Oaks

FALL/WINTER 2025 CALIFORNIA OAKS

The world around and under oaks

By Katherine Kerstetter, Intern, California Wildlife Foundation

Life moves constantly in oak woodlands, filled with myriad resident species as well as many that leave and return for food, shelter, and rest. Sunlight filtering through the leaves provides warmth to the cooling air, falling onto the back of a western gray squirrel sitting on a root in search of food. As she dashes around the tree's base—leaping over its large roots and fallen leaves—her sharp nose picks up the scent of acorns scattered among the leaf litter. After burying one acorn and quickly eating the other, she climbs up the tree, her tail helping her balance as she digs sharp claws into the bark. Her nest, seated on a high branch, is well concealed by foliage, providing a safe home.

Squirrels are just one of many animals that depend on this oak tree for food and shelter. California oak ecosystems support over 2,000 plant, 5,000 insect and arachnid, 80 amphibian and reptile, 160 bird, and 80 mammal species.[1] Oaks also sequester carbon, reduce ground surface temperatures, absorb pollutants, stabilize the soil, and produce oxygen.[2]

Acorns are an important food source for animals such as deer, chipmunks, raccoons, black bears, California Scrub Jays, and woodpeckers. Oaks produce a large number of acorns once every few years, an occurrence known as a mast (some oak species do so at the same time, miles apart). These nuts are eaten and stored as a vital resource during the winter when food is scarce.

Oaks and their acorns are also very important to Native Americans. Over thousands of years, they have utilized and tended California's native oak trees, recognizing their importance to the earth and appreciating their many uses including dyes, food, shelter, weapons, tools, medicine, and wildlife habitat. Native Americans respect and care for oaks in maintaining plant materials for basket making and other uses; clearing matter on the ground to prevent the risk of wildfires fed by the accumulation of ladder fuels in the understory; and conducting cultural burns to improve wildlife habitat and access for hunting. These practices result in larger oak groves, as well as higher production and quality of the materials produced by oaks.

© Bryant Baker, Los Padres ForestWatch

Western fence lizard resting on oak branch covered in lichen

A single oak tree supports hundreds of organisms. Creatures of different shapes and sizes coexist in every part of the oak. Along the branches and scattered on the leaves are caterpillars, oak worms, and moths. Birds and squirrels make their nests among the tree's bumpy and rigid branches, and all throughout the bark's crevices are spiders and insects such as aphids, borers, and beetles. Tree cavities serve as secure homes for birds and mammals, including raccoons, woodrats, Acorn Woodpeckers, and California Spotted Owls (*Strix occidentalis occidentalis*, of which the coastal distinct population segment is a candidate federal endangered species and the Sierra Nevada segment is a candidate federal threatened species).

Other organisms that grow on, alongside, and atop oaks provide ecological benefits to a multitude of species. Many wasp species induce galls on oak trees, which provide shelter and sustenance for their young as well as a food source for other creatures. Lichen, a fungus in symbiotic relationships with other organisms, covers some oaks with its often neon green-yellow or orange threadlike splotches. Oaks provide lichen with favorable access to sunlight and rainwater; in turn, the lichen provides a valuable resource for many creatures. Western gray squirrels, red tree voles, birds, and other critters use lichen for nesting material, while deer and rabbits may feed on pieces that fall on the ground. Here, around the base of the tree, beetles, earthworms, mites, and other organisms live within the litter zone and beneath the soil.

Underground, oaks contribute to a large and mostly unseen ecosystem. Oaks interact with and support fungi, bugs, worms, and other underground dwellers. Notably, mycorrhizal fungi have evolved alongside oak roots for millions of years, forming symbiotic relationships with tree root systems. Oaks provide energy in the form of sugars and other carbohydrates to the fungi, while fungal hyphae extend the oak's root system to reach

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Inside

Protecting and restoring California's biodiverse landscapes


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Cosumnes River at El Dorado Ranch

Important lands are being protected thanks to the perseverance of California Oaks Coalition's land trusts and other partners. American River Conservancy's multiyear effort to permanently protect El Dorado Ranch as El Dorado County's first State Wildlife Area (page 5) is vital to advancing California's biodiversity and climate goals in this rapidly developing corridor. Clover Valley in Placer County's Rocklin (page 4) is another priority landscape due to its cultural and ecological values.

While there is much to celebrate, development pressures abound. Oak ecosystems in the Sierra Nevada foothills face many threats, as detailed in two proposed specific plans for development in western El Dorado County (page 4). These projects are making their way through the public review process, with final environmental impact reports expected around press time. Unfortunately, the county's oak measures facilitate rather than prevent oak removals. For example, the in-lieu fee structure provides no meaningful incentive to keep oaks standing nor does it fund oak restoration or conservation at levels that compensate for the loss.

In addition to their biodiversity and cultural importance, oaks are a vital part of California's fire-prone landscape. We are grateful to the Santa Barbara Botanic Garden, another valued member of California Oaks Coalition, for their many years of research and collaboration to better understand the role of oaks in fire resilience and for sharing findings from their current study (page 8).

California Wildlife Foundation's programmatic partnerships are helping to protect and restore biodiverse ecosystems across the state. For example, we are an integral part of the South Bay Salt Pond Restoration Project. This includes tidal marsh restoration at Eden Landing in Hayward (Alameda County) that is recovering habitat for endangered and other species while making this stretch of shoreline more climate resilient (page 7).

Endangered Habitats Conservancy has long partnered with California Wildlife Foundation to protect important habitat and aid in the recovery of threatened and endangered species in San Diego County (page 6). The conservancy, also a member of the oaks coalition, is on the cutting edge of restoration science in a populous county that supports the greatest abundance of plant and animal species in the contiguous United States.

As we look to the future, we thank California Wildlife Foundation intern Katherine Kerstetter, who spent part of her summer writing the cover article for this issue. She is honing her environmental writing skills by sharing insights about the importance of keeping oaks standing.

Sincerely,

Janet S. Cobb, Executive Officer
California Wildlife Foundation/California Oaks

California Oaks Coalition

California Oaks Coalition brings together international, national, Tribal, state, regional, and local organizations to conserve and perpetuate the state's primary old-growth resource. Members of California Oaks Coalition are united by the vital role of oaks in sequestering carbon, maintaining healthy watersheds, providing habitat, and sustaining cultural values.

- Alameda Native History Project
- Amah Mutsun Land Trust
- American River Conservancy
- American River Watershed Institute
- Anderson Valley Land Trust
- AquAlliance
- Audubon California
- Baduwa't Watershed Council
- Butte Environmental Council
- California Institute for Biodiversity
- California Invasive Plant Council (Cal-IPC)
- California Native Plant Society (CNPS), including Dorothy King Young, El Dorado, Sanhedrin, and Yerba Buena chapters and the San Diego Restoration Committee
- California Rangeland Trust
- California State University Chico Ecological Reserves
- California Water Impact Network (C-WIN)
- California Wilderness Coalition (CalWild)
- Californians for Western Wilderness (CalUWild)
- Canopy
- Carrizo Plain Conservancy
- Center for Biological Diversity
- Central Coast Heritage Tree Foundation
- Chimineas Ranch Foundation
- Clover Valley Foundation
- Coastal Corridor Alliance
- Conejo Oak Tree Advocates
- Confluence West
- Dumbarton Oaks Park Conservancy
- Earth Discovery Institute
- El Cerrito Trail Trekkers
- Endangered Habitats Conservancy
- Endangered Habitats League
- Environmental Defense Center
- Environmental Protection Information Center (EPIC)
- Environmental Water Caucus
- Foothill Conservancy
- Forest Unlimited
- Forests Forever
- Friends of Harbors, Beaches and Parks
- Friends of Olompali
- Friends of Spenceville
- Friends of the Richmond Hills
- Global Conservation Consortium for Oak (GCCO)
- Hills For Everyone
- Laguna de Santa Rosa Foundation
- LandPaths
- Loma Prieta Resource Conservation District
- Lomakatsi Restoration Project
- Los Padres ForestWatch
- Lower Kings River Association

Micke Grove Zoo
Mountains Recreation and Conservation Authority
Northern California Regional Land Trust
Ojai Trees
100K Trees for Humanity
Pacific Birds Habitat Joint Venture
Placer Land Trust
Planning and Conservation League
Point Blue Conservation Science
Redbud Audubon Society–Lake County
Redlands Conservancy
Regrounding
ReLeaf Petaluma
Resource Conservation District of Santa Monica Mountains
River Partners
River Ridge Institute
Rural Communities United
Sacramento Tree Foundation
Sacramento Valley Conservancy
Santa Barbara Botanic Garden
Santa Clarita Organization for Planning and the Environment (SCOPE)
Save Lafayette Trees
Save Napa Valley
Sequoia Riverlands Trust
Shasta Environmental Alliance
Sierra Club Northern California Forest Committee–Oak Woodland Subcommittee
Sierra Club Placer Group
Sierra Foothill Conservancy
Smith River Alliance
Stewards of the Arroyo Seco
Tejon Ranch Conservancy
Tending the Ancient Shoreline Hill
Tuleyome
Tuolumne River Trust
Universidade de Trás-os-Montes e Alto Douro, Department of Forest and Landscape Architecture (Vila Real, Portugal)
University of California Botanical Garden at Berkeley
University of California, Los Angeles, Mildred E. Mathias Botanical Garden
Ventura Land Trust
Western Shasta Resource Conservation District
Woodland Tree Foundation

California Oaks provides the following support for coalition members:

1) Research and advocacy updates.

2) Collaboration in protecting oaks.

3) Information to educate and engage the public.

4) Tools for participating in planning processes and educating opinion leaders.

5) Materials to inform governmental agencies of the opportunities for and benefits of protecting oak woodlands.

6) Sharing stories from coalition efforts to keep oaks standing.

For more information, please contact Oak Project Director Angela Moskow, amoskow@californiaoaks.org.

Acorn Woodpecker holding an acorn while perched on a coast live oak

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nutrients, water, and minerals.[3] Sometimes mycorrhizal fungi can be seen aboveground forming fruiting bodies such as mushrooms or truffles. The longstanding relationship between oaks and mycorrhizae benefits plant growth, biodiversity, carbon sequestration, access to groundwater, and soil quality.

Squirrels are small creatures. Running around in search of acorns may not seem particularly remarkable. However, squirrels are important to various ecosystems and food chains. Besides acting as a food source for other animals, their burying of acorns perpetuates oaks. Every creature's life supports the existence of other species. I can no longer see a squirrel on a tree and forget the hundreds of other species that they interact with, depend on, and provide for. Oak trees are keystone species that support thousands of species through habitat, resources, and carbon sequestration. Unfortunately, oak tree removals for land conversions to other uses devastate these unique and biodiverse environments, wiping away the lives of countless creatures. If we want to preserve woodlands and forests, and the species that depend on them, we must fight for oak protection.

[1] Meadows, R. 2007. "Oaks: Research and outreach to prevent oak woodland loss." *California Agriculture* 61(1):7-10.

[2] Napa County Resources Conservation District, "Introduction to Oak Ecology," naparcd.org/wp-content/uploads/2017/10/1-Introduction-to-Oak-Ecology.pdf. 2017.

[3] USDA Natural Resources Conservation Service, "Mycorrhiza: The Hidden Plant Support Network," www.nrcs.usda.gov/plantmaterials/flpmcar13137.pdf. 2017.

RESOURCES

Issued by the California Wildfire and Forest Resilience Task Force, ***Managing Wildfire Risk in Southern California's Chaparral Landscapes: What Works & What Doesn't*** (wildfiretaskforce.org/managing-wildfire-in-southern-californias-chaparral-landscapes) recognizes the unique ecology of Southern California chaparral and coastal sage scrub. Its recommendations focus on home-hardening and defensible space, ignition control, early detection of fires, and strategic access for firefighting (fuel breaks). Landscape-scale vegetation removal is evaluated as being ineffective and counterproductive, as such methods lead to type conversion from native plants to highly flammable, nonnative weeds and grasses.

TAKE ACTION

California Environmental Quality Act (CEQA) was amended by the legislature earlier this year, limiting its scope. Nonetheless, it remains an important tool for improving projects that are subject to its requirements. CEQA allows the public to provide input and raise concerns regarding the potential impacts of a project during public comment periods.

Public comments can form the basis for legal challenges as long as they are submitted before a Notice of Determination (see below) is issued. A lead agency (the entity principally responsible for carrying out or approving a project) is required to accept all comments into the public record that are submitted prior to the agency filing a Notice of Determination, which either approves or determines to carry out a project subject to CEQA requirements. The determination can be legally challenged within 30 days of the notice.

California Native Plant Society, a member of Oaks Coalition, has a web page that provides an overview of each stage of the public review process under CEQA: ct.cnps.org/get-involved/ceqa-public-review-periods/. The page also provides links to an overview on environmental impact reports, tips on writing comment letters, a CEQA glossary, advocacy resources, and more.

Heart of Clover Valley permanently protected


© Placer Land Trust

Clover Valley is the land to the left of the roadway. Efforts to protect it are drawing the line against loss of this ecologically and culturally rich landscape.

By Julia Boorinakis Harper Barbeau, Media Manager

Clover Valley, home to one of the few remaining intact blue oak woodlands in western Placer County, is the City of Rocklin's last significant open space. In April 2025, after a multiyear effort, Placer Land Trust (a member of California Oaks Coalition), Jessup University, and project partners announced the permanent protection of 402 acres in the heart of Clover Valley for conservation, education, and public benefit. This accomplishment is the outcome of a decades-long effort of community groups, including oaks coalition members Clover Valley Foundation and Sierra Club Placer Group, focused on one of Placer County's most ecologically and culturally rich landscapes.

Home to a wide variety of ecosystems, wildlife habitat, and cultural resources, Clover Valley has long been under intense development pressure, with approvals and entitlements in place for more than 500 single-family homes and a roadway across the valley floor.

Starting in 2021, Rocklin-based Jessup University worked with the original landowner (a group of companies) as a willing seller, partnering with Placer Land Trust on an ambitious fundraising effort. In support of this effort, hundreds of people wrote to elected officials and spoke at public meetings about protecting Clover Valley.

This spring, Placer Land Trust recorded a perpetual conservation easement to permanently prohibit subdivision and residential development in the valley floor. "The protection of Clover Valley holds so many benefits for our community and the environment," says Jeff Darlington, the trust's executive director. "From habitat for rare and threatened species to Native American heritage sites, this land is truly unique to Rocklin and our region. The unprecedented collaboration of so many local supporters and partners shows just how much Clover Valley means to our community."

Clover Valley Creek flows year-round through the preserve, where native beavers have helped to form a 20-acre wetland. California Black Rail (*Laterallus jamaicensis coturniculus*, state threatened) has been observed in these wetlands. The valley also contains critical foraging habitat for Swainson's Hawk (*Buteo swainsoni*, state threatened), and supports a tremendous diversity of wildlife. Placer Land Trust is working with key partners on plans for educational and recreational access to Clover Valley that align with the protection of its natural and cultural values. Learn more at placerlandtrust.org/clover-valley.

"Clover Valley Foundation applauds the amazing efforts by Placer Land Trust that resulted in recording a conservation easement that preserves approximately 402 acres of the valley floor—wetlands, creek, oak woodlands, wildlife habitat, and more. However, we are not done yet, as our mission is to save the entire 620 acres, which includes side slopes and scenic ridges." —Marilyn Jasper, Clover Valley Foundation

"California Oaks has been engaged in the effort to protect Clover Valley for decades. Many thanks to everyone who has endeavored on behalf of this beautiful and sacred site over many years. We share Clover Valley Foundation's vision of saving the entire valley." —Janet Cobb, Executive Officer, California Wildlife Foundation/ California Oaks

Proposed El Dorado County developments threaten oak ecosystems and community safety

By Cheryl Langley, Rural Communities United

As a retired environmental scientist and El Dorado County resident, I engaged in the public input process as El Dorado County developed its Oak Resources Management Plan and other oak measures. As an active participant in Rural Communities United (a member of California Oaks Coalition), my goal was to ensure oak woodland protection and recommend adequate mitigation measures for oak removal.

Rural Communities United teamed up with California Oaks to challenge the county in a costly legal battle after measures that threaten oak ecosystems were enacted. Unfortunately, the county continues to value development over the biological and cultural values of its unique oak ecosystems and disregards the risks associated with ecosystem destruction.

The oaks of El Dorado County, which support important botanical and wildlife communities, are under immense threat from development pressures and inadequate protections. The county is deliberating two specific plans—Marble Valley and Lime Rock—for building over 4,000 homes on land dominated by oak woodlands. The two projects are adjacent to each other and will impact nearly 3,000 acres on an important wildlife corridor in the Sierra Nevada foothills.

Marble Valley would develop up to 3,236 residential units in an area dominated by nearly 2,000 acres of blue oak woodlands. This would remove nearly 700 acres of oak woodland and multiple individual oaks at offsite areas, including heritage oaks with diameters at breast height of 36 inches or greater. Impacts would include Marble and Deer creeks, along with intermittent drainages and seasonal swales, and riparian woodland. Nine special-status wildlife species would be affected as well.

The Lime Rock project would build up to 800 residential units on 740 acres of oak woodlands, streams, and wetlands. It would remove

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82 of the site's 265 acres of oak woodland, plus multiple individual oaks, including heritage oaks. The draft environmental impact report states that the project would result in the potential mortality or disturbance of northwestern pond turtle (*Actinemys marmorata*, candidate federal threatened) and coast horned lizard.

For both projects, the environmental analyses state that the impacts to oak woodland would be significant without mitigation, but conclude that project mitigation strategies would reduce impacts to "less than significant." However, a portion of the oak woodland mitigation would require payment of an in-lieu fee, which would not restore what is lost or likely result in tangible compensation for the loss.

Furthermore, the projects are also in High and Very High Fire Hazard Severity Zones. Other counties, such as Los Angeles, are beginning to challenge home building where the risk of catastrophic fire and downslope or downstream flooding and landslides is high, potentially resulting in injury or death.

See the Resources article on page 3 for information on submitting comments on these or other projects.

Reflections on the degradation of the Sierra Nevada foothills

"I have lived within a quarter mile of my childhood home in El Dorado County for over 60 years. During that time, I have witnessed the collapse of insect populations and heard a changing chorus of birdsong in my backyard. Some birds are newcomers, while many I knew from childhood are absent.

"I have seen a vernal pool and wildflower meadow plowed under to make space for homes. I have witnessed the removal of an oak woodland once graced by flying squirrels. All of this makes me wonder why we do not have the wisdom to hold a space for that beautiful otherness that surrounds us—for our precious, often unseen fellow travelers, large and small—in our meadows, streams, and woodlands."

—Cheryl Langley, Rural Communities United

Saving El Dorado Ranch: From proposed subdivision to State Wildlife Area

Blue oak woodland on Logtown Ridge at El Dorado Ranch.
By Elena DeLacy, Executive Director, American River Conservancy

In the early 1990s, developer Peter McCuen proposed the subdivision and development of El Dorado Ranch in southwestern El Dorado County. While McCuen's vision never became a reality—in large part due to resistance from local residents—the property was held by real estate development interests until recently. In 2010 American River Conservancy, a member of California Oaks Coalition, approached the current landowner with the goal of preserving the property's blue oak woodlands and important wildlife corridors, and establishing the first State Wildlife Area (land managed by California Department of Fish and Wildlife for habitat protection and public access) in El Dorado County.

El Dorado Ranch is a priority because it is located between public lands and two large ranches permanently protected by conservation easements. Conserving El Dorado Ranch's extensive oak woodland and other wildlife habitat safeguards the quality of water flowing downstream to Sacramento, sustains working agricultural lands, provides vital habitat, and ensures the preservation of cultural resources. The region is the ancestral homeland of the Miwok people and significant to local Tribes.

Since 1989, American River Conservancy has been working to permanently protect and steward important habitat and river corridors in the upper American River and upper Cosumnes River watersheds, areas that are under a great deal of development pressure.

The conservancy has acquired and permanently protected 4,182 acres of the entire 7,179-acre ranch, thanks to generous funding support from California Natural Resources Agency, Wildlife Conservation Board, Sierra Nevada Conservancy, California Wildlife Foundation, El Dorado County's oak woodland protection fund, and hundreds of community members. This work has been accomplished over the past 13 years, bringing over $18 million in conservation investments to the region. The conservancy is now working toward protection of the remaining 2,997 acres through two final acquisitions. To support this project and learn more, visit www.arconservancy.org/eldoradoranch.

Acknowledgements

The Board of Directors supports the important conservation efforts of California Wildlife Foundation/California Oaks (CWF/CO). We extend our deepest gratitude to Ellen Maldonado, Chair; Jim Lightbody, Treasurer; and Lynn Barris, Secretary, for their time and dedication to California's environment.

Many thanks also to CWF/CO Advisor Janet L. Byron who provided editorial support and guidance in development of the newsletter, to CWF/CO intern Katherine Kerstetter for her editorial review of the articles, to Daniel Applebee of California Department of Fish and Wildlife for reviewing the article on oak ecosystems, to Dave Halsing of the South Bay Restoration Project for reviewing the article about Eden Landing, and to Cathryn Bangs, Stefani Berger, and Sonia Pang for assistance with mailing.

Back from the brink: Butterflies, (very cute) rats, and frogs in San Diego

A male Hermes copper basking in the sun
By Michael Beck, Executive Officer, Endangered Habitats Conservancy

San Diego County's rich biodiversity includes an insect, a mammal, and an amphibian on the brink of extinction. Committed recovery efforts are showing positive results, with the amphibian making a dramatic comeback from local extirpation.

Hermes copper (*Lycaena Hermes*) is a small, cryptic butterfly, recently listed as federally threatened, with an extremely limited range and population, narrow life cycle requirements, and high vulnerability to external factors. One-hundred years of historical data identified the species in only a handful of locations in San Diego County and the northern edge of Baja California, with over half of its historic range lost to development. Hermes butterflies feed almost exclusively on California buckwheat nectar and depend on a single host plant, spiny redberry, for reproduction. Females deposit a single egg the size of a grain of salt on the underside of a redberry leaf. The few remaining scattered redberry populations are vulnerable to wildfire and often locally extirpated.

Endangered Habitats Conservancy (ehleague.org/EndangeredHabitatsConservancy.html), a member of California Oaks Coalition and decades-long conservation partner of California Wildlife Foundation, identified the remaining Hermes locations and initiated a land acquisition strategy in 2014. Over 3,000 acres have subsequently been acquired to protect the small, scattered populations. To reverse the extinction trajectory, Hermes expert Daniel Marschalek, PhD, Associate Professor of Insect Ecology and Conservation, University of Central Missouri, translocated redberry branches containing eggs to historically occupied locations with limited—but nonetheless some—success. Recent surveys identified a previously unknown population, and in 2024, the first example of postfire reoccupation was found on one of the conservancy's Hermes preserves.

San Diego populations of the federally and state-threatened Stephen's kangaroo rat (*Dipodomys stephensi*) are declining and geographically and genetically isolated. An effort focused on enhancing the 4,000-acre Ramona Grasslands Preserve was initiated earlier this year for the diminutive (and rather cute) rats and other sensitive and listed species including Burrowing Owl (*Athene cunicularia hypugaea*, state candidate), vernal pool species, arroyo toad (*Anaxyrus californicus*, federally endangered), Western spadefoot (*Spea hammondii*, federal candidate, threatened), and American badger. The grasslands represent a key mid elevation landscape and a critical migratory stopover for raptors including Ferruginous Hawks, Merlin, and Sharp-shinned Hawks. Golden Eagles (*Aquila chrysaetos*, California fully protected) nest on the perimeter and forage on the grasslands. Bald Eagles (*Haliaeetus leucocephalus*, California fully protected and state threatened) are recent residents. The preserve is the result of over 20 years of land acquisitions.

Populations of Stephen's kangaroo rat are isolated, even within the Ramona Grasslands Preserve, primarily due to dense nonnative grasses and other invasive species. Surveys have identified potential rat movement corridors, which will be enhanced via management strategies including mowing, grazing, prescriptive fire treatments, and long-term monitoring. Stephen's kangaroo rat research specialists will guide the effort in partnership with the San Diego Management and Monitoring Program and the San Diego Natural History Museum.

A translocation effort is being initiated to address genetic isolation. Fortunately, Riverside County supports genetically diverse Stephen's kangaroo rat populations and strategies are being developed to translocate small communities of rats to the grasslands preserve, a strategy that has been successful at Marine Camp Pendleton in northern San Diego County.

Stephen's kangaroo rat with ear tag foraging at Camp Pendleton

Red-legged frog in Baja California Norte, México

The California red-legged frog (*Rana draytonii*), the largest native frog species in the western United States, was federally listed as threatened in 1996 and has been extirpated from San Diego County since the 1970s. Over 90% of its prime central California wetland habitat has been filled or developed.

In 2020, Robert Fisher, PhD, of the U.S. Geological Survey began repatriating parts of the frog's historic range at donor sites in northern Baja California and two receiving sites in southern California counties—Santa Rosa Plateau in Riverside and Mesa Grande in San Diego. The genetic structuring and ancestry of the frogs from Baja California and southern California were analyzed and found to be compatible even though located 260 miles apart. Egg masses were collected from the donor sites and introduced into restored and receiving ponds (free of nonnative bull frogs, a red-legged frog predator) in Mesa Grande, with refinement of translocation protocols over the next 2 years.

While survival of translocated red-legged frogs was limited in years one and two, survival rates began to increase over the subsequent two years and continue to expand dramatically. Seventy adults were identified at the San Diego site in 2024, and they are migrating into the adjacent landscape. Expanding the effort, U.S. Geological Survey and the conservancy will initiate a pond restoration on the Hermes butterfly acquisition site to accommodate translocation of red-legged frog and southwestern pond turtle (*Actinemys pallida*, candidate for state threatened).

These three imperiled species—Hermes copper butterfly, Stephen's kangaroo rat, and California red-legged frog—are responding to intensive interventions to counteract years of loss of habitat due to development.

"Clean" dirt for habitat and climate resilience

By Garrett Allen, Manager, Eden Landing Ecological Reserve

Eden Landing Ecological Reserve (wildlife.ca.gov/Lands/Places-to-Visit/Eden-Landing-ER) is a 6,400-acre mosaic landscape of former salt ponds, tidal marshes, and habitat managed for resident and migratory waterbirds and tidal marsh species, located on the east San Francisco Bay adjacent to Union City. Since June 2024, I have had the honor of serving as the ecological reserve manager at Eden Landing and the wildlife biologist responsible for wildlife and lands management in Alameda and Contra Costa counties for the California Department of Fish and Wildlife (CDFW)—a position that was formerly held by my supervisor, John Krause, for over two decades.

I quickly became enamored with the beauty of Eden Landing and the many bird species that call the area their home—or their stopover during spring and fall migration. When I first started learning about the area, John and I reviewed the site's history as a once vast system of tidal marshes, sloughs, and mudflats that bordered San Francisco Bay, which provided food and habitat for a wide variety of waterfowl, shorebirds, and other wildlife. Throughout the 1800s, the bulk of tidal marshland throughout the San Francisco Bay Area, including Eden Landing, was diked off from the bay to create pastureland. During the mid- to late 1800s, the area was transformed into ponds for salt production and harvesting, and was operated in this manner for over a century. Even today, the public can walk the Eden Landing trail from the parking lot to the old Oliver Saltworks boardwalk and see remnant wood pilings from long ago—an area that I affectionately call the "graveyard"—an homage to what once was and a reminder of how far we've come in restoring the area to its historical condition.

Old Oliver Saltworks, from the public trail at Eden Landing

North Creek Marsh, restored during Phase 1 of Eden Landing restoration

In the beginning, while I was able to understand how CDFW acquired the existing salt production ponds and water control infrastructure and began managing them for their habitat value, I struggled to comprehend how we were going to convert over 1,300 acres of salt ponds to tidal marsh, densely vegetated with pickleweed and Pacific cordgrass, and provide habitat for vulnerable species such as the salt marsh harvest mouse (*Reithrodontomys raviventris*) and the California Ridgway's Rail (*Rallus obsoletus obsoletus*), both of which are state and federally endangered.

John explained that by breaching the bayfront levee separating the managed ponds from the bay, we would restore full tidal action to the area, and over time the tides would deposit sediment in the pond bottoms, raising the marsh plain elevation until plants could naturally establish (due to seeds of salt-tolerant plants from nearby marshes being carried with the tides). But before we could even entertain the idea of breaching a levee safely, we needed to raise and improve inboard (landward) levees and create habitat transition zones to connect pond bottoms to the adjacent levees and uplands—and to do that, we would need a lot of dirt.

In November 2011, CDFW completed Phase 1 of tidal marsh restoration at Eden Landing—part of the larger South Bay Salt Ponds Restoration Project (southbayrestoration.org), which will eventually restore 15,100 acres of former industrial salt ponds into a rich mosaic of tidal wetlands and other habitats and build the area's resiliency to coastal flooding, which is increasing with climate change. Additional benefits of the restoration include enhanced carbon sequestration and water filtration. A collaboration involving CDFW, the California State Coastal Conservancy, and the U.S. Fish and Wildlife Service, the restoration project also engages nonprofit organizations such as Ducks Unlimited and the California Wildlife Foundation. The foundation plays a vital role as a nonprofit partner, working with dirt brokers—construction and/or trucking companies that provide "clean" fill material from nearby excavation projects at no cost to the restoration project. In the case of Eden Landing, California Wildlife Foundation collaborates with Graniterock (a company that provides construction-related materials) to find, test, get approval for, and deliver the clean dirt.

Starting fall 2026 or spring 2027, CDFW will begin Phase 2 of restoration at Eden Landing. We will need approximately 550,000 cubic yards of dirt to raise and improve levees and create habitat transition zones. To put that volume of dirt into perspective, it's equivalent to filling an entire football field (including endzones) with dirt to a depth of about 10 yards.

Once the dirt work is complete in 3 to 5 years, we will be able to breach the bayfront levee and restore full tidal flows at Pond E2, which will slowly begin transforming the 1,300-acre area into a lush, vegetated tidal marsh that will provide habitat for threatened and endangered species, and benefit neighboring communities for generations to come.

You can have it all with a living oak fuel break

Planted in fall 2023 at Santa Barbara Botanic Garden, this young oak fuel break is providing valuable data for future fire safety efforts across California.

By Denise Knapp, PhD, Director of Conservation and Research, Santa Barbara Botanic Garden (former), President, Live Oaks Plants and Landscapes (current)

Oak trees provide food, shelter, and habitat for a diverse array of native plants and animals in California, including over half of the state's native terrestrial vertebrates. The icing on that cake is that oaks may also help to protect our built spaces from wildfire, an idea both scientists and firefighters have been communicating for decades. In 1962, scientist Phillip Wells noted that coast live oaks create a mesic environment that reduces wind speeds and temperatures, and suggested planting them around residential areas and roadsides to guard against fire. But hard data supporting the use of oaks as a living fuel break are lacking—and so are public demonstrations of this concept.

To meet both of these needs, Santa Barbara Botanic Garden (sbbotanicgarden.org), a member of California Oaks Coalition, installed 216 young coast live oaks in fall 2023 as part of a comprehensive Regional Wildfire Mitigation Program (rwmpsantabarbara.org) in partnership with the nonprofit SIG-NAL (until recently, I served as the garden's Director of Conservation and Research). We planted them in three patches among remnant mature oak trees to eventually form a continuous oak woodland. We also installed two weather stations: one under the canopy of a large, mature oak and the other in an open area near the recently planted oak seedlings. This design allowed us to test whether oaks can mitigate fire weather variables—via both near- and long-term comparisons—as our young oaks get larger and the data presumably converge.

With data collected every 15 minutes, a lot of information can be inspected from different angles. By comparing averages in the data, the first year yielded some interesting results. Not surprisingly, average temperatures and wind gust speeds in summer are significantly lower under the mature oak canopy. However, we also discovered that under the oak canopy (as opposed to out in the open), average humidity was lower in summer and higher in winter. Perhaps the canopy is capturing and retaining moisture from rainfall in winter, but blocking the lighter fog drip in summer.

Another piece of the flammability puzzle is live fuel moisture. As part of the Regional Wildfire Mitigation Program, we added coast live oaks to a repertoire of live fuel moisture monitoring we have been conducting since 2013 of two chaparral taxa, helping regional agencies to assess fire risk. The data show that between January and October 2023, moisture levels dropped for all three species but stayed 20 to 25% greater for oaks (average 60% for chamise, 65% for bigpod ceanothus, and 85% for coast live oak).

So far, the bulk of our data supports what Wells suspected all along—that oaks can act as a living fuel break. Of course, some maintenance is necessary, including trimming low branches and those that overhang your home, and removing dead fuels. But it's a small price to pay for having the best of all worlds—safety, beauty, and the many benefits of biological diversity.

How you can help:

- Donate to California Wildlife Foundation/California Oaks. A secure donation can be made from our website: californiaoaks.org
- Spend time in an oak woodland or forest. Click on californiaoaks.org/resources for a partial listing of oak landscapes around the state that have public access.
- Consider including oak conservation in your financial and estate planning efforts. Information can be found at: californiaoaks.org/donate
- Be vigilant about threats to oak woodlands and oak-forested lands in your community and consult californiaoaks.org for guidance.
- Send in comment letters on projects that will harm oak ecosystems and consult the Resources column on page 3 for tips on preparing a letter.
- Restore oaks to areas where they historically grew.
- Sign up for the *Oaks* e-newsletter at californiaoaks.org
- Support local and statewide measures to protect natural resources.
- Hold decision-makers accountable for protecting green infrastructure.
- Learn about and support Indigenous stewardship of oak ecosystems.

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