

# California's 30x30 Initiative in 2025: A Biodiversity Assessment of the State's 30x30 Conservation Areas

California Biodiversity Network

August 5, 2026



Portions of this report have been added and/or adapted from “30x30 at Its Midpoint” by Jeanette Howard, Carrie Schloss, Rachael Olliff Yang, Alicia Canales, Charlotte K. Stanley, Megan Webb, David Ackerly, Carl Boettiger, Cassie Buhler, Steven Monfort, Gary Bucciarelli, Rachel Meyer, Ariel Levi Simons, Jun Bando, Liz Chamberlin, Sam Veloz, Cole Dickison, Avery Hill, Rebecca Johnson, Ryan Hill, Amanda Kochanek, Dan Rademacher, Lisa Micheli, Kristeen Penrod, Giovanni Rapacciuolo, Nathaniel Roth, Dena Spatz, and Daniel Gluesenkamp, published in the California Native Plant Society journal *Artemisia* (Volume 51, issue 2; February 2026).

This assessment was prepared by Carrie Schloss (The Nature Conservancy), Jeanette Howard, and Rachael Olliff Yang (California Biodiversity Network), Nathaniel Roth (California Department of Conservation), Cole Dickison (California Natural Resources Agency), Alicia Canales, Charlotte K. Stanley, and Megan Webb (The Nature Conservancy), David Ackerly, Carl Boettiger, Cassie Buhler (University of California, Berkeley), Steven Monfort (UC Natural Reserve System), Gary Bucciarelli (University of California, Davis), Rachel Meyer and Ariel Levi Simons (University of California, Santa Cruz), Jun Bando (California Native Plant Society), Liz Chamberlin and Sam Veloz (Point Blue Conservation Science), Avery Hill and Rebecca Johnson (California Academy of Sciences), Ryan Hill (California Department of Fish and Wildlife), Amanda Kochanek and Dan Rademacher (GreenInfo Network, Lisa Micheli (Wildlands Network), Kristeen Penrod (South Coast Wildlands), Giovanni Rapacciuolo (Elimia), Dena Spatz (California State Parks), and Daniel Gluesenkamp (California Institute for Biodiversity).

## Acknowledgments

Thank you to California Native Plant Society and Michael Kauffman for edits on, and permission to include and/or adapt content from “California’s 30 x 30 Initiative at its Midpoint: A Biodiversity Assessment Snapshot of the State’s Conservation Areas” (Howard et al., 2026) into this annual update for the Biodiversity Assessment report. We are grateful for the advice and guidance from the California Natural Resources Agency, including Madeline Drake, Meghan Hertel, and Cole Dickinson. California Biodiversity Network (CBN) support for working group convenings and writing was funded in part by Moore Foundation funding to CBN (Grant #11615) and from the Resources Legacy Fund to R.L.O.Y. Data analysis, writing and design support funded by The Nature Conservancy.

## Suggested Citation

Schloss, C., Howard, J., Olliff Yang, R., Roth, N., Dickison, C., Canales, A., Stanley, C.K., Webb, M., Ackerly, D., Boettiger, C., Buhler, C., Monfort, S., Bucciarelli, G., Meyer, R., Levi Simons, A., Bando, J., Chamberlin, L., Veloz, S., Hill, A., Johnson, R., Hill, R., Kochanek, A., Rademacher, D., Micheli, L., Penrod, K., Rapacciuolo, G., Spatz, D., & Gluesenkamp, D. (2026). *California’s 30x30 Initiative in 2025: A Biodiversity Assessment of the State’s 30x30 Conservation Areas*. California Biodiversity Network.

## Table of Contents

|                                                                          |    |
|--------------------------------------------------------------------------|----|
| Acknowledgments .....                                                    | 2  |
| Suggested Citation .....                                                 | 2  |
| Executive Summary .....                                                  | 4  |
| Background.....                                                          | 5  |
| The 30x30 Initiative: A Bold Step Toward Biodiversity Conservation ..... | 5  |
| Where Do We Stand in 2025?.....                                          | 7  |
| Biodiversity Assessment .....                                            | 8  |
| Conservation Need and Opportunity Framework .....                        | 8  |
| Methods .....                                                            | 10 |
| Habitats and Features .....                                              | 11 |
| Network Characteristics .....                                            | 13 |
| Representation and Gaps.....                                             | 13 |
| Results .....                                                            | 13 |
| Land Characterization .....                                              | 13 |
| Network Composition .....                                                | 14 |
| Representation and Gaps.....                                             | 16 |
| Habitat.....                                                             | 16 |
| Richness.....                                                            | 26 |
| Connectivity and Resilience .....                                        | 31 |
| Freshwater Resources.....                                                | 33 |
| Uncertainty of Estimates .....                                           | 35 |
| Discussion.....                                                          | 35 |
| Making 30x30 Meaningful for Biodiversity .....                           | 35 |
| Climate Change.....                                                      | 36 |
| Moving The Needle Toward 30% .....                                       | 36 |
| Caveats.....                                                             | 37 |
| Conclusion .....                                                         | 37 |
| References .....                                                         | 38 |
| Appendix A.....                                                          | 41 |
| Appendix A References .....                                              | 42 |
| Appendix B.....                                                          | 44 |
| Sensitivity of Results to Analytical Assumptions.....                    | 44 |
| Scenarios .....                                                          | 46 |
| Analysis Results .....                                                   | 48 |

## Executive Summary

The 30x30 movement is the historic commitment to conserve 30% of lands and waters by the year 2030. In 2022, 190 countries adopted the Kunming–Montreal Global Biodiversity Framework, an international agreement with 23 targets aimed at halting and reversing biodiversity loss. Target 3, widely known as “30x30,” calls for 30% of the world’s terrestrial, inland water, and coastal and marine areas to be “effectively conserved and managed through ecologically representative, well-connected, and equitably governed systems” by 2030. California, USA, has been historically progressive in its biodiversity protection initiatives, and released “Pathways to 30x30” in 2022 following executive order N-82-20 by Governor Gavin Newsom in 2020 (State of California, 2020), committing the state to protecting 30% of its lands and coastal waters. Pathways to 30x30 defines the lands and coastal waters included as “30x30 Conservation Areas” and outlines ten pathways to reaching the 30% goal by 2030.

The California Biodiversity Network (CBN) is a group of academic institutions, NGOs, government agencies, and private entities with expertise in biodiversity conservation science and practice. CBN is a key partner in the implementation of California’s 30x30 Initiative, and has provided science support throughout its implementation, including the development of “Conserving California: Advancing Science in Support of 30x30,” a report outlining research and information priorities to advance California’s 30x30 key objectives (CNRA, 2022: Appendix D). In 2024, a working group of CBN formed to evaluate the biodiversity attributes of the State’s 30x30 Conservation Areas, evaluate gaps in habitat and feature representation within the 30x30 Conservation Areas, and identify opportunities for future conservation.

In this report, we examine the 30x30 Conservation Areas network with respect to network composition and representation and gaps of habitats and other ecological features important for sustaining biodiversity. We include the evaluation of habitats not only in the 30x30 Conservation Land Areas (i.e., GAP 1 and 2) but also other conservation areas, public lands, or conservation areas with unknown status (GAP 3 and 4), and non-conserved lands (privately-owned without legal protections and Department of Defense (DOD)). Here, the term non-conserved refers only to the protection status, and is not a reflection of the habitat value or resource management strategies of landowners. The holistic evaluation of the landscape across conservation status provides insight into not only representation and gaps, but additional pathways and opportunities to improve representation of habitats and features in the remainder of this commitment. We find that some habitats and features are under-represented and in need of additional protection statewide, while others are on par with or above representation levels in California. For these, future conservation can focus on enhancing ecoregional representation or protecting examples of those habitats that also protect fine-filter species or areas of cultural significance, improve connectivity, or enhance access for disadvantaged communities.

As the state continues to work towards conserving 30% of its lands, directing new conservation toward the most-species-rich areas, under-represented habitats at statewide and ecoregional scales and landscapes that support rare and/or threatened habitats and species will ensure that 30x30 delivers the greatest benefit for biodiversity. Our results indicate that multiple pathways including land acquisition, the establishment of conservation easements, investments in improved management, and enhancement of protection durability on public lands will all be necessary strategies for expanding the portfolio of 30x30 Conservation Areas.

This assessment is intended to inform opportunities to fill gaps necessary to achieve 30x30 key objectives and conservation priorities. It complements the tracking of statewide progress by CA Nature, a suite of interactive mapping and visualization tools to advance 30x30, by evaluating additional datasets on composition and representation and incorporating further metrics to identify pathway opportunities to close those gaps. These findings provide essential guidance for natural areas managers, stewards, and agencies as California advances toward its 30x30 goal, and they offer a model that other governments can adapt to their own jurisdictions.

## Background

Biodiversity refers to the variety of life, from genes to species to ecosystems (Gaston and Spicer, 2013). Protecting biodiversity is essential, not only for human health and quality of life, but also in maintaining functional ecosystems, our food systems, healthy soils, clean air and water, and so much more (Mooney et al., 2005). Our planet is in the midst of a severe biodiversity decline, and California is no exception. Across North America, large numbers of birds, insects, amphibians, and mammals have declined, and many species' historic ranges have contracted (Rosenberg et al., 2019, Crossley et al. 2020, Liebert and Ripple, 2004, Muths 2012). Nearly one million of the earth's species are at risk of extinction (IPBES, 2019, CNRA, 2022).

California is the most biologically diverse state in the country (CDFW, 2025; Hamilton et al., 2022) and is home to the most unprotected, range-restricted imperiled species in the continental United States (Hamilton et al., 2022). Additionally, California is one of 36 global biodiversity hotspots, which are designated regions with high biodiversity that are also threatened by development or conversion to other land uses (Myers et al., 2000). The 36 global hotspots together make up only 2.5% of the earth's land but account for more than 50% of endemic plants and terrestrial vertebrate species (Habel et al., 2019).

Land protection has long been a central strategy for addressing biodiversity decline and will remain critical in responding to the current crisis both globally and within California. Many protected areas established in past decades were designated opportunistically, reflecting historical conservation priorities and political circumstances rather than today's more systematic planning approaches. As a result, as of 2020, California's existing protected lands did not necessarily capture the full ecological diversity of the state (The Nature Conservancy, 2021). If conservation efforts fail to encompass the breadth of California's ecosystems, the species and ecological processes that depend on unprotected habitats will remain vulnerable. Ideally, the future network of conserved lands will represent the full diversity of each region—across species, communities, and ecological systems—and will be well connected. Representation of biodiversity within a connected network of protected areas is a foundational principle of conservation planning (Margules and Pressey, 2000; Olson and Dinerstein, 1998; Kukkala and Moilanen, 2013; Dinerstein et al., 2019) and an essential first step toward ecological resilience (Halpin, 1997). Ensuring representation not just across the state, but also within each ecoregion enhances resilience by conserving examples of each system under different climate conditions and with genetic or phenotypic variation to provide some redundancy against climate impacts or other catastrophic disturbances (Halpin, 1997). Systematic conservation planning seeks to ensure that protected areas are both effective at conserving biodiversity and meeting these goals for a protected area network with efficient use of limited resources.

## The 30x30 Initiative: A Bold Step Toward Biodiversity Conservation

In December 2022, over 190 countries adopted the Kunming-Montreal Global Biodiversity Framework (CBD, 2022; the "Biodiversity Plan"), an international commitment to better protect the planet that sustains us all. The framework includes 23 targets aimed at reversing habitat and species loss. Target 3, colloquially known as "30x30" (read "thirty by thirty"), specifically calls for 30% of the world's terrestrial, inland water, and coastal and marine areas to be "*effectively conserved and managed through ecologically representative, well-connected and equitably governed systems of protected areas and other effective area-based conservation measures*" by the year 2030. Put simply, 30x30 is an essential component of the biggest conservation commitment the world has ever made.

While the global 30x30 commitment was officially ratified in 2022, California was ahead of the curve. In October 2020, Governor Gavin Newsom issued Executive Order N-82-20, launching the state's own 30x30 initiative. This executive order set a bold target: to conserve 30% of California's lands and coastal waters by 2030.

By doing so, California joined this coalition in a united response to the accelerating global biodiversity crisis. The Governor tasked the California Natural Resources Agency (CNRA) with leading the charge, coordinating efforts across state agencies and stakeholders. Their first major milestone was the release of the Pathways to 30x30 strategy in April 2022 (CNRA, 2022), which laid out a roadmap for achieving the state's conservation goals.

The Pathways to 30x30 strategy identifies three key objectives:

1. Protect and Restore Biodiversity
2. Expand Equitable Access to Nature
3. Mitigate and Build Resilience to Climate Change

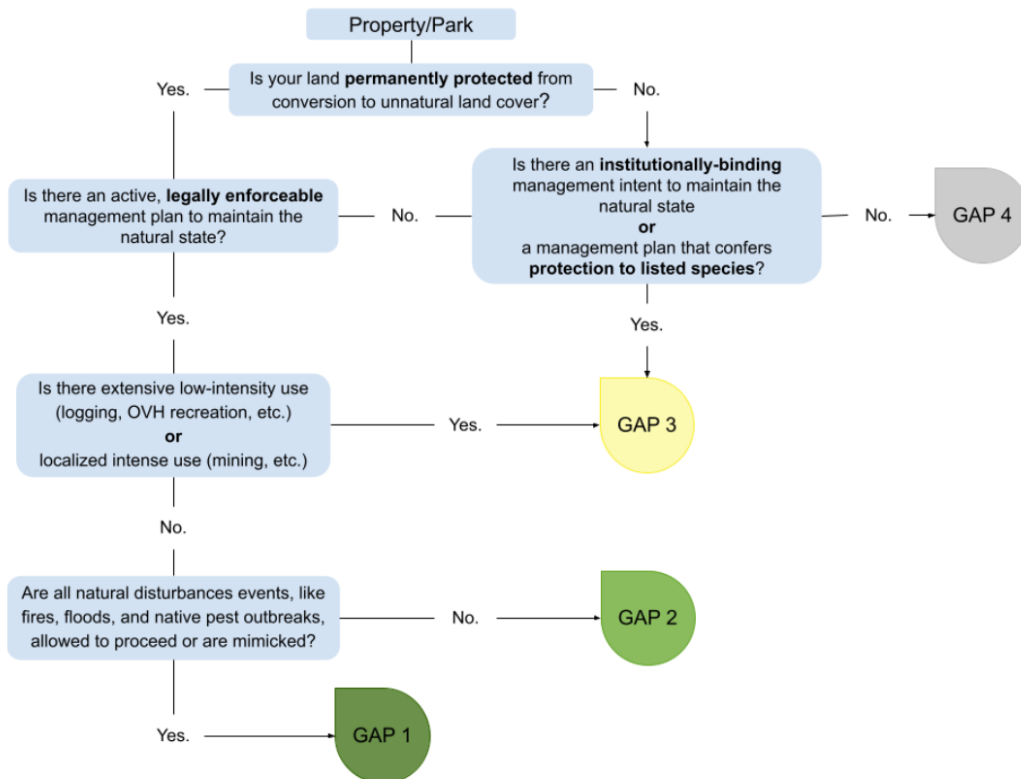
To qualify as a “30x30 Conservation Area,” land or coastal waters must be:

- “Durably protected and managed to sustain functional ecosystems—both intact and restored—and the diversity of life they support.”
- To determine which areas meet this definition, California uses a national classification system known as GAP (Gap Analysis Project) status codes. Specifically, lands with GAP Status 1 and 2 are considered to have strong, long-term protections in place for biodiversity and ecosystem health (Figure 1).

| Protected Area<br>GAP Status<br>Codes | Biodiversity<br>Assessment<br>Classification | Description                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b>                              | 30x30<br>Conservation<br>Area                | An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a natural state within which disturbance events (of natural type, frequency, intensity, and legacy) are allowed to proceed without interference or are mimicked through management.                                                           |
| <b>2</b>                              | 30x30<br>Conservation<br>Area                | An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a primarily natural state, but which may receive uses or management practices that degrade the quality of existing natural communities, including suppression of natural disturbance (for example, wildland fire or native insect outbreaks). |
| <b>3</b>                              | Other Conserved<br>or public lands           | An area having permanent protection from conversion of natural land cover for the majority of the area, but subject to extractive uses of either a broad, low intensity type (for example, logging, OHV recreation) or localized intense type (for example, mining). It also confers protection to federally listed endangered and threatened species throughout the area.      |
| <b>4</b>                              | Other Conserved<br>or Public lands           | There are no known public or private institutional mandates or legally recognized easements or deed restrictions held by the managing entity to prevent conversion of natural habitat types to anthropogenic habitat types. The area generally allows conversion to unnatural land cover throughout or management intent is unknown.                                            |
| <b>Not applicable</b>                 | Non-conserved<br>lands                       | Private lands with no legal protections. Here, the term non-conserved refers only to the protection status, and is not a reflection of the habitat value or resource management strategies of the land owners.                                                                                                                                                                  |

**FIGURE 1. GAP STATUS CODES AND DESCRIPTIONS ADAPTED FROM THE PROTECTED AREAS DATABASE OF THE U.S. (PAD-US, USGS).**

GAP status was originally sourced from PAD-US (USGS, 2022); then, to improve its accuracy, GreenInfo Network and CNRA led a data improvement effort enabling agencies and organizations to review and update their own GAP codes using a [standardized toolkit](#). Figure 2 illustrates the decision flow used in that toolkit to guide GAP status updates.



**FIGURE 2. FLOW CHART OF QUESTIONS FROM THE 30x30 TOOLKIT FOR CALIFORNIA (GREENINFO NETWORK (N.D.))**

To advance and track progress on the three Key Objectives, the California 30x30 Initiative launched [CA Nature](#) (CNRA, 2025a)—a suite of interactive mapping and visualization tools to advance 30x30. These applications allow for an in-depth look at the current 30x30 Conservation Areas to aid in planning conservation action. However, they do not allow for comparison of biodiversity across all remaining natural areas (both within and outside of the 30x30 Conservation Areas) and are limited in assessment of some critical aspects of biodiversity, such as species richness, freshwater resources, and connectivity.

The analysis presented here is designed to enhance CA Nature by introducing additional metrics and analytics that support the first Key Objective (i.e. protect and restore biodiversity) and elucidate where biodiversity is and is not currently legally protected, providing insight for planning for future protected areas that support biodiversity and effectively meet 30x30 targets. The analysis incorporates datasets supported by CA Nature with additional metrics and additional datasets. Our goal is to support conservation partners in developing effective strategies to protect California’s diverse ecosystems and species.

## Where Do We Stand in 2025?

The year 2025 marked the halfway point through the decade-long effort to achieve 30x30 objectives. With the remaining time until 2030, it is critical to take stock and ensure there is still time to implement effective conservation and management strategies. According to the most recent progress report from July 2025 (CNRA, 2025b), 26.1% of California’s lands currently meet the criteria for durable conservation, meaning these areas are protected and managed in perpetuity—for biodiversity. This represents an increase of 2.4 million acres since the launch of this effort in 2022. However, over 4 million acres still need to be conserved to meet the 30% target.

The remaining years until 2030 are critical for achieving California’s 30x30 conservation goals. Assessing how effectively current 30x30 Conservation Areas are protecting biodiversity is essential to shaping future priorities and guiding strategic investments. As a leader in climate action and environmental stewardship,

California's 30x30 initiative has the potential to exemplify a proactive, science-driven approach to conservation. This report seeks to: evaluate how well 30x30 Conservation Areas represent the state's biodiversity, identify existing gaps, and highlight opportunities to achieve the terrestrial component of the goal of protecting 30% of California's lands and coastal waters by 2030.

## Biodiversity Assessment

This report presents a comprehensive biodiversity assessment of California's 30x30 conserved lands, other conserved or public lands, and non-conserved lands. We examined vegetation types, species richness and rarity, connectivity features, freshwater resources, climate-relevant features, and other biodiversity-critical elements both within the 30x30 Conservation Areas and across other public and private lands. Specifically, we:

- Describe the characteristics and composition of the current 30x30 Conservation Area network; and
- Assess representation of habitats and other ecological features (hereafter habitats/features) within the 30x30 Conservation Area network and outline conservation strategies to address identified gaps.

To conduct this assessment, a working group was convened under the umbrella of the California Biodiversity Network (CBN). CBN is a coalition of experts from government, non-profit organizations, and academia dedicated to conserving California's rich and threatened natural heritage. CBN played a central role in launching and supporting the 30x30 Initiative and has provided technical and ecological expertise throughout its implementation. Early on, CBN identified key research needs and data gaps (outlined in Appendix D of Pathways to 30x30) to support effective conservation planning.

CBN assembled a dedicated working group to carry out this biodiversity assessment. Data analysis was led by a core team at The Nature Conservancy (TNC) and writing was contributed by members of CBN, TNC, and the California Natural Resources Agency (CNRA).

Throughout the process, the working group collaboratively developed key questions, and reviewed and agreed upon data sources, analytical methods, evaluation criteria, and interpretation of results. Draft findings and interpretations were presented and discussed during group meetings, ensuring that the final report reflects a consensus-based, scientifically grounded understanding of the current state of biodiversity conservation under California's 30x30 Initiative. This report contains results for a subset of data (Table 2) that was initially proposed and evaluated during the 2024–2025 working group sessions. Additional data evaluated during these sessions, but not evaluated for the 2025 30x30 Conservation Areas data release and associated report is listed in Appendix A.

This collaborative, cross-sector approach helped ensure that the assessment is both technically robust and aligned with the broader goals of California's conservation community.

## Conservation Need and Opportunity Framework

To evaluate the adequacy of protection for different features, we developed a conservation need and opportunity framework and applied it consistently to all biodiversity-relevant habitats and features.

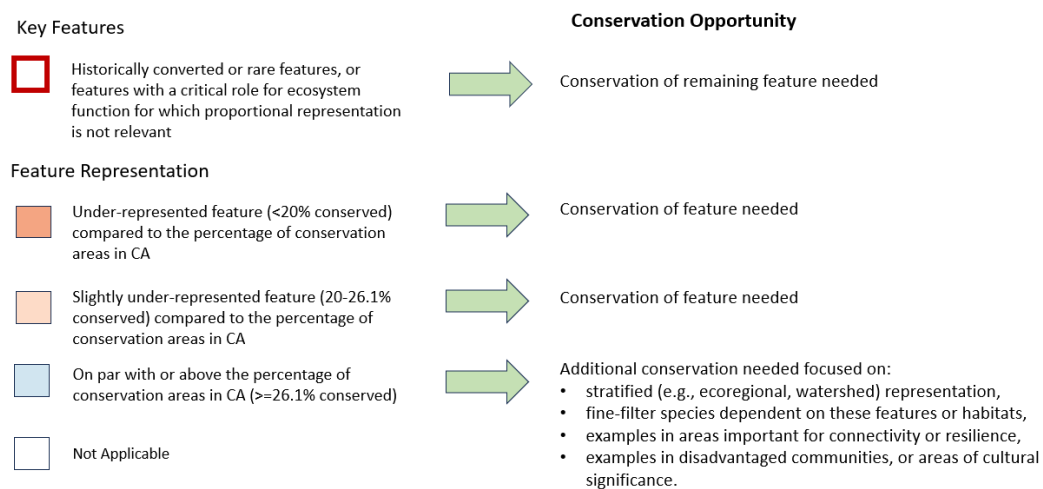
To determine conservation need (Figure 3), we compared the statewide level of conservation for each habitat/feature to the percentage of California's land that is currently in 30x30 Conservation Areas (26.1%).

- Habitats/Features with greater than or equal to 26.1% of their extent in 30x30 Conservation Areas are considered on par with or above statewide conservation levels (hereafter, "on par"). For these, habitats/features additional conservation should focus on areas that also achieve additional goals such as:
  - Improving representation within specific ecoregions or watersheds
  - Protecting rare or endemic fine-filter species within those habitats/features
  - Enhancing connectivity
  - Protecting landscapes more likely resilient to climate change

- o Improving equitable access for disadvantaged communities
  - o Prioritizing cultural values
- Habitats/Features with 20% to <26.1% of their extent in 30x30 Conservation Areas are considered slightly under-represented and would benefit from additional conservation to reach or surpass statewide coverage levels.
- Habitats/Features with <20% of their extent in 30x30 Conservation Areas are considered under-represented and in higher need of conservation action.

In some cases, simply reaching statewide conservation levels is not sufficient. We identify rare or highly impacted features—those that comprise  $\leq 3\%$  of the state (e.g., coastal migration space), have been historically converted (e.g., wetlands), or support critical ecosystem functions (e.g., key connectivity linkages, groundwater dependent ecosystems)—as “Key Features.” For these we recommend protecting all remaining examples wherever feasible.

We excluded non-typological, value-based features—such as top ranked biodiversity and species richness—from the representation framework thresholds because these datasets include only the highest portion of continuous data (e.g., the top quintile). In a network designed to protect the most biologically rich places, these high-value areas should, by definition, be disproportionately represented.



**FIGURE 3. FEATURE REPRESENTATION AND CONSERVATION OPPORTUNITY FRAMEWORK.**

In addition to assessing conservation need, we identified conservation opportunity pathways for each habitat/feature (Figure 4). For some habitats/features, most remaining opportunities lie on other conserved or public lands (outside the 30x30 Conservation Areas), suggesting a focus on improving management on those lands or increasing durability. For others, remaining opportunities occur primarily on non-conserved lands, pointing to the need for new acquisitions or conservation easements on private lands. These opportunities are determined by the proportion of the remaining habitat/feature on GAP 3 or 4 lands versus the proportion remaining on non-conserved lands. The yellow portion of the Proportional Pathway Opportunities pie chart (Figure 4) shows the portion of the remaining habitat's (i.e., outside of 30x30 lands) area that could be conserved through acquisition of easements or purchase of land for protection. The green portion of the pie chart (Figure 4) indicates the portion of the remaining habitat's area that could be conserved through improved or more durable management practices.

### Proportional pathway opportunities

Enhance management on public and other conserved lands to include biodiversity and ecosystem health

Execute strategic land acquisitions and voluntary conservation easements on non-conserved lands

Opportunities primarily for increased management/durability on other conserved lands



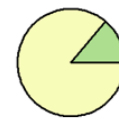
Increased management/durability on other conserved lands may be necessary to conserve this feature

Balanced opportunities on non-conserved lands and other conserved lands



Opportunities on other conserved lands or acquisitions and easements on non-conserved lands

Opportunities primarily for acquisitions and easements of non-conserved lands



Acquisitions and easements on non-conserved lands may be necessary to conserve this feature

**FIGURE 4. PROPORTIONAL PATHWAY OPPORTUNITIES.**

## Methods

We evaluated habitats and other ecological features (hereafter, habitats/features) within three categories of land status:

- 30x30 Conservation Areas (GAP 1 and GAP 2)
- Other conservation areas and other public lands or lands with unknown status (GAP 3 and GAP 4)
- Non-conserved lands

In this analysis, a conservation area *unit* (hereafter, *unit*) refers to a single polygon in the 30x30 Conservation Area dataset (CNRA, 2025c, Figure 5). Each unit contains a percentage of its area assigned to each of the four GAP status codes (Figure 1). Lands with GAP 1 or GAP 2 status are considered “30x30 Conservation Areas,” while GAP 3 and GAP 4 lands are categorized as “other conservation areas or public lands.” Land within California that falls outside any Conservation Area unit regardless of GAP status, is considered “non-conserved.” Because a unit may contain multiple GAP statuses, only a portion of a given unit may qualify as a “30x30 Conservation Area” with the remainder of the unit classified as “other conservation areas or public lands.” For example, if 45% of a 100-acre unit is GAP 1 or 2, only 45 acres is counted as part of the 30x30 Conservation Area’s network, with the remaining area classified as other conservation lands. A key challenge is that the percentages of each GAP Status are not spatially explicit within the unit. In other words, we do not know where within the unit the GAP 1 or GAP 2 acres are located.

Calculations of habitat and feature composition, representation, and gaps within the 30x30 Conservation Area network are based on the intersection of each habitat/feature with 30x30 Conservation Areas. Because GAP status is not spatially allocated within a unit, estimating these metrics requires assumptions about how much of each habitat/feature falls within each GAP category (Appendix B: Figure S1). As a result, all quantitative measures of composition, representation, and gaps are estimates. For each habitat or feature, we report a primary estimate based on the proportion of GAP 1 and GAP 2 lands within each unit—hereafter “proportional estimate.” To reflect uncertainty inherent in this approach, we also provide lower and upper estimates to indicate the range of uncertainty around this estimate.

To calculate the primary proportional estimate, we first multiplied the proportion of each unit classified as a 30x30 Conservation Area by the acreage of the habitat/feature within that unit. For example, if 90% of a unit

is GAP 1 or GAP 2, then the acreage of each habitat/feature extent in that unit is multiplied by 0.9 to estimate how much of the habitat/feature is potentially within the 30x30 Conservation Areas. We then summed these proportional habitat/feature acreages across all units containing that habitat/feature to calculate overall representation within the 30x30 Conservation Area network.

To characterize uncertainty around this proportional estimate, we calculated both lower and upper estimates for each habitat/feature. For the lower estimate, we restricted the analysis to only units in which at least 80% of their area qualified as a 30x30 Conservation Area (i.e., GAP 1 and GAP 2). For each of these units, we assumed that as much of the habitat/feature under consideration as possible was within the 30x30 portion of the unit. Thus, the estimated amount of habitat/feature within a single unit was the minimum of: the total acreage of the habitat/feature in the unit and the total acreage of the 30x30 Conservation Area lands within the unit. We then summed these values across all units meeting the  $\geq 80\%$  GAP 1 and GAP 2 threshold. For the upper estimate, we applied the same calculation but expanded the subset to include all units with at least 20% of their area in 30x30 Conservation Areas (i.e., GAP 1 or GAP 2).

To illustrate how these different approaches affect habitat/feature coverage, Table 1 presents a simple explanation using oak woodland across three 100-acre units (A, B, and C). Each unit contains 50 acres of oak woodland but differs in the proportion of land qualifying as 30x30 Conservation Areas. Across the three-unit network, the proportional method yields an estimated 70 acres of total oak woodland within 30x30 Conservation Areas, with a lower estimate of 50 acres and an upper estimate of 90 acres.

*Table 1. The lower, proportional, and upper estimates of hypothetical representation of oak woodland across a network of conservation areas consisting of three units (A, B, and C)*

| <b>Units</b>               | <b>GAP status of three 100 ac properties, each with 50 acres of oak woodland</b> | <b>30x30 Oak woodland habitat coverage Lower estimate (at least 80% GAP 1, 2)</b> | <b>30x30 Oak woodland habitat coverage Proportional estimate</b> | <b>30x30 Oak woodland habitat coverage Upper estimate (at least 20% GAP 1, 2)</b> |
|----------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| <b>Unit A</b>              | 90% GAP 1, 2 (90 ac of 30x30 conservation areas)                                 | 50 ac oak woodland                                                                | 45 ac oak woodland                                               | 50 ac oak woodland                                                                |
| <b>Unit B</b>              | 40% GAP 1,2 (40 ac of 30x30 conservation areas)                                  | 0 ac oak woodland                                                                 | 20 ac oak woodland                                               | 40 ac oak woodland                                                                |
| <b>Unit C</b>              | 10% GAP 1,2 (10 ac of 30x30 conservation areas)                                  | 0 ac oak woodland                                                                 | 5 ac oak woodland                                                | 0 ac oak woodland                                                                 |
| <b>Total across units:</b> | 140 ac total 30x30 conservation areas                                            | 50 ac oak woodland                                                                | 70 ac oak woodland                                               | 90 ac oak woodland                                                                |

We chose to include these three estimates (i.e., proportional, lower, and upper) for each feature/habitat based on the results of a sensitivity analysis comparing six different approaches (Appendix B), including the minimum possible and maximum potential values, for each major habitat type as defined in the FVEG dataset (CALFIRE, 2024). This sensitivity analysis showed that multiplying the proportion of GAP 1 or 2 areas in a unit by the habitat/feature acreage provides a moderate estimate within the broader set of possible outcomes (Appendix B).

## Habitats and Features

CBN working group identified datasets important to characterize California's biodiversity. When possible, datasets were chosen to be consistent with CA Nature and to include new research with statewide data published after the launch of CA Nature. Table 2 and Appendix A: Table S1 together show the feature data,

metrics, and data sources agreed upon by the working group that best represent the state’s biodiversity for this analysis. This full suite of recommended data was analyzed for the 2024 Conservation Area release. For 2025 and subsequent analyses, the data was limited to the subset of data (Table 2) shared in the report “California’s 30 x 30 Initiative at its Midpoint: A Biodiversity Assessment Snapshot of the State’s Conservation Areas” based on statewide consistency and interpretability.

*Table 2. Feature and habitat data and sources.*

| Topic                                            | Feature                                                                                                    | Source                                                          |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| <b>Ecoregion</b>                                 | 30x30 Ecoregions                                                                                           | CNRA (n.d.)                                                     |
| <b>Habitat</b>                                   | 13 class major habitat types (CWHR13)                                                                      | CAL FIRE (2024)                                                 |
|                                                  | 60+ class habitat types (CWHR)                                                                             | CAL FIRE (2024)                                                 |
| <b>ACE Biodiversity</b>                          | ACE Biodiversity (Rank 5; top 20% native richness, top 5% rare richness, and endemic richness by taxa)     | CDFW (2018)                                                     |
| <b>Additional biodiversity: species richness</b> | Plant richness (top 20%)                                                                                   | Kling et al. (2019)                                             |
|                                                  | Rarity-weighted endemic plant richness (top 20%)                                                           | Kling et al. (2019)                                             |
| <b>Connectivity</b>                              | Present-day connectivity (all categories)                                                                  | Cameron et al. (2022)                                           |
|                                                  | Climate migration routes                                                                                   | Schloss et al. (2022)                                           |
|                                                  | Regional connectivity linkages                                                                             | Beier et al. (2006)                                             |
| <b>Freshwater Resources</b>                      | Freshwater species richness                                                                                | Howard et al. (2015)                                            |
|                                                  | Wetlands (freshwater emergent wetland, freshwater forested/shrub wetland, or estuarine and marine wetland) | National Wetland Inventory, US Fish and Wildlife Service (2019) |
|                                                  | Groundwater dependent ecosystems                                                                           | Klausmeyer et al. (2018)                                        |
|                                                  | Streams by order                                                                                           | USGS NHD (2020)                                                 |
| <b>Climate-related risks and/or disturbance</b>  | Historic Fire Perimeters                                                                                   | CAL FIRE (2025)                                                 |
|                                                  | Flood hazard zones                                                                                         | First Street Foundation (2020)                                  |
|                                                  | Sea-level rise                                                                                             | NOAA (n.d.)                                                     |
|                                                  | Mid-century habitat climate exposure                                                                       | CWHR-based per Thorne et al. (2016)                             |

Most datasets represented discrete habitat types (e.g., wetlands, streams, oak woodland) or categorical conditions (e.g., channelized connectivity). For continuous or ranked datasets, such as ACE Top Ranked Biodiversity and ACE species richness (including richness of all native species, endemic richness, and rare

richness), we converted the continuous data into discrete features by applying thresholds (e.g., highest rank, the top 20% or top 5%).

We summarized each habitat/feature in terms of area (acres), length (miles), or counts for the lower, proportional, and upper estimates. We then calculated:

- Network Composition: The percentage of the 30x30 Conservation Areas network composed of each habitat/feature, and
- Representation and Gaps: The percentage of each habitat/feature's statewide extent occurring within each land status category. These two calculations are described in detail below.

## Network Characteristics

To characterize the composition of the current 30x30 Conservation Areas Network we calculated percentages based on the percent of the network composed of each feature as follows:

$$\% \text{ of network} = \frac{\text{area of feature within 30x30 Conservation Areas}}{\text{total area of the 30x30 Conservation Areas}} \times 100$$

Network composition provides a quick snapshot of the state's 30x30 Conservation Areas.

## Representation and Gaps

To better understand the representation of habitats and other features within the 30x30 Conservation Areas network, we calculated the percentage of habitats/features contained within the network as follows:

$$\% \text{ of feature} = \frac{\text{area of feature within a network}}{\text{total area of the feature statewide}} \times 100$$

With this simple calculation, we were able to assess how effectively diverse habitats and ecological features are represented within the 30x30 Conservation Areas network. This evaluation identifies gaps in habitat and feature representation, highlighting areas that require further conservation efforts. Additionally, we examined the presence of these habitats/features across other conservation areas and public lands (GAP 3 and GAP4), and non-conserved lands. Based on these insights, we identified proportional conservation pathway opportunities to address these gaps and enhance habitat protection and representation across the state.

## Results

First, we describe the characteristics and composition of the current 30x30 Conservation Areas network, then we share the results of the representation, gap, and opportunity pathway analysis through the Conservation Need and Opportunity Framework (Figures 3 & 4) for habitats, species-rich areas, connectivity, and freshwater resources.

## Land Characterization

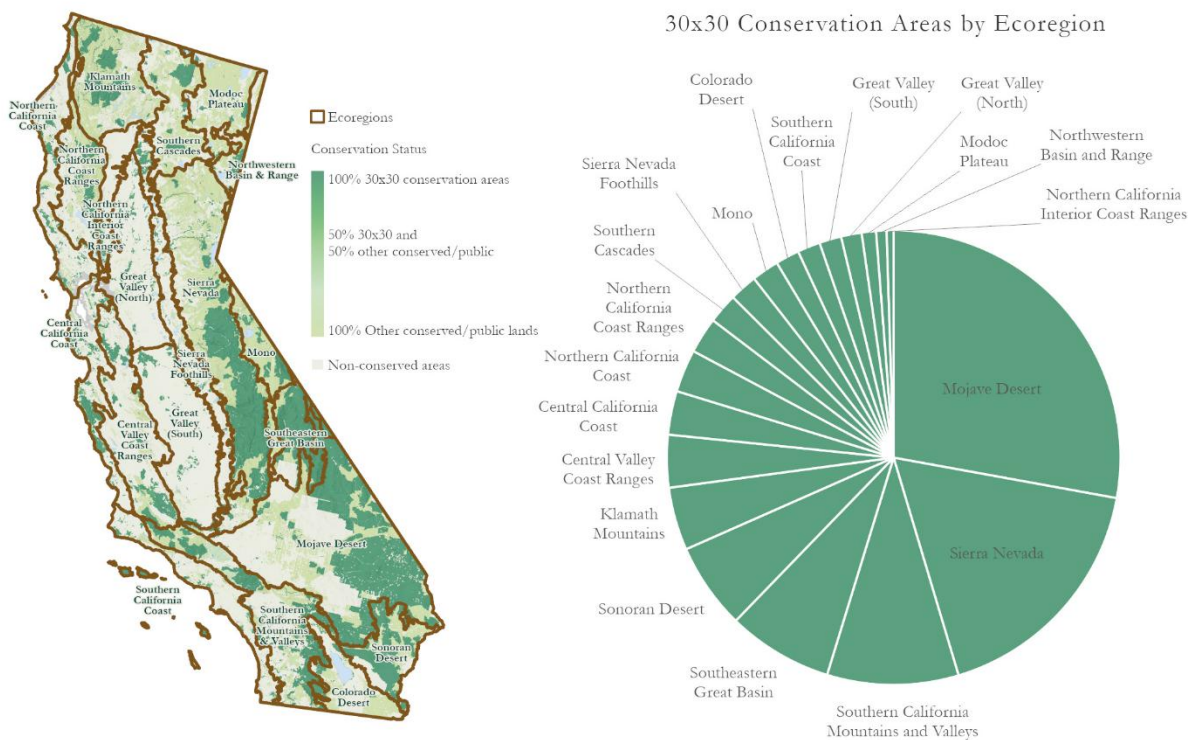
In alignment with CA Nature, our assessment shows that 26.1% of California is currently within 30x30 Conservation Areas. Another 25.5% is classified as other conserved lands, public lands, or lands with unknown status (GAP 3 or GAP 4). The remaining 48.4% is non-conserved land.



**FIGURE 5. MAP OF CONSERVATION STATUS WITHIN EACH ECOREGION IN CALIFORNIA SHOWING PROPORTION OF LAND WITHIN 30x30 CONSERVATION AREAS VS. OTHER CONSERVED LANDS AND/OR OTHER PUBLIC LANDS ALONG WITH NON-CONSERVED LANDS.**

### Network Composition

The largest portion of 30x30 Conserved Lands is made up of the Mojave Desert ecoregion (27.9%), followed by the Sierra Nevada (17.5%), Southern California Mountains and Valleys (9.4%), Southeastern Great Basin (7.5%), and Sonoran Desert (6%). All other ecoregions each comprise less than 5% of the network (Figure 6).

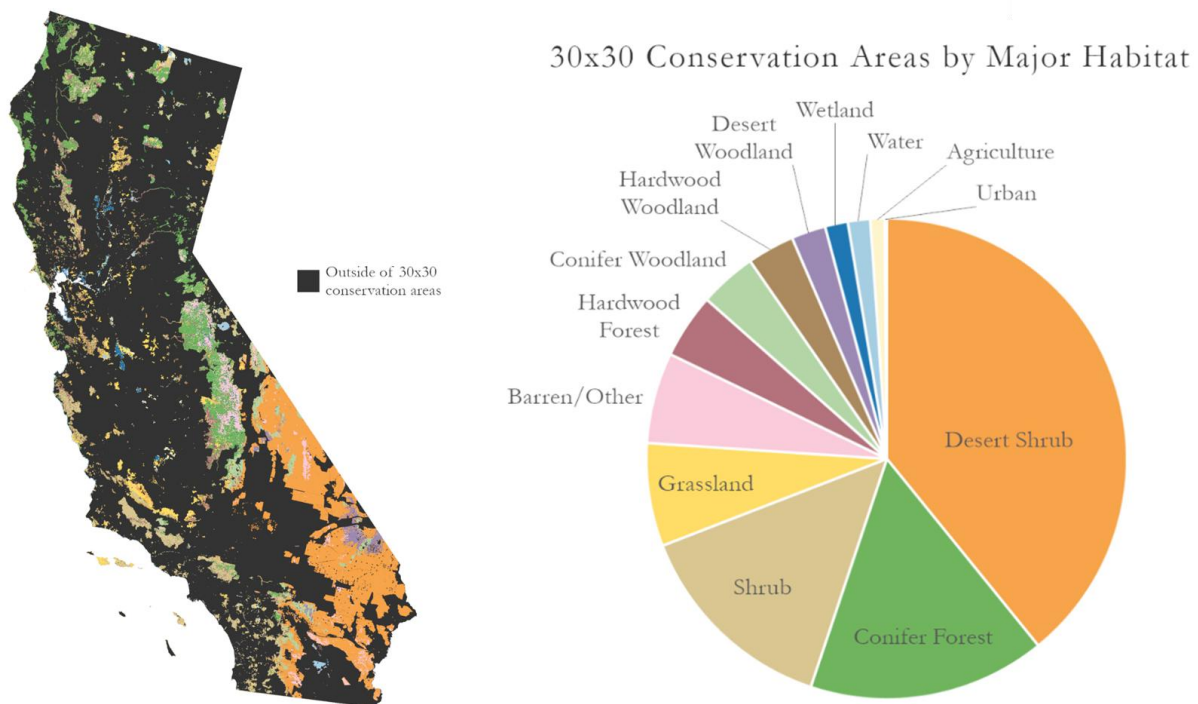


**FIGURE 6. A) MAP OF CALIFORNIA ECOREGIONS B) PIE CHART OF PROPORTIONAL ECOREGIONAL COMPOSITION OF THE NETWORK OF 30x30 CONSERVATION AREAS.**

Given that the Mojave Desert makes up the largest proportion of 30x30 Conservation Areas, it follows that desert shrub (e.g., desert scrub, desert wash, alkali desert scrub) habitat makes up 39% of 30x30 Conservation Areas (Figure 7). Conifer forest (15%), and shrub (e.g., chaparral, coastal scrub, bitterbrush, sagebrush) (13%) are also more widespread habitats in the 30x30 network of conservation areas. Together, these three broad habitat groups constitute more than two-thirds of the total area within California's 30x30 Conservation Areas network.



Sand dunes in Death Valley National Park © Greg Survant/TNC Photo Contest 2022



**FIGURE 7. A) MAP OF MAJOR HABITATS WITHIN 30x30 CONSERVATION AREAS B) PIE CHART OF PROPORTIONAL HABITAT COMPOSITION OF THE NETWORK OF 30x30 CONSERVATION AREAS.**

Climate and disturbance pressures are already reshaping the network. Roughly one-third (32%) of the network has natural vegetation that is projected to be stressed by mid-century climate change. About 0.5% of the network is at risk from sea-level rise, and 14% has burned in wildfires in the past decade. Though fire is both natural and beneficial to some systems, recent fire events have burned with higher severity, intensity, or frequency, which can be associated with ecological transitions (Miller et al., 2009; Williams et al. 2023).

## Representation and Gaps

We assessed how habitats and other ecological features are distributed across 30x30 Conservation Areas, other conserved or other public/unknown status lands, and non-conserved lands. This lens highlights where future public and private conservation actions can most effectively advance 30x30 biodiversity outcomes to build a more representative, resilient, and connected network.

Tables 3-13 and Figures 8-15 present detailed results for habitat, species richness, connectivity, and freshwater resources. Together, they show that every ecoregion and habitat type in California contains opportunities to build a more a representative, resilient, and connected network of biodiverse lands. Details for each metric and feature are provided below.

These tables report the percentage of habitats/features within the 30x30 Conservation Areas network, the type and magnitude of conservation needed to improve its representation, and the proportional opportunities for either acquisition in fee or easements on non-conserved lands, as well as increasing durability or adjusting management objectives on other conserved or public lands. Accompanying maps illustrate the distribution of each habitat/feature across GAP status categories.

## Habitat

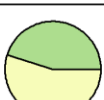
Some habitats are well represented within 30x30 Conservation Areas, while others are substantially under-represented (Figure 8, Table 3). Desert habitats, for example, are conserved above statewide conservation levels (48% of the desert shrub and 56% of the desert woodland are in 30x30 Conservation Areas). Additional conservation of desert habitats can focus on ecoregional representation, rare species, or important areas

for connectivity, climate resilience, or equitable access. In contrast, grasslands and hardwood woodland are poorly represented. Because most of the remaining extent of these habitats are on non-conserved lands (indicated by the yellow portion of the Proportional Pathway Opportunities pie chart, Table 3), these habitats are strong candidates for new acquisitions or conservation easements. Other under-represented habitats, such as conifer and hardwood forests, are more widely distributed across GAP 3 and GAP 4 lands (indicated by the green portion of the Proportional Pathway Opportunity pie chart, Table 3), which include public lands with limited or unclear conservation mandates, or conservation objectives that do not include management for biodiversity. On those lands, conservation opportunities include improving management to prioritize biodiversity and increasing the durability of protection, for example by retiring extractive uses or focusing management on activities that sustain and/or promote native biodiversity.



The oak woodlands and grasslands of the Tehachapi Mountains © Simon Williams/TNC

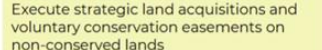
Table 3. Representation levels and the conservation need, pathways, and opportunities to advance conservation of major terrestrial habitats. Proportional pathway opportunities include improving management or increasing durability on other public lands or conserved areas (green) or acquisition or easements on non-conserved lands (yellow). \*Additional goals can include stratified representation (e.g., ecoregion, watershed), protection of fine-filter species, connectivity corridors, climate resilient landscapes, areas of cultural significance, or access for disadvantaged communities.

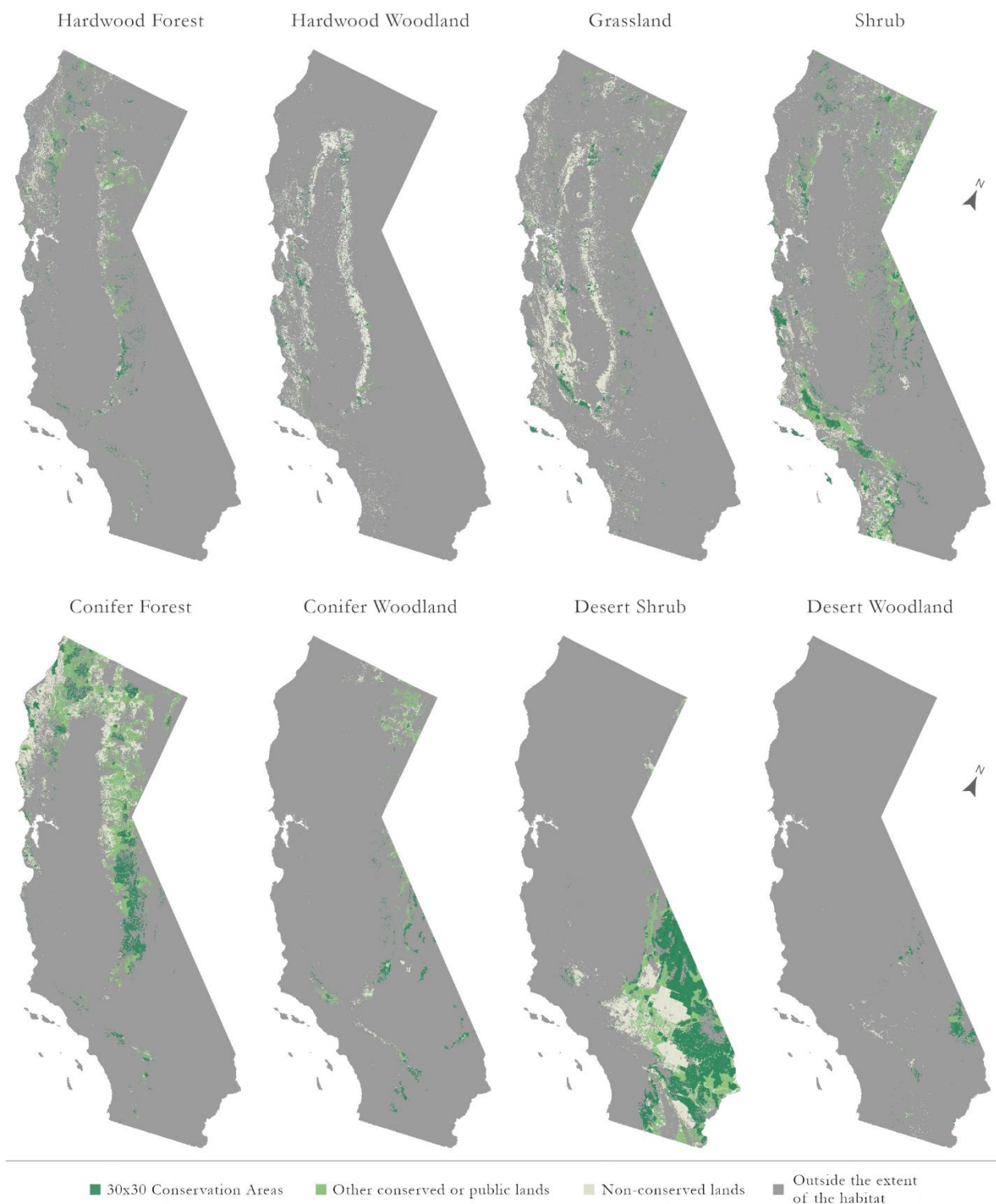
| Feature           | % of feature in 30x30 Conservation Areas | Proportional Pathway Opportunity                                                    | Conservation Opportunity                                                                                                |
|-------------------|------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Hardwood Woodland | 14 %<br>13.4 - 14 %                      |    | Conservation of feature needed: under-represented compared to the percentage of 30x30 Conservation Areas in CA          |
| Grassland         | 16 %<br>15.8 - 16 %                      |    | Conservation of feature needed: under-represented compared to the percentage of 30x30 Conservation Areas in CA          |
| Hardwood Forest   | 22 %<br>21.5 - 21.9 %                    |    | Conservation of feature needed: slightly under-represented compared to the percentage of 30x30 Conservation Areas in CA |
| Conifer Forest    | 24 %<br>24.1 - 24.2 %                    |   | Conservation of feature needed: slightly under-represented compared to the percentage of 30x30 Conservation Areas in CA |
| Shrub             | 28 %<br>27 - 28 %                        |  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Conifer Woodland  | 33 %<br>33.2 - 33.3 %                    |  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Desert Shrub      | 48 %<br>48.2 - 48.3 %                    |  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Desert Woodland   | 57 %<br>56.6 - 56.6 %                    |  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |

#### Feature Representation

-  Under-represented feature (<20% conserved) compared to the percentage of conservation areas in CA
-  Slightly under-represented feature (20-26.1% conserved) compared to the percentage of conservation areas in CA
-  On par with or above the percentage of conservation areas in CA (>=26.1% conserved)

#### Proportional pathway opportunities

-  Enhance management on public and other conserved lands to include biodiversity and ecosystem health
-  Execute strategic land acquisitions and voluntary conservation easements on non-conserved lands



**FIGURE 8. THE EXTENT OF MAJOR TERRESTRIAL HABITATS COLORED BY CONSERVATION STATUS: 30x30 CONSERVATION AREAS, OTHER CONSERVED OR PUBLIC LANDS, AND NON-CONSERVED LANDS. MAPPED CONSERVATION STATUS WITHIN CONSERVATION AREAS IS DETERMINED BY MAJORITY CONSERVATION STATUS. GRAY AREAS ARE OUTSIDE THE EXTENT OF THE HABITAT.**

Half of the finer-resolution natural terrestrial habitat associations are underrepresented relative to statewide conservation levels. Eastside pine, blue-oak foothill pine, ponderosa pine, blue oak woodland, and valley oak woodland are among the most under-represented, with only 8–10% their extents conserved within 30×30 Conservation Areas (Tables 4 and 5). For eastside pine, the primary pathway is improving management and durability on existing conserved and public lands, whereas for ponderosa pine the opportunity is split between management changes on conserved lands and new conservation on non-conserved lands (Table 4). Blue oak-foothill pine, blue oak woodland, and valley oak woodland all have more opportunity for additional conservation on non-conserved lands (Table 5). There is a lot of variability in representation across finer resolution conifer habitats, with subalpine conifer having some of the highest representation of all habitats and eastside pine the lowest (Table 4). There is less variability for finer resolution hardwood habitats with 7 of 9 being under-represented to some degree (Table 5).

Although broader habitat classifications of desert and shrub are on par with or above state-levels, several finer habitat classifications of these broader types are under-represented and in need of additional protection statewide, including desert riparian, alkali desert scrub, bitterbrush, low sage, and sagebrush (Tables 6 and 7). This highlights the importance of including finer habitat classifications in the analysis and points to the need for focused additional protection within broader habitats that are on par with state levels. The opportunities for additional protection for these under-represented shrublands are primarily through increasing the durability or management on other conserved or public lands, whereas the opportunities for conserving these under-represented desert habitats are more evenly distributed between management improvement and acquisitions/easements.



Las Piletas Ranch Preserve on the Central Coast © Ethan Inlander

*Table 4. Representation levels and the conservation need, pathways, and opportunities to advance conservation of finer-resolution conifer forest and woodland habitats. Proportional pathway opportunities include improving management or increasing durability on other public lands or conserved areas (green) or acquisition or easements on non-conserved lands (yellow). \*Additional goals can include stratified representation (e.g., ecoregion, watershed), or within these habitats, protection of fine-filter species, connectivity corridors, climate resilient landscapes, areas of cultural significance, or access for disadvantaged communities.*

| Feature                  | % of feature in 30x30 Conservation Areas | Proportional Pathway Opportunity                                                    | Conservation Opportunity                                                                                                |
|--------------------------|------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Eastside Pine            | 8.5 %<br>8.4 - 8.5 %                     |    | Conservation of feature needed: under-represented compared to the percentage of 30x30 Conservation Areas in CA          |
| Ponderosa Pine           | 9.9 %<br>9.9 - 9.9 %                     |    | Conservation of feature needed: under-represented compared to the percentage of 30x30 Conservation Areas in CA          |
| Montane Hardwood-Conifer | 15.4 %<br>15.4 - 15.6 %                  |    | Conservation of feature needed: under-represented compared to the percentage of 30x30 Conservation Areas in CA          |
| Klamath Mixed Conifer    | 16.8 %<br>16.8 - 16.8 %                  |    | Conservation of feature needed: under-represented compared to the percentage of 30x30 Conservation Areas in CA          |
| Douglas Fir              | 16.8 %<br>16.7 - 16.8 %                  |    | Conservation of feature needed: under-represented compared to the percentage of 30x30 Conservation Areas in CA          |
| Juniper                  | 17.2 %<br>17.2 - 17.2 %                  |  | Conservation of feature needed: under-represented compared to the percentage of 30x30 Conservation Areas in CA          |
| Sierran Mixed Conifer    | 20.2 %<br>20.1 - 20.3 %                  |  | Conservation of feature needed: slightly under-represented compared to the percentage of 30x30 Conservation Areas in CA |
| Redwood                  | 23.9 %<br>24.1 - 24.1 %                  |  | Conservation of feature needed: slightly under-represented compared to the percentage of 30x30 Conservation Areas in CA |
| White Fir                | 26.3 %<br>26.2 - 26.2 %                  |  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Closed-Cone Pine-Cypress | 30.1 %<br>30.1 - 30.4 %                  |  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Jeffrey Pine             | 36.1 %<br>36 - 36.1 %                    |  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Red Fir                  | 47.6 %<br>47.6 - 47.6 %                  |  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Pinyon-Juniper           | 52.6 %<br>52.6 - 52.7 %                  |  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Lodgepole Pine           | 71.1 %<br>71.1 - 71.1 %                  |  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Subalpine Conifer        | 85.8 %<br>85.7 - 85.8 %                  |  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |

Table 5. Representation levels and the conservation need, pathways, and opportunities to advance conservation of finer-resolution hardwood woodland and forest habitats. Proportional pathway opportunities include improving management or increasing durability on other public lands or conserved areas (green) or acquisition or easements on non-conserved lands (yellow). \*Additional goals can include stratified representation (e.g., ecoregion, watershed), or within these habitats, protection of fine-filter species, connectivity corridors, climate resilient landscapes, areas of cultural significance, or access for disadvantaged communities.

| Feature                  | % of feature in 30x30 Conservation Areas | Proportional Pathway Opportunity | Conservation Opportunity                                                                                                |
|--------------------------|------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Blue Oak-Foothill Pine   | 9.4 %<br>9.3 - 9.7 %                     |                                  | Conservation of feature needed: under-represented compared to the percentage of 30x30 Conservation Areas in CA          |
| Blue Oak Woodland        | 10.3 %<br>10.2 - 10.6 %                  |                                  | Conservation of feature needed: under-represented compared to the percentage of 30x30 Conservation Areas in CA          |
| Valley Oak Woodland      | 10.5 %<br>10.3 - 10.9 %                  |                                  | Conservation of feature needed: under-represented compared to the percentage of 30x30 Conservation Areas in CA          |
| Eucalyptus               | 11.4 %<br>10.8 - 11.8 %                  |                                  | Conservation of feature needed: under-represented compared to the percentage of 30x30 Conservation Areas in CA          |
| Montane Hardwood         | 20.4 %<br>20.2 - 20.7 %                  |                                  | Conservation of feature needed: slightly under-represented compared to the percentage of 30x30 Conservation Areas in CA |
| Valley Foothill Riparian | 20.7 %<br>20.5 - 21.4 %                  |                                  | Conservation of feature needed: slightly under-represented compared to the percentage of 30x30 Conservation Areas in CA |
| Coastal Oak Woodland     | 22 %<br>21.8 - 22.7 %                    |                                  | Conservation of feature needed: slightly under-represented compared to the percentage of 30x30 Conservation Areas in CA |
| Aspen                    | 29.7 %<br>29.7 - 29.7 %                  |                                  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Montane Riparian         | 43.8 %<br>43.4 - 44.1 %                  |                                  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |

#### Feature Representation

- Under-represented feature (<20% conserved) compared to the percentage of conservation areas in CA
- Slightly under-represented feature (20-26.1% conserved) compared to the percentage of conservation areas in CA
- On par with or above the percentage of conservation areas in CA (>=26.1% conserved)

#### Proportional pathway opportunities

- Enhance management on public and other conserved lands to include biodiversity and ecosystem health
- Execute strategic land acquisitions and voluntary conservation easements on non-conserved lands

Table 6. Representation levels and the conservation need, pathways, and opportunities to advance conservation of finer-resolution shrub and grassland habitats. Proportional pathway opportunities include improving management or increasing durability on other public lands or conserved areas (green) or acquisition or easements on non-conserved lands (yellow). \*Additional goals can include stratified representation (e.g., ecoregion, watershed), or within these habitats, protection of fine-filter species, connectivity corridors, climate resilient landscapes, areas of cultural significance, or access for disadvantaged communities.

| Feature                    | % of feature in 30x30 Conservation Areas | Proportional Pathway Opportunity                                                    | Conservation Opportunity                                                                                                |
|----------------------------|------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Bitterbrush                | 13.6 %<br>13.4 - 13.7 %                  |    | Conservation of feature needed: under-represented compared to the percentage of 30x30 Conservation Areas in CA          |
| Low Sage                   | 14.2 %<br>14.1 - 14.3 %                  |    | Conservation of feature needed: under-represented compared to the percentage of 30x30 Conservation Areas in CA          |
| Annual Grassland           | 15.2 %<br>15.1 - 15.4 %                  |    | Conservation of feature needed: under-represented compared to the percentage of 30x30 Conservation Areas in CA          |
| Sagebrush                  | 22.8 %<br>22.5 - 22.9 %                  |    | Conservation of feature needed: slightly under-represented compared to the percentage of 30x30 Conservation Areas in CA |
| Chamise-Redshank Chaparral | 26.6 %<br>25.3 - 29.4 %                  |   | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Coastal Scrub              | 26.6 %<br>26.1 - 27.6 %                  |  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Perennial Grassland        | 30.8 %<br>30.8 - 30.9 %                  |  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Mixed Chaparral            | 31.1 %<br>29.7 - 31.7 %                  |  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Montane Chaparral          | 32.1 %<br>32.1 - 32.2 %                  |  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Alpine-Dwarf Shrub         | 80.1 %<br>80.1 - 80.1 %                  |  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |

#### Feature Representation

-  Under-represented feature (<20% conserved) compared to the percentage of conservation areas in CA
-  Slightly under-represented feature (20-26.1% conserved) compared to the percentage of conservation areas in CA
-  On par with or above the percentage of conservation areas in CA (>=26.1% conserved)

#### Proportional pathway opportunities

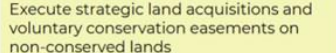
-  Enhance management on public and other conserved lands to include biodiversity and ecosystem health
-  Execute strategic land acquisitions and voluntary conservation easements on non-conserved lands

Table 7. Representation levels and the conservation need, pathways, and opportunities to advance conservation of finer-resolution desert habitats. Proportional pathway opportunities include improving management or increasing durability on other public lands or conserved areas (green) or acquisition or easements on non-conserved lands (yellow). \*Additional goals can include stratified representation (e.g., ecoregion, watershed), or within these habitats, protection of fine-filter species, connectivity corridors, climate resilient landscapes, areas of cultural significance, or access for disadvantaged communities.

| Feature                | % of feature in 30x30 Conservation Areas | Proportional Pathway Opportunity                                                    | Conservation Opportunity                                                                                                |
|------------------------|------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Desert Riparian        | 16.5 %<br>16.4 - 16.4 %                  |    | Conservation of feature needed: under-represented compared to the percentage of 30x30 Conservation Areas in CA          |
| Alkali Desert Scrub    | 19.7 %<br>19.7 - 19.7 %                  |    | Conservation of feature needed: under-represented compared to the percentage of 30x30 Conservation Areas in CA          |
| Desert Succulent Shrub | 37.2 %<br>37.2 - 37.2 %                  |    | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Palm Oasis             | 49.8 %<br>48 - 48 %                      |    | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Desert Scrub           | 50.1 %<br>50.1 - 50.1 %                  |   | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Joshua Tree            | 63.1 %<br>63.1 - 63.1 %                  |  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Desert Wash            | 65.4 %<br>65.4 - 65.5 %                  |  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |

#### Feature Representation

-  Under-represented feature (<20% conserved) compared to the percentage of conservation areas in CA
-  Slightly under-represented feature (20-26.1% conserved) compared to the percentage of conservation areas in CA
-  On par with or above the percentage of conservation areas in CA (>=26.1% conserved)

#### Proportional pathway opportunities

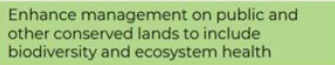
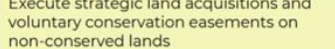
-  Enhance management on public and other conserved lands to include biodiversity and ecosystem health
-  Execute strategic land acquisitions and voluntary conservation easements on non-conserved lands

Table 8. Representation levels and the conservation need, pathways, and opportunities to advance conservation of finer-resolution wetland and aquatic habitats. Proportional pathway opportunities include improving management or increasing durability on other public lands or conserved areas (green) or acquisition or easements on non-conserved lands (yellow). \*Additional goals can include stratified representation (e.g., ecoregion, watershed), or within these habitats, protection of fine-filter species, connectivity corridors, climate resilient landscapes, areas of cultural significance, or access for disadvantaged communities.

| Feature                 | % of feature in 30x30 Conservation Areas | Proportional Pathway Opportunity                                                    | Conservation Opportunity                                                                                                |
|-------------------------|------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Riverine                | 17.6 %<br>17.7 - 17.8 %                  |    | Conservation of feature needed: under-represented compared to the percentage of 30x30 Conservation Areas in CA          |
| Lacustrine              | 23.7 %<br>23.6 - 23.8 %                  |    | Conservation of feature needed: slightly under-represented compared to the percentage of 30x30 Conservation Areas in CA |
| Estuarine               | 28 %<br>27.6 - 28.3 %                    |    | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Saline Emergent Wetland | 37.7 %<br>37.5 - 37.9 %                  |    | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Wet Meadow              | 42.7 %<br>42.6 - 42.9 %                  |   | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |
| Fresh Emergent Wetland  | 52 %<br>51.9 - 52.2 %                    |  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals* |

#### Feature Representation

-  Under-represented feature (<20% conserved) compared to the percentage of conservation areas in CA
-  Slightly under-represented feature (20-26.1% conserved) compared to the percentage of conservation areas in CA
-  On par with or above the percentage of conservation areas in CA (>=26.1% conserved)

#### Proportional pathway opportunities

-  Enhance management on public and other conserved lands to include biodiversity and ecosystem health
-  Execute strategic land acquisitions and voluntary conservation easements on non-conserved lands



TNC is working to improve forest health at Independence Lake in the heart of the Sierra Nevada © Simon Williams/TNC

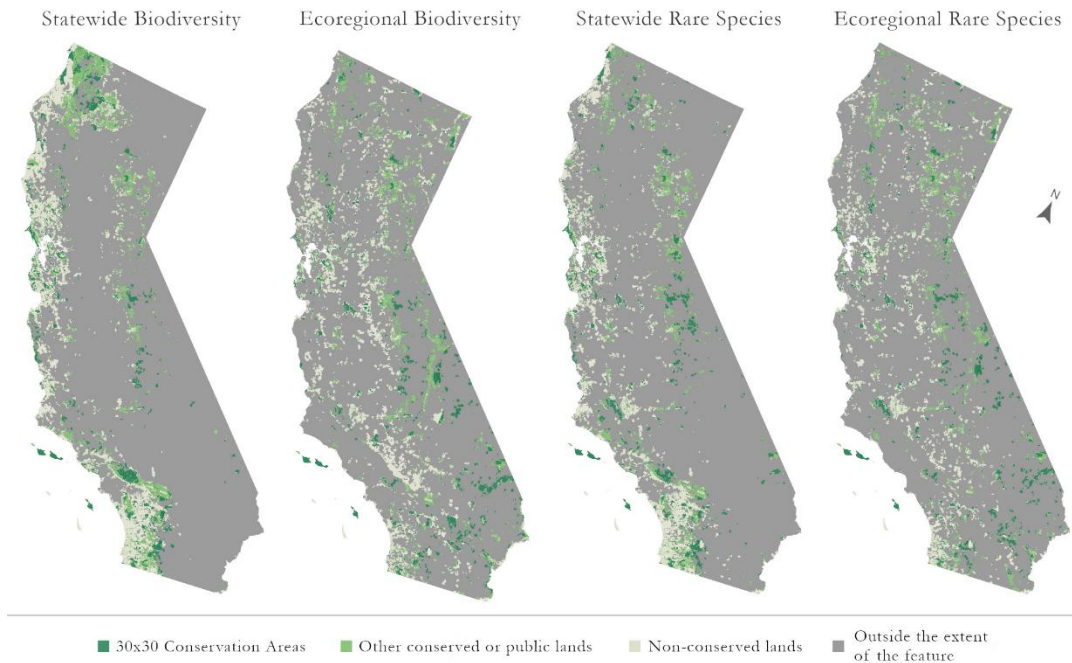
## Richness

Biodiversity rank and richness data (CDFW, 2018, Kling et al., 2019) are derived from continuous surfaces, so we evaluated top-ranked or top richness areas (top 20% for overall species richness and endemic plant richness, and top 5% for rare and endemic vertebrate richness). In a conservation network that effectively protects biodiversity, all, or most of the areas with the highest-ranked and most species-rich areas should be distributed within the conservation areas. Our results indicate that this is not yet the case: the top-ranked areas for overall biodiversity and rare biodiversity— both statewide and within ecoregions—are below statewide conservation percentages (Table 9, Figure 9).

Although plant richness, endemic plant rarity-weighted richness, and reptile richness are on par or above statewide conservation levels (Tables 10 and 11, Figures 10-14), this still indicates that less than half of the most species-rich areas are currently within the 30x30 Conservation Area network. Representation is particularly low for birds (all, rare, and endemic), amphibians, and endemic reptiles, whose remaining high-richness areas lie largely on non-conserved lands, again suggesting a need for acquisitions or easements to ensure the most species-rich areas for these taxa are conserved (Table 10, Figures 10-13). In contrast, many of the remaining opportunities to conserve the richest areas for plants and mammals occur on public or other conserved lands, where improved management and more durable protection could substantially improve outcomes.

*Table 9. Representation levels and the proportional pathway opportunities to advance conservation of the top ranked biodiversity priorities. For these threshold-derived features, comparison to California levels of conservation is not applicable, and conservation should target all of the most species-rich areas.*

| Feature                                    | % of feature in 30x30 Conservation Areas | Proportional Pathway Opportunity | Proportional pathway opportunities                                                                  |
|--------------------------------------------|------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------|
| Top Ranked Biodiversity Statewide          | 21 %<br>20.7 - 21.4 %                    |                                  | Enhance management on public and other conserved lands to include biodiversity and ecosystem health |
| Top Ranked Biodiversity per Ecoregion      | 23 %<br>22.5 - 22.7 %                    |                                  | Execute strategic land acquisitions and voluntary conservation easements on non-conserved lands     |
| Top Ranked Rare Biodiversity Statewide     | 23 %<br>23.1 - 23.8 %                    |                                  |                                                                                                     |
| Top Ranked Rare Biodiversity per Ecoregion | 25 %<br>24.7 - 25.1 %                    |                                  |                                                                                                     |



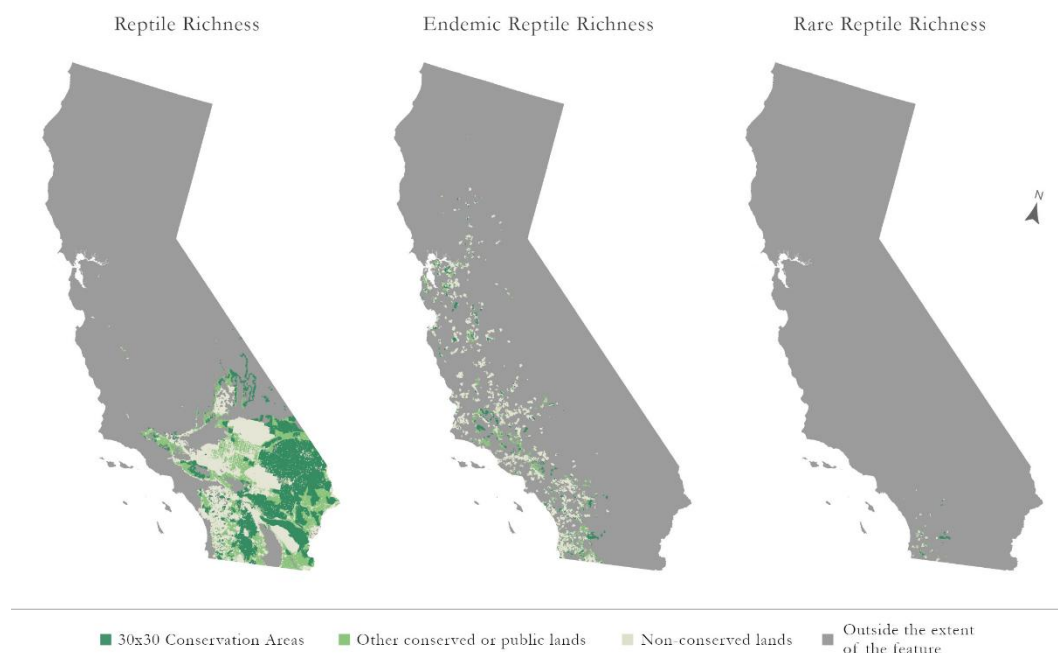
**FIGURE 9. THE EXTENT OF TOP RANKED BIODIVERSITY (ACE RANK 5) STATEWIDE AND PER ECOREGION AND THE TOP RANKED RARE BIODIVERSITY (ACE RANK 5) STATEWIDE AND PER ECOREGION COLORED BY CONSERVATION STATUS: 30x30 CONSERVATION AREAS, OTHER CONSERVED OR PUBLIC LANDS, AND NON-CONSERVED LANDS. MAPPED CONSERVATION STATUS WITHIN CONSERVATION AREAS IS DETERMINED BY MAJORITY CONSERVATION STATUS. GRAY AREAS ARE OUTSIDE THE EXTENT OF THE FEATURE.**



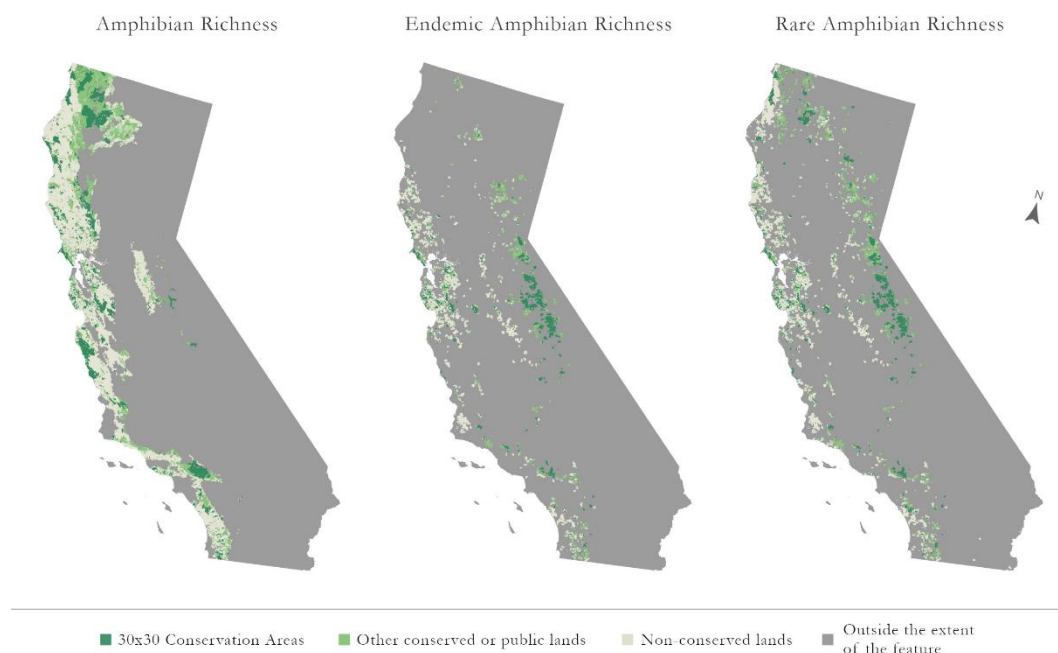
A Santa Cruz Island fox peers out through the grass © Ian Shive

Table 10. Representation levels and proportional pathway opportunities to advance conservation of the most species rich (top 20%) areas for vertebrate taxa and most species rich (top 5%) for rare and endemic subsets of each taxon. For these threshold-derived features, comparison to California levels of conservation is not applicable, and conservation should target all of the most species-rich areas.

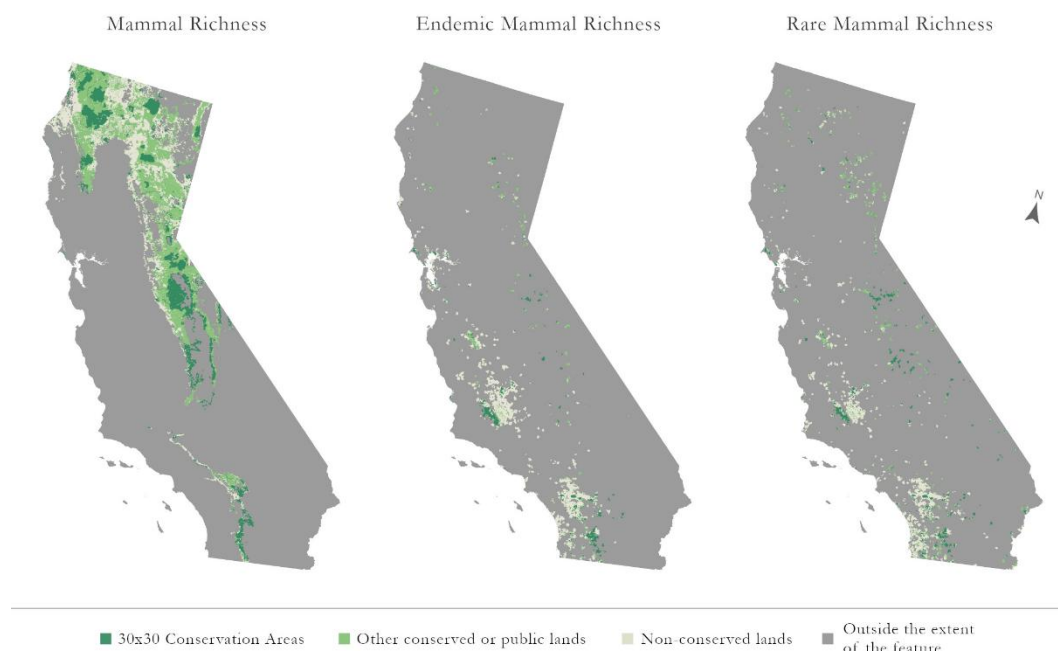
| Feature                    | % of feature in 30x30 Conservation Areas | Proportional Pathway Opportunity                                                    | Proportional pathway opportunities                                                                                                                                                                     |
|----------------------------|------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reptile Richness           | 41 %<br>40.6 - 41 %                      |    | Enhance management on public and other conserved lands to include biodiversity and ecosystem health<br>Execute strategic land acquisitions and voluntary conservation easements on non-conserved lands |
| Amphibian Richness         | 19 %<br>19.1 - 19.7 %                    |    |                                                                                                                                                                                                        |
| Mammal Richness            | 22 %<br>22.2 - 22.3 %                    |    |                                                                                                                                                                                                        |
| Bird Richness              | 12 %<br>11.7 - 12 %                      |    |                                                                                                                                                                                                        |
| Rare Reptile Richness      | 22 %<br>21.7 - 22.8 %                    |   |                                                                                                                                                                                                        |
| Rare Amphibian Richness    | 26 %<br>25.9 - 26.5 %                    |  |                                                                                                                                                                                                        |
| Rare Mammal Richness       | 23 %<br>23.1 - 23.5 %                    |  |                                                                                                                                                                                                        |
| Rare Bird Richness         | 16 %<br>15.7 - 16.5 %                    |  |                                                                                                                                                                                                        |
| Endemic Reptile Richness   | 19 %<br>18 - 19.7 %                      |  |                                                                                                                                                                                                        |
| Endemic Amphibian Richness | 27 %<br>27.1 - 27.9 %                    |  |                                                                                                                                                                                                        |
| Endemic Mammal Richness    | 20 %<br>20.4 - 20.6 %                    |  |                                                                                                                                                                                                        |
| Endemic Bird Richness      | 24 %<br>23.4 - 25.3 %                    |  |                                                                                                                                                                                                        |



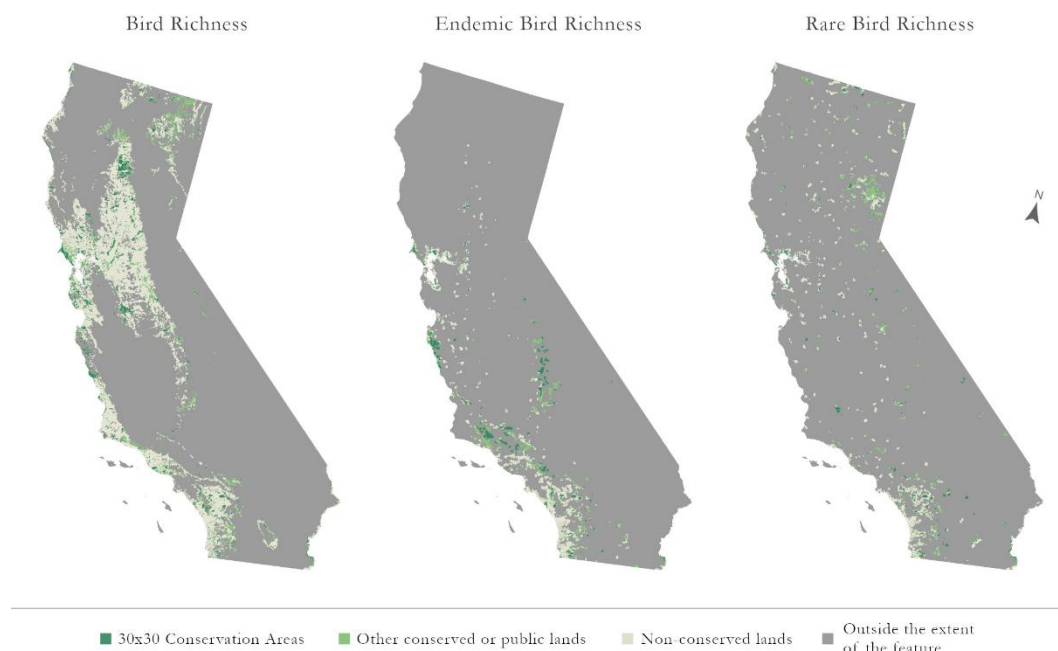
**FIGURE 10. THE EXTENT OF THE MOST SPECIES-RICH AREAS FOR ALL NATIVE REPTILES (TOP 20% MOST RICH), ENDEMIC REPTILES (TOP 5% MOST RICH), AND RARE REPTILES (TOP 5% MOST RICH) COLORED BY CONSERVATION STATUS: 30x30 CONSERVATION AREAS, OTHER CONSERVED OR PUBLIC LANDS, AND NON-CONSERVED LANDS. MAPPED CONSERVATION STATUS WITHIN CONSERVATION AREAS IS DETERMINED BY MAJORITY CONSERVATION STATUS. GRAY AREAS ARE OUTSIDE THE EXTENT OF THE FEATURE.**



**FIGURE 11. THE EXTENT OF THE MOST SPECIES-RICH AREAS FOR ALL NATIVE AMPHIBIANS (TOP 20% MOST RICH), ENDEMIC AMPHIBIANS (TOP 5% MOST RICH), AND RARE AMPHIBIANS (TOP 5% MOST RICH) COLORED BY CONSERVATION STATUS: 30x30 CONSERVATION AREAS, OTHER CONSERVED OR PUBLIC LANDS, AND NON-CONSERVED LANDS. MAPPED CONSERVATION STATUS WITHIN CONSERVATION AREAS IS DETERMINED BY MAJORITY CONSERVATION STATUS. GRAY AREAS ARE OUTSIDE THE EXTENT OF THE FEATURE.**



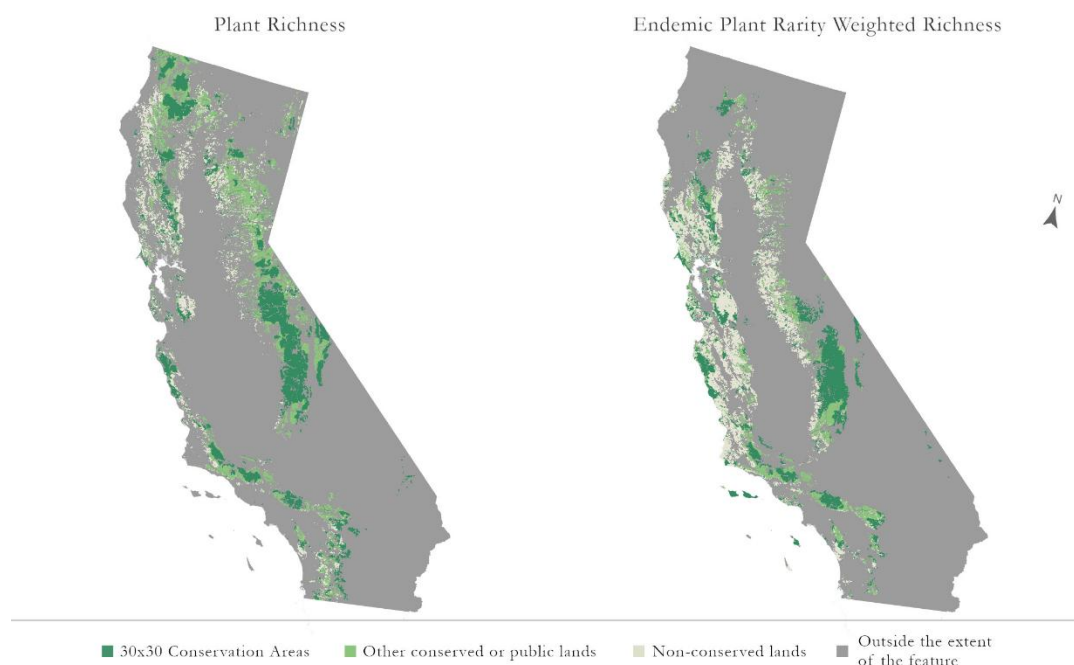
**FIGURE 12. THE EXTENT OF THE MOST SPECIES-RICH AREAS FOR ALL NATIVE MAMMALS (TOP 20% MOST RICH), ENDEMIC MAMMALS (TOP 5% MOST RICH), AND RARE MAMMALS (TOP 5% MOST RICH) COLORED BY CONSERVATION STATUS: 30x30 CONSERVATION AREAS, OTHER CONSERVED OR PUBLIC LANDS, AND NON-CONSERVED LANDS. MAPPED CONSERVATION STATUS WITHIN CONSERVATION AREAS IS DETERMINED BY MAJORITY CONSERVATION STATUS. GRAY AREAS ARE OUTSIDE THE EXTENT OF THE FEATURE.**



**FIGURE 13. THE EXTENT OF THE MOST SPECIES-RICH AREAS FOR ALL NATIVE BIRDS (TOP 20% MOST RICH), ENDEMIC BIRDS (TOP 5% MOST RICH), AND RARE BIRDS (TOP 5% MOST RICH) COLORED BY CONSERVATION STATUS: 30x30 CONSERVATION AREAS, OTHER CONSERVED OR PUBLIC LANDS, AND NON-CONSERVED LANDS. MAPPED CONSERVATION STATUS WITHIN CONSERVATION AREAS IS DETERMINED BY MAJORITY CONSERVATION STATUS. GRAY AREAS ARE OUTSIDE THE EXTENT OF THE FEATURE.**

Table 11. Representation levels and proportional pathway opportunities to advance conservation of the most species rich (top 20%) areas for plants and rarity-weighted endemic plants. For these threshold-derived features, comparison to California levels of conservation is not applicable, and conservation should target all of the most species-rich areas.

| Feature                                | % of feature in 30x30 Conservation Areas | Proportional Pathway Opportunity                                                  | Proportional pathway opportunities                                                                                                                                                                     |
|----------------------------------------|------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Plant Richness                         | 41 %<br>40.2 - 40.9 %                    |  | Enhance management on public and other conserved lands to include biodiversity and ecosystem health<br>Execute strategic land acquisitions and voluntary conservation easements on non-conserved lands |
| Endemic Plant Rarity Weighted Richness | 34 %<br>33.4 - 34.1 %                    |  |                                                                                                                                                                                                        |



**FIGURE 14. THE EXTENT OF THE MOST SPECIES RICH (TOP 20%) AREAS FOR ALL PLANTS AND RARITY-WEIGHTED ENDEMIC PLANTS COLORED BY CONSERVATION STATUS: 30x30 CONSERVATION AREAS, OTHER CONSERVED OR PUBLIC LANDS, AND NON-CONSERVED LANDS. MAPPED CONSERVATION STATUS WITHIN CONSERVATION AREAS IS DETERMINED BY MAJORITY CONSERVATION STATUS. GRAY AREAS ARE OUTSIDE THE EXTENT OF THE FEATURE.**

## Connectivity and Resilience

Channelized connectivity features (Cameron et al., 2022) are conserved at levels below overall statewide conservation coverage. Key regional linkages (e.g., those identified in the South Coast Missing Linkages project; Beier et al., 2006) are conserved at levels roughly on par with statewide levels of representation (Table 12, Figure 15). However, preservation of the entire linkage is critical for maintaining ecosystem function, making conservation of all of the remaining linkage extents and channelized connectivity a high priority. Some channelized and regional linkages could be secured through improved management and enhanced durability of GAP 3 and 4 lands, but the majority of these linkage areas occur on non-conserved lands that will require acquisitions or easements. Intensified connectivity is somewhat under-represented, whereas diffuse connectivity and climate linkages occur at levels above overall 30x30 coverage.

Table 12. Representation levels and the conservation need, pathways, and opportunities to advance conservation of habitat connectivity. Proportional pathway opportunities include improving management or increasing durability on other public lands or conserved areas (green) or acquisition and easements on non-conserved lands (yellow). \*Additional goals can include stratified representation (e.g., ecoregion, watershed), protection of fine-filter species, climate resilient landscapes, areas of cultural significance, or access for disadvantaged communities.

| Feature                      | % of feature in 30x30 Conservation Areas | Proportional Pathway Opportunity | Conservation Opportunity                                                                                                          |
|------------------------------|------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Channelized Connectivity     | 23 %<br>22.4 - 23.3 %                    |                                  | Conservation of remaining feature needed: rare or historically degraded feature that plays a critical role for ecosystem function |
| Intensified Connectivity     | 22 %<br>21.7 - 22.5 %                    |                                  | Conservation of feature needed: slightly under-represented compared to the percentage of 30x30 Conservation Areas in CA           |
| Diffuse Connectivity         | 37 %<br>36.7 - 37 %                      |                                  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals*           |
| Climate Linkage              | 42 %<br>41.3 - 42.1 %                    |                                  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals*           |
| South Coast Missing Linkages | 27 %<br>26.4 - 29.1 %                    |                                  | Conservation of remaining feature needed: rare or historically degraded feature that plays a critical role for ecosystem function |

#### Key Features



Historically converted or rare features, or features with a critical role for ecosystem function for which proportional representation is not relevant

#### Feature Representation



Under-represented feature (<20% conserved) compared to the percentage of conservation areas in CA



Slightly under-represented feature (20-26.1% conserved) compared to the percentage of conservation areas in CA

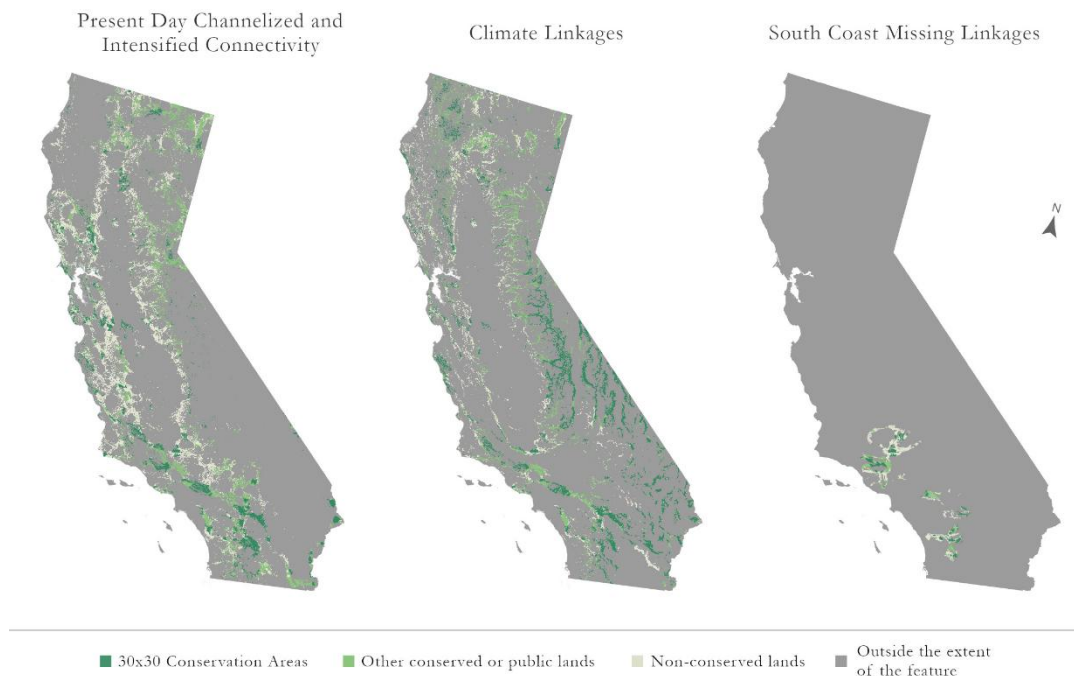


On par with or above the percentage of conservation areas in CA (>=26.1% conserved)

#### Proportional pathway opportunities

Enhance management on public and other conserved lands to include biodiversity and ecosystem health

Execute strategic land acquisitions and voluntary conservation easements on non-conserved lands



**FIGURE 15. THE EXTENT OF IMPORTANT CONNECTIVITY AREAS FOR WILDLIFE MOVEMENT COLORED BY CONSERVATION STATUS: 30x30 CONSERVATION AREAS, OTHER CONSERVED OR PUBLIC LANDS, AND NON-CONSERVED LANDS. DIFFUSE WELL-CONNECTED HABITATS ARE NOT MAPPED HERE. MAPPED CONSERVATION STATUS WITHIN CONSERVATION AREAS IS DETERMINED BY MAJORITY CONSERVATION STATUS. GRAY AREAS ARE OUTSIDE THE EXTENT OF THE FEATURE.**

## Freshwater Resources

Freshwater habitats emerge as both relatively well represented and highly vulnerable. For example, 32–33% of remaining wetlands and groundwater-dependent ecosystems are in 30×30 Conservation Areas, but their historical loss, restricted distribution, and crucial role in ecosystem function make them “Key Features” and underscore the need to conserve the remaining extent of these habitats (Table 13, Figure 16). Major rivers (22%) and mid-sized streams (24%) are slightly under-represented relative to overall conservation coverage, while headwater streams (27%) are on par with statewide levels. Conservation of rivers and streams and their surrounding riparian areas will be especially important to allow species to respond and adapt to climate change because they provide connectivity between habitats and across elevational gradients (Seavy et al., 2009). The 100-year floodplain (14%) is notably under-represented and is a clear opportunity for future conservation. Only 22% of the area of watersheds with the highest freshwater species richness are in 30×30 Conservation Areas, pointing to the need for targeted protections to ensure that conservation lands protect the most species-rich areas.



Chinook salmon on the North Coast ©Jeffrey Rich

Table 13. Representation levels and the conservation need, pathways, and opportunities to advance conservation of freshwater features. Proportional pathway opportunities include improving management or increasing durability on other public lands or conserved areas (green) or acquisition and easements on non-conserved lands (yellow). \*Additional goals can include stratified representation (e.g., ecoregion, watershed), protection of fine-filter species, connectivity corridors, climate resilient landscapes, areas of cultural significance, or access for disadvantaged communities.

| Feature                                             | % of feature in 30x30 Conservation Areas | Proportional Pathway Opportunity | Conservation Opportunity                                                                                                          |
|-----------------------------------------------------|------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Remaining Wetlands                                  | 32 %<br>32.1 - 32.4 %                    |                                  | Conservation of remaining feature needed: rare or historically degraded feature that plays a critical role for ecosystem function |
| Groundwater Dependent Ecosystems                    | 33 %<br>33.4 - 33.6 %                    |                                  | Conservation of remaining feature needed: rare or historically degraded feature that plays a critical role for ecosystem function |
| Rivers (order 6+)                                   | 22 %<br>21.7 - 21.9 %                    |                                  | Conservation of feature needed: slightly under-represented compared to the percentage of 30x30 Conservation Areas in CA           |
| Streams (3-5)                                       | 24 %<br>23.8 - 24.4 %                    |                                  | Conservation of feature needed: slightly under-represented compared to the percentage of 30x30 Conservation Areas in CA           |
| Headwaters (order 1-2)                              | 27 %<br>26.8 - 27.5 %                    |                                  | On par with the percentage of 30x30 Conservation Areas in CA. Conservation of feature should focus on additional goals*           |
| 100yr Floodplain                                    | 14 %<br>14.2 - 14.4 %                    |                                  | Conservation of feature needed: under-represented compared to the percentage of 30x30 Conservation Areas in CA                    |
| Watersheds with top 20% freshwater species richness | 22 %<br>21.4 - 22 %                      |                                  | Representation of feature not applicable - additional conservation needed for most species rich areas                             |

#### Feature Representation

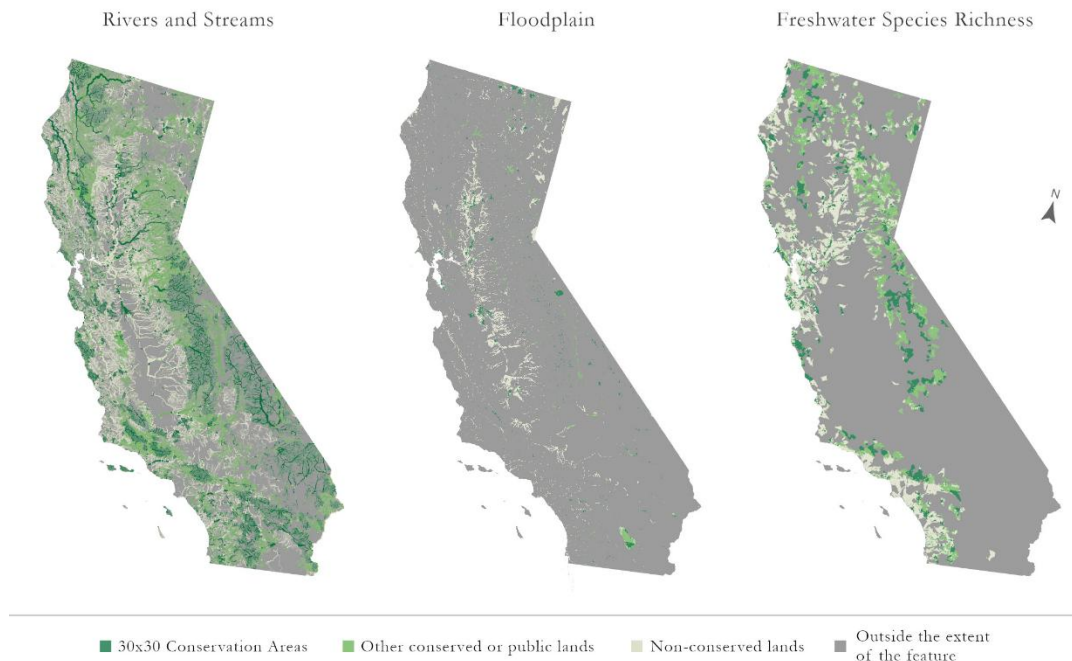
- Under-represented feature (<20% conserved) compared to the percentage of conservation areas in CA
- Slightly under-represented feature (20-26.1% conserved) compared to the percentage of conservation areas in CA
- On par with or above the percentage of conservation areas in CA (>=26.1% conserved)
- Not Applicable

#### Key Features

- Historically converted or rare features, or features with a critical role for ecosystem function for which proportional representation is not relevant

#### Proportional pathway opportunities

- Enhance management on public and other conserved lands to include biodiversity and ecosystem health
- Execute strategic land acquisitions and voluntary conservation easements on non-conserved lands



**FIGURE 16. THE EXTENT OF FRESHWATER FEATURES COLORED BY CONSERVATION STATUS: 30x30 CONSERVATION AREAS, OTHER CONSERVED OR PUBLIC LANDS, AND NON-CONSERVED LANDS. MAPPED CONSERVATION STATUS WITHIN CONSERVATION AREAS IS DETERMINED BY MAJORITY CONSERVATION STATUS. GRAY AREAS ARE OUTSIDE THE EXTENT OF THE FEATURE. WETLANDS AND GROUNDWATER DEPENDENT ECOSYSTEMS ARE NOT DISPLAYED.**

## Uncertainty of Estimates

Although the true coverage of any habitat or feature cannot be known—because GAP status is not spatially explicit—none of the features showed differences among the lower, proportional, or upper estimates that crossed key framework thresholds (i.e., 20%, 26.1%). As a result, there was no uncertainty in conservation need or recommended pathway for any habitat or feature.

## Discussion

This assessment highlights both progress and persistent challenges in meeting California’s 30x30 objectives. Ecoregional and habitat imbalances in the current network along with low protection levels for Key Features and the most species-rich areas underscore the importance of targeted conservation. Habitats such as hardwood woodlands and grasslands are markedly under-represented and primarily occur on non-conserved lands, emphasizing the need for strategic acquisitions and easements. Conifer forests and woodlands are only slightly under-represented, with more balanced opportunities for both management-based conservation on existing conserved lands and new protection on non-conserved lands.

While the Mojave Desert and Sierra Nevada together comprise nearly half of the network, many ecoregions contribute less than 10%, revealing gaps in representation that must be addressed to ensure biodiversity is conserved across the state and that access to nature is equitably distributed.

## Maximizing 30x30 for Biodiversity

California has a long history of land protection. Only recently, however, have conservation decisions been guided by explicit biodiversity priorities and principles such as representation, species richness and rarity, connectivity, and resilience. Ensuring that the 30x30 Conservation Area network effectively addresses biodiversity decline will require increased focus on:

- The most species-rich and highest-ranked biodiversity hotspots,

- Rare and functionally critical habitats, and
- Under-represented habitats and ecoregions.

The findings here can help prioritize where additional conservation will most effectively advance 30×30. For habitats with low representation within the 30×30 Conservation Areas—such as grasslands, blue oak woodland, valley oak woodland, and blue oak–foothill pine—increasing conservation to meet or exceed statewide levels is a clear objective. These habitats often occur on private lands, with additional conservation opportunities primarily for acquisitions and easements, or a need to identify how best to engage landowners in long-term conservation efforts. Where representation is already relatively high, as in many desert habitats, new investments in these habitats may best focus on fine-scale habitat classes, fine-filter targets such as rare and endemic species, improving ecoregional representation, strengthening connectivity and climate resilience, protecting cultural significance, and advancing equitable access for disadvantaged communities.

## Climate Change

Climate change increases the urgency of conservation and can help us further refine where investments will be most meaningful for biodiversity. Projections that one-third of the network’s vegetation will face climate stress (based on CWHR-level habitat exposure, methods from Thorne et al. 2016), combined with recent wildfire activity, highlight the need for a conservation strategy that is explicitly climate-aware. Fire remains a natural and often beneficial process, but increasingly severe fires and shortened return intervals can drive ecosystem transitions (Williams et al. 2023). Building resilience into the 30×30 network will need additional focus on:

- Ensuring representation of habitats within and across ecoregions and watersheds,
- Maintaining redundancy across climatic gradients,
- Prioritizing areas projected to remain climatically stable, or with habitats projected to be stable, or that contain high microclimatic diversity, and
- Creating a connected network of conservation areas that allows for movement.

However, even if protected areas are planned with a lens toward climate resilience, effects of climate change do not respect borders and can impact ecosystems both inside and outside of protected areas. Management can be an effective tool to enhance the ability for protected areas to conserve biodiversity in a changing climate. For example, in the case of wildfire, it is increasingly evident that wise forest management is critical to reduce the likelihood of high severity fire. This highlights the importance of coupling protection with stewardship, consistent with the priority pathways of California’s 30x30 strategy (CNRA, 2022) and aligned with state’s nature-based solutions climate targets (CNRA, 2024).

## Moving The Needle Toward 30%

This analysis focuses on three of the ten pathways identified by the state to meet 30×30 goals: executing strategic land acquisitions, increasing voluntary conservation easements, and enhancing conservation of existing public lands and coastal waters. These are the pathways that directly move the needle toward the 30% goal. In this report, we treat each of those three pathway opportunities as equally viable and compare opportunities based solely on the proportion of the habitat/feature occurring within areas suited to each pathway. In practice, however, these pathways differ substantially in feasibility, scale, cost, and implementation challenges. Recent progress toward 30x30 has come largely from increasing durability on other conserved lands – particularly through federal actions such as designations of the Chuckwalla National Monument and Sattitla Highlands National Monuments. Yet the extent to which this pathway can continue to deliver the acreage needed to meet the 30% commitment remains uncertain. Relying primarily on acquisitions and easements would require unprecedented annual rates of protection of non-conserved lands. Accelerating progress on these lands will require aligning state conservation funding with durable management (GAP 1 or 2), along with clear expectations for submitting boundary and GAP-status data so that conservation investments translate into measurable gains.

## Caveats

In this analysis we focused on three of the strategies outlined in the pathways document, but there are additional strategies—such as restoration, stewardship, and policy changes that do not directly contribute to the “30% by area” accounting. Although these are not evaluated here, they are essential for ensuring that California’s ecosystems are thriving and resilient.

Biodiversity data are inherently incomplete and evolving. Ongoing sampling and monitoring are needed to improve our understanding of species distributions and ecosystem condition. Future work could include the identification of data gaps needed to be filled to complete a more comprehensive biodiversity analysis. Frontiers in eDNA, community science data collection, Sentinel Site Network biodiversity, and sampling have the potential to fill in many needed gaps in California’s data on biodiversity. We encourage ongoing data submissions to the ACE datasets that drive many planning decisions in California.

The Conservation Areas dataset used in this analysis relies on GAP status codes at the unit level but does not spatially map GAP categories within units that contain multiple statuses resulting in uncertainty in representation estimates. Although the range of possible estimates is somewhat low for most features, it still comparable to – or larger than – the annual increases in 30x30 Conservation Area acreage. Without spatially explicit GAP data, we cannot test or improve the accuracy of these estimates.

## Conclusion

The expansion of 30x30 Conservation Areas has added roughly 2.5 million acres since 2022 through acquisitions and easements on non-conserved land, improved management, and durability on other conserved or public lands, and through an expansive data collection effort on conservation area boundaries and GAP status codes. Nearly 4 million more acres are needed to reach the 2030 goal. Under-represented ecosystems, species-rich areas, and key features—grasslands, oak woodlands, wetlands, floodplains, and connectivity corridors—should remain high priorities, many of which lie on non-conserved lands. Additionally, engaging landowners through incentive programs, voluntary easements, and collaborative conservation models will be critical in the years ahead.

At the halfway mark to 2030, California has made meaningful strides toward its 30x30 conservation goals, yet substantial challenges remain. The state’s diverse landscapes call for a balanced approach that strengthens existing protections, expands conservation in under-represented regions and habitats, and explicitly incorporates climate resilience and equity. Looking ahead, success will depend on strategically securing new lands for durable protection, improving management on existing conserved and public lands, and addressing representation gaps for vulnerable habitats and key biodiversity features. If these next steps are implemented thoughtfully and at scale and with complementary strategies, California’s 30x30 initiative can help build an interconnected, well-managed conservation network capable of sustaining the state’s extraordinary biodiversity in a rapidly changing world.

## References

- Beier, P., K. Penrod, C. Luke, and W. Spencer. (2006). South Coast Missing Linkages: restoring connectivity to wildlands in the largest metropolitan area in the United States. In: K. R. Crooks and M. Sanjayan (eds.), *Connectivity and conservation*.
- California Department of Fish and Wildlife (CDFW). (2018). Areas of Conservation Emphasis (ACE) Version 3: A California Department of Fish and Wildlife conservation analysis tool. <https://wildlife.ca.gov/Data/Analysis/Ace>
- California Department of Fish and Wildlife (CDFW). (2025). *California's State Wildlife Action Plan* (SWAP). <https://wildlife.ca.gov/SWAP>
- California Department of Forestry and Fire Protection (CAL FIRE)(2024). *FVEG*. <https://frap.fire.ca.gov/mapping/gis-data/>
- California Department of Forestry and Fire Protection (CAL FIRE). (2025). *California Fire Perimeters*. <https://www.fire.ca.gov/what-we-do/fire-resource-assessment-program>
- California Natural Resources Agency. (n.d.). *30x30 ecoregions*. <https://data.cnra.ca.gov/dataset/30x30-ecoregions>
- California Natural Resources Agency (CNRA). (2022). Pathways to 30x30: Accelerating Conservation of California's Nature. <https://canature.maps.arcgis.com/sharing/rest/content/items/8da9faef231c4e31b651ae6dff95254e/d ata>
- California Natural Resources Agency. (2024). *California's nature-based solutions climate targets*. <https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Expanding-Nature-Based-Solutions/Californias-NBS-Climate-Targets-2024.pdf>
- California Natural Resources Agency (CNRA). (2025a). *CA Nature: A suite of interactive mapping and visualization tools*. <https://www.californianature.ca.gov/pages/ca-nature>
- California Natural Resources Agency (CNRA). (2025b). *Pathways to 30x30 annual progress report*. <https://resources.ca.gov/-/media/CNRA-Website/Files/2025-30x30-Pathways-Progress-Report.pdf>
- California Natural Resources Agency (CNRA). (2025c). *30x30 Conserved Areas, Terrestrial* (2025). <https://www.californianature.ca.gov/datasets/CAnature::30x30-conserved-areas-terrestrial-2025/about>
- Cameron, D. R., Schloss, C. A., Theobald, D. M., & Morrison, S. A. (2022). A framework to select strategies for conserving and restoring habitat connectivity in complex landscapes. *Conservation Science and Practice*, 4(6), e12698.
- Convention on Biological Diversity (CBD). (2022). Kunming-Montreal global biodiversity framework. Secretariat of the Convention on Biological Diversity.
- Crossley, M. S., et al. (2020). No net insect abundance and diversity declines across US Long Term Ecological Research sites. *Nature Ecology & Evolution* 4(10): 1368–1376.
- Dinerstein, E., Vynne, C., Sala, E., Joshi, A. R., Fernando, S., Lovejoy, T. E., Cmayorga, J., Olson, D., Asner, G. P., Baillie, J. E. M., Burgess, N. D., Burkart, K., Noss, R. F., Zhang, Y. P., Baccini, A., Birch, T., Hahn, N., & Wikramanayake, E. (2019). A global deal for nature: Guiding principles, milestones, and targets. *Science Advances*, 5(4), eaaw2869.
- First Street Foundation. (2020). *Fathom-U.S. 2.0 Flood Risk Model*. <https://firststreet.org/methodology/flood/>
- Gaston, Kevin J., and John I. Spicer. (2013). *Biodiversity: an introduction*. John Wiley & Sons.
- GreenInfo Network (n.d.). *30x30 toolkit*. <https://calands.org/30x30-toolkit/>

- Habel JC, Rasche L, Schneider UA, Engler JO, Schmid E, Rödder D, Meyer ST, Trapp N, Sos del Diego R, Eggermont H, Lens L. (2019). Final countdown for biodiversity hotspots. *Conservation Letters* 12(6):e12668.
- Halpin, P. N. 1997. Global climate change and natural-area protection: management responses and research directions. *Ecological Applications* 7: 828–843.
- Hamilton, H., Smyth, R. L., Young, B. E., Howard, T. G., Tracey, C., Breyer, S., Cameron, D. R., Chazal, A., Conley, A. K., Frye, C. & Schloss, C. (2022). Increasing taxonomic diversity and spatial resolution clarifies opportunities for protecting US imperiled species. *Ecological Applications*, 32(3), e2534.
- Howard JK, Klausmeyer KR, Fesenmyer KA, Furnish J, Gardali T, et al. (2015) Patterns of Freshwater Species Richness, Endemism, and Vulnerability in California. *PLOS ONE* 10(7): e0130710. <https://doi.org/10.1371/journal.pone.0130710>
- Howard J, Schloss C, Olliff–Yang R, Canales A, Stanley CK, Webb M, Ackerly D, Boettiger C, Buhler C, Monfort S, Bucciarelli G, Meyer R, Simons AL, Bando J, Chamberlin L, Veloz S, Dickison C, Hill A, Johnson R, Hill R, Kochanek A, Rademacher D, Micheli L, Penrod K, Rapacciuolo G, Roth N, Spatz D, Gluesenkamp D. (2026). California’s 30 x 30 Initiative at its Midpoint: A Biodiversity Assessment Snapshot of the State’s Conservation Areas. *Artemesia* 51(2) 36–45.
- Intergovernmental Science–Policy Platform on Biodiversity and Ecosystem Services. 2019. Summary for Policymakers of the Global Assessment Report on Biodiversity and Ecosystem Services. <https://doi.org/10.5281/zenodo.3553579>
- Klausmeyer, K., Howard, J., Keeler-Wolf, T., Davis–Fadtke, K., Hull, R., & Lyons, A. (2018). Mapping indicators of groundwater dependent ecosystems in California: Methods report. *San Francisco, California*.
- Kling, M. M., Mishler, B. D., Thornhill, A. H., Baldwin, B. G., & Ackerly, D. D. (2019). Facets of phylodiversity: evolutionary diversification, divergence and survival as conservation targets. *Philosophical Transactions of the Royal Society B*, 374(1763), 20170397.
- Kukkala, A. S., & Moilanen, A. (2013). Core concepts of spatial prioritisation in systematic conservation planning. *Biological Reviews*, 88 (2), 443–464.
- Liebert, A. S., and W. J. Ripple. (2004). Range contractions of North American carnivores and ungulates. *BioScience* 54: 123–138.
- Margules, C. R., and R. L. Pressey. (2000). Systematic conservation planning. *Nature* 405: 243–253.
- Miller, J. D., H. D. Safford, M. Crimmins, et al. (2009). Quantitative evidence for increasing forest fire severity in the Sierra Nevada and Southern Cascade Mountains, California and Nevada, USA. *Ecosystems* 12: 16–32.
- Mooney, H. A., Cropper, A. Capistrano, D., Carpenter, S. R., Chopra, Kanchan, Dasgupta, P., Leemans, R., May, Robert M. et al. (2005). *Ecosystems and Human Well-being: Biodiversity Synthesis*. The Cropper Foundation, Trinidad and Tobago.
- Muths, E. (2012). *The state of amphibians in the United States*. U.S. Department of the Interior. U.S. Geological Survey, Amphibian Research and Monitoring Initiative.
- Myers, N., Mittermeier, R. A., Mittermeier, C. G., Da Fonseca, G. A., & Kent, J. (2000). Biodiversity hotspots for conservation priorities. *Nature*, 403 (6772), 853–858.
- National Oceanic and Atmospheric Administration (NOAA). Coastal Services Center, (n.d.) <https://coast.noaa.gov/digitalcoast/>
- Olson, D. M., & Dinerstein, E. (1998). The global 200: A representation approach to conserving the Earth's most biologically valuable ecoregions. *Conservation Biology*, 12 (3), 502–515.

- Rosenberg, K. V., Dokter, A. M., Blancher, P. J., Sauer, J. R., Smith, A. C., Smith, P. A., Stanton, J. C., Panjabi, A., Helft, L., Parr, M., & Marra, P. P. (2019). Decline of the north American avifauna. *Science*, 366 (6461), 120–124.
- Schloss, C. A., Cameron, D. R., McRae, B. H., Theobald, D. M., & Jones, A. (2022). “No-regrets” pathways for navigating climate change: planning for connectivity with land use, topography, and climate. *Ecological Applications*, 32(1), e02468.
- Seavy, N. E., Gardali, T., Golet, G. H., Griggs, F. T., Howell, C. A., Kelsey, R., ... & Weigand, J. F. (2009). Why climate change makes riparian restoration more important than ever: recommendations for practice and research. *Ecological Restoration*, 27(3), 330–338.
- State of California. (2020). Executive Order N-82-20. <https://www.gov.ca.gov/wp-content/uploads/2020/10/10.07.2020-EO-N-82-20-.pdf>
- The Nature Conservancy (2021). *Conserving a global biodiversity hotspot: 30×30—A path to a resilient future*. ArcGIS StoryMaps. <https://storymaps.arcgis.com/stories/91ee325b4ab64fab9bd9400fbbdf49e8>
- Thorne, J.H., R.M. Boynton, A.J. Holguin, J.A.E. Stewart, & J. Bjorkman. (2016) A climate change vulnerability assessment of California’s terrestrial vegetation. California Department of Fish and Wildlife (CDFW), Sacramento, CA.
- U. S. Fish and Wildlife Service. (2019). *National Wetlands Inventory website*. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. <http://www.fws.gov/wetlands/>
- U.S. Geological Survey. (2020). *National Hydrography Dataset (NHD) NHDFlowline*. <https://www.usgs.gov/national-hydrography/national-hydrography-dataset>
- U.S. Geological Survey. (2022). *PAD-US data overview*. <https://www.usgs.gov/programs/gap-analysis-project/science/pad-us-data-overview>
- Williams, J. N., H. D. Safford, N. Enstice, Z. L. Steel, and A. K. Paulson. 2023. “High-Severity Burned Area and Proportion Exceed Historic Conditions in Sierra Nevada, California, and Adjacent Ranges.” *Ecosphere*14(1): e4397. <https://doi.org/10.1002/ecs2.4397>

## Appendix A

Table S1. Data assessed in 2024 assessment and not included in this report.

| Climate Zones                                                             | 10 Climate Zones                                         | Acres; % of network; % of feature                                                          | Ackerly Lab n.d.                                                                                                      |
|---------------------------------------------------------------------------|----------------------------------------------------------|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Biodiversity: unique communities, species, abundance, and richness</b> | Abundance for 26 bird species                            | % of species that are underrepresented (measured as % abundance in network)                | Veloz et al. 2015                                                                                                     |
|                                                                           | 19 Fungi Communities (eDNA derived)                      | % of communities that are under-represented                                                | CALeDNA 2024                                                                                                          |
|                                                                           | 19 Invertebrate Communities (eDNA derived)               | % of communities that are under-represented                                                | CALeDNA 2024                                                                                                          |
|                                                                           | 19 Prokaryote Communities (eDNA derived)                 | % of communities that are under-represented                                                | CALeDNA 2024                                                                                                          |
| <b>Connectivity and Resilience</b>                                        | Resilient Connected Network - all categories             | Acres; % of feature % of network                                                           | Anderson et al. 2023                                                                                                  |
| <b>Freshwater Resources</b>                                               | Fish passage barriers                                    | Count; % of feature                                                                        | CDFW 2023                                                                                                             |
| <b>NBS and Agriculture</b>                                                | SAGBI (rated good+)                                      | Acres % of feature                                                                         | O'Green et al. 2015                                                                                                   |
|                                                                           | Drinking water source watersheds                         | Acres; % of feature                                                                        | Klausmeyer and Fitzgerald 2012                                                                                        |
|                                                                           | Farmland (prime, unique, statewide, or local importance) | Acres; % of feature                                                                        | DOC FMMP 2018                                                                                                         |
|                                                                           | Lands suitable for grazing                               | Acres; % of feature                                                                        | DOC FMMP 2018                                                                                                         |
|                                                                           | Carbon Storage                                           | Acres in top 20%; % of feature; % of network                                               | Sleeter et al. 2019                                                                                                   |
| <b>Progress Data - new protection</b>                                     | Protected areas                                          | % of newly protected acres that are within 0.1 mi of 2022 conserved lands (any GAP status) | CNRA 2022                                                                                                             |
|                                                                           | Risk of conversion                                       | % of newly protected acres that are in area with modeled land conversion                   | Integrated Climate and Land Use Scenarios (ICLUS), SSP2 Scenario, Version 2 U.S. Environmental Protection Agency 2016 |

|  |                                            |                                                                        |                                                                                                                                            |
|--|--------------------------------------------|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
|  | DAC                                        | % of newly protected acres that are in DAC                             | California Office of Environmental Health Hazard Assessment (OEHHA), California Environmental Protection Agency, CalEnviroScreen 4.0. 2021 |
|  | Priority Populations (all)                 | % of newly protected acres that are in Priority Populations            | CARB 2022                                                                                                                                  |
|  | Low-income communities                     | % of newly protected acres that are in Low-income communities          | CARB 2022                                                                                                                                  |
|  | Parks for all - park need (ac/k)           | % of newly protected acres that are in areas with identified park need | California Department of Parks and Recreation Community Engagement Division, Office of Grants and Local Services 2021                      |
|  | Parks for all - park need (no park 0.5 mi) | % of newly protected acres that are in areas with identified park need | California Department of Parks and Recreation Community Engagement Division, Office of Grants and Local Services 2021                      |

## Appendix A References

- Anderson M. G., Clark M., Olivero A. P., Barnett A. R., Hall K. R., Cornett M. W., Ahlering M., Schindel M., Unnasch B., Schloss C., Cameron D. R. (2023). A Resilient and Connected Network of Sites to Sustain Biodiversity under a Changing Climate. *Proceedings of the National Academy of Sciences*, 120(7) e2204434119
- California Air Resources Board. (2022). *California Climate Investments Priority Populations Mapping Tool 4.0*. [https://gis.carb.arb.ca.gov/portal/apps/experiencebuilder/experience/?id=5dc1218631fa46bc8d340b8e82548a6a&page=Priority-Populations-4\\_0](https://gis.carb.arb.ca.gov/portal/apps/experiencebuilder/experience/?id=5dc1218631fa46bc8d340b8e82548a6a&page=Priority-Populations-4_0)
- California Department of Conservation, Division of Land Resource Protection. (2018). *California Important Farmland 2018 (FeatureServer)*. [https://gis.conservation.ca.gov/server/rest/services/DLRP/CaliforniaImportantFarmland\\_2018/FeatureServer](https://gis.conservation.ca.gov/server/rest/services/DLRP/CaliforniaImportantFarmland_2018/FeatureServer)
- California Department of Fish and Wildlife. (2023.). *California Fish Passage Assessment Database*. <https://www.calfish.org/ProgramsData/HabitatandBarriers/CaliforniaFishPassageAssessmentDatabase.aspx>
- California Department of Parks and Recreation's Community Engagement Division – Office of Grants and Local Services (2021). *California's 2021–2025 Statewide Comprehensive Outdoor Recreation Plan (SCORP)*. [https://www.parksforcalifornia.org/scorp/2021#executive\\_summary](https://www.parksforcalifornia.org/scorp/2021#executive_summary)
- Klausmeyer, K., & Fitzgerald, K. (2012). Where does California's water come from? Land conservation and the watersheds that supply California's drinking water. *Nat. Conserv. California*, 1(1), 1-34.
- OEHHA, 2021. CalEnviroScreen 4.0. <https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40>

U.S. Environmental Protection Agency. (2016). *Updates to the Demographic and Spatial Allocation Models to Produce Integrated Climate and Land Use Scenarios (ICLUS) Version 2* EPA/600/R-16/366F (Washington, DC: National Center for Environmental Assessment)

Veloz, S., Salas, L., Altman, B., Alexander, J., Jongsomjit, D., Elliott, N., & Ballard, G. (2015). Improving effectiveness of systematic conservation planning with density data. *Conservation Biology*, 29(4), 1217-1227.



A flock of dunlin in the Sacramento Valley © Drew Kelly

## Appendix B

### Sensitivity of Results to Analytical Assumptions

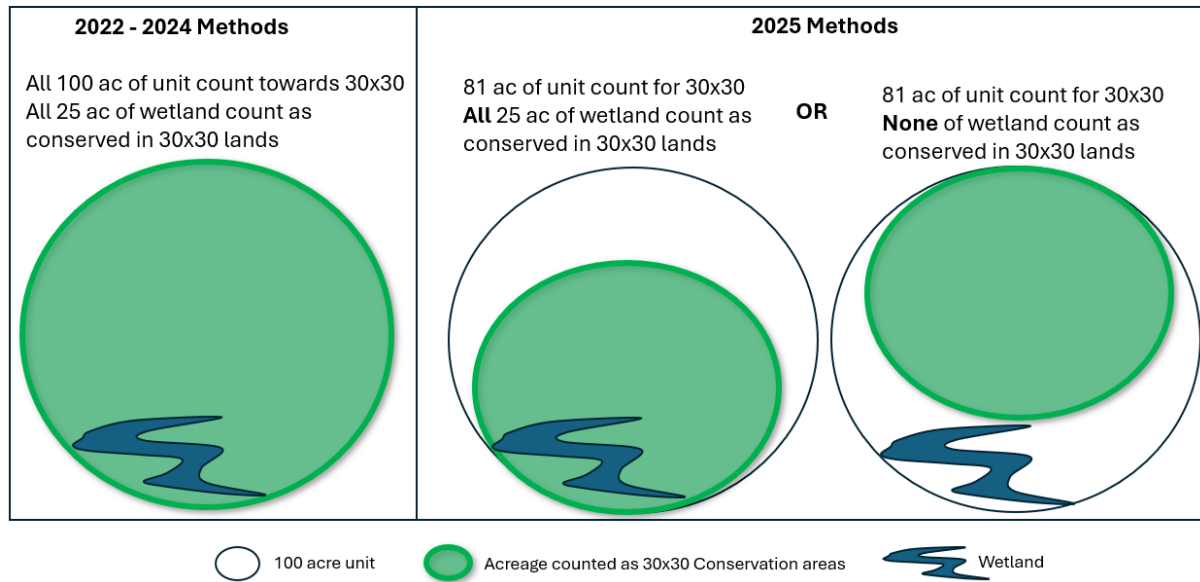
Conservation Area units (hereafter, units) can have multiple GAP statuses associated as non-spatially explicit percentages of the unit's area. Therefore, in some cases only a portion of a unit will count as a 30x30 Conservation Area rather than the whole unit. Further, the location within the unit of each GAP Status is unknown. Each of these statuses may have different management implications, allowed uses, and levels of protection for resources. Without spatial information on where 30x30 Conservation Areas are within units that have multiple gap statuses, there will be some degree of uncertainty regarding the level of protection represented by the GAP Status, imprecisely located, afforded to the feature and habitat representation which is more clearly known.

In previous Conservation Areas data releases (2022, 2023, 2024), the data contained a "reGAP" field which assigned a single GAP status to the entire unit based on an 80% 30x30 Conservation Area threshold. If at least 80% of the unit was either GAP status 1 or 2, then the entire unit was assigned that GAP status. The entire unit was mapped as a 30x30 Conservation area, all acreage within the unit was counted toward the 30x30 Conservation Area network, and all features and habitats within that unit were considered conserved within these 30x30 lands for assessing representation and gaps.

This method resulted in both over- and under-estimates of lands that count towards 30x30. First, for units with between 80% and 99.9% GAP 1 or GAP 2 lands, this method overestimated the area by including all land area within the unit, even those areas that did not have the durability or management of GAP 1 or 2 lands. On the other hand, it undercounted lands that were less than 80% in GAP 1 or GAP 2 lands because it excluded all lands in those units even the portions that had the durability and management of GAP 1 or 2 lands. This 80% threshold and associated assumptions propagated through the habitat and feature composition and representation estimates.

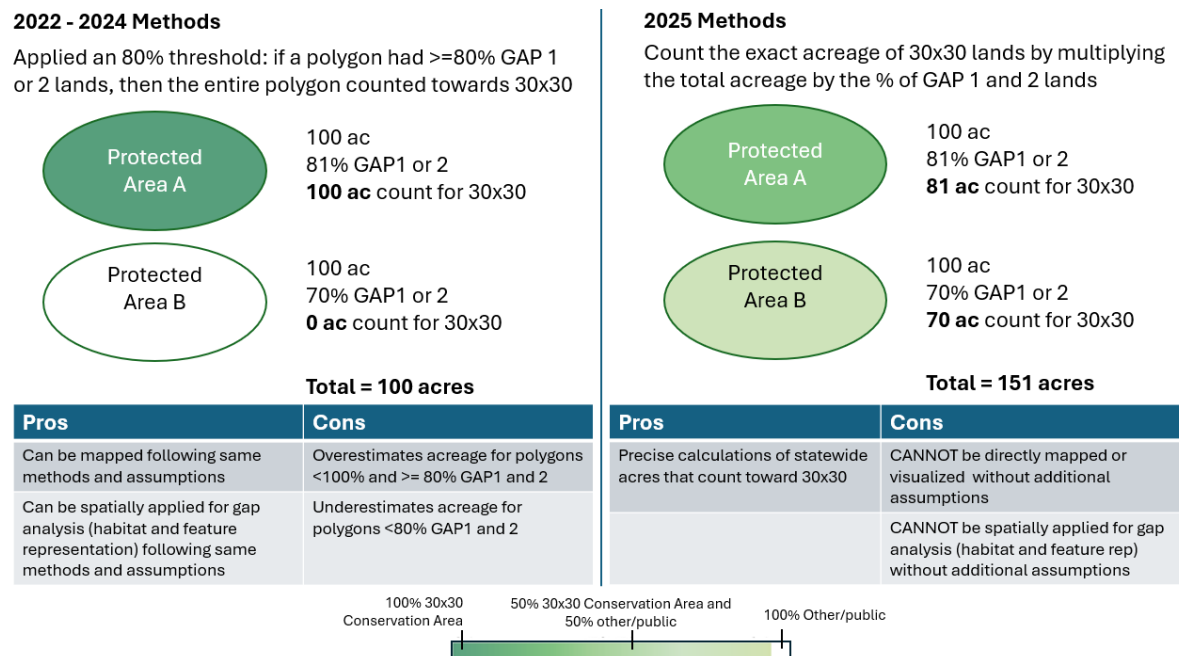
The approach CNRA took to counting 30x30 Conservation Areas in 2025 was more precise for counting total acres. This approach did not use any threshold for inclusion of units, and instead, used the acreages of GAP 1 and GAP 2 lands within any unit, regardless of the proportional contribution of those acres to the unit. While the overall acreage count was more precise, it highlighted the ambiguity in feature and habitat composition and representation because the proportional GAP status is not spatially allocated and therefore, it cannot be known how much of any given habitat/feature is covered by the 30x30 conservation areas (Illustrated in Figure S1).

100 ac unit that is 81% GAP 2 and 19% GAP 3 with 25 ac of wetland on the unit



**FIGURE S1. ILLUSTRATION OF THE CHALLENGE TO CALCULATING HABITAT/FEATURE REPRESENTATION THAT RESULTED FROM CHANGES TO THE APPROACH FOR CALCULATING 30x30 CONSERVATION AREA ACREAGE IN 2025. WITHOUT SPATIALLY DEFINED GAP STATUS CODES IT IS UNKNOWN IF ALL, NONE, OR SOME OF THE FEATURE IS COVERED BY 30x30 CONSERVATION AREAS.**

To estimate habitat/feature composition and representation in a network of 30x30 Conservation Areas using CNRA's new approach (starting in 2025), it is necessary to make assumptions as to whether any and how much of any habitat/feature is covered by 30x30 Conservation Areas in units that have multiple GAP statuses. Figure S2 compares the assumptions and resulting estimates from the previous methodology (2022-2024) and the current methodology (2025) and describes pros and cons of each method.



**FIGURE S2. COMPARISON OF THE 2022-2024 METHODS FOR CALCULATING 30x30 CONSERVATION AREA ACREAGE TO THE NEW APPROACH IN 2025.**

To determine the impact of potential assumptions and develop a consistent and transparent methodology for estimating feature and habitat network composition and representation, we conducted a sensitivity analysis of different methods for estimating feature/habitat coverage by 30x30 Conservation Areas. We convened a small working group of CBN, TNC, DOC, and CNRA to develop and apply the sensitivity analysis methodology and review the results. The results of the sensitivity analyses were used to determine a method for calculating feature and habitat representation and gaps and network composition. These metrics will be used for CNRA's Biodiversity Explorer and the CBN Biodiversity Assessment 2025 report (main document).

## Scenarios

Scenario 1: Minimum estimate: protected areas, and features within them, will only be counted and included as 30x30 lands if they are 99% in either GAP 1 or GAP2 lands. This results in a minimum estimate of network composition and feature and habitat representation. We used 99% to ignore edge effects/accounting errors.

Scenario 2: Lower estimate (80% cutoff): count the maximum possible acreage for all protected areas that are at least 80% in GAP 1 or GAP2. Maximum possible acreage means the total acreage of the feature unless it exceeds the acreage of the total acreage of GAP1 and GAP2 lands in that protected area, then the total acreage of GAP 1 or GAP 2 lands in that protected area would be used as the acreage for that feature within that protected area. None of the feature would be included if the protected area were less than 80% in GAP 1 or GAP2.

Scenario 3 Upper estimate (20% cutoff): count the maximum possible acreage for all protected areas that are at least 20% in GAP 1 or GAP2. Maximum possible acreage means the total acreage of the feature unless it exceeds the acreage of the total acreage of GAP1 and GAP2 lands in that protected area, then the total acreage of GAP 1 or GAP 2 lands in that protected area would be used as the acreage for that feature within that protected area. None of the feature would be included if the protected areas were less than 20% in GAP 1 or GAP2.

Scenario 4: Maximum estimate: all protected areas with greater than 1% within GAP 1 or GAP 2 lands will be counted as included in 30x30 lands up to the maximum acreage, that is GAP 1 or GAP 2. For example, if a protected area is 100 ac and is 60% protected and has 50ac of oak woodland, we would assume all 50ac are protected. But if the same property were 30% protected, we would count only 30ac of the oak woodland as that would be the maximum amount if all the oak woodland were in GAP 1 or GAP2 lands.

Scenario 5: Proportional: all units are included and feature representation is multiplied by the proportion of lands in GAP 1 or GAP 2 combined. If there are 100 ac of wetland and 75% of the 10,000-ac conservation area is GAP 1 or 2, we will assume that 75 ac of wetlands are protected.

Scenario 6: Mapped. Use the reGAP field which CNRA uses to map 30x30 Conservation Areas and count the entire area of all habitats and features within the polygons that are mapped as GAP 1 or GAP 2. reGAP is set based on the GAP status with the largest percentage of the unit and is intended primarily for cartographic use.

For each scenario, first, the subset of units included in the scenario is identified based on thresholds or rules (e.g., >99%, >80%, >20%, >1%, or reGAP equal to 1 or 2). Every scenario except the proportional scenario is based on a subset of conservation area units. The proportional scenario uses the full set of conservation area units. Next, within each unit in the subset, the potential acreage of the habitat/feature covered by 30x30 Conservation Areas is calculated. Last, the estimated habitat/feature acreage for each unit is summed for all relevant units.

For the minimum, lower, upper, and maximum scenarios, for each habitat/feature within each included unit, we calculate the maximum potential habitat/feature included. This value is calculated as the minimum of either the total habitat/feature acreage or the total acreage of GAP 1 and GAP 2 lands combined. Total habitat/feature coverage for a single habitat/feature (e.g., oak woodlands) cannot therefore exceed the combined acreage of GAP 1 and GAP 2 lands for that unit. However, because we are using the full potential acreage for each habitat/feature, the combined habitat/feature acreage (e.g., conifer forests and oak woodlands) could exceed the combined acreage of GAP 1 and GAP 2 lands. For example, a 100-ac unit that is

25% within GAP 1 or 2 lands, has 50 ac of oak woodland and 50 ac of conifer forest. The maximum amount of the 50ac of oak woodland that could count toward 30x30 Conservation areas is 25 ac (i.e., the minimum of the habitat acreage and the 30x30 acreage). The maximum amount of the 50 ac of conifer forest that could count toward 30x30 Conservation areas is 25 ac. We allow each habitat to count the maximum potential coverage (25 ac) even though the total across both habitats is double the total 30x30 Conservation Area lands for that unit.

For the proportional estimate, within each unit, first we multiplied the proportion of a unit that is considered a 30x30 Conservation Area by the acreage of the habitat/feature within that unit to get the estimate of the habitat/feature acreage within the 30x30 lands for that unit. For example, if a unit had 75% of its area managed as 30x30 Conservation Areas (i.e., GAP 1 or GAP 2), the acreage of each habitat/feature extent within the unit would be multiplied by 0.75 to estimate the amount of each habitat/feature potentially within the 30x30 Conservation Area portion of that unit.

For the mapped estimate, we summed all habitat/feature acreage within the subset of units and did not use GAP status proportions once the subset of 30x30 Conservation areas was determined (i.e., using the reGAP field which was determined by the majority area in a GAP status code).

Table S1 compares the six scenarios including comparison of which units are included, method for calculating habitat/feature coverage, and for an example network consisting of two units, A and B, the total estimated oak woodland covered by 30x30 Conservation Areas within each unit and for the network to illustrate the implications of assumptions on habitat/feature coverage estimates.

*Table S1. Sensitivity analysis scenarios and a comparison of which units are included in each scenario, method for calculating habitat/feature coverage, and the total estimated oak woodland covered by 30x30 Conservation Areas in a hypothetical network of two conservation area units.*

| <b>Scenarios</b>                        | <b>Polygons Included</b> | <b>Acreage Counted</b>                                                               | <b>Example A<br/>100 ac property<br/>50 ac of oak woodland<br/>85% protected</b> | <b>Example B<br/>100 ac property<br/>50 ac of oak woodland<br/>25% protected</b> | <b>Total Oak woodland from examples</b> |
|-----------------------------------------|--------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------|
| <b>Scenario 1:<br/>Minimum Estimate</b> | >99% in GAP 1 or 2       | Total acreage of feature in subset                                                   | 0 ac                                                                             | 0 ac                                                                             | 0 ac                                    |
| <b>Scenario 2: Lower estimate</b>       | >80% in GAP 1 or 2       | Minimum of:<br>-Total acreage of feature<br><br>OR<br>-Total acreage of GAP1&2 lands | 50 ac oak woodland                                                               | 0 ac                                                                             | 50 ac                                   |
| <b>Scenario 3:<br/>Upper estimate</b>   | >20% in GAP 1 or 2       | Minimum of:<br>-Total acreage of feature<br><br>OR<br>-Total acreage of GAP1&2 lands | 50 ac oak woodland                                                               | 25 ac oak woodland                                                               | 75 ac                                   |

|                                              |                                                          |                                                                                      |                      |                      |       |
|----------------------------------------------|----------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------|----------------------|-------|
| <b>Scenario 4:<br/>Maximum Estimate</b>      | >1% in GAP 1 or 2                                        | Minimum of:<br>-Total acreage of feature<br><br>OR<br>-Total acreage of GAP1&2 lands | 50 ac oak woodland   | 25 ac oak woodland   | 75 ac |
| <b>Scenario 5:<br/>Proportional estimate</b> | All polygons                                             | Total feature acreage is discounted by the total % in GAP1&2 lands                   | 42.5 ac oak woodland | 12.5 ac oak woodland | 55 ac |
| <b>Scenario 6: Mapped lands</b>              | Polygons mapped in CA Nature Conservation Areas explorer | Total acreage of feature in subset                                                   | 50 ac oak woodland   | 0 ac oak woodland    | 50 ac |

For each scenario, we calculated the total units included, the total acreage of 30x30 conservation lands, the difference between the scenario acreage total and the official 2025 30x30 Conservation Areas acreage (i.e., 26,471,461ac), and the total acres of each FVEG CWHR13 habitat (CAL FIRE, 2024) estimated within the 30x30 Conservation Area network. We estimated the maximum range in uncertainty as the difference between the minimum and maximum scenarios and determined how the proportional scenario compared both to the other scenarios and to 2024 results.

## Analysis Results

Each approach includes a different subset of units in the analysis, and the number of units varies from 14,624 in the minimum estimate to 18,372 (all polygons) in the proportional estimate. The overall acreage estimate of 30x30 Conservation Areas is also somewhat variable with approach (Table S2), with the minimum scenario under-estimating overall acreage of 30x30 Conservation Areas by nearly 1.2 million acres and the maximum scenario over-estimating overall acreage by more than 700 thousand acres.

*Table S2. Sensitivity analysis scenarios and a comparison of the number of conservation units that are included in each scenario and their overall acreage.*

| Scenarios                               | Polygons Included  | Total Polygons Included | Total Acreage of included polygons | Total acreage difference from 2025 Conservation Area acreage |
|-----------------------------------------|--------------------|-------------------------|------------------------------------|--------------------------------------------------------------|
| <b>Scenario 1:<br/>Minimum Estimate</b> | >99% in GAP 1 or 2 | 14, 624                 | 25,293,048                         | Underestimate by 1,178,413                                   |
| <b>Scenario 2:<br/>Lower estimate</b>   | >80% in GAP 1 or 2 | 16,993                  | 26,326,624                         | Underestimate by 144,837                                     |

|                                         |                                                                   |        |            |                            |
|-----------------------------------------|-------------------------------------------------------------------|--------|------------|----------------------------|
| <b>Scenario 3:<br/>Upper estimate</b>   | >20% in GAP 1 or 2                                                | 17,532 | 26,796,856 | Overestimate by<br>325,395 |
| <b>Scenario 4:<br/>Maximum Estimate</b> | >1% in GAP 1 or 2                                                 | 18,017 | 27,192,007 | Overestimate by<br>720,546 |
| <b>Scenario 5: Proportional</b>         | All polygons                                                      | 18,372 | 26,471,461 | NA                         |
| <b>Scenario 6: Mapped<br/>lands</b>     | Polygons mapped<br>in CA Nature<br>Conservation<br>Areas explorer | 17,301 | 26,387,676 | Underestimate by<br>83,785 |

The range in scenario estimates (i.e., the maximum scenario estimate minus the minimum scenario estimate) for 5 of the 13 land cover/ habitat types was less than 0.9%, which was the interannual change in percent of 30x30 Conservation Areas between 2024 and 2025 (Table S3). For context, the interannual change in % of each landcover type or habitat in 30x30 Conservation Areas was less than or equal to 0.9% for all habitat types except desert shrub and barren/other. The narrower ranges between scenarios for these 5 habitat/landcover types indicate more certainty in estimates for conifer woodland, desert shrub, desert woodland, urban, and agriculture. For conifer forest and woodland and barren/other, the range in estimates is slightly greater (1%-1.6%) than the interannual difference of 0.9%, for grassland, wetland, and shrub the range was more than double the interannual difference, and for hardwood woodland and water, the range was more than 3 times the interannual difference, indicating more potential uncertainty in representation estimates for these habitat/landcover types.

The biodiversity assessment framework uses representation cutoffs to determine if a habitat/feature is under-represented (<20% in 30x30 Conservation areas), slightly under-represented (in 2025, 20-26.1% in 30x30 Conservation Areas), or on par (in 2025, >=26.1% in 30x30 Conservation Areas). Shrub, which is sensitive to assumptions in the approach, is slightly under-represented in the minimum estimate, but is on par with state conservation levels in every other scenario. Similarly, water is under-represented in the minimum scenario but is only slightly under-represented in every other scenario. Because the minimum estimate was evaluated to determine the absolute minimum representation, but is unlikely to be a true estimate because it doesn't include any units with proportionally assigned GAP status (i.e., excludes >3,000 units that have 30x30 Conservation Areas), we conclude that the representation framework results for major habitats are robust to approach assumptions even though the absolute values and percentages cannot be known with certainty.

Table S3: Representation of landcover / habitat types (FVEG WHR13, CAL FIRE 2024) as percentages of each landcover / habitat statewide that is within 30x30 Conservation Areas as defined by the assumptions of each of the six scenarios.

|                          | <b>Scenario 1:<br/>Minimum Estimate<br/>(&gt;99% GAP1or 2)</b> | <b>Scenario 2:<br/>Lower estimate<br/><br/>80% (GAP1or 2) cutoff</b> | <b>Scenario 3:<br/>Upper estimate<br/><br/>20% (GAP1or 2) cutoff</b> | <b>Scenario 4:<br/>Maximum Estimate<br/>(&gt;1% GAP1or 2)</b> | <b>Scenario 5:<br/>Proportional</b> | <b>Scenario 6:<br/>Mapped lands</b> | <b>Range in % from minimum to maximum estimates</b> |
|--------------------------|----------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------|-------------------------------------|-------------------------------------|-----------------------------------------------------|
| <b>Conifer Forest</b>    | 23.0                                                           | 24.1                                                                 | 24.2                                                                 | 24.2                                                          | 24.1                                | 24.1                                | 1.2                                                 |
| <b>Hardwood Forest</b>   | 20.4                                                           | 21.5                                                                 | 21.9                                                                 | 22.0                                                          | 21.6                                | 21.5                                | 1.6                                                 |
| <b>Herbaceous</b>        | 14.3                                                           | 15.8                                                                 | 16.0                                                                 | 16.1                                                          | 15.9                                | 15.9                                | 1.8                                                 |
| <b>Shrub</b>             | 25.4                                                           | 27.0                                                                 | 28.0                                                                 | 28.0                                                          | 27.8                                | 27.2                                | 2.6                                                 |
| <b>Wetland</b>           | 44.4                                                           | 46.3                                                                 | 46.6                                                                 | 46.9                                                          | 46.4                                | 46.5                                | 2.5                                                 |
| <b>Barren/Other</b>      | 50.9                                                           | 51.7                                                                 | 51.7                                                                 | 51.9                                                          | 51.7                                | 51.7                                | 1.0                                                 |
| <b>Urban</b>             | 0.5                                                            | 0.7                                                                  | 0.8                                                                  | 0.8                                                           | 0.7                                 | 0.7                                 | 0.3                                                 |
| <b>Water</b>             | 15.4                                                           | 21.3                                                                 | 21.6                                                                 | 22.1                                                          | 21.5                                | 21.5                                | 6.7                                                 |
| <b>Agriculture</b>       | 2.1                                                            | 2.3                                                                  | 2.4                                                                  | 2.4                                                           | 2.3                                 | 2.3                                 | 0.3                                                 |
| <b>Hardwood Woodland</b> | 11.0                                                           | 13.4                                                                 | 14.0                                                                 | 14.1                                                          | 13.6                                | 13.6                                | 3.1                                                 |
| <b>Conifer Woodland</b>  | 33.2                                                           | 33.2                                                                 | 33.3                                                                 | 33.3                                                          | 33.3                                | 33.3                                | 0.1                                                 |
| <b>Desert Shrub</b>      | 47.9                                                           | 48.2                                                                 | 48.3                                                                 | 48.3                                                          | 48.2                                | 48.3                                | 0.4                                                 |
| <b>Desert Woodland</b>   | 56.3                                                           | 56.6                                                                 | 56.6                                                                 | 56.8                                                          | 56.6                                | 56.6                                | 0.5                                                 |

We hypothesized that the proportional scenario would be the most appropriate to include as the primary estimate in the Biodiversity Assessment and the CA Nature Explorer. For nearly all land cover types / habitats, the proportional scenario estimate was between the lower (80% threshold) and upper (20% threshold) estimates (Table S3). For shrub, the proportional scenario estimate was between the upper estimate and the maximum scenario. For all habitat types, proportional estimates were closer to the maximum estimate than the minimum estimate (Table S4). However, we believe that this does not indicate that all estimates are more likely overestimates, but rather that the minimum is further from the true coverage value due to the exclusion of so many partial polygons.

The Proportional Scenario estimates an increase in coverage between 2024 and 2025 for all habitat and land cover types except for wetland, water, and desert woodland (Table S4). Not only did the methods change

between 2024 and 2025, but some polygon geographies also changed as a result of data improvements and changes to data sources. Observationally, those changes were likely the reason for these decreases.

*Table S4: Representation of landcover / habitat types (FVEG WHR13, CAL FIRE 2024) as percentages of each landcover / habitat statewide that is within 30x30 Conservation Areas as defined by the proportional approach and the difference between that estimate and the minimum and maximum estimates for 2025, and the representation values for 2024.*

|                          | <b>Proportional Scenario %<br/>in 30x30 Conservation<br/>Areas</b> | <b>Proportional<br/>scenario<br/>difference from:<br/>Scenario 1:<br/><br/>Minimum<br/>Estimate</b> | <b>Proportional<br/>scenario<br/>difference from:<br/>Scenario 4:<br/><br/>Maximum<br/>Estimate</b> | <b>Proportional<br/>estimate<br/>difference from<br/>2024<br/>representation<br/>levels</b> |
|--------------------------|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| <b>Conifer Forest</b>    | 24.1                                                               | 1.1                                                                                                 | 0.1                                                                                                 | 0.9                                                                                         |
| <b>Hardwood Forest</b>   | 21.6                                                               | 1.2                                                                                                 | 0.4                                                                                                 | 0.6                                                                                         |
| <b>Herbaceous</b>        | 15.9                                                               | 1.6                                                                                                 | 0.2                                                                                                 | 0.9                                                                                         |
| <b>Shrub</b>             | 27.8                                                               | 2.4                                                                                                 | 0.2                                                                                                 | 0.4                                                                                         |
| <b>Wetland</b>           | 46.4                                                               | 2.0                                                                                                 | 0.5                                                                                                 | -0.5                                                                                        |
| <b>Barren/Other</b>      | 51.7                                                               | 0.8                                                                                                 | 0.2                                                                                                 | 2.9                                                                                         |
| <b>Urban</b>             | 0.7                                                                | 0.3                                                                                                 | 0.1                                                                                                 | 0.0                                                                                         |
| <b>Water</b>             | 21.5                                                               | 6.1                                                                                                 | 0.4                                                                                                 | -0.1                                                                                        |
| <b>Agriculture</b>       | 2.3                                                                | 0.2                                                                                                 | 0.1                                                                                                 | 0.1                                                                                         |
| <b>Hardwood Woodland</b> | 13.6                                                               | 2.5                                                                                                 | 0.5                                                                                                 | 0.9                                                                                         |
| <b>Conifer Woodland</b>  | 33.3                                                               | 0.1                                                                                                 | 0                                                                                                   | 0.2                                                                                         |
| <b>Desert Shrub</b>      | 48.2                                                               | 0.3                                                                                                 | 0.1                                                                                                 | 1.7                                                                                         |
| <b>Desert Woodland</b>   | 56.6                                                               | 0.2                                                                                                 | 0.2                                                                                                 | -0.5                                                                                        |