

California Society for Ecological Restoration *Quarterly News Journal*

Restoration With All – Taking a Generalist View to Specific Resource Needs *by Will Spangler¹*

I recently had the opportunity to join and work with my local Resource Conservation District (RCD), a type of California's earliest grassroots conservation organizations that were recently highlighted in the fall 2022 issue of *Ecesis*. RCDs are woven into their communities, where they leverage strong working partnerships to deliver a broad range of on-the-ground solutions to resource and conservation challenges. In one sense, RCDs serve as conservation “generalists,” similar to how the specific and varied expertise of ecological restoration practitioners throughout California, working together, allows our field to provide solutions to the complex challenges facing our environment. I encourage you, as a member of SERCAL, to consider this generalist approach in your own work — refine a skill you hadn't yet been able to practice, ask your colleagues what allows them to thrive in their work, engage with your local tribes (such as through the Kumeayaay Community College) to learn how people are a key component of healthy ecosystems, develop a new seed local source for restoration planting or agricultural cover-cropping, or participate in a citizen science project like the California Bumble Bee Atlas to learn about the pollinators in your backyard — all in an effort to broaden what you offer to your community. You can start here — please enjoy the articles that make up this “generalist” issue of the SERCAL newsletter.

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Guest Editor: Will Spangler

Gold Ridge Resource Conservation District

Restoration With All

- 3 Ecological Restoration for California's Native Bees
- 9 We Shape the Land and the Land Shapes Us
- 15 An Innovative Project is Underway to Supply Source-Identified Native Plant Materials for Resilient Habitat Restoration

Plus

- 20 Mentoring Today for a Better Tomorrow
- 22 Cultivating Collections: Just a few great moments from SERCAL 2023
- 23 Leadership Team & Supporting Members
- 24 Amplifying New Voices

Managing Editor: Julie St John

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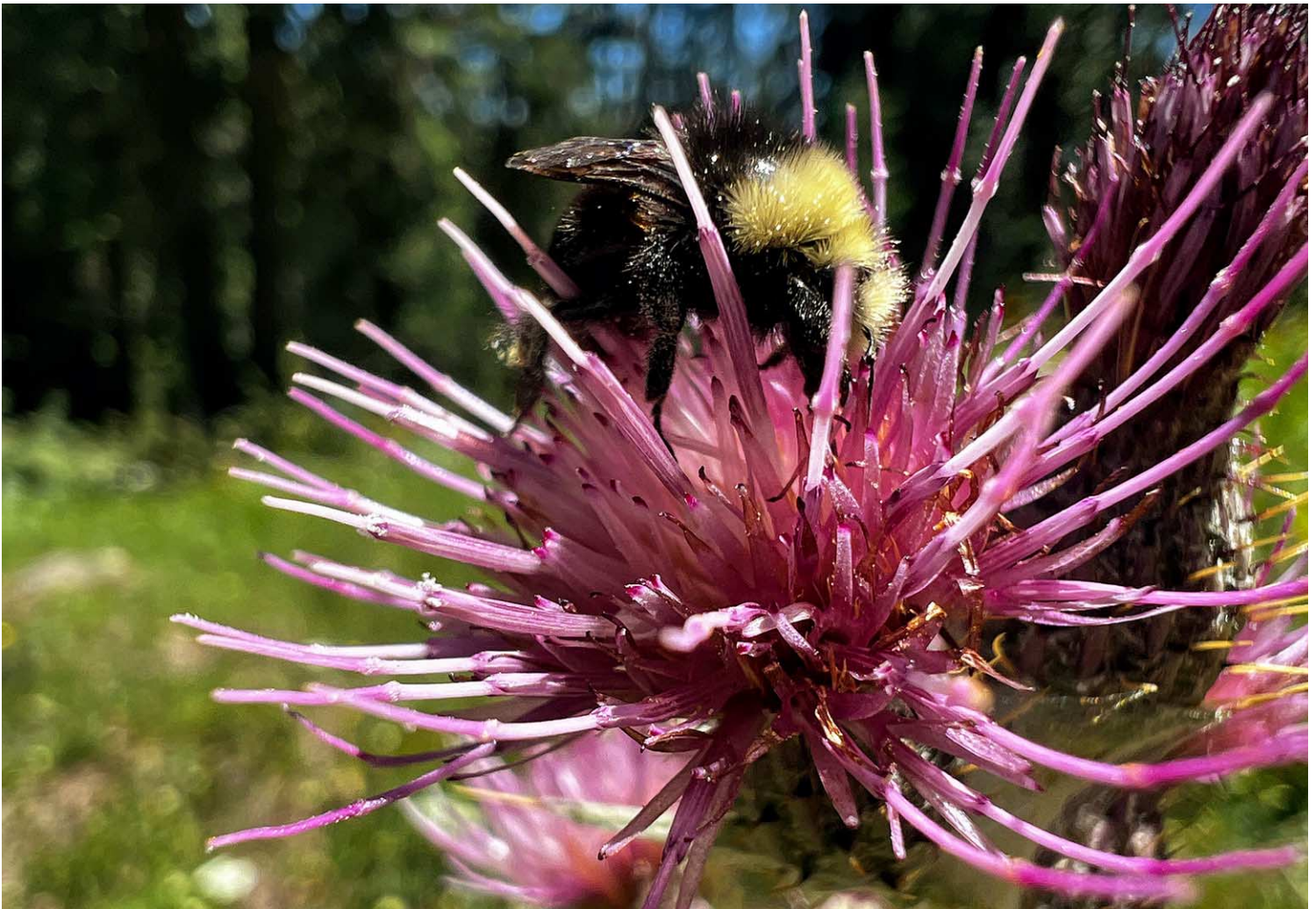


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Vosnesensky bumble bee (*Bombus vosnesenskii*) worker forages on thistle.

Ecological Restoration for California's Native Bees

by Leif Richardson¹ Photos courtesy the author and The Xerces Society

Ecological restoration can increase the abundance and diversity of native bees, but restoration efforts do not commonly center around this goal. Instead, many ecological restoration projects focus on returning native plants to the landscape, a laudable goal, given that plants form the backbone of terrestrial ecosystems, impacting other species' occurrence and biology. These plants participate in myriad ecological interactions, including pollination mutualisms with bees, so restoration that accounts for these insects can make strong contributions to invertebrate conservation.

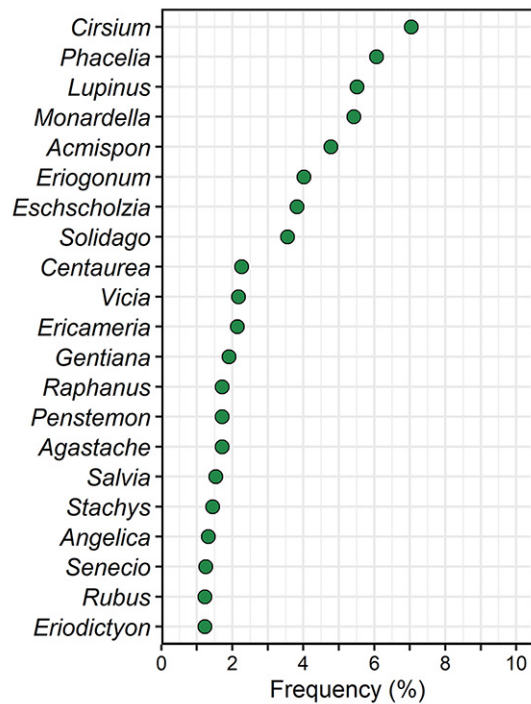
Interactions with bee pollinators are critical to plant reproduction, itself a key determinant of future condition in restored sites, but it's easy to overlook this mutualism when forecasting how our interventions will affect restored sites in the future. It is estimated

that more than 85% of flowering land plants benefit from animal-mediated pollination (i.e., the movement of pollen from male to female flower parts resulting in fertilization) (Ollerton et al. 2011). Bees are clearly important to ecological restoration projects, but is ecological restoration beneficial to bees? Overall, the answer is yes! (Tonietto and Larkin 2018)

California is home to more than 1,600 species of native bees. In this article, we'll explore how one group of bees, bumble bees (*Bombus* spp.), responds to ecological restoration, especially in California's arid environments. Most species of bumble bees are social insects with an annual colony life cycle. Reproductive females ('queens') of these social species emerge from subterranean hibernation in springtime and begin foraging for nectar and pollen, as well as searching for suitable nesting sites, usually belowground cavities,

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Left: The top 20 host plant genera for bumble bees in California, as reflected by observations made in 2022 by California Bumble Bee Atlas volunteers in 2022. Frequency represents the commonness of each type as an observed host plant for bees in our work. Bumble bees were collected from plants in 230 different genera in this survey. The majority of observations were made on plants native to California. Right: A queen-caste black tail bumble bee (*Bombus melanopygus*) forages for nectar at buttonbush (*Cephalanthus occidentalis*) at California Botanic Garden.

Ecological Restoration for California’s Native Bees *continued*

especially abandoned rodent dens. After selecting a site, these queens provision the nest with nectar and pollen, then lay eggs, which they incubate and feed through juvenile life stages, which then emerge as adult non-reproductive females (‘workers’). The workers now take on most colony maintenance tasks, and the queen continues laying eggs, steadily building colony size. Colonies eventually switch to production of males and new queens, and only these new queens (also known as ‘gynes’), once mated, will survive to found the next year’s colonies. Bumble bees live in a variety of habitats and are highly generalized in their host plant preferences, often functioning as key pollinators of these plants.

Unfortunately, like other insects, bumble bees around the world are showing worrying patterns of decline, due to interacting effects of habitat loss, climate change, pesticide exposure, and spread of viruses and other pathogens by managed bees (Cameron and Sadd 2020, Wagner et al. 2021). In California, roughly one-quarter of our 25 native bumble bee species are threatened, and one may already be extinct (Hatfield and Jepsen 2021). Because California is an agriculturally important state and

many bee stressors are tied to agriculture, it is critical that we address declines of these native pollinators of wild and crop plants. Happily, a growing body of literature demonstrates that we know how to reverse bumble bee declines—at least on a local scale—through habitat management. It is here that restoration has the potential to

make enormous contributions to ecological persistence of bumble bees and other native bees.

Effects of ecological restoration on bumble bees are mediated by ecological interactions, ecological succession, and presence of bee stressors. The most important interactions involving bees in restoration sites are those with host plants. Research has demonstrated that abundance and diversity of native bees in restored ecosystems is a function of both plant diversity and the identity of individual plant species present. In general, more diverse plant communities support more abundant and diverse bee communities.

However, some studies find that plant

species richness is not the only driver of this pattern, and presence of particular species matters. For bees generally, this is because nearly one-quarter of them are pollen specialists (‘oligoleges’), obtaining

Bees are an inviting target for restoration ecology because they are so closely related to the plants we work with, and also because local bee communities can recover along reasonably short timelines.

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Ecological Restoration for California's Native Bees *continued*

pollen from a restricted set of host plants. For example, in one grassland restoration study (Lane et al. 2022), reference-condition sites had higher species richness than restored sites with similar diversity because they featured a single plant species necessary to numerous pollen-specialist bees (and apparently not available to restoration ecologists!). But plant identity matters to generalists like bumble bees too (see graph of host plant use): for example, two California studies found that individual plant species were of particular importance to a common native bumble bee, *B. vosnesenskii* (these are toyon (*Heteromeles arbutifolia*), and bearclover (*Chamaebatia foliolosa*)) (Jha et al. 2013, Loffland et al. 2017). We know also that bumble bees can distinguish between individual plants of different genotypes or geographies, suggesting that local adaptation of plants to environmental conditions contributes to their attractiveness to bumble bees. Finally, restoration ecologists often have to combat invasive plants in their work, with mixed results for native bumble bees. While bumble bees often exhibit a preference for native plants, there are a number of troublesome invasives that provide excellent forage to these wild bees, for example, yellow star thistle (*Centaurea solstitialis*). There are many good reasons to remove such invasives, but when doing so, it is important to evaluate pollinator dependence on existing flowering stands. When possible, it's better to treat for these plants when bumble bees are not active (e.g., in fall/winter).

Restoration projects often influence ecological succession through changes in vegetation structure and shifts in disturbance regimes. Bees are sensitive to seral stage in natural communities, and practitioners should develop a sense of how succession influences bee communities (Griffin 2017). This will often mean identifying stand ages at which diversity of flowering plants is maximized. For example, bumble bees strongly benefit from wildfire, showing greater abundance, effective population size, and individual bee body size in the years after fire, but these effects may last as little as three years before bees in burned sites are indistinguishable from those in unburned adjacent sites (Mola et al. 2020). One way to maximize value of restored sites (whether managed with fire or not) for bees is to consider regular disturbance to maintain a diversity of seral stages for a range of flowering plants (Penado et al. 2022).

A key concept when managing for bees is to limit their exposure to stressors in restored ecosystems. Insecticides should be avoided, particularly those that are systemic within plants and expressed in floral parts. Fungicides and herbicides are not designed to kill

Best Practices for Management of Habitat for Native Bees

- ❖ Protect high-quality habitats dominated by native plants and regulated by natural processes.
- ❖ Study the regionally native bumble bees to learn where and when they occur in order to inform restoration projects.
- ❖ Promote a diversity of plant species that provide a range of flowering times across the growing season.
- ❖ Emphasize including plant species that are known to be pollen and nectar hosts for native bees, including pollen-specialist species.
- ❖ Consider that some invasive plant species provide flowering resources to pollinators, and when possible, treat invasive plants when bumble bees are not active.
- ❖ Mimic natural disturbance processes and maintain a diversity of seral stages to promote a range of flowering plants.
- ❖ Avoid insecticides, and minimize use of fungicides and herbicides.
- ❖ Protect and create microsites with a range of slope, aspect, and vegetation conditions to promote refugia from heat and drought.
- ❖ Keep honey bees — a competitor of native bees which can also introduce harmful pathogens — away from wildlands and restoration sites.
- ❖ Volunteer with the California Bumble Bee Atlas!

insects, but they too can have impacts on bees. For example, certain fungicide-insecticide combinations can have synergistic negative effects on bees, with combined toxicity much higher than their individual toxicities. Even herbicides can have negative impacts on bumble bees, and should be avoided when possible, particularly when plants are flowering and bumble bees are present. Climate change is also a major stressor for bees, and we can't very well address it in individual restoration efforts. However, microsite differences in temperature can make a difference for bees, so slope, aspect, and vegetation can be considered to protect and create local areas buffered from thermal extremes.

One potent stressor we can do something about: honey bees. Honey bees are not native to California, are widely deployed for pollination, and have naturalized extensively around the state. It is estimated that

A growing body of literature demonstrates that we know how to reverse bumble bee declines—at least on a local scale—through habitat management.

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Ecological Restoration for California's Native Bees *continued*

the pollen collected by a single honey bee hive in a growing season is enough to feed 100,000 native bee larvae, reflecting honey bees' ability to deplete local food resources and out-compete native bees (Cane and Tepedino 2017). Perhaps more worryingly, when they share flowers, honey bees can pass viruses and other pathogenic organisms to bumble bees. For these reasons, honey bees do not belong in ecological restoration areas. In fact, feral hives should be removed from sites where we desire to restore the pollinators on which our native plants depend.

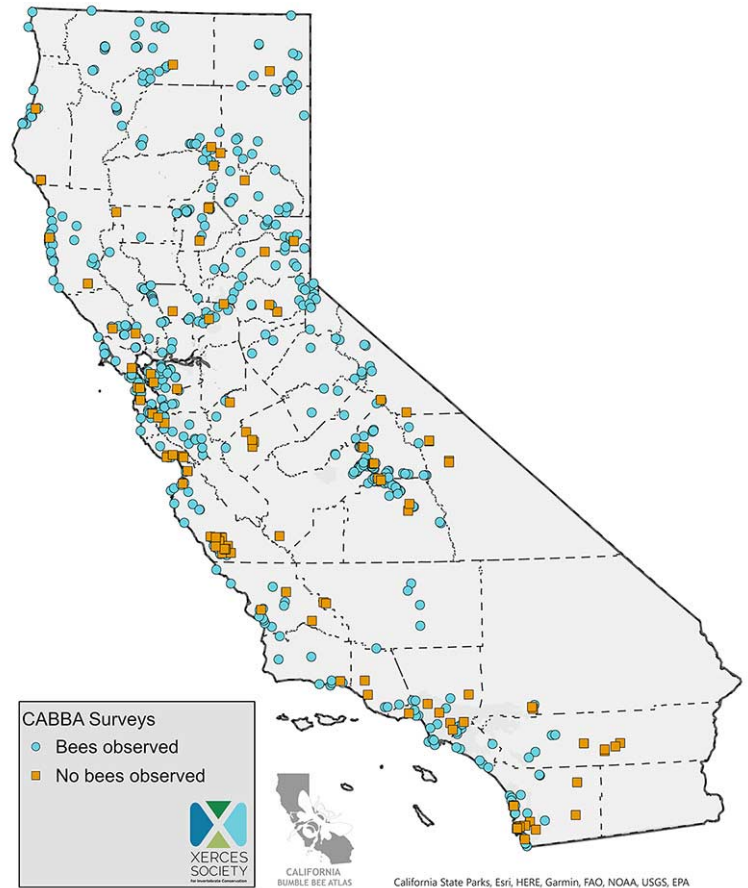
In summary, as we contend with ongoing losses of a functionally important bee pollinator, we can and should address a key driver of decline, the loss of high-quality habitats dominated by native plants and regulated by natural processes. Bees are an inviting target for restoration ecology because they are so closely related to the plants we work with, and also because local bee communities can recover along reasonably short timelines.

As much as we need to create and maintain habitat for bees, we also need to gather more information about where and when they occur. The **California Bumble Bee Atlas** is a community science collaboration filling this gap, with volunteers gathering non-lethal survey data around the state, identifying species in need of conservation, and assisting partners with recovery efforts (see map). Volunteers adopt an individual gridded area of the state and commit to completing two or more bee surveys per season there. If you would like to learn more about bumble bees and assist in their conservation, please join us! You can register to learn more about the project at the link above. Project volunteers and staff are currently conducting bee surveys statewide in our second field season. This is a fun and rewarding conservation initiative!



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Map of locations surveyed for bees by California Bumble Bee Atlas (CABBA) volunteers in 2022. Surveys in which bees were found are symbolized as blue circles; those where no bees were observed are shown as orange squares.

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Jamul Mountains, a part of unceded Kumeyaay lands.

We Shape the Land and the Land Shapes Us

Learning Perspective, Reciprocity, and Belonging from the Kumeyaay People

by Katy Chappaz¹

The Kumeyaay people say they have been in San Diego and Northern Baja since time immemorial. The archeological record certainly shows that people have lived here for over ten thousand years. As the land's original stewards, the Kumeyaay people thrived by learning to care for the land so that its resources would always be available to them and their descendants.

The Kumeyaay have been colonized three times since the 1500s, first by the Spanish, then by the Mexican government, and finally by the United States beginning in 1848. Like other Indigenous cultures, their population was greatly reduced by European diseases and later through policies to limit and eliminate them.

Colonization limited the Kumeyaay people's ability to practice their culture, language, and religion, which included caring for their land and migrating within it as they had done for millennia. They were prevented from feeding and healing themselves with their traditional foods and medicines, harvesting useful materials, and conducting cultural burns on the land to improve the quality of its resources. Their territory was bisected by the US-Mexico border. Ancient spiritual sites, artwork, and observatories were desecrated and built over. They endured a full spectrum of violence. And they were forced to make impossible choices about assimilation, citizenship, and reservations.

The Kumeyaay people survived through resistance, adaptation, and thanks to their knowledge of their land. Today, we are lucky that there are Kumeyaay people working to revitalize their culture and language. One hub for this is the Kumeyaay Community College, or KCC, in San Diego.

I became a student at KCC to show my respect to the Kumeyaay people and to learn new perspectives, especially about ecology. Working in restoration, I make decisions about Kumeyaay land every day. I'm grateful for that privilege. Over eighteen months, I have taken classes in Kumeyaay history, ecology, and in the languages of the Kumeyaay people. KCC is also a community for teaching and learning traditional skills. Students make and launch tule boats, share meals using Indigenous ingredients, and apply Traditional Ecological Knowledge to restore land.

At KCC I was shown Kumeyaay perspectives on various aspects of life and history that challenged many of the beliefs I had encountered and absorbed in my Westernized environment, including beliefs that I had promoted and beliefs I had been skeptical of. They included Kumeyaay perspectives on the history of Indigenous cultures and colonization, on how we relate to each other and to all living things, on land ownership and personal freedoms, on sustainable natural resource use and management, and on knowledge acquisition and

We Shape the Land and the Land Shapes Us *continued*

sharing. Gradually, those perspectives connected into a bigger picture of the world from the viewpoint of Indigenous people. That picture became clearer, until I could view it alongside my original world view. And when that happened, I found that I could pull at pieces of the original picture, and that it was not well-made but rather susceptible to falling apart with a few good tugs.

At KCC, I was shown what Kumeyaay people saw when they looked at the land before Europeans arrived and I was shown what Europeans have done to it. I was shown what Kumeyaay people felt when waves of other cultures encroached upon them. I was shown what was done to the people, and I can see now that colonization never ended.

Learning Different Perspectives on Ecology and Restoration

The Kumeyaay people's relationship with the land is a keystone of their culture. Thus, it is impossible to avoid the implication of these new perspectives on restoration. Here is what I've come to realize regarding ecology and restoration, summarized into three main ideas:

- * Mainstream ecology is mostly guided by non-Indigenous values, not Indigenous ones. Modern Western ecology rightly employs the scientific method to avoid biases in objectives and results, but it is fallible. Western values still influence science, and the scientific method can be wrongly wielded to delegitimize other ways of knowing when doing so helps achieve bigoted objectives. The Kumeyaay people have their own values and objectives guiding their ecological practices that must be considered alongside Western ones. And the Kumeyaay scientific process, which combines thousands of years of careful observation and trial and error with a standardized and rigorous system for conveying knowledge reliably over generations, is no less authoritative than the Western scientific method.
- * We misunderstand what the land was like before European contact, specifically that it was cared for by Indigenous people, whose work helped make California so biodiverse. And if we don't understand what the land was like and the processes that shaped it, then what are our restoration goals and methods based on?
- * The well-being of the people and the land are inseparable. By learning more about Indigenous people and their relationship with the land, we can adapt our practices to benefit both

Indigenous people and the land.

What do I mean by non-Indigenous and Indigenous values? It has to do with different perspectives of our place in nature and what's good for the land and the people. Here are three typically non-Indigenous beliefs about ecology that have influenced our culture and economics, and conservation and restoration:

- * People and nature can be ordered hierarchically, with humans at the top, entitled to exploit the natural world and not required to give back to it.
- * People and their activities generally harm nature. Human access should be reduced in natural areas that need protection. Successful habitats sustain themselves with no human intervention.
- * It is always the case that healthy ecosystems are climax communities undergoing little disturbance.

Now here are three contrasting perspectives I've learnt at KCC:

- * People and nature are one and the same. In the language of the Kumeyaay people there is no word for nature as separate from people. There is a word for land, "emat", which is the same as or very similar to the word for body.
- * People are a key component of healthy ecosystems. Native habitats without people, especially Indigenous people, are incomplete.
- * In Southern California, many of our habitats are healthier when they undergo regular, low-intensity disturbance, including by people. A healthy landscape may appear like a mosaic of vegetation communities at varying stages of succession.

Our Ecological Models Have Built-in Perspectives

Another way to think about perspective is with an ecological model like in Figure 1. An ecological model shows how drivers of ecological change create stressors that produce degraded habitat conditions. In restoration, we work backwards starting with the degraded conditions. First, we identify the qualities that make a habitat degraded, like having few native species. Those are the qualities we work to change. To guide our methods, we look for stressors causing the degraded conditions, like a history of native vegetation removal. We might ask ourselves what is driving the stressors. And if we work backwards further, we might blame those drivers on bigger issues like

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We Shape the Land and the Land Shapes Us *continued*

insufficient environmental education or a maladapted economic system. A model can help direct our restoration efforts. But what if our models suffer from perspective problems? How might this model be incomplete?

Figure 2 shows a similar model, but with Indigenous perspectives added back in. This time, all drivers of ecological change originate from the removal of Indigenous people from the land. Their removal enables colonization, with its values, economic systems, and ignorance of Traditional Knowledge. A major difference compared to Figure 1 is not that there are too many people in natural areas, but

that there are too few people caring for the land. And lastly, a main characteristic of degraded habitats is that Indigenous people and their practices are missing. The removal of Indigenous people from the land is both the initial driver of ecological change and a characteristic of degraded ecosystems. Think about a species you are conserving or a habitat you restore. How does this model change why that species or habitat is struggling?

Good Fire and Caring for the Land

My watershed moment happened during a class on cultural burning, or Good Fire. Good Fire was the case study I needed to understand

how habitats are healthier and more biodiverse when they are cared for continuously, how the relationship between people and the land is reciprocal, and how caring for the land can include low-intensity disturbance. The way Indigenous people traditionally use fire is thought to increase biodiversity because of how it modifies vegetation communities across the landscape. Figure 3 depicts the mosaic of vegetation

communities that are thought to form over large areas when fire is applied to different parcels at different frequencies, as it is thought to have been done by Indigenous people in this region. Each square represents a burn area. The numbers in the squares show the time that might have elapsed since each parcel was burned. The different shades of green show how each parcel is at a different stage of succession from the other surrounding parcels based on time since burn. A mosaic of habitats at different stages of succession is likely to be more biodiverse than a landscape with fewer successional stages because different species are adapted to different stages. And not only does each quadrant on this figure represent a different

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Ecological Model: Non-Indigenous Perspective

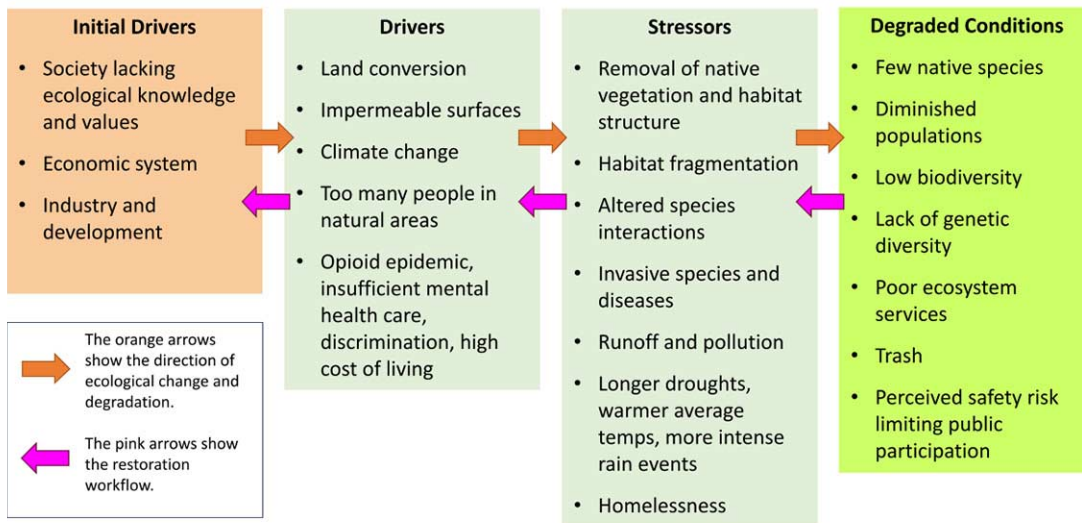


Figure 1: An Ecological Model with a Non-Indigenous Perspective.

Ecological Model: A More Complete Picture

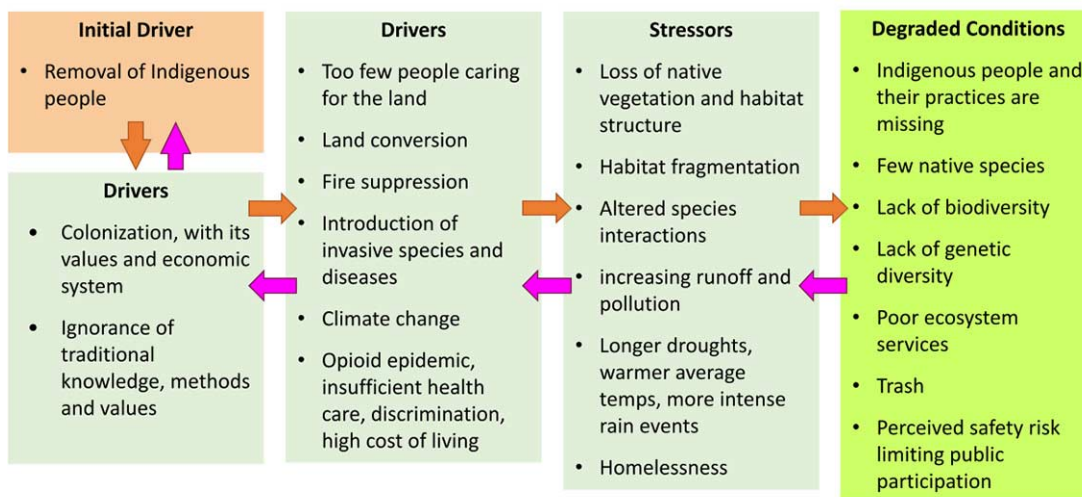


Figure 2: An Ecological Model with Indigenous Perspectives Restored.

We Shape the Land and the Land Shapes Us *continued*

habitat with different species, but the lines separating the quadrants are their own types of habitats: edge habitats. Edge habitats support species of their own, and each one differs based on the adjacent habitats it separates.

The words we use, like ‘succession’ and ‘climax community,’ show how Western perspectives about hierarchy and superiority are built into our language and normalized. But why would we attribute greater value to one habitat over another, when the greatest value is achieved by combining them all? Similarly, land “management” implies hierarchy and directionality between the manager and the managed, but does the land not also manage us? Good fire is an example of a gift people are compelled to give to the land, because in return the land gives better resources.

Kumeyaay people were prevented from performing cultural burns first by the Spanish missions and later by the U.S. government, because the encroaching cultures did not understand the purpose of burning. Today, firefighters mimic Kumeyaay practices when they perform controlled burns to prevent wildfires. This shows the importance of preserving and promoting Indigenous knowledge.

Policy, Reciprocity and Belonging

I’ve been asked for specific examples of Traditional Ecological Knowledge to apply to restoration today, but they are best taught by Indigenous people. What I can contribute are policy perspectives and the personal impacts of my learning journey. California is already a global leader in environmental awareness and policy. That includes policies that address biodiversity loss by planning conservation and restoration at regional levels, and a growing interest in funding restoration for climate resilience. Our response to those ecological crises would be even stronger with guidance from Indigenous people. Their perspectives fill gaps in our policy and science by normalizing the role of people as ecological stewards and by attributing value to caring for ecosystems where our current economics do not.

On a personal level, an outcome of studying at KCC has been a greater feeling of belonging in this land that was not my ancestors’. This feeling of belonging can’t be claimed. It arose by giving time, attention, and respect to the Kumeyaay people and it increases through ongoing reciprocity. For my consideration, I have been gifted with

Our response to those ecological crises would be even stronger with guidance from Indigenous people. Their perspectives fill gaps in our policy and science by normalizing the role of people as ecological stewards and by attributing value to caring for ecosystems where our current economics do not.



Figure 3: How Fire Can Create a Mosaic of Vegetation Communities and a More Biodiverse Landscape.

knowledge and perspectives that have strengthened my connection with the land and given me new purpose as an ecologist. In return, I am inspired to advocate for Indigenous perspectives in my field.

When I started this coursework, I expected to struggle with learning of the harm my culture has inflicted on Kumeyaay people. To be clear, learning about the atrocities that were committed to the people and the land is extremely painful. But I don’t resist the truth. Instead, learning the truth has felt like being let in on a secret. The secret is that there is another way to relate to the land. And the more I explore the other way, the more I find parts of myself that I had suppressed to survive under Western values, and the more I want to let those parts flourish. It has been a relief to meet people who think that it is normal to feel connected to the land. And it is exciting to learn that it can be good to shape the land. The land needs our participation. With the right knowledge and methods, we can make the land stronger, and in return, it will shape and strengthen us. And as I learn these lessons, a part of me that already knew them is waking up. And as a new picture of the world gains clarity, a new picture of who I can be in that world also forms. And I like who I can see.



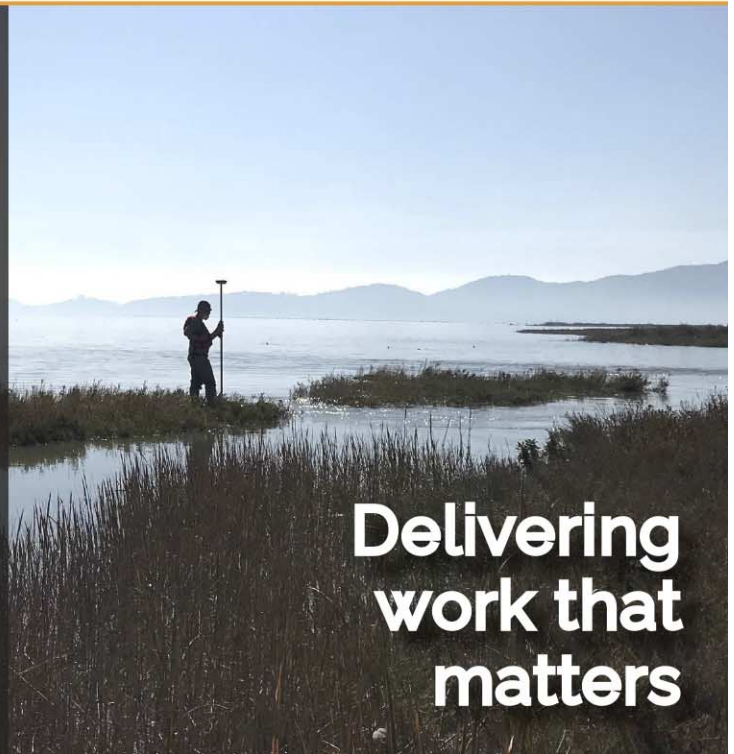


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Michele Ranieri, Heritage Growers Operations Manager, displays ripening seed from a field of *Lasthenia glabrata* (yellow ray goldfields).

An Innovative Project is Underway to Supply Source-Identified Native Plant Materials for Resilient Habitat Restoration

by Karina Mudd¹, Pat Reynolds², and Doug Iten³

In January of this year, the Wildlife Conservation Board (WCB) awarded a \$19.4M block grant to the California Association of Resource Conservation Districts (CARCD) for the Climate Resilient Habitat Restoration project focused on a range of restoration actions. This grant program includes critical support for capacity building and efforts to remove bottlenecks that will increase the availability and cost-effectiveness of source-identified native plant materials. This initiative is also piloting a new kind of relationship with native seed growers that will serve as an important example for seed users.

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What's at stake

In response to climate change, biodiversity loss, and drought in California, ambitious government initiatives and funding programs are driving large-scale landscape changes on natural and working lands. For example, the Sustainable Groundwater Management Act (SGMA) and corresponding funding programs are encouraging restoration and land-repurposing throughout the Central Valley. Additionally, the state's 30X30 initiative aims to increase conservation across California, along with numerous programs that incentivize other types of climate-smart land management practices. Increasing amounts of aligned federal funding are also becoming available through the Inflation Reduction Act and Bipartisan Infrastructure Law.

continued next page



Great Valley Seed's commercial grow-outs of local San Joaquin Valley ecotypes adapted to arid conditions.

Source-Identified Native Plant Materials for Resilient Habitat Restoration *continued*

Appropriate native seeds and plant materials will be crucial to the success of these initiatives, but demand for diverse species and ecotypes has already outpaced supply in many areas. This is a significant barrier to restoration efforts across the United States, which is a core message of the report published by the National Academies of Sciences, Engineering, and Medicine (NASEM) earlier this year, which “calls for concerted action to build a more robust native seed supply.”

To do this, we need to better align the seed industry with market demand. The ‘amplification’ of native plant materials can take from two to over five years to go from seed collected in the wild to propagation at commercial scale. Without clear seed forecasts or advance contracts from seed buyers, seed production is often speculative and therefore seed producers shoulder significant amounts of risk. If seed buyers — state agencies, conservation nonprofit organizations, mitigation companies, and engineering or landscaping firms, etc. — can forecast their seed needs two to five years in advance, seed producers can ramp up the production of appropriate species, which helps to bring the costs down.

In California, aligning the supply and demand of native seeds will be essential to ensure the state’s many conservation initiatives are both effective and affordable. Lower seed costs will also increase their accessibility for under-resourced projects, underserved communities,

and indigenous groups who may be interested in pursuing local restoration efforts. With California’s incredibly diverse ecoregions and limited water, successful restoration requires local, regionally adapted ecotypes. However, a number of regions in state have very

few species or ecotypes, currently in commercial production. The limited availability of stock seed for amplifications combined with the significant resources required to develop new commercially grown species and ecotypes are a significant barrier to improving regional habitat restoration efforts.

Creative solutions through the Climate Resilient Habitat Restoration project

The Climate Resilient Habitat Restoration project offers an innovative example of how to address this challenge through the \$19.4M block grant awarded to the CARCD by the WCB. RCDs are locally governed special districts that undertake resource conservation efforts. The funding from this grant supports over 40 RCDs across the state to implement projects on private and public lands that increase carbon sequestration and enhance habitat for pollinators and other wildlife. Partner organizations were included

in the block grant to support these efforts, including two native seed producers — Heritage Growers and Great Valley Seed — to help build the supply of native plants for these projects. This grant funding exemplifies a creative solution that helps to cover upfront

Aligning the supply and demand of native seeds will be essential in ensuring the state’s many conservation initiatives are both effective and affordable. Lower seed costs will also increase their accessibility for under-resourced projects, underserved communities, and indigenous groups who may be interested in pursuing local restoration projects.

continued next page

Source-Identified Native Plant Materials for Resilient Habitat Restoration *continued*

costs for seed producers and also provides an important platform for increased collaboration and regional coordination among native seed users and producers.

The project is already evolving in ways that have long term implications for improved habitat restoration. For example, the Gold Ridge RCD in Sonoma County has formed an ad-hoc group with other RCDs, landowners, and non-profit organizations that are merging into what could eventually become a potential North Bay Area Native Seed Collaborative, similar to collaborative seed efforts in other regions. By combining forces, these groups will help to increase the diversity of native species and ecotypes that are available for habitat restoration projects in the North Bay Area beyond the timeline of this grant.

“Of the many benefits this grant program provides, one of the most powerful is the facilitation of regional coordination of restoration efforts,” says Reyn Akiona, Executive Director of Valley Eco, which is supporting a number of RCDs and project partners on this grant program. “Improved regional collaboration increases opportunities to build habitat connectivity, and it increases the cost-effectiveness and resiliency of restoration projects. It also benefits restorationists and native plant and seed suppliers by better aligning native seed supplies with regional conservation demands.”

This model should be emulated across state agencies and other groups of seed buyers to help aggregate seed demand so suppliers can build their inventories to match those seed needs. An important outcome of this grant program will be to demonstrate to seed buyers the benefits of communicating and partnering with seed producers with as much lead time as possible—ideally at least 2 years. We need to shift away from the typical last-minute seed requests for shovel-ready projects, which often result in species substitutions or project cost overruns. Advance planning can prevent this, improving restoration outcomes and making projects more cost-effective in the process.

Planning ahead with native seed producers

Heritage Growers and Great Valley Seed are two native seed growers supporting this program as grant partners. The two companies have different business models and have each taken a unique approach to their participation in this grant, with a focus on their respective



Aerial photograph of Heritage Growers native seed production fields in spring 2022. Photo credit: John Brennan.

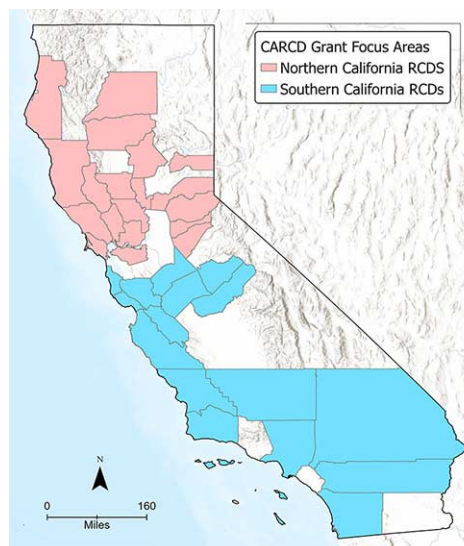
geographic regions. Both growers are available to work with all participating RCDs; the northern and southern regional focus of each grower is based on the environmental suitability for the amplification of ecotypes needed for RCD projects. Their involvement and contributions to this project are highlighted as follows.

Heritage Growers

Heritage Growers, located near Colusa, California, is a venture of River Partners. They provide source-identified native seed and plants to support River Partners habitat restoration efforts as well as non-River Partners habitat restoration projects. Heritage Growers is a non-profit organization that utilizes an earned income model. As a result, any profits that are generated by Heritage Growers goes back to support River Partners’ mission of restoring habitat for the benefit of people and the environment.

For the Climate Resilient Habitat Restoration project, Heritage Growers is working with Resource Conservation Districts (RCDs) primarily in Northern California, including the Bay Area, Delta, and areas to the north, to provide source-identified native seed (mostly) and source-identified native container plants (occasionally) to support individual RCD restoration projects. The material that Heritage Growers is providing originates from wildland stock seed that is collected and dried by RCDs, and then sent to Heritage Growers for amplification. Guidance and training will be provided to RCDs on species selection, collection, drying, storage, and appropriate shipping methods. The wildland-collected field material provided by the RCDs comprises native seed and impurities

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Inset: Counties where RCDs are participating in the grant.

Source-Identified Native Plant Materials for Resilient Habitat Restoration *continued*

such as chaff and weed seed that are cleaned out and sent to a seed lab for testing to determine purity, viability, and number of live seeds per pound. The lab results then dictate the seed amplification approach(s) possible for each collection.

After it has been determined how many live seeds are available, the seed is then amplified by direct seeding when enough seed is available or by plug planting (transplanting small container-grown plants) when seed is limited. Following planting, the fields are maintained, primarily via irrigation and weed control, and cut and harvested when the seed is ripe. The harvested seed is then dried, cleaned, tested, and sent back to the RCD for use in its projects. Heritage Growers will be amplifying 18 different items for this project.

Great Valley Seed

Great Valley Seed (GVS) originated from the collaboration between local ecologists and a sixth-generation San Joaquin Valley farming operation. GVS is a family-owned farming business committed to providing native plant material from the Central Valley that is the backbone of sustainable and effective farming and conservation efforts.

GVS propagates, harvests, and cleans seed onsite at its farm and production facility in Los Banos, California. With a deep appreciation for the arid climate and limited water supplies in the San Joaquin Valley, GVS specializes in locally-sourced, drought-tolerant species and ecotypes. In support of the rapidly expanding restoration efforts in the Central Valley, GVS is focused on leveraging its agronomic capacity to achieve economies of scale for the production of native plant materials that are applicable to both natural and working lands in the region.

For the Climate Resilient Habitat Restoration project, GVS is working with RCDs primarily in Central and Southern California to provide source-identified native seed and plants for their habitat projects. Partnering with RCDs early on helps GVS to achieve economies of scale, so GVS is offering 20% off plant materials to RCDs participating in the program. GVS is providing guidance on species selection and supplying RCDs with plant materials through the amplification of seed or transplants. When stock seed is not already available for requested species, GVS will be assisting with seed collection efforts. Local ecotypes will be grown out on a five-acre plot to establish stock seed, which will then be increased to larger fields over two growing seasons.



Native transplants used for both on-farm amplification and off-site restoration at scale.

The expansion of stock seed inventories through this program will not only benefit the RCD network, but other regional restoration initiatives as well. This is especially important in the Central and San Joaquin Valleys, where many species and ecotypes have not yet been propagated at scale.

Hope for resilient restoration

The Climate Resilient Habitat Restoration project is helping to accelerate the development of source-identified plant materials that will be required to achieve state and federal climate-smart land management goals. It provides critical support for collaboration among regional partners, capacity-building for seed suppliers, and increased coordination with seed users. This important grant program is an example of the progress we can make through collaboration and targeted funding for capacity-building that will make restoration projects more resilient for decades to come.



For more information

Heritage Growers Native Seed and Plant Supply: Pat Reynolds, General Manager, preynolds@heritagegrowers.com. **Great Valley Seed:** Doug Iten, General Manager, doug@greatvalleyseed.com. **California Resource Conservation Districts:** <https://carcd.org/rcds/find/>. **Link to National Academies of Sciences, Engineering, and Medicine report:** “Supply of Native Seeds Insufficient to Meet the Needs of Current and Future Ecological Restoration Projects, Says New Report.”



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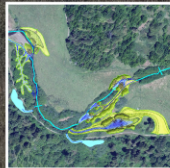
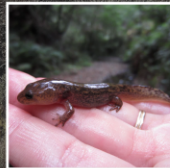


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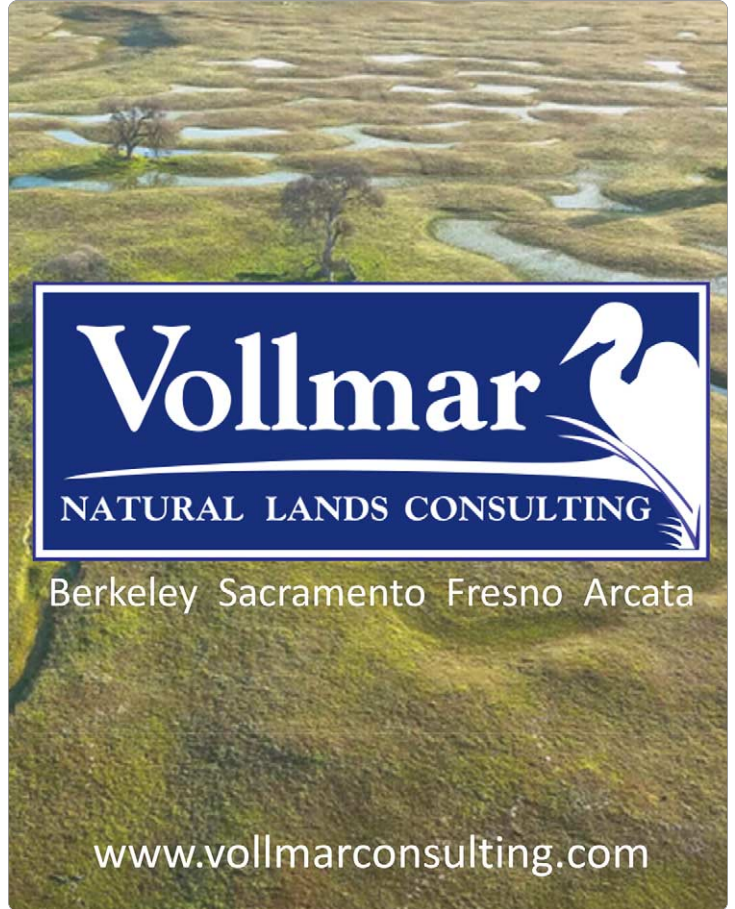
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Mentoring Today for a Better Tomorrow

by Joanna Tang with Will Spangler and Isaiah Thalmayer

What's the best thing about being a part of SERCAL? We asked our members and the results were loud and clear: the people! Being in community with like-minded people all motivated to restore and steward our beautiful ecosystems is a huge reason why folks love our annual conference. We also love learning from each other – it's amazing what ideas originate from gathering diverse individuals in a room and hearing each others' perspectives from all walks of life and all disciplines. That's why SERCAL is committed to increasing the diversity of our members. We know that restoring California's ecosystems is a monumental challenge and can only be solved by bringing everyone on board. One way we are aiming to bring more folks into our vibrant community is through our Mentorship Program.

If you were thrilled by meeting some new and old friends at our conference but didn't have time to sit down and have a good chat, or if you are craving connection throughout the year while waiting for the next conference, then the Mentorship Program is for you! We recently revamped our Mentorship Program to provide a platform for folks to establish and strengthen connections outside of the conference. Mentorship families typically consist of one mid- or late-career professional and one to three students or early-career professionals from The Next Generation.

With a wealth of knowledge and experience to impart, and resources to share, SERCAL mentors can bridge the gap for their mentees and set them up for success in our field. Our goals are to:

- * Provide a platform which facilitates individual growth opportunities for students, emerging professionals, and youth in environmental and STEM fields; and
- * Ensure equity in educational opportunities and professional advancement for historically underrepresented groups.

In order to provide mentorship experiences for all our mentees, we are looking for mentors throughout the state, but especially in southern California.



Just a few faces from this year's program... clockwise from upper left: Sonya Vargas, Sophie Wong, Zooey Diggory, Natalie Nemeth, Mando Valencia, Dmitrius Rodriguez, Ross Taylor, and Geoff Smick.

The structure of this one-year mentorship program consists of year-round (~quarterly) meetings between mentor families, culminating in mentorship families meeting (in-person or virtually) during SERCAL's annual conference. Participants have access to an online forum where they can see a directory of other participants and ask questions in a chat room.

If you're an emerging professional who's looking to start building your network and learn about different pathways and perspectives in ecological restoration, *join as a mentee!* If you're a working professional who's looking to expand your network and make sure you're in-the-know with all the newest restoration buzz, *join as a mentor!* In the first year of our new program, we've already had almost 70 participants, several of whom had a blast at our 2023 conference!



Mentoring Today for a Better Tomorrow... *Don't just take our word for it, here's what some of this year's participants had to say about their experience...*

"The SERCAL mentorship program is one step in the direction of providing clear access pathways for individuals interested in the field of restoration ecology..."

"Having a mentor gave me a direct connection and insight into the professional world of environmental restoration. By providing a welcoming relationship, my mentors allowed me to find my roots in the field and decide what steps work best for me moving forward in my career.

"Being able to bounce ideas and develop understanding from their experience has guided me immensely in determining what I can bring to the conversation and development in habitat conservation. By having mentors who are seasoned in their work, I can take their guidance with their understanding and proven track records for ecological integrity." — *Mando Valencia*

What's one of the most valuable things you've learned while being a Mentee/Mentor?

"Participating in the mentor program as a mentor was a great reminder of the importance of really listening to another person and understanding their background, their interests, and their vision as they're starting their careers in the restoration profession." — *Ross Taylor*

"One of the most valuable things I have learned from being both a mentor and a mentee has been that there is always something to contribute in a mentorship setting. I remember feeling as though maybe I was not in the right place or time in my career to be a mentor, or feeling as though I didn't have much to contribute as a mentor, but during my times as a mentee I have experienced how impactful even just a one-hour conversation can be. Being a mentor can be as simple as being an open ear for someone contemplating next steps, or finding a time when we experienced something similar and remembering how I navigated the situation." — *Sonya Vargas*

How has being a part of the SERCAL Mentorship Program helped support your career goals?

"The mentorship program was a great way to directly practice leadership and even succession planning, such as how to be organized and intentional in staff communications and feedback;

how to listen; and providing meaningful but practical support for staff development (such as reviewing resumes, practicing interview questions, etc.). It was also invigorating and hopeful, which every career needs every once in a while!" — *Zoey Diggory*

"The most valuable thing I learned while participating, as a mentee, was how tight-knit the restoration community is and can be! Hearing about [my mentor's] various roles with school, his job, and SERCAL inspired me because it shows how many different ways someone can participate in restoration throughout the state." — *Dmitrius Rodriguez*

"I had the chance to learn about my mentor's career path and it helped me reconsider the options I have. Before the conference I only considered attending graduate school then looking for positions. Since I haven't been part of the restoration field that long, looking for opportunities has been somewhat difficult. Thankfully, there are

plenty of job boards that I've found which have helped me find jobs I'm interested in. — I emailed him asking about the other job boards." — *Travis Kornegay*

What is one of the challenges you have faced in the field of restoration, and how can the restoration community be aware of and help alleviate that challenge for others?

"One challenge I have faced as a restoration ecologist is the lack of consolidated industry knowledge on how to approach various restoration problems. While restoration practitioners still have a lot to learn in our field, there is

also an immense amount of experiential knowledge that exists out there. SERCAL's mission is to support restoration education and has a primary goal of supporting this problem. The annual conference and mentorship programs are great examples of how this is occurring in real life." — *Geoff Smick*

"One of the challenges I have faced has been finding a place or sense of belonging in the field of restoration. Whenever I feel like I am not qualified or can't do something, I try to remember that I will always be learning and that's okay. SERCAL and other organizations that bring people together with a common interest are so important because they provide a space for us all to have a community where we can learn together and share our knowledge." — *Sonya Vargas*

At whatever stage or discipline you are in your career right now, networking will be sure to boost your trajectory. Participate in this program AND use our **Job Board** to gain access to industry opportunities AND The Next Generation of emerging talent.

Join the Mentorship Program TODAY to be matched with a mentorship family who will help you grow in your career interests and goals!



The Watershed Steward Program was with us in full force! It was so inspiring to meet The Next Generation of Restoration Heroes.

Cultivating Collections: Just a few great moments from SERCAL 2023



Evening plenaries from (L-R) Nailah Pope-Harden, Brook M. Thompson, Dr. Earyn McGee, and José González hit just the right chords. Amazing.



Time flew by, but we were able to catch a few of our nine stipend awardees (left) AND the 2nd place poster team from Victor Valley College (center). And a huge shout-out to Tech Heroes Lindsay and Sonya (and EVERYONE WHO HELPED) who made the technology happen, despite Zoom glitches.

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You are crucial to the resilience of California's native habitats

Just like our floral first responders, SERCAL members make California's ecological systems healthy and whole again. In the three-plus decades since SERCAL was founded, so much — almost everything — has changed. Yet one thing remains constant: *The exceptional power we have when we work together.* We are grateful for all our members and want to recognize these individuals and businesses for their generous support in 2023:

2023 Sustaining Individuals:

Philip Brownsey *Environmental Science Associates Sacramento* * **Robert Mazalewski** *Consulting Horticulturist La Mesa* * **Jim Hanson** *Richmond* * **F Thomas Biglione** *River View Financial Sacramento* * **Catherine Magill** *Portola Valley*

2023 Sustaining Businesses:

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Ross N. Taylor **Ross Taylor & Associates** *McKinleyville*
Ron Dietz **Dietz Hydroseeding** *Sylmar*
David Vigil **Solano RCD** *Dixon*

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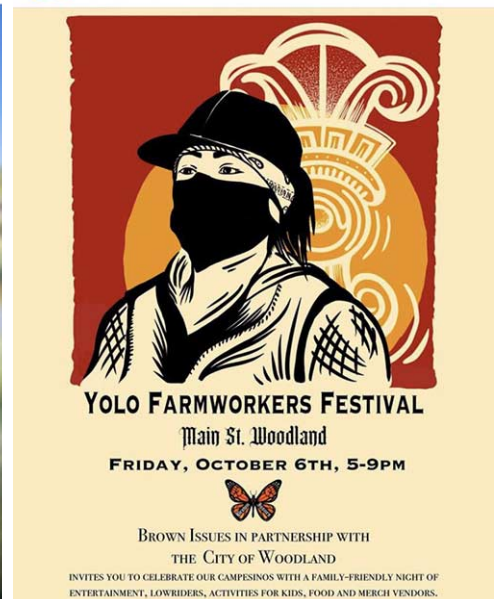
Jason is co-founder of *Rising Routes*, a new organization working at the intersection of social justice, environmental justice, and mental health.

 **numu_wanderer**



Autumn Harry (she/her) is member of Pyramid Lake Paiute Tribe. Autumn identifies as a fisherwoman, land defender, Indigenous rights advocate, artist and fly-fishing guide.

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