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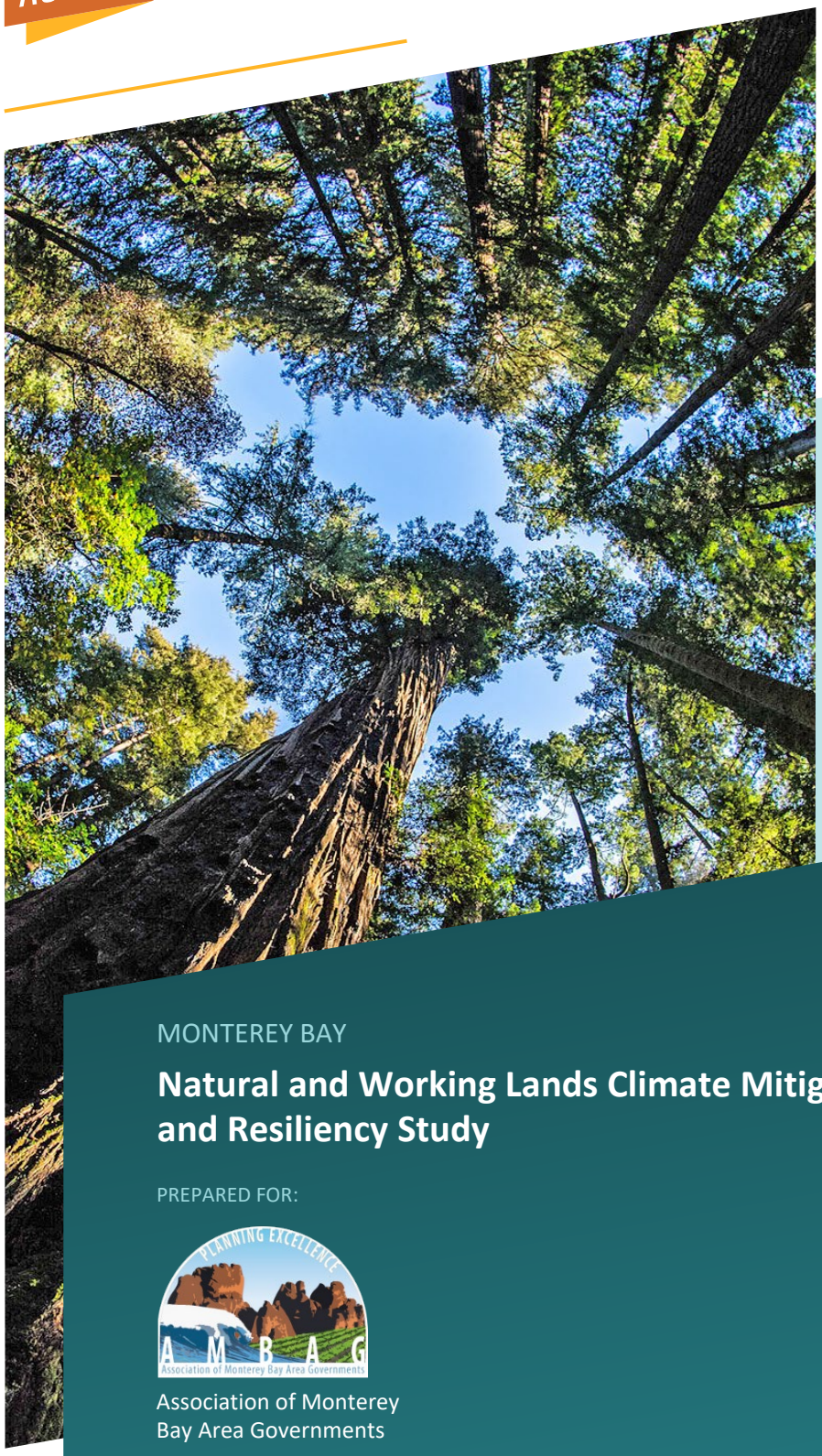

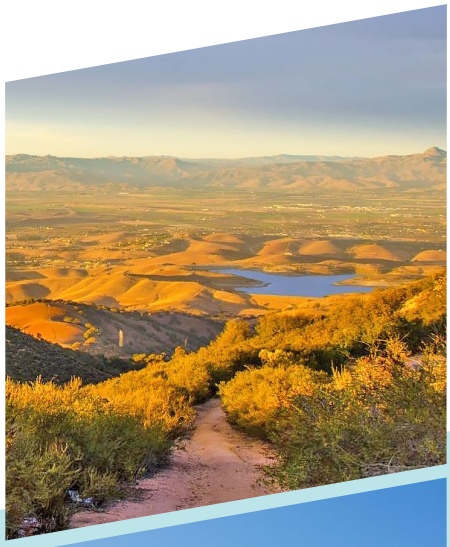

MONTEREY BAY

Natural and Working Lands Climate Mitigation and Resiliency Study

PREPARED FOR:

Association of Monterey
Bay Area Governments

ATTENTION:

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Sustainability Program Manager

APRIL 2024

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Natural and Working Lands Climate Mitigation and Resiliency Study

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ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
AMBAG	Association of Monterey Bay Area Governments
BAU	business-as-usual
C	carbon
CAL FIRE	California Department of Forestry and Fire Protection
CARB	California Air Resources Boad
CBO	community-based organization
CDFA	California Department of Food and Agriculture
Climate Study	Monterey Bay Natural and Working Lands Climate Mitigation and Resiliency Study
cm	centimeters
CNRA	California Natural Resources Agency
CO_2	Carbon dioxide
EAC	AB 1757 Expert Advisory Committee
EO	Executive Order
FRAP	Fire and Resource Assessment Program
GHG	Greenhouse gas
GIS	Geographic Information System
IPCC	Intergovernmental Panel on Climate Change
JPA	joint powers authority
MMT C	million metric tons of carbon
MT	metric tons
OR-3	Santa Cruz County Office of Response, Recovery, and Resilience
RCD	resource conservation district
RCPWG	Regional Climate Project Working Group
SALC	Sustainable Agricultural Lands Conservation
SB	Senate Bill
SSURGO	Soil Survey Geographic Database
UCCE	University of California Cooperative Extension
WUI	Wildland-urban interface

Chapter One
INTRODUCTION

1.1 OVERVIEW OF AMBAG

The Association of Monterey Bay Area Governments (AMBAG) operates under a Joint Powers Authority with local cities and the Counties of Monterey, San Benito, and Santa Cruz. AMBAG serves as both the federally designated metropolitan planning organization for Monterey, San Benito, and Santa Cruz Counties and the council of governments for Monterey and Santa Cruz Counties. The AMBAG Board of Directors is comprised of one City Council member from each city and two Supervisors from each of the three counties. AMBAG is a public agency funded through a combination of federal and state transportation funds, grants, and membership dues. AMBAG has several programmatic focus areas to support the Monterey Bay Area with planning, technical assistance, transportation improvements, and energy efficiency resources.

1.2 STUDY PURPOSE AND OBJECTIVES

AMBAG's Sustainability Program has developed this Monterey Bay Natural and Working Lands Climate Mitigation and Resiliency Study (Climate Study) to understand the magnitude and nature of existing carbon stocks, identify potential future carbon sequestration opportunities, and evaluate methods to protect the carbon stock in natural, working, and developed lands in order to advance climate change mitigation and adaptation planning in the Monterey Bay Area. The Climate Study was funded by a Sustainable Agricultural Lands Conservation (SALC) planning grant from the California Department of Conservation. Specifically, the Climate Study includes several objectives:

- Prepare a spatially based carbon stock inventory,
- Create a geoprocessing tool that can be integrated with AMBAG's land use model,
- Forecast future carbon stocks that align with climate projections,

- Develop feasible strategies to enhance carbon sequestration potential and protect the exiting carbon stock in the Monterey Bay Area,
- Provide member jurisdictions with carbon stock data and results,
- Engage stakeholders and technical experts throughout the process, and
- Identify gaps in information, data, funding, and policies at the state and regional levels.

The Climate Study evaluates all natural and working lands of the Monterey Bay Area, which is shown in Figure 1.1.

1.3 STAKEHOLDER ENGAGEMENT

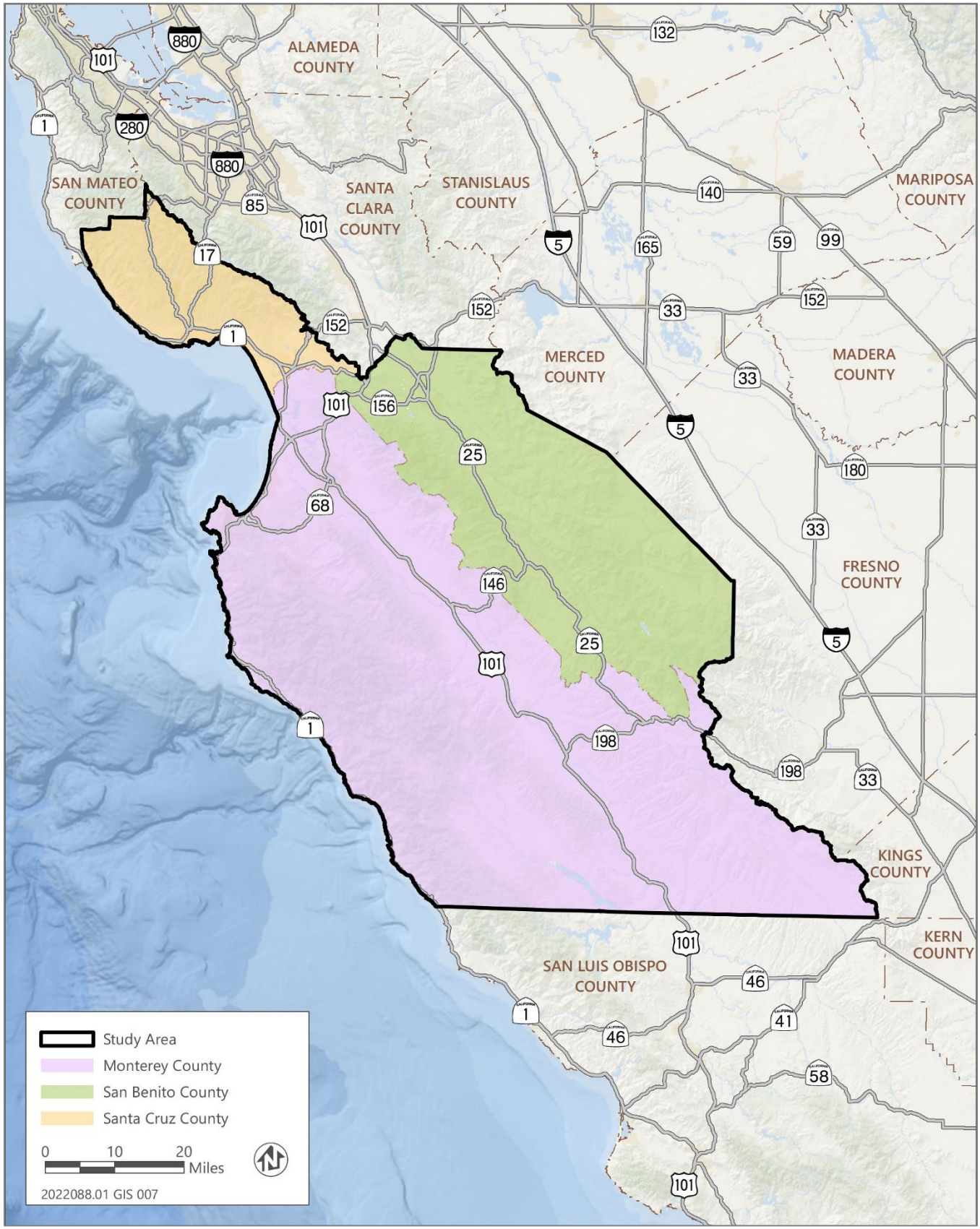
The stakeholder engagement process for the Climate Study involved various levels of stakeholder outreach efforts and interactions. Each level of community engagement sought to benefit from various stakeholders' diverse perspectives and expertise, enhancing the accuracy and effectiveness of the carbon sequestration strategies presented in Chapter 4.

A stakeholder working group was established to provide technical expertise and feedback through the Climate Study development process. This group comprised local jurisdictions, regional agencies, members of the agricultural community, conservation groups, and technical experts. The stakeholder working group met three times during the project to offer key insights into data gaps, develop metrics for the inventory, provide considerations for forecast scenarios, and brainstorm regionally appropriate and scalable carbon sequestration strategies.

Additionally, three focus groups were created with representatives from the larger stakeholder working group. The focus groups were developed to align with specific land types: urban forests and parks; forests; and conservation, open space, and agriculture. Focus group discussions aimed to ground-truth spatial data as part of the project's validation process. Additionally, members of the focus groups provided invaluable feedback on the challenges and opportunities related to carbon stock and sequestration potential, ensuring that the project's analysis is robust and comprehensive.

Upon public release of the draft Climate Study, AMBAG conducted two public workshops focused on the three counties covered by the study area (i.e., Monterey County, San Benito County, and Santa Cruz County). These workshops educated members of the public on the results of the Climate Study, gathered feedback, and demonstrated how the accompanying data can be used to support carbon sequestration activities in the region.

Figure 1.1 Study Area



Source: adapted by Ascent in 2024.

1.4 SUMMARY OF STUDY PROCESS

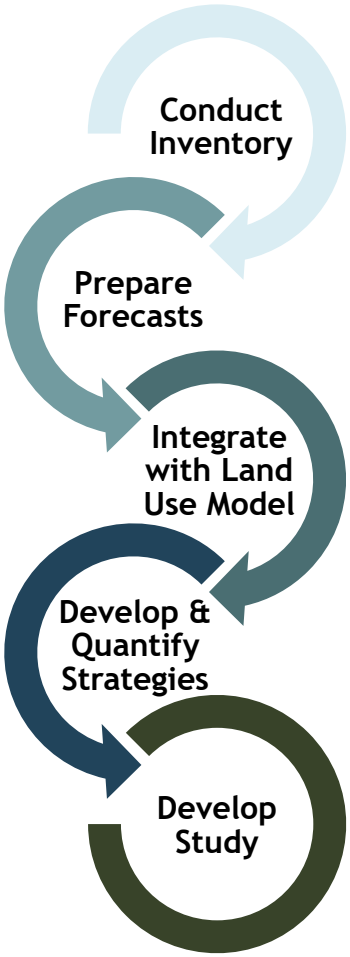
At present, there is no readily available tool that precisely estimates the carbon stock and sequestration potential at a local level. Instead, and as part of the Climate Study, a variety of existing tools, datasets, and methods were evaluated and used to develop a carbon stock inventory for the study area. After a baseline estimate was developed, forecasts of future carbon stock held by natural and working lands in the study area were prepared, aligning with statewide projections that incorporate the impacts of land management practices and climate change on future carbon stock.

The Climate Study represents the culmination of the carbon stock inventory, preparation of forecasts, and public and stakeholder participation. These components have helped shape the carbon sequestration strategies, the level of carbon sequestration anticipated, ancillary benefits (in addition to carbon sequestration) from implementing these strategies, and suggested actions for implementing sequestration projects in the Monterey Bay Area. The Climate Study followed a public review process and includes a list of feedback, comments, and responses on the public draft (see Appendix C). The Climate Study and all supporting materials were finalized and presented in the summer of 2024.

The project was initiated in October 2022. Initial steps of the project focused on refining project objectives, timeline, and milestones, identifying critical stakeholders, and setting dates for stakeholder engagement. Internal and external meetings were intended to build a framework for Geographic Information System (GIS) analysis, carbon stock and sequestration quantification, and identify roles among AMBAG and partners.

The quantification of carbon stock and sequestration potential is an evolving area as statewide efforts are focusing more on carbon sinks to meet the goal of carbon neutrality by 2045.

Figure 1.2 Process Chart



1.5 KEY TERMS

The following key terms are used throughout the Climate Study.

- **Adaptation:** The process of assessing and responding to climate change's current and future impacts.
- **Aboveground carbon:** Aboveground carbon is the carbon stored in living vegetation and woody biomass in ecosystems like forests, shrublands, and grasslands, including trees, bushes, leaves, branches, and stems.
- **Belowground carbon:** Belowground carbon is the carbon stored in soil and the roots of plants and trees. It exists in organic forms like decomposed plant material and roots.
- **Carbon dioxide (CO_2):** CO_2 is a greenhouse gas that traps heat in the Earth's atmosphere, contributing to the greenhouse effect, with its increased concentration due to the burning of fossil fuels being a major factor in climate change. A metric ton of sequestered carbon (C) is equivalent to 3.67 metric tons of CO_2 in the atmosphere; this conversion factor is used throughout this Climate Study.
- **Carbon pool:** A system which has the capacity to accumulate or release carbon, considered to be a reservoir. Examples include forest biomass, wood products, soils, and the atmosphere (Intergovernmental Panel on Climate Change [IPCC] 2000).
- **Carbon sequestration:** The process of increasing the carbon content of a carbon pool other than the atmosphere (IPCC 2000). All references to carbon sequestration in this Climate Study refer to carbon sequestration in natural and working lands. Generally, carbon is stored as C in these lands via processes such as photosynthesis, and oxygen is released back into the atmosphere. This is distinct from human-made carbon capture and storage (CCS) technologies, which capture CO_2 emissions from industrial processes. CCS technologies are outside of the scope of this Climate Study.
- **Carbon stock:** The absolute quantity of carbon held within a carbon pool at a specified time (IPCC 2000). For the purposes of this Climate Study, all carbon stock values are expressed in terms of metric tons of C.
- **Greenhouse gas (GHG):** Gases that trap heat in the atmosphere, and consist mainly of water vapor, CO_2, methane, nitrous oxide, ozone, and chlorofluorocarbons.
- **Greenhouse effect:** GHGs provide an insulating effect to Earth, which is necessary to support life. However, the combustion of fossil fuels and other human-caused activities since the Industrial Revolution in the 19th century have introduced GHGs into the atmosphere at an increasingly accelerated rate. These significantly elevated levels of GHGs above natural ambient concentrations have caused a trend of unnatural warming of the Earth’s climate.
- **Mitigation:** The process of lessening heat-trapping GHG emissions that contribute to climate change.
- **Natural lands:** Lands consisting of forests, grasslands, deserts, freshwater and riparian systems, wetlands, coastal and estuarine areas, watersheds, wildlands, or wildlife habitats, or lands used for recreational purposes such as parks, urban and community forests, greenbelts, trails, and

other similar open-space lands. For purposes of this paragraph, “parks” includes, but is not limited to, areas that provide public green space (California Public Resources Code 9001.5).

- **Resiliency:** The ability of individuals, communities, and ecosystems to withstand, adapt to, and recover from the adverse impacts of climate change.
- **Working lands:** Lands used for farming, grazing, or the production of forest products (California Public Resources Code 9001.5).

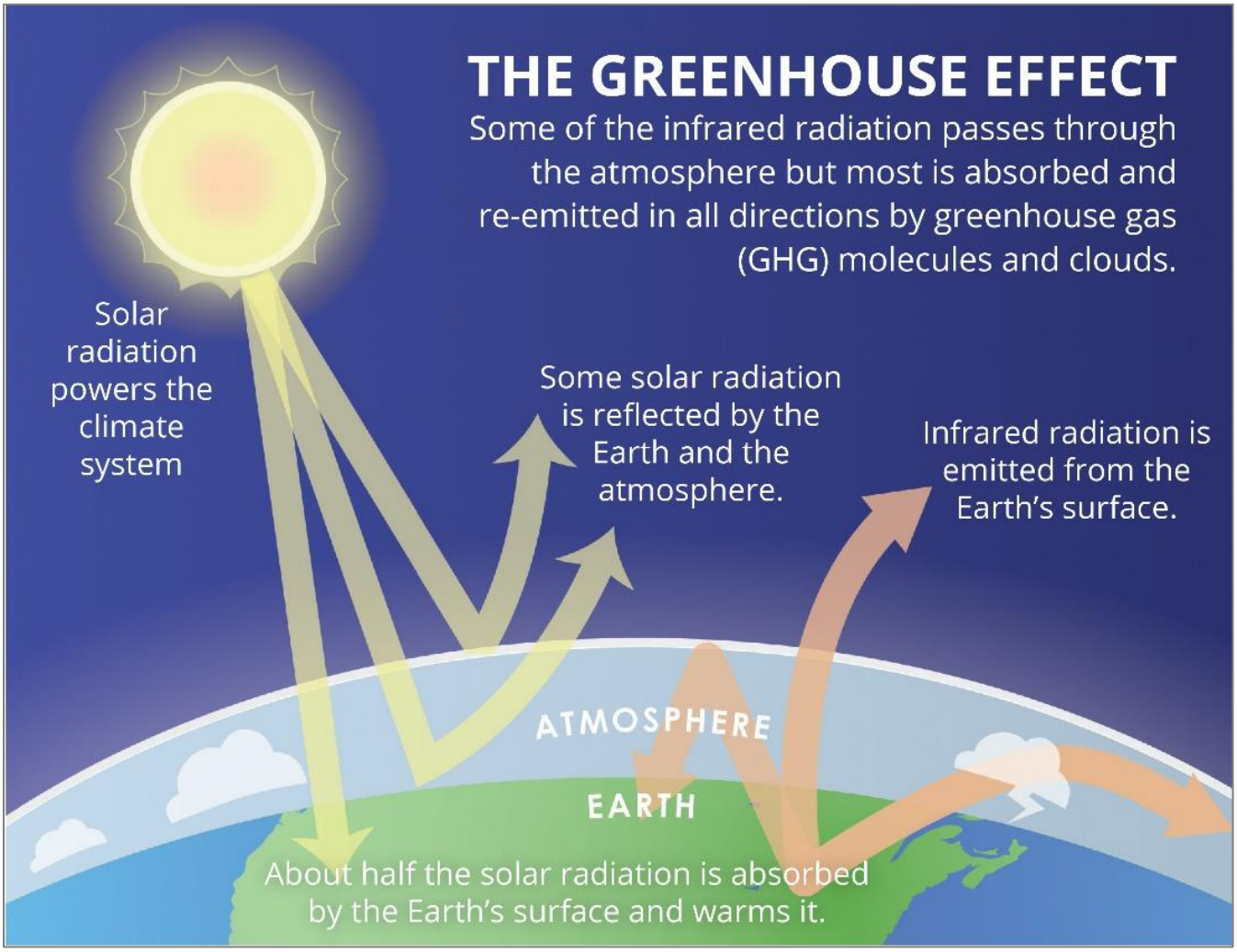
Chapter Two Background

Chapter Two explores carbon sequestration as a valuable climate mitigation and adaptation tool. It delves into the biology and storage of carbon in vegetation, soils, and aquatic environments, emphasizing its role in achieving carbon neutrality and building climate resilience. Further, it highlights the significance of conserving natural and working lands in alignment with local, regional, and state goals and policies. These efforts combat climate change and promote community investments, equity, and sustainability through nature-based solutions and strategic land management practices.

2.1 CARBON STOCK AND SEQUESTRATION OVERVIEW

Carbon dioxide (CO_2), the most commonly produced **greenhouse gas (GHG)**, acts as a global insulator by absorbing infrared radiation that is emitted by Earth and re-emitting it back down, causing the planet's climate to warm. This impact is known as global climate change. The combustion of fossil fuels and other human-caused activities since the beginning of the Industrial Revolution in the 19th century have introduced GHGs into the atmosphere at an increasingly accelerated and unprecedented rate. GHG concentrations in the atmosphere have continued to increase from the combustion of fossil fuels and other human-caused activities, amplifying the **greenhouse effect** (Figure 2.1) and further intensifying global climate change. These significantly elevated levels of GHGs above natural ambient concentrations have caused a trend of unnatural warming and global climate change. As a result, these temperature changes have driven more extreme weather patterns, increases in sea level, rapid melting of the polar ice caps, and other impacts on biological resources and human beings.

Figure 2.1 The Greenhouse Effect



Source: Created by Ascent in 2022.

Climate change **mitigation** involves reducing the sources of GHG emissions into the atmosphere and climate change **adaptation** involves reducing the impacts due to the hazards and risks posed by climate change. In recent years, there has been more attention shown to the potential of **carbon sequestration** as both a climate change mitigation and climate change adaptation strategy. Carbon sequestration is the process of capturing and storing atmospheric CO_2 (USGS n.d.a) in the form of C (the oxygen molecule is released back into the atmosphere). Biologic carbon sequestration refers to the carbon stock or accumulation of C in vegetation, woody products, soils, and aquatic environments (USGS n.d.b). This type of sequestration can occur on both **natural lands** (i.e., the original landscape before human disturbance) and **working lands** (i.e., lands that are used to produce goods such as crops or livestock).

Land use changes have direct impacts on the amount of C that is stored and sequestered within vegetation and soils in the study area (see Figure 1.1 in Chapter 1). New development that converts grasslands, forests, shrublands, or other natural land covers to urban land uses reduces the carbon sequestration potential of affected lands. Reforesting or afforesting barren, unproductive lands to preserve them from development will have the opposite effect, increasing carbon sequestration potential in the study area. This complex link between land use and carbon

sequestration highlights the need for thoughtful land use planning that minimizes losses to current carbon stock and maximizes preservation/enhancements.

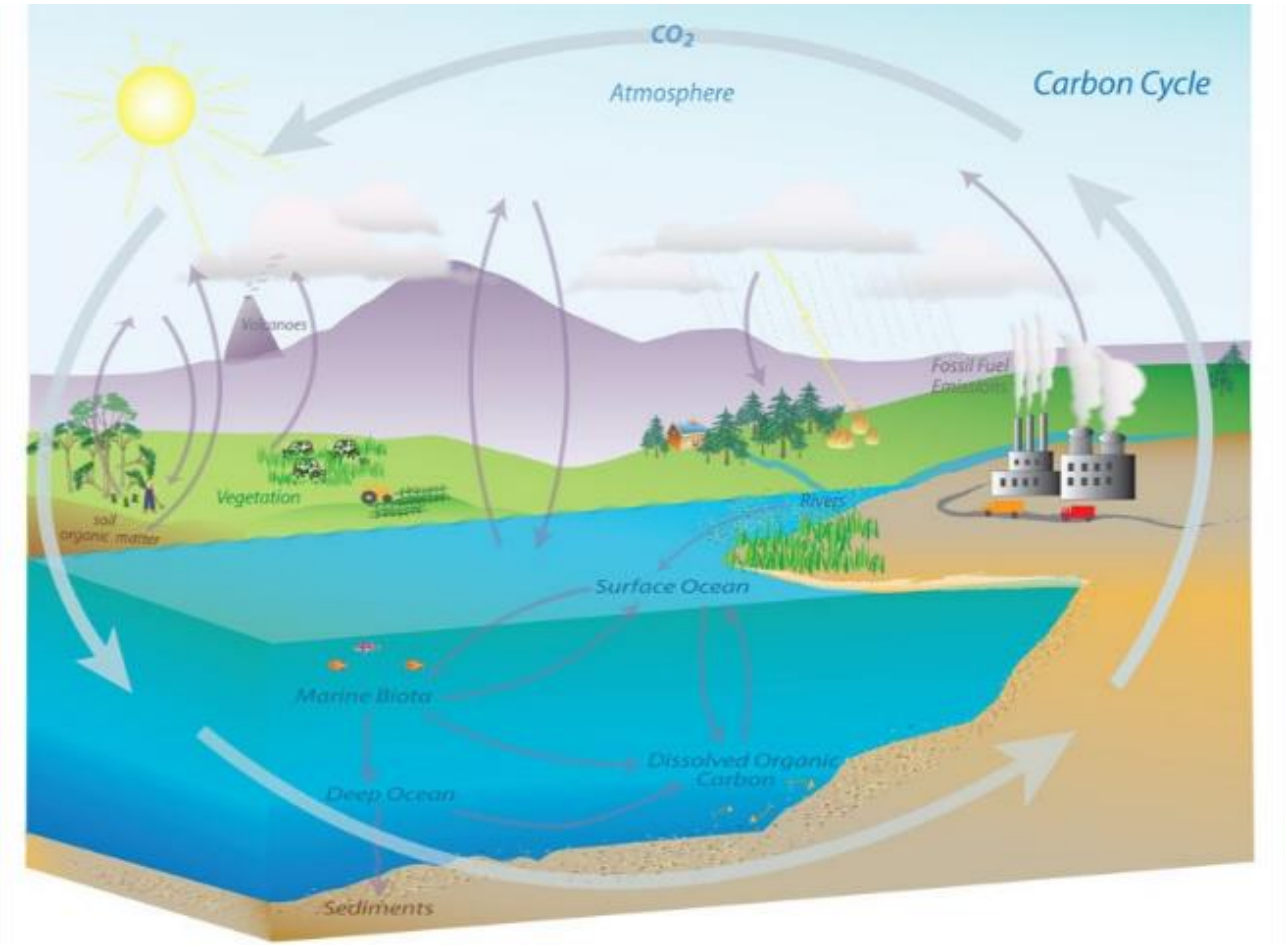
Biologic carbon sequestration in natural and working lands holds a prominent place in California's path toward carbon neutrality. Understanding the magnitude and nature of existing carbon stock and potential future sequestration opportunities from natural and working lands will be an important advancement in climate mitigation and resilience planning in the counties of Monterey, San Benito, and Santa Cruz. As stated in the California Air Resources Board's (CARB's) *2022 Scoping Plan for Achieving Carbon Neutrality* (2022 Scoping Plan), we must "re-envision our natural and working lands—forests, shrublands/chaparral, croplands, wetlands, and other lands—to ensure they play as robust a role as possible in incorporating and storing more carbon in trees, plants, soil, and wetlands that cover 90 percent of the state's 105 million acres while also thriving as a healthy ecosystem" (CARB 2022a: 2).

2.2 BIOLOGIC CARBON SEQUESTRATION

The process of biologic carbon sequestration is a fundamental part of the naturally occurring carbon cycle, which occurs when plants, animals, and ecosystems absorb CO_2 from the atmosphere and store the C atom in various forms, commonly within biomass, vegetation, soils, woody products, and aquatic environments. A **carbon pool** refers to the ability of a system to store and release carbon.

The natural carbon cycle involves the exchange of carbon between the atmosphere and the Earth (land and ocean). As part of the carbon cycle, fire, plant respiration, and decomposition are balanced by plant growth and other processes that take place over decades or centuries. When in balance, these biogenic CO_2 emissions from fire and other sources are balanced by carbon sequestration (C) in natural and working lands and waters, resulting in relatively minimal change in the total concentration of atmospheric CO_2 that drives climate change. Emissions from fossil fuel combustion and other human activities have accumulated in the atmosphere at an unprecedented pace and contributed to putting the natural carbon cycle out of balance, thereby increasing the greenhouse effect, and causing climate change. This imbalance in Earth's carbon cycle also contributes to a feedback loop for, among other things, natural and working lands in which increasing atmospheric concentrations of emissions result in warmer temperatures, extreme heat events, droughts, and wildfires, which in turn release additional emissions into the atmosphere. In addition to limiting emissions from fossil fuel combustion and other human activities, managing natural and working lands to maintain the aboveground and belowground carbon stock is critical to efforts to achieve carbon neutrality, which means balancing all sources of GHG emissions with carbon sinks. The carbon cycle is depicted in Figure 2.2.

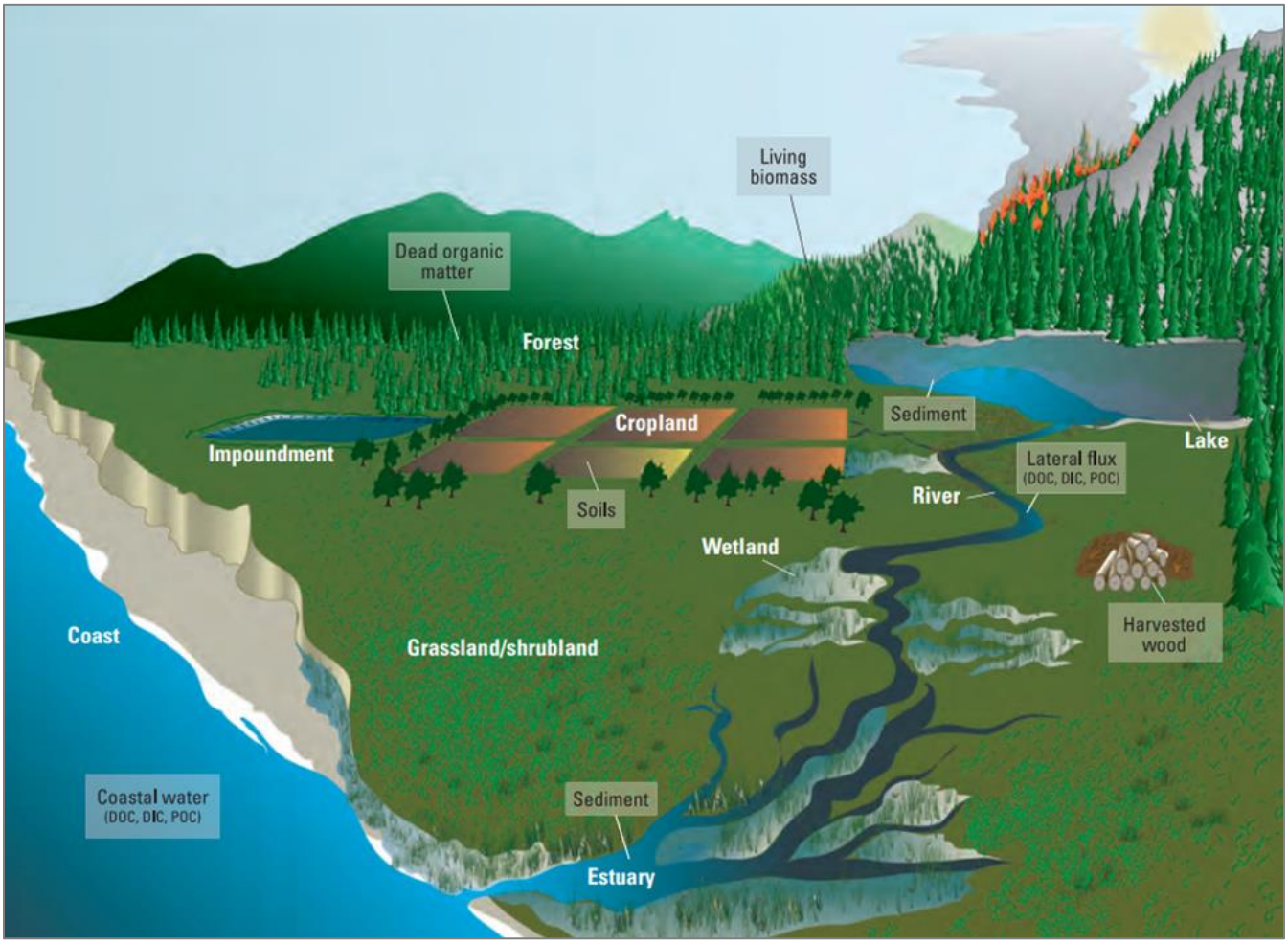
Figure 2.2 The Carbon Cycle



Source: NOAA 2019

Figure 2.3 provides examples of natural and working lands that serve as **carbon pools** or places that store carbon. The forest ecosystem is a significant carbon pool that stores carbon within individual trees and vegetation. Like most carbon pools, forest ecosystems are dynamic, constantly losing and gaining carbon, and emitting carbon back into the atmosphere during wildfire events. Natural carbon pools are at risk due to the increasing frequency of deforestation and wildfires, which release carbon at unprecedented rates.

Figure 2.3 Natural and Working Lands Carbon Pools



Source: Zhu et al. 2010.

When a system can store more carbon than it releases, it is classified as a **carbon sink**. Carbon sinks play a crucial role in helping offset the impacts of human activities because they can keep carbon stored for long periods of time. Both carbon pools and sinks play a critical role in the carbon cycle, keeping CO_2 from being released into the atmosphere and mitigating climate change.

2.3 CARBON STOCK INVENTORY OVERVIEW

To assess the amount of carbon stored through biologic sequestration, it is important to assess both aboveground and belowground carbon pools.

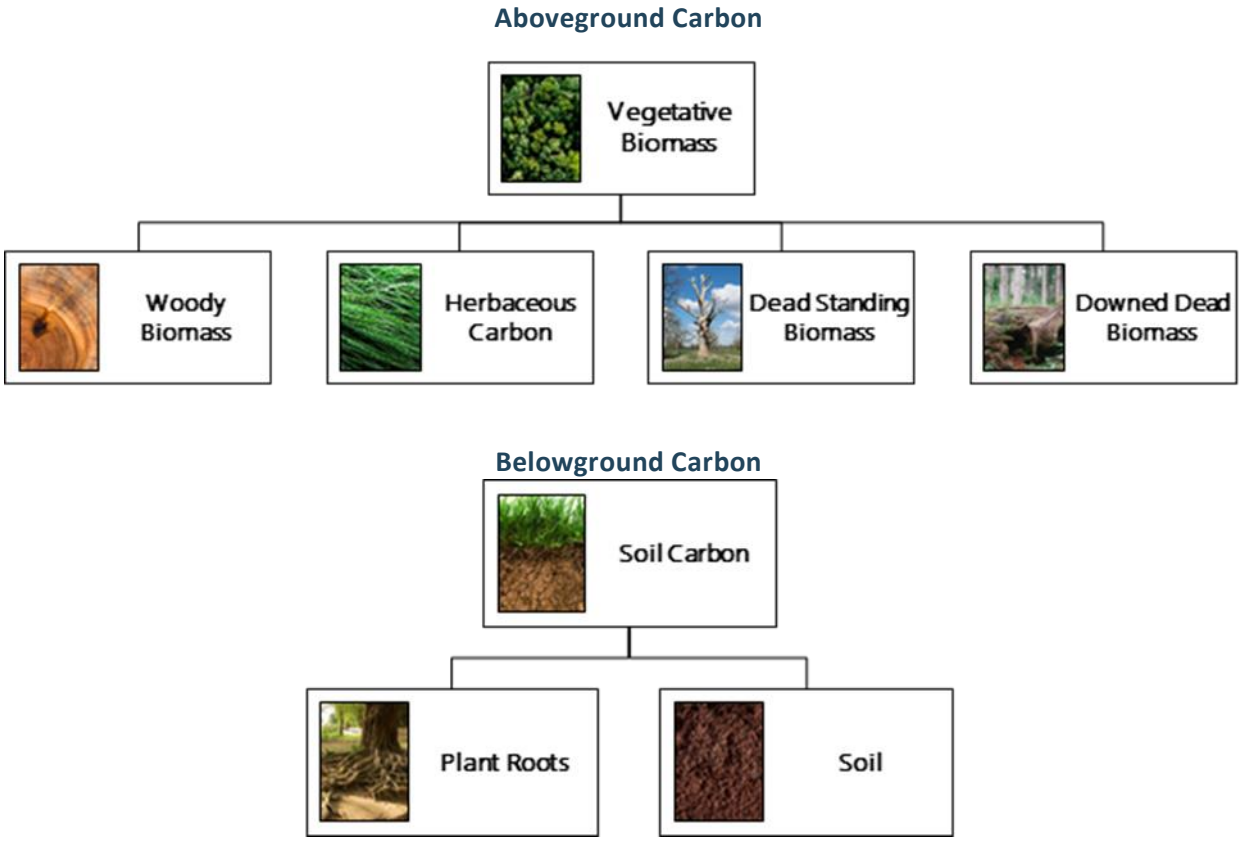
Aboveground carbon is the carbon stored within vegetative biomass above the soil. Vegetation uses photosynthesis to take CO_2 from the atmosphere and incorporate carbon (C) into biomass. Aboveground carbon sources include woody biomass in trunks, branches, and shoots as well as herbaceous carbon in leaves, flowers, fruiting bodies, and grasses. Additionally, aboveground carbon includes the carbon in leaf litter, dead standing biomass, and downed dead biomass.

Belowground carbon is the carbon stored within plant roots and soil. In soil, carbon is primarily stored as soil organic matter, a mixture of decomposing plant and animal tissue, soil minerals, and microbes. Belowground carbon constitutes approximately 75 percent of the carbon in terrestrial environments, which is three times the amount stored in living plants and animals (Lal 2004).

Belowground carbon can either be stored in the soil for millennia or released back into the environment due to decomposition.

The anatomy of a carbon stock inventory is depicted in Figure 2.4, which includes the types and sources of carbon that can be included.

Figure 2.4 Types and Sources of Carbon Included in a Carbon Stock Inventory



Source: Developed by Ascent in 2022.

Different ecosystems have different proportions of carbon in both aboveground and belowground pools. For example, while forests tend to have more aboveground carbon, grasslands include a large proportion of carbon belowground. It is important to preserve and protect each diverse ecosystem to balance the impacts of climate change.

2.4 STATE AND REGIONAL GOALS

In October 2020, Governor Newsom outlined efforts to expand nature-based solutions through an Executive Order (EO) N-82-20 calling for the restoration of nature and landscape health to meet climate goals and conserve 30 percent of the state's natural and working lands and coastal waters by 2030 (CARB 2022a: 48). The 2022 Scoping Plan identifies near- and long-term actions to increase the sequestration capacity of forests, wetlands, agricultural soils, and land conservation activities, particularly in low-income and disadvantaged communities. Actions focused on conserving natural and working lands include:

- **Forest, shrublands, and grasslands**: Treat 2.3 million acres annually through strategies that include harvesting, prescribed fire, thinning, and other land management practices.

- **Croplands**: Implement climate-smart agricultural practices on 150,000 acres per year over current levels.
- **Urban Forests:** Double the current level of investment in urban forests.
- **Wildland-Urban Interface (WUI):** Establish defensible space in 50,000 properties per year.
- **Wetlands:** restore 60,000 acres of Delta wetlands by 2045 to enhance carbon sequestration, combat land subsidence, improve flood protection, and create vital habitat.
- **Sparsely vegetated lands:** Increase conservation of these lands by 15,000 acres per year. (CARB 2022b: 18).

Other relevant policies, EOs, and statutes that aim to help the state achieve its goals are outlined in the 2022 Scoping Plan include:

- **EO N-82-20 and Senate Bill (SB) 27 of 2021:** Directs CARB to incorporate nature-based and working lands targets into the 2022 Scoping Plan.
- **Assembly Bill (AB) 1757 of 2022:** Requires the California Natural Resources Agency (CNRA), in collaboration with other state agencies and an expert advisory committee, to set targets for natural carbon sequestration and nature-based climate solutions through 2045, and integrate those targets into the 2022 Scoping Plan and other state policies.
- **SB 1386 of 2016:** Requires all relevant state agencies to consider the protection and management of natural working lands and highlight their significance as effective strategies for achieving greenhouse gas reduction objectives.
- **EO B-52-18:** Commits $96 million in addition to state funds to improve forest and fire management and calls for doubling the land actively managed through reforestation, controlled fires, and vegetation, increasing from 250,000 to 500,000 acres.
- **SB 859 of 2016:** Requires the Department of Food and Agriculture to establish and oversee the Healthy Soils Program, which acknowledges the role of soils in mitigating GHG emissions from agricultural areas.
- **AB 2251 of 2022:** Requires the Department of Forestry and Fire Protection to develop a statewide strategic plan to increase urban tree canopy coverage by 10 percent by 2035.

Statewide efforts to conserve natural and working lands are crucial in achieving state GHG reduction goals. These actions offer many benefits, including enhancing forest health to prevent carbon loss, improving air quality, increasing water capacity, supporting rural economies, and effectively utilizing forest biomass resources. Moreover, these actions can help increase tree coverage, reduce heat islands, improve water infrastructure, and lower fire risks in urban areas. By promoting carbon sequestration in natural and working lands, local communities will be better positioned to offer a comprehensive approach to tackling the impacts of climate change by reducing GHG-intensive land uses.

Strategies to conserve and improve natural and working lands' ability to store carbon are also reflected in regional and local goals (refer to Appendix B). Cities and counties acknowledge the significance of mitigating GHG emissions by implementing policies that sequester carbon and incorporating them into their climate action plans. Efforts encompass increasing green space, developing carbon offset programs, identifying innovative sequestration solutions, restoring degraded land, and promoting equitable engagement. AMBAG member jurisdictions have developed climate action plans with specific measures related to carbon sequestration, which include:

- The City of Watsonville Climate Action Plan
- The City of Carmel-by-the-Sea Climate Action Plan
- The City of Santa Cruz Climate Action Plan
- The City of Capitola Climate Action Plan
- The City of Gonzales Climate Action Plan
- The City of Hollister Climate Action Plan (Public Review Draft)
- County of Santa Cruz Climate Action and Adaptation Plan

Beyond climate action plans, regional investment strategies also aim to advance carbon sequestration planning efforts through prioritizing conservation efforts. These strategies establish priorities, goals, and actions for conservation, encompassing areas such as land protection, habitat restoration, creek and river rehabilitation, and habitat connectivity improvement. Climate action plans primarily address climate change through GHG mitigation and adaptation measures. In contrast, regional investment strategies focus on broader conservation and habitat protection within the same region. Some of the regional investment strategies relevant to the study area include:

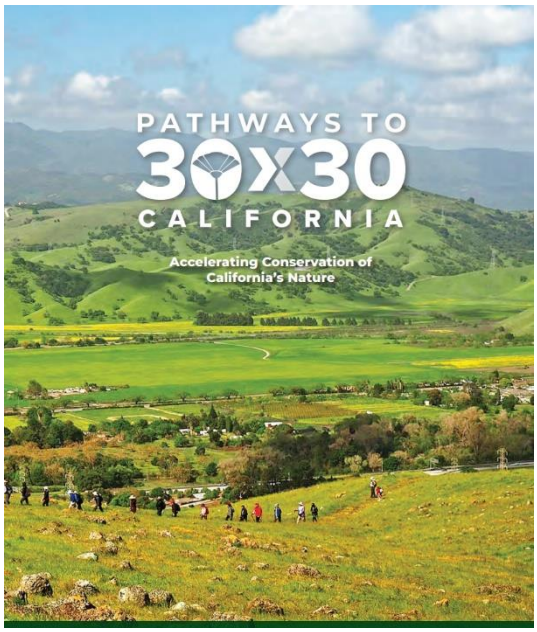
- **Santa Cruz Regional Conservation Investment Strategy:** Developed between 2020 and 2022 by the Santa Cruz County Regional Transportation Commission and the Resource Conservation District of Santa Cruz County, this comprehensive plan advances conservation in Santa Cruz County through research-based and collaborative actions. It involved input from public, local, state, and federal resource agencies, as well as technical experts. The strategy prioritizes conservation to protect, create, restore, and reconnect habitats, supporting vulnerable species, aiding climate adaptation, and enhancing resilience.
- **Monterey Regional Conservation Investment Strategy:** A strategic guide aimed at benefiting species and habitats, enhancing resilience, and supporting climate change adaptation. It establishes clear priorities, goals, and actions for conservation, encompassing activities like land protection, habitat restoration, creek and river rehabilitation, and habitat connectivity improvement. The strategy also identifies co-benefits related to public health, agricultural lands, natural ecosystems, air quality, and reduction of greenhouse gas emissions. Its key objectives include identifying suitable habitat and agricultural mitigation locations, addressing vulnerabilities related to climate change, advancing climate adaptation projects, and providing benefits to disadvantaged communities.

Expanding the use of nature-based solutions and promoting the maintenance of healthy natural and working landscapes through state, local, and regional action plays a crucial role in achieving climate change goals and other important objectives, such as promoting equity and inclusion, strengthening partnerships with local communities, and supporting economic development, clean energy resources, and food and water security (CNRA 2018).

2.5 OTHER RELEVANT DOCUMENTS

Other documents outside of action plans and investment strategies are also relevant to the Climate Study. *Pathways to 30x30 California* and the *Natural and Working Lands Climate Smart Strategy* offer guidance on land practices that promote conservation, establish partnerships, and address equity challenges. These initiatives recognize the capacity of natural and working lands to sequester carbon. They provide a holistic approach to addressing climate change, fostering sustainable communities and ecosystems, and advancing broader ecological, social, and economic goals.

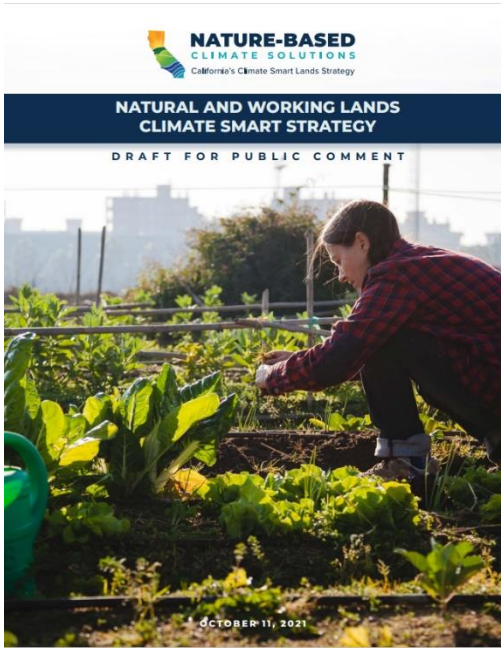
Pathways to 30x30 California



Pathways to 30x30 California outlines California's commitment to conserving 30 percent of its lands and coastal waters by 2030. The 30x30 initiative aims to protect and restore biodiversity, enhance access to natural spaces, and enhance resilience to climate change. California's participation in this effort is part of broader state commitments to promote justice, equity, diversity, and inclusion, strengthen tribal partnerships, and ensure the sustainability of economic prosperity, clean energy resources, and food supplies (CNRA 2022a: 3).

2.5.1 Natural and Working Lands Climate Smart Strategy

The Natural and Working Lands Climate Strategy outlines California's approach to addressing climate change through its natural and working landscapes. The strategy emphasizes essential nature-based solutions to combat the climate crisis and opportunities for implementing smart land management practices at the regional level. It also discusses ways to measure progress in nature-based climate action and presents opportunities to expand such management across various regions and sectors in California (CNRA 2022b: 1).



Agricultural, Climate, and Environmental Justice Organizations Recommendations for AB 1757 Targets and Pathways for Annual and Perennial Agriculture

In September 2023, a coalition of agricultural, climate, and environmental justice organizations submitted a letter to CNRA recommending specific quantitative targets (in acres treated) for climate-smart agricultural practices. These targets included, but were not limited to, practices such as composting, organic farming, managed grazing, and the reduction of pesticides. The letter highlighted the benefits of these actions outside of greenhouse gas reductions, such as environmental co-benefits (e.g., reduced erosion) as well as justice and equity benefits such as improved air quality (Shobe et al 2023).

1757 Expert Advisory Committee Recommendations for Implementation Targets for Natural and Working Lands (NWL) Sector Climate Actions

In November 2023, the AB 1757 Expert Advisory Committee (referred to hereafter as EAC), a panel of experts supporting the implementation of AB 1757, released its recommendations for climate action on California's natural and working lands. These recommendations comprise, among other things, land conservation, the expansion of organic agriculture, promotion of green spaces such as urban forests, and accelerated defensible space establishment in the wildland-urban interface (WUI). The EAC recommends investing at least $10 billion in NWL statewide over the next five years (CNRA 2023).

Chapter Three
Carbon Stock Inventory, Forecasts, and Treatments

Chapter Three presents the methodology for conducting a carbon stock inventory within the study area (refer to Figure 1.1 in Chapter 1), as well as quantities of aboveground and belowground carbon for various land cover types. This chapter also evaluates changes in carbon stock over time, aligning with two modeling scenarios conducted as part of the 2022 Scoping Plan. Lastly, this chapter describes treatments (i.e., any land management action that increases the land's ability to sequester carbon) and their associated benefits, providing valuable insights for potential carbon sequestration strategies.

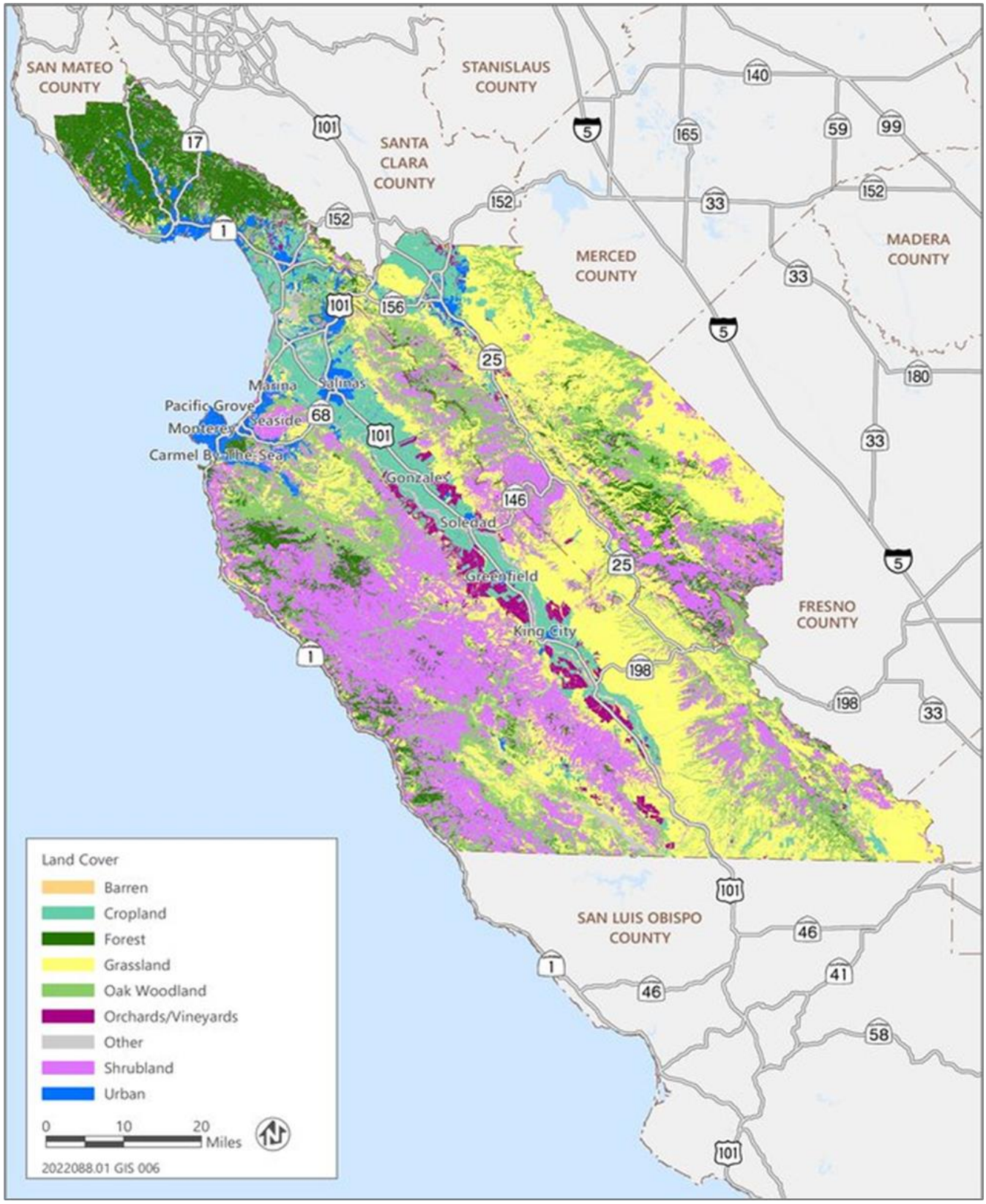
3.1 CARBON STOCK INVENTORY METHODOLOGY

An estimate of existing carbon stock in the study area was conducted, which includes an inventory of carbon stored in vegetation and soils on natural and working lands within Monterey, San Benito, and Santa Cruz counties. To do so, a Geographic Information Systems (GIS)-based analysis was performed using the best available data for land cover (i.e., vegetation) and soil. The data sources used include the following:

- United States Department of Agriculture Natural Resources Conservation Service's Soil Survey Geographic Database (SSURGO)
- California Department of Forestry and Fire Protection (CAL FIRE) Fire and Resource Assessment Program (FRAP) vegetation data layer
- California Department of Water Resources' statewide crop mapping
- United States Fish and Wildlife Service's National Wetlands Inventory

The combination of these data sources resulted in a variety of land cover types that were incorporated into the carbon stock inventory. These land cover types are shown in Figure 3.1.

Figure 3.1 Land Cover Types Identified in the Study Area



Source: Prepared by Ascent in 2023.

Additional details regarding the GIS-based analysis can be found in Appendix A.

ABOVEGROUND CARBON STOCK METHODOLOGY

Using the land cover types and acreages derived from the GIS-based analysis, aboveground carbon stock values were applied. These values, in metric tons of C per acre, were multiplied by the acreage of their corresponding land cover type. Where possible, literature values that were regionally specific were used. In instances where regionally specific values were not available, statewide values were used. Details regarding this calculation can be found in Appendix A.

BELOWGROUND CARBON STOCK METHODOLOGY

Belowground carbon stock was estimated using the SSURGO dataset, which provides data throughout California, inclusive of the study area. SSURGO provides data on the quantity of soil carbon at the depths of 5, 20, 50, 100, and 150 centimeters (cm), based on soil surveys performed throughout Monterey, Santa Cruz, and San Benito counties. For the Climate Study, soil carbon was included up to a depth of 50 cm. This depth was chosen due to the 96 percent availability of soil carbon data at this depth; greater depths had significantly less data available.

CARBON STOCK RATES

Using the methodologies described above, rates of aboveground and belowground carbon were derived, as shown in Table 3.1 and Figure 3.2. Forests and fresh marshes have the highest aboveground carbon stock rates among all land cover types. Urban lands, croplands, and orchards/vineyards have the highest belowground carbon stock rates.

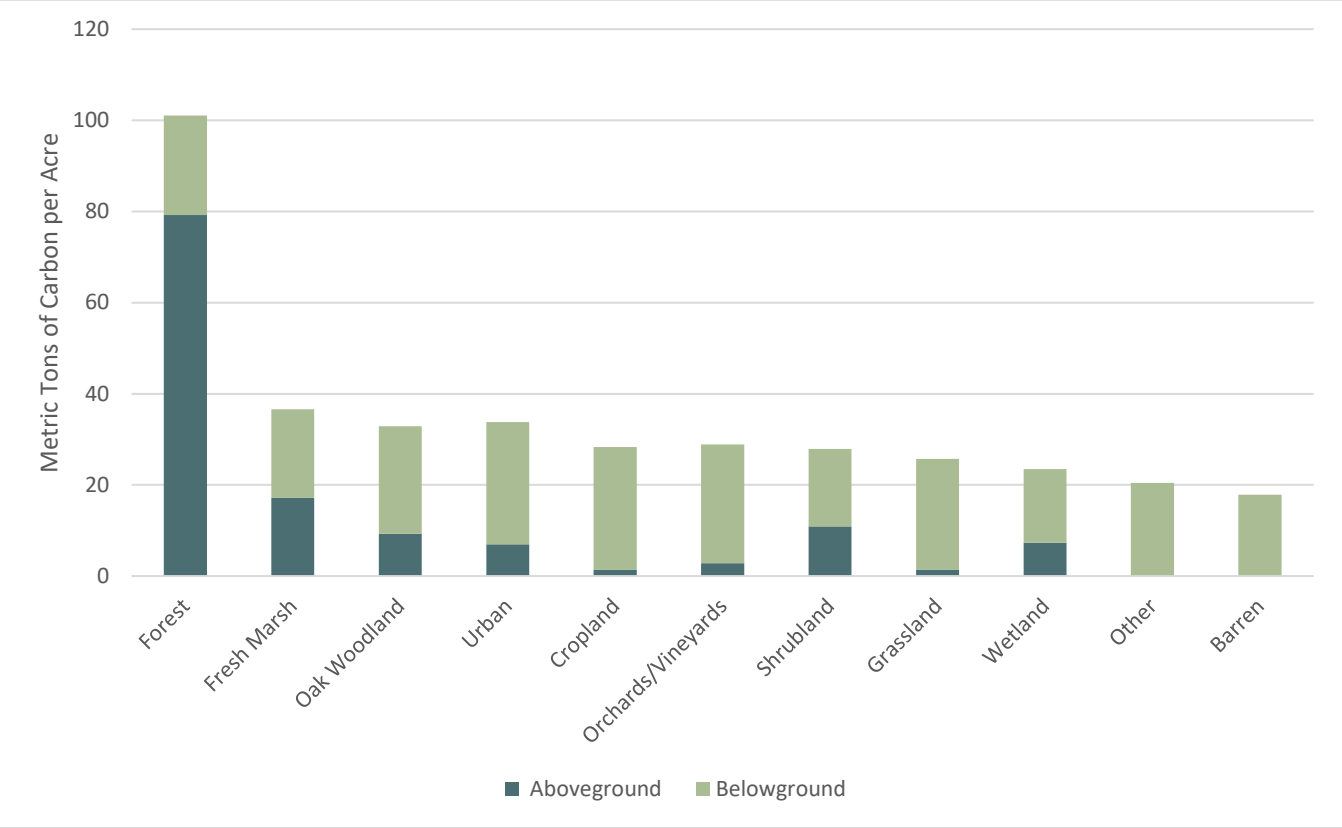
Table 3.1 Acreage and Metric Tons of Carbon per Acre by Land Cover Type in Study Area

Land Cover Type	Acres	Aboveground MT C / acre	Belowground MT C / acre	Total MT C / acre	Total MT C
Grassland	1,039,070	1.42	24.32	25.74	26,742,255
Shrubland	803,213	10.88	16.99	27.87	22,383,175
Oak Woodland	563,980	9.25	23.60	32.85	18,525,818
Forest	322,437	79.21	21.87	101.08	32,592,147
Cropland	265,179	1.37	26.95	28.32	7,510,388
Urban	119,422	6.95	26.85	33.80	4,036,857
Orchards/Vineyards	70,438	2.81	26.05	28.86	2,032,979
Fresh Marsh	55,500	17.12	19.46	36.58	2,030,136
Wetland	20,373	7.34	16.16	23.50	478,828
Barren	19,031	0.00	17.88	17.88	340,346
Water	13,145	0.00	10.23	10.23	134,437
Other	201	0.00	20.48	20.48	4,114
Total	**3,291,989**	**13.20**	**22.28**	**35.48**	**116,811,480**

Notes: C= carbon; MT = metric tons.

Source: Analysis completed by Ascent in 2023.

Figure 3.2 Carbon Stock Rates by Land Cover Type (MT C/acre)



Notes: C = carbon; MT = metric tons.

Source: Analysis completed by Ascent in 2023.

3.2 CARBON STOCK INVENTORY RESULTS

Applying the aboveground and belowground carbon stock rates to the acreages by land cover type resulted in approximately 117 million metric tons of carbon (MMT C) held in the study area. As shown in Table 3.2, Monterey County has the most stored carbon stock among the three counties in the study area, estimated at approximately 68 MMT C. In comparison, Santa Cruz County was estimated to hold approximately 26 MMT C, and San Benito County was estimated to hold approximately 23 MMT C.

Table 3.2 Baseline Aboveground and Belowground Carbon by Jurisdiction (MT C)

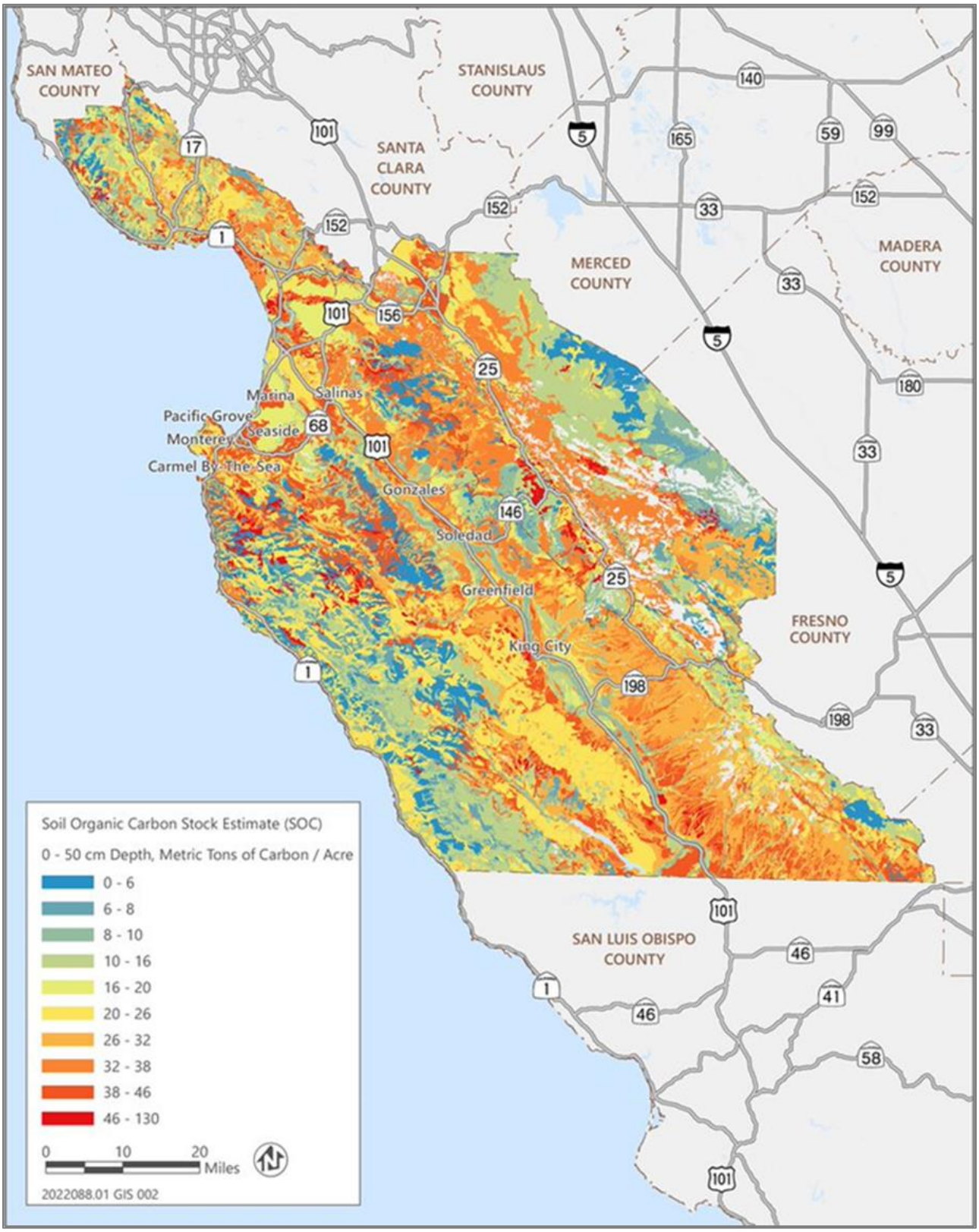
Jurisdiction	Aboveground Carbon	Belowground Carbon	Total Carbon	Total Acres	MT C / Acre
Santa Cruz County					
Capitola	14,921	30,103	45,025	938	47.99
Santa Cruz	174,731	162,882	337,614	7,856	42.98
Scotts Valley	111,695	71,290	182,985	2,951	62.02
Unincorporated Santa Cruz County	19,074,575	5,976,604	25,051,179	268,560	93.28
Watsonville	49,577	103,255	152,832	4,416	34.61
Santa Cruz County Subtotal	**19,425,500**	**6,344,134**	**25,769,634**	**284,720**	**90.51**
Monterey County					
Carmel By-The-Sea	3,931	19,510	23,441	671	34.93
Del Rey Oaks	4,786	25,758	30,543	671	45.52
Gonzales	5,339	32,040	37,379	1,251	29.88
Greenfield	8,012	44,465	52,477	1,899	27.63
King City	13,663	63,185	76,848	2,513	30.58
Marina	33,574	174,228	207,802	5,668	36.66
Monterey	36,125	152,677	188,803	5,462	34.57
Pacific Grove	9,747	45,326	55,073	1,683	32.72
Salinas	73,653	435,732	509,386	15,040	33.87
Sand City	1,219	6,032	7,251	223	32.49
Seaside	41,784	180,773	222,557	5,724	38.88
Soledad	13,896	78,370	92,266	2,994	30.82
Unincorporated Monterey County	18,334,806	48,033,984	66,368,790	2,074,157	32.00
Monterey County Subtotal	**18,580,535**	**49,292,081**	**67,872,615**	**2,117,957**	**32.05**
San Benito County					
Hollister	8,887	163,699	172,586	5,220	33.06
San Juan Bautista	893	13,496	14,389	504	28.57
Unincorporated San Benito County	5,447,113	17,535,143	22,982,257	883,589	26.01
San Benito County Subtotal	**5,456,893**	**17,712,339**	**23,169,231**	**889,312**	**26.05**
Total	**43,462,927**	**73,348,553**	**116,811,480**	**3,291,989**	**35.48**

Notes: C = carbon; MT = metric tons.

Source: Analysis completed by Ascent in 2023.

Figure 3.3 shows the spatial distribution of belowground carbon throughout the study area.

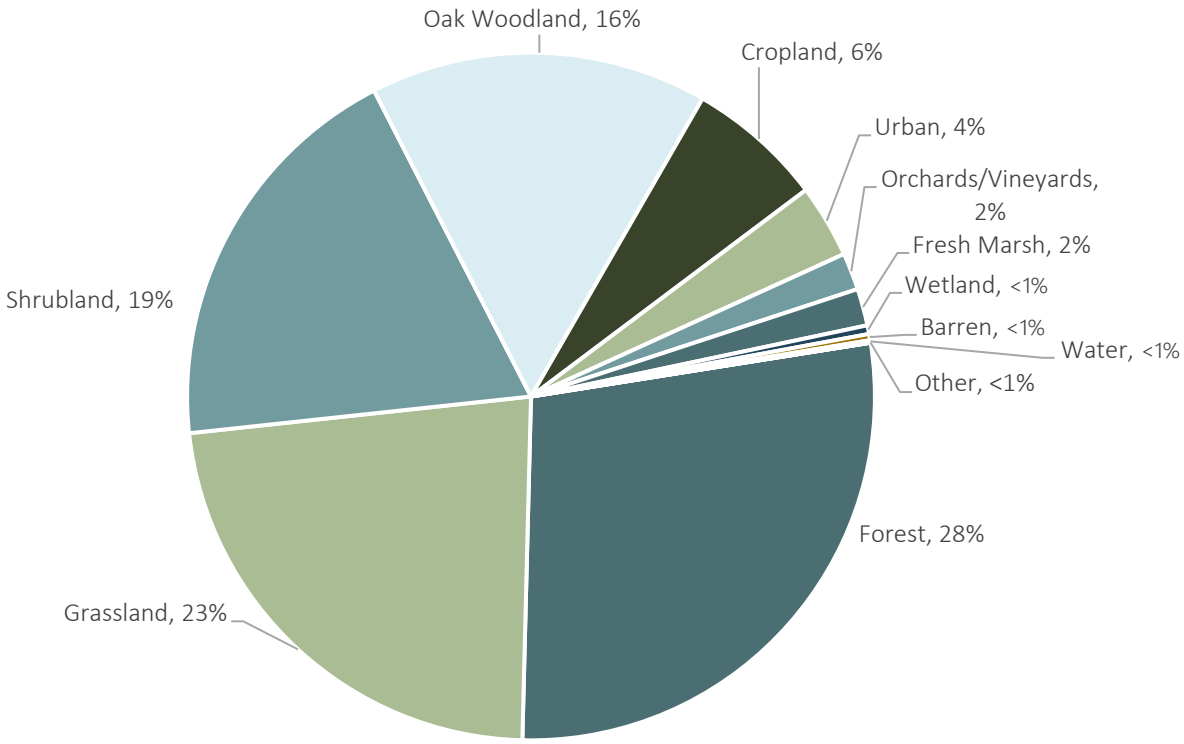
Figure 3.3 Belowground Carbon Stock within the Study Area (Metric Tons of Carbon per Acre)



Source: Analysis completed by Ascent in 2023.

Figure 3.4 shows percentages of total carbon stock by land cover, inclusive of aboveground and belowground carbon.

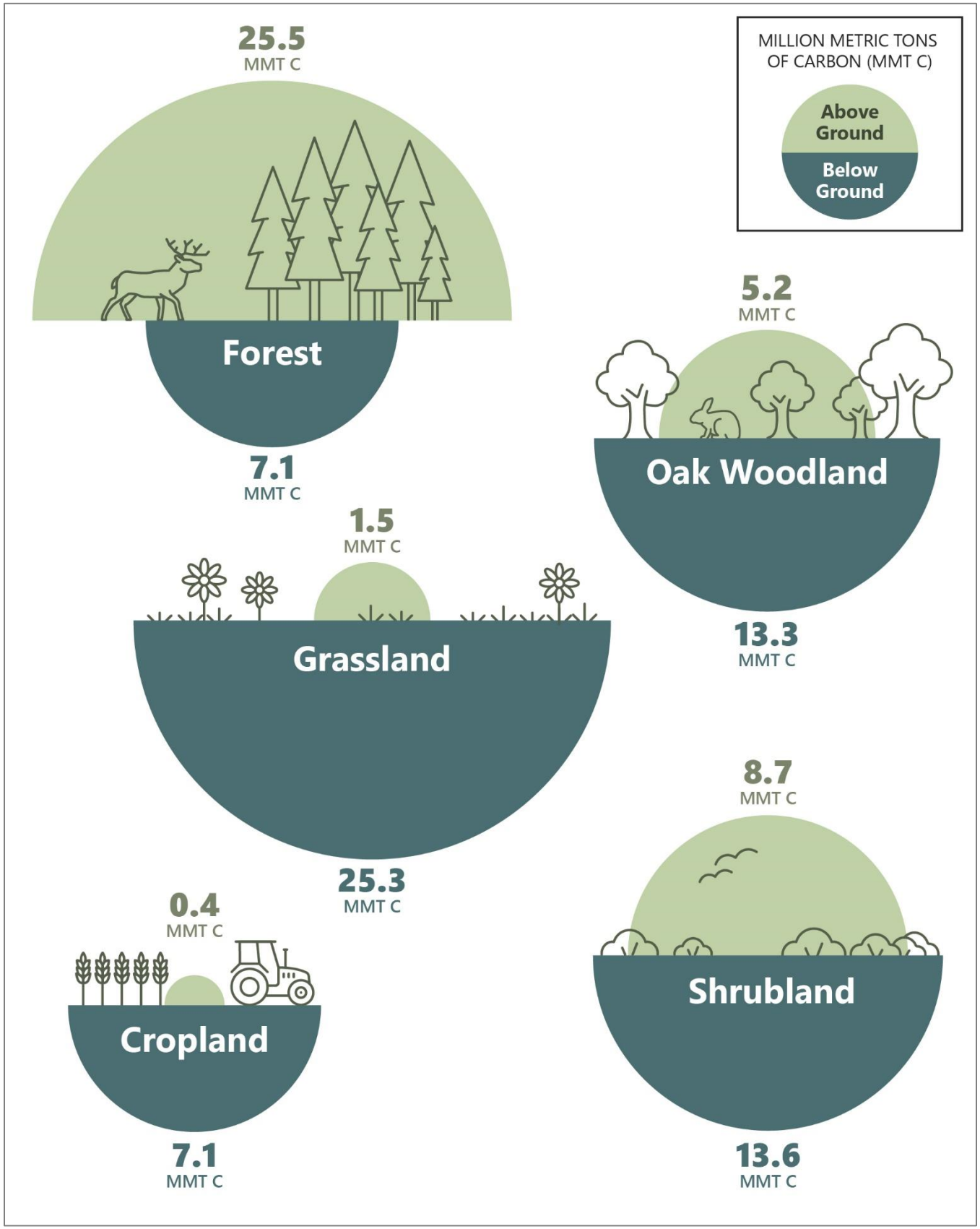
Figure 3.4 Total Carbon Stock by Land Cover Type



Source: Analysis completed by Ascent in 2023.

Figure 3.5 visualizes carbon stock across the study area by land cover type, including above and belowground carbon for the five largest land cover types by acreage.

Figure 3.5 Aboveground and Belowground Carbon Stock by Land Cover Type within the Study Area



Source: Created by Ascent in 2024.

Additional details about carbon values and more granular results can be found in Appendix A.

3.3 CARBON STOCK FORECASTS

After preparing the carbon stock inventory, forecasts were used to estimate the future carbon stock in the study area based on the natural and working lands modeling conducted by CARB for the 2022 Scoping Plan. CARB modeled five future scenarios of the quantity of statewide carbon stock for different land cover types. Each scenario differs in the type and extent of land use practices that it implements, though all account for future climate change and wildfire impacts.

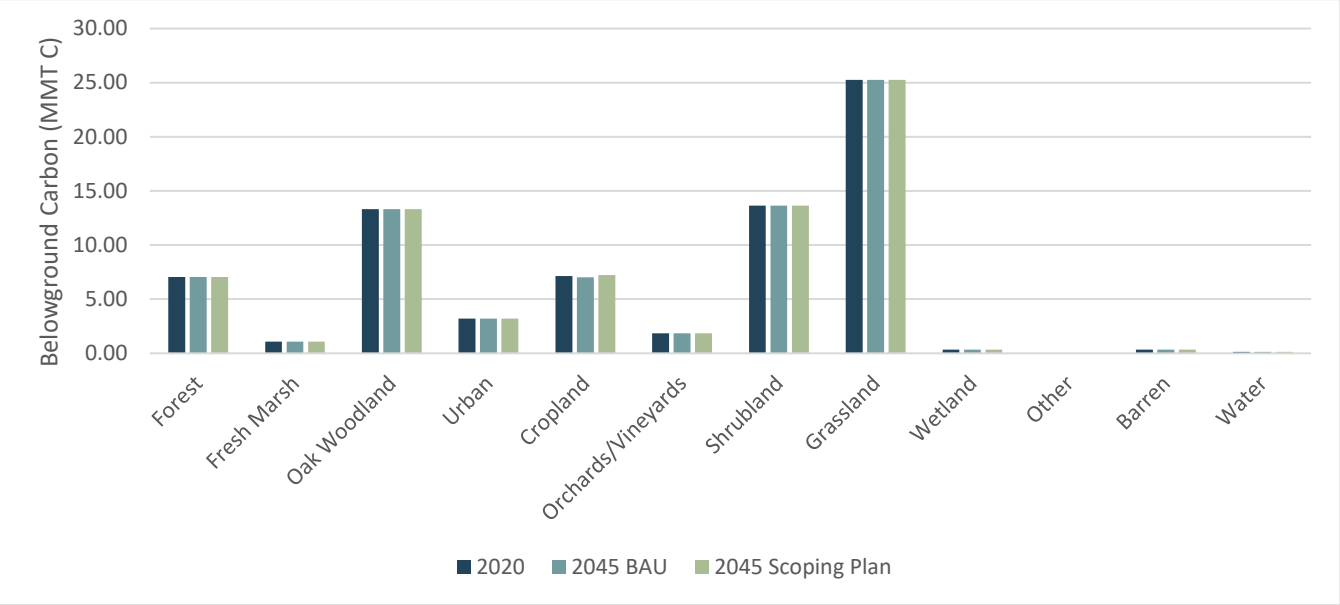
For the purpose of the Climate Study, two forecast scenarios were evaluated to understand potential changes in carbon stock in the study area: the business-as-usual (BAU) scenario and the 2022 Scoping Plan Scenario. The BAU scenario assumes that the land management practices in place from 2001 through 2014 continue through 2045 (CARB 2022a: 39). The 2022 Scoping Plan scenario is the scenario that CARB selected to achieve carbon neutrality by 2045 per its mandate in AB 1279, the California Climate Crisis Act (CARB 2022b: 71). These scenarios were used for the Climate Study because locally specific data is currently unavailable to account for the potential impacts of climate change on the existing carbon stock. As discussed in Section 2.4 of this Climate Study, the Scoping Plan scenario assumes accelerated rates of treatments on all lands, which are listed below. All values are statewide.

- **Forest, shrublands, and grasslands**: Treat 2.3 million acres annually through strategies that include harvesting, prescribed fire, thinning, and other land management practices.
- **Croplands**: Implement climate-smart agricultural practices on 150,000 acres per year over current levels.
- **Urban Forests:** Double the current level of investment in urban forests.
- **Wildland-Urban Interface (WUI):** Establish defensible space in 50,000 properties per year.
- **Wetlands:** restore 60,000 acres of Delta wetlands by 2045 to enhance carbon sequestration, combat land subsidence, improve flood protection, and create vital habitat.
- **Sparsely vegetated lands:** Increase conservation of these lands by 15,000 acres per year. (CARB 2022a: 18).

Both the BAU and the Scoping Plan forecasts from CARB were used to calculate percent changes in carbon by 2045, and these percentages were then applied to AMBAG lands. Figures 3.6 and 3.7 and Table 3.3 below show the forecast results by study area land cover type and jurisdiction, respectively. Both forecast scenarios show a loss of carbon stock in the study area. These results are consistent with CARB's results in the 2022 Scoping Plan, which states that under all land management levels, forests and shrublands are expected to lose carbon over the next two decades due to climate change, drought stress, and wildfire (CARB 2022b: 251).

Specifically, Figures 3.6 and 3.7 and Table 3.3 show that, from 2020 to 2045, there is a decrease in carbon stored in the study area of approximately 2.2 MMT C, or 1.9 percent, in the BAU scenario, and a decrease of 1.8 MMT C, or 1.5 percent, in the Scoping Plan scenario. The decrease is smaller in the Scoping Plan scenario than in the BAU scenario by approximately 0.4 MMT C. This difference is due to the land treatments detailed in the 2022 Scoping Plan, which includes the impact of statewide actions that create more climate-resilient carbon stocks.

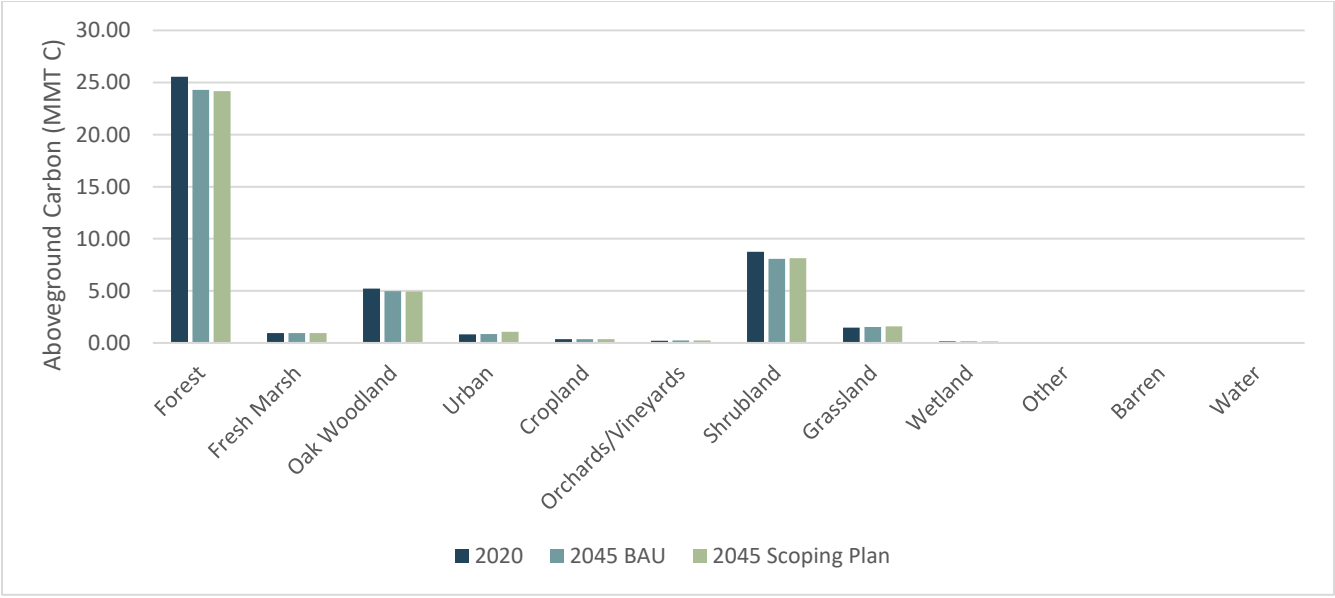
Figure 3.6 Study Area Current and Forecasted Belowground Carbon Stock by Land Type (MMT C)



Notes: C = carbon; MMT = million metric tons.

Source: Analysis completed by Ascent in 2023.

Figure 3.7 Study Area Current and Forecasted Aboveground Carbon Stock by Land Type (MMT C)



Notes: C = carbon; MMT = million metric tons.

Source: Analysis completed by Ascent in 2023.

Table 3.3 Study Area Current and Forecast Total Carbon Stock by Jurisdiction[1] (MT C)

	2020	2045 BAU Scenario	2045 Scoping Plan Scenario
Santa Cruz County			
Capitola	45,025	45,008	47,593
Santa Cruz	337,614	333,545	349,249
Scotts Valley	182,985	179,025	184,115
Unincorporated Santa Cruz County	25,051,179	24,127,124	24,123,888
Watsonville	152,832	153,328	164,141
Santa Cruz County Total	**25,769,634**	**24,838,030**	**24,868,986**
Monterey County			
Carmel By-The-Sea	23,441	23,523	24,508
Del Rey Oaks	30,543	30,367	30,797
Gonzales	37,379	37,301	38,780
Greenfield	52,477	52,395	54,536
King City	76,848	76,740	79,209
Marina	207,802	207,421	212,117
Monterey	188,803	189,055	196,483
Pacific Grove	55,073	55,283	57,791
Salinas	509,386	509,182	528,872
Sand City	7,251	7,249	7,488
Seaside	222,557	221,797	227,414
Soledad	92,266	92,348	95,186
Unincorporated Monterey County	66,368,790	65,382,496	65,633,881
Monterey County Total	**67,872,615**	**66,885,157**	**67,187,061**
San Benito County			
Hollister	172,586	172,000	174,402
San Juan Bautista	14,389	14,343	14,549
Unincorporated San Benito County	22,982,257	22,711,875	22,787,304
San Benito County Total	**23,169,231**	**22,898,217**	**22,976,255**
Grand Total	**116,811,480**	**114,621,404**	**115,032,302**

Notes: BAU = business-as-usual; C = carbon; MT = metric tons.

[1] Includes belowground and aboveground carbon stock.

Source: Analysis completed by Ascent in 2023.

Based on the modeling conducted, the results of the Scoping Plan scenario forecast imply that the land treatments listed in the 2022 Scoping Plan, if implemented proportionally to the size of the study area, could reduce the loss of C by up to 0.4 MMT. This is an approximation; the exact amount would depend on the timing, specific areas, and extent to which these practices were implemented, as well as the study area's current level of land management activities.

3.4 POTENTIAL CARBON SEQUESTRATION TREATMENTS

As shown by the data above, land treatments affect the amount of carbon that the land can sequester. The Climate Study evaluated the following treatments to determine which may be applicable and appropriate for the study area, presented by land cover type.

AGRICULTURAL LAND TREATMENTS

- **Compost/biochar amendment.** Adding compost or biochar to agricultural lands can improve plant growth and provide organic matter and microorganisms to the soil. Increased plant growth results in increased carbon stock and increased organic matter, and microorganisms from compost and biochar allow the soil to better retain organic carbon.
- **Transition to organic farming.** This requires producers to use multiple practices that maintain soil health, including crop rotation, reduced tillage, and natural pest control.
- **Cover crops,** or any crop grown to cover the soil (as opposed to being harvested for sale), prevent erosion and help feed beneficial organisms such as bacteria, fungi, and earthworms.
- **Reduced tillage.** Tilling the land disturbs soil carbon and can result in its release into the atmosphere. Avoiding or reducing tillage keeps the carbon in the soil.
- **Hedgerows/windbreaks/shelterbelts** are linear plantings of trees and shrubs that block the wind, protecting soil from erosion and the resulting loss of carbon**.**
- **Conservation of cropland** prevents productive lands from being converted to developed land, which results in carbon benefits such as the reduced disturbance of soil and reduced GHG emissions from avoided development.
- **Establishment of riparian forest buffers**, or planting trees between crops and waterways. This helps control runoff of nutrients, pesticides, and animal waste. It also stabilizes the soil.

- **Grazing management** involves controlling areas where animals are allowed to graze, such that the grass is allowed to "rest" and avoid exhaustion. This ensures that the grass is healthy and long-lived, which in turn ensures that it can store carbon.
- **Silvopasture,** or the integration of trees with pastureland, reduces erosion and improves nutrient cycling, among other benefits.
- **Riparian restoration,** or the use of compost and mulch near waterways to help restore some of the ecosystem functions, enriches the health of the soil near these waterways.

FOREST/SHRUBLAND/GRASSLAND TREATMENTS

Forests, shrublands, and grasslands are distinct land cover types; however, CARB treats them as an interlinked system for the purposes of carbon sequestration modeling. Generally, the treatments listed below enhance the health of plants in these ecosystems, as well as reduce the risk of wildfire. Although some carbon stock may be lost from these treatments by removing vegetation, it reduces the likelihood of catastrophic wildfires that release large amounts of carbon held in vegetation resulting in a net benefit of carbon sequestered.

- **Prescribed burning** is any pre-planned fire ignited by humans to achieve a land management objective, such as the prevention of more catastrophic wildfires or the enrichment of soil.
- **Mastication**. Vegetation is mowed or chipped into small pieces, which can slow the advance of wildfire by breaking up its fuel source.

- **Biological and chemical treatments**. A general term for actions performed on vegetation to achieve a desired outcome. Biological treatment includes introducing plant or animal species to control weeds, pests, or disease. Chemical treatment includes substances such as herbicides, which improve the health of the other plants.
- **Clearcutting, thinning, harvesting**. These treatments all reduce the number of trees in a stand by eliminating them (clearcutting) or reducing their density (thinning). "Harvesting" is a catch-all term that refers to forest treatments where data is insufficient to determine if a stand was clearcut or thinned. All three of these treatments lower the risk of fire spreading tree-to-tree.
- **Other Mechanical Treatments.** This refers to any other mechanical treatment not described above, such as removing branches and scattering them on the forest floor (a practice called "lop and scatter"), which lowers the risk of fire spreading tree-to-tree.

OTHER LANDS TREATMENTS

- **Investment in urban forests and parks** can reduce GHG emissions in developed areas through reduced need for energy to cool buildings. By increasing tree canopy cover, promoting native plants, and creating green spaces, carbon sequestration potential can increase.
- **Wildland-urban interface defensible space establishment** involves removing fuel and making structures more fire-resistant in parcels at risk of wildfire (i.e., lands that are situated between wildfire-prone natural lands and areas of development). This reduces the risk of property destruction and wildfire spreading.
- **Wetland restoration** involves re-planting lost vegetation in wetlands, or by re-flooding areas which have subsided due to lack of groundwater. These actions, respectively, increase carbon sequestration in the soil through plant photosynthesis, and prevent the release of methane, a potent GHG, from microbial digestion.

- **Conservation of barren or sparsely vegetated lands.** Like the "conservation of cropland" treatment described above, forgoing development on these lands avoids disturbing the carbon held in the soil.
- **Habitat restoration and invasive species removal** promotes overall ecosystem health and promotes biodiversity, water retention, and nutrient cycling. This provides an environment for plants to thrive, thus aiding in carbon sequestration.

Treatments such as these were considered for their applicability, appropriateness, and scale for the study area. Stakeholders provided insights into the feasibility of these treatments, which are discussed in more detail in Chapter 4.

Chapter Four
Carbon Sequestration Strategies

This chapter outlines overarching strategies and implementation actions to drive carbon sequestration efforts in the Monterey Bay Area. First, region-wide strategies are presented that apply to all geographies and land cover types in the Monterey Bay Area. Next, strategies within one of three land types are presented: 1) urban forests and parks, 2) forests, and 3) conservation, open space, and agriculture. High-level strategies incorporate corresponding implementation actions, which are organized into the themes of collaboration, funding, and workforce development (shown in Table 1). This chapter also identifies potential lead organizations for the implementation actions, ongoing efforts, foreseeable barriers, benefits, and quantitative data on costs and carbon sequestration potential for each strategy.

4.1 STRATEGY DEVELOPMENT PROCESS

AMBAG conducted extensive research across the region and state to develop a list of strategies that were appropriate and scalable in the Monterey Bay Area. Stakeholders and subject matter experts were then consulted to assist in refining strategies and implementation actions through a series of focus group and stakeholder working group meetings held in 2023 and 2024. Feedback from these meetings was incorporated into the Climate Study. Additional information regarding the focus group and stakeholder working group meetings is included in Appendix C.

Table 1 Themes for Implementation Actions

Theme	Description
	**Collaboration:** Work collectively among local governments, special districts, community-based organizations, industry groups, and other actors. Existing partnerships could be expanded, or new ones formed.
	**Funding:** Obtain funding to support the implementation action through grants, philanthropy, or other funding sources.
	**Workforce Development:** Train a local workforce to support the implementation actions. Some implementation actions may require specialized knowledge and skills, which may not be present at the scale needed in the region.

Source: Prepared by Ascent in 2024.

The strategies described below, if implemented, will have benefits beyond carbon sequestration, shown in Table 2. The description of each strategy in Section 4.2 identifies corresponding additional benefits.

Table 2 Benefits of Carbon Sequestration Strategies

Benefits	Description
	**Biodiversity conservation** safeguards ecosystem health.
	**Climate adaptation** helps communities respond to and recover from the impacts of climate change, including flooding, extreme heat, wildfire, and drought.
	**Economic resilience** increases the region's ability to foresee, adapt to, and leverage changing conditions to its advantage.
	**Equity** ensures everyone has access to the same opportunities and resources, regardless of background or circumstances.

Benefits	Description
	**Forest resilience** improves the ability of forests to stay healthy and recover quickly from natural and anthropogenic disturbances.
	**Water security** improves the reliability of access to a safe, clean water supply.

Source: Prepared by Ascent in 2024.

4.2 REGION-WIDE STRATEGIES

Stakeholders and subject matter experts identified wide-reaching strategies to support climate mitigation and resiliency within natural and working lands. These strategies are expected to be applicable in the Monterey Bay Area irrespective of jurisdiction, geography, or land cover type.

1. DEVELOPING NETWORKS FOR SHARING BEST PRACTICES

Throughout the development of this Climate Study, stakeholders and subject matter experts participated in focus group and working group meetings. Participants shared examples of current efforts within the Monterey Bay Area of projects and partnerships that work to enhance carbon sequestration directly or indirectly. Sharing knowledge and best practices based on real-world experiences is an essential part of protecting and maintaining the region's carbon stock. Additional avenues through which this information can be shared would generate benefits throughout the region, either through relying on existing channels or by creating new ones.

2. COLLABORATING TO OBTAIN FUNDING

Activities that support carbon sequestration, climate mitigation, and resiliency objectives require funding that is not readily available from local agencies' and organizations' budgets. Importantly, there are opportunities to obtain funds that can support such activities, such as grant funding and philanthropic giving. Grant funding opportunities can require significant staff time and expertise to prepare competitive applications. Collaborating among local agencies, organizations, and others to pursue such funding could provide efficiency in application preparation and the ability to seek larger grants to support multiple projects.

3. IMPLEMENTING ACTIONS AT A REGIONAL SCALE

Based on the results of the carbon stock forecast analysis presented in Chapter 3, there is a need to begin implementing land treatments to protect the existing carbon stock over the coming decades. The implementation actions included in this chapter offer solutions and aim to drive action, but the ability of the Monterey Bay Area's natural and working lands to continue to hold carbon will only be as good as the actions taken to support and enhance them.

Urban Forest & Park Strategies

4.3 URBAN FOREST AND PARK (UFP) STRATEGIES

Urban forests and parks present an opportunity to increase the capacity to store carbon in developed areas and can be integral components of supporting broader carbon sequestration efforts in the region. **In the Monterey Bay Area, urban forests and parks hold 4 million metric tons of carbon (MMT C), with 3.2 MMT C below ground and 0.8 MMT C above ground.** By increasing tree canopy cover, promoting native plants, and creating green spaces, urban areas can improve their carbon sequestration potential, bolstering their capacity to capture and store carbon. Investments in urban forests also yield benefits such as promoting healthy communities and reducing the heat island effect. Urban forest initiatives can also create jobs and provide economic benefits such as increasing property values and reducing energy use.

UFP STRATEGY 1

Collaborate among utility providers, water districts, and local governments to identify and distribute rate-payer funds and grant-funded opportunities to accelerate urban forestry.

BENEFITS

Climate Adaptation

Equity

While developing the Climate Study, stakeholders and subject matter experts were supportive of investing in urban forests and parks and their capacity to store carbon. However, they noted that lack of funding and agency capacity were significant barriers to implementing urban forest initiatives. While funding sources exist for urban forests, including from the United States Forest Service (2024), California Department of Forestry and Fire Protection (CAL FIRE) (2024a), California Natural Resources Agency (2024), and California Transportation Commission (2024), obtaining this funding requires the submittal of complex grant applications and funding is only available during specific application windows. Many agencies currently cannot dedicate the staff to obtain this grant funding. This strategy aims to overcome these barriers by fostering increased collaboration among agencies that stand to benefit from expanded urban forestry initiatives.

IMPLEMENTATION ACTION UFP 1.1

Convene a meeting every three to six months. This meeting's goal would be to share information and best practices about obtaining urban forestry grants, including the reduction of duplicative effort(s) when applying for grants and coordination on how best to collaborate on grant applications.

Collaboration

Currently, there is no coordinated effort to address urban forestry projects on a regional scale. However, numerous agencies, fire-safe councils, community-based organizations (CBOs), and industry groups exist that could collaborate to improve resource coordination and knowledge sharing. This type of collaboration could support increased momentum toward participating in grant opportunities.

Lead Organization(s)

The collaboration needed to address urban forestry projects on a regional scale could involve agencies like resource conservation districts (RCDs), water districts, local governments, fire-safe councils, CBOs, and industry groups. The Regional Climate Project Working Group (RCPWG), which coordinates climate projects across the three counties in the Monterey Bay Area, could establish a subcommittee dedicated to urban forests.

Current Efforts

The RCPWG could help leverage its existing grant writing experience to help seek funding for urban forestry initiatives. Collaborating closely with The California Urban Forest Council could also be

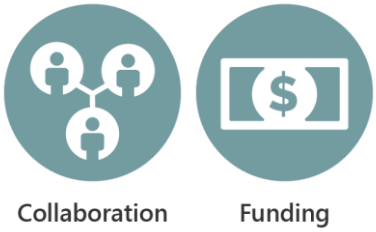
helpful as they provide guidance on eligibility and funding requirements for grants that enhance green spaces and promote the health of trees. The California Wildfire and Forest Resilience Task Force already serves a coordination role in grant-related efforts. At the state level, funding support could come from CAL FIRE's Urban and Community Forestry program.

Barriers to Implementation

Staff capacity at local jurisdictions is a challenge that could prevent participation in these meetings and subsequent work, which are important for sharing information and best practices on obtaining urban forestry grants, reducing duplicative efforts, and fostering collaboration on grant applications.

IMPLEMENTATION ACTION UFP 1.2

Develop a methodology for prioritizing projects when seeking funding in a collaborative regional framework.



There is currently no consistent methodology for interpreting the carbon sequestration benefits of urban forestry projects and prioritizing those projects using appropriate evaluation techniques.

Lead Organization(s)

This action is underway, with the RCPWG and the Monterey Bay Area Climate Justice Collaborative working together. RCPWG is pursuing a grant to establish a governance structure that enhances decision-making processes for prioritizing collaborative grant efforts.

Current Efforts

See Lead Organization(s) above.

Barriers to Implementation

Stakeholders and subject matter experts have identified limited staff capacity to pursue grants and difficulty in accurately quantifying the carbon stock benefits of projects seeking funding as barriers to implementation. Additionally, grant funding opportunities typically have limited application windows, compounding the barriers to implementation.

Quantifying the carbon sequestration benefits of projects can also be difficult, especially for ecosystems like wetlands, which can sometimes function as a sink or source of carbon. The complexity of ecosystems means focusing solely on carbon can overlook their broader ecological significance and the various ways they interact within natural systems. However, many grant opportunities focus on carbon sequestration, resulting in the need for quantifying sequestration benefits.

UFP STRATEGY 2

Reduce the regulatory burden for invasive vegetation removal and native planting in urban areas to allow native species to thrive.

BENEFITS

Climate Adaptation

Biodiversity Conservation

Invasive vegetation removal and native planting are both proven strategies for the renewal and growth of urban vegetation. Native plants are often more climate resilient and drought-tolerant than non-native plants, making them ideal for planting in urban landscapes. However, local ordinances do not necessarily incentivize their planting, either through a lack of monetary incentives or through regulatory requirements. Additionally, securing grants for these efforts may be difficult due to short grant submittal timelines and a lack of staff capacity. This strategy aims to reduce these burdens to accelerate invasive vegetation removal and native planting.

IMPLEMENTATION ACTION UFP 2.1

Explore opportunities to create coalitions for elevating issues around regulatory burden of invasive vegetation removal and native planting—for example, simplifying permitting requirements.

Collaboration

Funding

There can be differences in sentiment towards non-invasive species and invasive species across the region and among decision-makers. Establishing a coalition could provide an opportunity to build consensus, streamline bureaucratic processes, develop incentives, and invest in outreach efforts to build awareness.

Lead Organization(s)

Potential collaborators to aid in reducing the regulatory burden of invasive species could include the California Association of Councils of Governments, the California State Association of Counties, the League of California Cities**,** and local jurisdictions.

Current Efforts

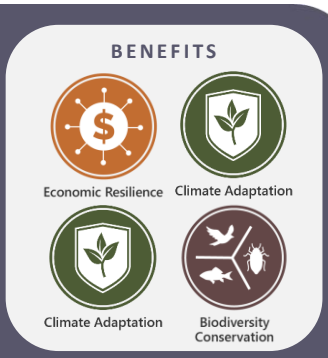
Stakeholders and subject matter experts did not identify current efforts that could be built upon to create such coalitions.

Barriers to Implementation

Coordination and collaboration amongst stakeholders could be complex, as local jurisdictions may not consider the same plants invasive or native, and plants that are considered native or invasive now may change status as the climate changes. As a result, it can be challenging for jurisdictions to find common ground and advocate for simpler permitting requirements. For example, local governments have their tree ordinances governing invasive vegetation removal—some do not allow the removal of large invasive trees, but others do, and some may not have tree ordinances at all. Invasive vegetation removal can also be expensive, especially for larger trees.

UFP STRATEGY 3

Expand and maintain both urban tree canopy and green spaces to moderate urban heat islands, decrease energy use, and contribute to carbon sequestration.



Tree canopies and green spaces benefit communities by moderating heat islands, decreasing building energy use, and sequestering carbon. Closing the tree canopy gap in low-income and marginalized communities would improve the resiliency of individuals vulnerable to the impacts of extreme heat, hazardous air quality, and flooding and increase their access to nature. In order to create and expand the urban forests and parks in the region, there will need to be local workforce training and job creation initiatives. This strategy would involve increased spending on tree-planting programs, including creating local jobs to plant and maintain trees and green spaces.

IMPLEMENTATION ACTION UFP 3.1

Explore the creation of programs for urban forestry that can fund and support services needed to expand and maintain urban tree canopies and green spaces.

Additional investments in urban forestry could increase climate resilience, improve community health and well-being, enhance aesthetics, and provide economic benefits for the region. Programs could provide local job opportunities and can take various forms, including tree-planting initiatives, inventory and mapping efforts, and education opportunities.

Lead Organization(s)

Cities and counties could collaborate with educational partners such as the University of California and local community colleges. Collaborating with CBOs such as Rancho Cielo, which offers workforce development training and has expertise in urban forestry management, could also be a valuable partnership to support implementing this action.

Current Efforts

The City of Watsonville's Community Forestry Project is designed to expand urban forest activities by evaluating current urban forestry resources and identifying locations and opportunities to sustain or enhance urban forestry throughout the city.

Barriers to Implementation

Urban forestry increases the amount of combustible biomass in jurisdictional boundaries and thus requires increased fire safety measures. Further, maintaining urban forests requires regular upkeep, including staff time and financial investment. Planting trees is also restricted to specific areas within a jurisdiction's boundary; for instance, trees can typically be planted only in areas in the right-of-way, and mandating tree planting on private lands is not feasible. Stakeholders and

subject matter experts also noted that some local jurisdictions have scaled back their tree-planting programs and associated staff allocation over the past two decades due to lack of resources.

IMPLEMENTATION ACTION UFP 3.2

Convene a meeting to share best practices among local jurisdictions that have active urban forestry programs.


Collaboration

Increased collaboration among jurisdictions could facilitate better integration of urban forestry programs, reducing costs as the demand for such services becomes more widespread and normalized. Additionally, this could present an opportunity to exchange knowledge and gather insights on essential components for developing urban forestry plans.

Lead Organization(s)

Organizations that could support this effort include AMBAG, local governments, and CBOs.

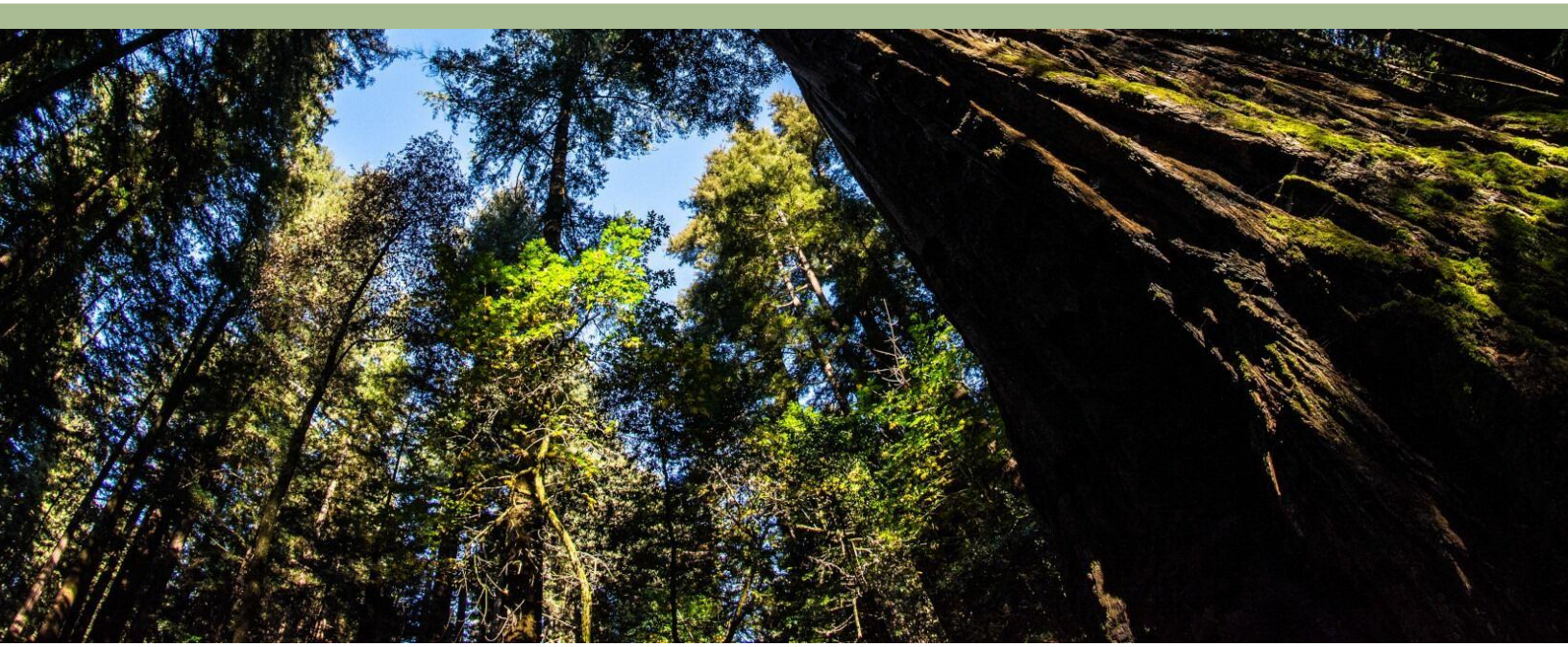
Current Efforts

Stakeholders and subject matter experts did not identify existing efforts for this action.

Barriers to Implementation

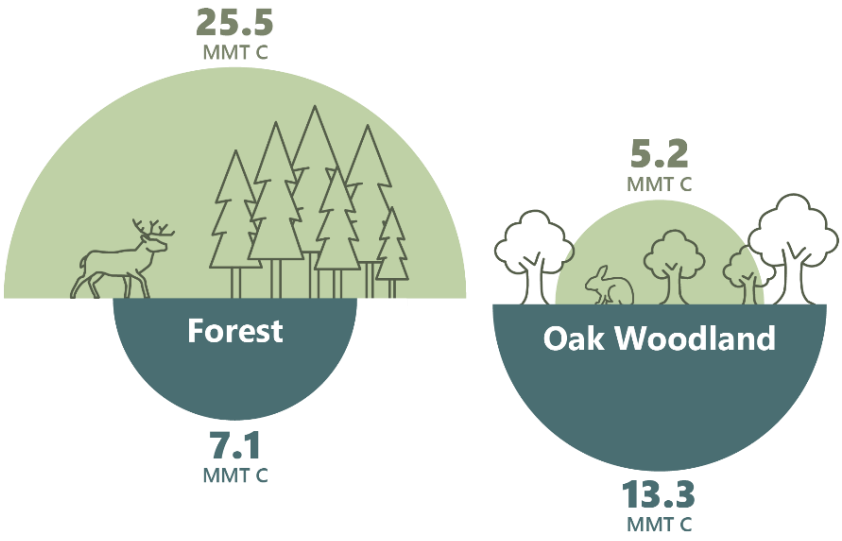
No barriers were identified as stakeholders and subject matter experts supported the benefits of collaboration and sharing best practices across jurisdictions. This collaboration could create economies of scale, enabling shared learning and facilitating reasonable contracting prices for urban forestry work.

Forest Strategies



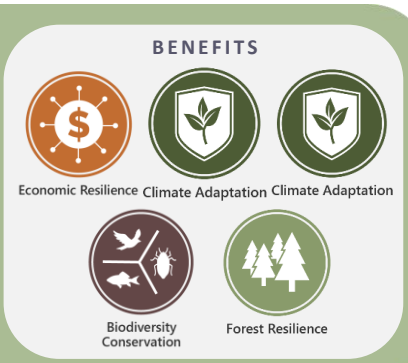
4.4 FOREST STRATEGIES

Forests also play a crucial role in capturing carbon from the atmosphere. **In the Monterey Bay Area, forests and oak woodlands hold over 50 MMT C, with 20.4 MMT C below ground and 30.7 MMT C above ground.** Efforts to protect and maintain forests and oak woodlands boost their carbon-capturing potential and reduce wildfire risk. There is an opportunity to support small timber-based businesses and foresters in managing forests sustainably. Biochar, a carbon-rich material made from woody waste, can improve soil health by reducing the need for fertilizers and allowing live trees, shrubs, and plants to better absorb carbon from the atmosphere.



FOREST STRATEGY 1

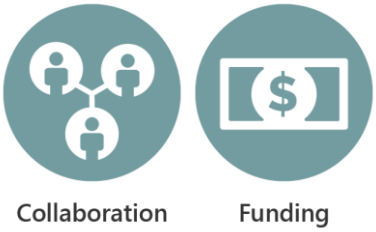
Incentivize small timber-based businesses, landowners, and foresters to provide services to reduce the probability of catastrophic wildfires, including thinning, and prescribed burns.



This strategy focuses on land management techniques for reducing the effects of large, catastrophic wildfires. Currently, there is insufficient monetary incentive to do so, especially for small businesses, that may not have the resources to identify where this work needs to occur or obtain the necessary permits. This strategy would address that barrier, providing monetary incentives for small forestry businesses to provide needed ecosystem services.

IMPLEMENTATION ACTION FOREST 1.1

Form a collaborative to obtain funding for forestry treatments, such as Community Wildfire Defense Grants from the US Forest Service or Wildfire Prevention Grants from CAL FIRE.



Several grant opportunities already exist, and forming a collaboration could further support the identification of funding sources to encourage investments in wildfire risk reduction activities. Collaboration could also help leverage expertise and provide technical assistance to navigate implementation and compliance barriers, as well as support that could ultimately increase the size and scale of forestry treatment efforts in the region.

Lead Organization(s)

Stakeholders and subject matter experts identified several potential lead organizations during focus group meetings. These include collaborations with public agencies such as air districts, local governments, CBOs, RCDs, and industry groups. Forming an RCPWG subcommittee or establishing a joint powers authority (JPA) could also support forestry treatment grant coordination. Additionally, partnerships with organizations such as the Santa Cruz Mountain Stewardship Network could further promote regional land stewardship and encourage collaborative cross-sector efforts.

Current Efforts

An application for the National Oceanic and Atmospheric Administration Climate Resilience Regional Challenge was recently submitted by local organizations looking to collaborate to use nature-based solutions to improve climate resiliency. Additionally, the Santa Cruz and San Mateo RCDs are

collaborating on a Forest Health grant from CAL FIRE. The State Coastal Conservancy has also secured grants from the Department of Conservation's Regional Forest and Fire Capacity funding to support fire-adapted communities and landscapes through ecosystem health investments and fire resilience improvements.

Barriers to Implementation

Fuel management needs can vary from one area to another. For example, the Santa Cruz Mountains have a distinct and specific ecosystem compared to the rest of the Monterey Bay Area. Therefore, collaborative goals may not necessarily be aligned.

IMPLEMENTATION ACTION FOREST 1.2

Explore the development of an incentive program to support the costs of forest services such as thinning, clearcut, and prescribed burns. These values should be expressed in dollars per acre treated. As an alternate way of reducing financial barriers to forest treatments, local governments could purchase equipment and rent it to landowners who need it.

Upfront costs for forest management practices can be expensive. Incentives reduce financial burdens and provide avenues to increase activities that can reduce the severity and frequency of wildfires, promote ecosystem health, and align the region with broader climate action and adaptation goals.

Lead Organization(s)

Local governments could support this action by procuring equipment and facilitating rental services. Like Implementation Action Forest 1.1, collaboration among city and county governments with RCDs, CBOs, and industry groups could be helpful. A JPA could also be useful in developing a regional incentive program. Organizations such as Blue Forest Conservation collaborate with investors, agencies, private companies, and landowners to establish revenue streams for forest restoration. These organizations could partner with agencies and landowners to execute forest health treatments and provide compensation upon project completion.

Current Efforts

Incentive programs could receive funding from grant sources like the Natural Resources Conservation Service's numerous programs. It is important to note that these programs would apply exclusively to non-industrial harvesters. Additionally, support could come from the Forest Resilience Bond offered by Blue Forest Conservation, which compensates agencies and landowners for forest health treatments.

Barriers to Implementation

Meeting grant requirements is often challenging and complex, compounded by limited agency staff availability for application processes. Manual work in compiling and executing plans may also deter landowners from participating. Additionally, the costs for executing different forest services can vary and could be challenging to define.

IMPLEMENTATION ACTION FOREST 1.3

Host information-sharing opportunities on best practices for prescribed burns and other specific forest treatments.

Convening subject matter experts such as practitioners, researchers, policymakers, and community members could provide an opportunity for capacity building and knowledge sharing to address forest management challenges. As best practices and technologies continue to evolve, information-sharing opportunities can be an effective way to access up-to-date information and technical guidance. Efforts could include organized workshops and training sessions, field demonstrations of various forest treatment types, online resources, and public events such as panels or roundtable discussions.

Lead Organization(s)

Collaboration across agencies such as RCDs, air districts, local governments, CBOs, and industry groups would facilitate effective implementation of this action. Universities such as Cal Poly San Luis Obispo could also be involved, given their expertise in fuel treatment and programs such as the Fuels and Vegetation Education Program, which educates professionals about wildfire fuel mitigation and vegetation management approaches to promote sustainability and fire resilience.

Current Efforts

The Wildfire Task Force offers a Wildfire and Landscape Interagency Treatment Dashboard, completed in 2022, and showcases data of recently completed forest and wildland projects from various federal and state agencies, serving as a valuable resource for planning burns. The Santa Cruz County Office of Response, Recovery, and Resilience (OR-3) also provides emergency management services. OR-3 offers a Wildfire Resilience Program intended to help prepare the county for wildfire events of any size that could emulated in other parts of the region and leveraged for knowledge sharing.

Barriers to Implementation

Stakeholders and subject matter experts did not identify specific barriers to implementing this action.

Santa Cruz Mountains Stewardship Network

SCMSN is a collaborative of 25 organizations working across the Santa Cruz Mountains who are committed to practicing effective stewardship on their own lands and coordinating their efforts with other land stewards to enhance stewardship on a regional level. The SCMSN has initiated deep knowledge sharing about woody biomass waste utilization and treatment in the Santa Cruz Mountains and are moving forward with regional efforts collaboratively to address this complex issue.

FOREST STRATEGY 2

Explore the development of a locally based carbon offset program for forest fuel treatment projects to avoid carbon loss.

BENEFITS

Forest Resilience

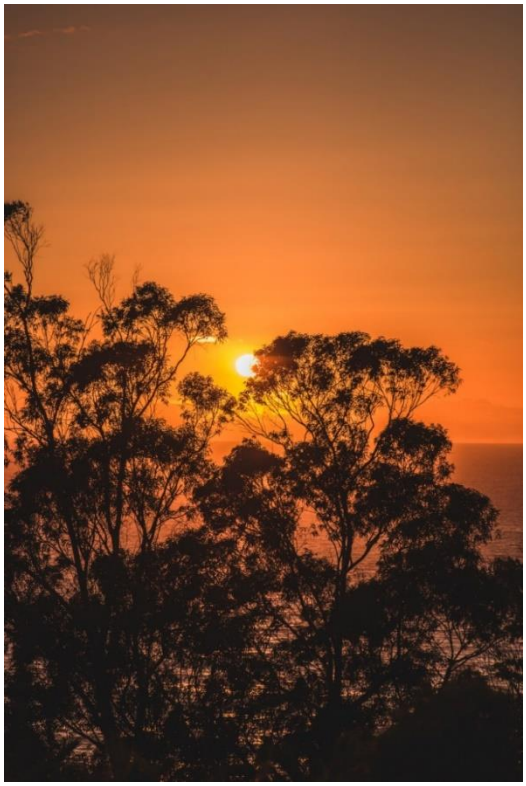
Fuel treatment projects, such as prescribed burns and thinning, are essential to reducing the likelihood of catastrophic wildfires, which can result in significant carbon emissions and loss of carbon stock. Local communities can encourage sustainable forest management practices by implementing carbon offset programs that incentivize these projects. Offset programs could enhance the region's carbon sequestration and storage potential, contributing to broader climate change mitigation efforts.

IMPLEMENTATION ACTION 2.1

Create a regional collaborative to explore the development of a locally based carbon offset program for forest fuel treatment projects.

Collaboration

A collaborative effort allows communities and subject matter experts to pool resources and expertise to evaluate the creation of a carbon offset program tailored to local needs. By working together, interested parties could identify and address specific challenges and opportunities related to forest fuel treatment projects, ensuring that the carbon offset program effectively supports sustainable forest management goals.



Lead Organization(s)

Lead organizations could include collaboration across RCDs, local governments, and land trusts.

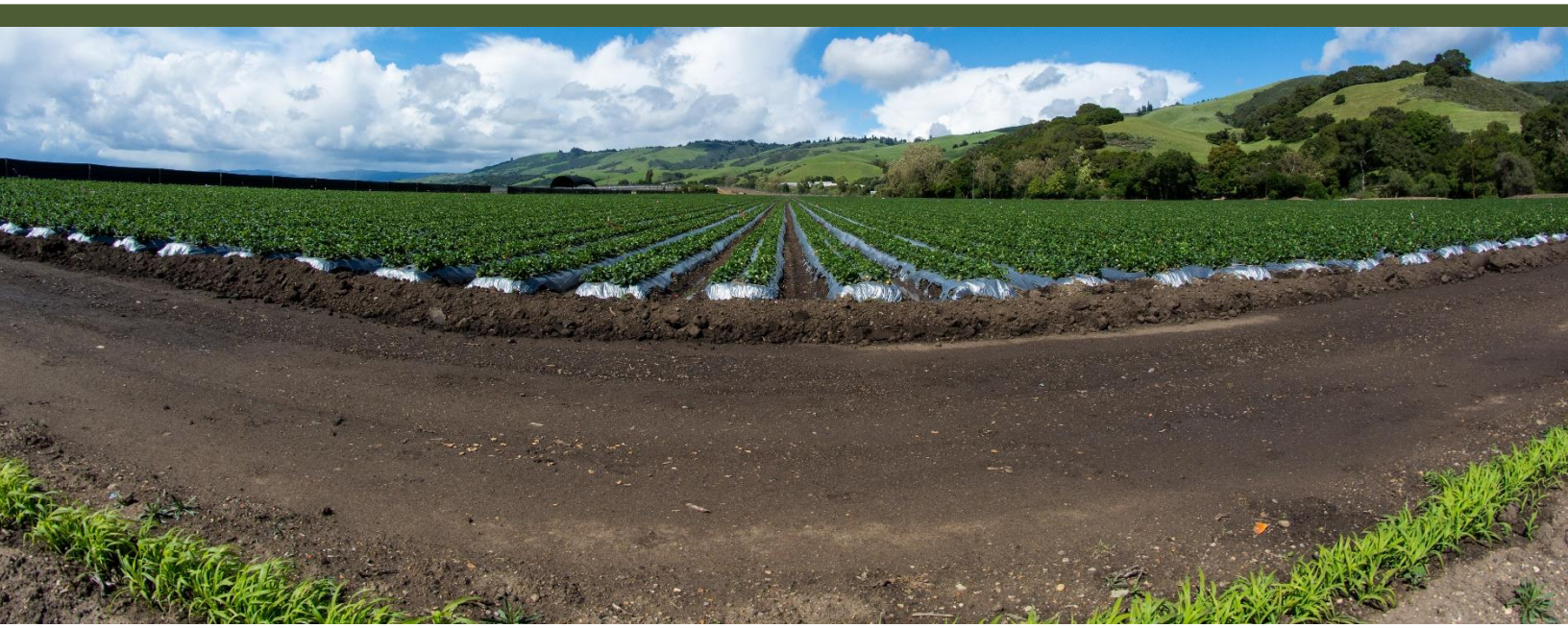
Current Efforts

The Central Coast Climate Collaborative hosted a carbon sequestration and offset webinar series in 2022, providing valuable insights that could serve as a starting point for evaluating the creation of a carbon offset program.

Barriers to Implementation

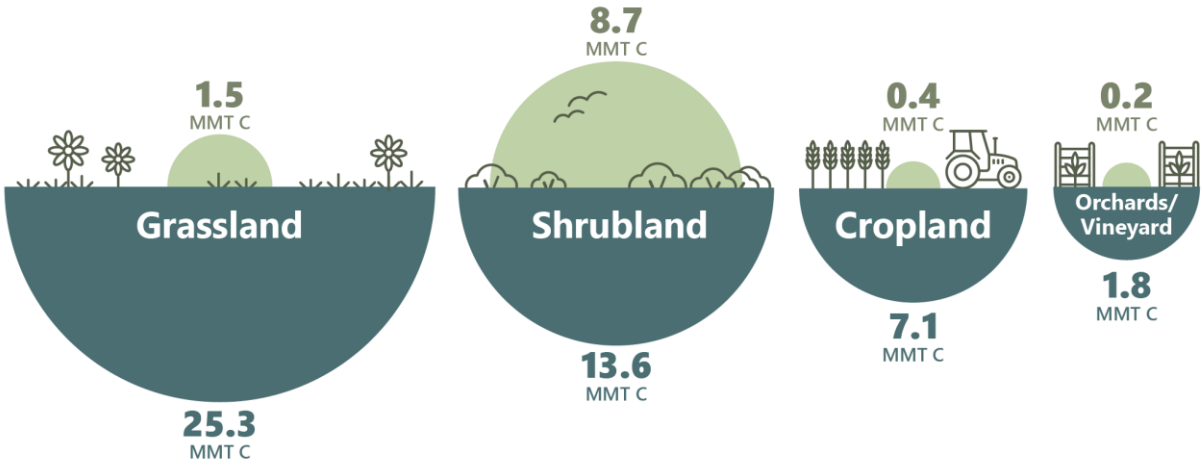
Creating offset programs is complex and expensive, compounded by the administrative challenges of setting up the program. Additionally, there are regulatory barriers and forest practice rules that may prevent the creation of this market. In areas such as the Santa Cruz Mountains, which have the state's most restrictive forest practices and rules, conducting forestry work proves challenging. As a result, there may be few opportunities to develop carbon credits under the current regulatory practices in the region.

CONSERVATION, OPEN SPACE, AND AGRICULTURE STRATEGIES



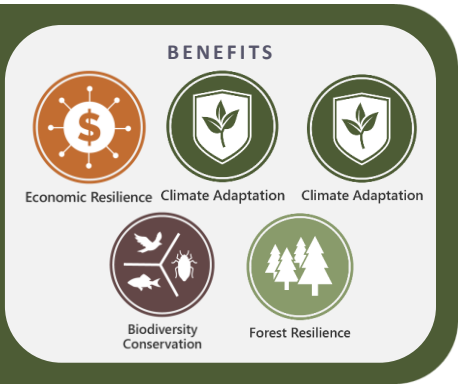
4.5 CONSERVATION, OPEN SPACE, AND AGRICULTURE (COA) STRATEGIES

Land management practices such as conservation, cover cropping, reduced tillage, and compost application can increase carbon sequestration potential in agricultural and grazing lands. **In the Monterey Bay Area, grasslands, shrublands, croplands, orchards, and vineyards hold approximately 58 MMT C, with 47.8 MMT C below ground and 10.8 MMT C above ground.** These practices help to reduce GHG emissions and promote healthier ecosystems.



COA STRATEGY 1

Advance the use of conservation easements and carbon offsets through a locally managed program and maintain continued participation in existing state programs (e.g., Sustainable Agricultural Lands Conservation program) that protect critical agricultural lands and open spaces.



Conservation easements are legal agreements that limit development or changes to a plot of land to conserve its resources. This strategy promotes their use as a tactic to retain and enhance the land's ability to sequester and store carbon.

IMPLEMENTATION ACTION COA 1.1

Build relationships with landowners and land managers to promote the benefits of conservation easements.

Engaging with landowners and land managers could improve relations, fostering transparency and stronger connections regarding the benefits of conservation easements. Building these relationships could lead to collective action to offset carbon emissions within the region. Engagement with landowners and land managers could help cultivate long-term relationships, demonstrate a regional commitment to conservation, and help customize conservation approaches.

Lead Organization(s)

RCDs, land trusts, private landowners, and industry groups could all serve as possible lead organizations.

Current Efforts

Stakeholders and subject matter experts did not identify existing efforts.

Barriers to Implementation

Stakeholder and subject matter experts noted challenges to conservation efforts through development mitigation fee requirements. Additionally, those interested in enrolling in easement programs have already done so, leaving little available land unless new incentives are introduced. The easily accessible conservation easements have already been secured, leaving the more complex ones requiring additional resources, relationship-building efforts, and long-term development.

IMPLEMENTATION ACTION COA 1.2

Conduct a feasibility study on developing a local carbon offset program including potential financial benefits and incentives as well as barriers and challenges.

A feasibility study could help assess viability and understand the benefits and challenges of establishing a local carbon offset

program. A study would help inform decisions to enhance the program's effectiveness. To be successful, the study would require gathering regional data and seeking input from stakeholders, experts, community members, and decision-makers across various sectors and jurisdictions to identify potential obstacles and pathways for a future program's success.

Lead Organization(s)

RCDs could collaborate with local governments, CBOs, landowners, and industry groups. Establishing JPA to coordinate across the region could also be beneficial. Additionally, incorporating University of California Cooperative Extension (UCCE) research could support the subject.

Current Efforts

The Central Coast Climate Collaborative conducted a series of webinars focused on carbon sequestration and offset in 2022, providing valuable insights that could serve as a foundation for developing a carbon offset program. Additionally, existing programs such as the Mitigation Credit Agreement by the California Department of Fish and Wildlife offer opportunities that can only be developed within the boundary of approved Regional Conservation Investment Strategies. Moreover, platforms like Nori.com are actively engaged in carbon removal credits and climate impact integration, presenting possibilities for collaboration and leveraging such initiatives to advance regional goals. Research into carbon sequestration specific to specialty crops is also underway, indicating potential avenues for further exploration.

Barriers to Implementation

Barriers include cost, the administrative complexities associated with measuring carbon reduction from land treatments including monitoring and evaluation, and limitations in staff capacity. Successful adoption relies on ensuring that changes are both feasible and economically viable. Viticulturists have emphasized that the integration of biochar should demonstrate cost savings and offer opportunities for accessing new markets to support climate-smart and climate-friendly products.

IMPLEMENTATION ACTION COA 1.3

Convene landowners and land managers to learn what climate-smart practices they are already using on managed rangelands, what is working, and the barriers they face in implementing those practices.

This action aims to foster a collaborative and supportive environment where landowners and managers can share experiences and exchange ideas. As climate-smart practices evolve, convening landowners and managers is crucial to sharing successful practices and knowledge among peers. These gatherings could also help identify common barriers and potential solutions, informing future strategies and building on existing successes.

Lead Organization(s)

RCDs, land trusts, local governments, and agricultural associations could serve as potential partners or lead organizations, with the possibility of involvement from the Bureau of Land Management.

Current Efforts

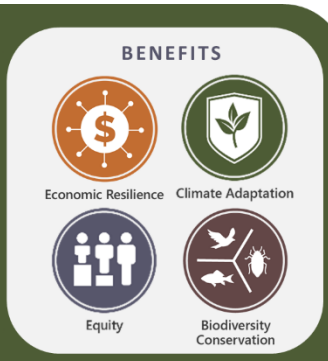
A list of Healthy Soils Program grant recipients for 2017-2020 and 2021 is publicly available. UCCE is also involved and has established strong relationships with agricultural associations such as the Cattlemen's Association. UCCE holds a forum for agriculture participants to convene. Additionally, rangeland management has expanded to include wildfire fuel load suppression. The Central Coast Community Energy Ag Electrification Program offers rebates to customers who transition from fossil fuel-powered agricultural equipment to new, all-electric alternatives.

Barriers to Implementation

The cost of climate-smart practices and the necessity to prevent duplication of efforts among rangeland managers' were identified as barriers to implementing this action.

COA STRATEGY 2

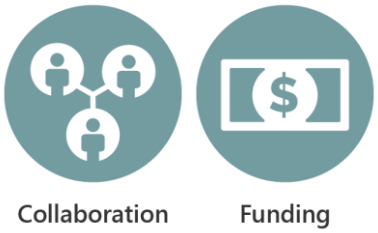
Promote health soils practices such as cover cropping, reduced tillage, compost amendment, biochar, and soil additives. Support farmers in estimating carbon sequestration on their lands and evaluate ways to reward and/or incentivize farmers and ranchers for quantified carbon sequestration on their lands.



The healthy soils practices described above improve carbon sequestration on the land and provide substantial additional benefits such as improved soil health and yields.

IMPLEMENTATION ACTION COA 2.1

Provide technical assistance to prepare farm-specific carbon plans to position farmers and ranchers for funding opportunities.



Identifying best practices and providing technical and financial support for farmers to prepare carbon plans facilitates knowledge sharing and could pave the way for successful implementation. Technical assistance, such as workshops, demonstrations, or personalized consultations, could provide guidance on practices like soil health, grazing, and vegetation management. Additionally, it could facilitate access to resources, funding, and expert advice to adopt climate-smart practices more effectively.

Lead Organization(s)

Local governments, RCDs, land trusts, UCCE, and Measure to Improve LLC, which specializes in fresh produce sustainability, could provide support. UCCE could be particularly valuable due to their extensive network and established relationships with experts in the field.

Current Efforts

Stakeholders and subject matter experts did not identify existing efforts for this action.

Barriers to Implementation

Stakeholders and subject matter experts identified cost and water usage as barriers, as well as limited incentives for adopting new and innovative practices like cover cropping and composting. As a result, there is little motivation to prepare farm-specific carbon plans, as growers do not receive additional credits or reductions in compliance requirements.

Sustainable Vineyards

Winegrowers and winemakers in Monterey County lead the charge in sustainable agriculture, employing various beneficial techniques for the soil, the community, and the environment. For instance, local vineyard operators send the wood from vine cuttings to be composted locally, and they then utilize the resulting compost in the vineyards to nurture healthy soils. Moreover, some have integrated biochar soil amendments into their practices, applying them during vineyard establishment and as supplements to existing vineyards. This promotes vine growth, revitalizes soils, and responsibly sequesters carbon, contributing to long-term sustainability.

IMPLEMENTATION ACTION COA 2.2

Form a collaborative to share resources and obtain funding for healthy soil practices in the Monterey Bay Area. Consider convening annual meetings for members of the collaborative and interested parties.

Collaboration Funding

Bringing together stakeholders from diverse sectors, including farmers, NGOs, government agencies, and community members, could help share resources, secure funding, and advocate for sustainable soil management practices. This collaborative effort could help enhance the economic viability of farming operations, contribute to environmental conservation, encourage carbon sequestration, and promote successful food production practices.

Lead Organization(s)

Potential collaboration could involve collaboration among local governments, RCDs, land trusts, UC Davis, UCCE, CBOs, and industry groups. Agricultural associations already promote healthy soil practices and have experience with obtaining grants that are dispersed regionally. Partnering with agricultural associations to participate in existing meetings could help prevent duplication of efforts and maximize efficiency.

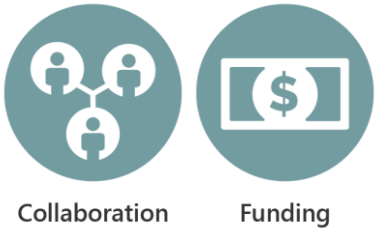
Current Efforts:

Existing grant programs, such as the California Department of Food and Agriculture's (CDFA's) Healthy Soils Program and the Natural Resources Conservation Service's Environmental Quality Incentives Program, serve as valuable resources for many growers actively participating in these programs. The Monterey County Vintners & Growers Association also helps foster collaboration among growers, providing a platform to share resources. CDFA's RePlan tool streamlines the grant application process for the Healthy Soils Program by automatically generating supporting documents and simplifying administrative tasks for applicants. The CDFA also offers a list of technical assistance providers and grant application templates that RCDs can utilize to effectively disburse grant funds to individual farmers and ranchers, facilitating greater accessibility to funding and support for soil health initiatives. For the wine industry, Sustainability in Practice and California Sustainable Winegrowing certifications are also available.

Barriers to Implementation

Many landowners and land managers already employ healthy soils practices, making the marginal benefits of additional measures unclear. Grants may also stipulate conditions that are impractical to manage. Further, obtaining certifications can be labor-intensive and complex. It was also noted that there are challenges in establishing a standard or certification for vegetables and leafy greens due to the complexity of various crops and the difficulty in accommodating the diverse range of 150 crop types grown in the region.

IMPLEMENTATION ACTION COA 2.3



Develop a methodology for prioritizing healthy soils projects when seeking funding in a collaborative regional framework.

Developing a methodology would assist in directing and allocating funding for projects that enhance soil health projects. Such a methodology could involve an approach that considers a project's feasibility, scalability, and alignment with regional climate goals, benefits, and community needs. Establishing a methodology would also streamline decision-making, promote equitable resource distribution, and facilitate prioritization of projects addressing the most pressing soil health challenges more easily.

Lead Organization(s)

Local and state governments could prioritize promoting healthy soils projects through legislative action, including providing incentives. Collaboration among RCDs, land trusts, industry groups, agriculture associations, and UCCE could further advance these efforts.

Current Efforts

The local agricultural community is already collaborating and establishing frameworks for healthy soil projects. Agricultural associations could help address existing research gaps, particularly in evolving areas such as food safety, which intersect with topics like composting, cover crops, and land use on rangelands and adjacent land uses.

Barriers to Implementation

Implementation of healthy soils practices varies significantly across individual crops, adding complexity to the process. Legislative support may be necessary to secure the required funding.

However, while state environmental goals help reduce GHG emissions and adapt to climate change, considerations for ensuring technology, infrastructure, and affordability are often lacking, which places farming communities at risk. Incentives and regulatory relief are essential, especially in rural areas and regions.

COA STRATEGY 3

Apply compost, additives, and other soil regenerative techniques 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.

While compost has traditionally been applied to croplands, with only small amounts on grasslands, emerging science highlights the benefits of compost on grasslands and rangelands (Fenster et al. 2023). This strategy would support scaling the application of compost to more acres. Additionally, compost could be augmented with woody biomass from the forest sector.

IMPLEMENTATION ACTION COA 3.1

Prepare a feasibility study to explore the development of community compost banks, with benefits for ranchers or other bulk users.

A feasibility study could evaluate the viability and potential impact of establishing community compost banks in the Monterey Bay Area. Through a feasibility study, stakeholders could gain insights into establishing community compost banks through logistical, financial, and environmental lenses. This could involve assessing factors like the availability of organic waste materials for composting, market demand for compost products, potential cost savings, and infrastructure needs.

Lead Organization(s)

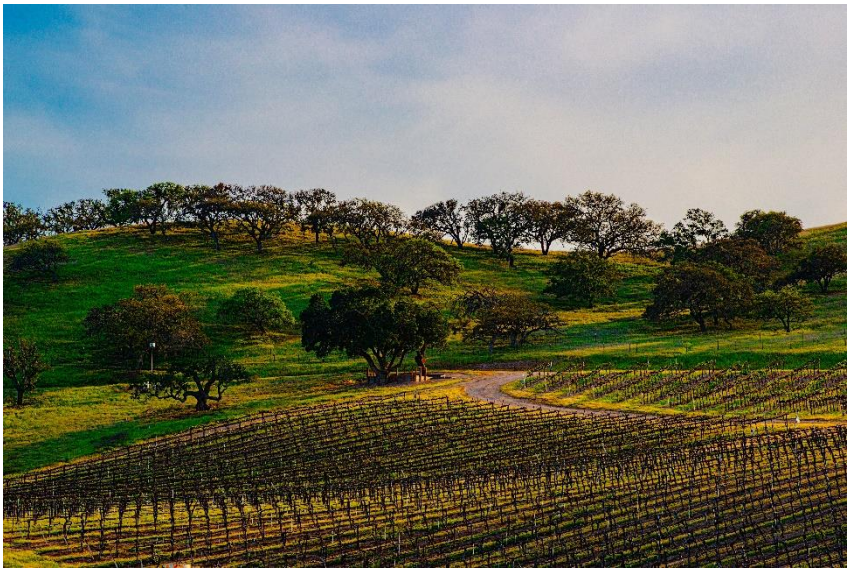
Possible lead organizations could include RCDs, local governments, CAL FIRE, and UCCE. There is an opportunity to collaborate with the forest sector to increase the availability of woody biomass for broader use.

Current Efforts

Cal Recycle has provided guidance on initiating a Community Composting for Green Space Grant Program intended to promote community-scale composting projects in green spaces within disadvantaged and low-income communities.

Barriers to Implementation

There is an excess input of compost compared to the capacity to manage the output effectively. Additional challenges include the quality of compost material and concerns regarding food safety, as not all crops can safely utilize any compost—particularly favoring vines and trees over row crops. As highlighted by stakeholders and subject matter experts, there is also the risk of heavy metal accumulation and inadequate transportation infrastructure dedicated to distributing compost to farmland areas.



IMPLEMENTATION ACTION COA 3.2

Form a collaborative to share resources and obtain funding for sustainable techniques, where appropriate for a given type of crops, in the Monterey Bay Area.

Agricultural sustainability goals could be achieved through a collaborative intended to foster innovation and amplify collective input. Given the region's diverse range of crops cultivated, such collaboration could help coordinate efforts and pool resources, expertise, and funding to support adopting sustainable agricultural practices tailored to specific crops. This approach could encompass techniques that enhance soil health and mitigate environmental impacts, ensuring the long-term viability of farming in the Monterey Bay Area. Through this effort, members could identify priority areas for intervention, share best practices, access funding opportunities, and address challenges related to sustainable agriculture.

Lead Organization(s)

RCDs, local governments, industry associations, and UCCE are potential leading organizations. The RCPWG could also assist local jurisdictions in the Monterey Bay Area in securing large-scale funding for implementing measures outlined in action plans. Further, a subcommittee dedicated to agriculture and interested growers could foster collaboration and offer administrative and grant management support.

Current Efforts

Ongoing research and field trials are underway to identify suitable techniques and encourage early adopters within the Monterey Bay Area, including biochar application research for wine grapes. Additionally, many vineyards in the region already incorporate compost techniques and do not have the food safety issues affecting other growers.

Barriers to Implementation

Cost, ensuring techniques are applicable to the variety of crop types grown in the region, and the necessity to ensure that practices are grounded in research-based evidence were identified as barriers.

IMPLEMENTATION ACTION COA 3.3

Develop a methodology for prioritizing sustainable agricultural projects when seeking funding in a collaborative regional framework.

This action aims to maximize impact and streamline regional sustainable agriculture projects. Clear criteria and evaluation processes could help identify projects aligned with regional goals and ensure efficient resource allocation to initiatives with the highest potential impact. The methodology could include criteria like feasibility, scalability, benefits, and engagement components, with opportunities for regular review to adapt to changing needs.

Lead Organization(s)

Local governments, RCDs, land trusts, industry groups, UCCE, and the Natural Resources Conservation Service.

Current Efforts

The USDA recently opened the Sam Farr United States Crop Improvement and Protection Research Center in Salinas which may provide findings that can support local sustainable agricultural practices and projects. Stakeholders also mentioned field trials happening within the Salinas Valley to test sustainable agricultural practices.

Barriers to Implementation

With cost constraints and the diversity of crop types in the region, it can be challenging to tailor techniques to suit each specific crop type effectively.

4.6 SCALE OF STRATEGIES

This Climate Study calculated the cost, carbon sequestration benefits, and quantity (in acres) of land treatments for all land cover types in the study area, where this information was available. The cost and carbon sequestration benefits of the treatments were derived from multiple sources, including the 2022 Scoping Plan, the COMET-Planner tool (a tool that calculates carbon sequestration per acre treated, which was developed in a collaboration between the USDA, Colorado State University, CARB, and CDFA), and data from the Environmental Quality Incentives Program (which provides reimbursements to farmers and ranchers for the cost of implementing conservation practices). Acres treated were derived from statewide targets and downscaled to the study area. The Carbon and Cost Quantification Technical Appendix of this Climate Study contains a full description of the methodology.

Table 4.1 below shows a summary of the results of this analysis. On an annual basis, 110,183 acres in the study area would be treated at a cost of $214,711,736 (in terms of 2021 dollars, which was the year used in the Scoping Plan for all cost values), resulting in a reduction of 32,333 MT C. The 2022 Scoping Plan gives a window of 20 years (2025 – 2045) to achieve carbon neutrality. If the treatments described above were implemented over this 20-year period, it would result in a cumulative total of approximately 2.2 million acres treated, carbon sequestration benefits of 647,000 MT C, and $4.3 billion dollars spent in the study area.

Table 4.1 Summary of Acreage, Cost, and Carbon Reduction by Treatment for the Study Area

Land Cover/Treatment	Acres Treated Per Year	Annual Values Carbon Sequestered (MT C / year)	Annual Values Cost per year	Per-Unit Cost per acre	Per-Unit Costs per 1 MT C Sequestered
Forests, Shrublands, and Grasslands					
Prescribed Burning	16,447	NA[1]	$6,776,210	$412	NA
Mastication	14,658	NA[1]	$11,726,185	$800	NA
Thinning	8,486	NA[1]	$12,363,709	$1,457	NA
Other Mechanical	3,847	NA[1]	$2,135,140	$555	NA
Biological, Chemical, and Herbaceous Treatments	1,641	NA[1]	$221,572	$135	NA
Harvesting	1,402	NA[1]	$2,279,577	$1,626	NA
Clearcut	1,204	NA[1]	$7,970,492	$6,618	NA
Forests, Shrublands, and Grasslands Subtotal	*47,686*	*765[1]*	*$43,472,885*	*$912*	*$56,833*
Agriculture					
Compost amendment (cropland, orchard, vineyard)	13,460	7,636	$2,692,006	$200	$353
Compost amendment (rangeland)	5,303	6,407	$1,060,562	$200	$166
Transition to organic farming	4,569	3,381	$15,913,032	$3,483	$4,706
Cover cropping (legumes)	2,473	270	$935,080	$378	$3,466
Cover cropping (non-legumes)	2,473	47	$935,080	$378	$19,806
No till	1,236	74	$117,664	$95	$1,586
Reduced till	1,236	37	$104,916	$85	$2,828
Hedgerows/windbreaks/shelterbelts	897	2,532	$27,361,548	$30,492	$10,807
Conservation of annual cropland [2]	869	NA	$6,083,509	$7,000	NA
Conservation through easements (rangeland) [2]	1,745	NA	$12,218,077	$7,000	NA
Riparian forest buffers (cropland, orchard, vineyard)	71	38	$639,791	$9,055	$16,768
Grazing management	24,636	739	$1,339,486	$54	$1,812
Silvopasture	2,028	365	$424,488	$209	$1,163
Agriculture Subtotal	*60,998*	*21,526*	*69,825,239*	*$1,145*	*$3,244*
Wetlands	239	2,037	$478,071	$2,000	$235
Wildland-Urban Interface[3]	1,232	NA	$4,866,978	$3,950	NA
Urban Forests[4]	NA	8,005	$95,977,818	NA	$11,990
Deserts	28	0	$90,746	$3,243	$1,653,667
Total	110,183	32,333	214,711,736	$1,949	$6,641

Notes: C = Carbon; MT = metric tons; NA = not applicable. All dollars shown are 2021 dollars.

[1] The forests, shrublands, and grasslands treatments do not increase the natural sequestration ability of these lands per se—instead, they prevent wildfires and thus slow the rate of wildfire emissions. CARB does not provide individual carbon sequestration values for these treatments, so they have a value of "NA" for carbon sequestered. However, the 2022 Scoping

Plan states that, in aggregate, these forests/shrublands/grasslands treatments have an average cost of $15,500 per metric ton of carbon dioxide equivalent reduced (CARB 2022a: 156), which translates to $56,833 per metric ton of carbon sequestered. As shown in the table, in aggregate, these treatments will cost $43,472,885 per year. This allows for the calculation of a rate of carbon sequestration in the study area: $43,472,885 per year divided by $56,833 per metric ton of carbon sequestered equals 765 metric tons of carbon sequestered per year.

[2] Carbon sequestration was not quantified for conservation measures. Calculating carbon sequestration due to conservation is dependent on the specific characteristics of the site where conservation occurs, including soil type, distance from urban centers, and the type of structures built. This calculation is beyond the scope of this Climate Study.

[3] Specific carbon sequestration values for the wildland-urban interface are not quantified because these treatments do not increase the rate of carbon sequestration per se. Instead, treatment of these lands mitigates the risk of wildfire loss.

[4] Urban forest acreage is not quantified because, per the 2022 Scoping Plan, the treatments do not target a specific number of acres. Instead, urban forest treatments reflect an increase in investment in these lands, which comprises a combination of planting new trees, maintenance, removal, and disposal.

Sources: Analysis conducted by Ascent Environmental in 2024, using data from CARB 2022; Shobe et al 2023; CNRA 2023; Natural Resources Conservation Service et al 2024; United States Department of Agriculture 2024.

The EAC recommends several other conservation measures whose cost and carbon sequestration cannot be quantified and thus do not appear in Table 4.1. These measures are listed in Table 4.2.

Table 4.2 AB 1757 Expert Advisory Committee Recommended Measures Downscaled to Study Area

Treatment	Acres per Year
Move farmland to equilibrium status[1]	13,425
Conserve privately-owned managed conifer forests[2]	1,826
Reduce expansion of developed land[3]	18
Reduce annual conversion rate of grasslands	75 % reduction from current rate

Notes:

[1] The EAC recommends that 100% of California farmland be moved to equilibrium status by 2050. Equilibrium status is defined by the EAC as follows: "Fallow land must be rehabilitated to a climate change-resistant ecosystem category, and farmland that is lost due to development must be offset by an increase in agricultural or park uses in unused urban spaces" (CNRA 2023: 14). The calculation shown in this table was performed assuming 9.5 million statewide acres of agricultural land, per the 2022 Scoping Plan (CARB 2022: 254), and a 25-year implementation timeframe. It was scaled down to the Monterey Bay Area, which has 3.5 percent of statewide agricultural land.

[2] Assumes the midpoint of EAC's range of 1-3 million acres (i.e., 2 million) of statewide private conifer forests are conserved by 2034 (see CNRA 2023: 33), with a start date in 2025. This implies a rate of 222,222 statewide private conifer forest acres conserved per year over 9 years.

The Monterey Bay Area contains approximately 100,656 acres of privately-owned coniferous forests (data from AMBAG 2023), representing approximately 0.82 percent of 12.25 million statewide acres (see CNRA 2023: 31: "Of the 24.5M acres of conifer forest, roughly half is in public ownership," implying that the other half, or 12.25 million is privately owned). Downscaling the 222,222 statewide treatment rate shown above to 0.82 percent in the Monterey Bay Area results in 1,826 acres treated per year.

[3] The EAC recommends reducing expansion of developed land to less than 10,000 new acres within 10 years (CNRA 2023: 26), or 1,000 acres per year. This statewide value was downscaled by the proportion of statewide urban lands that are in the Monterey Bay Area (1.8 percent; see AMBAG 2023 and CARB 2022a).

Sources: Analysis conducted by Ascent Environmental in 2024, using data from AMBAG 2023; CNRA 2023; CARB 2023.

4.7 CONCLUSION

Maximizing carbon sequestration and other benefits in the Monterey Bay Area will involve establishing robust community partnerships and ongoing engagement and collaboration with key stakeholders. Other important efforts include identifying potential funding sources, simplifying permitting procedures, and minimizing associated costs related to land management practices. Forging partnerships with community-based organizations, land trusts, and park districts is a crucial step for promoting sequestration practices and monitoring implementation. Addressing workforce-related challenges is another key consideration, ensuring a skilled and capable workforce is available to support carbon sequestration-related initiatives.

Chapter Five
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