

Oaks

FALL/WINTER 2023

CALIFORNIA OAKS

In Napa vineyard battle, oak trees win

by Tiffany Yap, DEnv/PhD, Senior Scientist, Center for Biological Diversity

It is not easy to wage a fight against vineyards in wine country. But with the climate and biodiversity crises worsening and wildfires growing more destructive, the future of Napa County is worth the fight.

A coalition of neighbors, environmentalists, and scientists who opposed a plan to destroy 14,000 mature oak trees for a vineyard conversion project had always known the fight would be long and difficult. From the time county supervisors first approved the project known as Walt Ranch in 2016, through a Court of Appeal ruling (<https://biologicaldiversity.org/w/news/press-releases/california-court-upholds-challenge-control-versial-walt-ranch-vineyard-2019-10-01>) rejecting the project and the county reapproving the project in 2021, it was a roller-coaster ride marked by victories and setbacks.

Few could have predicted the final outcome. In May the Land Trust of Napa County completed the purchase of the 2,300-acre ranch. The riparian, oak, shrubland, and grassland habitat will be permanently protected as a nature preserve with public hiking trails.

The Walt Ranch developers picked the habitat of the federally threatened California red-legged frog (*Rana draytonii*) and federally endangered Contra Costa goldfields (*Lashenia conjugens*) to build their winery. The project would have emitted an estimated 106,000 metric tons of greenhouse gases, mostly due to the destruction of 14,000 carbon-sequestering trees—a figure that did



© Photo courtesy of Joseph (Joe) Clark, Land Trust of Napa County

Land Trust of Napa County staff hike on a fire road at Walt Ranch.

not include carbon lost from other habitat types that would have also been bulldozed. Development of this biologically diverse hotspot also would have destroyed an important wildlife corridor.

Thankfully, the California Environmental Quality Act, the state's bedrock environmental law, requires the county to have a mitigation plan to offset the environmental harms of such a massive, destructive project. Unfortunately, Napa County supervisors approved inadequate mitigation plans each time they deliberated.

In 2021, the developers proposed planting seedlings to replace mature trees that sequester carbon in their massive trunks, branches, roots, and soils—an immediate carbon loss with unknown future carbon gains. Their analysis did not consider whether seedling sites would be suitable for new trees and offered no guaranteed funding to ensure they would thrive.

That is why the Center for Biological Diversity, a member of California Oaks Coalition, challenged this project a second time in 2021 (<https://biologicaldiversity.org/w/news/press-releases/appeal-challenges-weak-climate-plan-for-harmful-napa-vineyard-project-2021-10-25>). Among the measures scientists and attorneys with the Center for Biological Diversity pushed for was a plan to prioritize preserving habitats vulnerable to development. If seedlings were to be part of a mitigation program, they should be planted in ecologically appropriate locations with adequate funding for long-term monitoring and management to ensure their survival.

Supervisors approved the project again in 2022, this time without an ill-conceived tree-planting program, but still allowing thousands of mature oaks and hundreds of acres of pristine habitat to be destroyed.

But before any grapes were planted, the
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Sustaining California's imperiled oaks requires preservation, restoration, rigorous research, and collaboration



© Ellen Maldonado, Chair, California Wildlife Foundation/California Oaks Board of Directors

"If we are to truly understand the full ecological importance of oak trees, we must recognize their contributions to the food web of oak woodlands and nature as a whole ... A single oak tree can be a jungle of entangled relationships of species, so complex that the individual strands often defy discovery and understanding.

A single tree when lost to a fire or bulldozer can impact hundreds of species."

— Ron Russo, author of *Plant Galls of the Western United States*

Blue oaks in Paso Robles, San Luis Obispo County

Oaks, as Ron Russo observes, are vital to sustaining biodiversity. To that end, the conservation solution reached for Walt Ranch is welcome news from a county that is rapidly converting its oak ecosystems. Praise goes to the Center for Biological Diversity and Land Trust of Napa County for their respective roles in perpetuating the ecological values of the property.

California Wildlife Foundation is pleased to partner with Carrizo Plain Conservancy to expand the Carrizo Plain National Monument to the east to include a greater swath of the Temblor Range, a mountain ecosystem that includes groves of Tucker oaks and other unique habitats. We encourage our conservation and Tribal partners to reach out to Carrizo Plain Conservancy to join this important initiative. Information is in the article on page 6.

We need to pick up the pace of oak protection and restoration as climate stressors worsen conditions. Efforts by the Resource Conservation District (RCD) of the Santa Monica Mountains, described in the article on page 5, point to the importance of research and best management practices to guide oak restoration. A study by Morgan and Dagit is an important addition to the literature about oak propagation. The RCD's important work also highlights the role of restoration in protecting the natural environment. Coast live oaks are resilient to many climate stressors, but monitoring data from 41 tree plots throughout the Santa Monica Mountains National Recreation Area pointed to the intersecting impacts of drought, extreme heat, and beetle infestations in a widespread tree die-off that began in 2015. These conditions were also tied to fires, including the 2019 Woolsey Fire, which impacted over 96,000 acres of the recreation area, including many oak woodlands.¹

If we wish to leave a world that is habitable to future generations, we must shift our focus to the ecosystem level, valuing and protecting the natural environment, including oaks, California's primary old-growth resource.

Sincerely,

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

¹ Morgan, A, and R Dagit. 2023 (in preparation). *Assessing Coast Live Oak Restoration Effort Success in the Santa Monica Mountains, Topanga State Park; a Comprehensive Analysis*. RCD of the Santa Monica Mountains, Topanga, CA.

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.

- Amah Mutsun Land Trust
- American River Conservancy
- American River Watershed Institute
- AquAlliance
- Banning Ranch Conservancy
- Butte Environmental Council
- California Institute for Biodiversity (CIB)
- California Invasive Plant Council (Cal-IPC)
- California Native Plant Society (CNPS), including Dorothy King Young Chapter, San Diego Restoration Committee, Sanhedrin Chapter, and Yerba Buena Chapter
- 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
- Chimeneas Ranch Foundation
- Clover Valley Foundation
- Conejo Oak Tree Advocates
- Confluence West
- Dumbarton Oaks Park Conservancy
- Earth Discovery Institute
- El Cerrito Trail Trekkers
- Elder Creek Oak Sanctuary
- Endangered Habitats Conservancy
- Endangered Habitats League
- Environmental Defense Center
- Environmental Protection Information Center (EPIC)
- Environmental Water Caucus
- Foothill Conservancy
- Forests Forever
- Friends of Harbors, Beaches and Parks
- Friends of Olompali
- Friends of the Richmond Hills
- Friends of Spenceville
- Global Conservation Consortium for Oak (GCCO)
- Hills For Everyone
- Laguna de Santa Rosa Foundation
- LandPaths
- Lomakatsi Restoration Project

Restoring and valuing oaks in Portugal

Loma Prieta Resource Conservation District
Los Padres ForestWatch
Lower Kings River Association
Mountains Recreation and Conservation Authority
Northern California Regional Land Trust
Ojai Trees
Placer Land Trust
Planning and Conservation League
Point Blue Conservation Science
Redbud Audubon Society–Lake County
Redlands Conservancy
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
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 (Vila Real, Portugal)
University of California, Los Angeles, Mildred E. Mathias Botanical Garden
Ventura Land Trust
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 local, regional, and state 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.



© João P. F. Carvalho

Oaks build an ecosystem of great value that supports biodiversity, watershed protection, and climate change mitigation. We are working to save and promote this threatened and often neglected Portuguese ecosystem and its associated life forms.

by Professor João P. F. Carvalho, University Trás-os-Montes Alto Douro (UTAD), Department of Forest Sciences and Landscape Architecture, Centre for the Research and Technology of Agro-Environmental and Biological Sciences, and Fulbright Scholar

Oaks are an important yet imperiled part of Portugal's natural forest landscape. They provide multiple goods and services, with broad ecological, economic, and social benefits. The main species in Portugal are the deciduous common oak (*Quercus robur* L.), Pyrenean oak (*Quercus pyrenaica* Willd.), and Portuguese oak (*Quercus faginea* Lam.), as well as the evergreen cork oak (*Quercus suber* L.) and holm oak (*Quercus ilex* L.).

Oaks provide important ecological functions related to the hydrologic cycle, carbon sequestration and storage, climate regulation, and soil conservation, and they play a vital role in combating desertification. They also provide habitat for many forms of life that depend on them. Oaks are less prone to wildfires compared to species with a high content of resins and volatile oils. They create favorable conditions for reducing fire spread and lowering fire intensity, thereby increasing ecological resilience.

Oaks provide goods and services of high-value to society and the environment, such as wood and nonwood products, habitat for wildlife, water retention, and water-quality protection. They contribute to the economy of rural areas and to the country as a whole, providing aesthetic spaces that promote societal well-being, recreation, and tourism.

Despite their importance, oaks face several threats and challenges, having been reduced to 2.5% of the forest land of the country—a reflection that Portugal's current forest composition is unbalanced. In the country's north and center, two widely introduced plantation species (eucalyptus and pine) account for 74% of the forested area, creating several issues. In the south, where the climate is drier, cork and holm oak are in decline, mostly due to overgrazing and other

harmful land use practices, which include thinning, soil depletion, and oak replacement. In many cases, oaks have disappeared or are excessively fragmented, which increases their vulnerability to disturbances and poor forest management practices. These impacts also harm wildlife communities, foster pathogens, and ultimately lead to dead oak trees. More than 100,000 cork oaks were killed in 2022 by drought, climate stressors, and ecosystem degradation.

Since the early 1990s, several studies and programs have been undertaken by UTAD in collaboration with partners to promote understanding of oak forest characteristics and appropriate uses. We have carried out trainings for landowners and managers, foresters, politicians, and the general public to raise awareness.

More recently, Project Bosques (<http://www.projectbosques.ars-id.org/>), now also linked to the California Oaks Coalition, has conducted research and activities focused on valuing the ecosystem and adopting nature-based practices for sustainability. We are also part of the Scapefire Project (<https://www.isa.ulisboa.pt/proj/scapefire/en>), an innovative landscape planning model where oaks play an important role in the prevention of forest fires.

Presently only the country's evergreen oaks are legally protected, but an effort is underway to extend this protection to deciduous white oaks.

Appropriate conservation, management, and oak protection measures are essential to ensure the preservation and integrity of Portugal's oaks, and thereby sustain the well-being of human communities and social and economic development.

To learn more contact Professor Carvalho at jpfc@utad.pt.

Engaging communities in oak conservation

© Ida Keller-Vincent



Oak workshop participants practice their identification skills at Crestridge Ecological Reserve by Lyla Schoenig, Conservation Technician, Earth Discovery Institute

As California's southernmost county, San Diego is known for its diverse landscapes and high levels of biodiversity, which include ten oak species, two varieties, and three named hybrids. Land development, agricultural expansion, disease, and increased wildfire frequency have resulted in oak habitat loss, fragmentation, and degradation, impacting many native species that depend on the county's oak woodlands.

Earth Discovery Institute (EDI; <https://earthdiscovery.org>), a member of California Oaks Coalition, restored oak woodlands at El Monte Ecological Preserve and engaged communities in citizen science through the Oaks of San Diego collaboration with California Oaks. El Monte is a 142-acre parcel of protected land in eastern San Diego County that is part of the Multiple Species Conservation Plan (conservation plan), a framework for land acquisition and restoration with the goal of providing large, connected preserves to protect and recover imperiled species.

Over the course of three weeks and with the help of 12 volunteers, EDI planted 188 coast live oak (*Quercus agrifolia*) trees at El Monte. Over time these oaks will replace nonnative eucalyptus trees on the property, benefiting tricolored blackbird (*Agelaius tricolor*), a California threatened species, as well as numerous bird, bat, and butterfly species. The oaks border

a 15-acre cactus scrub restoration site, which provides habitat for at-risk species.

As part of the Oaks of San Diego collaboration, EDI also hosted two workshops at Crestridge Ecological Reserve, which were generously funded by San Diego Foundation. Crestridge, located 3.5 miles south of El Monte and also a biological core of the conservation plan, is home to three oak species: coast live oak, Nuttall's scrub oak (*Quercus dumosa* Nutt.), and Engelmann oak (*Q. englemannii*). The latter two are evaluated as endangered in *The Red List of Oaks 2020* (<https://usercontent.one/wp/www.globalconservationconsortia.org/wp-content/uploads/2021/08/RedListOaks2020.pdf>).

The workshops, which also advanced the Oaks of the Californias effort to recover six imperiled species (<http://www.globalconservationconsortia.org/2022/08/16/oaks-of-the-californias-conservation-planning-2>), focused on the importance of oaks, the threats they face, and how we can help by participating in community science to map oak populations. The mapping utilizes an OakWatch identification tool on the iNaturalist platform developed by Oaks of the Californias. Participants from diverse communities across San Diego were taught how to contribute to OakWatch to broaden understanding of the distribution of oak species, including imperiled species. They

RESOURCES

California's Forests and Rangelands Strategy Report: 2020 Update Click on the *California Forest Action Plan* link at <https://www.fire.ca.gov/Home/What-We-Do/Fire-Resource-Assessment-Program/Assessment> to download a zip folder, which includes the strategy report.

California Oak Disease and Arthropod Database (CODA), a comprehensive compilation of the many agents that affect oaks in California: <http://coda.phytosphere.com>; the interactions link provides a means to find an agent by symptoms.

California Oak Planting Guide, a publication by Point Blue Conservation Science, a member of California Oaks Coalition, is available to download at: <https://www.pointblue.org/wp-content/uploads/2023/06/Planting-Oaks-Guide-Version-1.pdf>

Data sharing for conservation: A standardized checklist of US native tree species and threat assessments to prioritize and coordinate action, authored by Carrero, C, et al. 2023. *Plants, People, Planet*, 5(4):600–616. <https://doi.org/10.1002/ppp3.10305>

Klamath Siskiyou Oak Network Oak Restoration Planning Web Map shows oak distribution and other data useful for oak restoration planning in the network's areas in Southern Oregon and Northern California: <https://klamathbird.org/partnerships/kson/resource-links/kson-oak-restoration-planning-web-map/>

Smithsonian Museum of Natural History's Online California Geological Survey Collections from 1870-1874 are available to view at: <https://collections.nmnh.si.edu/search/botany/?q=ex+Geological%20Survey%20of%20California> (Read about the California Geological Survey at: <https://naturalhistory.si.edu/research/botany/about/historical-expeditions/california-geological-survey/>)

honed their oak identification skills and became familiar with the iNaturalist application by mapping oaks throughout the reserve. All participants communicated that they had a better understanding of oak woodlands, 97 percent said they would continue to use iNaturalist, and 68 percent indicated they were likely to continue their participation in OakWatch.

Collaborative efforts are necessary to address the challenges to San Diego County's oak woodlands and ensure their long-term health and vitality. Building awareness and knowledge of the value of oaks, the threats they face, and ways individuals can advance oak conservation is essential for these unique ecosystems.

Lessons in coast live oak restoration from Trippet Ranch

© RCDSMM Stream Team



Volunteers used water in buckets to help establish oak seedlings at Trippet Ranch.

by Alyssa Morgan, Biologist, and Rosi Dagit, Senior Conservation Biologist, Resource Conservation District of the Santa Monica Mountains

Coast live oak is a keystone species, supporting thousands of insect, amphibian, reptile, bird, and mammal species.¹ Tragically, drought, extreme heat, invasive insects, and disease have caused devastating oak woodland die-off throughout the Santa Monica Mountains over the past decade. Restoration of these profoundly important native trees is crucial for ecosystem preservation. However, restoration efforts are costly and often have high mortality rates for a variety of reasons.^{2,3}

The Resource Conservation District of the Santa Monica Mountains (RCDSMM, rcdsmm.org), a member of California Oaks Coalition, developed a volunteer-based restoration program to maximize tree survival at a relatively low cost. Begun in 2019, 368 coast live oaks were planted, tagged, mapped, and placed in wire cages to protect the roots and shoots at Trippet Ranch in Topanga State Park. Continued care of planted oaks involved watering at five gallons per tree twice monthly during the hot/dry season to maintain oak saplings until established. Due to the wildland setting, this required setting up over 2,000 feet of hose to reach planting sites and lots of volunteers carrying buckets.

Over the course of this three-year restoration program, 235 oaks were successfully established, demonstrating a relatively high survival rate of 64%. This exceeded the target of 200 established oaks and provided exciting and valuable insights on best management practices.

Continued maintenance was key to this observed survival rate, with a mean of 12.3 volunteer hours required for each surviving oak tree. Planting locality was one of the most important factors for oak survival—those closest to mature oaks and not overrun by wild rye did best. At the same time, bad locations do not get better: replanting where a seedling had died resulted in a 29% higher likelihood of the replacement oak seedling dying. Weed management and mulching helped reduce competition from invasive annuals.

Rainfall during establishment was also a critical factor supporting oak growth, with a single year of significant rainfall sufficient for oak establishment, but even those trees benefited from additional watering over a three-year establishment period. Interestingly, planting an acorn or seedling was relatively unimportant, with both surviving equally well.

Our findings provide insights to maximize oak survival and mitigate effort and cost for future oak restoration. The benefits of supporting the growth of native trees in the face of climate change are real. Native trees provide significant ecosystem services, especially carbon sequestration and wildlife habitat.⁴ Perhaps most important was the sense of hope that infused our volunteers. Taking action to restore an oak woodland provided hundreds of volunteers a chance to make a difference. It lowered costs to provide a high level of care that supported greater levels of establishment.

Source: This article is based on: Morgan, A, and R Dagit. 2023 (in preparation). *Assessing Coast Live Oak Restoration Effort Success in the Santa Monica Mountains, Topanga State Park; a Comprehensive Analysis*. RCDSMM, Topanga, CA.

Key steps for establishing oaks:

- Check drainage and soil before committing to plant, which can mean digging extra holes.
- Stay close to a nearby mother tree.
- Cage above- and belowground to prevent herbivory.
- Mulch is magic.
- Add water!

¹ Pavlick, BM, et al. 1991. *Oaks of California*. California Oak Foundation and Cachuma Press. Santa Barbara, CA.

² Callaway, RM, et al. 1999. Facilitation in plant communities. In Pugnaire, FI, et al., eds. *Handbook of Functional Plant Ecology*. Marcel Dekker, NY. p. 623–48.

³ Brown, LB, et al. 2009. Forest stand dynamics and sudden oak death: Mortality in mixed-evergreen forests dominated by coast live oak. *Forest Ecology and Management* 257(4):1271–80.

⁴ Von Holle, B, et al. 2020. Restoration at the landscape scale as a means of mitigation and adaptation to climate change. *Current Landscape Ecology Reports* 5:85–97.

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Land Trust of Napa County negotiated a deal (<https://biologicaldiversity.org/w/news/press-releases/critical-habitat-in-california-wine-country-slated-for-conservation-2023-01-05>) to buy the property for \$18 million. The purchase was finalized in May 2023 following the land trust's successful fundraising effort, which included a \$7 million grant from the California Wildlife Conservation Board.

Not all challenges end with a conservation success like this one. California forests, shrublands, grasslands, deserts, and other native habitats are vulnerable to encroaching development and threatened by climate change.

Success stories like Walt Ranch show us there are good alternatives, such as smarter land-use planning, science-backed mitigation measures, and better conservation strategies. It is our responsibility to remind decision-makers that environmental degradation is not the only option.



Joseph (JoeJoe) Clark, Land Trust of Napa County, holding a blue oak leaf.

© Photo courtesy of Joseph (JoeJoe) Clark, Land Trust of Napa County

In Memoriam: Vivian Lynn Parker

© Photo courtesy of Craig Thomas



Vivian Lynn Parker

Vivian Lynn Parker passed away on January 9, 2023, after a long, difficult journey with cancer. A contributor to *Oaks*, Parker was active in the field of native plant conservation for much of her career. She worked as a botanist for the U.S. Forest Service, National Park Service, and California Indian Basketweavers' Association, and was active with California Native Plant Society since the early 1980s. She shared a love for oak woodlands and fostered oak habitat at her home with her beloved husband, Craig Thomas, in the Sierra foothills.

Her work with the California Indian Basketweavers' Association included the restoration of beneficial fire to promote the regeneration of bear grass (*Xeropyllum tenax*) for basketry. Over the past five years she and Thomas created the Fire Restoration Group to expand beneficial fire in California, including in oak woodland habitat and work with the Native American Cultural Fire community.

Parker was an articulate advocate for old growth forests and restoration of biodiversity after fire. She understood the links between uniform plantation forestry and increasing levels of stand-replacing fire. Her passing places a greater load on all of us who are working to keep oaks standing, but her vision, advocacy, and tenacity provide inspiration and a path forward.

Conservation organizations seek expansion of Carrizo Plain National Monument

by Neil Havlik, PhD, President, Carrizo Plain Conservancy

Carrizo Plain National Monument, in eastern San Luis Obispo and western Kern counties, occupies approximately 205,000 acres containing most of the Carrizo Plain, nearly all of the Caliente Range to the west and southwest, and portions of the Temblor Range to the east. Carrizo Plain Conservancy (carrizoplainconservancy.org), a member of California Oaks Coalition, and partners are working to expand the monument to include more of the Temblor Range.

The plain has been called “America’s Serengeti” for its extensive grassland habitats, which support populations of tule elk, pronghorn, and many smaller wildlife species, several of which are federally listed as endangered or threatened. The monument was established to protect these habitats and the species diversity they support.

Adjacent mountains contain additional grassland, shrub habitats, stands of drought-tolerant oak species, and extensive stands of California juniper. One of these shrub habitats, and one of the rarest vegetation types in California, is known by the interesting name of Upper Sonoran Sub-Shrub Scrub (USSSS). It is largely restricted to the Temblor and nearby San Emigdio ranges.

When the monument was established in 2001, the boundary was drawn along the ridgeline of the Temblor Range, placing the western side in the monument and leaving out the eastern side, which is home to the richest and healthiest portions of USSSS and associat-

ed wildlife habitat. The Temblor Range extends in a northwest-southeast direction, creating numerous moist and cool north- and east-facing slopes on its eastern side. So, although the monument’s boundary included the hydrographic Carrizo Plain, it did not include the ecological boundary, which extends over the ridgetop and down into those more mesic canyons and slopes.

Because of this, the relatively undisturbed condition of these areas, and their known and potential cultural and archeological values, a group of conservation and Tribal organizations is seeking to add about 16,000 acres of grassland, USSSS, Tucker oak, and California juniper habitat to the monument. The proposed expansion would add significantly to the protection of important habitat types; and provide additional opportunity for wildlife habitat enhancement, as the ridge and east-facing slopes of the Temblor Range are higher in elevation, receive more rainfall, and are cooler than areas farther to the west. It would also provide greater protection for cultural artifacts in the expansion area.

The proposal would not change any existing rights within the expansion area. At least 98% of the land involved is currently in federal ownership. Moderate levels of livestock grazing would be expected to continue in the area, as is the case within the monument today.

Finally, the expansion would contribute to national and state efforts to reach 30x30

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© Neil Havlik

An attractive grove of Tucker oaks and California junipers in Crocker Canyon on the east side of the Temblor Range dramatically shows the importance of aspect in this arid environment.

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goals—to conserve 30% Earth’s land and water by 2030—by protecting an area of long-unrecognized habitat diversity and richness.

Organizations supporting Carrizo Plain monument expansion: California Native Plant Society (including Kern and San Luis Obispo chapters), California Wildlife Foundation, Carrizo Plain Conservancy, Conservation Lands Foundation, Endangered Habitats Conservancy, Los Padres ForestWatch, North County Watch (San Luis Obispo County), Northern Chumash Tribal Council, Resources Legacy Fund, Sierra Club (Santa Lucia and Bakersfield chapters), Western Conservation Foundation, and The Wildlife Society (San Joaquin Valley and San Luis Obispo chapters).

Other conservation and Tribal organizations are encouraged to join this effort. Please contact Carrizo Plain Conservancy: conservecarrizo@gmail.com.

California hardwood biomass map

by Tom Gaman, Registered Professional Forester and Angela Moskow, California Oaks

Keeping trees standing is essential for California to reach its climate goals. Researchers who authored an article published in *Nature Climate Change* observed: “Global carbon dioxide (CO²) emissions from land-use change (primarily deforestation) represented around 12% of global emissions for 2007 to 2016, while the terrestrial carbon sink stored around 28% of emissions over the same time period.”¹

To better understand carbon stored in oak ecosystems, the *Oaks* authors estimated CO² equivalents for hardwoods utilizing spatial imputations created by LEMMA (Landscape Ecology, Modeling, Mapping, and Analysis; lemma.forestry.oregonstate.edu).

(See the map below.) LEMMA is a collaborative research group of the U.S. Forest Service Pacific Northwest Research Station and Oregon State University. LEMMA staff model forest structure and composition using Landsat imagery (landsat.gsfc.nasa.gov) and other environmental variables in combination with the U.S. Forest Service Forest Inventory and Analysis (FIA) (www.fs.usda.gov/srsfia/data_center/index.shtml) ground-based vegetation survey plot data, to create Gradient Nearest Neighbor (GNN) structure maps.

LEMMA uses the GNN method to develop predictive vegetation maps covering all forest and woodland areas of Oregon, Washington, and California at 30-meter (0.22-acre) pixel resolution. LEMMA provided its first comprehensive statewide map and dataset using Landsat imagery and FIA ground plots available through 2012, and recently provided updated analyses using data that extend through 2017. Both analyses provide high-resolution, predictive vegetation maps with supporting attribute tables.

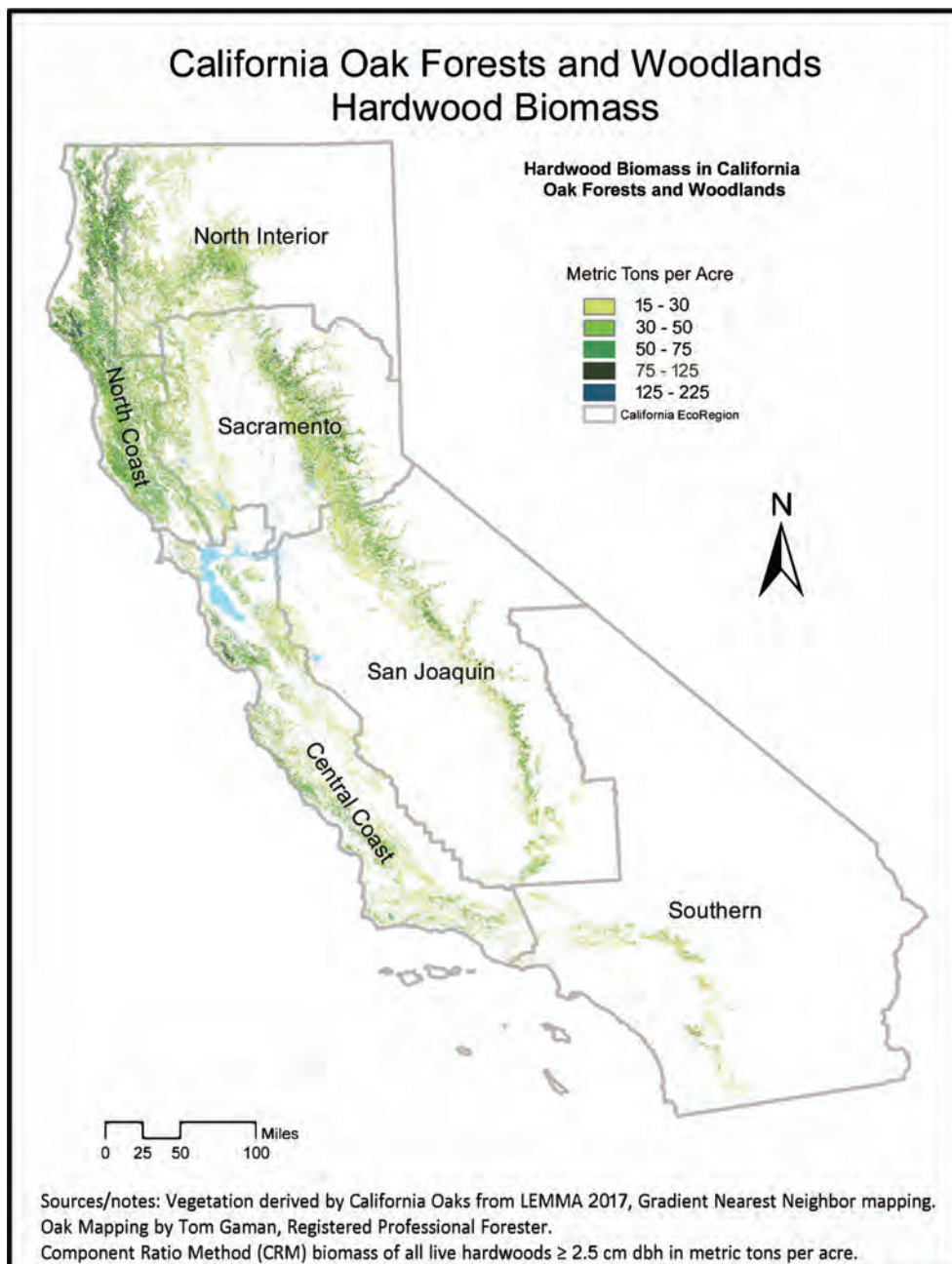
LEMMA compiled overall biomass per hectare in aggregate for all trees and separately for hardwoods and conifers. Biomass is readily converted to carbon and then to CO² equivalents. Compiling the hardwood component of California forest and woodlands yields 903.6 million metric tons of above-ground carbon dioxide equivalents on 18.9 million acres (7.65 million hectares) of oak forest and woodland as of 2017.

The 18.9 million acres map the most abundant oak species by plurality (eight *Quercus* species and tan oak [*Notholithocarpus densiflorus*]) where they are present with a minimum basal area of 10 square feet per acre.²

California ecosystems vary dramatically, thus there is a great deal of variability, ranging from 1 to 223 metric tons of hardwood biomass per acre.

¹ Seddon N, et al., 2019. Grounding nature-based climate solutions in sound biodiversity science, *Nature Climate Change*, Vol. 9.

² GNN imputes to each pixel the dominant hardwood and dominant conifer species, and the overall dominating species. The authors characterized oak woodlands as vegetation types where an oak species was determined to be the dominant species. Where the overall dominating (plurality) species is a conifer and the plurality hardwood is an oak, such types are classified as oak forests.



A personal remembrance of Jane Hagedorn and California Oaks

© Grant Werschull, Co-Executive Director, Smith River Alliance, a member of California Oaks Coalition



Blue oaks were Jane Hagedorn's favorites. Photo taken at Murphy Creek Institute in Clements, California. by Janet Cobb, Executive Officer, California Wildlife Foundation/California Oaks

Jane Hagedorn was a focused, purposeful, energetic force for good during her time from 1943 to 2023.

Hagedorn, along with Charles Warren, co-founded California Oak Foundation in 1988. The three of us served on the Planning and Conservation League's Board of Directors when Jerry Meral was executive director. It was a time of action on behalf of California's heritage lands and biodiversity, clean air, and water. Under Meral's leadership, the Planning and Conservation League helped to pass many statewide initiatives that funded additions to state parks and open spaces, wildlife measures, and other greater-good issues such as the tobacco tax and rail bond, totaling \$16 billion worth of investments by California voters.

After handing off California Oaks to me, Hagedorn became executive director of the American Lung Association's Sacramento

chapter and Warren became executive officer of the California State Lands Commission. They never stopped caring about the importance of the oak ecosystem as green infrastructure for our state.

When Jane and I met for the last time, we talked of successes and defeats, opportunities, challenges, and priorities. We agreed that all of the work we have been fortunate enough to do has been with the hope that our grandchildren and great grandchildren—and all children—will have a healthy world to sustain them.

Jane Hagedorn's impact will continue through California Oaks and the other organizations that she rallied people around. Just as California's native oaks are foundation species with an outsize role in supporting the ecosystem, her legacy will continue to enhance many human and natural commu-

Acknowledgements

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

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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.
- Please 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.
- 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.

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Latin names are used for species with designated state or federal conservation status. They are also used by some of the newsletter authors for oak species.

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