NATURE-BASED
CLIMATE SOLUTIONS
California's Climate Smart Lands Strategy

NATURAL AND WORKING LANDS CLIMATE SMART STRATEGY

APRIL 22, 2022

NATURE-BASED CLIMATE SOLUTIONS

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EXECUTIVE SUMMARY

Our lands are a critical yet underutilized sector in California's critically urgent effort to achieve carbon neutrality and build resilience to the impacts of climate change.

Healthy landscapes can sequester and store carbon, limit future greenhouse gas emissions into the atmosphere, protect people and nature from the impacts of climate change, and build resilience to future impacts of climate change. Unhealthy landscapes have the opposite effect – they release more greenhouse gases than they store, worsen climate risks to people and nature, and are more vulnerable to future climate change impacts.

In October 2020, Governor Newsom outlined a comprehensive and results-oriented agenda to expand nature-based solutions across California through Executive Order N-82-20. It called for restoring nature and landscape health to deliver on our climate change goals and other critical priorities, including improving public health and safety, securing our food and water supplies, and achieving greater equity across California.

This Natural and Working Lands Climate Smart Strategy will help to implement the Governor's Executive Order, and expand climate action in this sector, which has been called for in California's Climate Change Scoping Plan and California's recently updated Climate Adaptation Strategy. This Natural and Working Lands Strategy:

- Defines California's eight natural and working landscapes.
- Describes how improved management of these landscapes can deliver on our climate change goals and advance broader environmental, economic, and social objectives.
- Highlights priority nature-based climate solutions to address the climate crisis.
- Outlines regional opportunities for climate smart land management.
- Identifies options to track nature-based climate action and measure progress.
- Packages recommendations to scale nature-based climate solutions in California identified through our public engagement process.

The Strategy also identifies priorities for areas of near-term state focus to increase climate action on California's natural and working lands:

1. **Accelerate on-the-ground projects** that deliver climate benefits through nature-based solutions across California's diverse landscapes that state agencies and partners can learn from and that can be scaled-up over time.
2. **Invest in science** to improve our understanding of implementation pathways here in California and to help scale nature-based climate solutions around the world.
3. **Prioritize equity** to drive solutions that help those residents and communities hit first and worst by climate change impacts, including through targeted funding, workforce development, capacity building, and support for tribally-led nature-based solutions
4. **Scale investment** to support climate action in the natural working lands sector, including through public-private partnerships, demonstration projects, and leveraging federal funds.
5. **Build capacity of implementation partners** through approaches including technical assistance and focused support, grant funding opportunities, and partnering with California Native American tribes.
6. **Improve internal coordination** among state agencies to align and leverage funding, authorities, and programs to accelerate implementation of nature-based solutions.
7. **Strengthen collective action** by advancing new and innovative partnerships with non-state government groups and leaders and through organizing annual updates and periodic convenings on implementation.

California is committed to taking urgent and focused climate action in the natural and working lands sector now, and continuously improving our approach over time.

IN APPRECIATION

This Strategy is shaped by the insights, experience, and expertise of a diverse, growing, and deeply valued coalition of leaders and groups across California and beyond. We are deeply grateful for this collective wisdom and shared commitment. This forward-looking collaboration will be essential to achieving the goals of this Strategy.

INTRO DUCTION

Sacramento Valley, CA

SECTION ONE

INTRODUCTION

OUR CHALLENGE AND OPPORTUNITY

California is doubling down on our efforts to achieve carbon neutrality and build resilience to the impacts of climate change. In October 2020, Governor Newsom called for accelerated use of nature-based solutions to deliver on California's climate change goals through Executive Order (EO) N-82-20.

The EO outlined a comprehensive and results-oriented nature-based solutions agenda for California, including the development of a Natural and Working Lands Climate Smart Strategy to align relevant existing state efforts under one cohesive strategy and identify land management actions that help protect climate vulnerable communities, achieve carbon neutrality, improve public health and safety, and expand economic opportunity.

"Nature-based solutions" describe actions that work with and enhance nature to help address societal challenges. This term is an umbrella concept being used across the world to describe a range of approaches that protect, sustainably manage, and restore nature to deliver multiple outcomes, including addressing climate change, improving public health, increasing equity, and protecting biodiversity.[1]

"Natural and working lands" are a cornerstone of California's nature-based climate solution sector. **These lands** cover approximately 90 percent of the state's 105 million acres:[2]

1. **FORESTS** – lands with greater than or equal to 10% canopy cover comprised of trees, such as oak woodlands, riparian forests, and conifer forests.
2. **SHRUBLANDS & CHAPARRAL** - lands with greater than or equal to 10% canopy cover comprised of shrubs or chapparal. These lands are dominated by woody plants such as manzanita, coastal scrub, huckleberry oak, as well as desert shrubs.
3. **DEVELOPED LANDS** - lands developed for human use, such as urban, suburban, and rural communities; urban and community forests and greenspaces; and physical infrastructure.
4. **WETLANDS** – lands saturated by water for all or portions of a year, such as coastal wetlands, floodplains, peatlands, mountain meadow wetlands, and vernal pools.
5. **SEAGRASSES & SEAWEEDS** - seagrasses are marine flowering plants, such as eelgrass and surfgrass. Seaweeds are algae, such as kelp.
6. **CROPLANDS** – lands with annual or perennial crops and fallow land, such as perennial orchards and irrigated annual crops.
7. **GRASSLANDS** – lands with less than 10% tree canopy cover that are dominated by grasses or herbaceous vegetation.
8. **SPARSELY VEGETATED LANDS** – lands characterized primarily by low levels of vegetation, including deserts with less than 10% vegetation cover, beaches, and areas covered by ice, snow, and bare rock.

These Lands | Did you know?

California's natural and working lands are organized into eight land types, defined by dominant land cover (a description of what is physically at a location) and developed by a team of scientific experts from multiple state agencies based on national data. These land type classifications are consistent with international carbon accounting methodologies, and the California Air Resources Board Natural and Working Lands Inventory and Scoping Plan. They set an aligned foundation on which we can model, analyze, and measure climate action on our lands. Because the land types are based on dominant land cover, ecosystems may be spread across a mix of these landscapes despite having unique ecological characteristics and management needs.

For example, in this strategy, ocean and coastal areas contain land cover that places them within three of California's natural and working landscapes - sparsely vegetated lands; seagrasses and seaweeds; and wetlands.

Similarly, California's deserts contain a diversity of land cover that places it primarily within shrublands and chaparral, sparsely vegetated lands, croplands, and developed lands.

Lakes, reservoirs, rivers, and oceans that don't overlay seagrasses and seaweeds are identified as "open water."

The LANDFIRE dataset, underpinning our landscape designations, is the result of applying computer algorithms to data from satellites and scientific field surveys. The data represents an estimate of what was present on the ground at a specific location and time. While procedures are in place to catch gross errors, small errors are to be expected. For details on the process see appendix E.

Although not a landscape, California's waters, both inland and coastal, surface and ground, play a vital role in sustaining our communities and economy, and ensuring the state's natural and working lands can deliver on California's climate change goals.

Healthy landscapes can sequester and store carbon, limit future greenhouse gas emissions into the atmosphere, protect people and nature from the impacts of climate change, and build resilience to future impacts of climate change. Unhealthy landscapes have the opposite effect – they release more greenhouse gases than they store, increase climate risks to people and nature, and are more vulnerable to future climate change impacts.[3]

Our natural and working lands are a critical yet underutilized sector in the fight against climate change. International leaders recognize this timely opportunity. According to the United Nations Environment Program, "By working with nature, we have the potential to reduce emissions by more than a third of what is needed by 2030...without nature, we will not be able to achieve 1.5°C or net-zero emissions by 2050, nor will we achieve the Sustainable Development Goals."[4]

"Climate smart" is the term we use in this strategy to describe land management that delivers climate benefits through nature-based solutions.

Scaling climate smart land management in California requires taking action now and playing the "long game" by establishing and maintaining consistent, patient approaches and programs. Plants, soils, and trees operate on decadal time scales; to achieve climate benefits over time, we must act today.[5]

WHAT IS THE CONNECTION BETWEEN LANDS AND GREENHOUSE GASES?

Greenhouse gases act like a blanket around Earth, trapping heat near the surface and raising the temperature. It is a natural process that keeps the planet warm enough to support life. However, greenhouse gas emissions from fossil fuel use, land conversion, other human activities, and extreme disturbances of our lands are creating an alarming and worsening imbalance in this natural system and causing the greatest threat to humanity of our time — climate change.[6]

The Earth's carbon cycle transfers carbon between land, oceans, and the atmosphere, and in turn, facilitates the life cycle of all living things globally. **Carbon dioxide** in the atmosphere is absorbed into the ocean, soils, vegetation, and other ecosystem materials as **organic carbon** via photosynthesis. During photosynthesis, plants and water-based algae take carbon from the atmosphere and store it in their biomass. These processes occur within a few hours to years. Additionally, large stores of inorganic carbon exist in California landscapes, especially deserts, rock formations, and ocean sediments, with these processes occurring over much longer time periods.

Carbon Dioxide
Carbon dioxide is a naturally occurring gas, and also a by-product of burning fossil fuels and biomass; land-use changes; and other industrial processes.

Naturally occurring fires, plant respiration, and decomposition naturally emit carbon back into the atmosphere as carbon dioxide and methane, another powerful greenhouse gas. This dynamic, natural exchange has occurred throughout Earth's history.

Many of our natural systems have lost significant amounts of carbon and will continue to if not appropriately managed for resilience in the face of climate change. For example, sequoia monarch trees have sequestered carbon from the atmosphere for many centuries and stored it in their massive trunks and roots. These fire resilient trees have likely survived dozens of fires in their life before the fire suppression era. The removal of frequent fire, degrading forest health, drought, and climate change have put these monarchs in peril, and recent fires are estimated to have killed 13-20% of these invaluable trees.

As the basic building block of all life on Earth, a healthy stock of carbon in soils, wetlands, forests, grasses, and other vegetation generally supports water and nutrient function in these systems. This in turn increases both biodiversity and the resilience of these ecosystems to extreme weather and over time shapes local and regional climates. The movement of carbon in ecosystems is complex. In many cases, it is necessary to proactively utilize various management practices to support ecosystem health, biodiversity, and long-term carbon stocks, recognizing this will be challenging under a changing climate.

Organic Carbon
Organic carbon is produced by and found in biologic things including plants and soils, whereas inorganic carbon is present in minerals, rocks, and non-biologic sediments.processes.

Human management activities and other natural factors have impacted carbon storage on California's natural and working lands for centuries. Since time immemorial, California Native American tribes used fire and other practices to maintain and restore ecosystem health, with implications for carbon stocks. More recently, certain land management practices such as clearcutting and tilling, increasingly extreme patterns of drought and wildfire, and other severe disturbances increase the risk of rapid carbon movement into the atmosphere. Burning fossil fuels exacerbates the problem by releasing large amounts of carbon into the atmosphere that had previously been stored underground for millions of years.

From the carbon released with the loss of peat wetlands in the Sacramento-San Joaquin River Delta, to the emissions in wildfires, to the long-term storage of carbon in soils, California's natural and working lands play a critical role in our state's contributions to and reductions in atmospheric greenhouse gases.

As noted in the sections to follow, the diversity of natural systems across California and the stressors acting on those systems are complex. California is committed to understanding these dynamics and to documenting the impacts our land management can have, for positive or negative. These efforts have already begun, as evidenced by ongoing work through the California Air Resources Board (CARB)'s Inventory of Ecosystem Carbon in California's Natural and Working Lands[7] and the California Department of Forestry and Fire Protection (CAL FIRE)'s California Forest Ecosystem and Harvested Wood Product Carbon Inventory[8]. These inventories are complementary; building upon each other to provide a holistic view of carbon in California.

The gains and losses of carbon on our lands will fluctuate in the future; what is important is to restore carbon in places where it has been lost and reduce large carbon losses on our natural and working lands through active, attentive, and adaptive management.

California is committed to achieving **carbon neutrality** by 2045. According to the Intergovernmental Panel on Climate Change (the global body for assessing the state of scientific knowledge related to climate change), reducing emissions in transportation, industry and buildings are not enough to avert catastrophic climate change - lands must be part of the climate solution.[9] Scientific assessments tell us the same is true in California; we know climate smart land management is needed to achieve carbon neutrality, and that our lands have potential to be either a significant barrier or a helpful solution to reaching this goal.[10]

Carbon Neutrality
Carbon neutrality is achieved when the flux of greenhouse gas sources and sinks are equal.

WHAT ARE THE CLIMATE RISKS PROJECTED TO IMPACT OUR NATURAL AND WORKING LANDS?

While the impacts vary in different regions of California, every area of the state is already experiencing climate change impacts. Between 2020-2021:

- Governor Newsom declared drought emergencies in all 58 California counties; the 2021 water year was the second driest on record in terms of statewide precipitation.[11]
- In 2021, California experienced four of the 20 largest wildfires in our history, with 8,000 wildfires burning over 2.5 million acres across the state. The 2021 fire season also marked the first time fire crossed the granite crest of the Sierra, California's largest natural fuel break.[12]
- In 2020, the planet experienced the second-hottest year on record. This was followed by the sixth hottest year on record in 2021[13] In California, a Death Valley temperature reading hit 130 degrees Fahrenheit - the third hottest temperature ever recorded on Earth and the hottest temperature recorded on the planet since 1931.[14]

The best available science tells us these impacts will continue into the future:

- **Heat**[15] - Annual temperature increases experienced over most of California have already exceeded 1°F, with some areas exceeding 2°F. The daily maximum average temperature, an indicator of extreme temperature shifts, is expected to rise between 4.4– 5.8°F by 2050 and 5.6– 8.8°F by 2100.[16]

Heat | Did You Know?
Among natural disasters in California, heat is responsible for the most deaths in the last 30 years. Heat is responsible for more deaths than any other natural hazard in the United States.

- **Rain and Snow**[17] - California is known for its highly variable precipitation and multi-year wet or dry periods. The science points to more extreme precipitation events, increased drought severity, and more dry years in the future.[18]

Rain and Snow | Did You Know?
The snowpack in California's mountains is a key source of surface and groundwater in the state, and rising temperatures will cause a decline in snowpack by more than a third by 2050 and more than half by 2100 - even if precipitation levels remain stable.

- **Wildfires**[19] – Wildfires are affected by multiple, complex, and interacting factors such as the weather, land use, and human activity that can make future wildfires difficult to predict. A model developed for California's Fourth Climate Change Assessment projected a 77 percent increase in average area burned and a 50 percent increase in the frequency of extreme fires by 2100.[20]

Wildfires | Did You Know?
The 2020 wildfires resulted in the largest wildfire season recorded in California's modern history that was characterized by nearly 10,000 fires that burned over 4.2 million acres.

- **Sea Level Rise, Flooding, and Erosion**[21] – Sea level rise is the most well-documented indicator of climate change and is affecting California's coasts at an accelerating rate. The state's coastline is estimated to experience between 1.1 – 1.9 feet of sea-level rise by 2050 (with a low-probability, but high impact extreme of 2.7 feet) and between 2.4 – 6.9 feet by 2100 (with a low-probability, but high impact extreme of 10.2 feet). [22]

With no intervention, up to two-thirds of Southern California beaches could be lost to the impacts of sea level rise by end of the century.

Sea Level Rise | Did You Know?
Global mean sea level has risen faster since 1900 than over any preceding century in at least the last 3000 years.

- **Ocean Warming, Hypoxia, and Acidification** – The world's oceans absorb excess heat (~90%) and carbon dioxide (~30%) from greenhouse gas emissions, the former contributing to ocean warming and the latter to ocean acidification. Both warming and acidification can be catastrophic to marine habitats (e.g. disease, degradation, bleaching) and the coastal communities and industries that rely on them. Relatedly, deoxygenation of surface waters can lead to dead zones inhospitable to marine life.[23]

- **Pests and Invasive Species** – Climate change is expected to continue the spread of invasive aquatic and terrestrial species, pests, diseases, and parasites. Invasive species and pests can heavily alter habitats, drive species migrations and native species declines, decimate crops, clog waterways, and transmit diseases. Together, these impacts create systems that are less resilient to wildfire, drought, and other larger scale ecosystem stressors.[24]

WHY ARE NATURE-BASED SOLUTIONS IMPORTANT?

Nature-based solutions deliver on many of California's priorities, including building resilience to the impacts of climate change, helping achieve carbon neutrality, improving public health, expanding economic opportunity, and protecting California's world-renowned biodiversity. Numerous examples of effective nature-based solutions are readily available, including:

- ***Introducing more locally appropriate natural vegetation in cities and communities, like trees and parks*** increases carbon sequestration and builds resilience to extreme heat and flooding. This suite of nature-based solutions can also create **high-road jobs** , improve neighborhood quality of life, drive down building energy costs, reduce vehicle-miles traveled, allow soils to better absorb and retain water, expand access to nature, enhance biodiversity, improve mental and physical health and wellbeing, and increase social cohesion and quality of life for communities.[25]

High-Road Jobs
Optimizing climate policy outcomes while supporting the creation of and access to family-supporting jobs is a "high-road" approach to economic development.

- ***Climate smart management of wetlands and*** **riparian areas** allow for greater carbon storage, and reduce risks of flooding and soil erosion. These nature-based solutions can also improve water quality; increase the richness and diversity of our soils and coastal habitats; sustain important cold-water habitat for California's native species; and create outdoor recreation opportunities.[26]

Riparian areas
Riparian areas describe lands along rivers, creeks and streams. They can be found on many of our natural and working landscapes.

- ***Climate smart agricultural practices increase*** soil carbon and function for improved water quality and availability, nutrient efficiency and natural fertility, crop production, and forage growth. They can also increase water storage for flood and drought resilience; contribute to our economy; increase food security; improve water and air quality; support biodiversity; and on grasslands, can reduce the risk of extreme wildfire.[27]

- ***Climate smart forest management*** reduces the threat of catastrophic wildfire and supports long-term carbon storage. Nature-based solutions that improve the health of our forests also capture and clean our water supply, improve air quality, provide habitat for wildlife, create high-road jobs, and support local economies through tourism, recreation, and forest products.[28]

The reasons Californians value healthy lands are as diverse and important as the outcomes those lands can deliver.[29] This strategy is intended to elevate and accelerate the role of healthy lands in achieving our climate change goals. Its focus, therefore, is on nature-based solutions that advance carbon neutrality and climate resilience – which they often do simultaneously. The actions called for in this strategy also advance other priorities, including building a more equitable state and preserving ecosystems and biodiversity.

HOW CAN NATURE-BASED SOLUTIONS ADVANCE EQUITY?

While we all pay a price when our lands are unhealthy – with our health, our economic growth, and our security – some of us are burdened more than others. **Climate vulnerable communities** experience heightened risk and increased sensitivity to climate change and have less capacity and fewer resources to cope with, adapt to, or recover from climate impacts. For more information on community vulnerability to climate change, please refer to this resource guide.[30]

We are actively working to address a legacy of racism, discrimination, and injustices that have placed disproportionate burdens on many Californians, especially California Native American tribes and communities of color.[31] These structural injustices influenced land protection, ownership, access, use, and management of land in California, and

Climate Vulnerability
Climate vulnerability describes the degree to which natural, built, and human systems are **at** risk of exposure to climate change impacts.

resulted in dispossession and attempted destruction of tribal communities and other vulnerable communities, including increased concentrations of environmental pollution, limited access to nature, limited community engagement, reduced opportunities to farm and manage land, and loss of sacred lands and species and the ability to steward them.[32]

We are committed to transcending this legacy by working with California Native American tribes and climate vulnerable communities to advance equal access and opportunity; advocate for those who have been historically

disadvantaged; and enable all to succeed.[33] Increasing diversity of those who work with and enjoy our natural assets will bring a rich array of experiences and perspectives, and support an inclusive, well-rounded, and intersectional approach to fulfilling the promise of nature-based climate solutions.[34]

Opportunities for climate smart land management to increase equity and environmental justice in California include:

- ***Protecting vulnerable communities.*** Climate change exacerbates existing inequities, and disproportionately impacts those with the least capacity to prepare for, respond to, and recover from the impacts of climate change.[35] Nature-based solutions can reduce climate risks for and build climate resilience of the most vulnerable among us.

- ***Addressing California's historical wrongs toward California Native Americans.*** California Native American tribes' lifeways, culture, and economies are closely linked with climate sensitive resources. California Native American tribes have been dislocated from their natural resources and lands through historical wrongs including state sanctioned violence and genocide , and are disproportionately vulnerable to the impacts of climate change.[36] We must address these historical wrongs and develop strong partnerships with California Native American tribes to implement Governor Newsom's Native American Ancestral Lands Policy and ensure tribal Traditional Ecological Knowledges and expertise can be respectfully and properly employed to address the climate crisis.[37]

- ***Preserving and protecting traditional cultural resources and landscapes.*** Accelerating nature-based climate solutions is an opportunity to incorporate best available science and Traditional Ecological Knowledges and tribal expertise into our portfolio of nature-based solutions. This effort will support the protection of traditional cultural resources and landscapes at risk from climate change, and can be achieved through partnership with California Native American tribes and federal and state research institutions.[38]

- ***Dismantling structural racism.*** According to a 2020 study, formerly redlined neighborhoods are on average five degrees hotter in the summer than formally greenlined areas that were previously favored for housing loans. Some cities experience differences of up to 12 degrees between formally red- and greenlined areas." These neighborhoods consistently have far fewer trees and parks that provide shade and clean the air, and have more paved surfaces that absorb and radiate heat.[39] Nature-based solutions that are developed through community involvement and address community priorities can contribute to closing this gap.[40]

- ***Expanding economic opportunity.*** Nature-based solutions can create paths towards wealth building in multiple ways, such as multibenefit/multisector approaches that emphasize local economic development opportunities associated with land stewardship. It is important to ensure new jobs in the natural and working lands sector are good quality jobs (for example, in terms of pay and benefits, working conditions, and advancement opportunities) and to create access to these jobs through workforce development and career pathway strategies that ensure the inclusion of all individuals and communities.[41]

- ***Increasing access to nature.*** Six of every ten Californians live in park-poor neighborhoods and four of every ten Californians have no access to open space within walking distance of their home.[42] Nature-based climate solutions can close these gaps, while also delivering multiple other benefits such as protection from extreme heat and flooding, improved public health, and habitat for biodiversity.[43]

- ***Empowering communities***. Local communities need to be involved in all aspects of climate smart decision-making,

from planning to implementation, including workforce development, to ensure equity and sustainability.[44] This meaningful engagement will benefit from scheduling and holding meetings at appropriate times and locations, including in person, virtual, and hybrid, that facilitate the ability of members of the public to participate and, where appropriate, providing interpretation and accommodations in public meetings and translation and accessibility of accompanying visuals, handouts, and presentations.[45] Local communities need information in plain, straightforward language, avoiding technical terms as much as possible.[46] Additionally, equitable implementation of nature-based solutions will be bolstered through education, incentives, technical assistance, and capacity building.[47]

HOW CAN NATURE-BASED SOLUTIONS ADVANCE BIODIVERSITY?

California is considered one of the world's 36 "**biodiversity** hotspots" because of the high concentration of unique species and ecosystems experiencing unprecedented threats.[48] Climate change is one of the greatest threats to biodiversity in the state; resulting in habitat loss, the introduction and spread of invasive species, increased exposure to novel diseases and toxins, and increasing rates of species extinction. The science is clear – the climate and biodiversity crises are interconnected. Thriving biodiversity supports climate resilience and carbon neutrality. In turn, resilient landscapes protect biodiversity. There are many nature-based solutions that can address both the climate and biodiversity crises, such as:

Biodiversity
Biodiversity refers to the variety of life from genes to species to ecosystems.

- ***Ecological connectivity.*** This connectivity is vital to building resilience of California's biodiversity to climate change. Increased temperatures, changing precipitation patterns, and other climatic changes will cause habitats and food sources to shift; species will need to move across the landscape to find these necessities. Fragmented landscapes create barriers to species movement, which could critically impact survival. Habitat connectivity is also essential to support migrating animals, birds, and insects. Nature-based solutions can help enhance and connect landscapes, allowing species to access suitable habitat as the climate changes; migrate within, between, and across habitat boundaries; and maintain the population diversity necessary for natural communities to adapt to future environmental changes.

Ecological Connectivity
Ecological connectivity refers to the unimpeded movement of species and the flow of natural processes that sustain life on Earth.

- ***Protection of landscapes that support high levels of biodiversity.*** As the climate changes, nature-based solutions present opportunities to protect and restore the ecosystems and landscapes which California's exceptional biodiversity relies on to thrive.[49] This includes potential areas of refugia, which are relatively buffered from climate change and likely to continue supporting species persistence in the future.
- ***Restoring vulnerable ecosystems.*** The restoration of climate-vulnerable and threatened ecosystems will help enhance

biodiversity through the creation and expansion of wildlife habitats, in addition to delivering key services to build resilience of human communities, such as water storage and extreme heat and flood mitigation. Restoration can include invasive species removal, revegetation, reintroduction of keystone species, and other activities that are critical for restoring ecological function to support biodiversity and resilience.

According to the Intergovernmental Panel on Climate Change's Sixth Assessment Report, maintaining resilience of biodiversity and the many benefits provided by healthy ecosystems that we rely on will depend on effectively and equitably conserving at least 30% of the planet's land, freshwater, and oceans.[50] California's 30x30 initiative will expand enduring conservation measures across a broad range of landscapes, waterways, and seascapes to achieve three key objectives: 1) Protect and restore biodiversity, 2) Expand access to nature, and 3) Mitigate and build resilience to climate change. To learn more about the state's 30x30 initiative, please visit californianature.ca.gov.

OVERARCHING GOALS OF THE NWL CLIMATE SMART STRATEGY

This Strategy is intended to advance several goals:

1. Align existing state efforts impacting natural and working lands under one cohesive strategy, and identify opportunities to improve our approaches over time.
2. Increase awareness of nature-based climate solutions and their ability to deliver environmental, economic, public health, and equity improvements in California.
3. Guide and accelerate both near-term and long-term climate action on California's lands, prioritizing durable solutions that deliver multiple outcomes
4. Advance equity and opportunity for all regions and residents of California as we implement nature-based climate solutions, and prioritize investments that benefit climate vulnerable communities.
5. Begin to track and measure our collective efforts to accelerate climate smart land management and meet natural and working lands targets identified in the state's Climate Change Scoping Plan.

The North Campus Open Space (NCOS), Santa Barbara County, CA

NEXUS WITH OTHER STATE STRATEGIES

Addressing the climate crisis requires transformational, systems-wide changes and unprecedented collective action. California is driving toward these shifts through an increasingly integrated approach, with a broad range of plans that advance climate action. These can be generally organized into four plan types. Climate actions across all plan types inform one or both of the state's central frameworks for addressing climate change – the Scoping Plan and California's Climate Adaptation Strategy:

Statewide climate action plans are centrally focused on delivering climate change action across California. Examples include the:

- Department of Finance's Climate Investment Framework
- Climate Action Plan for Transportation Infrastructure
- Extreme Heat Action Plan
- 2021 SB-100 Joint Agency Report
- Short-Lived Climate Pollutant Reduction Strategy
- Zero Emission Vehicle Market Development Strategy
- Putting California on the High Road: A Jobs and Climate Action Plan for 2030
- State Agency Sea-Level Rise Action Plan for California
- Farmer and Rancher-led Climate Change Solutions
- Natural and Working Lands Climate Smart Strategy

Sector-based strategies address many of California's most pressing challenges and include but are not exclusively focused on climate change-centered actions. Examples include the:

- Wildfire and Forest Resilience Action Plan
- Forest Carbon Plan
- Unified Strategic Workforce Development Plan
- Water Resilience Portfolio
- Integrated Energy Policy Report
- Pathways to 30x30: Accelerating Conservation of California's Nature
- California Statewide Housing Plan
- Bank Climate Catalyst Fund
- State Water Resources Control Board Strategic Plan
- California Transportation Plan 2050
- Strategic Plan to Protect California's Coast and Ocean
- California Department of Health's Strategic Plan
- State Wildlife Action Plan

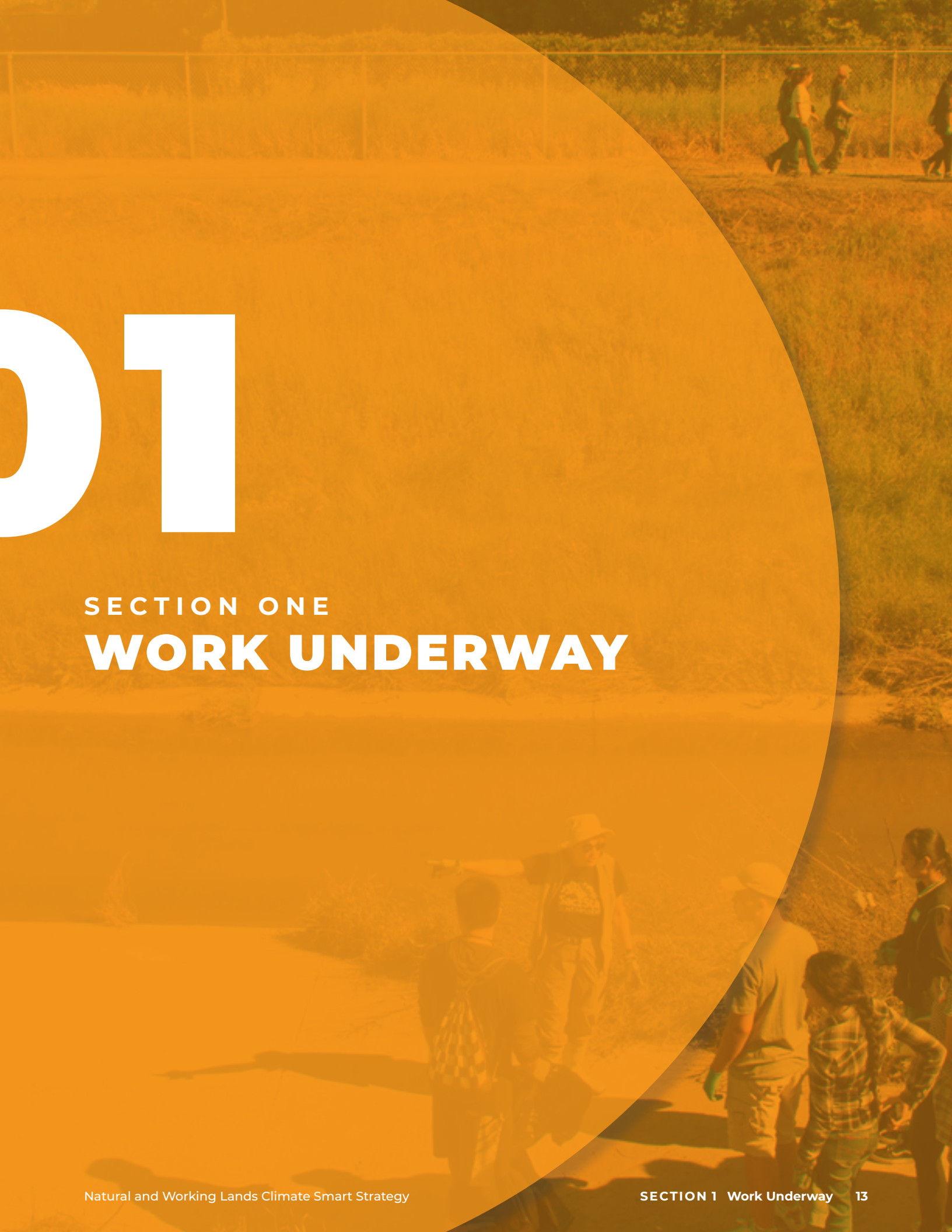
Regionally-focused strategies are developed by state entities to address climate change and other critical challenges in line with regional conditions and priorities. Examples include the:

- Central Valley Flood Protection Plan
- Salton Sea Management Program
- Numerous place-based state conservancy, board, and commission plans

State stewardship plans guide approaches to state operations and stewardship that advance climate action and our broader policy agenda. Examples include the:

- California Water Plan
- State Parks Sea Level Rise Strategy
- Department of General Services Sustainability Plan
- State Lands Commission's Strategic Plan
- CalPERS' Investment Strategy on Climate Change
- CalSTRS' Net Zero Implementation Framework

The Natural and Working Lands Climate Smart Strategy is a statewide climate action plan. It reflects and reinforces nature-based climate solutions called for in all other plan types, and informed the 2021 Climate Adaptation Strategy and 2022 Scoping Plan.



01

SECTION ONE
WORK UNDERWAY

Morrison Creek Clean Up event in Sacramento, CA

SECTION ONE

WORK UNDERWAY

EXISTING STATE EFFORTS

The State of California is advancing climate smart land management through a broad range of initiatives, summarized in this section and detailed in Appendix E. We are grateful to undertake these efforts alongside so many climate leaders managing lands across California, including California Native American tribes, federal and local government entities, farmers and ranchers, land trusts, community-based organizations, non-profits, community service districts, and more.

LEGISLATIVE DIRECTIVES

The California legislature has played a key role in advancing climate smart land management by codifying the importance of the state's natural and working lands in achieving carbon neutrality and building climate resilience. For example:

- Senate Bill (SB) 1386 (Wolk, Chapter 545, Statutes of 2016) declared protecting and managing natural and working lands as an important strategy in meeting greenhouse gas reduction goals a policy of California, and required all state entities to consider this policy when carrying out activities related to the protection and management of natural and working lands.
- Assembly Bill (AB) 1482 (Gordon, Chapter 603, Statutes of 2015) recognized climate smart land management of our natural and working lands as a critical pillar of our state adaptation efforts.
- Assembly Bill (AB) 691 (Muratsuchi, Chapter 592, Statutes of 2013) requires local trustees that manage state lands to assess vulnerability to state lands and assets from sea level rise and describe potential adaptation strategies for their protection and resiliency.
- Assembly Bill (AB) 1183 (Ramos, Chapter 380, Statutes of 2021) established the California Desert Conservation Program to undertake a number of efforts including protecting, preserving, and restoring portions of the Mojave and Colorado Deserts, promoting the protection and restoration of desert biodiversity, and providing climate resilience in the region.
- Senate Bill (SB) 27 (Skinner, Chapter 237, Statutes of 2021) required California Natural Resources Agency (CNRA) to develop the Natural and Working Lands Climate Smart Strategy, and to establish a California Carbon Sequestration and Climate Resiliency Project Registry. The registry is intended to

identify projects that drive climate action on California's natural and working lands seeking funding from state agencies or private entities. SB 27 also requires the California Air Resources Board (CARB) to establish carbon dioxide removal targets for 2030 and beyond as part of its Scoping Plan, considering the Natural and Working Lands Climate Smart Strategy, science-based data, cost-effectiveness, and technological feasibility in doing so.

- Senate Bill (SB) 1260 (Jackson, Chapter 624, Statutes of 2018) aimed to clear the path for more collaborative wildfire fuel reduction and prescribed burning projects to reduce the risk of catastrophic wildfire.

- Assembly Bill (AB) 2470 (Grayson, Chapter 870, Statutes of 2018) established the Invasive Species Council of California to coordinate efforts to prevent invasive species introduction and advise efforts to control or eradicate such species.

- Assembly Bill 398 (E. Garcia, Chapter 135, Statutes of 2017) made numerous important climate policy changes, including requiring the CWDB to report to the Legislature on the need for increased education, career technical education, job training, and workforce development resources or capacity to help industry, workers, and communities transition to economic and labor-market changes related to specified statewide greenhouse gas emissions reduction goals. The 2020 report included recommendations for the natural and working lands sector.

- Assembly Bill (AB) 4211 (McCarty, Chapter 238, Statutes of 2018) required State Parks to develop programs to restore public lands that use compost, co-compost, rice straw, and chemically fixed sewage sludge

STEWARDSHIP OF STATE-OWNED AND MANAGED LANDS

California state government owns approximately 3 percent of the state's land mass. While this is a small portion of overall land, state agencies can lead the way demonstrating effective land management policy. In addition to owning lands, the state manages lands throughout California. Many state agencies directly implement climate smart land management:

- The Department of Parks and Recreation (State Parks), manages 1.6 million acres of land across 281 parks in every region in the state. As a stewardship agency, State Parks works to restore degraded lands while managing its intact landscapes and extensive coastal holdings to be resilient to climate change impacts. State Parks' educational mission seeks to inspire and empower the public with knowledge about how to address the state's emerging climate challenges.

- The Department of Fish and Wildlife (CDFW) conserves, manages, enhances, and restores one million acres on 700+ properties, as well as the state's network of 124 Marine Protected Areas. Actions taken to promote climate resilience include conserving critical habitat linkages to provide movement corridors and targeting invasive species to protect native biodiversity.

- The Department of Transportation's (Caltrans) owns and manages over 350,000 acres of right-of-way throughout the state and implements various climate smart land management practices. Caltrans' has expanded the used of compost application and mulch in landscaping, seeding and erosion control activities. Caltrans' Adopt-a-Highway Program provides an avenue for individuals, organizations, and businesses to help maintain sections of roadside within the California Highway System. This maintenance can include planting and establishing trees or wildflowers and controlling vegetation. Caltrans' Advance Mitigation Program is set up to proactively plan for potential future impacts from transportation projects to natural resources and seeks to meet conservation goals. Caltrans is incorporating principles of nature-based solutions to address climate risks to transportation infrastructure to include sea level rise adaptation strategies.

- The California State Lands Commission manages nearly 4.5 million acres of land (much of which are submerged or tidal lands), and monitors land legislatively granted in trust to local jurisdictions. All applications for permits and leases for the use or occupation of these lands are evaluated for climate change considerations. Where applicable, provisions relating to climate change resilience, adaptation, and protection are included.

- The Department of Forestry and Fire Protection (CAL FIRE) undertakes research projects and experimental harvest techniques on nine Demonstration State Forests, which cover approximately 72,000 acres. These efforts explore how to balance the effects of management in dynamic forests, and help inform management practices for California's many private forest landowners.

- The Department of General Services (DGS) manages a portfolio of 72 state-owned properties across the state (2021). DGS is working to support achieving carbon neutrality and increase infrastructure resilience across state-owned buildings, supporting state agencies and departments to implement state sustainability initiatives.

STRATEGIES AND PLANS

- The State Planning Priorities, developed by the Legislature, prioritize infill development and equity, the protection of natural and working lands, and efficient development patterns overall. The Governor's Office of Planning and Research (OPR) encourages local planning activities that are consistent with the State Planning Priorities by providing guidance, tools, and technical assistance.

- Caltrans' Transportation and Community Planning Program comments on local development proposals affecting the state highway system and recommends mitigation that supports smart growth development patterns, conservation of our natural resources, and protection of the global commons. Specifically, Caltrans supports strategies and recommendations of no build in low lying flood prone/tidal inundation areas, prime farmland, forests, and rangelands.

- CDFW's Natural Community Conservation Planning and Habitat Conservation Planning programs facilitate regional planning for the protection and resilience of biodiversity. There are currently 17 approved Natural Community Conservation plans and more than nine in various stages of planning. Together, these plans cover more than 8 million acres.

- Nature-based solutions are one of four action tracks in the state's Extreme Heat Action Plan , which outlines established actions underway and recommends new actions to reduce heat risks and build the resilience of human and natural systems.

GRANT FUNDING

California currently operates nearly 150 grant programs that fund climate smart land management implementation (details in Appendix E).

PARTNERSHIPS

Land ownership in California is complex and diverse; trusted partnerships are therefore essential for successful climate action on our natural and working lands. Illustrative examples of successful collaboration include:

- The State of California and the U.S. Forest Service are implementing a Shared Stewardship Agreement signed in 2020 outlining a long-term, coordinated, and science-based forest management strategy. As the U.S. Forest Service manages 57 percent of California's forests for the public trust, this partnership is central to our climate smart forest management efforts.

- The California Workforce Development Board's High Road Training Partnership Initiative is supporting:

- An 18-month training program for over 2,000 individuals to become certified tree trimmers in California in partnership with the International Brotherhood of Electrical Workers 1245 and the California Nevada Joint Apprenticeship and Training Committee of the Line Construction Industry. The program will reduce wildfire risk, build community resilience, and increase worker safety, job quality, and wages.
- The Community Revitalization and Ecosystem Workforce training program to increase capacity of California Native American tribal crews in the Sierra Nevada region to utilize Traditional Ecological Knowledges and tribal expertise; secure government contracts to perform restoration work on their ancestral lands; and train workers in forest health, ecology, wildfire risk reduction, etc. Among others, partners include the Sierra Institute for Community and Environment and Calaveras Healthy Impact Solutions, and others.

- The Tahoe Central Sierra Initiative is a partnership of state, federal, nonprofit, and private entities to improve the health and resilience of the Sierra Nevada through large landscape forest restoration. To date, partners have secured over $32 million in grant funds to implement high-priority forest health projects that sequester carbon and reduce the risk of wildfires.

- Redwoods Rising is a partnership among the non-profit organization Save the Redwoods, the National Parks Service, and State Parks to accelerate redwood forest recovery and help protect their remaining old-growth groves. Redwood National and State Parks are home to almost half of the world's remaining protected ancient old-growth redwood forests. These ancient redwoods store more carbon per acre than any other forests on Earth.

- The Healthy Soils Initiative is a whole of government approach involving 15 state agencies and departments to increase the pace and scale of healthy soils practices throughout California through program and regulatory alignment, leveraging resources, and cultivating public-private partnerships.

- The state's ten Conservancies partner with local government, non-profit organizations, and tribes to develop and implement multi-benefit projects that conserve natural and working lands and advance climate adaptation.

- The Delta Interagency Invasive Species Coordination Team, facilitated by the Delta Conservancy, fosters collaboration and communication among state and federal agencies, researchers, conservation organizations, and other stakeholders to detect, prevent, and manage invasive species in the Sacramento-San Joaquin Delta.

California also encourages partnerships through a variety of programs, such as:

- The Department of Conservation's (DOC) Regional Forest and Fire Capacity Program, which increases regional capacity to advance projects that improve forest health, boost fire resilience, and increase carbon sequestration in forests throughout California.

- The Department of Pesticide Regulation's Alliance Grants Program, which brings together collaborative teams to encourage and assist growers, urban pest managers, school staff, and other interested parties to adopt promising and proven reduced-risk alternatives to conventional pest management practices.

SCIENCE, RESEARCH, DATA, ANALYSIS

California conducts analysis and funds a broad range of research to advance climate smart land management:

- California's Climate Change Assessments fund research and tools to help us understand what climate change means for California's future, empowering us to plan and take action accordingly. Many of the research topics focus on natural and working lands. For example, what does increased

likelihood of drought mean for food production? What are the implications of decreased snowpack on water supply? How might we quantify the benefits of healthy natural and working lands?

- CARB's Inventory of Ecosystem Carbon in California's Natural & Working Lands helps California understand trends in our ecosystem carbon stocks. The inventory will monitor the State's progress towards the targets set in the Scoping Plan by tracking how much carbon exists in California's ecosystems and where that carbon is located at discrete moments in time. It also estimates how much carbon is moving in and out of the various land types and carbon pools.

- The Department of Water Resources' (DWR) Greenhouse Gas and Subsidence Reversal Research Program, with academic institutions and other partners, measures and monitors greenhouse gas fluxes throughout the Delta – where oxidation of the highly organic peat soils annually releases approximately 2 million metric tons of carbon (the equivalent of amount of carbon sequestered by 11 million acres of California forests in one year) and results in land subsidence.

- California's Ocean Protection Council and San Francisco Estuary Institute are partnering to create a coastal wetlands, beaches, and watersheds inventory. This effort will improve the state's ability to identify and implement successful **blue carbon**[51] projects, implement and track statewide restoration efforts, and understand vulnerability to sea level rise.

- The California Department of Food and Agriculture (CDFA)'s Soil Carbon Map, slated to be complete at the end of 2022, will provide information related to carbon storage of California's soils.

- CDFA's Office of Pesticide Consultation & Analysis conducts research aimed at giving California agriculture additional and often lower risk tools to combat pests, including on biologically integrated farming systems to further the outreach of innovative, efficient, and scientifically sound IPM-based practices.

The state also supports external research that advances nature-based climate solutions. For example:

- CDFA's Healthy Soils Program Demonstration Projects aims to improve soil health, sequester carbon and reduce atmospheric greenhouse gases by funding on-farm demonstration projects that collect data and/or showcase conservation management practices to promote widespread adoption of climate smart agricultural management throughout the state.

- The Strategic Growth Council's Climate Change Research Grant Program is supporting research that evaluates the carbon sequestration potential of soil amendments, and creates data and tools for more effective forest management.

- CAL FIRE's Forest Health Research Grant Program funds scientific studies that provide critical information and tools to support climate smart forest management.

Blue Carbon

Blue carbon is the term used to describe carbon captured and held in coastal vegetation and soils, such as seagrasses and wetlands. The U.S. was the first nation to include blue carbon in its national greenhouse gas emissions inventory. According to the National Oceanic and Atmospheric Administration, "this addition means that conservation and restoration partners can provide authoritative numbers on the carbon-storing capacity of their coastal projects—and potentially make a profit, too, through carbon-trading financial markets. Credit for the inventory addition goes to NOAA's land cover program, which has documented coastal land cover data and change over more than three decades."

- The Delta Stewardship Council funds scientific research that furthers our understanding of how climate change will impact vulnerable communities and ecosystems in the Sacramento-San Joaquin Delta; examines how different wetland restoration strategies promote carbon sequestration and affect greenhouse gas fluxes; and identifies strategic opportunities to address sea level rise.

POLICIES AND REGULATIONS

California manages and protects its natural and working lands through several policies and regulations. For example:

- Governor Newsom's Ancestral Lands Policy calls for increased access and co-management of state lands and the return of state excess lands to tribal ownership and control.

- California High Speed Rail incorporates a range of nature-based solutions and criteria requirements in construction contracts, such as utilizing vegetation to reduce the impacts of flooding, green storm-and-wastewater infrastructure, fire-resistant landscaping, and constructed wetlands.

- The California Public Utilities Commission requires utilities to file climate vulnerability assessments. These assessments become the basis by which utilities plan infrastructure investments. Additionally, utilities must file Wildfire Mitigation Plans that outline effective actions to reduce utility-related wildfire risk, including approaches for vegetation management.

- The Coastal Commission, the State Coastal Conservancy, and BCDC work to protect and enhance natural resources of and access to our coast and ocean through implementation of California's Coastal Zone Management Program. This includes ensuring coastal resources and public access ways to the coast are safe from hazards such as sea level rise and erosion.

- The State Board of Forestry regulates commercial timber production to protect ecological health of forests.

- The California Natural Resources Agency's Cutting Green Tape Initiative is increasing the pace and scale of ecological restoration and stewardship by improving interagency coordination, partnerships, and agency processes and policies.

OUTREACH, EDUCATION, CAPACITY AND TECHNICAL SUPPORT

California invests in outreach and education, capacity development, and technical support to support landowners and managers implement nature-based climate solutions. For example:

- CARB provides publicly available methodologies and tools for estimating greenhouse gas emission reductions and co-benefits and determining benefits to disadvantaged and low-income communities.

- The Department of Resources Recycling and Recovery manages the Community Composting for Green Spaces Grant Program, which supports small-scale composting programs, environmental education, and compost-related job training in communities across California.

- DOC provides capacity and planning grants to resource conservation districts, land trusts, local land use agencies, and others to support regional conservation partner development and strategic planning.

- BCDC's Adapting to Rising Tides program and the State Coastal Conservancy's Climate Ready program prepare climate vulnerability assessments, adaptation tools, and on the ground projects to increase resilience in the San Francisco Bay Area.

LEVERAGING FUNDING AND FINANCE

Several state programs leverage funding and finance to support climate smart land management, such as:

- The California Infrastructure and Economic Development Bank's (IBank) Climate Catalyst Fund, which was created to provide low-interest loans for projects that deliver on priority actions to meet the state's climate goals, and where technologies and infrastructure exist that should be deployed at much greater speed and scale, yet face barriers in the private market.

- CAL FIRE's California Forest Improvement Program, which encourages private and public investment in California forest lands and resources, including management planning, tree purchase and planting, timber stand improvement, habitat improvement, and land conservation practices.

- The California Tahoe Conservancy's Livable Communities Program, which helps reduce greenhouse gas emissions by supporting equitable smart growth. The Program transfers development rights from environmentally sensitive lands to town centers to increase climate resilience for natural communities interspersed within urban areas.

- CDFW's Regional Conservation Investment Strategies Program, which uses a science-based approach to identify habitat conservation and enhancement opportunities that can contribute to species adaptation to climate change and resiliency. These strategies can be used as a basis to provide advanced mitigation through the development of credits or to inform other conservation investments.

MARKET MECHANISMS

California aims to make climate smart land management cost-effective through the implementation of market mechanisms.

- One of the state's largest market mechanisms is its Cap-and-Trade program, managed by CARB. The Cap-and-Trade program establishes a declining limit on greenhouse gas emissions and creates a powerful economic incentive for investment in efforts that support greenhouse gas reductions and carbon neutrality. To meet its compliance obligations under the program, a regulated entity may use offsets from one of the six approved compliance offset protocols. These protocols include forestry, urban forestry, and rice-cultivation nature-based solutions. In addition to compliance offset projects, the cap-and-trade program also generates auction proceeds for the state, which have provided significant funding for nature-based solution projects.

- The Voluntary Carbon Market allows regulated and non-regulated sources of greenhouse gas emissions to offset their emissions through purchase of credits derived from projects that support carbon neutrality. A team lead by the Sacramento-San Joaquin Delta Conservancy has received approval by the American Carbon Registry on a voluntary market protocol that allows landowners to convert their land to managed wetlands or rice fields to stop subsidence and related carbon emissions. The team continues to work with landowners to convert lands.

EQUITY

California is also working to intentionally integrate equity into our climate smart land management efforts. Examples include:

- Numerous state agencies driving nature-based solutions along the coast have committed to partner with underserved communities, including tribal communities in California, to build coastal and ocean climate resilience. Success metrics with timeframes for this work are included in California's 2021 Climate Adaptation Strategy.

- Expanding access to nature is one of three key objectives of California's 30x30 initiative, which will expand enduring conservation measures across a broad range of landscapes, waterways, and seascapes.

- The Department of Parks and Recreation's Statewide Park Program creates new parks and recreation opportunities in and for underserved communities across California.

- The Governor has called on all state agencies to incorporate Traditional Ecological Knowledges and tribal expertise into land and resource management practices and decisions through Executive Order N-82-20.

- CDFA's Climate Smart Agriculture Technical Assistance program is supporting Socially Disadvantaged Farmers and Ranchers and disadvantaged communities through making climate smart agricultural knowledge and incentives available.

- CAL FIRE, the California Department of Corrections, California Conservation Corps, and the Anti-Recidivism Coalition are supporting a joint collaborative to train former inmates to become wildland fire fighters, help implement prescribed fire projects, and provide targeted re-entry support at the Ventura Training Center.

- The State Lands Commission, Coastal Commission, State Coastal Conservancy, Ocean Protection Council, and BCDC have all worked to integrate environmental justice into their programs to ensure equitable climate adaptation and resilience measures, as well as meaningful community involvement in their projects, permitting, and leasing processes.

- DOC's Sustainable Agriculture Land Conservation Program (SALC) team hosted two listening sessions and two working group sessions to identify ways to increase program participation by disadvantaged communities, socially disadvantaged farmers and ranchers and tribal entities. DOC also engaged subject area experts to complete a full review of the SALC program guidelines through a tribal lens and will be using this feedback to inform upcoming rounds of guidelines.

TRACKING ACTION ANDMEASURING OUTCOMES

Several of California's climate smart land management initiatives monitor, track, and evaluate their impacts. Examples include:

- CNRA is designing a Project Tracking and Reporting System to track and assess the performance of the agency's projects that, for example, restore land health, conserve lands, protect critical habitat, sequester greenhouse gases, and build resilience to climate impacts.

- CNRA's forthcoming Statewide Timberland Ecosystem Monitoring and Assessment Program will use science and data to track the health of California's forests to understand how management and harvest practices impact forest and watershed health.

- DOC's Farmland Mapping and Monitoring Program produces maps and statistical data used for analyzing impacts on California's agricultural resources to inform decision-making. Agricultural land is rated according to soil quality and irrigation status; with best quality land deemed Prime Farmland.

- Through its Climate-Biodiversity Sensor Network, CDFW is installing climate sensors on selected CDFW lands alongside ecological sensors and/or monitoring programs to inform how climate variables affect biodiversity management targets over time.

- CDFA's Healthy Soils Program Demonstration Projects collect data and showcase conservation management practices that improve soil health, sequester carbon, and reduce atmospheric greenhouse gas emissions.

02

SECTION TWO

PRIORITY ACTIONS AND APPROACHES

West Fork of the Carson River in Alpine County, CA

SECTION TWO

PRIORITY ACTIONS AND APPROACHES

CLIMATE ACTION POTENTIAL AND PRIORITY APPROACHES

This section describes how natural and working lands can support California's efforts to build a resilient, carbon neutral future, including the vital role water plays. It identifies landscape-specific priority nature-based solutions, as well as cross-cutting priorities that underpin successful climate action across all natural and working lands .

CROSS-CUTTING PRIORITIES FOR CLIMATE SMART LAND MANAGEMENT

- Prioritize and practice equity, including through meaningful community engagement and prioritizing implementation of nature-based solutions that benefit the communities most vulnerable to climate change.
- Advance multi-benefit, collaborative, landscape-level approaches that engage communities and landowners, and incorporate adaptive managements.
- Empower all Californians (and youth in particular) through technical assistance, education, outreach, and training pathways into high road jobs that drive California's restoration economy.
- Align, leverage, and scale resources, particularly through partnerships.
- Partner with California Native American tribes to increase co-management and tribal management authority; restore and enhance natural cultural resources, traditional foods, and cultural landscapes; and support tribes' implementing tribal expertise and Traditional Ecological Knowledges and cultural easements.
- Protect landscapes that deliver multiple ecosystem services, are resilient and likely to persist under future climate conditions, and have high carbon storage capacity.
- Conserve established and potential climate change **refugia** and corridors, facilitating migration, range shifts, and connectivity to support biodiversity.
- Avoid conversion and advance durable protection measures, such as acquisition and voluntary easement and infill and compact development, as means of preserving carbon sequestration and storage value and building climate resilience.
- Combat invasive species.
- Expand capacity of public and private nurseries and native seed banks to increase amount and variety of seedlings available to be used in restoration and post-disturbance recovery, and to prepare for changing climate conditions.

Refugia
Refugia are places where plants and animals can thrive in a changing climate.

The actions called for in this strategy are included because they deliver climate benefits, can be implemented in a locally/regionally appropriate manner, and support other important environmental, cultural, economic, and equity goals across California's natural and working lands and the water systems that support them.

Redwood Forest, Northern CA

FORESTS

CLIMATE BENEFIT POTENTIAL

Forests cover 27% of California (28.7 million acres).[52] Including trees, soils, other plant materials, forests currently store the largest proportion of carbon on California's lands. Forests in California are diverse in their composition and structure, ranging from expansive oak woodlands to towering redwood and sequoia groves, and the climate smart land management needs on this landscape are just as diverse and often site-specific.

Forests

Forests Ownership Percentages:

- Federal Government: 54.6%
- State Government: 2.2%
- Local Government: 1.1%
- Private: 41.4%
- Non-profit: 0.7%

Over the past century, forests have largely served as a carbon sink that removed carbon from our atmosphere. Prior to the policy of excluding wildfire from our landscapes, which began just over a century ago, fire played an important role in supporting healthy forests.[53] Many California Native American tribes recognized this interdependence between fire and the environment and used cultural burning to maintain and restore environmental health and to promote the growth of resources important to their communities.[54] Whether through natural ignition or cultural burning, fire in our forests encouraged fire-resilient species to thrive, reduced the risk of catastrophic fires by decreasing the amount of vegetation that could catch and spread fire, supported diverse ecosystems, and shaped forests that were predominantly open with very large and resilient trees.[55]

The combination of a century of fire exclusion practices that have generated far greater fuel loads, historic timber harvesting methods that removed many of the largest, most fire-resilient trees, and climate change impacts have culminated in far more large, catastrophic wildfires.[56] Our forests are, or are becoming, a carbon source emitting more carbon than they

remove from the atmosphere.[57] Without climate smart forest management, we cannot count on them being carbon sinks in the future.

Large portions of our forests now consist of smaller, tightly spaced trees that are vulnerable to drought, disease, and pests.[58] These smaller trees are also much more vulnerable to high-severity wildfire[59] – a risk that is further compounded by the approximately 163 million trees that have died since 2010, a mortality strongly correlated to the effects of the 2012-2016 drought.[60] Since 2000, wildfires have caused forest ecosystem pools to become a significant and growing source of GHG emissions.[61] The associated carbon losses (greenhouse gas emissions released into the atmosphere) of these wildfires contribute to the very problem healthy forests naturally help solve.

Climate smart management can help return forests stabilize their carbon stocks, limit the release of significant emissions due to catastrophic wildfire activity and drought, and build forest resilience to better withstand the impacts of climate change.[62] Forest thinning of smaller diameter trees restores ecosystem integrity to forests by reducing competition and allowing more carbon to be sequestered and retained in the large trees that remain.[63] Fewer large trees have been shown to sequester and store more carbon than many small trees occupying the same space. Additionally, maintaining a diversity of forest structures enhances biodiversity across California and increases forest resilience to disturbances such as drought, pest attacks, and severe fire.

Forest thinning can be achieved by prescribed fire, mechanical or manual thinning, and may result in an initial loss of carbon; however, within a decade or two of treatment, the larger and more resilient trees will recover the carbon and will sequester it at a faster rate than an untreated stand. Ongoing climate smart management will be needed to maintain resilient forest conditions. Specific management actions must be determined with local expertise to match the landscape and local carbon sequestration goals aligning with the diversity of California's forests.[64]

In the near term, climate smart land management calls for building forest health and reducing excess fuels that contribute to high-severity wildfire.[65] While these actions may result in short-term emissions, they will deliver healthy and resilient forests in the long-term[66] that contribute to carbon neutrality through:

- ***Limiting Future Carbon Losses*** – Large wildfires, drought, unsustainable harvesting practices, land use change, conversion, etc. results in significant carbon loss from losing trees and plants and soil degradation. Without additional climate smart management, there will be an increase in greenhouse gas emissions, a decrease in carbon sequestration, and an acceleration of carbon stock loss from the landscape.[67] Healthy forests experience lower severity wildfires, and fewer drought impacts. They can store carbon in larger, more resilient trees,[68] and demonstrate greater flexibility for future adaptive management.

- ***Sequestering Carbon*** – Over the long-term, healthy and diverse forests are able to sequester carbon at a higher rate than overly dense forests under a broader range of stressful conditions. This will become increasingly important as climate change impacts worsen in the future.

- ***Storing Carbon*** – Healthy forests are able to store significant amounts of carbon and are at a lower risk of carbon loss due to climate impacts such as wildfire and drought. After large, high-severity fires, some of California's forests may convert to shrublands and grasslands[69] that are not capable of supporting the same level of carbon storage as forests.

Climate smart forest management will advance climate resilience by:

- ***Supporting resilient communities and natural systems*** – Forests provide much of the state's water supply and protect essential biodiversity.[70] Climate smart forest management can strategically protect vulnerable communities and California Native American tribal resources; cool habitat[71] and migration corridors that salmon, steelhead, and other native species need to survive increasing temperatures; and

increase the resilience of forests to withstand future impacts from climate change.[72]

- ***Supporting resilient economies*** – Many forests contribute to California's economy through tourism and recreation. Expanding California mill capacity and markets for innovative, sustainable wood products that utilize low- to no-low value forest residues such as biochar will improve forested economies and drive long-term climate smart forest management.[73]

PRIORITY NATURE-BASED CLIMATE SOLUTIONS

A. Protect resilient forests and large trees and advance proactive vegetation management in more vulnerable stands, using forest thinning, which includes methods such as prescribed and cultural burns and managed natural wildfire, to reduce the risk of catastrophic wildfire, increase resilience to future drought, increase carbon sequestration rates, and stabilize carbon storage.

B. Increase active reforestation efforts in areas recovering from severe wildfires and suffering from reduced natural regeneration as a result. Timely post-wildfire reforestation efforts can also prevent conversion of forest to shrublands[74] and reduced water storage capacity in watersheds.

C. Protect and **restore riparian forest ecosystems** to enhance carbon storage, protect biodiversity, and expand wildlife corridors and climate migration pathways for native species.

D. Reconnect aquatic habitat within forests to help fish and wildlife endure drought and adapt to climate change.

E. Increase voluntary cultural easements for cultural burns and to ensure California Native American tribes have access to natural cultural resources and cultural landscapes.

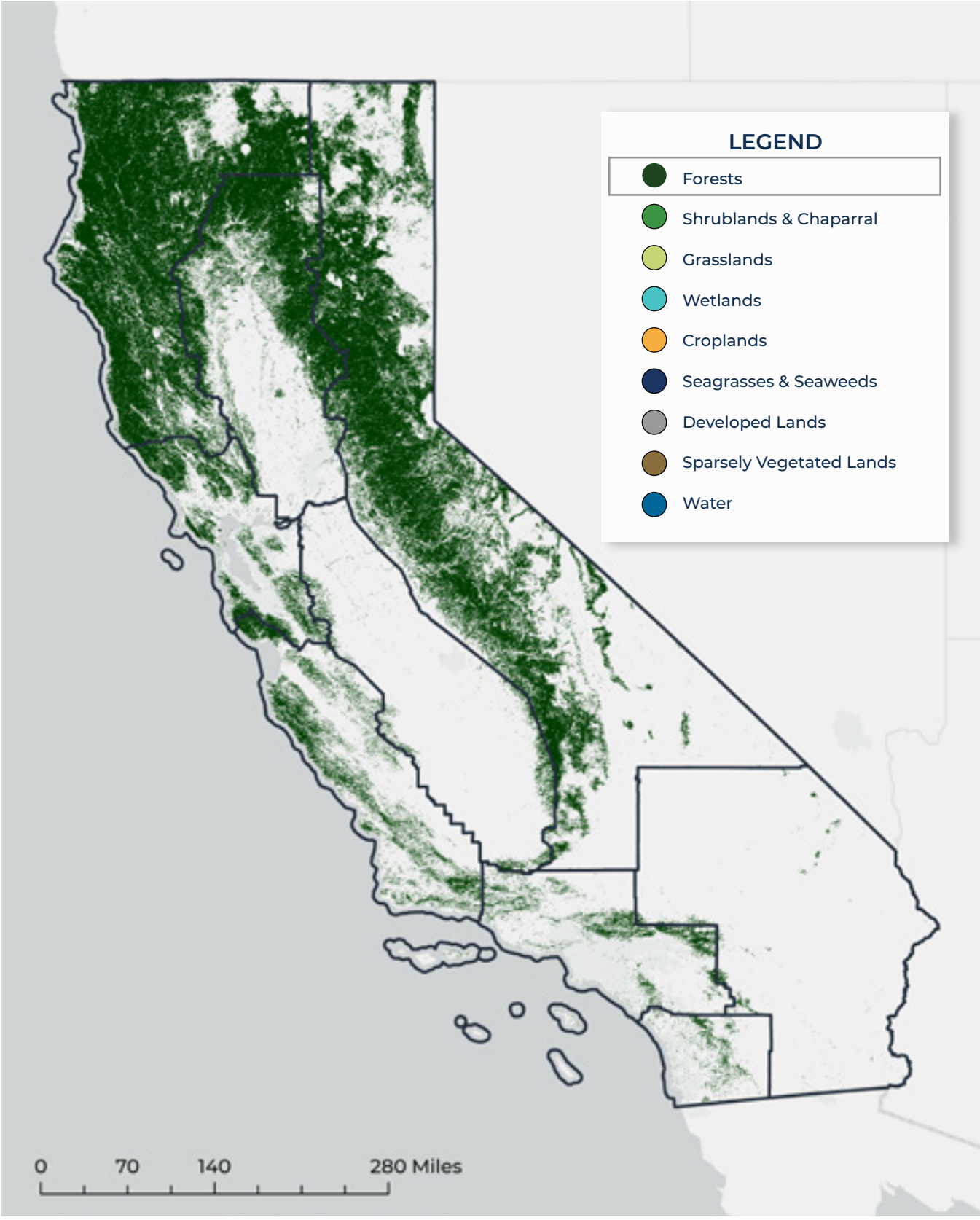
Restore Riparian Forest Ecosystems | Did You Know?

Beavers contribute to climate action on our natural and working lands! The dams they build support ecosystem health in many ways, and deliver a number of climate benefits. A few examples:

- They store and slow down water, which can reduce flood risk, replenish groundwater, and build drought resilience.
- They keep water cool, supporting native fish and wildlife's ability to survive increasing temperatures.
- They expand wetlands, which can act as fire breaks and reduce erosion. They expand wetlands, which can act as fire breaks and reduce erosion.

STATEWIDE LAND COVER MAP

FORESTS



Pinnacles National Park, CA

SHRUBLANDS AND CHAPARRAL

CLIMATE BENEFIT POTENTIAL

Shrublands and chaparral cover 31% of California (32.9 million acres).[75] These landscapes include a broad diversity of shrubs, such as manzanita, chamise, toyon, and ceanothus. In addition to creating a unique mosaic of habitats for locally adapted species, these ecosystems are important wildlife corridors, connecting landscapes throughout California. They are present from the far north of the state to the south, and from the coastal sage stands along the Pacific Ocean to the deserts along the borders of Nevada and Arizona.

Shrublands and Chaparral

Shrublands and Chaparral Ownership:

- Federal Government: 67.8%
- State Government: 3.6%
- Local Government: 1.7%
- Private: 26.6%
- Non-profit: 0.6%

Shrublands in California's deserts consist of many desert scrub communities and include creosote bush, white bursage, brittlebush, and

others. Desert shrublands with more than 10% vegetation cover are included in this land type; those with less than 10% are considered within the sparsely vegetated land type.

Shrub and chaparral lands are largely open space and habitat, with some areas having significant residential development intermixed. As a result of their broad distribution, shrublands are owned and managed by every type of owner: governmental, non-governmental organization, or private. Although lacking tree cover, shrublands and chaparral are dominated by woody plants, similar to forests.

Shrublands are differentiated from forests by their unique structure, ecologies, carbon dynamics, fire regimes, and working land uses. Despite having roughly comparable land area to forests, the dynamics of their growth and disturbance are less well known.[76] Evidence indicates that shrublands in California are burning more frequently than they would have historically,[77] leading to degraded conditions, possible conversion to grasslands, and reduced carbon storage in above ground biomass.[78]

Given the fire prone nature of this landcover and the driver of human-caused ignitions, managing shrublands and chaparral to provide stable storage and sequestration of carbon is challenging, situational, and does not have a broad consensus on a best approach. Techniques adopted from the management of forests, such as thinning or fuel breaks may only reduce fire risks and may not prove effective in modifying fire behavior. However, when utilized in conjunction with fire suppression forces, strategically-placed fuel breaks and managed grazing can provide opportunities to defend threatened communities and protect natural resources. Enabling shrub and chaparral landscapes as a contributor to achieving carbon neutrality will require:

- ***Limiting Future Carbon Loss*** – Avoid the long-term loss of biomass and soil carbon to high frequency and high severity fires, land degradation, land type conversion to grasslands, or conversion to developed landscapes. Reducing ignition sources, such as through chipping and grazing where appropriate, and utilizing fuel breaks in higher risk areas reduce the potential for fire entering these systems. Fires at a higher frequency lead to loss of carbon through conversion to grasslands, slower recovery, and degraded conditions. Additional study is needed to determine appropriate management actions and to set carbon storage targets.

- ***Sequestering Carbon*** – Manage these landscapes using approaches informed by science with sequestration targets appropriate to these land cover types. Actively restore severely burned areas to prevent conversion to grasslands.

- ***Storing Carbon*** – In the absence of disturbance, shrub and chaparral lands can store carbon, both above and below ground, at the decade to century timescale.

Climate smart management of California's shrublands and chaparral will also advance climate resilience by:

- ***Supporting resilient communities and natural systems*** – Improving our management of shrubland and chaparral landscapes can reduce the risk of wildfire, protect water supplies, stabilize eroding slopes, and maintain important habitat for biodiversity and connectivity. Shrublands and chaparral also provide recreational opportunities and have cultural significance to many Californians.

- ***Supporting resilient economies*** – A lowered risk of catastrophic fires leads to reduced disruption and risk to the economy. It also protects the communities from post-fire flooding and debris flows. Additionally, shrublands and chaparral contribute to the state's economy through open space tourism and recreation.

PRIORITY NATURE-BASED CLIMATE SOLUTIONS

A. Protect existing shrublands and chaparral systems from development and conversion and restore degraded shrubland and chaparral systems that will increase connectivity, enhance system resilience, and reduce the permanent loss of carbon on the landscape.

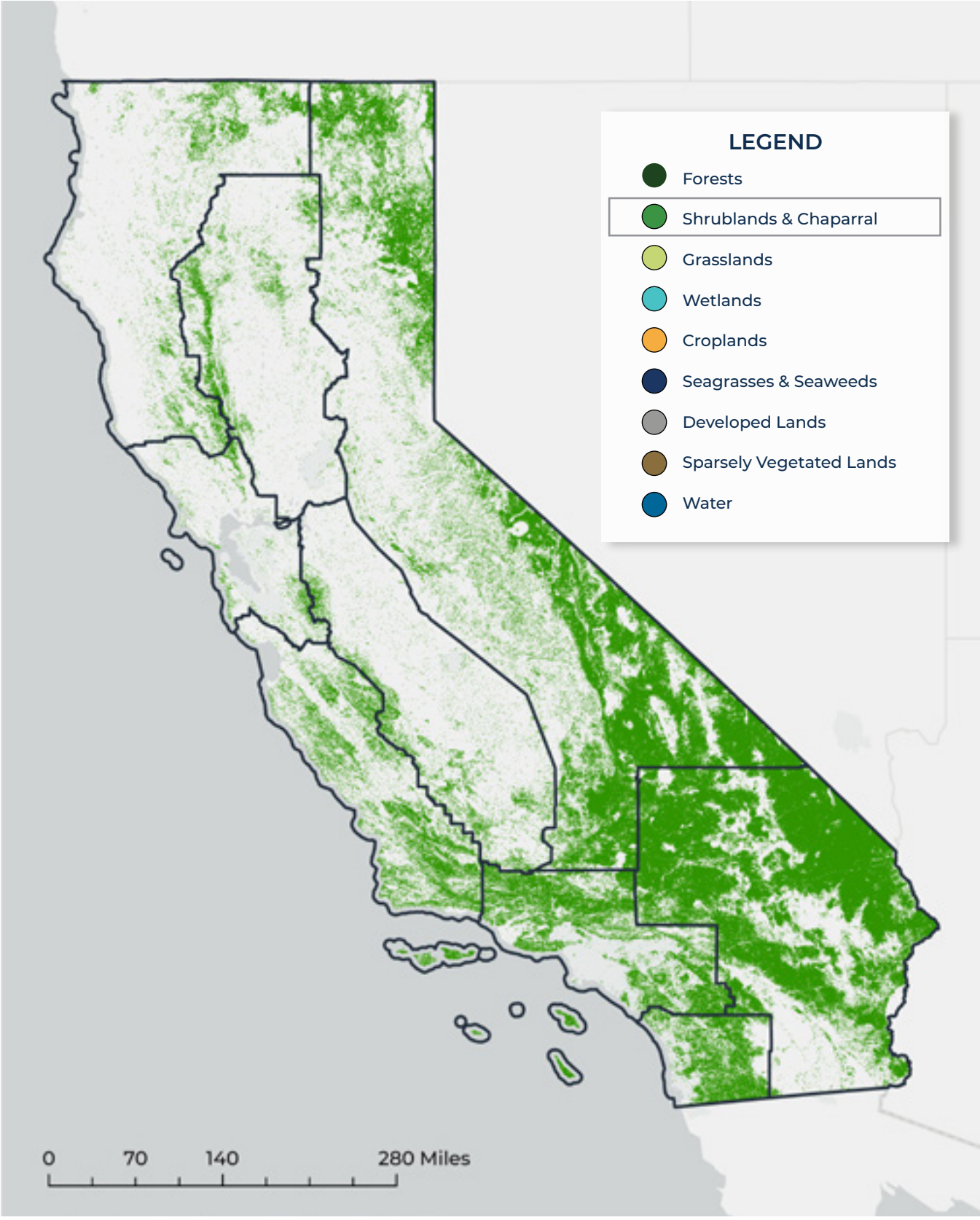
B. Build healthy soils.

C. Reduce wildfire risks through climate smart management of lands near communities and transportation infrastructure, including through development of buffer zones.

D. Apply managed grazing with goats when appropriate as an effective carbon-neutral fuels management technique to maintain fuel breaks in shrublands and chaparral and in transitional lands between these systems and forests.

STATEWIDE LAND COVER MAP

SHRUBLANDS AND CHAPARRAL



Vineyards, Central Valley, CA

CROPLANDS

CLIMATE BENEFIT POTENTIAL

California's irrigated **croplands** cover nine percent of California (9.5 million acres)[79] and make the state a global leader in agriculture. These croplands include a mix of annual (planted each year) and perennial (producing for multiple years) crops that provide over a third of all vegetables and two-thirds of the fruits and nuts in the United States. These 400+ commodities represent an essential economic engine for agricultural and rural regions across the state.[80]

Croplands

Croplands Ownership:

- Federal Government: 1.2%
- State Government: 0.4%
- Local Government: 0.4%
- Private: 97.8%
- Non-profit: 0.2%

Perennial crops, particularly orchards, store carbon within their woody materials and in soils. Annual crops store less carbon in their biomass due to their smaller size and harvest frequency. In these annual systems, soils represent the primary carbon reservoir. Broadly speaking, soils in annual croplands have low to moderate carbon content and represent an

important opportunity to store additional carbon if actively managed for carbon sequestration.[81]

Croplands' carbon stocks are relatively stable relative to risks from fire because they are heavily managed and generally irrigated landscapes. Water availability, changes in agricultural practices, fallowing or crop replacement, and conversion to urban development are significant risks to the carbon stocks in California's croplands.

Agriculture is fundamental to human civilization and has enabled the development of the social, economic, and cultural practices that buttress our communities. California's croplands are managed to product nutritious foods, myriad fibers, and nursery plants which are essential to food security, public health, art and quality of life for all Californians while simultaneously being a key economic driver in our rural communities. While being stewards of the land, farmers in California operate under resource constraints that make adopting new practices a challenge. Adding to the complexity of land management, a large portion of the state's croplands are owned by non-operating landowners who lease or rent it to tenant farmers who may or may not be able to make significant investments in the land.

The intersection of management for carbon sequestration and crop production is an area of active research and practical application. There is more to learn about how long carbon is stored through carbon farming practices. The opportunities to increase carbon storage through climate smart land management actions are substantial and generally dependent on continuing those practices or other ongoing conservation practices.

Climate smart cropland management can contribute to carbon neutrality through:

- ***Limiting Future Carbon Losses*** – Avoiding conversion of productive croplands to developed lands prevents both a loss of existing carbon and the curtailment of carbon sequestration on those lands. It also reduces pressure to convert other lands, such as grasslands and wetlands, into croplands.
- ***Sequestering Carbon*** – Through climate smart farming practices including compost application, nutrient management, conservation tillage, cover crops, and others, farmers in California can increase carbon storage in the state's croplands and reduce greenhouse gas emissions.[82]
- ***Storing Carbon*** – Croplands represent an opportunity to store additional carbon in a managed landscape while reducing risk from fire and increasing soil water holding capacity.

Climate smart cropland management can also contribute to climate resilience through:

- ***Supporting resilient communities and natural systems*** – Agricultural lands provide food security to California, the nation, and the world, and can support climate resilience through provision of habitat and resources for pollinators and wildlife, flood management, buffering against fires, and groundwater recharge.[83] With the complex intermixing of croplands and communities across California, agricultural practices have important implications for equity and public health. These outcomes benefit all Californians, and are particularly important for rural, vulnerable communities.
- ***Supporting resilient economies*** – Agriculture is a critical sector of California's economy. Climate smart cropland management promotes economic resilience, can buffer communities from extreme heat, improve air and water quality, and provide local food sources. Local and regional food systems help to reduce the carbon footprint of food production and help maintain both climate and supply chain resilience. Local food systems support diversified crop production, provide a source of local food, create local jobs, and offer habitat for beneficial insects, animals and other plant species. Additionally, these lands can contribute to regional tourism sectors.

PRIORITY NATURE-BASED CLIMATE SOLUTIONS

A. Scale up soil health practices for carbon storage, greenhouse gas emission reduction from soils, climate resiliency, soil water retention, improved water and air quality, and more, while supporting socially disadvantaged farmers. Practices include, but aren't limited to cover cropping; retention of crop residue; production and application of organic amendments, such as compost and biochar; planting of hedgerows; grass filter strips; low or no-till; integrated pest management that utilizes natural pest-predator dynamics and supports biodiversity above and below ground; and others.

B. Protect at-risk agricultural lands from development through conservation easements, Williamson Act contracts, and agricultural zoning.

C. Increase water and nutrient use efficiency, including through installation of climate smart irrigation systems.

D. Increase managed groundwater recharge on working croplands that capture rain and storm runoff and redirect water during periods of extended high flows to allow water to sink into aquifers in a manner that does not exacerbate water quality issues and ensures diversions are protective of native fish and wildlife.

E. Repurpose cropland retired or fallowed due to lack of water supply for environmental, cultural and societal benefits, such as sequestering carbon, capturing floodwater, recharging aquifers, reducing dust, and providing habitat.

F. Enhance circular economies for organic waste utilization which prioritize ecosystem and biological health, such as use as animal feed, compost creation and utilization, manure markets, whole orchard recycling and mulching.

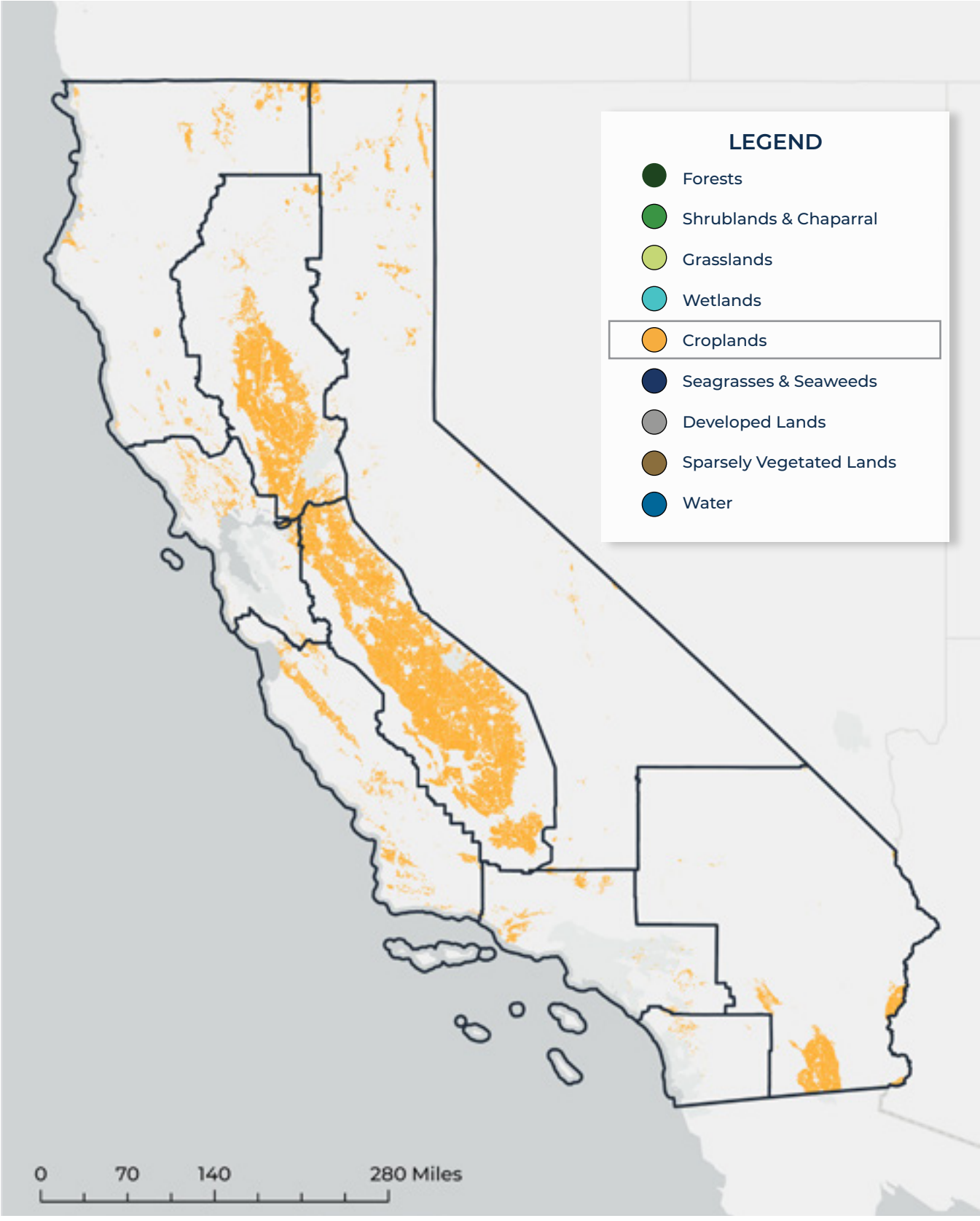
G. Facilitate planting, harvesting, and sustaining culturally and historically significant food crops by California Native American tribes.

H. Reactivate flood plains on working croplands, including rice fields to improve flood management and aquifer recharge and enhance biodiversity and habitat.

I. Scale up the use of integrated pest management; advance safer, more sustainable pest management practices and provide tools to support the accelerated transition away from harmful pesticides.

STATEWIDE LAND COVER MAP

CROPLANDS



Davis, CA

WETLANDS

CLIMATE BENEFIT POTENTIAL

Wetlands cover 2 percent of California (1.7 million acres).[84] They are defined as land that is covered or saturated by fresh, brackish, or salt water for all or portions of a year. These include both inland and coastal wetlands, such as vernal pools, peatlands, mountain meadows, salt marshes, riparian areas, mudflats, and alkali sinks and meadows.

Wetlands are highly productive and biologically diverse ecosystems that have experienced significant habitat degradation and loss in the last century.[85] The history of wetlands is one of reclamation, diking, draining, and dredging for the primary purpose of supporting the present needs of surrounding communities. It is estimated that less than 10 percent of California's historical wetlands remain.[86] Such land-use changes have complicated management around wetland habitats as the interests of various stakeholders are often in conflict.

Wetlands
Wetlands Ownership:

- Federal Government: 17%
- State Government: 7.5%
- Local Government: 3.3%
- Private: 71.2%
- Non-profit: 1.1%

There has been increasing recognition of wetlands as a significant carbon sink,[87] with

their storage capacity varying across wetland types, location, and environmental conditions. Coastal wetlands are sometimes referred to as "blue carbon" ecosystems; momentum has been building over the last decade to gather site-specific data on carbon storage and sequestration rates.

Climate smart wetland management can contribute to carbon neutrality through:

- ***Limiting future carbon losses*** - Preventing the filling or draining of wetlands is key to limiting carbon losses. Reclaimed lands in the Sacramento-San Joaquin Delta represent a well-studied opportunity to re-saturate former wetlands to stop substantial carbon emissions directly to the atmosphere from the drained peat.[88] Additionally, coastal wetlands are threatened by sea level rise and if these wetlands are not given space to migrate upland, we may lose them and the benefits they provide.[89]

- ***Sequestering Carbon*** - Wetlands are capable of sequestering carbon, but this is threatened by climate change and land use decisions.[90]

- ***Storing Carbon*** - Wetlands are also considered highly effective at storing carbon for long periods of time. This is because, as the name suggests, wetland soil remains wet - thus the breakdown of organic material is relatively slow. Certain wetlands (e.g., tidal marshes, mudflats) respond to rising seas by trapping more sediment which stores more carbon. Carbon storage potential varies greatly across wetland types and within and across sites.

Climate smart management of wetlands can also provide many climate resilience benefits to Californians, including:

- ***Supporting resilient communities and natural systems*** – Healthy wetlands can improve biodiversity, water quality and supply, easing the effects of drought; provide shoreline stability and erosion control, reducing flood risk; provide habitat and refugia for shorebirds and other species during warming temperatures; and provide habitat for commercially important species from juvenile Dungeness crab to halibut.[91] Mountain meadow wetlands improve groundwater storage, reduce and delay peak flows, improve water quality, and support native species habitat.[92]

- ***Supporting resilient economies***– In some places, wetlands are our first line of defense, protecting communities, ecosystems, and built infrastructure from the impacts of sea level rise, flooding, and storms. Many commercial and recreational fisheries are dependent on healthy wetlands as important nursery habitat[93] (for example, the Bay Delta supports steelhead and chinook salmon). Healthy wetlands can also support resilient economies through sustainable recreation and tourism and a voluntary carbon market incentive to protect and restore wetlands in California.

PRIORITY NATURE-BASED CLIMATE SOLUTIONS

A. Protect against habitat loss, degradation, and fragmentation to help maintain carbon sequestration, protect biodiversity and culturally-significant species, reduce climate risks, and increase climate resilience.

B. Restore and enhance coastal wetlands in a manner that ensures these habitats can keep pace with future sea level rise, such as conserving and restoring inland areas to allow for upland migration and through sediment augmentation.

C. Identify and prioritize wetland restoration near communities most vulnerable to climate change and where climate smart land management can improve groundwater and water quantity, protect communities from flooding, and increase access to nature.

D. Restore Delta tidal wetlands to improve ecological function and flood protection. Encourage conversion of deeply subsided Delta peatlands to rice cultivation and managed wetlands to stop subsidence and resulting carbon emissions.

E. Restore rivers, floodplains, and estuaries and facilitate their natural function and connectivity.

F. Protect and restore mountain meadow function and hydrology using site appropriate solutions, such as beaver reintroduction, to enhance water quality and reliability, biodiversity, carbon storage, and natural system connectivity.

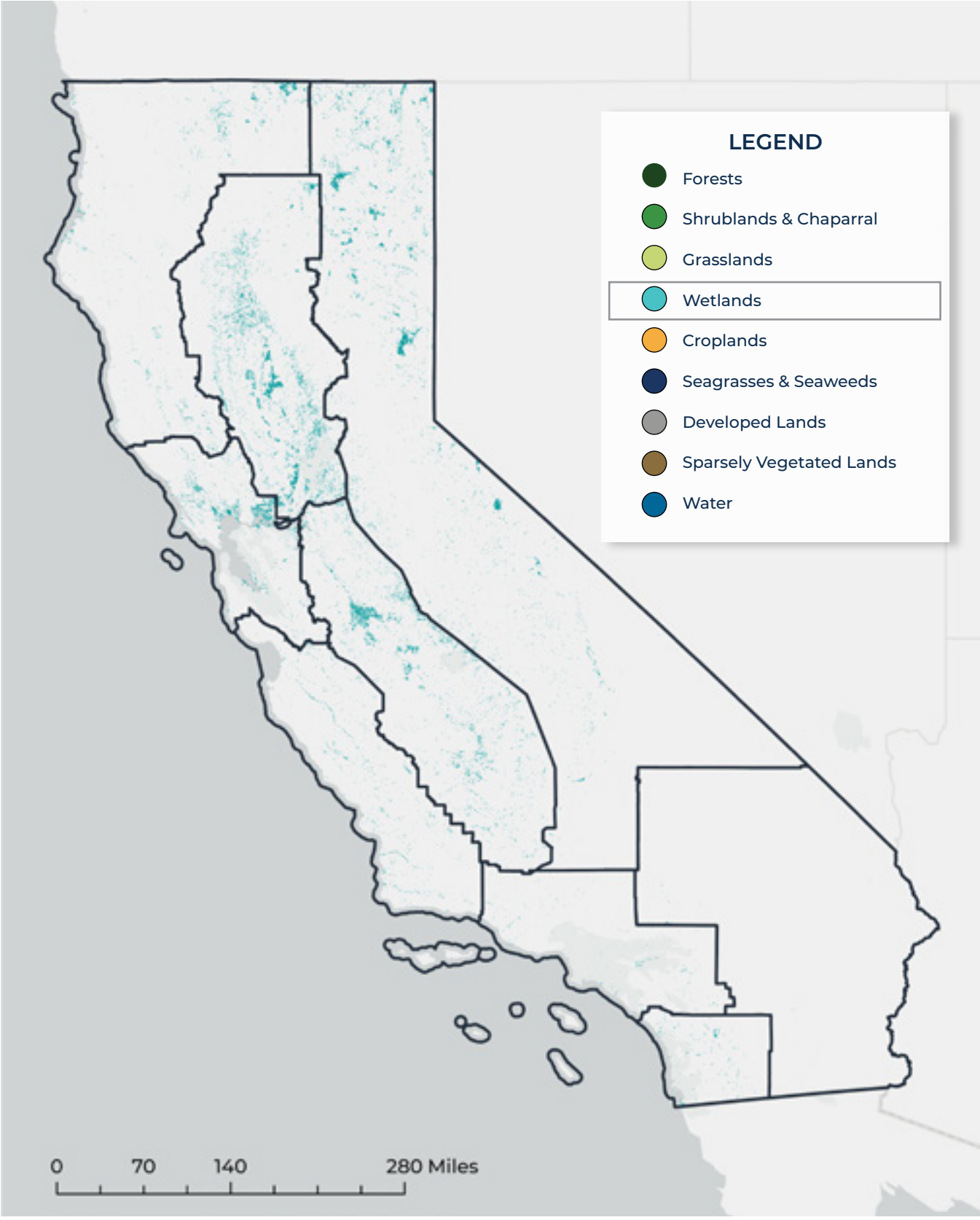
G. Treat water through nature-based solutions such as constructed wetlands and treatment channels, which can often store recycled and/or treated potable water, provide habitat for wildlife, and increase access to nature, educational opportunities, and recreation.

H. Identify opportunities to reconstruct wetlands and saltmarshes where possible, for example during construction projects in areas where these nature-based solutions could deliver climate and other beneficial outcomes to communities.

I. Construct living shorelines, which are protected, stabilized shorelines constructed with natural materials that can sequester carbon and maintain carbon stores of the wetlands they protect, build resilience to sea level rise, improve water quality, and provide coastal access and habitat.

STATEWIDE LAND COVER MAP

WETLANDS



Pacific Ocean, CA

SEAGRASSES AND SEAWEEDS

CLIMATE BENEFIT POTENTIAL

Seagrasses and seaweeds account for 0.1% of California's land cover (15,000 and 55,000 acres respectively).[94] Seagrasses (e.g. eelgrass, surfgrass) are marine flowering plants and seaweeds (e.g. kelp, fucoids) are algae. Both vegetation types are highly productive habitats that support a broad diversity of species found in shallow coastal areas.

Seagrasses and seaweeds need sunlight to grow and sequester carbon.[95] Seagrasses are most often found in muddy environments such as estuaries and wetlands, restricting them to shallow waters. In some regions, seagrass occurs intertidally, but risk of drying out can prevent expansion.

Seagrasses and Seaweeds
A Note on Ownership: ownership percentages of water, including seagrasses and seaweeds, are complex and not readily available. This also includes unique ownership types not included in other land types, such as public trust lands managed by the California State Lands Commission and Waters of the U.S., which are defined in the regulations of federal agencies to establish the scope of federal jurisdiction.

In contrast, seaweeds typically occur on the open coast where water clarity is much better.

In recent years, California has seen dramatic declines of both seagrass and kelp.[96] The leading causes of seagrass loss are nutrient pollution, poor water clarity, disease, and disturbance. The main causes of kelp loss are related to multiple climate-related stressors including a marine heat wave and mass die-off of seastars in 2014, and subsequent overgrazing of the kelp by sea urchins.[97]

These losses have impacted fisheries and critical ecosystem services, including the degradation of natural storm protection and buffering against acidifying ocean conditions.[98] These declines have impacted local economies by reducing tourism, and contributing to the collapse of major recreational and commercial fisheries. These losses have also impacted tribes' ability to gather traditional foods. Restoration efforts are on the rise, providing the added potential benefit of increasing short- and long-term carbon stores, bolstering shoreline protection, and building broader climate resilience within the coastal zone.

Climate smart management of seagrass and seaweeds can support California's efforts to achieve carbon neutrality through:

- ***Limiting Future Carbon Losses*** - Preventing the loss of or disturbance to seagrass and seaweed habitats will limit future carbon losses.

- ***Sequestering Carbon*** - Despite the relatively small footprint, seagrasses are recognized as a potentially significant carbon sink. Seaweeds could represent carbon sequestration potential, but more research is needed to understand how much carbon is sequestered versus re-released into the atmosphere after kelp dies. Given this potential, seagrasses and seaweeds have earned the moniker shared by salt marsh and mangrove systems of being "blue carbon" habitats.[99]

- ***Storing Carbon*** - The majority of the carbon stored in seagrass habitats is not from seagrass itself (e.g. standing biomass), rather it is from material that is carried into and trapped by seagrass.[100] Conversely, nearly all the carbon stored by seaweeds is locked up in its biomass. The carbon storage potential in seagrass, while variable, is quite large. In kelp forests, carbon storage potential remains a substantial data gap; their high growth rates (up to 18 inches per day) may allow them to serve as substantial short-term stores.[101]

There are many climate resilience benefits to climate smart seagrass and seaweed management, including:

- ***Supporting resilient communities and natural systems*** – Seagrasses and seaweeds can improve water quality;[102] act as storm buffers to developed coastlines; and protect sensitive species such as oysters and mussels.[103]

- ***Supporting resilient economies*** – Seagrasses and seaweeds serve as important habitat for many culturally and commercially important species of fishes and invertebrates, facilitate the recovery of local fisheries,[104] and present opportunities for aquaculture. They also provide educational and tourism opportunities through SCUBA, snorkeling, kayaking, and more. Additionally, kelp provides highly valued services related to food and nutritional supply, fertilizer, and biofuel production.[105]

PRIORITY NATURE-BASED CLIMATE SOLUTIONS

A. Protect and restore seagrass ecosystems[106] from future sea level rise, nutrient pollution, poor water clarity, disease, and disturbance.

B. Protect and restore California's kelp forests in the face of changing ocean conditions.

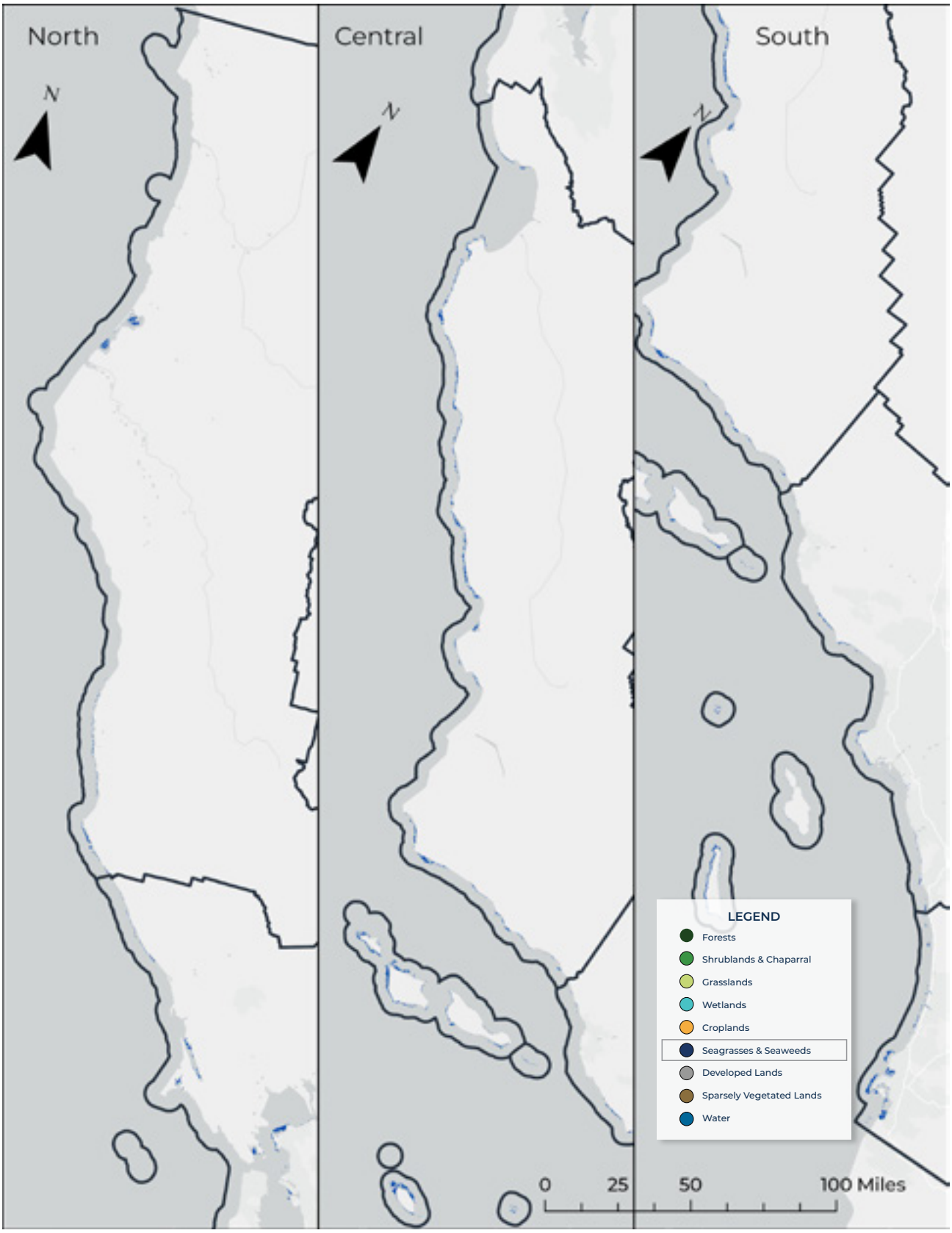
C. Continue science-based adaptive management of California's statewide network of marine protected areas to protect biodiversity in a changing climate, and further explore the role of these areas in providing resilience to climate impacts.

D. Construct living shorelines, which are protected, stabilized shorelines constructed with natural materials, such as native seagrasses. Living shorelines can support carbon sequestration and storage, build resilience to sea level rise, improve water quality, and provide coastal access and habitat.

E. Consistent with the state's Guiding Principles for Marine Aquaculture in California, support aquaculture and co-management that facilitates California Native American tribes' subsistence, cultural, and commercial practices; a sustainable blue economy; and ecosystem health.

STATEWIDE LAND COVER MAP

SEAGRASSES AND SEAWEEDS



School greening supported by the San Gabriel and Lower Los Angeles Rivers and Mountains Conservancy at Santa Fe Middle School in Monrovia, CA

DEVELOPED LANDS

CLIMATE BENEFIT POTENTIAL

Developed lands cover six percent of California (6.8 million acres).[107] These lands include a broad-range of urban, suburban, and rural settings, from city centers and town squares to transportation and water infrastructure. Urban and community forests, such as landscaping, community greenspaces and parks, green infrastructure, vegetation along grey infrastructure, gardens, and soils in urban, suburban, and rural areas are all part of developed lands.

Developed Lands

Developed Lands Ownership:

- Federal Government: 7.8%
- State Government: 1.1%
- Local Government: 3%
- Private: 88%
- Non-profit: 0.2%

California Public Resources Code defines urban forests as "those native or introduced trees and related vegetation in the urban and near-urban areas, including, but not limited to, urban watersheds, soils and related habitats, street trees, park trees, residential trees, natural riparian habitats, and trees on other private and public properties."[108] Urban and community forests

have the potential to sequester carbon at a rate that can help address climate change,[109] and are our opportunity to apply climate smart land management in the places most Californians call home.

Their character is diverse, which heavily influences the localized selection of management options and outcomes related to climate and other benefits. Carbon stocks within urban and community forests also vary, depending on the climate, design, historic investment and planning decisions, and character of the space and forest.

Appropriate climate smart land management will depend on the local character of the landscape and goals of the community.[110] Because vegetation can be tightly mixed with impervious surfaces and highly varied in size and type, improvements in the detail of mapping and scientific sampling of vegetation are important to understanding the carbon stocks and sequestration.

The way developed lands are designed and managed can contribute to achieving carbon neutrality through:

- ***Limiting Future Carbon Losses*** – Urban forests, vegetation, and soils managed to encourage healthy densities, avoid disease, and other disturbance or conversion reduce the risk of losing existing carbon stocks.

- ***Sequestering Carbon*** – Urban forests can sequester carbon in both natural and managed trees, vegetation, and soils.[111]

- ***Storing Carbon*** – With appropriate stewardship, the trees, vegetation, and soils in developed landscapes can provide a stable or increasing store of carbon. Covering bare soils with compost and mulch helps to protect their carbon and water stores and increase their potential to sequester carbon. At end of life, urban trees can be turned into wood products furthering the carbon storage period for carbon sequestered in the tree during its lifetime.

Developed lands can also contribute to climate resilience through:

- ***Supporting resilient communities and natural systems*** – Nature-based climate solutions on developed lands can address climate risk in many ways, such as mitigating extreme heat, providing groundwater infiltration, improving air and water quality, and serving as a refuge for both people and species. Nature-based climate solutions can also provide significant health benefits that include reduced stress levels, increased physical activity, mental restoration, and social cohesion.[112] Resilience benefits of urban and community forests and green infrastructure are not equitably distributed across the state. Communities of color have had limited access to these spaces due to injustices in land protection, management, and use.[113] As mentioned previously, six of every ten Californians live in park-poor neighborhoods and four of every ten Californians have no access to open space within walking distance of their home.[114]

- ***Supporting resilient economies*** – Most of California's jobs and residences are located in developed areas. Nature-based climate solutions can deliver economic benefits in a number of ways, such as improving public health outcomes during extreme heat events; creating and maintaining high quality local urban forestry jobs; reducing risk of costly property damage through flood protection; providing recreational opportunities; and decreasing energy costs through strategic shading of homes and buildings.[115] Additionally, there are numerous options to transition away from turf-dominant and/or inefficiently irrigated yards that can reduce carbon emission, increase climate resilience, and conserve both energy and water.

PRIORITY NATURE-BASED CLIMATE SOLUTIONS

A. Integrate nature-based climate solutions into (new and retrofit) community infrastructure investments, particularly pedestrian walkways, housing, schools, transportation, stormwater, and recreational spaces. Examples include, but are not limited to green schoolyards; community compost; community gardens; bioswales; urban farms; rain gardens; tree-shaded sidewalks and bike lanes; green roofs; bioretention ponds; etc.

B. Protect against habitat loss and fragmentation and reconnect fragmented habitats in developed lands to help maintain carbon sequestration, protect biodiversity and improve connectivity, limit exposure to climate risks, and increase climate resilience.

C. Invest in land acquisition, improvements, urban greening, on site organic material recycling, and high-quality, low-chemical management of parks and green spaces in and around cities to benefit communities who are often the most negatively affected by health impacts related to air pollution and extreme heat caused by urban heat islands.

D. Prioritize protection of public safety by treating vegetation near roads and energy infrastructure using best practices to protect ecological health.

E. Accelerate the adoption of integrated pest management and other safer, more sustainable pest management tools, increasing soil health and alternative practices to combat invasive species.

F. Expand and maintain both urban tree canopy and green spaces to moderate urban heat islands, decrease energy use, and contribute to carbon sequestration. Close the tree canopy gap in low-income/disadvantaged communities, particularly those vulnerable to the impacts of extreme heat, hazardous air quality, and/or with the least access to nature.

G. Utilize place-based tree and plant selection and intensity with the principle of "the right tree for the right place," to ensure the species selection process considers climate, water, and locally-specific circumstances.

H. Protect urban trees from pests, disease, and drought for as long as feasible, and seek the highest and best use for trees and other biomass that must be removed due to pests and disease or for valid management purposes.

I. Connect communities with greenways/greenbelts; consider how these landscapes can protect communities (particularly the most vulnerable) from climate impacts such as flooding, fires, heat, etc.

J. Protect and restore urban river/streams, riparian areas, floodplains, seasonal wetlands, and corridors.

K. Increase water-reuse and recycled water for urban green spaces.

L. Increase urban agriculture, and address known barriers such as land access, water hook ups, lack of local soil creation/availability, fencing, community knowledge and capacity, and local infrastructure for packaging and storage for local and regional markets.

M. Scale community land stewardship, including through neighborhood-run and owned gardens, school food gardens, community clean-ups, residential and community composting, and youth-focused land management programs.

N. Prioritize nature-based climate solutions that protect vulnerable communities from projected impacts of climate change in developed lands (such as those that absorb floodwater, prevent the spread of wildfire, and reduce temperatures) and deliver benefits beyond climate that deliver on community priorities (such as reduced air pollution, increased access to nature, and high road nature-based careers).

O. Implement healthy soils practices, including through native and locally-adapted plant landscaping and mulch and compost application.

P. Increase drought-tolerant yards and landscaping through, for example, native plant species replacements and lawn removal and by adopting, implementing and enforcing the State's Model Water Efficient Landscaping Ordinance.

Q. Ensure brownfield revitalization supports community efforts to become more resilient to climate change impacts by incorporating adaptation and mitigation strategies throughout the cleanup and redevelopment process. These efforts also increase equity, as many climate vulnerable communities live close to brownfields and other blighted properties.

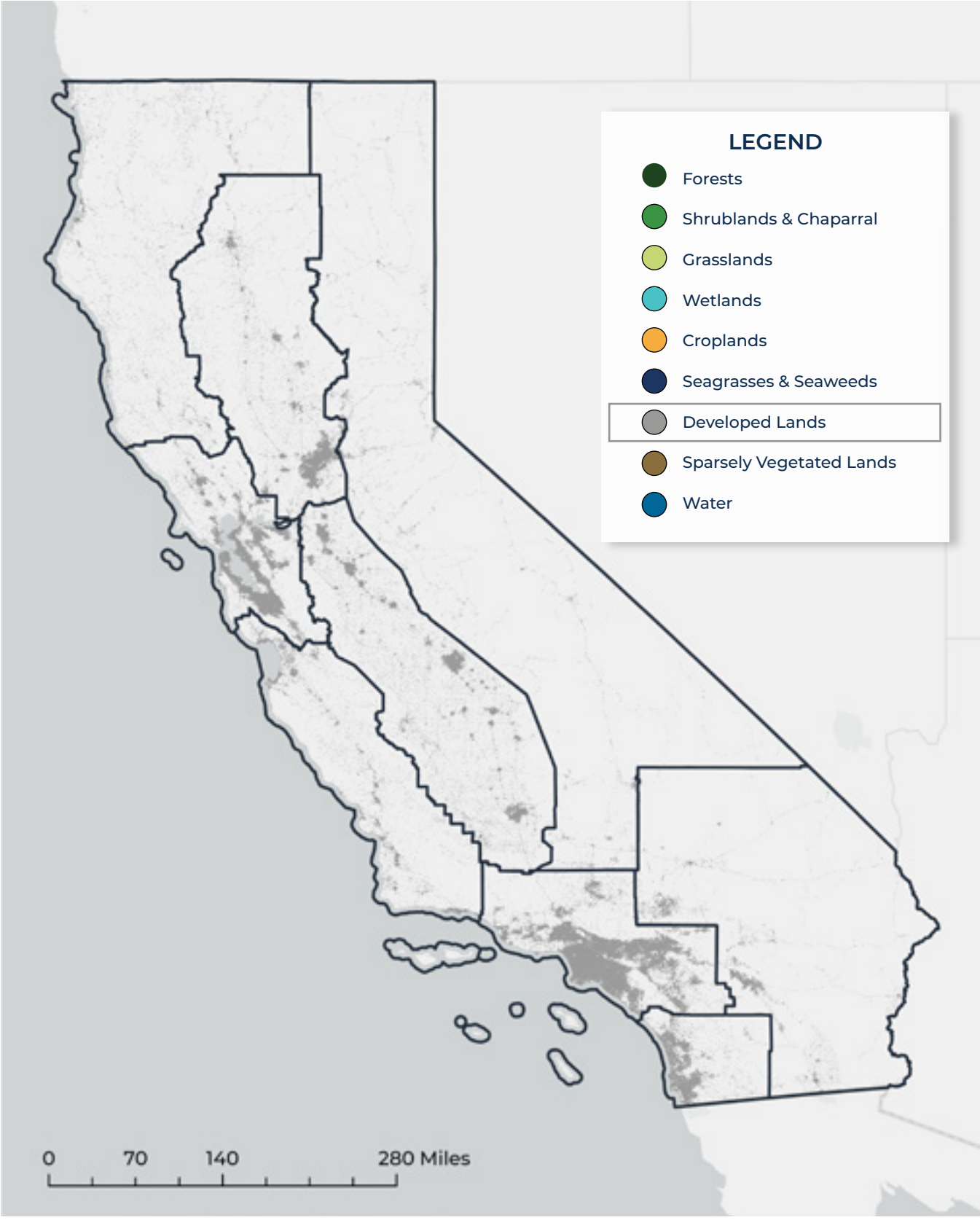
R. Utilize urban forest related efforts such as tree planting and maintenance to help create high quality local jobs where they are needed most and provide training and workforce development opportunities for priority communities to enhance the effectiveness of the urban forest economic sector.

S. Support community land stewards, gardeners, and composters to reclaim empty or unused urban spaces.

T. Restore and conserve lands developed for oil and gas production or other industrial uses, especially those near vulnerable communities, to improve public health, enhance access to nature, and create new economic opportunities.

STATEWIDE LAND COVER MAP

DEVELOPED LANDS



GRASSLANDS

CLIMATE BENEFIT POTENTIAL

Grasslands cover 9% of California (9.7 million acres).[116] They consist of areas dominated by grasses or herbaceous vegetation, where tree and shrub canopies account for less than 10% of the vegetation cover. They provide space for livestock grazing, open space and wild habitat including the biodiverse ecologies of vernal pools. Ownership of grasslands spans almost all categories, including federal, state, tribal, and local government; non-governmental organizations; and private ownership by both individuals and commercial organizations.

In grasslands, the bulk of carbon components and associated storage is in soil and root systems versus standing biomass, thus grasslands offer a potentially significant, and unique, carbon sink.[117] However, their ability to store carbon and their resilience is highly dependent on both management practices and species diversity and abundance.[118] Over the past few centuries, native perennial grasses with large root systems

Grasslands

Grasslands Ownership:

- Federal Government: 13.1%
- State Government: 2.1%
- Local Government: 2.2%
- Private: 81.3%
- Non-profit: 1.2%

have been replaced by invasive annual grass species across California.[119] The state's grasslands are experiencing the stress of climate change and historic degradation and are losing existing carbon stocks due to associated species composition change, changes in annual wet up events and disturbance patterns, and decreased groundwater replenishment.[120]

California's grasslands can contribute to the state's carbon neutrality goals through:

- ***Limiting future carbon losses*** – The spread of invasive species, drought, overgrazing, wildfires, and other disturbances can degrade carbon stores. Although climate smart agriculture can compensate for some grassland carbon sequestration losses, long term soil carbon stock losses and increases in greenhouse gas emissions may persist without active management for beneficial carbon cycling.

- ***Sequestering carbon*** - While aboveground vegetation contributes to carbon cycling, sequestration in grasslands occurs through the growth of root systems in the soil. Climate smart practices for managing grazing may improve livestock forage while sequestering carbon in perennial biomass and soils, and offer strong potential avenues for enhancing carbon sequestration rates, improving water quality, and enhancing desired species in grasslands.[121]

- ***Storing carbon*** – Native perennial grasslands could represent a long-term stable carbon sink,[122] as carbon is stored more heavily in the soil and root systems underground where it is less vulnerable to extreme climatic events (e.g., drought). Reducing invasive grasses through ecological grazing and appropriate compost application may help protect existing carbon stores by enhancing perennial grass growth, increasing photosynthetically derived carbon from vegetation and decreasing the impacts from disturbances such as fire.[123] Grasslands dominated by annual species will require active management that supports carbon sequestration and storage if they are to meet their potential for climate action.

Climate smart land management of the state's grasslands can also build climate resilience through:

- ***Supporting resilient communities and natural systems*** – Protecting refugia in grasslands that include a high diversity of native species can increase production, improve resilience to disturbance, and provide habitats that support higher biodiversity and connectivity. These lands can also increase soil water function,[124] which is critical for supporting ecosystems.

- ***Supporting resilient economies*** - Managing these lands through regenerative practices such as grazing that supports beneficial carbon cycling, biodiversity, and other ecosystem services are important tools for both protecting and restoring grasslands while also providing opportunities for climate-smart agriculture.[125]

PRIORITY NATURE-BASED CLIMATE SOLUTIONS

A. Increase climate smart and regenerative practices on grasslands, such as range planting, riparian restoration, grazing management regimes that work to support positive ecological outcomes and to increase the amount of deep rooted, quality rangeland grasses for improved vegetation for feed, carbon and water storage, and fire resiliency.

B. Preserve and restore native grasslands to improve carbon storage, biodiversity, and connectivity.

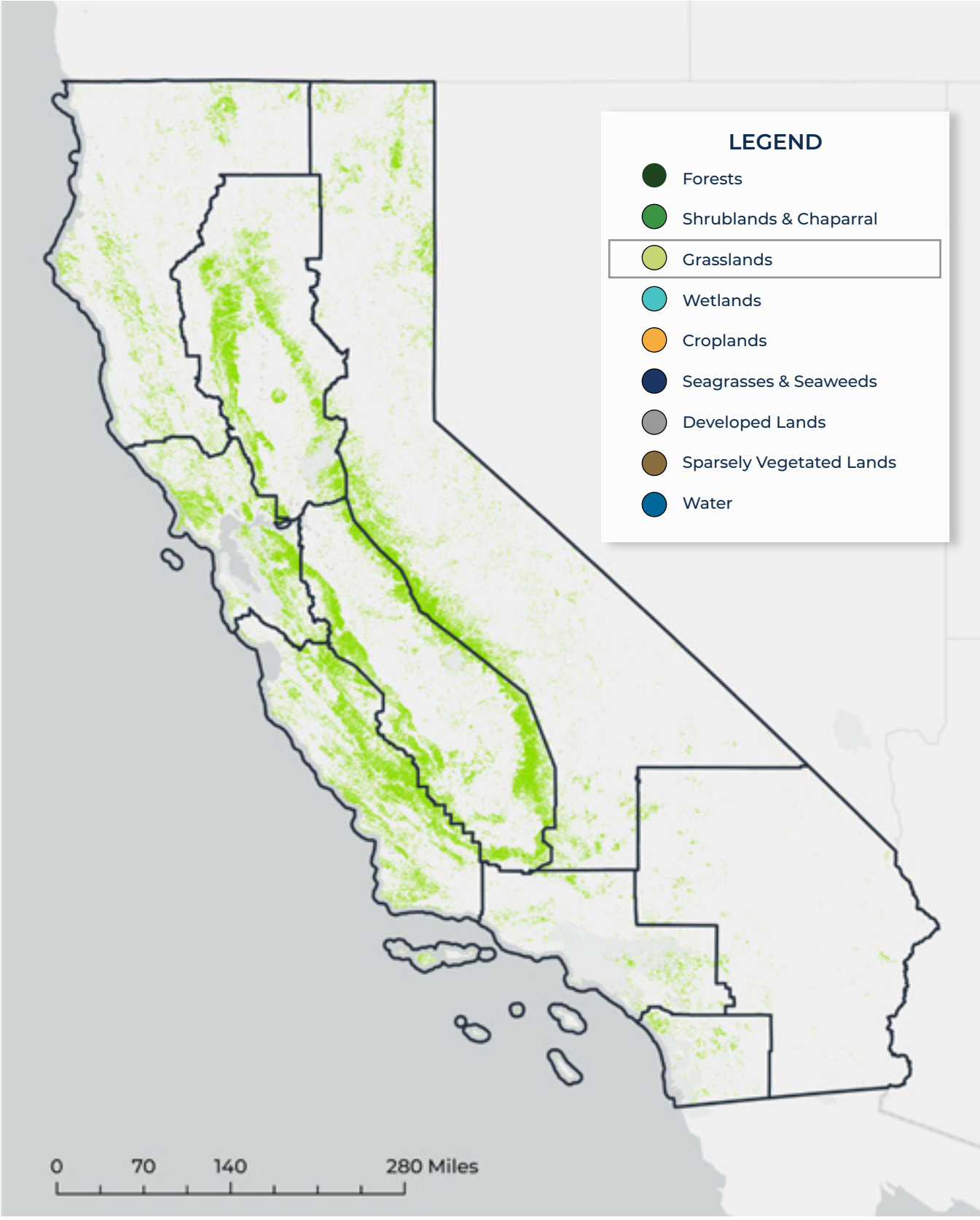
C. Protect grasslands from development and conversion to more intensive agricultural production.

D. Apply compost in ecologically appropriate contexts to grasslands to enhance carbon sequestration and storage, increase water quality and availability, and support the overall health of grazed or historically degraded grasslands.

E. Increase adoption of compost production on farms and application of compost in appropriate grassland settings for improved vegetation and carbon storage, and to deliver waste diversion goals through nature-based solutions.

STATEWIDE LAND COVER MAP

GRASSLANDS



Trona Pinnacles, CA

SPARSELY VEGETATED LANDS

CLIMATE BENEFIT POTENTIAL

Sparsely vegetated lands cover 10% of the state (10.2 million acres),[126] and include desert, beach and dune areas with less than 10% vegetation cover, bare rock landscapes, and areas covered in ice or snow such as those above the tree line in mountainous regions. This landscape also includes barren lands with hostile growing conditions resulting from lack of soil or high levels of disturbance. These lands are largely publicly owned, and can provide open space and support unique habitats. This land type consists

Sparsely Vegetated Lands

Sparsely Vegetated Lands Ownership Percentages:

- Federal Government: 78.3%
- State Government: 4.8%
- Local Government: 1.1%
- Private: 15.5%
- Non-profit: 0.3%

of extremely diverse landscapes, so this section seeks to distinguish their unique management needs.

Sparsely vegetated lands can help California achieve its carbon neutrality goals through:

- ***Limiting future carbon losses*** – Surface and subsurface disturbance and habitat loss are the greatest risks for carbon loss in deserts.[127] Although the rate of carbon sequestration is unclear in these ecosystems, it is possible the regeneration of these carbon stocks after disturbance will be additionally slowed by the sparse and relatively slow vegetative growth resulting from the harsh growing conditions.[128]

- ***Sequestering carbon*** - The more vegetated areas of this land type can account for meaningful carbon sequestration in above and below ground biomass and soils. Additional carbon sequestration in desert soil with low vegetation is possible, but the extent and rate of sequestration is still unclear.[129]

- ***Storing carbon*** – Similarly to sequestration rates, the level of carbon storage in desert soils is unclear and the duration or stability of carbon in these habitats are unknown. However, the more vegetated areas are better understood, and can account for meaningful stable carbon benefits both above and below ground.

These lands can help California build resilience to climate change through:

- ***Supporting resilient communities and natural systems*** – Reducing soil disturbance will increase public health through improved air quality. These unique ecosystems provide important habitat for endemic and specially adapted plant and animal species, and serve as wildlife corridors connecting diverse habitats throughout the state. Beaches and dunes can act as storm buffers to protect communities, ecosystems, and built infrastructure along California's coast.[130]

- ***Supporting resilient economies*** – Many beaches, low-vegetation deserts, and sparsely vegetated lands provide substantial opportunities for sustainable recreation. Some of the more isolated areas within this landscape category represent rare opportunities for scientific and educational programs, due to their unique environments and minimal light or noise pollution. In addition, beaches and dunes protect public safety and critical infrastructure, bolster tourism, and generate revenue for coastal businesses and communities.

PRIORITY NATURE-BASED CLIMATE SOLUTIONS

A. Protect sparsely vegetated lands from disturbance and conversion to other land types, particularly where these efforts protect public health and/or wildlife.

B. Restore native plants and animals on sparsely vegetated lands.

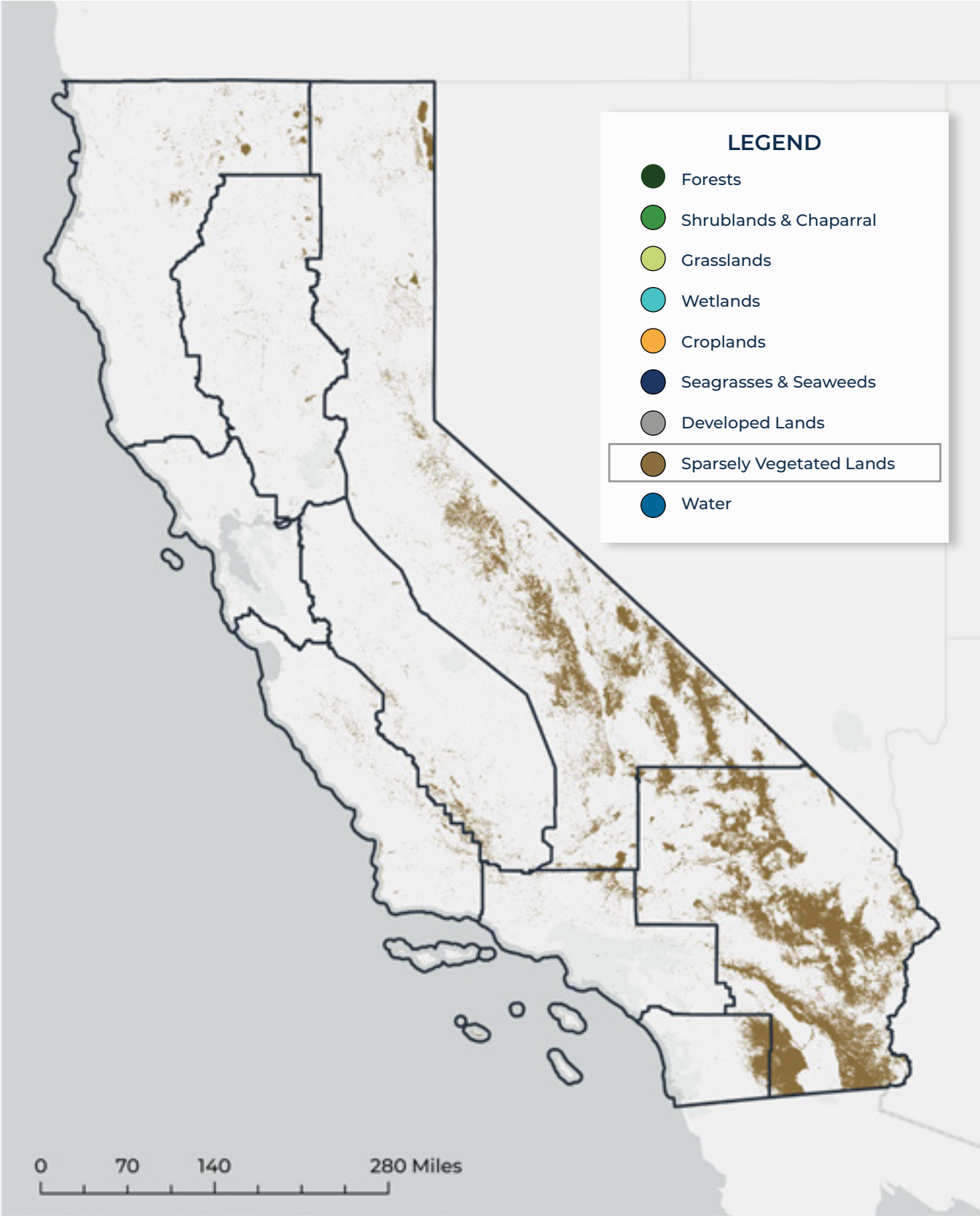
C. Appropriate use of cultural fire.

D. Increase use of living shorelines, which are protected, stabilized shorelines constructed with natural materials. Living shorelines include a variety of strategies including beaches and vegetated dunes. Living shorelines can sequester carbon and maintain carbon stores of the wetlands they protect, build resilience to sea level rise, improve water quality, and provide habitat.

E. Identify beach and dunal habitats that are vulnerable to sea level rise and develop approaches for addressing loss of these habitats, including removing barriers and protecting buffer areas on adjacent undeveloped lands to allow for inland migration.

STATEWIDE LAND COVER MAP

SPARSELY VEGETATED LANDS



Burney Falls, CA

WATER

Water is our lifeblood in California. It has supported California Native American cultures from time immemorial and today grows our food, underpins our health and well-being, fuels our economy, and sustains our natural places. From desert washes to coastal redwoods, California is home to some of the most diverse landscapes and ecosystems in the world, and its biggest cities and agricultural economy are supported by extensive engineering that captures and transports hundreds of miles

Water

A Note on Ownership: ownership percentages of water, including seagrasses and seaweeds, are complex and not readily available. This also includes unique ownership types not included in other land types, such as public trust lands managed by the California State Lands Commission and Waters of the U.S., which are defined in the regulations of federal agencies to establish the scope of federal jurisdiction.

water that originates in the Sierra Nevada and Southern Cascade mountains, and Colorado River watershed.

California's surface water includes freshwater such as rivers, streams, and lakes; **brackish water** such as estuaries; and seawater along the coastline. Some of this surface water is ephemeral or intermittent, meaning that it is only present in certain seasons. In addition to surface water, there are 515 **groundwater** basins across the state. Whether above or below ground, these waters are vital to the functions and ecosystem services provided by the state's eight natural and working landscapes, including carbon sequestration and storage, drought prevention, flood protection, and habitat creation.

Brackish Water
Brackish water has a salinity that exceeds normally acceptable standards for municipal, domestic, and irrigation uses but has less salinity than seawater.

Groundwater
Groundwater is water that occurs beneath the land surface and provides about 40 percent of the water Californians use on average. The majority of groundwater aquifers are not vast underground lakes, but rather water located between soil and sand particles, and within cracks in geologic rock formations. The water is generally supplied from the surface – by rain or melting snow – and it can take anywhere from months to tens and even hundreds of years for surface water to make it to these aquifers, depending on location.

Climate change has already significantly impacted California water resources, reducing average snowpack in the Sierra Nevada and Cascades, increasing flashy winter runoff and flood risks, curbing spring and summer streamflow, exacerbating drought, raising sea levels, and increasing wildfire risk. These impacts threaten water supply and quality. Adapting and building resilience to these impacts is imperative to sustaining the valuable functions provided by water systems and ensuring the health of the lands served by these water systems.[131]

Nature-based solutions, such as protecting and restoring wetland and riparian corridors, building healthy soils, and using drought-tolerant landscaping, are central to building water resilience. Across all of California's natural and working landscapes, nature-based solutions can improve water retention and storage, reduce risks of flooding, improve water quality, and sustain habitat.

In addition to climate-smart management on our landscapes, there are water-centric nature-based solutions that also help the state meet its climate goals. Priority nature-based solutions that advance the state's climate and water goals include:

A. Protect and restore **state waters**.

State Waters
State waters refer to any surface water or groundwater, including saline waters, within the boundaries of the state.

B. Ensure flows in rivers and streams are sufficient to provide key ecological and climate-resilience functions.

C. Bring groundwater basins into sustainable conditions that avoid adverse effects including land subsidence, degradation of water quality, and drying of surface waters.

D. Increase connection of rivers to floodplains, including restoration of riparian corridors.

E. Where practical, remove barriers, such as aging or obsolete dams and undersized culverts, to allow streams to function naturally and restore species' access to cooler water habitats.

F. Reconnect aquatic habitat to help fish and wildlife endure drought and adapt to climate change.

G. Encourage landscape-scale management, including restoration and protection of wetlands, to restore watershed health and improve community resilience.

H. Acquire land for the purposes of constructing setback levees necessary to allow streams to return to a more natural flow regime, slow down overland flow, and enhance groundwater infiltration.

I. Partner with California Native American tribes to preserve, restore, and enhance rivers, lakes, and coastal areas on ancestral lands.

For more information on how the State of California is building resilience of its water systems, please see the 2020 California Water Resilience Portfolio, the 2021 Water Resilience Portfolio Progress Report, and the Strategic Plan to Protect California's Ocean and Coast 2020-2025.

STATEWIDE LAND COVER MAP

WATER

03

SECTION THREE

TRACKING ACTION, MEASURING OUTCOMES

Pre-forest treatment survey at the French Meadows Restoration Project in Placer County, CA. Photo credit: Sierra Nevada Conservancy

SECTION THREE

TRACKING ACTION, MEASURING OUTCOMES

California is committed to taking urgent climate action in the natural and working lands sector now, and continuously improving our approach over time.

We will work to track nature-based climate solutions and their outcomes, as well as to improve our understanding and ability to measure outcomes from climate smart actions based on the best available science, data, and technologies. To improve over time, our efforts will need to be flexible; successful climate smart land management requires adaptive approaches that are continually reassessed as ecosystems and communities are affected by climate change. As climate-driven impacts endure and evolve across the state, so must our understanding of and approach to climate smart land management. Advancing this work requires addressing several challenges, such as bringing down the cost of monitoring and increasing accessibility of common evaluation practices for use by landowners and managers.

Measuring outcomes of the nature-based solutions identified in this strategy should include monitoring (planned and consistent collection of data) and evaluation (analysis of data collected). Monitoring and evaluation identify changes and trends in the natural environment and help measure the success of climate smart land management practices.[132]

Developing a comprehensive system to track

trends at a landscape scale requires a process for deriving suites of metrics, which reflect specific, measurable, representative, and time-sensitive (SMART) objectives and broader goals. These suites of metrics are used to guide decision-makers in responding adaptively to changing conditions on the ground. Once project-level indicators are in place, monitoring and evaluation efforts can be scaled to respond to broader management questions at the program and even landscape level. The more consistently metrics and measurement protocols are applied, the greater the ability land managers will have to compare project activities at scale, observe trends over time, and track the effectiveness of various climate smart land management practices. Consistent monitoring of these practices over time is essential to ensuring that projects not only achieve their intended goals, but that any challenges to the success of a land management activity can be addressed, adaptively, early on. This is critical considering the increasingly frequent and compounding climate events that are impacting California's natural and working lands. This section outlines pillars of successful progress tracking and offers potential information and indicators to measure.

INTEGRATED, COORDINATED MONITORING AND TRACKING

Lack of project communication, coordination, and data sharing are currently some of the most significant issues with environmental tracking and monitoring. Programs currently exist for tracking and monitoring separate facets of climate change, ecosystem carbon, landscape resilience, public health, regional and local land use planning, biodiversity and more.

Moving forward, it is essential that greater communication and collaboration is established between these efforts. This includes increased cooperation between all stakeholders involved in environmental tracking and monitoring within governments, academic institutions, and private organizations. Related, sustained investment in open data and open science practices are critical for nimble, data-based decision making and to facilitate community engagement.[133]

Opportunities to increase integration and coordination of environmental monitoring successfully include:

- Explore the potential for statewide monitoring system based on a set of climate indicators to track status and trends over time and inform climate smart land management in California.
- Expand and enhance the use of open data and open science practices.
- Link relevant monitoring efforts to climate goals and outcomes achieved.
- Track impacts on communities and/or ecosystems.
- Regular and meaningful community engagement.
- Ensuring our monitoring and tracking efforts reflect the needs of and are accessible and understandable to all Californians.
- Develop a unified statewide definition for aquatic resources, such as wetlands and develop a central data repository for changes in wetland location, quantity and health.
- Coordinate with the California Government Operations Agency's Statewide Data Strategy and the California Department of Housing and Community Development's Statewide Housing Data Strategy.

PARTNERSHIPS

Due to the complexity and diversity of our natural and working lands, climate smart land management often requires partnerships to be successful. To understand the scope and scale of collaborations in this sector, and to identify trends for their success, it would be useful to track:

- Nature-based solution goals, and outcomes achieved for communities, ecosystems, and workers.

- Significant barriers to implementation.
- Number and diversity of meaningful and collaborative partnerships.

DEMONSTRATION PROJECTS

Projects that demonstrate new approaches to solve problems pave the way for future successful efforts. Nature-based solutions tested through successful demonstration projects represent opportunities to scale climate smart land management, and share lessons learned such as:

- How to successfully achieve goals for communities, ecosystems, and workers using Nature-Based solutions
- Number and diversity of meaningful and collaborative partnerships.
- The level of investment required to achieve meaningful outcomes.
- Best technologies and practices defined and applied.
- Potential commercial applicability.
- Equity issues that emerge during the demonstration project.
- Regulatory hurdles to implementation and/or scaling and potential resolutions.

TRACKING AND CATALYZING INVESTMENTS

Increased and accessible public and private capital is required to scale nature-based solutions at the speed and scale necessary to deliver durable climate outcomes. Information to track collective investment and outcomes may include:

- Nature-based solution, location, and size.
- Number and diversity of meaningful and collaborative partnerships.
- Goals and outcomes achieved by landscape.
- Impacts on communities and/or ecosystems.
- Aggregate funding amount supporting nature-based climate solutions.
- New private investment mobilized in California for these practices, as a multiple of public capital committed.
- Improved access to investment capital for practitioners of climate-smart land strategies.
- Economic multipliers in California communities resulting from increased investment in climate-smart land strategies.
- Improvements in economic productivity of lands managed using climate-smart strategies.
- Changes to gross state product, state and local tax bases as a result of climate-smart land strategies.
- Studies to understand the value of nature-based solutions over the long-term.
- Amount of public and private investments prioritizing vulnerable and disadvantaged communities, as well as communities that lack access to green space.

This information can also be used to quantify the investments needed to implement nature-based solutions based on type, location, and size.

ENABLING POLICY

Policy must evolve to support and accelerate nature-based climate solutions. Policy action that facilitates climate smart land management can be tracked, evaluated, and adjusted through improved understanding of:

- Policies established to enable nature-based climate solutions.
- Policies amended to advance nature-based climate solutions.
- Changes in corporate and finance policy to support nature-based solutions.

- Economic development created by nature-based industries.
- Workforce development in high road nature-based jobs.

SCIENCE TO INFORM ACTION AND MEASURE SUCCESS

Data development, coordination, acquisition, analysis, synthesis, and utilization are central to any successful efforts for tracking nature-based solutions, their costs, outcomes, as well as to identify trends and recommend adjustments. State-wide surveys of land-use and land use change, land cover and land cover change, vegetation health, changes in GHG emissions from natural and working lands, and other variables will be needed on a frequent and regular basis both to support research and to monitor progress. Well-monitored research landscapes are needed to provide baselines and an evaluation of changes from baseline that will allow for quantitative measures of outcomes and informing adaptive management responses.

Evaluating success in these efforts may include tracking the following information:

- The number of identified data gaps in spatial and non-spatial data.
- The use of new or improved data sources to fill identified data gaps and inform decision making.
- Number of spatial layers, areas covered, gaps identified.
- Number of non-spatial data types and how many link to the spatial data.
- Level of data integration across state and non-state entities.
- Type and level of effort managing data and analytics.
- The identification and incorporation of missing key data.
- Use of peer-reviewed science and qualified scientific methods.

ADDITIONAL SUCCESS INDICATORS

Additional opportunities to track collective climate smart land management actions and measure outcomes delivered include:

1. **Ecosystem Carbon and Greenhouse Gas Indicators**
   - Metric tons of carbon stored in lands or metric tons of carbon dioxide equivalent sequestered or avoided as emissions.
   - Metric tons of carbon emitted from lands or metric tons of carbon dioxide equivalent emitted.
2. **Ecological Indicators**
   - Acres of natural and working lands managed to deliver climate benefits, such as:
     - The use of Comet Planner or similar tools to quantify opportunities for applying nature-based solutions. Acres of land under durable conservation easements that include climate-smart management requirements.
     - Acres of land with restoration efforts underway.
     - Acres of lands that contribute to the state's 30x30 goal through delivering climate benefits.
     - Average trend of high severity wildfire patch size and occurrence.
     - Acres of land covered with landscape level planning.
     - Total percentage of a select area or community that is covered by an urban tree canopy.
   - Percent decrease in ambient temperature during high heat months in urban areas, in particular in vulnerable communities.
   - Percent of agricultural acres with on-farm technical assistance, demonstration projects, and incentives.
   - Percent change in soil organic matter.
   - Percent change in soil moisture content.
   - Percent of infrastructure projects that incorporate nature-based solutions.

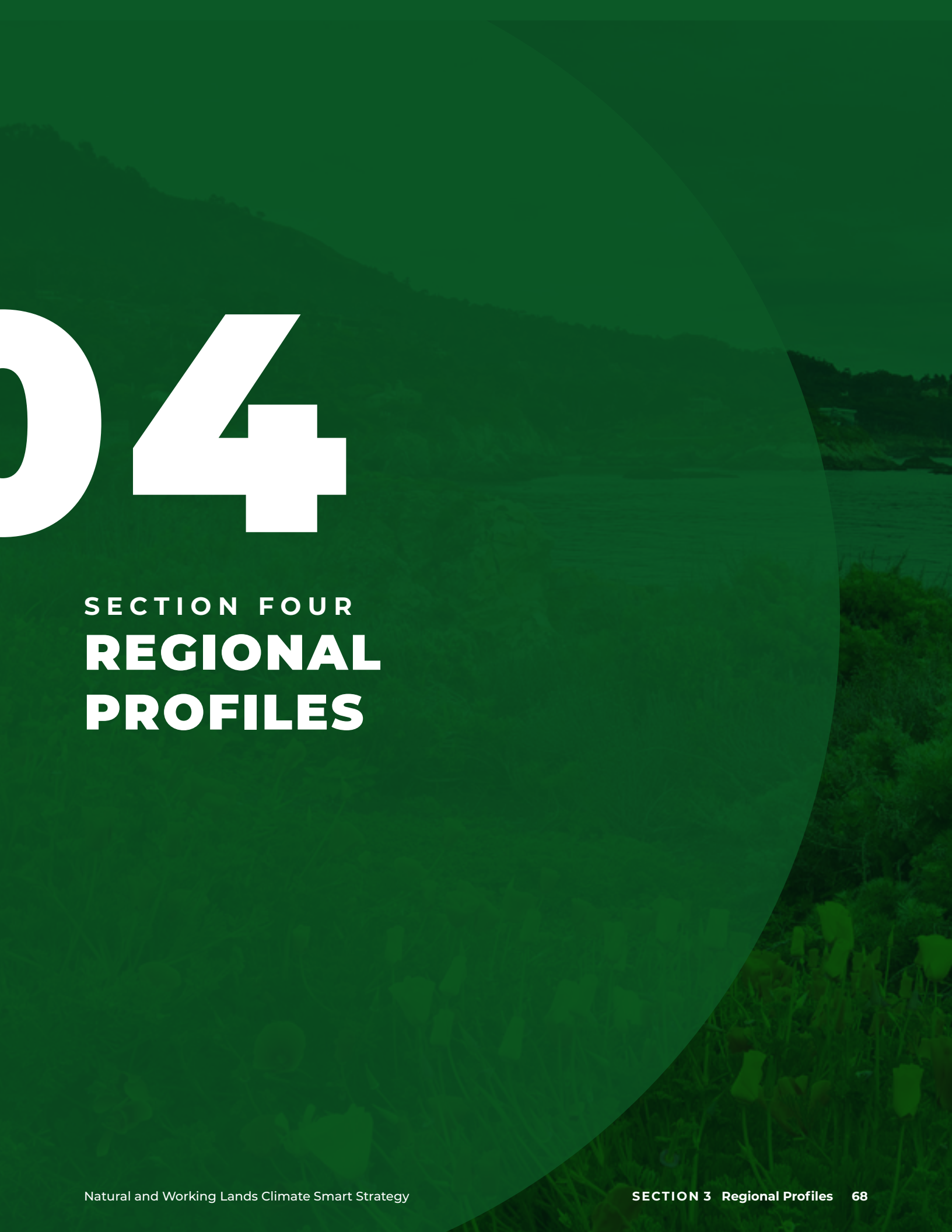
- Quantifying land cover and land use changes as part of a monitoring framework.

3. **Economic Indicators**
   - Number of workers contributing to climate smart land management.
   - Numbers of workers trained and placed into jobs, disaggregated by race, ethnicity, geography, with wages and other job quality indicators.
   - Number of high road jobs created or maintained.
   - Units of durable wood products (derived from woody material generated through forest health and resilience projects) sold.
   - Number of accessible training opportunities that provided meaningful, transferrable skills for nature-based career development.
   - New investment motivated by nature-based climate solutions.
   - Economic multipliers associated with investment in nature-based climate solutions.
4. **Infrastructure Indicators**
   - Soil water holding capacity.
   - Regional, local, and traditional food harvesting, food processing, storage and related infrastructure to support the agriculture industry and food security.
   - Managed Aquifer Recharge capacity, particularly in critically over-drafted basins and other areas in need of long-term groundwater storage.
   - Changes in the timing of watershed runoff, and number of projects implemented to address these changes.
   - Compost infrastructure capacity.
   - Percentage increase in hard infrastructure investments that incorporate nature-based solutions.
5. **Social Justice/Equity Indicators**
   - Number of acres managed, co-managed, transferred to, and owned by California Native American tribes.
   - Availability and utilization of programs that engage and support nature-based solutions that deliver environmental, equity, and economic benefits in communities most vulnerable to climate change.
   - Prioritization of communities most vulnerable to climate change for financial incentives, technical assistance, and other supportive resources.
   - Number of nature-based solutions implemented in climate vulnerable communities.
   - Percentage of socially disadvantaged farmers and ranchers with on-farm technical assistance, demonstration projects, and incentives.
   - Farmworker quality of life (including wages, health, and wellbeing).
   - Access to capital and opportunity.
   - Access to food and supply chain resilience.
   - Access to parks/greenspace.
   - Acres of community co-managed or owned properties managed for climate benefits.
6. **Public Health Indicators:**
   - Emergency department visits / hospitalizations associated with heat, wildfires, wildfire smoke, etc.
   - Excess deaths
   - Physical activity levels associated with outdoor activities, e.g., hiking, walking, cycling, etc.
   - Food security.
   - Water security.
   - Acreage of lands used for community/ urban farms.

- Market saturation with locally-produced/ grown food.
- Access to nature or green spaces.
- Air quality.
- Water quality.
- Number of nature-based solution projects that reduce health risks.

California is committed to developing systems to track the success of nature-based climate solutions and enable us to adaptively manage our natural and working lands.

CNRA is developing the Resources Agency Project Tracking and Reporting (RAPTR) System, which will be used to collect project-level information across CNRA's various grant and loan programs, including after a project is complete. Like any successful monitoring and evaluation program, this process relies on securing adequate funding and infrastructure, ensuring adequate technical expertise and staff capacity, and carefully deriving appropriate the monitoring protocols to track project and program effectiveness over time.



04

SECTION FOUR
REGIONAL PROFILES

Monterey County, CA

SECTION FOUR

REGIONAL PROFILES

Every region in California can contribute to our climate change goals through climate smart land management in line with the priority nature-based solutions identified in this strategy. California is a large, diverse, and complex state; successful climate action must reflect locally and regionally specific circumstances and priorities.

It is important to note that every region in California is also the ancestral homelands and homewaters of the many California Native American tribes, containing many places of deep cultural significance. Accelerating climate action on our natural and working lands is also an important opportunity to consult and partner with California Native American tribes.

Regional Profiles

California's 4th Climate Change Assessment identified how climate change is projected to impact our state's diverse regions. The Assessment served as a key input to this Strategy, including through our approach to defining regions. For more detailed information on each region's ecological, social, and infrastructure vulnerability to climate impacts, please visit California's Climate Change Assessments.

Cultural Groups

For more information on the cultural groups in your region and how to contact specific tribes, please visit the California Native American Heritage Commission's Digital Atlas of California Native Americans.

NORTH COAST REGION

The North Coast is home to approximately 370,000 people.[134] This region makes up 12% of the state's land area,[135] and includes the entirety of Del Norte, Siskiyou, Trinity, Humboldt, Mendocino, and Lake counties.[136]

The North Coast region is notable for its extensive natural ecosystems, higher annual precipitation, and cooler overall temperatures. Many of the region's native plants and animals, including endangered plant, wildlife, and fish species, are dependent on these cool, wet conditions.

The North Coast Region's largest industries, measured in gross domestic product (GDP) include government and government enterprises, real estate and rental and leasing, retail trade, health care and social assistance, and construction.[137]

NATURAL AND WORKING LANDSCAPE TYPES AND TOTALS

Forests: 70%

Shrublands and Chaparral: 9.6%

Grasslands: 5%

Developed Lands: 3.2%

Croplands: 2.3%

Sparsely Vegetated Lands: 1.6%

Wetlands: 0.96%

Seaweeds and Seagrasses: 0.05%

The remaining 6.41% of the region's land cover is open water.

LAND OWNERSHIP

Private: 48.79%

Federal Government: 47.08%

Bureau of Indian Affairs: 1.07%

State Government: 2.36%

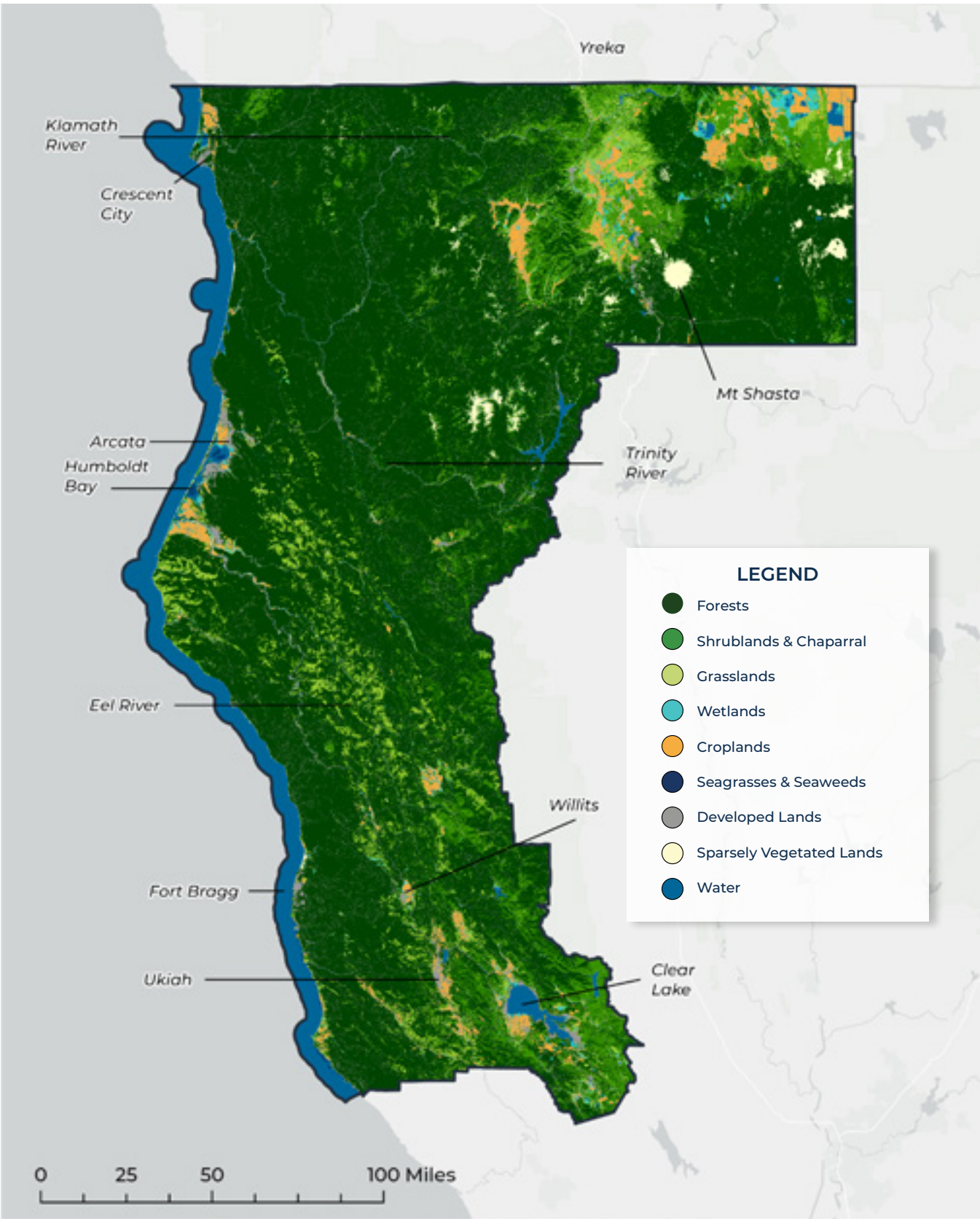
Local Government: 0.12%

Non-profit: 0.58%

Klamath River in Siskiyou County, CA

REGIONAL LAND COVER MAP

NORTH COAST REGION



PROJECTED CLIMATE CHANGE IMPACTS

- **Increased temperatures**
  By the end of the century, average annual maximum temperatures are likely to increase by 5-9°F throughout the region. Interior regions will experience the greatest degree of warming. Summer season temperatures will increase 3-5°F by mid-century and 6-9°F by end of century. Winter season temperatures are expected to warm by a greater magnitude: 5-7°F by mid-century and 8-11°F by end of century.

- **Variable precipitation**
  Change in overall annual precipitation is expected to be small; however, an "average" rainfall year will become less common as the variability in precipitation is likely to increase with a higher likelihood of extreme wet years and extreme dry years. More intense storms within a shorter wet season are expected.

- **Decreased snowpack**
  Snow and total snowpack will be a small fraction of its historical average. As a result, the region is expected to experience prolonged dry seasons and reduced soil moisture conditions, even if annual precipitation stays the same or moderately increases. River stream flows are expected to decline in the dry season and increase in the winter. The rise in extreme precipitation events will increase the frequency and extent of flooding, particularly along the coast where flood risk is also enhanced due to sea level rise.

- **Sea level rise**
  Projections of sea level rise in the North Coast are significant, and differ within the region due to different rates of vertical land motion. As a result, land subsidence (sinking of the ground's surface) is occurring along the Pacific Northwest coast and driving sea level rise in some places at a rate 34 percent greater than the global average. Recent estimates indicate that Humboldt Bay has the highest local sea level rise rate in California, greater than both global and regional rates, due to land subsidence in and around the bay. This suggests that global sea level rise will impact the Humboldt Bay area faster than other parts of the U.S. west coast.

- **Increased wildfire**
  Projections suggest a longer fire season, an increase in wildfire frequency, and an expansion of the area susceptible to fire. Temperature increases are expected to extend fire season throughout the region, especially in higher elevation sites with variable and decreasing snowpack. Lightning-ignited wildfires are likely to increase due to a longer fire season and more available fuels. Increased populations will also increase the probability of human-ignited wildfire.

- **Shifting habitat**
  As the climate warms and precipitation patterns change, the North Coast's cool, wet habitats may shift or disappear from the landscape.[138]

REGIONAL INPUT

A public workshop was held on May 4, 2021 to understand what nature-based climate solutions are important in the North Coast, and how this strategy can support the region's environmental, economic, and equity priorities.

Examples of participant input on what long-term success looks like for climate smart land management in the North Coast region included:

- Fire ecosystem resilience; no longer a threat, but brings diversity and richness
- Forests restored to old growth conditions
- Healthy communities, even in the event of climate disasters
- Community stewardship
- Restored wetlands and oak woodlands
- Rivers full of fish
- Co-management of lands with California Native American tribes is common

Some of the nature-based solutions identified by workshop participants as priorities for the region included:

- Prescribed and cultural burning, working forest conservation easements, extended rotations in timberlands and managing them for old growth
- Riparian and meadow restoration
- Managed grazing
- Living shorelines and restoration of estuaries, dunes, and wetlands
- Enhance and protect cold water refugia
- Carbon farming
- Community greening through, for example, capturing rainwater runoff and planting in empty lots
- Increased tribal land stewardship through co-management and land agreements

Opportunities to increase equity in the region through nature-based solutions identified by workshop participants included:

- Protecting cultural artifacts
- Increasing education to reconnect people with nature through, for example, incentives for parents and grandparents to accompany school nature field trips
- Expanding training for climate smart land management, and ensuring nature-based careers, such as restoration jobs, pay a living wage
- Creating community forests

SAN FRANCISCO BAY REGION

The San Francisco Bay Region consists of nine counties surrounding the San Francisco Bay and the Sacramento-San Joaquin River Delta. It includes the entirety of Marin, Sonoma, Napa, Contra Costa, Alameda, Santa Clara, San Mateo, and San Francisco Counties as well as the western extent of Solano County.[139] The region occupies approximately 4.7% of California's total land area,[140] and is home to approximately 7.5 million people.[141]

The largest industries, measured in GDP, for the counties entirely within the San Francisco Bay Area region, include information; manufacturing; professional, scientific, and technical services; real estate and rental and leasing; and government and government enterprises. The largest industries for the counties only partially within the region include manufacturing, government and government enterprises, real estate and rental and leasing, health care and social assistance, and construction.[142]

The San Francisco Bay Region has a Mediterranean-type climate with cool, wet winters and warm, dry summers. Like other regions in California, the San Francisco Bay Region experiences highly variable precipitation. This climate supports high biological diversity and successful wine and dairy industries.

NATURAL AND WORKING LANDSCAPE TYPES AND TOTALS

Forests: 28.9%

Developed Lands: 19%

Grasslands: 17.9%

Shrublands and Chaparral: 7.7%

Croplands: 5.2%

Wetlands: 3.3%

Sparsely Vegetated Lands: 0.3%

Seaweeds and Seagrasses: 0.17%

The remaining 17.4% of the region's land cover is open water.

LAND OWNERSHIP

Private: 74.75%

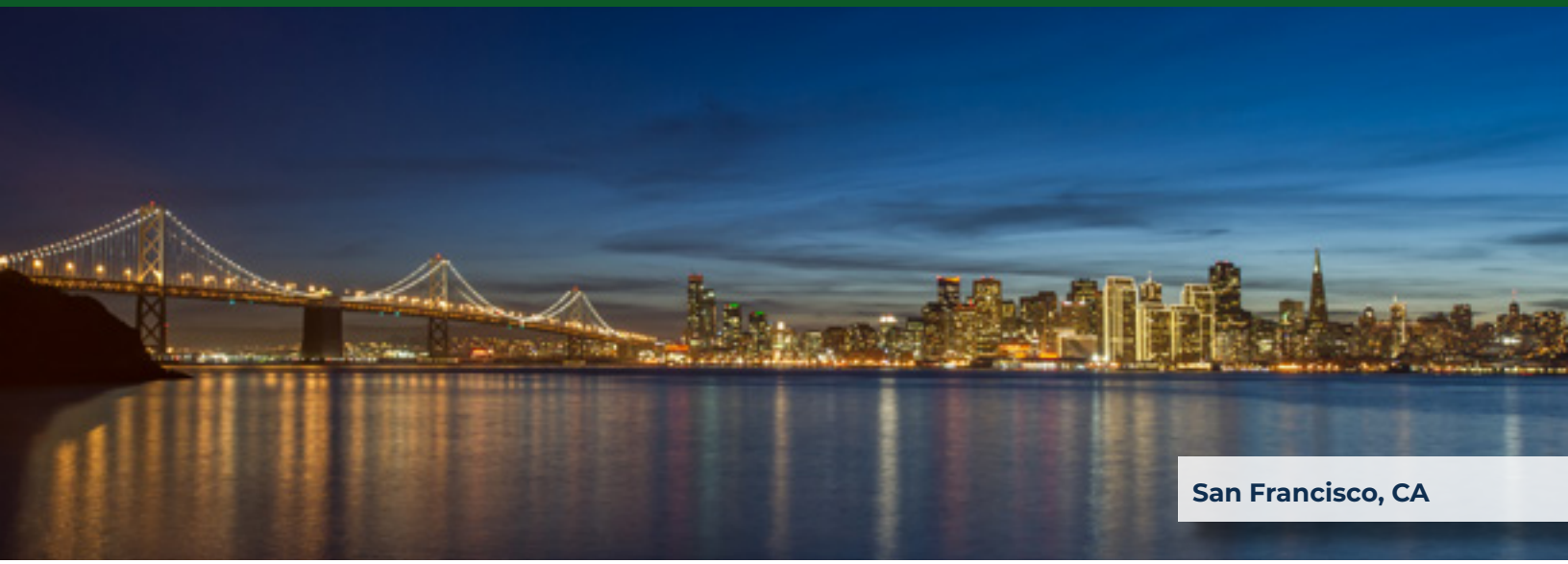
Federal Government: 5.52%

Bureau of Indian Affairs: 0.02%

State Government: 6.47%

Local Government: 11.31%

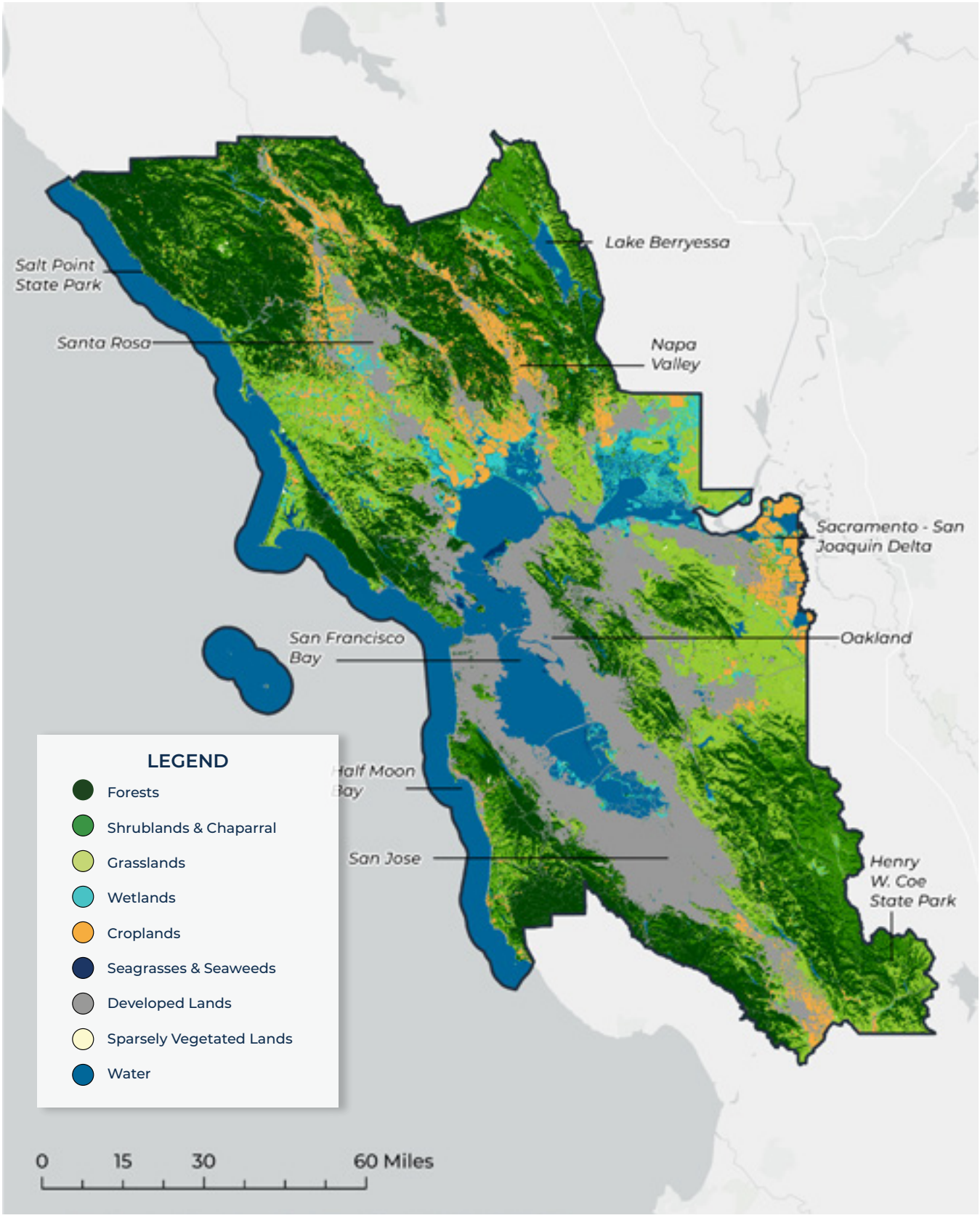
Non-profit: 1.93%



San Francisco, CA

REGIONAL LAND COVER MAP

SAN FRANCISCO BAY REGION



PROJECTED CLIMATE CHANGE IMPACTS

- **Significant temperature increases**
  By mid-century, the Bay Area is expected to warm around 3-4.5°F. By 2100, the region is projected to warm between 5.5-8°F. The inland areas of the San Francisco Bay region are projected to experience more warming than their coastal counterparts.

- **Continued variable precipitation, with intensified winter storms**
  Due to anticipated warming, droughts will likely be longer and more severe, causing major stress to water supplies, natural ecosystems, and agriculture.

- **Sea level rise**
  Rising sea levels, with consequences for the region including but not limited to destructive flooding, especially when combined with high tides or storms. The region is expected to see sea levels rise between 2.4 feet and 4.5 feet by 2100. However, newer science, including the modeling of Antarctic ice sheet melt, has suggested that sea levels could rise nearly 10 feet by 2100.

- **Increased wildfire**
  Increased fire risk, due to warming temperatures and development into the wildland-urban interface. As the region becomes more urbanized, some of the risk may be mitigated.[143]

REGIONAL INPUT

A public workshop was held on April 21, 2021 to understand what nature-based climate solutions are important in the San Francisco Bay region, and how this strategy can support the region's environmental, economic, and equity priorities.

Examples of participant input on what long-term success looks like for climate smart land management in the San Francisco Bay region included:

- Vibrant, green communities
- Regenerative economy
- Nature for everyone, everyday
- Sustainable funding for nature-based solutions
- Oyster populations return to pre-1930 levels
- Expanded job opportunities in climate smart land management
- Net negative greenhouse gas emissions from agriculture

Some of the nature-based solutions identified as priorities by workshop participants for the region included:

- Regenerative agriculture
- Green communities – urban parks, green schoolyards, green infrastructure, community forests, residential composting
- Living shorelines and levees, saltmarsh restoration, oyster and kelp farming and traditional gathering
- Wetland and riparian area protection and restoration
- Prescribed and cultural burning, redwoods protection, agroforestry, reforestation
- Grazing, native plant restoration
- Corridor protection to facilitate range shifts

Opportunities to increase equity in the region through nature-based solutions identified by workshop participants included:

- Increasing land access for historically marginalized groups
- Expanding the use of community greening to reduce the impacts of pollution
- Support nature-based curriculum and experiences in underserved community schools
- Build workforce development capacity through climate smart land management job training, apprenticeship opportunities, and California Conservation Corps programs
- Engage and listen to historically disadvantaged leaders and communities
- Increase tribal capacity to scale climate smart land management

CENTRAL COAST REGION

Home to 1.5 million residents,[144] and stretching from the Monterey Bay south to the Channel Islands, the Central Coast includes all of Santa Cruz, Monterey, San Benito, San Luis Obispo, and Santa Barbara Counties.[145] The region covers approximately 11,000 square miles or 8% of the state's land area.[146]

The Central Coast region's largest industries, measured in GDP include real estate and rental and leasing; government and government enterprises; agriculture, forestry, fishing and hunting; manufacturing; and healthcare and social services.[147]

The Central Coast region is notable for its extensive natural ecosystems, many of which will be impacted by climate change. Hardwood forests, scrublands, and herbaceous grasslands comprise most of its land cover, with a range of agricultural intensities and small-to medium-sized cities in the region. The region has a varied geography and topography. The highest peaks in the Santa Lucia Mountains form a wall behind coastal hillsides that traps cooler marine air, affecting air temperatures, humidity, and other climate factors.

NATURAL AND WORKING LANDSCAPE TYPES AND TOTALS

Shrubland and Chaparral: 28%

Grasslands: 22%

Forests: 19.5%

Developed Lands: 6.2%

Cropland: 6%

Sparsely Vegetated Lands: 2%

Wetlands: 0.94%

Seaweeds and Seagrasses: 0.38%

The remaining 14.6% of the region's land cover is open water.

LAND OWNERSHIP

Private: 67.98%

Federal Government: 27.02%

Bureau of Indian Affairs: 0.03%

State Government: 2.59%

Local Government: 1.11%

Non-profit: 1.26%

San Luis Obispo, CA

REGIONAL LAND COVER MAP

CENTRAL COAST REGION

PROJECTED CLIMATE CHANGE IMPACTS

- **Overall decrease in annual precipitation**
  The Central Coast varies in precipitation depending on location, with the coastal mountain ranges receiving high amounts while inland locations receive less per year. The region is projected to experience substantially increased variability in precipitation. Across the Central Coast region, extremely wet and dry years may become more severe. For example, the wettest day of the year is expected to increase up to 35 percent. In addition, projected future droughts are likely to be a serious challenge to the region's already stressed water supplies.

- **Increasing temperatures**
  Temperatures vary depending on distance from the coast, with coastal temperatures being lower and less variable than inland temperatures. However, maximum and minimum temperatures for the Central Coast will continue to increase through the next century, with greater increases in the inland region. By mid-century, the average annual maximum temperature is expected to rise between 4-5°F across all five counties.

- **Sea level rise**
  This climate impact is accelerating and poses a significant threat to the regions' coastal communities. Sea level rise will cause as many as two-thirds of the beaches to be completely lost over the next century, along with the ecosystems supported by those beaches. The landward erosion of beaches will be driven by accelerating sea level rise combined with a lack of sediment, effectively drowning the beaches between the rising ocean and the backing cliffs and/or urban environments. Future flooding and saltwater intrusion are also serious concerns. Sea level rise and flooding pose significant threats to coastal California Native American tribal lands and sacred sites.

- **Wildfire**
  The Central Coast is projected to experience more frequent and sometimes large wildfires, as well as more lengthy post-fire recovery times.[148]

REGIONAL INPUT

A public workshop was held on April 27, 2021 to understand what nature-based climate solutions are important in the Central Coast, and how this strategy can support the region's environmental, economic, and equity priorities.

Examples of participant input on what long-term success looks like for climate smart land management in the Central Coast region included:

- Healthy rivers full of clean water and native fish
- Resilient communities
- Landscapes dominated by native species
- Negative emissions
- Collaborative partnerships
- Green jobs
- Co-management with California Native American tribes

Some of the nature-based solutions identified by workshop participants as priorities for the region included:

- Restore kelp, wetlands, dunes, salt marsh; build living shorelines; protect land that can be future habitat for coastal habitat migration inland
- Restore sediment flow, and cool streams through riparian corridor restoration
- Traditional Ecological Knowledge, prescribed and cultural burning, oak woodland restoration; open space as fire buffer; control invasive plants
- Green stormwater infrastructure; accessible, shaded parks and trails; green communities
- Regenerative agriculture practices, agroecology, cooperative farming, rangeland protection

- Expand nature-based education and job opportunities
- Increased capacity for California Native American tribes to manage and steward lands through co-management and land agreements

Opportunities to increase equity in the region through nature-based solutions identified by workshop participants included:

- Increasing nature-based education opportunities through, for example, subsidized trips to sustainable agriculture farms and family nature programs
- Engaging in deep listening with communities and supporting community-based organizations that accelerate nature-based solutions
- Expanding access to job opportunities in nature-based industries
- Making nature more accessible through, for example, more public trails and ADA accessible outdoor recreation, restoration of degraded sites, and creating green spaces in communities

LOS ANGELES REGION

The Los Angeles Region consists of five counties in Southern California situated on the coast between the San Diego and Central Coast Regions and bordered on the eastern side by the Inland Desert Region.[149] The region is home to about 18 million people.[150] At about 9,900 square miles, it represents 6.8% of California's land area[151] and includes the entirety of Ventura, Los Angeles, and Orange Counties and the western portions of San Bernardino and Riverside Counties.

The largest industries, measured in GDP, for the counties entirely within the Los Angeles region, include real estate and rental and leasing; manufacturing; information; government and government enterprises; and professional, scientific, and technical services. The largest industries for the counties only partially within the region include government and government enterprises, real estate and rental and leasing, wholesale trade, health care and social assistance, and retail trade.[152]

The Los Angeles region is characterized by a Mediterranean climate with hot, dry summers and cool, wet winters. Countless ecosystems thrive throughout the region's coasts, mountains, and interior landscapes. Substantial agricultural production occurs here, taking advantage of the bountiful sunshine and generally warm temperatures.

NATURAL AND WORKING LANDSCAPE TYPES AND TOTALS

Shrubland and Chaparral: 40.2%

Developed Lands: 27.2%

Forests: 10.8%

Grasslands: 4.0%

Cropland: 2.8%

Sparsely Vegetated Lands: 2.6%

Wetlands: 0.32%

Seaweeds and Seagrasses: 0.20%

The remaining 11.9% of the region's land cover is open water.

LAND OWNERSHIP

Private: 58.68%

Federal Government: 32.68%

Bureau of Indian Affairs: 1.25%

State Government: 2.32%

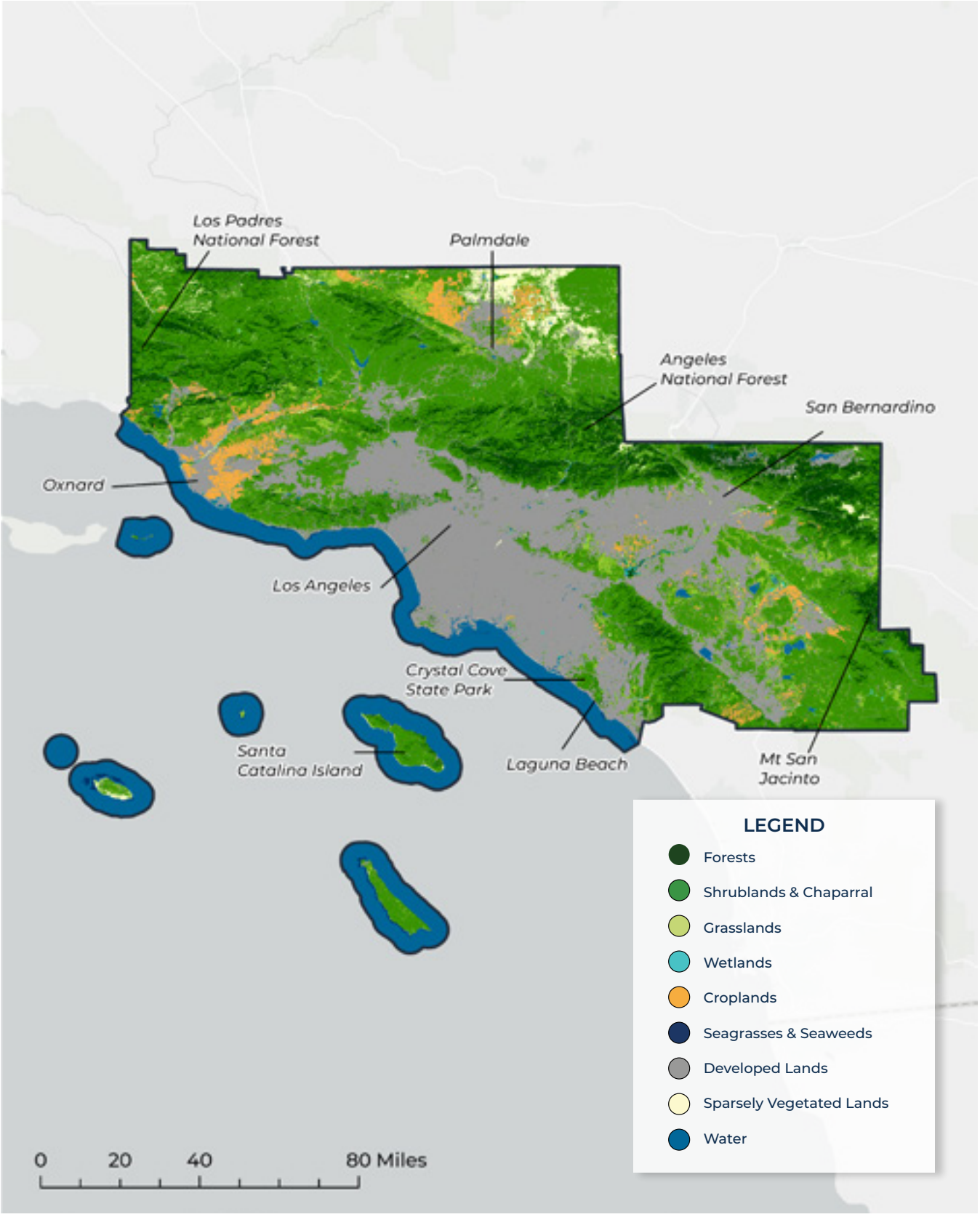
Local Government: 4.15%

Non-profit: 0.92%

Malibu, CA

REGIONAL LAND COVER MAP

LOS ANGELES REGION



PROJECTED CLIMATE CHANGE IMPACTS

- **Significant temperature increases**
  By mid-century, average maximum temperatures across the Los Angeles region are projected to increase 4-5°F and by late-century, 5-8°F. Extreme temperatures are also expected to increase. The hottest day of the year may be up to 10°F warmer for many locations across the LA region by late-century. The number of extremely hot days is also expected to increase across the region. The interior regions are expected to experience the highest amounts of average warming, up to 10°F in late-century.

- **Increased dry and wet extremes**
  By late-century, the wettest day of the year is expected to increase across most of the LA region, with some locations experiencing increases of 25-30 percent. Increased frequency and severity of rain events are also projected to occur for this region, as well as potentially a doubling in frequency of extremely dry years over southern California by late-century.

- **Sea level rise**
  The best available science suggests the Los Angeles region will experience sea levels to rise by roughly 1-2 feet by the mid-century. The most extreme projections anticipate 8-10 feet of sea level rise by the end of the century.

- **Increased wildfire**
  Nearly 80 percent of wildfires occur during the summer and fall, with a quarter of annual wildfires occurring during the Santa Ana winds. Projections indicate that wildfire may increase over southern California, but there remains uncertainty in quantifying future changes of burned area over the LA region.[153]

REGIONAL INPUT

A public workshop was held on May 5, 2021 to understand what nature-based climate solutions are important in the Los Angeles region, and how this strategy can support the region's environmental, economic, and equity priorities.

Examples of participant input on what long-term success looks like for climate smart land management in the Los Angeles region included:

- Climate resilient communities and nature
- Clean air and water
- Green economy
- Abundant native plants, green infrastructure, and urban parks
- Public awareness and support for nature-based solutions
- Restorative environmental justice
- Deep community stewardship, including youth
- Improved public health

Some of the nature-based solutions identified by workshop participants as priorities for the region included:

- Wetland protection and restoration
- Marine Protected Areas
- Living shorelines
- Community greening - river corridors, green stormwater infrastructure, urban forest planting and maintenance, greenbelts, school greening, parks, preserving mature trees, accessible and shaded trails
- Native plant restoration – sage, grasslands, riparian areas, kelp, eelgrass, oak savannahs
- Increase tribal engagement in climate smart land management through, for example, co-management and land agreements

Opportunities to increase equity in the region through nature-based solutions identified by workshop participants included:

- Build pathways for nature-based professionals in the region through workforce development, such as Conservation Corps programs, internships, and efforts to expand urban greening and address extreme heat

- Create and maintain green spaces in communities, prioritizing those with the least access to nature

- Support environmental education programs through, for example, schoolyard restoration programs, subsidized field trips, multi-language interpretation, and native plant demonstration gardens

SAN DIEGO REGION

The San Diego region includes only San Diego County[154] with a land area of about 4,500 square miles, approximately 2.8% of the state.[155] The region is home to 3.3 million people.[156]

The San Diego region's largest industries, measured in GDP, include government and government enterprises; real estate and rental and leasing; professional, scientific, and technical services; manufacturing; and healthcare and social assistance.[157]

The San Diego region is known for its mild year-round climate, beaches, low inland mountains, deserts, and highly variable Mediterranean climate. The region contains markedly different climate zones where relatively mild coastal conditions transition rapidly to harsher interior valleys, foothills, and low mountains. Climate change impacts will play out in different ways across the various climates within the region.

NATURAL AND WORKING LANDSCAPE TYPES AND TOTALS

Shrubland and Chaparral: 48.7%

Developed Lands: 17.6%

Sparsely Vegetated Lands: 12%

Forests: 7.7%

Grasslands: 4.7%

Cropland: 1.5%

Wetlands: 0.94%

Seaweeds and Seagrasses: 0.34%

The remaining 6.5% of the region's land cover is open water.

LAND OWNERSHIP

Private: 39.65%

Federal Government: 24.21%

Bureau of Indian Affairs: 4.98%

State Government: 23.28%

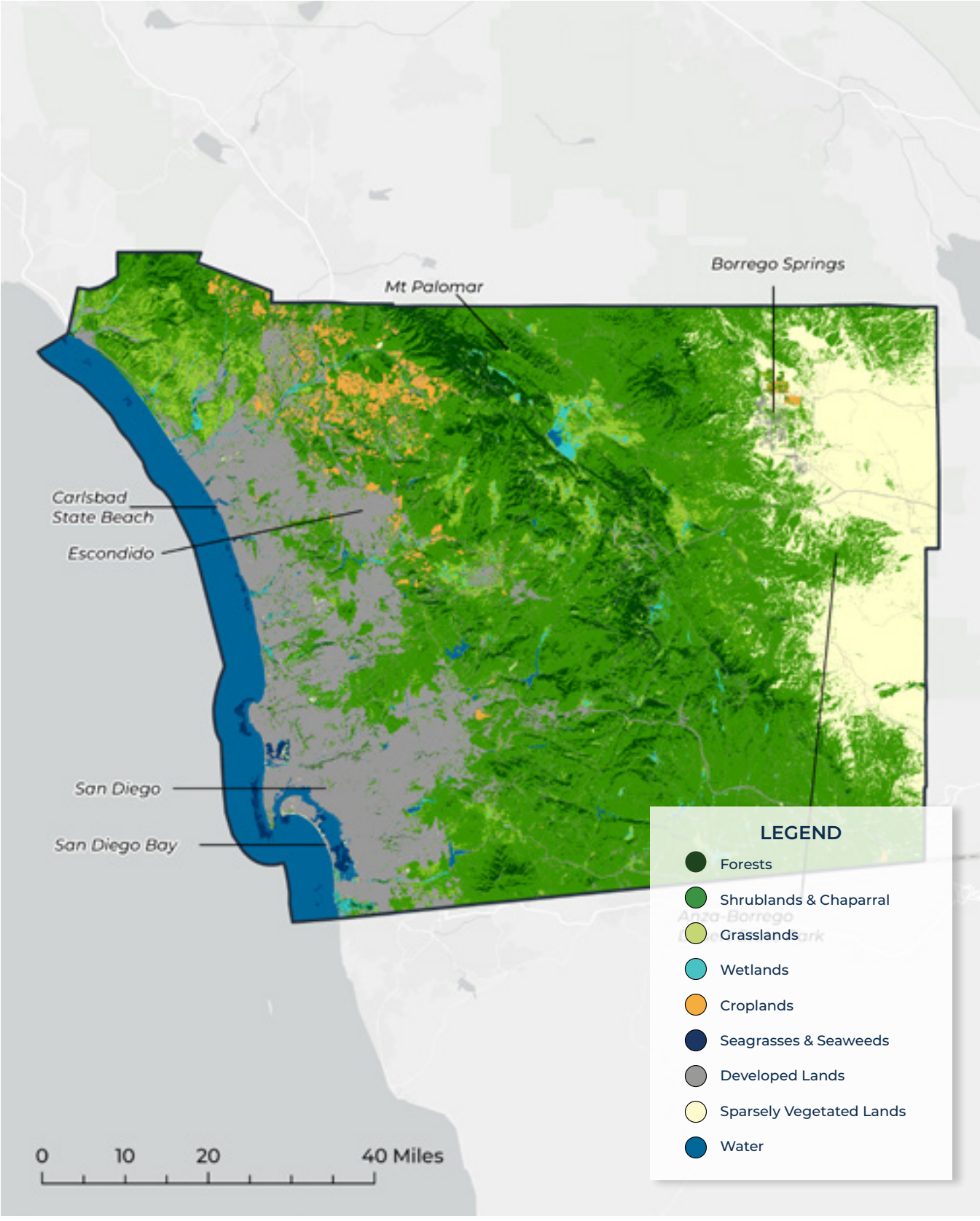
Local Government: 6.82%

Non-profit: 1.05%

Torrey Pines State Beach, San Diego, CA

REGIONAL LAND COVER MAP

SAN DIEGO REGION



PROJECTED CLIMATE CHANGE IMPACTS

- **Extreme heat**
  Substantial temperature increases are projected by 2100 – between 5 to 10°F. Along with average temperature, heat waves will be more frequent, more intense, and will last longer. The number of heat wave days is projected to increase between 20-50 percent with a temperature increase of 6°F. Higher amounts of warming are expected in inland areas compared to coastal areas.

- **Precipitation shifts**
  Wetter winters, drier springs, and more frequent and severe droughts are projected. Changes in annual total precipitation are uncertain, but most models indicate that there will be fewer wet days, but with more intense precipitation. Longer dry, warm seasons with less daytime humidity will cause stronger seasonal dryness of the landscape and more dry years. More dry years also result in an increase in longer, more frequent and severe droughts in the future, leading to larger water deficits across the landscape.

- **Sea level rise**
  Sea levels are expected to rise approximately 1 foot by mid-century and 3 feet or more by 2100. For the next several decades, high tides combined with elevated shoreline water levels will drive extreme events. Projections suggest sea level rise will increase rapidly in the second half of the century.

- **Increase wildfire**
  Risk of wildfires is expected to increase due to increasingly warm and dry landscapes and longer dry seasons coupled with occasional dry windy weather patterns. The largest fires in this region typically start during strong, dry Santa Ana winds, which occur within a broad season from September through May, but most intensely in December and January. Increased drought, less moisture for vegetation, and dead vegetation are likely to increase wildfire risk during dangerous fire weather extremes caused by Santa Ana winds.[158]

REGIONAL INPUT

A public workshop was held on May 11, 2021 to understand what nature-based climate solutions are important in the San Diego region, and how this strategy can support the region's environmental, economic, and equity priorities.

Examples of participant input on what long-term success looks like for climate smart land management in the San Diego region included:

- Living coastlines, return of native wetlands and kelp forests
- Blue-green economy
- Climate smart agriculture
- Green communities, deep community commitment to nature
- Abundant native plants
- Science-based land management and monitoring
- Partnerships, funding, and planning for nature-based solutions

Some of the nature-based solutions identified by workshop participants as priorities for the region included:

- Keep landscapes intact, protect habitat corridors, manage lands holistically
- Prescribed burning; restore oak woodlands; protect native species from wildfire
- Restore wetlands, estuaries, kelp forests, eel grass, saltmarshes; build living shorelines; protect coastal habitat; beach nourishment; Marine Protected Areas.
- Increase urban parks; connect parks with green corridors; restore native trees and plants; green stormwater infrastructure; neighborhood gardens.
- Regenerative agriculture, community/local farming, managed grazing; soil regeneration

- Opportunities to scale nature-based education and businesses

Opportunities to increase equity in the region through nature-based solutions identified by workshop participants included:

- Creating nature parks in urban areas, and ensuring they are safe, accessible, and meet community needs such as being ADA compliant

- Expanding educational opportunities for nature-based learning, such as science programs for girls, community gardens, outdoor education programs, multilingual signage, and nature curriculum in schools

- Increasing access to employment and job training in climate smart land management, for example through youth internships and programs that leverage state and national Conservation Corps initiatives.

SACRAMENTO VALLEY REGION

The Sacramento Valley Region is just north of the Sacramento-San Joaquin Delta, and is made up of the 11 counties in the Central Valley between the Sierra Nevada Mountains and Northern Coast Range.[159] This includes the entirety of Butte, Colusa, Glenn, Sacramento, Shasta, Sutter, Tehama, Yolo, and Yuba Counties, as well as the western extent of Placer County and eastern extent of Solano County. The region makes up 9.2% of the state's land area or just over 15,000 square miles.[160] The Sacramento Valley Region currently has about 3.1 million residents,[161] and supports a thriving agricultural industry. The largest industries, measured in GDP, for the counties entirely within the Sacramento Valley region, include government and government enterprises; real estate and rental and leasing; health care and social assistance; professional, scientific, and technical services; and retail trade. The largest industries for the counties only partially within the region include manufacturing, real estate and rental and leasing, government and government enterprises, health care and social assistance, and construction.[162] Historically, the region has been characterized by mild winters and dry, hot summers.

NATURAL AND WORKING LANDSCAPE TYPES AND TOTALS

Forests: 38.7%

Cropland: 20.9%

Grasslands: 15.7%

Shrubland and Chaparral: 9.8%

Developed Lands: 7%

Wetlands: 4.9%

Sparsely Vegetated Lands: 1%

Seaweeds and Seagrasses: 0%

The remaining 1.7% of the region's land cover is open water.

LAND OWNERSHIP

Private: 74.73%

Federal Government: 21.52%

Bureau of Indian Affairs: 0.10%

State Government: 2.77%

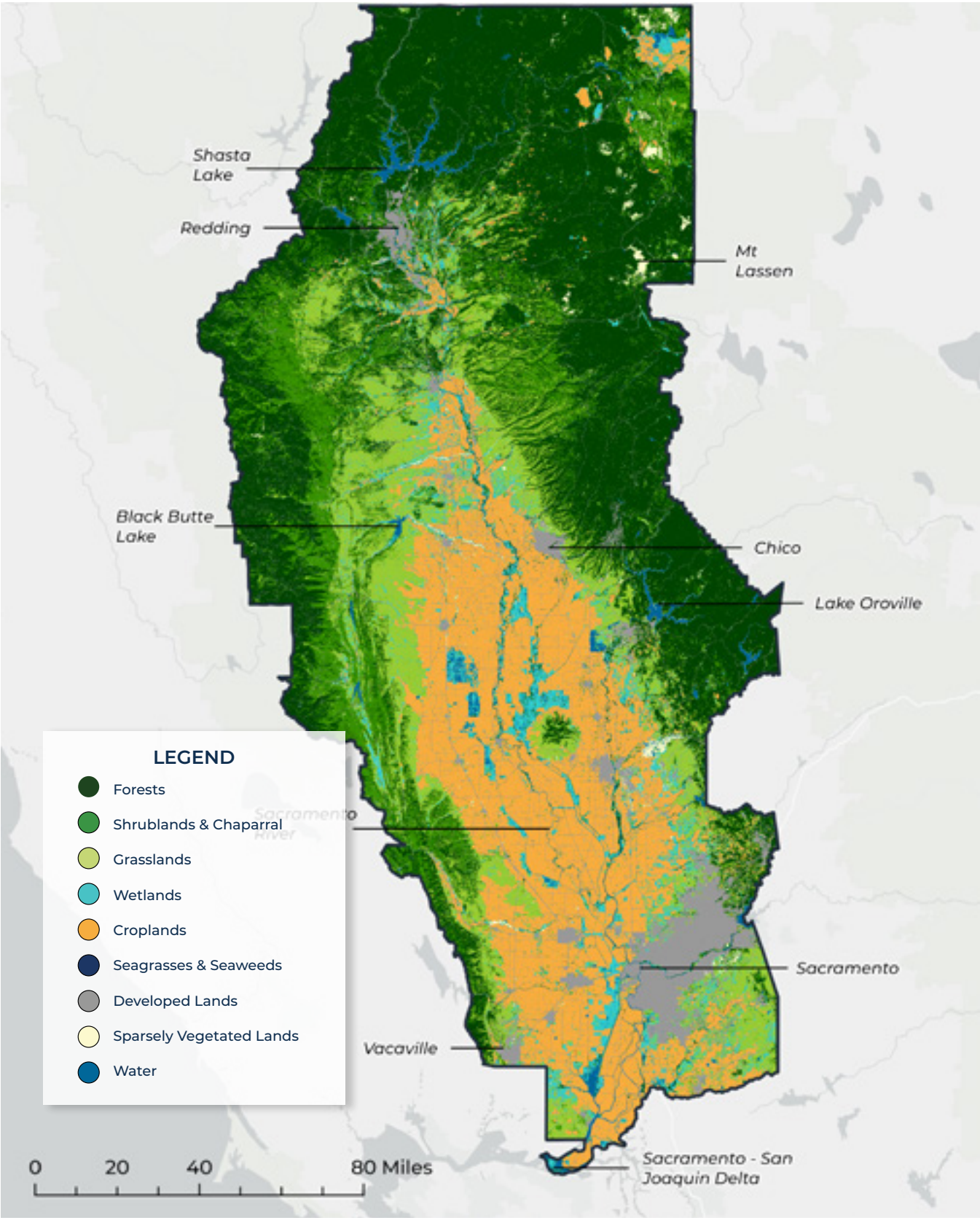
Local Government: 0.57%

Non-profit: 0.31%

Tower Bridge, Sacramento, CA

REGIONAL LAND COVER MAP

SACRAMENTO VALLEY REGION



PROJECTED CLIMATE CHANGE IMPACTS

- **Increased temperatures**
  More frequent and intense heat waves are anticipated to have higher daytime and nighttime temperatures, last longer, and have a larger geographic extent.

- **Precipitation extremes**
  Relatively similar annual precipitation; however, wetter years are anticipated to become wetter and drier years will likely become drier. Extreme storms are likely to become more intense and cause flooding to the Sacramento Valley region. Due to increased temperatures, snow will increasingly fall as rain, and snowpack will diminish in the Sacramento Valley region.

- **Increased flooding**
  Increased flooding due to warmer storms, more extreme precipitation, and sea level rise in the San Francisco Bay. Higher tides will push salty ocean water deeper into the fresher waters of the Sacramento-San Joaquin Delta.

- **Increased wildfire**
  Increased large summer and fall wildfires due to earlier spring conditions, wetter winters, and drier summers. Fires both within the Sacramento Valley and in other parts of the state will impact air quality in the region, as experienced during recent large fire events.[163]

REGIONAL INPUT

A public workshop was held on April 20, 2021 to understand what nature-based climate solutions are important in the Sacramento Valley region, and how this strategy can support the region's environmental, economic, and equity priorities.

Examples of participant input on what long-term success looks like for climate smart land management in the Sacramento Valley region included:

- Thriving, healthy communities and ecosystems
- Sustainable funding for nature-based solutions, such as endowments and farmland conservation easements
- Net zero emissions
- Invasive species are in check
- Oak woodland and salmon populations restored
- Environmental literacy
- Equitable community engagement

Some of the nature-based solutions identified by workshop participants as priorities for the region included:

- Green communities – urban forests, connected parks, shaded fuel breaks and trail systems, rain gardens, floodplain parks, urban agriculture, community gardens, native plant buffers, stormwater capture and recharge basins
- Wetland restoration, floodplain expansion and connectivity, post-wildfire reforestation
- Regenerative agriculture, healthy soils, managed grazing, carbon farming, hedgerows, riparian restoration
- Forest and oak woodland restoration, prescribed and cultural burning, watershed protection and restoration
- Building tribal and community capacity to manage and steward lands through, for example, increased co-management and Increase tribal engagement, co-management, and land agreements

Opportunities to increase equity in the region through nature-based solutions identified by workshop participants included:

- Increasing economic resilience through climate smart land management workforce development programs, such as urban forestry, outdoor recreation, and urban agriculture

- Investing in nature-based solutions that protect vulnerable populations from climate impacts, and build community resilience.
- Involving a broader range of community stakeholders in decision-making
- Connecting young people with opportunities to learn about and enjoy nature

SAN JOAQUIN VALLEY REGION

The San Joaquin Valley is home to approximately 4 million residents.[164] The region includes the entirety of the Kings, Merced, San Joaquin, and Stanislaus Counties, and the western extents of Fresno, Kern, Madera, and Tulare Counties.[165] At about 17,000 square miles, the San Joaquin Valley makes up 10.4% of the state's total land area.[166]

The largest industries, measured in GDP, for the counties entirely within the San Joaquin Valley region, include government and government enterprises, real estate and rental and leasing, manufacturing, health care and social assistance, and retail trade. The largest industries for the counties only partially within the region include government and government enterprises; agriculture, forestry, fishing and hunting; health care and social assistance; and manufacturing.[167] The region comprises the southern portion of California's Central Valley, south of the Sacramento Valley. The San Joaquin Valley was historically a humid region with ephemeral rivers and lakes surrounded by San Joaquin Valley Desert and perennial grasslands. However, 95% of these wetlands have been lost. The San Joaquin Valley is the most productive agricultural region in the United States.

NATURAL AND WORKING LANDSCAPE TYPES AND TOTALS

Cropland: 46.7%

Grassland: 21.4%

Shrubland and Chaparral: 10.9%

Developed Lands: 9.2%

Forests: 4.6%

Wetlands: 3.1%

Sparsely Vegetated Lands: 2.2%

Seaweeds and Seagrasses: 0%

The remaining 1.7% of the region's land cover is open water.

LAND OWNERSHIP

Private: 91.65%

Federal Government: 5.35%

Bureau of Indian Affairs: 0.27%

State Government: 1.13%

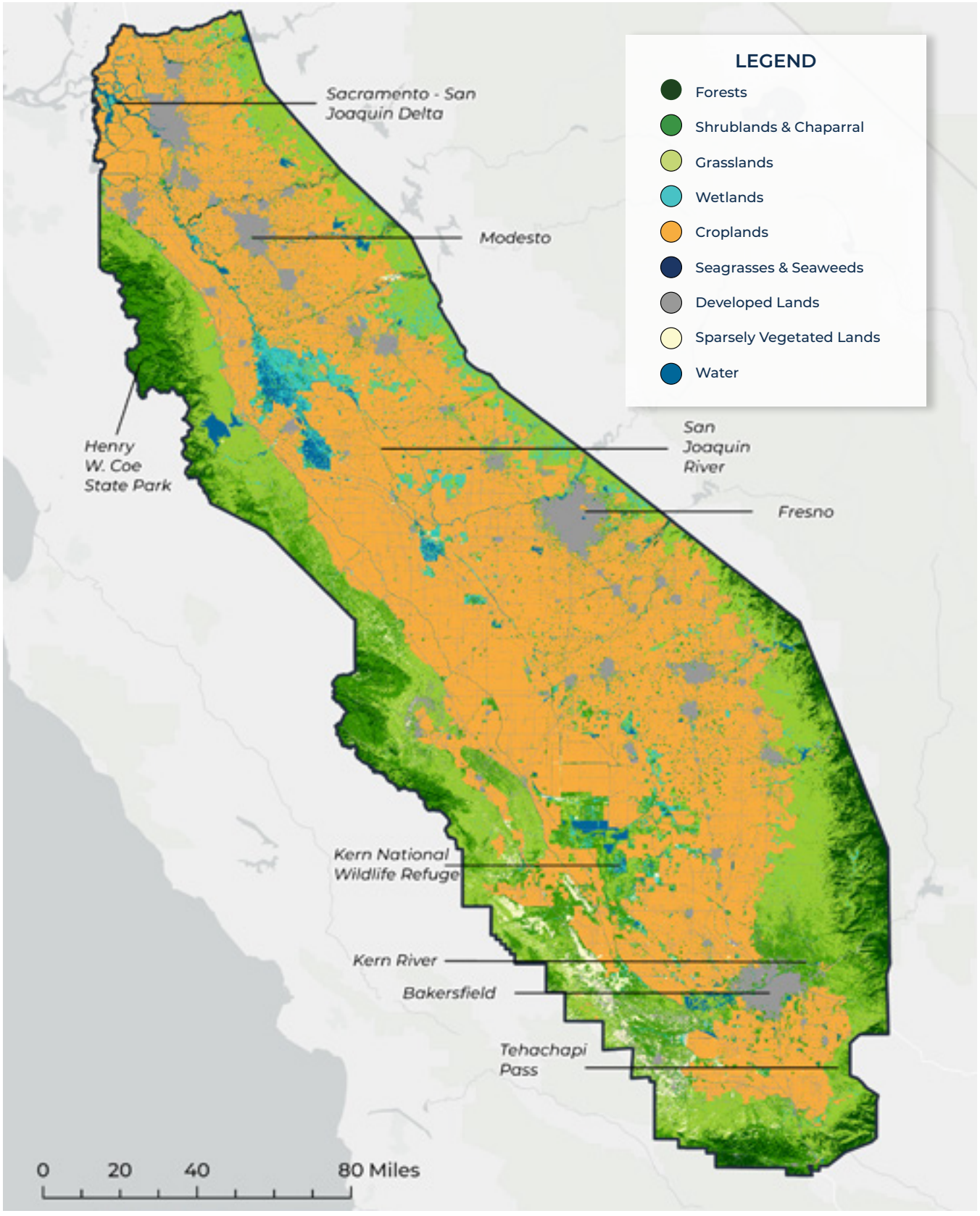
Local Government: 0.39%

Non-profit: 1.21%

The Sacramento-San Joaquin Delta, CA

REGIONAL LAND COVER MAP

SAN JOAQUIN VALLEY REGION



PROJECTED CLIMATE CHANGE IMPACTS

- **Continued rising temperatures**
  The annual average maximum temperature is projected to increase 4 °F to 5 °F by mid-century, and 5 °F to 8 °F by 2100. This has grave consequences for the region as many agricultural workers work outdoors and are increasingly at risk for heat-related illnesses.

- **Longer dry seasons, as precipitation patterns change**
  This may lead to increased groundwater pumping, causing further subsidence and impacts to infrastructure. Additionally, snowpack decline in the Sierra Nevada is increasing water scarcity in the San Joaquin Valley. These will have dramatic impacts on the agricultural sector, as well as drinking water supplies, especially as higher average temperatures exacerbate naturally occurring cycles of drought. Drought will have dangerous impacts on this region, as was evidenced by the 2012-2016 drought, when hundreds of household and small community drinking water wells ran dry and thousands of residents lost water security.

- **Faster snowmelt**
  Faster snowmelt can complicate reservoir operations and increase the risk of catastrophic flooding. Although not a coastal region, sea level rise is also a concern, as it will threaten the Delta communities of San Joaquin County with increased flooding.

- **Increased wildfire**
  The San Joaquin Valley will likely experience more frequent wildfire, which will further threaten drinking water supplies and increase soil erosion.[168]

REGIONAL INPUT

A public workshop was held on April 29, 2021 to understand what nature-based climate solutions are important in the San Joaquin Valley region, and how this strategy can support the region's environmental, economic, and equity priorities.

Examples of participant input on what long-term success looks like for climate smart land management in the San Joaquin Valley region included:

- Sustainable, green jobs
- Nature-based solution education and cultural shift towards nature-based solutions
- Restored oak woodlands
- Increased prescribed grazing
- Clean water and sustainable water use
- Sustainable food production and institutional procurement for organic products
- Authentic partnerships
- Traditional Ecological Knowledge

Some of the nature-based solutions identified by workshop participants as priorities for the region included:

- Native, drought-resilient planting
- Carbon farming
- Managed grazing
- Increased community greenspace and urban habitat, such as pocket parks, removing asphalt to restore natural areas, and planting native species.
- Nature-based solutions workforce development
- Tribal land management
- Riparian forest restoration
- Prescribed and cultural burning
- Wetland restoration and creation

Opportunities to increase equity in the region through nature-based solutions identified by workshop participants included:

- Increasing access to nature, including through creating parks and greenways in low-income communities, expanding outdoor education, and creating multilingual interpretation.
- Increasing community engagement, and supporting community-led nature-based solutions
- Expanding workforce development for careers in climate smart land management, such as native plant restoration

INLAND DESERT REGION

The Inland Desert Region represents the three counties that comprise the southeastern corner of California. Characterized by low mountains and arid desert valleys, the region includes all of Imperial County and the majority of eastern Riverside and San Bernardino Counties.[169] The Inland Desert Region supports a population of 1.2 million people.[170] At 28,000 square miles, this region makes up 18% of the state's land area.[171]

The largest industries, measured in GDP, for the counties entirely within the Inland Desert region, include government and government enterprises; agriculture, forestry, fishing and hunting; utilities; real estate and rental and leasing; and retail trade. The largest industries for the counties only partially within the region include government and government enterprises, real estate and rental and leasing, wholesale trade, health care and social assistance, and retail trade.[172]

The Inland Desert region has the largest amount of protected lands in the state – 7,448 square miles of National Parks and Monuments, as well as significant tourism and agricultural sectors. Containing both the Mojave and Sonoran deserts, this region historically has the hottest and driest climate throughout the state. It is known for high temperatures with a high frequency of extremely hot days (days with temperatures over 95°F). Like other regions, specific climate conditions vary depending on elevation in the inland deserts. Precipitation historically averages 5 inches per year, but it can be extremely variable in amount and location from year-to-year.

NATURAL AND WORKING LANDSCAPE TYPES AND TOTALS

Shrubland and Chaparral: 61.2%

Sparsely Vegetated Lands: 29.8%

Cropland: 3.7%

Developed Lands: 2.3%

Forests: 0.8%

Grasslands: 0.7%

Wetlands: 0.02%

Seaweeds and Seagrasses: 0%

The remaining 1.4% of the region's land cover is open water.

LAND OWNERSHIP

Private: 18.85%

Federal Government: 76.42%

Bureau of Indian Affairs: 1.02%

State Government: 2.77%

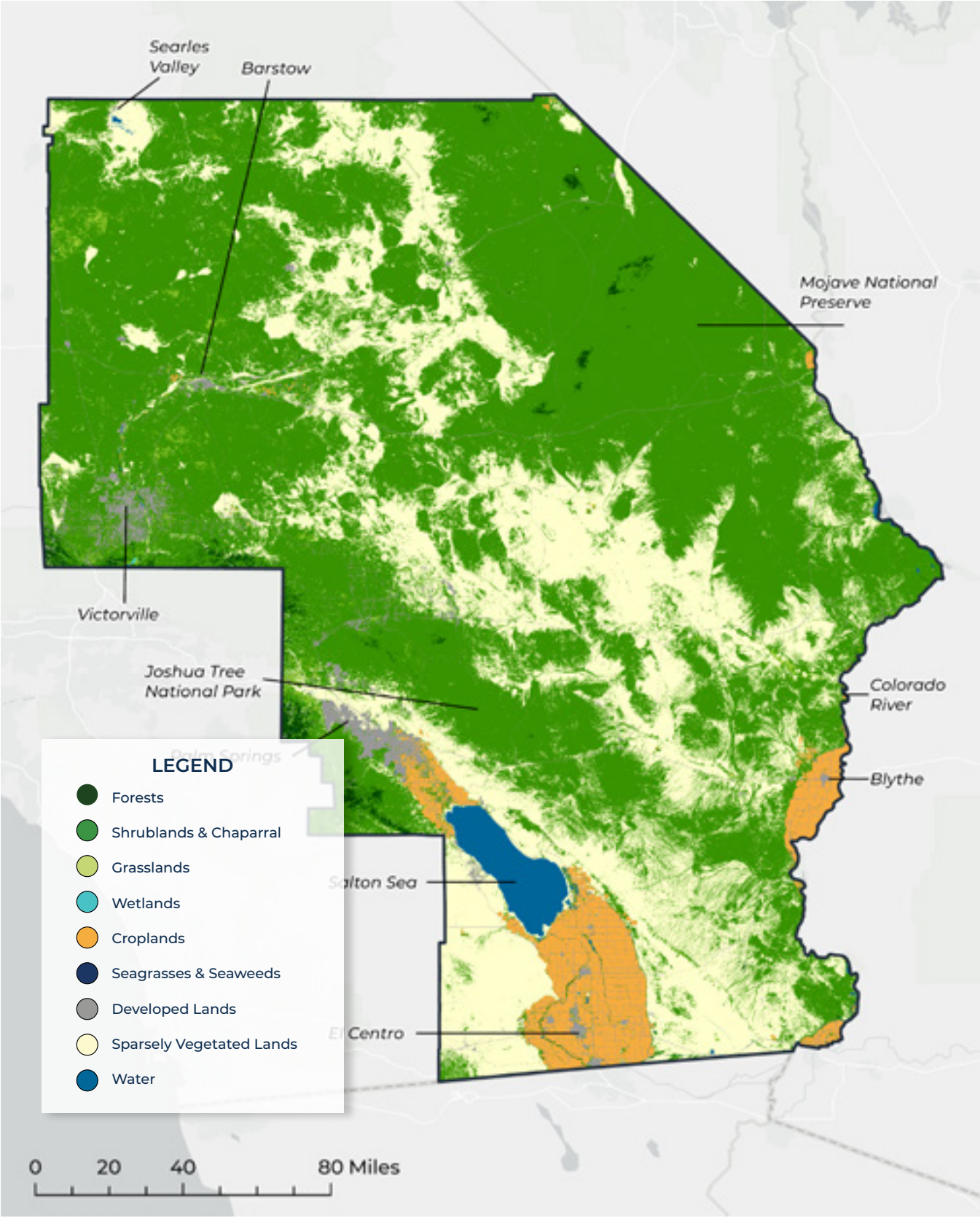
Local Government: 0.69%

Non-profit: 0.26%

Salton Sea, CA

REGIONAL LAND COVER MAP

INLAND DESERT REGION



PROJECTED CLIMATE CHANGE IMPACTS

- **Extreme heat**
  Temperatures are expected to increase 6-10°F by mid-century and 8-14°F by late-century. The number of extremely hot days per year in the region is also projected to increase, with up to 141 extremely hot days in the Mojave and 179 in Palm Springs, which is over a 50% and 30% increase, respectively, from historical averages. These increased temperatures will stress an already-limited regional water supply.

- **Precipitation extremes**
  Similar average precipitation, but the dry periods will likely become drier and the wet periods wetter. Warmer and drier conditions may increase the likelihood of severe drought in this region.

- **Increased wildfire**
  Depending on vegetation, increased wildfire activity. Inland desert vegetation growth is driven by precipitation, which will remain highly variable for this region.[173]

REGIONAL INPUT

A public workshop was held on May 6, 2021 to understand what nature-based climate solutions are important in the Inland Desert region, and how this strategy can support the region's environmental, economic, and equity priorities.

Examples of participant input on what long-term success looks like for climate smart land management in the Inland Desert region included:

- Green economies and jobs, with members of historically disadvantaged communities represented in leadership positions
- Increased education on nature-based solutions, particularly those in the desert
- Healthier communities
- Water for wildlife
- Secure water sources
- Restoration of historic desert ecosystems
- Management based on Traditional Ecological Knowledge

Some of the nature-based solutions identified by workshop participants as priorities for the region included:

- Protect groundwater supply
- Urban farming
- Keep deserts intact
- Control non-native grasses and restore native plants
- Wildlife crossings and land conservation for species movement
- Create and protect urban greenspaces
- Increased co-management with California Native American tribes
- Increased education

Opportunities to increase equity in the region through nature-based solutions identified by workshop participants included:

- Engage and invest in communities
- Support environmental justice
- Small parks accessible to older adults and community members with disabilities
- Tribal-led interpretive education programs
- Community gardens
- Financial incentives to invest locally
- Trails that are accessible to community members with disabilities
- Accelerate the just transition through workforce development in nature-based solutions, for example removing invasive species and native species restoration

SIERRA NEVADA REGION

The Sierra Nevada Region covers approximately 45,000 square miles, or 29% of the state's total land area.[174] The region includes the entirety of Alpine, Amador, Calaveras, El Dorado, Inyo, Lassen, Mariposa, Modoc, Mono, Nevada, Plumas, Sierra, and Tuolumne Counties as well as the eastern extents of Fresno, Kern, Madera, Placer, and Tulare Counties.[175] It supports a population of approximately 750,000 people.[176]

The largest industries, measured in gross domestic product (GDP), for the counties entirely within the Sierra Nevada region, include real estate and rental and leasing, government and government enterprises, construction, retail trade, and utilities. The largest industries for the counties only partially within the region include government and government enterprises; real estate and rental and leasing; agriculture, forestry, fishing and hunting; health care and social assistance; and manufacturing.[177]

The Sierra Nevada region is famous for its picturesque mountains and deep desert basins. The region is characterized by geographic, ecological, and climatological diversity. Historically, the Sierra Nevada region has experienced cool, wet winters, and dry, warm summers. Given that this region varies significantly in elevation, different portions of the region experience different climates. For example, the southern Sierra are much higher in elevation and tend to be snowier compared to the northern Sierra.

The snowpack in this region is a critical part of our state's water supply and is considered to be the state's largest reservoir.

NATURAL AND WORKING LANDSCAPE TYPES AND TOTALS

Shrubland and Chaparral: 38%

Forests: 37.7%

Sparsely Vegetated Lands: 11.9%

Grassland: 6.5%

Wetlands: 1.5%

Developed Lands: 1.3%

Cropland: 1.2%

Seaweeds and Seagrasses: 0%

The remaining 1.9% of the region's land cover is open water.

LAND OWNERSHIP

Private: 26.73%

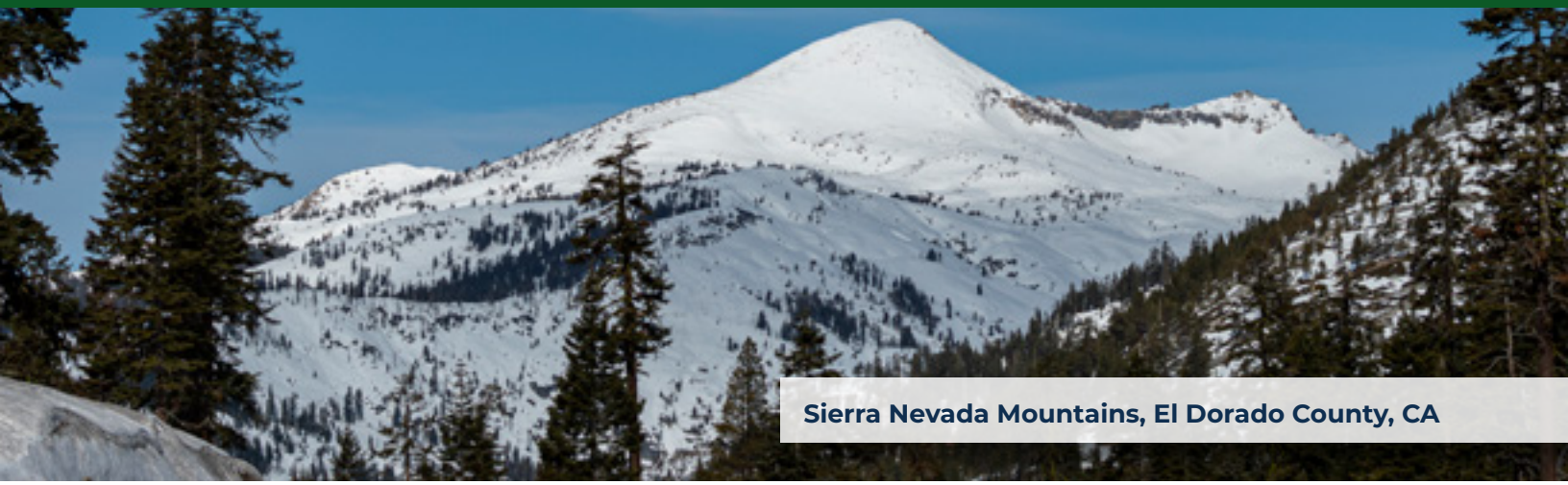
Federal Government: 70.08%

Bureau of Indian Affairs: 0.21%

State Government: 1.35%

Local Government: 1.46%

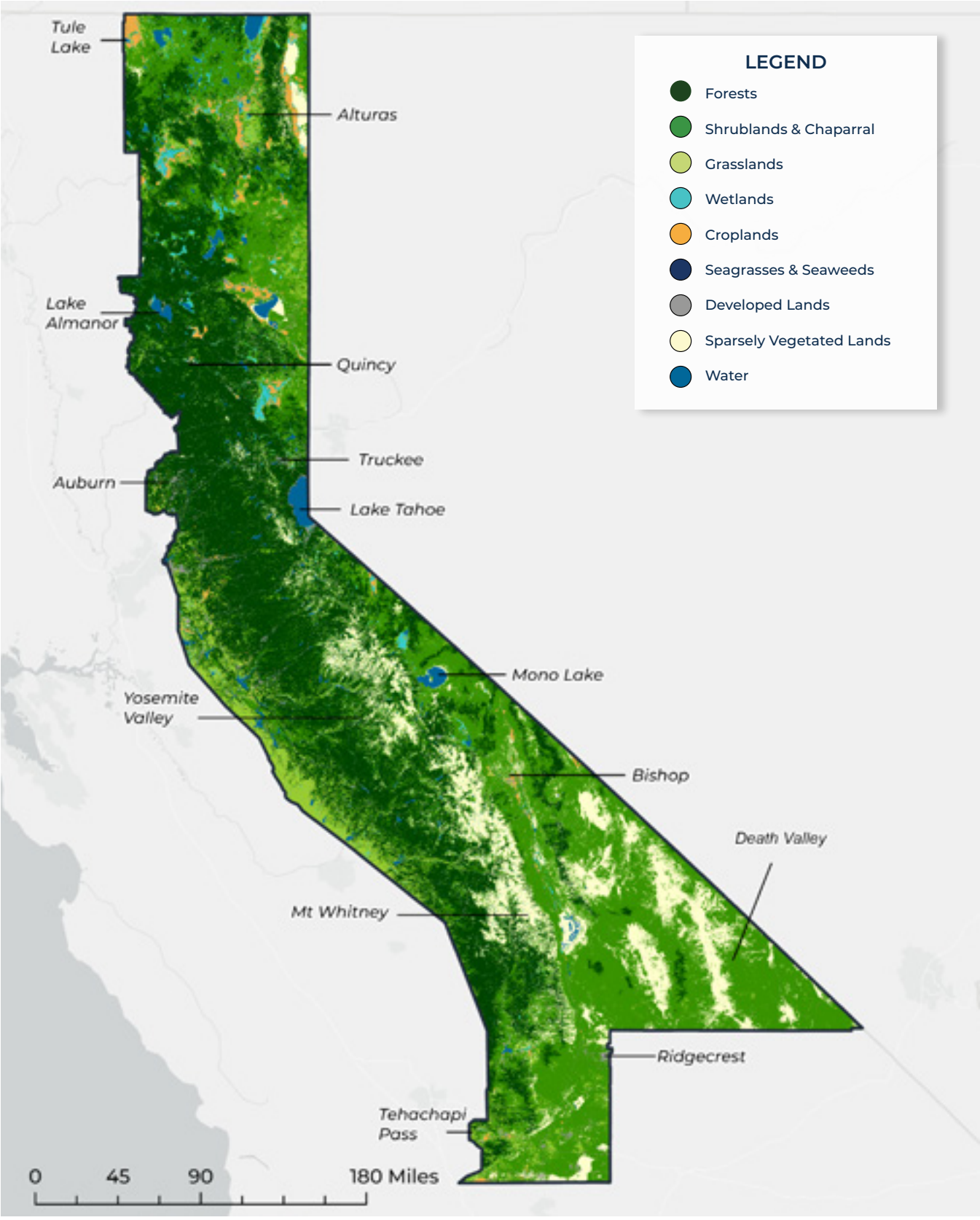
Non-profit: 0.17%



Sierra Nevada Mountains, El Dorado County, CA

REGIONAL LAND COVER MAP

SIERRA NEVADA REGION



PROJECTED CLIMATE CHANGE IMPACTS

- **Increasing temperatures**
  By the end of this century, the Sierra Nevada region is expected to warm by 6-9°F on average, which will stress the region's trees. This warming will have impacts on precipitation at certain elevations-- more will fall as rain where it has historically fallen as snow.

- **Precipitation extremes**
  Future estimates in precipitation trends in the Sierra Nevada reveal an uncertain future, although it is clear that droughts years and peak precipitation years are likely to become more extreme, and that more of that precipitation will fall as rain, and not snow, as temperatures increase. Again, the region's differences in elevation will mean that these projected increases in extremes will not be felt uniformly across the region. The highest elevations (the southern Sierra) will likely feel more extreme precipitation changes than the lower elevations in the region.

- **Reduced snowpack**
  Even though precipitation is not projected to change much on average, warming will have detrimental impacts to the Sierra Nevada snowpack. The region's snowpack is projected to decline by 60% with snow eradicated below 6,000 feet in elevation. Scientists now believe that these snowpack projections could be underestimates, as there are complex, less understood feedback loops between temperature rise and snowmelt. This loss of snowpack will have damaging consequences for the region, including impacts to water bodies and stress to wildlife.

- **Increased wildfire**
  A major climate impact facing the Sierra Nevada region is wildfire. If forest health remains poor across the majority of this region, climate change is expected to increase the risk from large wildfires.[178]

REGIONAL INPUT

A public workshop was held on April 28, 2021 to understand what nature-based climate solutions are important in the Sierra Nevada, and how this strategy can support the region's environmental, economic, and equity priorities.

Examples of participant input on what long-term success looks like for climate smart land management in the Sierra Nevada region included:

- Healthy ecosystems
- Equitable and thriving communities
- Adequate resources
- Land trusts and conservation easements
- Increased public awareness and commitment
- Meaningful partnerships and collaborations

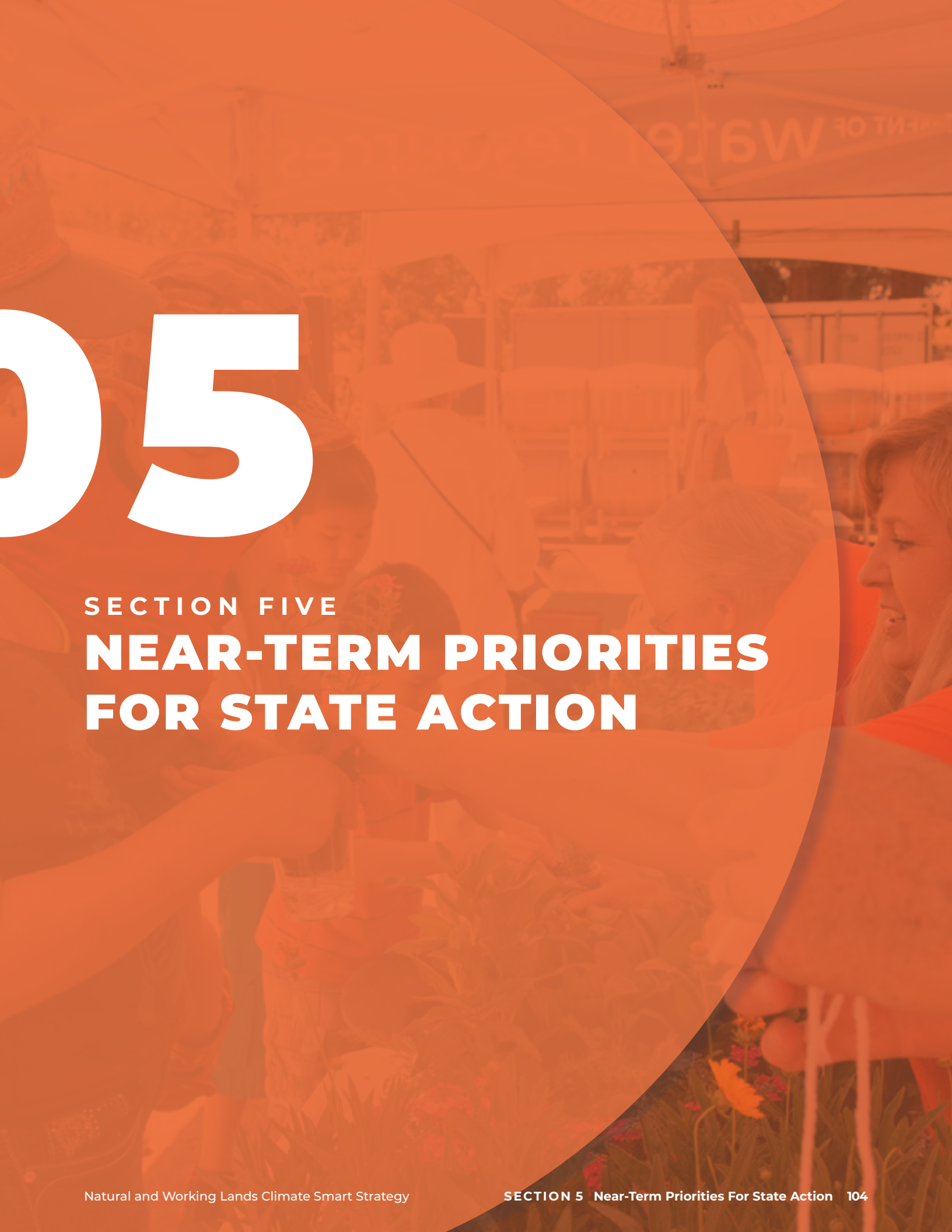
Some of the nature-based solutions identified by workshop participants as priorities for the region included:

- Prescribed and cultural burning, fuel reduction, natural fire regimes, reforesting deforested areas, composting for fire scarred land, tree removal, forest thinning and sustainable forestry
- Prescribed and science-based grazing
- Landscape connectivity, conservation easements, the creation of wildlife corridors, habitat restoration and protection
- Traditional Ecological Knowledge
- Wetland protection, conservation, and restoration
- Build partnerships with and expand stewardship capacity of California Native American tribes
- Education, outreach, improved outdoor education on nature and ecosystems,

partnerships with schools and youth outdoor programs

Opportunities to increase equity in the region through nature-based solutions identified by workshop participants included:

- Community engagement, particularly local youth in underserved communities
- Local and regional collaboration to:
  - Increase access to nature, for example through more parks in underserved areas
  - Expand nature-based education, for example through outreach, improved outdoor education on nature and ecosystems, partnerships with schools and youth outdoor programs
  - Workforce development, for example through programs for interested underserved community members to train for permanent opportunities in climate smart land management
- Programs to engage undeserved and historically disadvantaged communities



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SECTION FIVE

NEAR-TERM PRIORITIES FOR STATE ACTION

Kids Day at California State Fair in Sacramento, CA

SECTION FIVE

NEAR-TERM PRIORITIES FOR STATE ACTION

We are committed to moving faster and on multiple fronts to enlist nature-based solutions in our expanding portfolio of climate action.

With the path to a resilient, carbon neutral future narrowing, the Governor and members of the Legislature have committed record funding for climate action – including in the natural and working lands sector.

This section outlines the building blocks of the state's natural and working lands agenda in the near-term, and identifies key areas of focus within each.

1. **Accelerate on the ground projects that deliver climate benefits through nature-based solutions across California's diverse landscapes that state agencies and partners can learn from and that can be scaled-up over time.**

   The world's leading climate scientists have made it clear - our window to avoid the worst impacts of climate change is narrowing faster than expected, and success requires urgent and unprecedented levels of action. Plants, soils, and trees operate on decadal time scales; to achieve climate benefits over time, we must act today. Key areas of focus for this near-term priority include:

   A. Make available a balanced and comprehensive portfolio of nature-based solution grant programs to enable projects across the state.

   B. Expedite permitting of large-scale restoration projects through interagency teams to accelerate climate smart land management.

C. Test innovative, nature-based climate solutions on state lands.

D. Solicit demonstration project proposals to scale climate smart management and share lessons learned, prioritizing those projects led by California Native American tribes and climate vulnerable communities.

2. Invest in science to improve our understanding of implementation pathways here in California and to help scale nature-based climate solutions around the world.

This sector can either contribute to or undermine our efforts to build a resilient, carbon neutral future, requiring us to move with urgency and ambition. Using the best available science to inform an adaptive approach is critical. The state will continue our legacy of leadership in this space, and engage world-class scientists and innovators to support this work in California. Key areas of focus for this near-term priority include:

A. Build on and expand our approach to modeling climate action in this sector to support development of implementation pathways for the natural and working lands sector to achieve the target in California's 2022 Scoping Plan target and the goals in our updated Climate Adaptation Strategy.

B. Identify nature-based climate solution research priorities. Given the scope and complexity of this sector (and as reflected in the suite of related recommendations in Appendix A) there are numerous research interests to pursue. The state's climate research agenda will incorporate many of these, including:

- A meta-analysis of peer-reviewed and published literature on the natural and working lands sector, to help the state identify what research exists to inform modeling, management, and policy, as well as identify gaps in original research.
- The degree to which protecting the soil, above and below ground vegetation, and inorganic stores of carbon in deserts will contribute to a resilient, carbon-neutral future.
- Improving climate science related to healthy soils.

C. Utilize the state's climate change research funding to support science-based action in this sector, such as the Fifth California Climate Change Assessment, funds proposed for climate related research and incubators at the University of California, and research to advance the state's 30x30 goal.

D. Explore opportunities for the state to leverage rapid scientific advancement occurring in measuring and managing climate action in this sector through monitoring technologies.

3. Prioritize equity to drive solutions that help those residents and communities hit first and worst by climate change impacts, including through targeted funding, workforce development, capacity building, and support for tribally-led nature-based solutions.

As we accelerate nature-based solutions to address climate change, a core goal for California is to do so in a manner that increases equity and environmental justice. Outcomes must benefit all California tribes, peoples, and communities. Key areas of focus for this near-term priority include:

A. Increase workforce development opportunities in this sector that connect Californians, particularly frontline youth, with access to jobs and career pathways needed to deliver an equitable, resilient, and carbon-neutral California.

B. Reduce risks of extreme heat to California students in the most vulnerable, low-

income schools through greening campuses and transportation corridors.

C. Develop and utilize the Vulnerable Communities Platform to identify opportunities to invest in community-led nature-based climate solutions in the most climate-vulnerable communities and populations.

D. Invest in tribally-led climate adaptation research on nature-based climate solutions through California's 5th Climate Change Assessment.

E. Champion a shift across state agencies to make best practices for technical assistance and capacity building standard practices, and explore opportunities to pilot new approaches through nature-based solution programs.

4. **Scale investment to support climate action in the natural working lands sector, including through public-private partnerships, demonstration projects, and leveraging federal funds.**

Advancing climate action in the natural working lands sector requires resources. There are numerous opportunities to unlock greater investment, and we are committed to exploring them. The state will engage thought partners, seek expert recommendations, and undertake analyses to inform these efforts through a number of initiatives. Key areas of focus for this near-term priority include:

A. Identify opportunities to drive climate action on our natural and working lands through incentives, markets, and other relevant mechanisms that also increase equity and economic opportunity for all Californians.

B. Estimate the economic costs of high, medium, and low ambition climate action, or inaction, in our natural and working lands sector.

C. Explore the potential for public-private partnerships to leverage investments in nature-based climate solutions.

D. Develop an approach to improve California's efforts to track, evaluate, and catalyze investments for climate action on lands in California, considering Section IV, the California Carbon Sequestration and Climate Resiliency Project Registry, the Resources Agency Project Tracking and Reporting system, the forthcoming Vulnerable Communities Platform, and other important tools to track progress and communicate outcomes.

E. Leverage federal funds to deliver on our nature-based climate solution priorities.

5. **Build capacity of implementation partners through approaches including technical assistance and focused support, grant funding opportunities, and partnering with California Native American tribes.**

Successful climate smart land management must reflect local and regional circumstances and often requires trusted partnerships given the complexity of land ownership in California, importance of meaningful community engagement, and opportunity to leverage resources. Landowners and managers will play a central role in implementing the priority solutions listed in this Strategy, as will on-the-ground technical assistance providers and land-use decision-makers. Key areas of focus for this near-term priority include:

A. Expand state support for climate smart land managers, including through technical assistance and capacity building across all regions in California.

B. Partner with California Native American tribes to identify and invest in shared nature-based solution implementation priorities.

C. Explore opportunities to increase support for historically disadvantaged small-scale farmers in implementing climate smart land management.

D. Adjust grant programs as needed to improve and accelerate project implementation, such as amending grant criteria, application requirements, reimbursement and cost-share rules, allowable administrative expenses, reporting requirements, and public engagement efforts.

6. Improve internal coordination among state agencies to align and leverage funding, authorities, and programs to accelerate implementation of nature-based solutions.

California's climate leadership has always pushed the boundaries of our institutions and systems. The world's leading scientists have been clear – we will not succeed without transformational change. Nature-based climate solutions offer significant potential to support this change. A near term priority for state action is to increase support for and opportunities to learn from long-time leaders in this sector, and to partner with teams across the Administration to deliver on a broader set of objectives through nature-based solutions. Key areas of focus for this near-term priority include:

A. Increase support for and collaboration among nature-based climate leaders across agencies, and amplify their experience and expertise.

B. Expand the state's nature-based solutions portfolio in partnership with leaders across agencies responsible for advancing the state's public health, labor and workforce, education, housing, and transportation priorities. These efforts are intended to showcase the environmental, equity, and economic benefits nature-based solutions can deliver.

C. Ensure alignment across relevant funding programs with cross-cutting and landscape-specific nature-based climate solutions called for in this Strategy.

D. Provide technical resources for data collection and tracking and conduct comprehensive analysis on potential future land management actions and their multiple benefits.

E. Evaluate how relevant nature-based solution programs deliver on community priorities, and adjust approaches where needed.

7. Strengthen collective action by advancing new and innovative partnerships with non-state government groups and leaders and through organizing annual updates and periodic convenings to drive implementation

California is home to a deep bench of thought leaders and experienced implementers advancing the nature-based climate solutions agenda. Our path to an equitable, climate-resilient future is narrowing quickly. To move with the speed and at the success rate required, we are seeking to expand and deepen engagement with leaders in this space to inform and accelerate our collective work in communities, regions, and sectors across California. Key areas of focus for this near-term priority include:

A. Launch a series of convenings, listening sessions, and expert roundtables to amplify success stories, learn from one another's mistakes, tackle difficult issues, explore new solutions, evaluate progress, and more. A few areas of near-term focus for state agencies include community/school greening and forestry; land access and tenure; crop insurance; and endowment funding.

B. Release annual updates on implementation of the Natural and Working Lands Climate Smart Strategy, and convene partners to share their reflections on progress and priorities for the following year.

NATURAL AND WORKING LANDS CLIMATE SMART STRATEGY

APRIL 2022

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