



California Society for Ecological Restoration Quarterly Newsletter

A Comprehensive Approach to Vernal Pool Restoration and the Innovative Technologies that Support Success

by Jake Marcon¹

Vernal pool restoration at the SANDER site is showing initial indicators of success following preliminary precipitation events. This City of San Diego project being implemented in Kearny Mesa, San Diego, reestablishes, rehabilitates, and enhances vernal pools, and restores and preserves sensitive wetland and upland habitats within an approximately 30-acre site. The project endeavors to restore vernal pool habitat while comprehensively restoring, preserving, and protecting the habitat values surrounding the vernal pool mesa.

Installation was completed in January 2021, which brought an end to the planning and implementation process collaboratively undertaken by the City of San Diego and Dudek, which began in the spring of 2017. In the early planning stage, Dudek staff used Ground Penetrating Radar (GPR) to identify the depth below ground surface of the hard pan that undulates across the site. Dudek was able to approximate the position of the hard pan in and around existing, functioning vernal pools, as well as in areas identified for potential vernal pool reestablishment, by using line transects positioned through significant portions of the site. The GPR data defined the baseline characteristics of functioning vernal pools on site, providing a template for vernal pool

continued on page 3

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Above: A re-established vernal pool and associated mima mound with container plants and drip irrigation tubing at the SANDER site.

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- 1 A Comprehensive Approach to Vernal Pool Restoration and the Innovative Technologies that Support Success
- 7 The Impact of Herbicide Restrictions on Vernal Pools and Habitat Restoration
- 12 Become an Annual Sponsoring Member: Better Benefits Throughout the Year
- 13 Know Your Audience: The Importance of Including the Public in Restoration
- 19 Leadership Team and Supporting Members

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Ground Penetrating Radar at the SANDER site.



Pre-project view of the SANDER site from drone.

A Comprehensive Approach to Vernal Pool Restoration and the Innovative Technologies that Support Success continued from page 1

design specific to the site characteristics. This technological approach provided the project team and regulators with an elevated level of certainty that the vernal pool design was tailored to the precise conditions of the site.

The Dudek design team then used UAS-based (drone) LiDAR to create a high-resolution digital elevation model (DEM) of the site (i.e., 0.1-foot average point spacing), and 6-inch contours, providing high accuracy mapping of the vernal pool watersheds existing on the site.

Since the design placed reestablished vernal pools within the existing constellation of vernal pools on site, the level of detail provided by the LiDAR data helped ensure that the watersheds of existing vernal pools would not be unintentionally modified during reestablishment of additional vernal pools and vernal pool watersheds in their vicinity. Additionally, the hydrologic balance of proposed reestablished vernal pools and existing vernal pools was calculated to ensure appropriate watershed-to-basin ratios and to corroborate that proposed reestablished vernal pool basins would be similar in function to those existing on the site.

Final design included individualized restoration actions at 67 vernal pool locations. These actions integrated removal of debris from historic illegal dumping activities and amelioration of topographic irregularities from historic off-road activity, while working within the ecological context of the site. Adding to the significance of the site

context was the occurrence of listed San Diego fairy shrimp (*Branchinecta sandiegonensis*; federally endangered), and rare and listed plant species including San Diego mesa mint (*Pogogyne abramsii*; federally endangered, state endangered, California Rare Plant Rank [CRPR] 1B.1), Orcutt's brodiaea (*Brodiaea orcutti*; CRPR 1B.1), Nuttall's scrub oak (*Quercus dumosa*; CRPR 1B.1), long-spined spineflower (*Chorizanthe polygonoides* var. *longispina*; CRPR 1B.2), and San Diego barrel cactus (*Ferocactus viridescens*; CRPR 2B.1).

Sensitive vernal pool wildlife species have already begun to carry out their lifecycles within the site, including San Diego fairy shrimp and western spadefoot toads.

The restoration approach included avoidance and minimization of impacts to all rare plant species, as well as avoidance of biological soil crust and western spadefoot toad (*Spea hammondi*). Comprehensive restoration of the site included restoration and habitat enhancement actions within adjacent freshwater marsh, coastal scrub–chaparral transition, and scrub oak chaparral vegetation communities within and surrounding the

vernal pool watersheds and the vernal pool mesa itself. This conceptual design was taken to final design, which included development of a detailed grading plan and elevation model based on interpolation of the conceptual vernal pool alignment, the LiDAR-derived base map, and GPR data. Construction documents were generated to guide contractor installation for all phases, including invasive plant removal, grading, temporary irrigation, and container planting and seeding.

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A Comprehensive Approach to Vernal Pool Restoration and the Innovative Technologies that Support Success *continued*

Restoration activities began in October 2019, with the removal of all invasive plant species on site. This included removing all non-native grasses and herbs growing in and around the vernal pools, as well as treatment and removal of perennial invasive species growing in the adjacent stream channel.

Vernal pool grading was initiated on November 15, 2019, and halted for the season on December 19, 2019, due to precipitation events, which resulted in ponding of existing and graded basins on site. Fortunately, all reestablishment basins were graded prior to grading being stopped, which gave them an entire wet season to progress before installation was technically complete. Native vernal pool species, such as toad rush (*Juncus bufonius*) and American pillwort (*Pilularia americana*), opportunistically established within many of the reestablished vernal pools during this time period. Final grading activities recommenced on August 17, 2020, and were completed on August 20, 2020.

Soil excavated from reestablished basins was used to create mima mounds surrounding the basins, which were placed to mimic natural topographical patterns seen on the adjacent Miramar Mounds National Natural Landmark.

In addition to excavation associated with reestablishment of vernal pools, minor soil modification was performed in areas where anthropogenic features, such as road ruts, had degraded the ecological functions of existing basins on site. The microtopography was modified to ensure basins were capable of retaining water without significantly altering the hydrologic patterns on site.

Upon completion of grading activities, Dudek created a second, high-resolution DEM of the site using drone-based LiDAR. Dudek compared the two LiDAR-derived DEMs (i.e., one prior to and one subsequent to grading) in order to delineate with high levels of accuracy the extent and location of all newly excavated areas and all

newly created mounds on site. Dudek then used hydrological modeling to analyze the post-project DEM and delineate the maximum extent of ponding possible at each vernal pool basin. Field verification proved that this methodology accurately and efficiently identified ponding areas, providing an enhanced level of confidence in as-built acreage calculations for the City of San Diego and regulatory agencies.

The project team capitalized on the existence of a nearby vernal pool complex to perform focused seed collection of native vernal pool plant species adapted to the conditions being restored on site. These seeds were used to introduce a native seed bank to reestablished vernal pools and to enhance the seed bank within existing vernal pools, including augmentation of populations of sensitive and rare plant species. Vernal pool seeding occurred in conjunction with inoculation of the vernal pools with surface soils collected from existing pools on the SANDER site. Inoculum addition is anticipated to introduce San Diego fairy shrimp and other vernal pool wildlife and plant species to the reestablished vernal pools. Both seeding and inoculum placement occurred only after vernal pools were observed to be capable of ponding sufficiently to support vernal pool plant and wildlife species.

Following initial vernal pool grading and upfront restoration actions, a drip irrigation system was installed to irrigate upland container plants throughout the site. Installation of over 1,200 native container plants and 4 different native seed mixes was completed in phases, with the first phase completed in January 2020 and second phase completed in November 2020.

In all, approximately 520 cubic yards of invasive plant material and approximately 23 cubic yards of anthropogenic trash and debris were removed from the SANDER site during project implementation. Site protection was also improved in the form of additional fencing and repair of existing fencing.

Dudek built and installed sensor arrays in each reestablished vernal pool; these arrays collect ponding duration data remotely. Select arrays will also delineate the ponding and dry down dynamics within the pools. This data collection approach reports ponding status in 2-hour increments, which greatly improves on the data collection intervals typically provided by monitoring visits.

Initial precipitation events have produced ponding in all vernal pools and have demonstrated major improvements to the functionality of the vernal pools on site. Sensitive vernal pool wildlife species have already begun to carry out their lifecycles within the site, including San Diego fairy shrimp and western spadefoot toads.

Vernal pool maintenance and monitoring on site will continue for 7 years as designated in the SANDER Mitigation Plan and upon achievement of the project success criteria, will transition into long-term monitoring and management by the City of San Diego under the



Vernal pool grading in action.

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Meet the Contributing Member: **Jake Marcon**

Occupation: Restoration Ecologist at Dudek

County of residence or work: San Diego County

How long have you been a member of SERCAL? I've been attending conferences for about five years, but only became a member about a year ago.

What do you like best about the SERCAL conferences? The opportunity to share ideas with others in our field and a chance to catch up with old colleagues and friends who I don't get to see on a regular basis.

What is your specific discipline (or underlying education)? I work in environmental consulting with an emphasis on restoration, mitigation, and conservation of rare plants, wetlands, and sensitive vegetation communities. My background is in earth system sciences, ecology, and conservation planning. I have a B.S. in Earth System Sciences from UC Irvine, and a Masters in Environmental Science and Management with an emphasis in Conservation Planning from the Bren School of Environmental Science and Management.

What services do you provide for restoration in California, or what is your restoration passion? I bring a systems approach to every restoration project I work on and I have a particular affinity for projects that are ecologically complex and challenging. I am passionate about rare and endangered plant restoration and I enjoy working in other challenging ecological settings such as vernal pools, sensitive/rare



vegetation communities, and the Mojave and Sonoran Deserts to name a few.

How did you get into the field of ecological restoration? Ecology was a long-time interest of mine and I've always enjoyed spending as much time outdoors as possible. While attending the Bren School of Environmental Science and Management I had an opportunity to work with the Cheadle Center for Biodiversity and Ecological Restoration (CCBER) on a vernal pool restoration project, and with the Coal Oil Point Reserve on some endangered plant restoration work. These

experiences got me hooked. I began working in habitat restoration for Dudek after graduating from the Bren School and have been here ever since.

What is your favorite California native species? What an impossible question. How could you choose one! I grow, and attempt to grow, native plants at my house and right now I am most excited about some Humboldt lily seeds (*Lilium humboldtii* ssp. *ocellatum*) that I'm working with.

Any advice for others in the field of restoration? Always do what is best for the resource and focus on the ecological context of your project. The things we can readily observe are just snapshots of physical and biological systems that are in constant flux. Building habitat resilient to future perturbations requires a systems approach, which involves an accounting of the past, a prediction of future possibilities, and a step-wise approach to push your project towards equilibrium conditions.



A Comprehensive Approach to Vernal Pool Restoration and the Innovative Technologies that Support Success *continued from page 3*

City of San Diego Vernal Pool Habitat Conservation Plan and City's Multiple Species Conservation Program Subarea Plan.

Acknowledgements

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special thanks to the following people: Cheryl Jenkins and Keli Balo (City of San Diego); Summer Adleberg (formerly with City of San Diego); Stuart Fraser, Scott McMillan, Charles Adams, Andrew Greis, Curtis Battle, Janice Wondolleck, and Alexandra Kookootsedes (Dudek); Andy Thomson (formerly with Dudek); Meagan Olson, Kevin Israel, and the entire installation team from RECON Environmental, Inc.



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Figure 1. Dennery Canyon Vernal Pool Preserve, Otay Mesa.

The Impact of Herbicide Restrictions on Vernal Pools and Habitat Restoration

by Scott McMillan¹

Scott will be presenting this topic at SERCAL's 2021 conference, where he will discuss some of the alternatives to synthetic herbicides, including safety, effectiveness, and cost. This presentation will also update the status of the City of San Diego's IPMP program review, process, and path forward.

Recently, our industries related to land management and habitat restoration have seen a dramatic increase in the restrictions and bans against the use of herbicides for non-native vegetation management and control. In California alone, numerous cities, counties, other governments, and non-government organizations have begun restricting or banning the use of herbicides at some level. In some cases, these bans and restrictions are against all herbicides, while in other cases they target the herbicide glyphosate, with all its various forms and brands. Often, these bans and restrictions are specifically against synthetic herbicides and are accompanied by recommendations for the

use of organic herbicides in replacement. Unfortunately, these bans and restrictions usually don't include an evaluation of the negative impact they will have on our efforts to effectively manage open space areas, implement habitat enhancement and restoration, and preserve our rare and endangered biological resources.

The control of non-native weeds is one of the major challenges of habitat enhancement and restoration. For many rare and endangered species, weed invasion and the subsequent habitat conversion that follows is a major contributor to the decline of preserved and managed populations. For decades, we have been using herbicides in our habitat restoration efforts as one of the many tools for implementing weed control. This use of herbicide has not been just for general vegetation management, but for the restoration of habitat for rare and endangered species, including some of the most sensitive species we attempt to manage and protect. No habitat is more sensitive to disturbances from altered hydrology, weed invasion, chemical pollution, or other threats, than the vernal pools habitats found in California. At the same time, no habitat has benefitted more in the last 25 years from enhancement and

continued next page

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The Impact of Herbicide Restrictions on Vernal Pools and Habitat Restoration *continued*

restoration efforts for mitigation and preservation, and the use of herbicide played a key role in many of the most successful examples. Vernal pool habitat restoration is a prime example of how and when herbicides can be used safely and what these recent herbicide bans and restrictions will mean to our efforts in the future.

By the early 1990s, several large vernal pool restoration projects for mitigation were being approved for implementation in San Diego County, some including hundreds of vernal pools across many acres of upland watershed. These vernal pool mitigation projects included one or more of San Diego County's seven federally listed vernal pool plants or fairy shrimp species. At the same time, most vernal pool restoration efforts, particularly those for mitigation, had failed or were failing to meet full expectations. Regulatory agencies like the United States Fish and Wildlife Service and the California Department of Fish and Wildlife began stepping up requirements for both the planning and implementation of vernal pool restoration, including increased financial commitments and increased requirements for success.

With the elevated expectations for these mitigation projects came the new requirement for a maximum weed cover of just 10% in both the vernal pools and upland watershed areas. This requirement to maintain

the total vegetative cover of annual and perennial weeds to less than 10% was something never attempted or achieved in vernal pool restoration up to that point. The weed control efforts on these projects

were required to target the non-native grasses and forbs at a level never attempted, yet the regulatory agencies restricted the use of herbicides in and around the vernal pools. While the requirement to hand weed in the vernal pools was very challenging and expensive, it was achievable. Hand weeding the upland watershed areas, which are often ten times or more the area of the vernal pools, was infeasible. Mechanical methods of removal, like mowing, would simply not be sufficient to achieve the 10% threshold without other measures. It was clear that the full suite of weed control tools was needed, including

herbicide, if the low rate of weed cover was going to be achieved.

With the proposal of herbicide use came concerns about chemical contamination of the vernal pools themselves, even if herbicide was limited to upland areas away from the pools. Most of these vernal pool mitigation projects are specifically designed to maximize capture of the watershed through the mima mound and basin topography and then direct that watershed through the vernal pool complex through high-water outflow from pool to pool (Figure 1). With this concentration of the watershed in the pools comes a potential concentration of chemical residues and other water quality issues.

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Vernal pool habitat restoration is a prime example of how and when herbicides can be used safely and what these recent herbicide bans and restrictions will mean to our efforts in the future.



Figures 2 and 3. Many of the plant and animal species that are targeted for establishment in the vernal pools are particularly sensitive to water chemistry and contamination, including the San Diego button-celery (left) and the western spadefoot toad (right).

The Impact of Herbicide Restrictions on Vernal Pools and Habitat Restoration *continued*

To make matters even more concerning, many of the plant and animal species that are targeted for establishment in the vernal pools are particularly sensitive to water chemistry and contamination. Five of the seven federally endangered species found in San Diego County are aquatic or semi-aquatic plants (Figure 2). These plants, like the San Diego button-celery (*Eryngium aristulatum* ssp. *parishii*), have a suite of physiological and anatomical adaptations that allow them to absorb minerals, gases, and other chemical compounds more readily, helping them survive the inundation and soil saturation that excludes the non-adapted species. In addition to the specialized vernal pool plants, these mitigation projects also target the establishment of aquatic crustaceans like fairy shrimp, as well as native amphibians, like the western spadefoot toad (*Spea hammondi*), both of which live and breed in the vernal pools (Figure 3). Both aquatic invertebrates and amphibians are well known to be highly sensitive to chemical changes and/or contamination in their environments. Any use of herbicide in the vernal pool watershed areas would need to demonstrate safe and appropriate methods of application and demonstrate that any residuals in the watershed do not negatively impact the sensitive species living in the pools.

Working with the regulatory agencies in the 1990s, pilot efforts were conducted to test the effectiveness and safety of using herbicides in the watershed areas that support vernal pools and other sensitive species. To address the concerns for safe application, implementation crews were trained in specific methods of safe herbicide application, emphasizing plant identification and spot-spraying techniques. To address the concerns for chemical contamination, glyphosate was the herbicide of choice for these early efforts. With a low cover requirement for both non-native grasses and forbs, glyphosate's non-selective and systemic effects would minimize herbicide application while maximizing effectiveness per pass. Most importantly of all, glyphosate quickly loses its effectiveness within a few days, so the risk of rainfall or irrigation washing active herbicide into the pools was minimized.

With close monitoring of implementation efforts, sensitive plant and animal populations, and general habitat recovery, glyphosate and other synthetic herbicides have now been used in vernal pool habitat restoration for over 25 years (McMillan and Cavallaro 2016). Not only has herbicide been proven to be safe and effective, but its use as a tool for weed control has contributed to the restoration and mitigation of many hundreds of vernal pools in San Diego County alone. Species like the Otay Mesa mint (*Pogogyne nudiuscula*), a vernal pool species endemic to southern San Diego County, have been brought back from the brink of extinction with these programs that have included extensive herbicide use (Figure 4) (McMillan 2011). When applied appropriately by trained implementation crews, these mitigation projects have seen the establishment and long-term preservation of the aquatic plants and animals without evidence of impacts from the use of



Figure 4. The Otay Mesa mint, a vernal pool species endemic to southern San Diego County, was brought back from the brink of extinction with programs that have included extensive herbicide use.

herbicides. Today, these tools, techniques, and lessons learned in the 25 years of vernal pool restoration are now being applied by public and private land managers who have vernal pools in their preserves and open space areas. There is no better example of this than the City of San Diego's Vernal Pool Habitat Conservation Plan (VPHCP) and the program associated with it.

The VPHCP was adopted by the City of San Diego (City) in 2019, and this plan and associated program will guide the implementation of habitat management and preservation of the seven federally listed vernal pool species, along with the 2,800 vernal pools in the City's preserve lands (City of San Diego 2019). The goals and expectations of this plan, as well as the budgets to achieve these goals and expectations, are strongly based on the assumption that herbicide use will be one of the available tools for weed control. Based on a series of Cease and Desist orders received by the City of San Diego Attorney's office, the City was threatening to prohibit the use of glyphosate and other non-organic herbicides in 2019. Various departments and divisions within the City pushed back with documentation on the substantial ramifications of banning glyphosate and other non-organic herbicides.

The pushback centered around concerns that the loss of synthetic herbicide could lead to dramatic increases in cost to implement weed control management, likely to be many times the current cost. In addition, the inability to control weeds in the preserves could lead to failure of the VPHCP program and a failure of the City's Multiple Species Conservation Plan (MSCP); the program that guides the conservation and management of all the City's opens space areas and

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The Impact of Herbicide Restrictions on Vernal Pools and Habitat Restoration *continued*

conserved biological resources (City of San Diego 1997). Ultimately, the weakening or failure of these City programs could lead to lawsuits from environmental groups and agencies, the loss of the incidental take permits tied to the MSCP and VPHCP programs, and potential impacts to businesses and other City budgets. With this valuable information on the impacts of herbicide bans and restrictions, continued herbicide use was temporarily approved by the City for the VPHCP and MSCP programs, and the City began the process of updating and expanding their Integrated Pest Management Plan (IPMP), expected to be released for public review some time in 2021.

The IPMP will evaluate all methods of weed control, when each method is appropriate, where herbicides will be essential for management, and where there are opportunities to use alternative methods, like organic herbicides. Understanding the safety of these herbicides, how much these herbicides move around, and how long their effects stay active is paramount before we proposed them for wide use in programs like the

City's VPHCP and MSCP. Just because organic herbicides are naturally derived does not mean they are necessarily safe for use in habitat management and restoration, especially with concern to our sensitive plant and animal species.

It is imperative that those of us who depend on herbicides for our land management and restoration activities provide input into documents like the City's IPMP. The benefits and concerns must be weighed against the cost and goals of these programs, and we are the practitioners who best understand these balances of cost, safety, and the ability to achieve our conservation and restoration goals. The outcry against herbicides has become substantial in recent years, and any counter arguments will need to be robust and backed by facts if we are going to maintain this very valuable tool for habitat management and restoration into the future.

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Meet the Contributing Member: **Scott McMillan**

Occupation: I work at Dudek, a consulting firm in San Diego, where I am a senior botanist and habitat restoration ecologist. I also serve on the Board of Directors for the Back Country Land Trust, a non-profit land trust in San Diego County.

County of residence or work: I have lived in San Diego County my entire life, and I work extensively throughout Southern California and beyond.

How long have you been a member of SERCAL? On and off for over 20 years.

What do you like best about the SERCAL conferences? The wide array of habitat restoration projects presented, despite coming from California alone.

What is your specific discipline (or underlying education)? Bachelor of Science in Biology with an emphasis in Botany from San Diego State University.

What services do you provide for restoration in California, or what is your restoration passion? I enjoy working on a wide range of habitats and species, from the coastal habitats of Southern California to the mountains and deserts of the southwest. My work is often associated with our rare and endangered plants and wildlife species. I love what I do for a living because I never stop learning about the incredible biological diversity of the southwest, as well as learning about the methods and approaches to restoring and managing those resources.



How did you get into the field of ecological restoration? While studying botany at San Diego State University, I was fortunate to become involved in some of the habitat restoration efforts of Dr. Ellen Bauder, where my passion for

habitat restoration was established. I have since taken that passion and education and applied it to my efforts as a biological consultant, working to help mitigate, restore, and manage our rare and endangered biological resources.

What is your favorite California native species? There is so much diversity in Southern California and

throughout the rest of the State, it is tough to pick just one, but I have to turn to my beginnings, and pick Otay Mesa mint (*Pogogyne nudiuscula*). I have been working on Otay Mesa mint since college, and I will never grow tired of seeing and smelling it in bloom each spring.

Any advice for others in the field of restoration? To be an accomplished habitat restoration ecologist, you need to blend many fields of expertise, including botany, wildlife biology, landscape management, hydrology, and soils, just to name a few. Always be open to learning about these fields of expertise, even if they aren't your primary area of interest. Bringing this info together will help you better understand the habitats and ecosystems that we are attempting to restore and manage, as you will better understand the full scope and value of our very important work.



Above: In October 2019, Scott led SERCAL attendees on a great walking tour of the Dennery Canyon Vernal Pool Restoration Site.

The Impact of Herbicide Restrictions on Vernal Pools and Habitat Restoration *continued*

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

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

Know Your Audience: The Importance of Including the Public in Restoration

by Milan Mitrovich, PhD¹

In September, Dr. Milan Mitrovich participated as a presenter at SERCAL 2020 in the special session hosted by California Department of Fish and Wildlife (CDFW) on Greenspaces and Trails. His presentation was the genesis for this article.

Working as a conservation scientist in southern California, I learned restoration is one of the most powerful tools for helping people connect to the world around them. When we take time to consider the human element in restoration design and practice, opportunities emerge to foster these connections and bring increased attention and opportunities to our work.

As Science Director for Natural Communities Coalition, the non-profit management corporation overseeing implementation of the conservation strategy for a large habitat reserve system in Orange County, I worked with national leaders in the field of recreation ecology to study the motivations, desires, and perceptions of visitors to the urban-proximate wildlands we helped to protect. Through interviewing

the thousands of people who visited our local wilderness parks in 2017 and 2018, our research team learned that for many, the preferred experience is one of nature immersion. Unlike what was predicted by many land managers and concerned members of the public, almost two to one, people were driven principally by their desire to experience nature versus engaging in exercise-based forms of recreation. Furthermore, people want to be part of the story, learning about and contributing to the protection and recovery of natural systems.

The practice of restoring natural landscapes provides a unique opportunity to engage the public in a way that aligns closely with their values. My experience working on restoration projects reinforces many of these findings and provides new insight into how best to accomplish stated goals. In the article that follows, I will touch briefly on three case studies highlighting the unique relationship people have with restoration and opportunities to go further in our practice in strengthening these bonds.

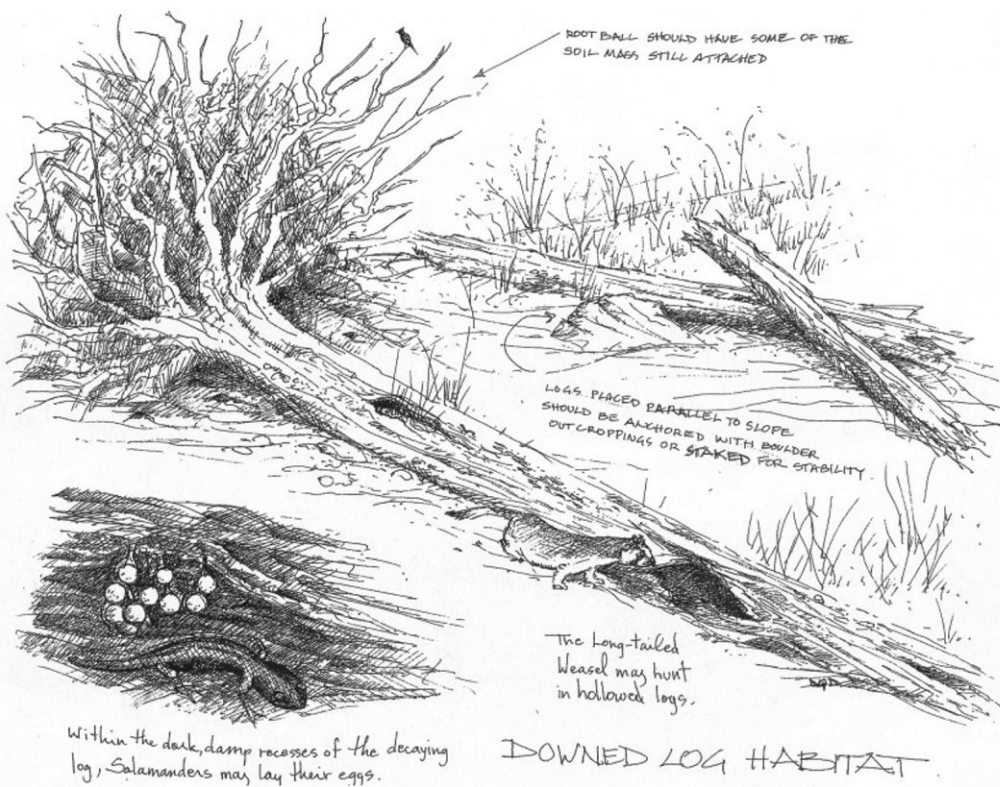
Orange County Great Park — Ecological Guidelines

In the early 2000s, I had the opportunity to work on design of the Orange County Great Park. The Great Park is the focal point of redevelopment of the former Marine Corps Air Station, El Toro. Its

creation was made possible by a public measure voted on by the people of Orange County in 2002. Participating in the Great Park Design Studio presented a unique opportunity for ecologists, like myself, to work with world-renown designers and architects, engineers, local municipalities, and community groups.

The ecological design of the park included day-lighting a stream buried under the runway for over 60 years, pairing of created habitat features with needed infrastructure and the envisioned trail system, and creation of a wildlife corridor. In everything we did, we looked to maximize the opportunity to be inclusive in our work, and to teach about the natural history of the region with stakeholders and future park visitors. When describing our work to reporters who were sharing our story with people from all over the world, it was likened by a few to something from the “Book of Genesis” — for them it was a story of creation.

¹Senior Conservation Biologist with ICF (see *Meet the Contributor* on page 17). Milan.Mitrovich@icf.com



Downed log habitat creating instant habitat structure supporting terrestrial wildlife in the Great Park. Sketch by Domenico D'Alessandro.

continued next page

Know Your Audience: The Importance of Including the Public in Restoration

continued

As my boss, restoration ecologist, Dr. Steven Handel, liked to say, we were creating “One Great Big Beautiful Buffet”. We used all available materials in design, including the broken concrete from runways, trees that were taken down to serve as dead wood, bundles of twigs, and rock when it was available. We realized, if we did not create it, the physical structure so many species depend upon would not exist for decades, if ever. We built wildlife resources islands, stream and boulder habitat, and changed local topography to inspire folks and help them to see nature.

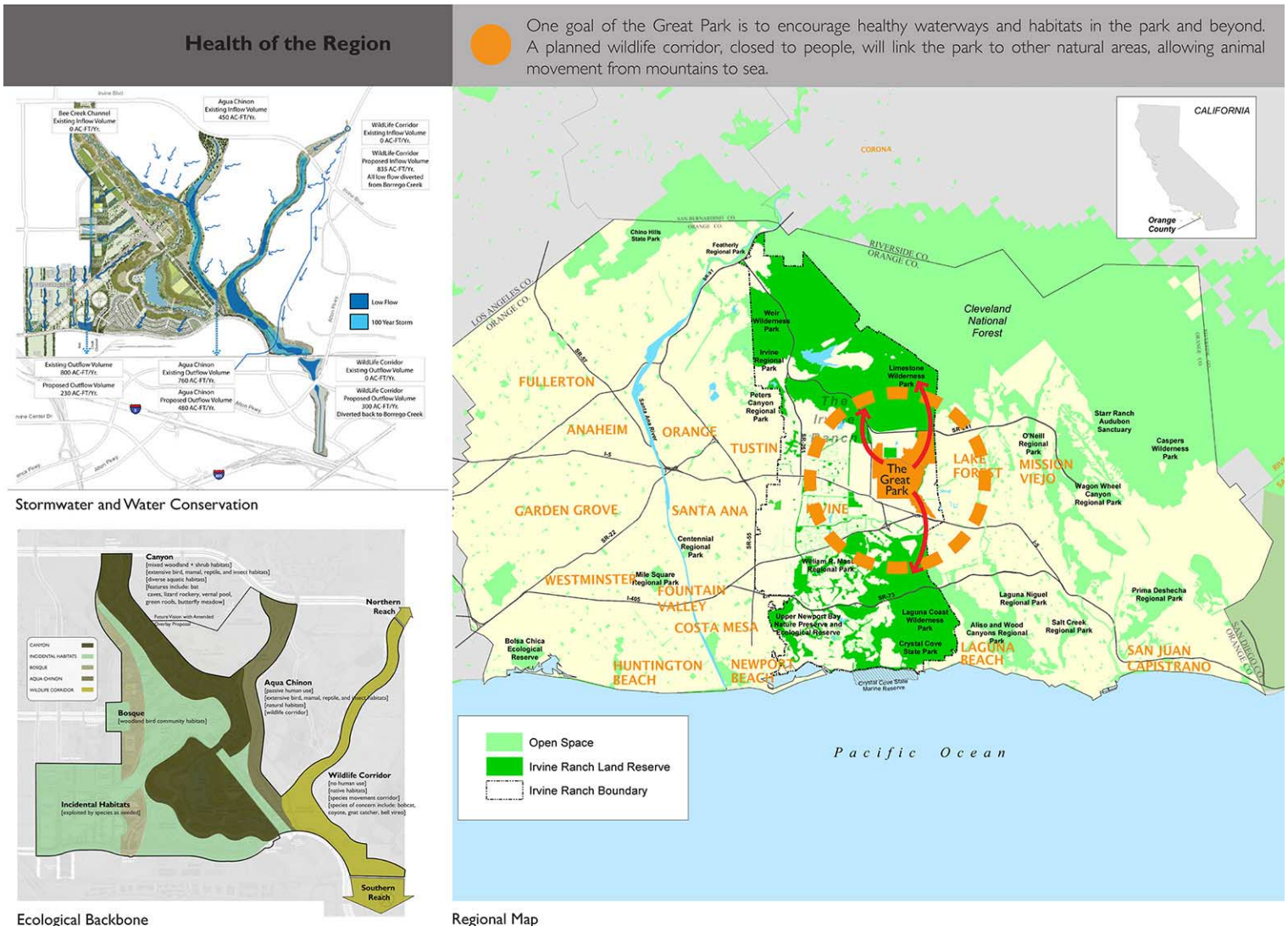
The Great Park was a high-profile project and we realized early in the planning process that there was great value in bringing in the local community to participate in and experience the process of design. Communicating our planning work to a diverse audience was essential.

From beetles to butterflies, songbirds to large mammalian carnivores, our goal was to involve the public in the study of change.

We looked to be inclusive and gave talks and presentations to parties interested in learning how the design was unfolding. We created a guidelines book and partnered with landscape architects to create drawings of ecological features that could help to stir the public’s imagination. We wrote about the design, about what could be, and explained the science. The book was to be sold in museums that would one day populate the Park.

Design of the Great Park included creation of an urban wildlife corridor. Never meant to include people, the Wildlife Corridor was meant to link natural areas along the coast and the foothills, long separated by agricultural and urban development. The Wildlife Corridor was very much ambitious in scope and in many ways without

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Orange County Great Park Ecological Guidelines — Health of the Region. Image created by Studio-MLA.

Know Your Audience: The Importance of Including the Public in Restoration

continued

precedent for an urban setting. From beetles to butterflies, songbirds to large mammalian carnivores, our goal was to allow the public to observe the changes as wildlife began using the corridor. We considered the formation of tracking teams, photo stations, and even the use of blinds in our design work. We wanted to create future opportunities for park visitors and children in classrooms to experience and learn about the Corridor without disrupting the wildlife who were to use it.

A small group of politically savvy and well-connected members of the local environmental community was the driving force behind the effort to re-connect coastal and foothill habitats. Their story, spanning 20 years, is one of tenacity. With the collapse of the housing market that preceded the Great Recession and later the disappearance of redevelopment agencies from California, the plans for the Great Park and Wildlife Corridor were shuttered, at least temporarily. Yet the continued drive of this group persisted through the economic collapse and expansion of the last 12 years, and following new negotiations between the City of Irvine and the developer, the Great Park is again under construction. Although the plans are now different for many of the other areas of the park, miles of the Wildlife Corridor are under construction today as originally envisioned and key members of the local community are still very much engaged and again driving the effort forward.

Teach throughout the process — Coastal Cactus Wren

Natural materials salvaged from development sites are invaluable for both restoration and the storytelling that can accompany a great effort to restore natural systems. Working with knowledgeable restoration

ecologists and contractors over the last decade, we were able to pioneer use of salvageable materials from neighboring development projects to support habitat restoration activities designed to aid the Coastal Cactus Wren, one of two target bird species for the Natural Community Conservation Program in southern California.

Similar to our design work with the Great Park, through bringing in native soil and salvaged cactus, we were able to create instant structure that could be utilized by the wrens for foraging and nesting that would otherwise take decades to establish on its own. We used the material to create stepping-stones to aid dispersal and support the metapopulation dynamics so critical to the species. In addition to facilitating the movement of wrens, we looked to bolster isolated populations by adding one or two more territories to otherwise small populations to increase the probability they could otherwise withstand the periods of extended drought characteristic of the southern California region.

By partnering with Matt Yurko, a professor from Saddleback College, and director of Project Grow with California Coastal Commission, we were able to teach throughout the process of restoration. By repeatedly visiting the sites over a five-year period with his students, the next generation of restoration ecologists were included in the process of discovery, helping them see firsthand the value of utilizing natural resources often lost to development. Working collaboratively with OC Parks, we used signage to pull visitors in and get them involved in the process of seeing what is possible when restoring habitat for sensitive species. When speaking about the restoration efforts at public forums, we told stories about loss and decline — of habitats, of corridors, of

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We applied the tools of historical ecology to understand, not the “way things were”, but the “way things work” to help identify what was most achievable for the project.



Above: Cactus salvage operation involving the capture and transportation of large cactus clumps for use in restoration.

Right: Coastal Cactus Wren bringing back food to nest embedded in prickly pear cactus in coastal Orange County. Photo by Sandrine Biziaux.



Know Your Audience: The Importance of Including the Public in Restoration *continued*

species — and educated folks about present-day threats like wildfire. Through offering field tours, we were able to introduce local elected officials and the public to stories that instill hope and teach about our ability to perpetuate positive change through active restoration of habitats and translocation of salvaged resources. The messages, when well-crafted, can have an impact and lead to real change and new opportunities for future work.

There is a role for science — Western spadefoot

Science improves our work as restoration ecologists. It allows us to measure effectiveness of our actions and helps to engage the public. For more than a decade, my colleagues and I talked about creating seasonal pools in the coastal hills of Orange County to address forecasted impacts of increased aridity on native amphibians. We were focused on improving breeding opportunities for the western spadefoot, a state Species of Greatest Conservation Need and candidate for federal listing. With passage of Prop 68, funding was made available and we pursued this new opportunity relentlessly. Through partnering with CDFW, OC Parks, California State Parks, and the Wildlife Conservation Board, we were able to make the project a reality in 2019.

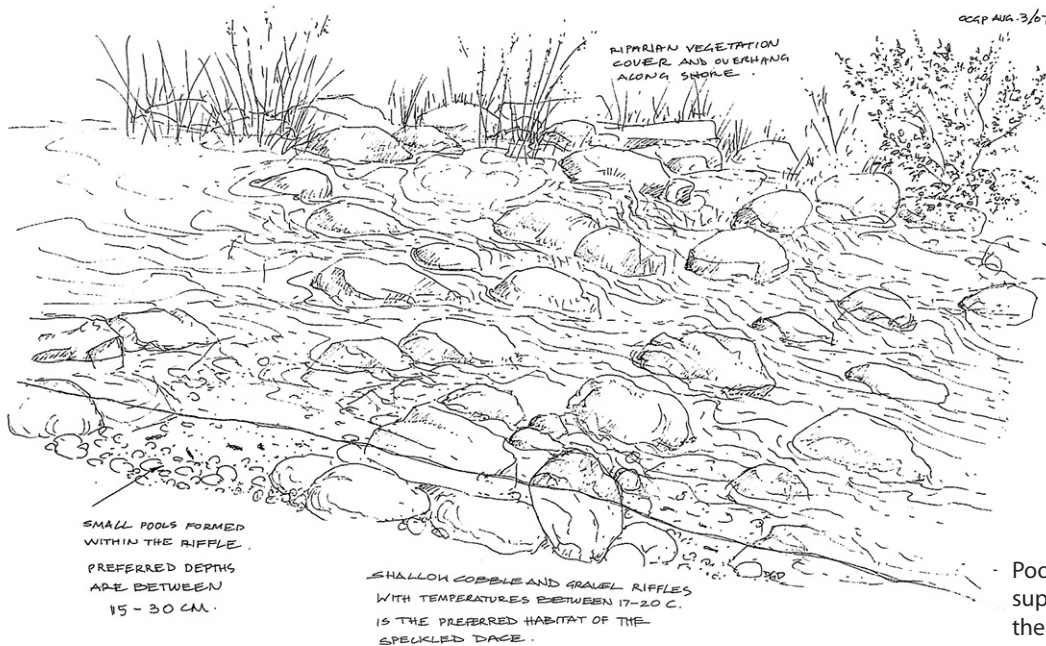
Knowing there is a role for science in our work, we engaged the UCLA La Kretz Center for California Conservation Science and U.S. Geological Survey (USGS) to use the application of conservation genomics to guide our planning work. We brought in Dr. Margot Griswold and the great restoration team from Land IQ and applied the tools of historical ecology to understand, not the “way things were”, but



Western spadefoot in coastal Orange County wearing a radio transmitter for purposes of tracking the movement of the toad. *Photo by Kathy Baumberger (U.S. Geological Survey).*

the “way things work” to help identify what was most achievable for the project. From modeling work performed by UCLA to guide pool design, to enlisting the support of the USGS for long-term monitoring, and with the California Coastal Commission as a regulator, the resulting multi-agency partnership was essential to moving the work forward.

Knowing the story that was unfolding would be appreciated by park visitors and local residents, we partnered with California State Parks and OC Parks to employ digital media to tell the story of project planning and design long after the work has been completed. Although I stepped away to join ICF late last year, the larger team remains focused and is exploring different methods to help people envision the results years later — after construction and management activities have concluded, the coastal sage scrub is established, and the seasonal pools and amphibians they support have otherwise “disappeared” from public view.



A few months into my new job, I got a message. Our work was successful. Just months after construction was complete, the heavy rains falling in late March filled the newly built pools. In a matter of weeks, the pools built on ridgetops overlooking the Pacific Ocean were discovered by spadefoot toads active in the area and successful breeding occurred as recorded by USGS biologists.

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Pool and riffle habitat designed as a water feature supporting native fish and riparian vegetation in the Great Park. *Sketch by Domenico D'Alessandro.*

Meet the Contributing Member: Milan Mitrovich

Occupation: Senior Conservation Biologist at ICF

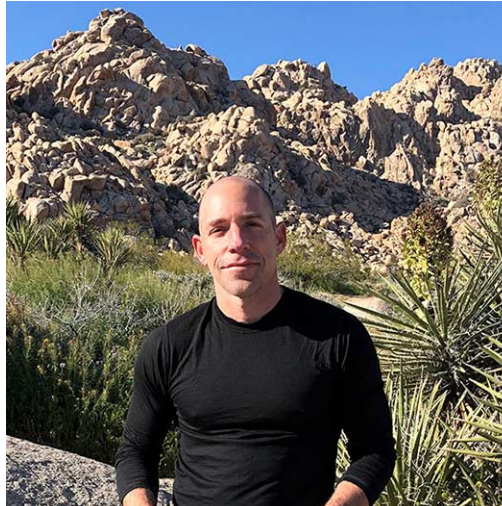
County of residence or work: County of Orange.

How long have you been a member of SERCAL? Less than a year, although my relationships with members of SERCAL and participation in conferences go back more than 10 years.

What do you like best about the SERCAL conferences? I appreciate having the opportunity to hear from passionate people about instilling positive change in our world through the restoration of natural systems.

What is your specific discipline (or underlying education)? I have a PhD in Ecology from UC Davis and San Diego State University.

What services do you provide for restoration in California, or what is your restoration passion? I work with a wonderful team of restoration ecologists and conservation professionals who specialize in coupling landscape-level habitat conservation with restoration. Over the last several years we have focused much of our work on advance mitigation planning for public agencies.



How did you get into the field of ecological restoration? In 2005, I met Margot Griswold soon after taking the position of Ecologist at what was then the Nature Reserve of Orange County (and now goes by Natural Communities Coalition). Margot was very inspiring and very much shared her knowledge about restoration, leading to my interest in contributing to the field.

What is your favorite California native species? The sweet smell of dried California everlasting (*Pseudognaphalium californicum*), which reminds me of maple syrup, has always been a favorite treat to me and one you can take home for a short while on your clothes after spending the day working in the chaparral and sage scrub that so much makes up the wildlands of southern California.

Any advice for others in the field of restoration? Include the public in your work when you are able. Many find hope and meaning in our ability to restore natural systems, so share your experiences with them when possible.



Know Your Audience: The Importance of Including the Public in Restoration *continued*

Final Thoughts

I am convinced ecological restoration is one of our greatest tools for helping people connect to the world around them and feel empowered. By including the public in our work and showing them the importance of our collective decisions, we all reap the benefits. I recently reconnected with the folks who were the driving force behind the Wildlife Corridor. As the Corridor is undergoing construction, I am getting excited about the teaching opportunities beginning to emerge; the opportunities to partner with San Diego Natural History Museum, The Nature Conservancy, and others in telling the story of one of the first great urban wildlife corridors in the country. As we invest the time and effort to learn more about establishment of new habitats, a story is beginning to emerge and its impact is sure to extend well beyond the wildlands of Orange County.

The End.



Meet the Contributing Editor: **James Mizoguchi**

How long have you been a member of SERCAL? 4 years.

What is the biggest benefit of your SERCAL membership? Well, you've got to love the conference and reduced pricing but I think the biggest benefit is contributing to a non-profit focused on restoration.

What do you like best about the SERCAL conferences? I like the chit chat, I like the presentations, and one time the veg option at lunch was a quinoa salad I'll never forget.

How did you get into the field of ecological restoration? I got interested in conservation first through my childhood obsession with PBS' Nature series and then got into restoration during my undergrad study at UC Davis.

What is your specific discipline (or underlying education)? I have BS in Wildlife and Fish Conservation Biology with a minor in Landscape Restoration from UC Davis.

What is your Occupation and where do you work? I'm a biologist for Teichert Materials and a restoration ecologist with Triangle Properties.



What services do you provide for restoration in California, or what is your restoration passion? I'm lucky — I get to do a little bit of everything from writing proposals to implementing and monitoring restoration projects.

County of residence or work: From Tahoe down through the central valley and into the delta and Bay Area.

What is your favorite California native species? Well, I really like spotted owls, valley oaks, amsinckia, and madrones. Marah's flowers are really cute, too.

Any advice for others in the field of restoration? Dig deeper! Oh, and don't forget sunscreen!



If you need volunteers, California Climate Action Corps can help.

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



Navaretia heterodoxa

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

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Mark Cederborg *Hanford ARC* *Petaluma*

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The Last Word: *Intersections*

“When you step into an intersection of fields, disciplines, or cultures, you can combine existing concepts into a large number of extraordinary ideas. — *Frans Johansson*”

Has this also been happening to you? Lately, my BC (Before Covid) impulses and habits automatically kick into gear, but just as I’m achieving my desired pace, an infinitesimal neuron will fire and I am reminded that I can’t be certain about what next month might bring, let alone next year. It doesn’t matter that I’ve never been able to see into the future; it’s that I definitely can’t *now*. I don’t know about you, but I often find these moments seismically unsettling.

Yet each of us is still moving forward — *because that is what we do* — even though our individual and collective spheres continue to spin at varying speeds and with changing trajectories.

SERCAL is also moving forward. We are thinking beyond who we’ve always been as an organization, reaching out to underserved communities, forging stronger connections with partners, and envisioning a future where diversity, equity, inclusivity, and justice intersect with the restoration of California’s native habitats. We may not be able to predict the future, but I truly believe that when we look back on these days, we will see we made a huge impact.

If you haven’t already, please renew your membership today. We’ve got extraordinary work to accomplish this year.

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

SERCAL, the California Society for Ecological Restoration, is a non-profit membership-based organization dedicated to advancing the science, art, and practice of restoring native California habitats.

See what's new at www.sercal.org.

Ecesis

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

Upcoming issues:

Publish	Due Date*	Guest Editor
Apr 2021	Mar 15	Ross Taylor
Jul 2021	Jun 15	Mauricio Gomez
Oct 2021	Sep 15	Will Spangler
Jan 2022	Dec 15	Liz Agraz & Geoff Smick

*Contact Julie, James, or the Guest Editor (see all contacts, page 19) early to secure your spot. Find guidelines at www.sercal.org/newsletter

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