. Her focus is on habitat restoration and plant pathology in degraded environments. She holds a Master's in Agriculture Science and a Bachelor's in Plant Science with minors in Soil Science and Pest Management from Cal Poly Pomona. Deborah is a field scientist for the California Department of Food and Agriculture, where she assesses plant and soil pests and diseases. She also consults on phytoremediation projects across the state.

Laurel Sebastian, 2022/2023 GRASS Recipient

UC Davis

Project Title: *Tracking tradeoffs and synergies: Carbon sequestration across three grassland restoration designs*

I'm a second year MS student studying restoration ecology in the Graduate Group in Ecology at UC Davis. I hope to identify restoration strategies that support soil carbon sequestration in California grasslands. Leveraging an experiment that used plant traits (e.g., root depth) to optimize either drought tolerance, invasion resistance, or diversity, I will test whether any of those restoration goals exhibit tradeoffs with soil carbon. Across restoration treatments, I hope to identify traits or species that can support carbon sequestration and other restoration goals simultaneously. Furthermore, drought and invasive species treatments will help us understand how common environmental stressors may alter carbon sequestration processes.

Jessica Solis, 2023 GRASS Recipient

San Francisco State University

Project Title: *Investigating the impact of wildfire disturbance and microclimate on carbon and water fluxes in a coastal fog-influenced grassland ecosystem*

I am a second year M.A. student at San Francisco State University studying geography with an emphasis in resource management and environmental planning. My thesis research aims to understand how coastal fog and wildfire disturbance impact carbon water fluxes in coastal grassland ecosystems. I hope that my research will advance our understanding of vegetation recovery post-fire and the associated carbon dynamics that are key to improve climate-adaptive land management. I am a San Francisco native and my passion for understanding how coastal fog influences native plant communities has been driven by my long-term observations of fog declining along the California coast.

Meet the Class of 2023: GRASS Recipients *continued*

Jennifer Valadez, 2023 GRASS Recipient

UC Santa Cruz

Project Title: *What is the spatial and temporal variability of soil carbon storage after grassland restoration?*

Hi I am Jennifer Valadez. I am a third-year undergraduate at UC Santa Cruz majoring in environmental sciences. My research is focusing on the soil carbon storage potential of restored grasslands, specifically of commonly planted native bunch grasses. In addition, I'll be investigating the impact of age on soil carbon in restored grasslands. I am excited to focus on this for my senior thesis, and further investigate soil carbon in our California grasslands.

Annalise Taylor, 2023 GRASS Recipient

UC Berkeley

Project Title: *Good fire: Impacts of controlled and cultural burning on diversity and abundance of Amah Mutsum food and medicine plants in coastal grasslands*

As a PhD Candidate at UC Berkeley, I'm partnering with the Amah Mutsun Tribal Band of California's Central Coast to study the ecological impacts of Indigenous stewardship practices with innovative geospatial tools. I've worked extensively in Google Earth Engine, a powerful remote sensing API, to study ecosystem change over time and space. I'm currently working to track the impacts of Amah Mutsun cultural burning on the landscape, and mapping culturally important plants. Broadly, I aim to apply my skills in remote sensing, ecology, and GIS to promote environmental justice and Indigenous sovereignty. I also love designing and leading Earth Engine workshops, and I hope to make this incredible tool accessible and exciting for all people, and particularly people who are traditionally excluded from programming communities.

Brooke Wainwright, 2022/2023 GRASS Recipient

UC Davis

Project Title: *Proposing a novel drought-response trait framework for California grasslands and beyond*

Brooke is a second-year PhD student at UC Davis investigating how California grassland species, both native and nonnative, cope with drought by modifying their traits. She received her master's degree from the University of New Mexico in 2021 and studied the recruitment dynamics of desert grassland species under various climate change regimes. She is passionate about learning about and teaching others about the diverse California flora. Her goal is to use science to inform land management and have a positive effect on the way humans interact with their natural landscape.

Meet the Class of 2023: GRASS Recipients *continued*

Melissa Grim, 2023 GRASS Recipient

UC Davis

Project Title: *The role of fire and functional frameworks in restoring oak savanna understorydrought resistance*

My research primarily focuses on terrestrial-aquatic interactions, but with the help of *Hands On the Land* I will be participating in research conducted at the McLaughlin Natural Reserve studying the interactions between fire management and restoration of an oak savannah understory.

Meet the Class of 2023: GRASS Recipients *continued*

Sabella Vasquez-Rey, 2023 GRASS Recipient

UC Davis

Project Title: *Impact of livestock management and grazing intensity on avian taxonomic and functional diversity in montane riparian meadows within California's federal public lands*

I am a master's student in Dr. Leslie Roche's lab at UC Davis. After completing my bachelor's degree, I have been privileged to research multiple ecosystems and to work with fascinating wildlife species, including monitoring piping plovers and least terns in Colorado's grand grasslands; studying sage thrashers, sagebrush sparrows, and brewer's sparrows in Wyoming's vast sagebrush shrublands; and observing barn swallows in Colorado's ranching communities. Currently, I am interested in studying how local land management strategies and livestock grazing pressure are impacting avian communities at a taxonomic and functional level across grazing allotments managed by the U.S. Forest Service in the Sierra Nevada region, with an emphasis on sites with montane riparian meadows. In the Sierra Nevada, montane meadows are essential ecosystems that provide benefits to both biodiversity and human society; thus, their conservation is of utmost importance if we wish to maintain major ecosystem functions and services. With this study, I aim to determine the relationship between the conditions of montane meadows and wildlife communities. Additionally, I hope to develop the technical skills and qualifications necessary to become a wildlife biologist for a state or federal agency and learn new ways of tackling natural resource dilemmas that are becoming more prevalent in the Anthropocene epoch.

Summer Santich, 2023 GRASS Recipient

UC Davis

Project Title: *A future for ecological urbanization*

Hi! My name is Summer Santich, and I am a Second Year Landscape Architecture major at UC Davis. My research studies the growth of California native grassland plants on green roofs, the relationship between the green roof and pollinators such as bees, hummingbirds, and butterflies, as well as the social relationship between people and the roof. The research aims to study alternatives to California grassland restoration in urban landscapes and understand the social relationship between the two. During my free time, I love to hike, camp, run, and sketch, as well as play with my dogs and sisters.

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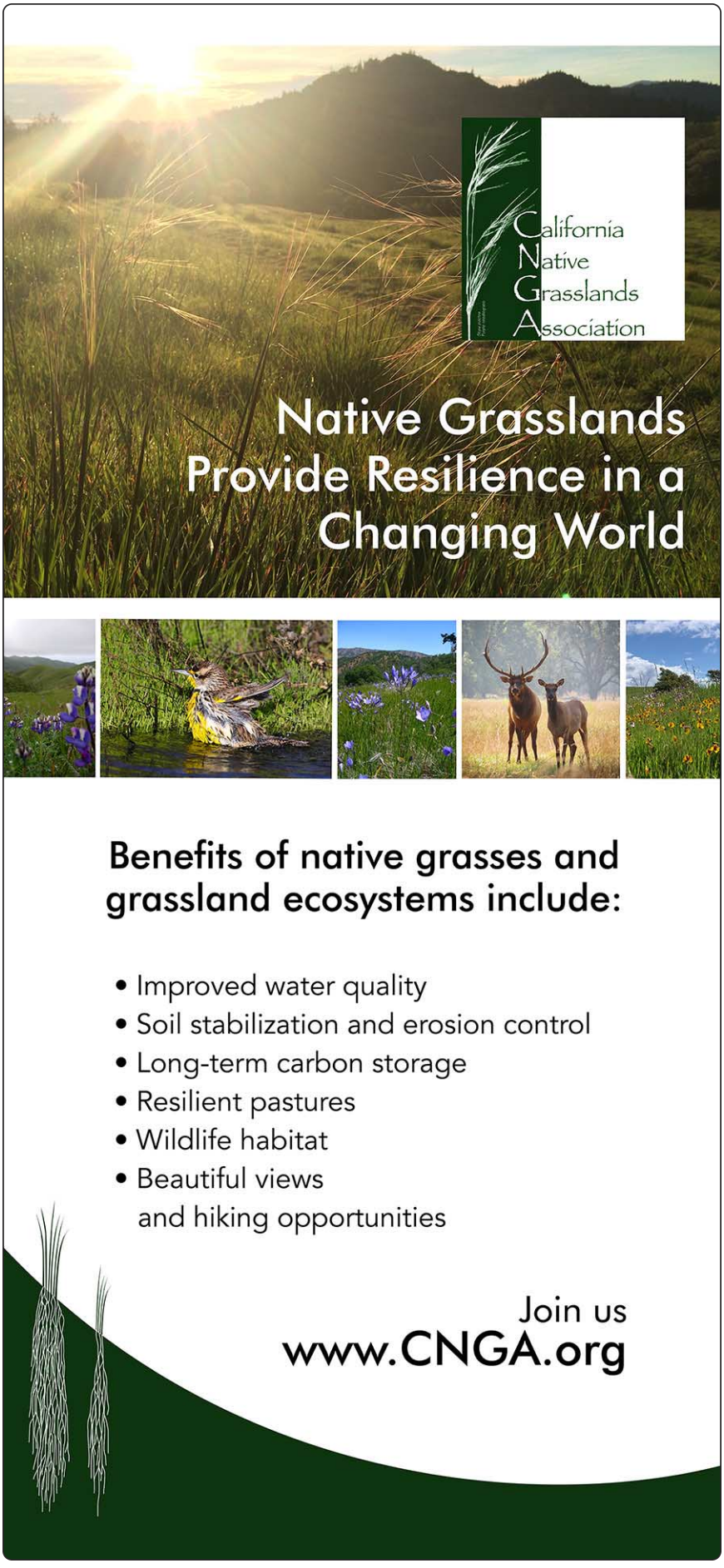

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The mission of the California Native Grasslands Association is to promote, preserve, and restore the diversity of California's native grasses and grassland ecosystems through education, advocacy, research, and stewardship.

California Native Grasslands Association

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Front cover: View of Mt. Tamalpais from the predominantly-native serpentine grasslands of Ring Mountain Preserve, Marin County.

Photo credit: Jen Mathers, May 2008.

Back cover: Arnow's needlegrass in Cucamonga Canyon, Sylvania Mountains, next to the northern edge of Death Valley National Park, Inyo County, CA. *Stipa* or *Eriocoma arnowiae*, a species described from Utah.

Photo credit: Laura Cunningham, May 2023.