California Native Grasslands Association

GRASSLANDS

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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

I write these few lines as we near the close of 2021 and the celebration of CNGA's 30th anniversary. What a year it has been!

All of your elected Board members, assisted by Diana Jeffery, our Administrative Director, have worked hard to serve you, our members and sponsors, and CNGA in promoting California native grasslands. Despite the difficulties of the COVID-19 pandemic, CNGA's committees have accomplished a lot. As the President, I couldn't be prouder to serve with such a dynamic, passionate and dedicated group of volunteers.

With the help of generous donors and sponsors, we were able to offer great workshops and are gearing up towards a two-day conference at the Pepperwood Preserve in May, similar to our past annual conferences. Our support, along with many other groups, to save the Tesla Park native grassland ecosystem from OHV use, was successful, and its preservation was just signed by our Governor. The research committee conducted a survey and the results will guide us in the near future. The *Grasslands* journal committee has been working diligently to find and review articles for each issue, including this year's two special editions devoted to John Anderson and CNGA's 30th Anniversary. Diversity, equity, and inclusion are important for us, and we are finalizing our organization statement on this topic.

It has been a very good year, but we cannot stop here. We need more support from new members and sponsors by way of new memberships and donations to go the extra step to reach out to more people, landowners, state and federal agencies to advocate for the importance of native grasslands ecosystems and that grasslands are a critical factor in the 30x30 preservation goal set by the State and many countries around the world. For all of our current members and sponsors: we thank you for your continuous support.

Climate change and the increased occurrence of large, destructive fires in California make restoring the land with native plants, including native grasses, more important than ever. We will keep advocating for this and educating members of the public and agencies of its benefits not only to the soil but also to wildlife with wildfire prevention in mind.

Enjoy this last *Grasslands* edition of 2021, and please send us articles and images that would be beneficial to share with all of our members. And don't hesitate to contact us to see how you can be involved with CNGA.

On behalf of CNGA,

JP Marié, Board President

CNGA 2021 Board of Directors Elections —

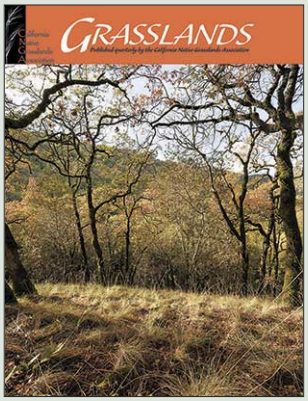
Online voting is open from December 1–20...

YOUR VOTE COUNTS!

See page 22 for details

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:

Winter 2022 15 Nov 2021 ❊ **Spring 2022**: 15 Feb 2022
Summer 2022: 15 May 2022 ❊ **Fall 2022**: 15 Aug 2022

In this issue

CNGA'S 14th Annual Field Day at Hedgerow Farms

Sowing the Seeds of Grassland Restoration & Celebrating CNGA's 30th Anniversary

by Pat Reynolds[1] and Diana Jeffery[2]

The California Native Grassland Association (CNGA) presented the 14th Annual Field Day at Hedgerow Farms in a virtual format for the second year in a row in response to the coronavirus pandemic. CNGA President JP Marie, who served as the Zoom Master for this event, quickly resolved some initial technical issues, and the rest of the day went smoothly. There were 167 attendees, with participants attending from all over California and even as far as Colorado and Nevada.

We took full advantage of the virtual format by providing video tours of restoration projects from several locations in California along with the key operational aspects of Hedgerow Farms. The Field Day program featured the entire restoration process, from harvesting wildland seed, through increasing seed at the farm, to using seed and plugs in habitat restoration projects. In celebration of CNGA's 30th Anniversary, we called on some of our long-term members and former board members to provide their perspectives on the evolution of grassland habitat restoration over the last three decades. Finally, to honor CNGA founder and habitat restoration icon John Anderson who passed on in 2020, we included a tribute to Dr. Anderson and the incredible legacy of his work.

Evaluation responses were exceptionally positive, with participants showing a great appreciation for the technical depth, variety of restoration topics, and expanse of geographic area covered.

There was too much important information to cover here, but we will try to summarize some of the major points in the presentations. We ask the presenters to please forgive us for any omissions or misinterpretations. If you were unable to attend but would like to learn more, we are offering Field Day 2021 as an on-demand event. Registration information is on our website at cnga.org.

The day began with a video led by veteran restoration professionals Tanya Meyer of the Yolo County RCD, Bryan Young of the

continued next page

[1]Pat Reynolds is the Sacramento Valley Regional Director for River Partners and a CNGA board member. [2]Diana Jeffery is a plant ecologist and administrative director of CNGA.

CNGA'S 14th Annual Field Day at Hedgerow Farms *continued*

Sacramento County Sanitation District, and Jeff Quiter of Hedgerow Farms. They demonstrated how to collect wildland seed and discussed some of the many things to consider during the collection process. They stressed the importance of obtaining permission to collect wildland seed, collecting only a small proportion of the seed present, and the proper timing of seed collection, including some techniques to determine seed ripeness.

The next segment of the day featured how native seed is increased at Hedgerow Farms. Bryan Young, Jeff Quiter, Pat Reynolds from River Partners, and Chris Rose from Solano County RCD covered several topics, including the planning puzzle of choosing when and where on the farm to plant different ecotypes of the same species to prevent cross-pollination and maintain local genetics. They presented detailed protocols and techniques for growing out seed, including planting, weed control, irrigation, harvesting, and the importance of matching ecotype to the site conditions at different projects.

The day also featured an informative discussion of the 30-year evolution of grassland restoration by several seasoned restoration professionals. Truman Young, Professor Emeritus from the UC Davis Department of Plant Sciences, spoke on the element of time in restoration. He stressed how variable restoration success is across sites and years and how native forbs are often displaced over time by both native grasses and exotic annuals. He advised us not to judge the success of seeded native grasses by their initial density, as they grow slowly and can eventually dominate.

"Time is both the enemy and the friend of grassland restoration." — *Truman Young*

Long-time CNGA Board Member Jim Hanson discusses grassland conservation in what he calls "the grassland conservation two-step." He focused on how important it is to speak out or organize to protect or manage these unique habitats. The two-step process is the same for any size of grassland patch: Keep an eye out for a hidden native grassland gem in your area; then find a venue to speak and act in some way on behalf of these wonderfully resilient areas of grasses and wildflowers.

Former CNGA President and Preserve Manager for the Center for Natural Lands Management (CNLM) Erik Gantenbein, spoke from the Oxbow Preserve, located in Lathrop in the San Joaquin River floodplain. The preserve was set aside primarily as habitat for one of only two remaining natural populations of riparian brush rabbit (USFW 2020). The preserve flooded in 2017 and, because the site lacked quality high-water refugia with appropriate cover and food resources, CNLM had to supply emergency artificial cover structures and supplemental food for the brush rabbit (USFW, 2020). His message is that conservation is a continuing process.

"It's important to conserve but the job doesn't end there." —*Erik Gantenbein*

Seated on the front porch at his Poppy Hill Farm, CNGA Board Member Richard King spoke excitedly about grazing management and grassland health and how native perennial grasses and native perennial forbs were "invading" his ranch's annual grasslands! He was able to achieve this through holistic grazing management as opposed to conventional management, which he says is the opposite of the prescription needed for growing native grasses and forbs. The native perennials build soil, sequester carbon, and build biodiversity above and below ground—all helping the land act as a sponge to absorb rainwater. Holistic grazing management considers several aspects relating to the site, including poisonous plants, endangered species, riparian corridor health, animal performance, people, and money to find success—and Richard has fun taking part in it!

"We have to learn how nature managed these great grasslands." — *Richard King*

Ecologist Jaymee Marty's presentation covered the changes she has seen in how we approach grassland and vernal pool restoration and management—particularly shifts in our view of livestock grazing. Perspectives have changed dramatically from removing cattle to slowly realizing, as thatch build-up replaced wildflowers in non-grazed vernal pool grasslands, that cattle are an essential component of vernal pool management. Another notable change in our views is how we mitigate for the loss of vernal pools. Initially, vernal pools were packed into mitigation areas at the expense of upland grasslands. However, we learned that upland grasslands are critical in maintaining the diversity of animal life and ecological functions. Jaymee urges us to stop

"Grazing is important for maintaining diversity in grasslands including some sensitive habitats like vernal pools." — *Jaymee Marty*

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CNGA'S 14th Annual Field Day at Hedgerow Farms *continued*

requiring vernal pool creation and focus on the conservation of existing vernal pools and their surrounding upland grassland habitat.

Rachael Long, Farm Advisor, and Interim County Director at the UC Cooperative Extension, Yolo County, presented "Corridors are for the Birds," a film she made with Wild Farm Alliance on the benefits of native hedgerows. The film focuses on declining bird species. Hedgerows provide many benefits, including safe dispersal corridors, nesting places, refuge, and food. She recommended identifying the birds in your area, planting a diversity of habitats, and installing nest boxes and raptor perches.

With the theme "From Farm to Field: Where are They Now (the Seeds!)?", the afternoon sessions featured a series of habitat restoration projects throughout California illustrated in a mix of slide presentations and video tours. Emily Allen, ecological consultant, and CNGA board member, added commentary in the Zoom "chat box" feature supplementing the information provided.

Valerie Eviner, Professor, from the UC Davis Department of Plant Sciences, led off with a discussion of drought in her presentation, "Challenges, opportunities, and priorities for managing grasslands during drought: perspectives from previous drought years." She began with a review of lessons learned from earlier droughts between 2012 and 2016. She cited research that showed drought decreased exotic annual grass cover and composition but had mixed effects on annual forbs. Although negatively affected, established native perennial grasses tended to persist and recover after drought. In another experiment, initial seedling establishment of native grasses was negatively affected by drought, but there was no difference in seedling survival by the fourth year. However, there is evidence that drought can positively affect native establishment because it reduces the abundance of non-native species. She emphasized how grasslands are more resilient to drought when they contain a diverse suite of species with appropriate disturbance regimes (to increase the forb seedbank) and healthy soil practices. Although grasslands can recover, droughts can have lasting impacts on soils and plants. She warns, for example, that future droughts may differ from the historic droughts that California has evolved with. What can we do to prepare our grasslands to be able to withstand these droughts of the future?

Promote and restore native grasses and forbs.

Protect groundwater resources that many native plants and ecosystems depend on.

Vic Claassen, Soil Scientist from the UC Davis Department of Land, Air, and Water Resources, shared his presentation titled, "Soil structure condition can improve plant growth during droughts." California's plants and soil systems have evolved with historically variable weather. However, the interval between rains has lengthened. He cited a study with five decades of weather data that found an increase in the average time between rainfall from 20 to 32 days across the west; the current 2021 winter rainy season fits this pattern. He pointed out that the problem with global warming is that "it will be hard on us, and it is so gradual that we don't perceive the trends."

He discussed ways to improve and protect the soil for optimal plant growth, noting the benefits of a protective mulch surface, granular water-stable soil aggregate structures, and a deep soil profile facilitating rainwater percolation, root penetration, and moisture retention. He offered prescriptions for improving soils and increasing water and root infiltration success. He noted that deep rooting perennial native grasses generate 'hydraulic lift' bringing subsoil moisture to the dry mid-soil horizons.

In her presentation, "Back-to-back burns: post-fire restoration of coast range grasslands," Michelle Halbur, preserve ecologist for the Pepperwood Preserve in Sonoma County, described observations, experiences, and outcomes from two large-scale fires in two years (Tubbs in 2017 and Kincade in 2019) and how fires have influenced their restoration practices at the preserve. Pepperwood's mission, to inspire conservation through science, makes them particularly well-situated to answer questions including, how do you insert your restoration and prescription burning into a new context with more frequent fires under climate change? How much fire is too much fire? What opportunities are there to steward affected areas towards native systems? How are fire and drought influencing the grassland communities? The grasslands regenerated quickly after the

> "Plants and soils work together. They depend on each other, and when we try and reestablish these systems on damaged sites, we need to kind of take an inventory of how many of those hidden soil characteristics are really helping plants grow and get them back in or help them regenerate by minimizing tillage and keeping the organics in the soil." — *Vic Claassen*

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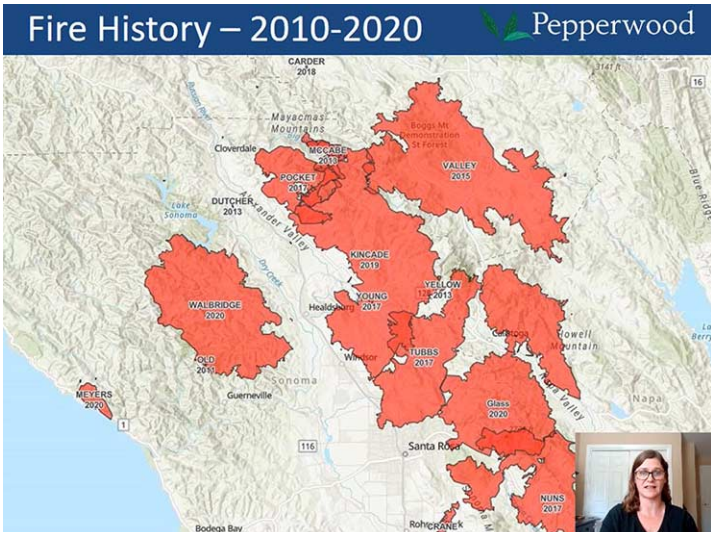

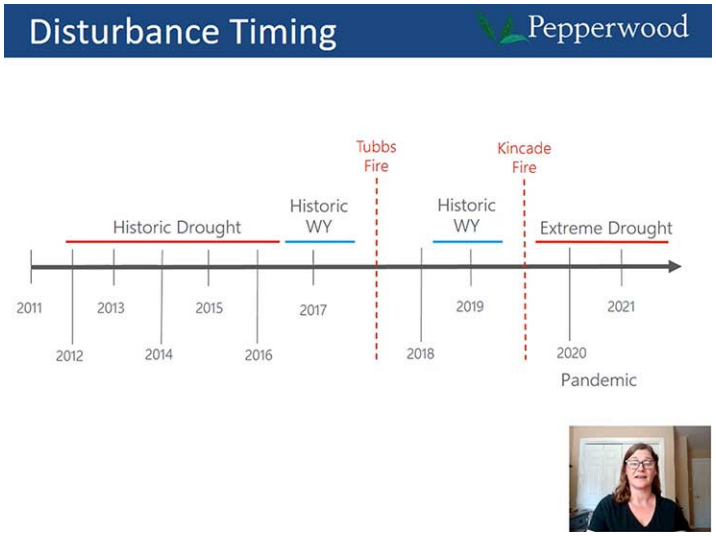

Left: Michelle Halbur presenting a slide depicting the disturbance at Pepperwood Preserve with historic droughts, water years (WY), two wildfires, and current extreme drought in Sonoma, Napa, and Lake Counties. Recent fires are larger in scale, more frequent, and with more overlap than under fire-suppression regimes (burn history map sourced from **www.wildfirefuelmapper.org**). Right: Wildfire history of Sonoma County, slide from Michelle Halbur's presentation.

CNGA'S 14th Annual Field Day at Hedgerow Farms *continued*

2017 fire and produced stunning wildflower displays. Native perennial grasses were the first to regenerate before precipitation because of their deep roots and the nutrients and sunlight made available by the fire. Challenges included the many bulldozer lines—although they were grateful for the bulldozer's fire work. She described in detail the process of restoring bulldozer lines to reduce erosion and restore grasslands.

She recommended this preparation for wildfire: Incorporate fire into your restoration and stewardship plans, consider starting a "fire-day fund' to cover unexpected costs, keep extra restoration planting stock, be creative, and think of ways to utilize succession to enhance your restoration success.

> "Areas with native grass populations really become obvious after fire. In fact, if you are going to map your native grasslands I recommend you do it after fire as it is so easy to find them." —*Michelle Halbur, observation after Tubbs Fire*

Stephen Sheppard, Director of Operations at River Partners led a video site tour titled, "Restoration of native herbaceous vegetation at large scale riparian restoration projects, Dos Rios Ranch." He described the techniques used to restore the understory at Dos Rios Ranch and showed us areas at different growth stages, from newly installed to several years after restoration. They planted three species: creeping wildrye, great valley gum plant, and mugwort. These species thrive in this floodplain habitat, provide resources for wildlife, and are fast-growing and aggressive enough to crowd out any competing weeds, ideally requiring no further weed control three years after establishment. Site preparation was 2-years of weed control before planting the understory. They planted in single-species swaths to facilitate weed control and prevent competition among the three species planted. They also created "life rafts" of high-ground refugia for the endangered brush rabbit and other animals during flooding events. He took us with him on a wonderfully swishing and crackling hike up through the native grass stands to the top of one of these "bunny mounds." And from atop one of the mounds, we're given a sweeping view of a portion of the property.

JP Marié, manager of the UC Davis Putah Creek Riparian Reserve and CNGA President, took us on a Russell Ranch mitigation area tour. He showed slides depicting the transformation of farm fields, pastures, and orchard lands into restored grasslands at the site located on UC Davis-owned lands. The location was designated to fulfill legal and regulatory mitigation requirements for development on the UC Davis campus. The goals were to create habitat for Swainson's hawks, burrowing owls, and valley elderberry longhorn beetles while informing future UC mitigation efforts adhering to the University's teaching, research, and public service mission.

The planning committee included grassland restoration mentors John Anderson and Truman Young. JP described the restoration process of converting the former farmed areas to grasslands. The project began in 2005, with site preparation and then selecting and planting Hedgerow Farm-sourced native grass and forb seed mixes.

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CNGA'S 14th Annual Field Day at Hedgerow Farms *continued*

Grasslands grazing management using goats to remove thatch for bunch grass health at Bee Flat in southern California.

Weeds grew wildly the first year during a pre-drought wet winter, and JP took us through the weed control methods they used, including cattle grazing and prescribed fire. Local fire departments trained their crews by conducting controlled burns on the property—a win-win proposition! He explained how some type of periodic disturbance—burning, mowing, grazing—is required to remove thatch and keep the grasslands healthy. JP ended his presentation by showing photos of the restored area with colorful poppies and lupines blooming among the native grasses.

Next, Robert Freese and Collin Raff of the Irvine Ranch Conservancy and Megan Lulow from UC Irvine and UCI-Nature Southern California worked as a team in their site-tour video to share lessons they have learned on an Orange County mitigation site in the foothills of the Santa Ana Mountains. The restoration project is part of an agreement to restore a mosaic of habitats on property degraded by decades of heavy grazing and repeated wildfires. Collin introduced himself from the West Loma Ridge restoration project, 34 acres of native grassland habitat. Megan then described some factors to take into consideration when selecting a restoration site. Initially, they planted similar seed mixtures on both north and south-facing slopes. They found that native grasses performed well on north-facing slopes but not so well on the hot, dry south-facing slopes that favored scrub vegetation. Another factor they noted was soil properties. For example, purple needlegrass grows best on clay soils, which hold moisture longer into the growing season. Restoration site preparation included mowing and multi-year herbicide applications (2 to 4 years depending on weed species) to control the accumulated weed seed bank.

> "Remnant vegetation is a good guide to selecting grassland restoration sites." — *Robert Freese*

Robert described three approaches to establishing grasslands and gave pros and cons for each. The tour then took us to the Irvine Ranch Native Seed Farm, where seeds are grown and harvested for their projects. We traveled next to West Loma Ridge and Bee Flat Canyon grasslands, where they explained the restoration methods and necessary maintenance for each site.

They emphasized the importance of utilizing disturbance, such as mowing, raking, burning, or grazing (see photo), to maintain a healthy grassland.

In a video tour filmed on a residential site in San Jose, Billy Krimmel, Founder & President of Miridae Landscape Architecture & Construction, described the process of creating a native grassland meadow. When the project began five years ago, rip-gut brome dominated the area. They applied herbicide to kill the brome and converted the existing sprinklers to a drip system. After removing weeds, they dethatched the area and established a perennial grid of

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Billy Krimmel demonstrates how to sample insects using a selfie stick and a beating net.

CNGA'S 14th Annual Field Day at Hedgerow Farms *continued*

native grasses, adding showy perennials for structure. A year later, they planted forb seed from Hedgerow Farms, separating it into subgroups of species creating ephemeral swaths of colors appearing at different seasons. Billy listed the plants they used and described the weed management employed. He discussed the landscape design and suggested planting in clusters with "explosions" of deer grass to recreate the look of wildflower meadows within a more organized structure that makes the wildness of a meadow more pleasing for residential areas. Billy showed us newly emerging milkweed plants popping up from rhizomes developed at Hedgerow Farms.

Billy could not help but delight us with tidbits of information about the insects that visit these flowering plants. He closed with a lesson on how easy it is to discover what insects are on an individual plant using a shallow canvas beating net and any stick, ax handle, or similar object—in this case, a selfie stick. Holding the net beneath a plant, Billy carefully knocks the plant with the stick. The idea is that insects drop off the plant and fall into the net, ready for examination.

The 14th Annual CNGA Field Day at Hedgerow Farms was comprehensive and unique. The virtual format allowed us to cover a greater depth and diversity of topics and a wider geographic spread of projects, including more in southern California. It similarly allowed for greater participation by individuals that are farther away from Hedgerow Farms. Thus, in this regard, the pandemic and virtual format had some positive benefits. We followed the seed from wildland collection through seed increase to use on various sites. This process was put into perspective by experienced restoration professionals who have seen the science and practice evolve over 30 years. The tribute to John Anderson was a touching and powerful reminder of the significant influence he had on the restoration community and how individuals can make a substantial and lasting difference. Overall, the participants and we were pleased with how we adapted to the situation and came up with a quality Field Day that most certainly helped advance the science and practice of grassland restoration. We look forward to planning for next year's Field Day.

References Cited

USFWS. 2020. Species Status Assessment for the Riparian Brush Rabbit (*Sylvilagus bachmani riparius*) February 2020, Version 3.2. **https://www.fws.gov/cno/Science/Review%20PDFs/2020/Comments/riparian_brush_rabbit_ssa_2020-06_comments.pdf.**

CNGA's Bunchgrass Circle

A Special *Thank You* to our Bunchgrass Circle Members!

As a nonprofit organization, CNGA depends on the generous support of our Corporate and Associate members. Ads throughout the issue showcase levels of Corporate membership ($1,000, $500, $250). Associate members ($125) are listed below. Visit **www.cnga.org** for more information on joining at the Corporate or Associate level.

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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.

Changing the Way People See Grasslands

For 30 years, the California Native Grasslands Association has represented people concerned with the continued loss and degradation of California's grasslands, the most threatened ecosystem in California. Our dedicated Board of Directors volunteer their valuable time to educate and promote awareness of the beauty and importance of healthy grassland ecosystems.

We invite you to support our mission with your donation or through CNGA membership.

JOIN ❊ RENEW ❊ DONATE

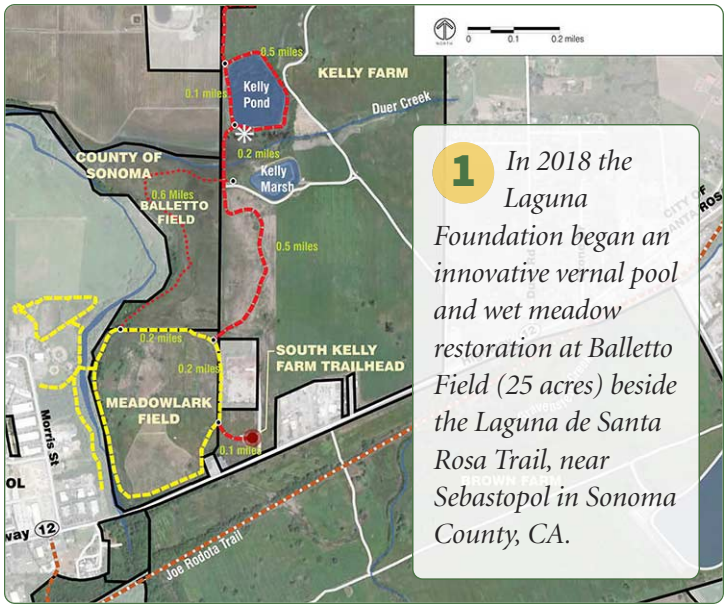
Four ways to make your gift:

1. **Online** — cnga.org
2. **By Mail** — send your check or credit card information to: CNGA, PO Box 485, Davis CA 95617
3. **By Phone** — call us at (530) 902-6009 with your credit card info
4. **Consider Donating your Time and Expertise** — join the CNGA Board of Directors! Contact admin@cnga.org for more information.

A Story of Vernal Pool Restoration Within the Laguna de Santa Rosa Floodplain

by Sarah P. Gordon, Asa Voight and Wendy Trowbridge, Laguna de Santa Rosa Foundation.

A collaboration with Sonoma County Regional Parks, Sonoma Water, the California Department of Fish and Wildlife, and Santa Rosa Junior College (SRJC).



1 *In 2018 the Laguna Foundation began an innovative vernal pool and wet meadow restoration at Balletto Field (25 acres) beside the Laguna de Santa Rosa Trail, near Sebastopol in Sonoma County, CA.*

2 *Endangered Sebastopol meadowfoam* (Limnanthes vinculans) *thrived in Balletto Field under dairy cattle grazing (photo circa 1997), but grazing was removed once the property was transferred to public ownership.*

3 *Fast forward to 2018: after nearly 20 years without grazing, thatch accumulation from annual non-native grasses was smothering the native vernal pool species, including meadowfoam.*

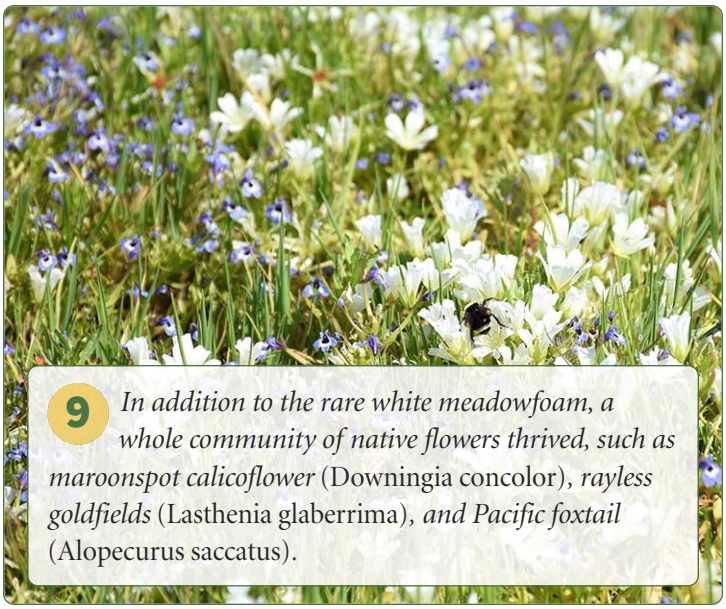
4 *In summer 2018, we collected 400 Sebastopol meadowfoam seeds from the remnant population at Balletto Field… and grew them out in our nursery to produce 130,000 new seeds.*

5 *Thatch was removed the following summer in 2019, by 300 sheep… and 20 botany students from the local college.*

6 *In the fall of 2019, just at the start of the rainy season, we broadcast our seeds into the carefully raked and prepared vernal pools and waited for the rain.*

7 *As the wetlands filled with water over the winter, our seeds germinated, and their leaves reached up above the surface.*

8 *In spring of 2020, the vernal pools were covered in flowers.*



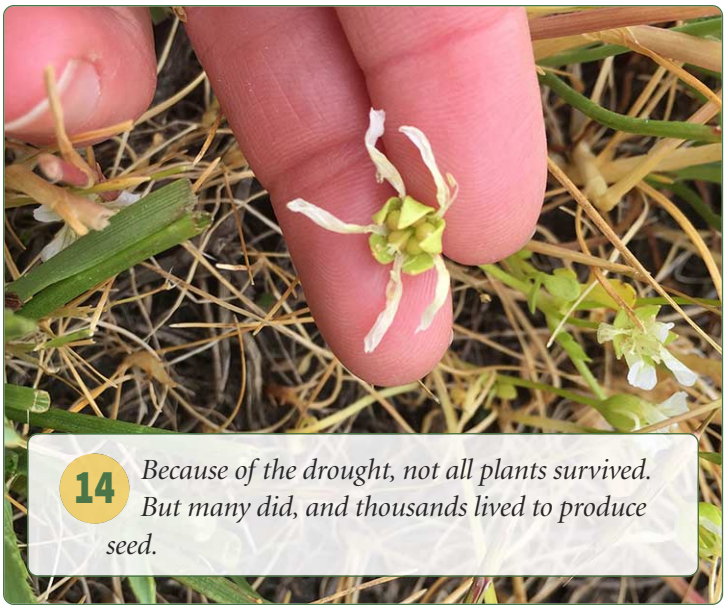
9 *In addition to the rare white meadowfoam, a whole community of native flowers thrived, such as maroonspot calicoflower* (Downingia concolor), *rayless goldfields* (Lasthenia glaberrima), *and Pacific foxtail* (Alopecurus saccatus).

10 *In fall of 2020, we placed the remaining seeds and waited again for rain… and waited some more… Rainfall for the season was only 30 percent of normal and the wetlands never filled.*

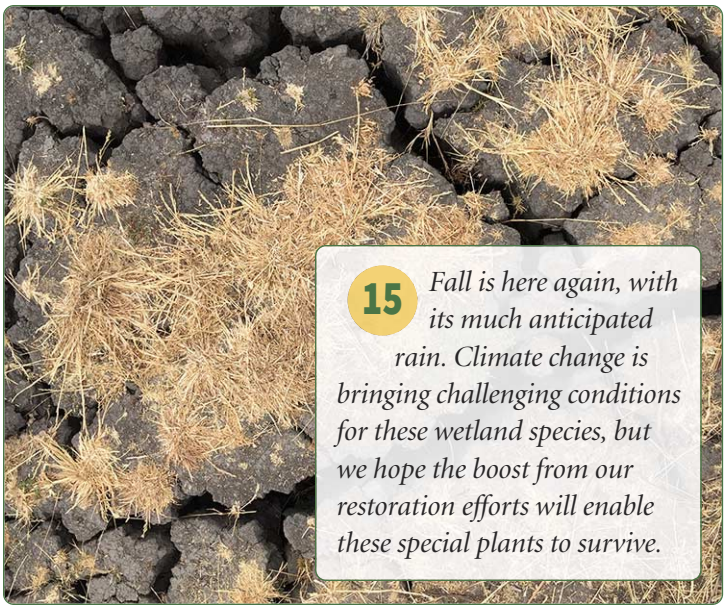
11 *But the tiny seeds germinated, and in places there were carpets of small, valiant meadowfoam.*

12 *This spring, in 2021, the display was not as impressive as the previous year, but when we looked close…*

13 *…there they were!*



14 *Because of the drought, not all plants survived. But many did, and thousands lived to produce seed.*



15 *Fall is here again, with its much anticipated rain. Climate change is bringing challenging conditions for these wetland species, but we hope the boost from our restoration efforts will enable these special plants to survive.*

A Story of Vernal Pool Restoration Within the Laguna de Santa Rosa Floodplain *continued*

Conclusion

Removal of legacy thatch and a reduction in annual thatch accumulation, through grazing or mechanical means, is critical to restore and maintain populations of vernal pool endemics. In cases where the seed bank is depleted, such as for the meadowfoam at Balletto Field, re-seeding may be necessary to re-establish the lost species.

For more information and specific details on the restoration techniques and results, please contact **sarah@lagunafoundation.org**.

Year	2017	2018	2019	2020	2021	2022
Sebastopol meadowfoam estimates	50	765	91	49,016	124,073	?

The average time between rainfall has increased from 20 to 32 days across the west. — from a study cited by Vic Claassen in his presentation at CNGA's Field Day at Hedgerow Farms (*see page 5*).

Diversity & Inclusion Conversations

Thank you for walking with me: Setting intentions as we redefine the terminology

by Leticia Morris[1] Originally printed in the Fall 2021 issue of SERCAL's *Ecesis* newsletter

Thank you for joining me today. We are going to go for a walk. I'm hoping this will be the first of many. And some of you reading will lead many of these walks. Although I am not sure where we are going or how far we will walk together, I can tell you that nothing I share on this walk with you will be new or novel. Yet, I have a deep knowing that wherever we walk, we may see old things more fully and older things more clearly. Perhaps the things that we see in-between may unravel within us a sense of wonder for the new things that we might be better able to discover or uncover together. I use the phrase "unravel within us" because I want to acknowledge that the seeds of every part of this walk are already planted within each of us and may simply require stirring. And so, on these walks, we will water these seeds as authentically and as honestly as we can with liberation in mind. We will water these seeds walking respectfully into direct intersections of race, gender, sex, income, ability, "isms" and restoration ecology.

> Our walk through diversity and inclusion terminology will be like walking through the mud and the grassland and the stream to the places you may not have seen and to the people you may not have heard in the lands that you may already love.

Some parts of this walk will not be comfortable, not for you and not even for me. Some parts of this walk may feel like the floor falling out beneath our footsteps. But sometimes the floor has to come out in order to transform a space and make it as expansive as what we imagine can be co-created. Any conversation of race and place in our industry comes with it a responsibility not only to see things as they are but also to see and envision things as they can be. Which is where we are beginning this walk today. A while back, I was kindly, gently, and lovingly approached by a friend and fellow botanist colleague to see if I was interested in sharing anything within (or even beyond) the general umbrella of *diversity and inclusion* within our community. What

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Diversity & Inclusion Conversations *continued*

spoke to me as a topic was *Terminology within the diversity and inclusion* framework. And I want to *walk with you* on this journey and talk ***with you*** about defining terms because language and the way we define and choose to present terms has the power to breathe life into our ability to invigorate spaces where less liberatory definitions often reign. But I can only do that so far as we both are committed to seeing each other in this process. And to do that we have to be open to the process of unlearning. There is a sacred simplicity in this process: in order to learn about these terms, we have to unlearn some terms both individually and together.

Like the process of ecological restoration of a stream as we, in the restoration field, are often sought to look at a landscape that we love which has been degraded and then try to help return it to a more sustainable version of its former self, we often find that we have to take a step back before making any prescriptive assessments. We have to walk the extent of the watershed. We have to be open to learning from those who have tended to the land and its needs for generations. We have to be accessible to the stories and perspectives from the point of reference of the land's inhabitants. We have to sit still and listen in some places and meander in others. We have to walk around and seek out the quietest conditions in the upstream and the faintest indicators downstream. We often have to travel great distances to see the parts that may not be readily apparent from standing in the middle of the land and looking down at the watershed. Or maybe we have to walk uphill to look at the things that we couldn't hear from standing beside the rapid streamflow. As brother James Baldwin so clairvoyantly tells us, "If I love you, I have to make you conscious of the things you cannot see." I imagine that if you are reading this article, you and I, we have a common interest in loving the land and wanting to help make it better than it is right now. And if we love the land authentically, we also learn how to authentically love all who steward it.

> Any conversation of race and place in our industry comes with it a responsibility not only to see things as they are but also to see and envision things as they can be.

And so, our walk through *diversity and inclusion terminology* will be like walking through the mud and the grassland and the stream to the places you may not have seen and to the people you may not have heard in the lands that you may already love. Maybe these walks will bring you into some spaces that you will learn to love. And throughout each walk, we will flow back to our intention: to learn and unlearn terminology in this industry in a way that allows us to see each other authentically. As this is a *diversity and inclusion column,* the perspectives as we define and redefine terms will be especially *from and with* those whom many of us may not have seen or heard from in this process. Our goal is rooted in love in that on every walk we may listen, see, and feel so that we may better care for each other and our landscapes and all of our relations which we seek every day to restore.

And so now that we have set our intention on this walk, I would like to ask you: what definition would you like to walk to from here?

In thanks and in gratitude until we walk again…

Aphyllon californicum (formerly *Orobanche californica*), California orobanche. Taken in September 2018 at the Point Arena Field Station in Mendocino County.

Notable Revisions to Grassland Species Treatments in the Jepson eFlora

by Emily Allen, Independent Consultant and CNGA Board Member. All photos by author.

> "Eventually the flora will be, in a way, out of date. The herbarium never will be—botanists will always wish to go back to it." –*Willits Linn Jepson*

The Jepson eFlora has been available online since 2011 and builds off the second edition of the Jepson Manual, which was published in 2012. At least once a year updates are made to taxa in the Jepson eFlora to make it reflective of the current understanding of the vascular flora of California. These revisions, beginning in 2013, can be found on the Supplement Summary Page of the eFlora website **https://ucjeps.berkeley.edu/eflora/supplement_summary.html**.

There is a wide variety of opinions among botanists and plant enthusiasts on the changes that are made. After taking the time to learn the Latin binomial of a plant, it can be frustrating to have it changed, and often the reasoning behind the change is not easily found. Taking time to understand why taxonomy is updated and becoming familiar with the background stories can help with learning the new names and relationships. This can lead to a broader appreciation for taxonomists and their work to keep our flora updated.

The main reasons for these recent name changes are threefold. First, through DNA and other molecular techniques our understanding of phylogeny, the evolutionary relationships between species, has increased dramatically in the last decade. Most systemic classifications of plants are based on phylogenetic studies, with close genetic relatives grouped. The speed at which genetic relationships can be determined is increasing as the process of genetic mapping has become faster, less expensive, and more widely used. Second, botanists are also focusing

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Bromus sitchensis var. *carinatus* (formerly *Bromus carinatus*), California brome, in flower. Taken in April 2020 on the Willits Bypass Project in Mendocino County.

Notable Revisions to Grassland Species Treatments in the Jepson eFlora

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more on exploring areas that have been overlooked in the past, especially areas with unique soils, hydrology, or other features that might indicate high species diversity, leading to new plant discoveries. Finally, new additions and changes to the eFlora also come from weed scientists and others focusing on monitoring and detecting non-native, invasive, and waif species as they move into the California floristic province. Recent revisions of grassland species have occurred for all these reasons in the last several years.

Some of the most direct changes include the addition of new species that haven't previously been described in California. For example, *Agrostis lacuna-vernalis*, vernal pool bent grass, was added to the eFlora in 2014 as a newly described native grass. This annual grass was discovered in 2006 by botanist Ellen Homes on a CNPS field trip. With the collaboration of several botanists, the species was described in 2011 and added to the Jepson eFlora in 2014 (Neubauer 2016). It has only been found at Fort Ord National Monument and has a rare plant list of 1B.1. What distinguishes it from the other annual *Agrostis* species in California is its awnless lemmas (Peterson et al. 2011).

Crepis pulchra, smallflower hawksbeard, was added to the eFlora as a non-native naturalized species in 2020 after being found 30 years ago. Small populations have remained limited to Napa, Solano, and Contra Costa counties (Iqbal 2017). However, while this species has not, to date, shown itself to be invasive, in general adding non-native species to eFlora soon after they are described allows for better tracking of new species and can help with early detection and monitoring to prevent significant invasions.

Recent phylogenetic evidence has provided insights into the relationships between species, leading to substantial, and often controversial, changes. A recent example of this type of revision happened in 2018 with the split of *Diplacus* and *Erythranthe* from *Mimulus*. *Mimulus* is a widely recognized genus and there were strong arguments for retaining the name, even though that goes against some principles of botanical names. The reasoning behind the changes is described in a series of journal articles beginning in 2012 with *A taxonomic conspectus of Phrymaceae: a narrowed circumscription for*

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Dipterostemon capitatus (formerly *Dichelostemma capitatum*), blue dips. Taken in March 2019 along Highway 20 in Colusa County.

Notable Revisions to Grassland Species Treatments in the Jepson eFlora

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Mimulus, new and resurrected genera, and new names and combinations. In 2019, after years of discussions, 38 authors wrote *The case for the continued use of the genus name Mimulus for all monkeyflowers* and made a passionate argument for the retention of the name *Mimulus* Not to be outdone, the authors of the first paper and three others, including Bruce Baldwin, wrote a rebuttal titled: *Response to "The case for the continued use of the genus name Mimulus for all monkeyflowers,"* confirming their reasoning behind the changes. There is also a wonderfully informative episode of the *In Defense of Plants* podcast with Dr. Naomi Fraga, the author of these treatments in the Jepson eFlora.

A less controversial change of this type was the moving of all New World *Orobanche* taxa to *Aphyllon* in 2017. *Orobanche* is now reserved for Old World species and *Aphyllon* is the genus of all New World species. *Aphyllon* was first used in 1769 but wasn't widely used in America until 1890 (Schneider 2016). *Aphyllon* is Greek and means leafless (a = without, phyllon = leaf) (Calflora.net).

The most significant revisions of the grass family, Poaceae, occurred in 2019 within the *Bromus* genus. The changes are all based on new phylogenetic understandings of the species. The first revision was the splitting of the two subspecies of *Bromus madritensis* into separate species. This is a move that has been considered for many years (Oja, 2002; Sales, 1994). *Bromus madritensis* subsp. *madritensis* transitioned to *Bromus madritensis,* and *Bromus madritensis* subsp. *rubens* became *Bromus rubens.* In their 2008 paper, *Molecular phylogeny and reticulate origins of the polyploid Bromus species from section Genea (Poaceae)*, Fortune et al. make solid arguments for splitting the species, stating "our data unambiguously support the independent formation of these two allopolyploids from different paternal progenitors and confirm the recognition of two genomically distinct species."

The second, and perhaps more noticed change, was the expansion of the *Bromus sitchensis* complex, moving *Bromus carinatus*, *B. marginatus, B. maritimus*, and *B. polyanthus* under *B. sitchensis* as varieties. In the "Brome" chapter of their 2011 book, *Wild Crop Relatives: Genomic and Breeding Resources*, Williams et al. hint towards this change based on morphologies and infertilities but states that "a revision of this group using molecular phylogenetic methods is

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Notable Revisions to Grassland Species Treatments in the Jepson eFlora

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required." They suggest the complex might be grouped under *B. carinatus*, but *B. sitchensis* is what was used because of the rule of priority of publication in the *International Code of Botanical Nomenclature*. This rule states the earliest publication of a name is the one that should be used. *B. carinatus* was described by Hooker and Walker-Arnott in 1840 (Brainerd et al. 2016), while *B. sitchensis* was described in 1832, so it became the name that now contains all the combined varieties. California brome, now *B. sitchensis* var. *carinatus*, found in every county in California (Calflora.org), is well known and is one of the most widely seeded species of native grass in the state.

There were also two notable recent changes made to the *Helianthus* genus. In 2020 *Helianthus exilis*, serpentine sunflower, was determined to be a synonym for *Helianthus bolanderi*, Bolander's sunflower. In 2016, Owens et al. found that "*H. bolanderi* and *H. exilis* form one genetic clade, with weak population structure that is associated with geographic location rather than soil composition and likely represent a single species, not two."

In 2017 *Helianthus winteri*, Winter's sunflower, was added as a newly described native perennial sunflower species after Stebbins et al. (2013) described it in the paper *Helianthus winteri (Asteraceae), a New Perennial Species From the Southern Sierra Nevada*. It is a California endemic found only in limited areas of Fresno and Tulare counties and was given a CNPS ranking of 1B.2. It was named for Robert F. (Bob) Winter, an emeritus with Fresno City College and is closely related to *H. annuus*. Its "combination of morphological and phenological attributes coupled with its presence in sites with specific ecological and geographical features" (Stebbins et al. 2013) led to it being recognized as a separate species. In contrast to most sunflowers in California, which bloom in the summer through autumn, Winter's sunflower is the only sunflower in California that blooms year-round (Calflora.org).

A noteworthy change to the eFlora occurred in 2019 when non-native *Acroptilon repens*, Russian knapweed, changed to *Rhaponticum repens* due to new findings when looking at the *Rhaponticum* group's DNA phylogeny. This weed is rated moderate by Cal-IPC and widespread throughout California and North America. It is believed to be allelopathic and also can pull zinc up to the surface creating toxic areas where it makes dense single-species stands (DiTomaso et al. 2013).

There were also several significant changes made to the Themidaceae family in 2019. Two subspecies are now recognized under *Brodiaea*

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Notable Revisions to Grassland Species Treatments in the Jepson eFlora

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rosea: *B. rosa* subsp. *rosea* and the newly described grassland species *B. rosa* subsp. *vallicola*. Robert Preston described this new subspecies and he recognizes it as a separate subspecies because of "morphologically distinct populations that occur along the eastern edge of California's Central Valley." Its subspecies name comes from the Latin for "of the valley" (Preston 2013).

Another very well-loved species, *Dichelostemma capitatum,* changed names in 2019, to *Dipterostemon capitatus*. Using phylogenetic studies, it was found that the core *Dichelostemma* species are closely related to the genus *Brodiaea* and they all have three fertile stamens where *D. capitatus* has six fertile stamens (the three outer are reduced). The species has been misnamed several times over the last few centuries and the number of counted stamens played a significant role in that story. Robert Preston's 2017 paper *New nomenclatural combinations for blue dicks (Dipterostemon capitatus; Asparagaceae: Brodiaeoideae)* includes a telling of the comedy of errors for various names the species has had over time. Some of its past names include *Hookera pulchella, Brodiaea pulchella,* and *Dichelostemma pulchellum* before most recently being called *Dichelostemma capitatum. Dipterostemon* is a name coined by Per Axel Rydberg in 1912 meaning "two-winged stamen," and was resurrected for this recent name change (Preston 2017b). While common names do not officially change with binomials, I favor calling them blue dips rather than blue dicks moving forward, as I have heard several others do.

There are now three recognized subspecies of *D. capitatus*: *D. capitatus* subsp. *capitatum*, *D. capitatus* subsp. *pauciflorus*, and the newly recognized *D. capitatus* subsp. *lacuna-vernalis*. *Dipterostemon capitatus* subsp. *lacuna-vernalis* was first recognized in 1974 but was not thought to be distinct enough morphologically and ecologically to be identified as a separate species and was thus included as part of *D. capitatum* in the first Jepson Manual. It is found in grasslands adjacent to vernal pools, and although it has a limited distribution, it is not considered rare but has been proposed to be added to the watch list due to the vulnerability of its habitat and its narrow range (Preston 2017a).

We can expect another round of changes in the Jepson eFlora to be published before the end of 2021. One change that is anticipated is the split of the genus *Cynoglossum*. Phylogenetic studies show that the Old World *Cynoglossum* differs considerably from the New World species. It is anticipated that the two native species *Cynoglossum grande* will move to *Adelinia grandis* and *C. occidentale* will move to *Andersonglossum occidentale*. "*Andersonglossum* and *Adelinia* differ from the Old World species of *Cynoglossum* by their shorter, broadly triangular areolae (Weigend et al. 2013) and the lack of leaves or bracts subtending flowers and inflorescences. *Andersonglossum* and *Adelinia* differ from each other by vegetative, pollen, and fruit characteristics" (Cohen 2015). The non-native naturalized *C. officinale* will keep its name as it is an Old World species.

Diplacus aurantiacus (formerly *Mimulus aurantiacus*), sticky monkey flower. Taken in April 2019 at the University of California Hopland Research & Extension Center in Mendocino County.

If you find this information interesting, you might consider making yourself a reminder to check the Jepson eFlora Supplement Summary Page at the end of each year to see what changes have been made. Each species treatment lists the references used in determining the current taxonomy and is helpful for getting a clearer picture of why changes are adopted. This information can, in turn, help with learning and remembering these new names and relationships.

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CNGA 2021 Board of Directors Elections — Online voting is open from December 1–20

YOUR VOTE COUNTS

On December 1, we will send out an email announcement to all members with links to the candidate statements and directions on how to access to your ballot.

For more information, visit us online at **cnga.org**, email **admin@cnga.org**, or call (530) 902-6009.

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MEET A GRASSLAND RESEARCHER

Eliza Hernández

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What is your study system?

My current focus is on California serpentine grasslands, a model system for testing plant competition and invasion ecology. Serpentine systems cover only 1% of California's landscapes, yet contain 10% of California's endemic plant species. Low in essential plant nutrients, grasslands on serpentine soil have largely resisted exotic annual grass invasion. However, remaining patches of high native diversity serpentine grasslands are experiencing nitrogen enrichment from nearby on-road sources (i.e., nitrogen deposition), and are increasingly invaded by exotic annual grasses, rendering conservation difficult. Further complicating the conservation of these high native diversity systems is how climate change can interact with nitrogen deposition to accelerate invasion. For my master's thesis in the Environmental Studies Program at the University of Oregon, I conducted a greenhouse experiment using nitrogen, watering, and seeding manipulations with serpentine species and soil to test how increasing rainfall variability interacts with chronic nitrogen deposition to drive invasion in serpentine grasslands.

What are your primary research goals?

My primary thesis research goal is to predict how multiple drivers of global change affect species population trajectories and how this in turn can affect community structure with species immigration (e.g., invasive species) and loss (e.g., native forbs) over time. While nitrogen (N) deposition acts as continuous resource addition that can favor invasive species, increasing interannual rainfall variability under climate change can also create conditions that may favor either invasive or native species at different times. One of these invasive species is soft brome (*Bromus hordeaceus*), an introduced annual winter grass from Eurasia. Soft brome invasion in serpentine grasslands has been facilitated by N deposition, however, it has a demonstrated pattern of invading and receding over time. California grasslands are limited both by N and water, and this pattern may be jointly shaped by N deposition and climate variability. Another of my primary thesis research goals is to highlight the importance of continual management and restoration in serpentine grasslands facing ongoing global change to promote native recovery, bolster trophic interactions, and restore ecosystem functioning.

Inset: Eliza Hernández at Carrizo Plain National Monument in April, 2019. *Photo: Jose Marfori*

Who is your audience?

My goal is to produce practical science that can improve ecosystem management and restoration, and to this end, I try to reach both the scientific community and land managers/practitioners.

Who has inspired you, including your mentors?

I was first inspired as an undergraduate student at Cal Poly Pomona in my Biodiversity Conservation course taught by Associate Professor, and later my undergraduate research advisor and mentor, Dr. Erin Questad. I was on track to work with wildlife, but her work in plant community ecology made me think, "I want to do what she's doing!" On my journey since, I've been inspired by other mentors I've worked with that have a contagious passion for their influential work: Jesus Reyes, President and Head Researcher at Pacific Coast Environmental Conservancy, Nicole Balloffet, Program Manager with the U.S. Forest Service, and my current graduate research advisor, Dr. Lauren Hallett, Assistant Professor at the University of Oregon.

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"?

In addition to my thesis research, another portion of my master's has been dedicated to analyzing management outcomes of fire and grazing in a serpentine grassland on Tulare Hill, California, using a long-term monitoring dataset collected by the Creekside Science Center for Earth Observation. Publication of this research, and hopefully that of my thesis research as well, will promote continual management as necessary in the face of ongoing global change to restore and maintain native

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California Grassland Research Awards for Student Scholarship (GRASS)

STUDENTS! *Call for Applications*

Submit your application now through January 31, 2022

CNGA is again offering competitive research funds to promote undergraduate and graduate student research focused on understanding, preserving, and restoring California's native grassland ecosystems in accordance with the CNGA Mission and Goals.

Eligibility: Students from an accredited college or university doing research within California may apply (home institution may be outside California).

Awards: CNGA will fund four or more $500 awards per year. These awards are designed to support basic undergraduate and graduate research in native grassland ecosystems. Funds can be used for fieldwork, small equipment purchases, visits to herbaria, materials and/or books. Students may re-apply and receive a scholarship award for a maximum of two yearss.

Visit **https://cnga.org/GRASSgrants** for application information. Application deadline is January 31, 2022.

Support the Next Generation of Grassland Researchers: Would you like to fund a student scholarship to encourage a new generation of grassland conservationists? For more information or to make a donation visit **https://cnga.org/GRASSgrants**.

MEET A GRASSLAND RESEARCHER

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populations in serpentine grasslands, particularly that of dot-seed plantain (*Plantago erecta*), a primary host plant for the endemic and federally threatened Bay checkerspot butterfly (*Euphydryas editha bayensis*).

Why do you love grasslands?

I love grasslands because they love us! I have lived most of my life in eastern Los Angeles County, California, and I developed a particular love for grasslands after visiting the Santa Rosa Plateau Ecological Reserve for the first time in 2015. Grasslands share so many gifts with us – from the air we breathe, to the water we drink, to the pollinators we hear, to the plants we touch, and to the beautiful landscapes we see. To return the love, I try to protect and learn about them with science; we might not ever figure them out completely, but I think their mystery is humbling and awesome.

Eliza Hernández applying "wet" and "dry" watering treatments to pots with different nitrogen treatments and densities of serpentine species at the University of Oregon Greenhouse Facility in 2019. *Photo: Lauren Hallett*

From left: **Red Fescue** (*Festuca rubra*). Hitchcock, A.S. (rev.A. Chase). 1/1/1950. **California Oatgrass** (*Danthonia californica*). Hitchcock, A.S. (rev.A. Chase). 1/1/1950. **Dune Bent Grass** (*Agrostis pallens*). Hitchcock, A.S. (rev.A. Chase). 1/1/1950. **Tufted Hairgrass** (*Deschampsia cespitosa*). Hitchcock, A.S. (rev.A. Chase). 1/1/1950. **Purple Needlegrass** (*Stipa pulchra*). Hitchcock, A.S. (rev.A. Chase). 1/1/1950. All images courtesy the USDA-NRCS PLANTS Database (**https://plants.sc.egov.usda.gov/**, 11/08/2021).

Native California Meadow Grasses

by David Amme [1985 Reprint: scientific names were updated in 2017]

David Amme is a founding member of the California Native Grasslands Association. He was a Past-President, taught the Grass Identification class across California, and has written many articles on California's coastal native grasses, as well as native grasslands in general. Many in the Bay Area have been introduced to the beauty and resilience of coastal prairie bunchgrasses and wildflowers thanks to grassland hikes he's led at Richmond's Pt. Molate.

To establish and manage a meadow, it is important to understand the nature and requirements of the primary native meadow grasses and sedges. The native perennial meadow grasses are competitive, long-lived plants and respond positively to supplemental irrigation and periodic cutting or mowing.

Red Fescue (*Festuca rubra*). Red fescue is a creeping fine-leaf grass common in the turf trade. In the landscape trade red fescue is now becoming a staple grass of the occasionally mowed naturalistic meadows used around golf courses, home developments, and maintained freeway interchanges. The native coastal red fescue is different from the turf varieties. It is the most winter-active grower of all the world's red fescue ecotypes and thrives in full sun. There are many compact bluish ecotypes from the north coastal terraces of Sonoma and Mendocino Counties available in nurseries from divisions (Patrick's Point, Jana's Choice, Jughandle, etc.). An ecotype from Point Molate near Point Richmond is the best known seed-grown native variety available and has a well-earned reputation as a hearty and adaptable meadow grass. A mature Molate stand can reach heights of 12 to 14 inches. Molate fescue is extremely variable with many diverse forms, a virtual gold mine for the grass breeder or discerning gardener. There are green and blue ecotypes and both fast creeping forms and erect bunchy forms that spread sparingly from the base. It is surprisingly drought tolerant and develops a waxy coat on its leaves giving it a distinctive blue-gray color in the late spring as the stand begins to dry out. Best of all, the seed is plentiful and easy to establish. For seeding a single species meadow, sow at 1.5 ounce per 1,000 square feet.

California Oatgrass (*Danthonia californica*). California oatgrass was once the premier prairie bunchgrass of the central and north coastal prairie, home to herds of elk chased by grizzly bears and humans. It has largely succumbed to overgrazing by sheep, grazing exclusion, and exotic annual and perennial grass competition. The best stands thrive with moderate cattle grazing or periodic mowing. Oatgrass is the most common grass along treaded paths on the coastal terraces, which otherwise are smothered by exotic grasses, such as bentgrasses (*Agrostis* sp.), velvetgrass (*Holcus lanatus*), sweet vernal grass (*Anthoxanthum odoratum*), and annual grasses and weeds. Oatgrass is one of the only perennial bunchgrasses with long-lived seed, and a stand can be rapidly revived from a latent seed bank with mowing, weeding, and clearing. An oatgrass meadow works best as a pure stand but will readily fill in along paths and in compacted areas with other meadow grasses. Unmowed, oatgrass is a sprawling dense bunchgrass 10 to 12 inches in height and 14 to 16 inches across. Mowed or grazed plants can form tight turf-like stands no more than a few inches high. Establishing an oatgrass meadow requires patience. Seed over a year old germinates faster than fresh seed. *Danthonia* establishes very slowly but is a persistent grower. Its roots can eventually reach down to 3 or 4 feet. Because of its deep roots, oatgrass does not require frequent irrigation. It thrives in rich, loamy, and clay soils and is well adapted to the home garden setting, and stays green year-long if it is cut back

continued next page

Native California Meadow Grasses *continued*

and receives extra moisture. A good oatgrass "turf' can be established by planting plugs 8 to 10 inches apart. For seeding a single species meadow, sow at 1.5 ounce per 1,000 square feet.

Dune Bent Grass, Thingrass, San Diego Bent Grass (*Agrostis pallens*). Dune bent grass is a native creeping bentgrass that spreads from underground rhizomes. A valued coastal ecotype known as 'thingrass' (formerly *A. diegoensis*; awned lemma, creeping rhizomes) is found in California's coastal grasslands from southern California to Sonoma County, primarily on east and north facing slopes and in woodland meadows and shady glades. Plants normally grow to 10 to 12 inches in height. *A. pallens* is an excellent component of the native meadow landscape and is closely associated with red fescue and junegrass. As a single species, it forms a lush natural meadow in the sun or filtered shade. A vigorous creeping variety from the Berkeley Hills is sold on the market as 'thingrass' or 'San Diego bent grass'. *A. pallens* seed has moderate seedling vigor and a good stand can be established without the use of plugs. For seeding a single species meadow, sow at 0.5 ounce per 1,000 square feet.

Tufted Hairgrass (*Deschampsia cespitosa*). The California coastal form of tufted hairgrass is primarily associated with wet meadows and/or the rich prairie soils of the immediate coastal terraces from northern San Luis Obispo County to Mendocino County. It is a coarse, strict bunchgrass and grows primarily in pure stands. There are two or three varieties along the coast ranging from large erect forms, 18 to 20 inches in height, to sprawling decumbent forms, 8 to 12 inches high. The latter form has wider veined leaves and grows on the windswept first terrace of Jughandle State Reserve south of Fort Bragg. Because of its size and requirements, tufted hairgrass forms a cohesive "tufted hairgrass" meadow feature that tends to dominate other native perennial grasses and wildflowers. For this reason, it is best planted as plugs between 8 to 16 inches apart. The farther apart they are planted the larger they get. For seeding a single-species meadow, sow at 0.5 ounce per 1,000 square feet.

Purple Needlegrass (*Stipa pulchra*). Purple needlegrass is a deep green, long-lived bunchgrass. It thrives on the sunny south facing slopes and plains of the foothill grassland. It is also tolerant of serpentine soils. Purple needlegrass grows from 18 to 24 inches in height and forms a deep root system 3 to 4 feet deep. It stays green into the early summer and gradually becomes dormant in mid to late summer. Cut or grazed plants are the first to put on fresh green growth in the fall whether it rains or not, tapping the moisture deep in the soil. Unlike oniongrass or pine bluegrass, purple needlegrass will stay green or regrow with extra summer irrigation. Purple needlegrass has good seedling vigor and can be seeded or planted by plugs. For a single species meadow, sow at 10 ounces per 1,000 square feet.

Idaho fescue (*Festuca idahoensis*). The coastal and valley form of Idaho fescue in California was formerly identified as a separate subspecies (subsp. *roemeri*). Although it is now not officially recognized as subspecies, it is geographically distinct from the Idaho fescue of the Great Basin and prairies of eastern Oregon and eastern Washington State. Idaho fescue is a dense, fine-leafed bunchgrass with blue and green forms. It normally grows from 18 to 24 inches in height. Idaho fescue thrives on serpentine soils and grows on loamy clay soils along the coast in San Mateo, Alameda, Marin, and Sonoma Counties. Extra moisture will keep it fresh, but eventually Idaho fescue needs a rest in the late summer and fall. Idaho fescue is found usually in pure stands on north or east facing slopes associated with *Agrostis pallens*, junegrass, and a rich assortment of native perennial wildflowers. Idaho fescue has good seedling vigor and can be established by either seed or plugs. For seeding a single species meadow, sow at 2 ounces per 1,000 square feet.

Junegrass (*Koeleria macrantha*). Junegrass is a long-lived, perennial bunch-like grass that spreads with short underground rhizomes and has an erect ornamental flowering panicle. Junegrass is associated with woodland glades, grassland prairies, and rocky outcrops from sea level to the highest mountains. Junegrass grows from 10 to 16 inches in height. It responds favorably to irrigation but eventually needs a late summer, early fall rest. Junegrass has tiny seeds and establishes slowly from seed. For a garden meadow, Junegrass is most practically established by plugs. For seeding a single species meadow, sow at 0.5 ounce per 1,000 square feet.

Pacific Dune Sedge (*Carex pansa*). The common name of this sedge aptly describes its habitat but not its unmatched meadow-forming characteristics. Pacific dune sedge is found in scattered locations in mesic back dunes of central California. It is a strong creeping sedge and forms a dense leafy cover 8 to 10 inches in height with no mowing. Dune sedge is well adapted to the garden setting. With adequate moisture it grows well in all kinds of soils, stays green year-long, thrives in sunny sites, and is heat tolerant. It germinates very slowly from seed but spreads quickly when planted as plugs 6 to 8 inches apart.

Foothill Sedge (*C. tumulicola*). Foothill sedge, also known as Berkeley sedge, is a large deep-green bunch sedge that grows to 20 inches in height and sprawls wider. If kept small with periodic mowing at a 4- to 6-inch height, it responds by putting out fresh new growth from the base and gradually spreads forming a durable carpet depending on how often and closely it is mowed. Like the Pacific dune sedge, its seed is slow to germinate but a stand is easily and efficiently established by plugs 8 to 12 inches apart.

Slender Sedge (*C. praegracilis*). Slender sedge is very likely a taller, closely-related cousin to Pacific dune sedge. It inhabits mesic inland valley settings and grows up to 16 inches in height spreading at a slightly slower pace. Like the Pacific dune sedge, slender sedge is best established by plugs 6 to 8 inches apart.

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Notable Revisions to Grassland Species Treatments in the Jepson eFlora *(see page 16)*

Front cover: Revitalized by early rains, California fescue (*Festuca californica*) is illuminated through a canopy opening in an Oregon white oak (*Quercus garryana*) savanna at the top of the Graham Creek drainage, Sonoma Mountain, Sonoma County, California. *Photo: Jeffery T. Wilcox*

Back cover: Buttercups (*Ranunculus californicus*) and tomcat clover (*Trifolium willdenovii*) bloom under a dancing overstory of semaphore grass (*Pleuropogon californicus*) in late March on the Mitsui Ranch, Sonoma County, California. *Photo: Jeffery T. Wilcox*