Sonoma County Climate Resilient Lands Strategy

Overview and critical concepts

PREPARED FOR THE COUNTY OF SONOMA
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We gratefully acknowledge the considerable time and expertise contributed by members of the project's Technical Advisory Committee and Implementation Advisory Group, our Tribal Partners, participants in focus groups, and the individuals and organizations who met with us over the course of this effort.

This is a living strategy, and we look forward with hope for our collective stewardship of this remarkable place we share and call home.

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Aerial View of Sonoma County.

Sonoma County, comprising over 1.1 million acres (1,500 square miles) and with a population of approximately 488,000 people, hosts a diverse landscape with coastal geography, varied topography, and a range of microclimates. Collectively, the landscape supports an array of ecological zones, plant and animal species, working lands, waters, and communities (Ag + Open Space, 2021a). Sonoma County's natural and working lands provide benefits that support the county's social, ecological, and economic health. These natural and working lands, however, are vulnerable to increasingly dramatic and rapid climate changes. To strengthen the climate resilience of natural and working lands throughout Sonoma County, the County of Sonoma (also referred to as "the County") has worked with partners and stakeholders throughout the county to develop this bold and critical Climate-Resilient Lands Strategy ("Lands Strategy"), which aims to address the following objectives:

- Conserve, manage, and restore as much of the county as possible across public, private, natural, developed, and agricultural lands.
- Focus early actions on areas with the greatest potential for climate risk reduction and biodiversity enhancement, and, where possible, promote carbon sequestration opportunities.
- Provide a forum for coordinated action on climate resilience in Sonoma County.
- Reduce fragmentation of the natural lands system by adding to conserved spaces, increasing connections and corridors, and working with private landowners to develop shared management strategies.
- Partner with local Native American tribes within Sonoma County to advance traditional ecological knowledge and preserve tribal cultural resources and tribal cultural properties.
- Identify funding and financing strategies from the county, state, and federal governments, as well as private funding sources, to advance this innovative and bold plan. Identify new concepts for funding and financing sources as well.
- Prioritize equity and climate justice approaches that are measurable and clear.

Defining Resilience in Sonoma County

Through this non-regulatory Lands Strategy, the County is working to build resilience into its natural and working landscapes, which encompass a diverse array of public and private uplands, soils, forests, chaparral, rangelands, coastal areas (including estuaries and oceans), riparian habitat, urban green spaces, wetlands, farms, and vineyards. A resilient landscape system can:

1. **Adapt and offer protection** to ecosystems and communities from extreme events and increasing climate risks.

2. **Provide critical ecological, economic, and social functions and benefits**—such as habitat for native species, improved agricultural production, methane reduction, carbon sequestration, clean water and air, food access and security, and more—to the county's human, built, and natural communities and systems.
3. **Reduce risk** to the county's natural, human, and built communities, with a priority on underserved and under-resourced communities.
4. **Promote equitable distribution of benefits** to the county's residents, with a focus on underserved and under-resourced communities.

Wildflowers at Cooley Ranch in Sonoma County.

To promote continued resilience of the natural and working lands system, the County will work with communities and public and private landowners to ensure that there are adequate financial and personnel resources, institutional capacity, and infrastructure for sustainable management and maintenance of the landscape system over time. Collectively, the natural and working lands of Sonoma County will serve as an adaptable and redundant (i.e., replicates the same land types, species, or features) system that is integrated into the county's water, mobility, housing, and public health systems and institutions to provide resilience, sustainability, and capacity over the next century and beyond.

Climate Hazards

A variety of hazards could impact Sonoma County's natural and working lands, and the County and its partners must consider these hazards in determining actions to strengthen resilience. The Lands Strategy provides details on historical and projected impacts of the following climate hazards:

Warming climate. Temperatures within Sonoma County are expected to increase by nearly 5 degrees Fahrenheit by the 2060s (U.S. Federal Government, 2021), with an increasing number of high-heat days with temperatures over 93 degrees Fahrenheit. Increased temperatures could result in desiccated plants and soils, increased likelihood of drought, and the creation of major public health concerns, especially among vulnerable populations.

Changing rainfall patterns and flooding. While rainfall projections vary regarding estimated annual precipitation for Sonoma County, projections concur that the timing and amount of rain that falls during individual events will change. Although rain can be beneficial, the predicted increase in intensity and volatility of these events can turn a much-needed rainstorm into a hazardous event due to concerns such as flooding, erosion, landslides, crop damage or loss, property damage or loss, and damage to roadways.

Drought. Although drought is a recurring feature of California's lands, climate change has led to more frequent, intense, and prolonged droughts in California and Sonoma County (Desert Research Institute & Western Regional Climate Center, 2021; Public Policy Institute of California Water Policy Center, 2021). These conditions will continue in the coming decades. Prolonged drought can make ecosystems vulnerable to pests and non-native species, impact water quality and ecosystem function, and increase wildfire risk (North Coast Resource Partnership, 2020). During droughts,

ranchers may also struggle with providing adequate food or grazing land for their animals, and farmers' water supplies may be limited or reduced.

Wildfire. A combination of historical fire suppression, prolonged periods of extreme drought, and increasing temperatures have led to increased frequency and severity of wildfires. Within Sonoma County, changes in land use and development—including development in the wildland-urban interface and low-density development patterns—have led to loss of life, property, and infrastructure due to fire. The potential for increased fires could reduce the ability of Sonoma County's natural and working lands to buffer climate impacts, store carbon, and provide ecological and economic benefits.

Sea level rise and coastal storms. Sea level rise, storms, and erosion are already impacting Sonoma's Pacific-side and Bayside habitats and communities. As seas rise, Sonoma County communities along the Pacific coast and San Francisco Bay shoreline will face damaging effects from El Niño–driven storm events combined with high tides and large waves. Without adaptation, homes, critical infrastructure, agricultural lands, tourist destinations, and important coastal habitat will be lost to flooding, permanent inundation, and erosion (Griggs, 2021). Additional impacts that could occur from sea level rise include landslides, migration of saline water farther upstream, groundwater rise and salinity intrusion, and limited shoreline access.

Climate-Resilient Lands and Ecoregions

RESILIENT LAND TYPES

The natural and working lands that are the focus of the Lands Strategy include many natural and agricultural land cover types. The Lands Strategy details eight specific land types that constitute the natural and working lands of the county. Table 1 below summarizes these land types. (Note that because some areas within Sonoma County have mixed or overlapping land types, the percent breakdowns in Table 1 may add up to over 100 percent).

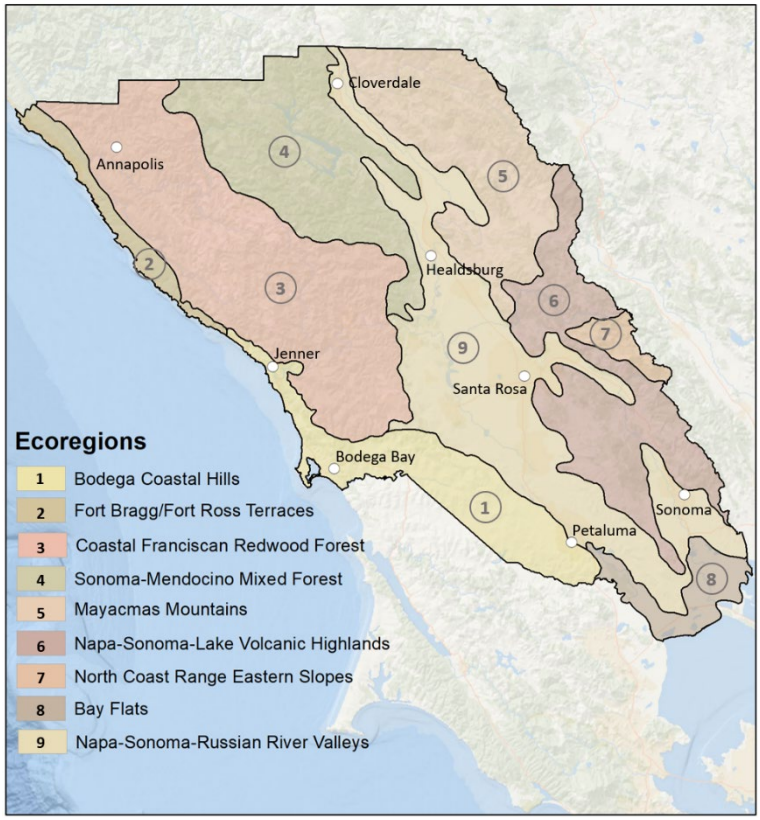
Table 1. Land types.

Land Type	Description
Forests	Composing 50% of the county and covering approximately 525,000 acres, the forests of Sonoma County contain oak woodland, coast redwood, Douglas fir, and mixed hardwoods. Forest communities are critical in building climate resilience and ecological and community health and can also play an important role in sequestration of atmospheric carbon. The forests are, however, at significant risk to climate-related changes including drought, warmer temperatures, and reduced precipitation, which are predicted to drive increasing intensity and frequency of wildfires and species range shifts.
Agricultural Lands: Croplands, Vineyards, and Grazing Lands	The 227,000 acres of agricultural lands (22% of lands) in Sonoma County are a cornerstone of the heritage and local economy of the region and an important element of a dynamic and diverse landscape. The vast rangelands support numerous agricultural industries, including meat and dairy farming, while preserving large tracts of land that provide habitat and movement corridors for a range of native species. The local farms, ranches, and vineyards that produce food as well as fiber and plant materials constitute an industry that generates approximately $1 billion dollars annually, with vineyards alone being responsible for half this amount.

Land Type	Description
Aquatic Ecosystems: Wetlands and Riparian Streams and Corridors 	Wetlands in Sonoma County constitute about 52,500 acres (5% of lands); additionally, Sonoma County also has riparian streams and corridors that have maintained some of their natural characteristics in spite of climate change and human intervention. Sonoma County's wetlands provide enormous benefits in terms of biodiversity, water quality, carbon sequestration, and flood protection. These wetlands also serve as key stops on the Pacific flyway and, as such, support incredible bird biodiversity. Benefits provided by a healthy riparian corridor include biodiversity, recreation areas, nutrient cycling, cool microclimates, reduced peak flows, flood risk reduction, and disrupted spread of wildfire (U.S. Forest Service, n.d.). These services are especially important in the context of a changing climate.
Grasslands 	Grasslands cover about 264,000 acres (25% of lands) of Sonoma County, and non-native grasses dominate most of this landscape. Some land managers, however, are working to bring back native grasses, which have deeper roots and provide more ecological and climate benefits. Grasslands have the potential to provide grazing land, open spaces, habitat, preservation, and water capture. Coastal prairie, a highly variable mixture of native perennial grasses and forbs, native and nonnative annual forbs, and non-native grasses, supports the highest plant diversity of all North American grasslands. One of the largest remaining areas of contiguous coastal prairie is situated west of Petaluma but encroaching invasive grasses continue to threaten its range (Kraft et al., 2007). Although Sonoma's grasslands have been significantly impacted by human activity, adjacent land use, and land management practices, they can increase carbon sequestration potential while also reducing risk from flooding, drought, erosion, wildfire, and heat.
Shrubland and Chapparal 	Shrubland and chaparral compose approximately 42,000 acres (4%) of Sonoma County's lands. Shrubland and chaparral areas are generally known to be rich in native species and biodiversity and are fairly resilient to heat and drought. However, resource users and managers have historically considered these lands less appealing than other land types. This has resulted in shrublands and chaparral suffering a significant amount of removal for agriculture and grazing, encroachment by development, and damage due to clearing for development and exposure to flooding and fires (Underwood et al., 2018). Recent studies have found that the extreme droughts, as well as an increase in the intensity and duration of extreme heat events, are causing significant damage to these vegetative communities.
Developed Lands 	Sonoma County has about 70,500 acres (6.7% of lands) of developed lands, which include urban areas, human development in non-urban areas, and infrastructure and utilities in both urban and non-urban areas. Interspersed within developed areas are a variety of natural communities and habitats, creating a mosaic of built environment and natural spaces. Urban forests, streams, wetlands, and community parks contribute significant social, economic, and ecological benefits, as well as contributing to climate resilience. However, the benefits from urban trees and green spaces, in addition to naturalized riparian corridors or green infrastructure, are not experienced equally across the county. Focusing these benefits equitably across the county will increase resilience to the entire county and reduce the intensity of hazard events, as well increasing the potential for carbon sequestration, creating a continuous network of healthy, climate-resilient lands across the county.

ECOREGIONS

Figure 1. Ecoregions in Sonoma County.



Characterizing and assessing the scope of the diverse and unique natural resources of Sonoma County required identifying a spatial framework that acknowledges the underlying physical processes and patterns that drive habitat suitability for living organisms and feasibility for different land uses, including agricultural lands and production. The Lands Strategy uses the U.S. Environmental Protection Agency (U.S. EPA) Level IV ecoregions as a foundation for defining ecological land classifications within the county using distinctive physical and biological features such as geology, landform, soil, vegetation, climate, wildlife, water, and human factors. EPA developed ecoregions based on similar variations of environmental characteristics that influence biological community use and composition. As shown in Figure 1, the regions are used to support a variety of planning and assessment applications for large geographic areas (Omernik & Griffith, 2014). The physical and biological characteristics of each ecoregion provide information on the suitability of the area for native plants and animals, as well as agricultural lands and production. The Lands Strategy contains more details on each of Sonoma County's nine ecoregions.

Landscape- and Watershed-Scale Project Recommendations

The impacts of climate change on Sonoma County's natural and working lands are not anticipated to be uniform and will vary based on some of the vulnerability characteristics that are inherent to specific vegetation communities, as well as throughout the landscape system (Weiskopf et al., 2020). Certain natural communities, species, agricultural types, and human communities are more likely to readily adapt to a changing climate based on existing resilience characteristics, while others will be more sensitive due to existing or underlying factors and stressors. The recommendations below are non-regulatory actions the County should consider prioritizing at the county-wide scale. Recommendations regarding specific projects and actions will be considered in more detail during implementation of the Lands Strategy, which may include permiting requirements, CEQA analysis, and will require additional stakeholder engagement.

1. **Bring climate resilience to people most at risk** so that resilience projects—such as resilient buffer zones, urban stream restoration, and support for regenerative agricultural practices—can provide benefits and reduce risks to disadvantaged and marginalized populations.
2. **Conserve and manage forests**—including conserving existing healthy forests and conserving, managing, and restoring degraded forests in high-fire-risk zones through climate-resilient management practices and reforestation approaches that mimic historical ecological patterns. These actions will promote a protected mosaic of different land types that can provide risk

reduction, promote genetic transfer and wildlife migration, and allow for habitats, wildife, and vegetation to shift and adapt to new climate conditions.

3. **Conserve and restore native grasslands** through promoting regenerative practices that can restore grasslands to native species and sequester and store carbon above and below the ground. These actions could help grasslands become an important contributor to the county's overall carbon reduction goals. These actions reduce water usage by increasing root depth and the water storage capacity of the soils, help the County find new sources of funding, and create more sustainable grazing lands. Climate-resilient rangeland management practices also contribute to flood, fire, and heat risk reduction countywide.

Cows Grazing on Uncle Henry's Ranch in Sonoma County.

4. **Develop partnerships to increase climate resilience** to leverage the skills, knowledge, and capacity of the wide range of agencies, organizations, private businesses, private landowners, farmers, grazers, agricultural organizations, community organizations, and local Native American tribes in Sonoma County. Many of these entities are already working on these issues at smaller geographic scales or in relation to a particular climate hazard, and promoting coordination among these organizations could help build trust, increase capacity, advance projects, and ultimately share the benefits and responsibilities of taking action to build climate resilience.
5. **Increase and connect the amount of conserved lands** to help reduce the current fragmentation of Sonoma County's conserved areas, increase the size of conserved lands, and create space for migration of species and habitat due to climatic shifts. Through tools such as conservation easements, strategic land acquisition, carbon banking and carbon sequestration planning, and more, the County has an opportunity to undertake actions at the scale of change necessary to improve climate resilience throughout its natural and working lands for the whole county's benefit.
6. **Make Sonoma County a sponge** so it can fully realize the climate resilience benefits offered by aquatic habitats, such as the ability to capture and store water and release it to adjacent rivers, streams, and soils. Through projects such as nature-based approaches to shoreline management, design and planning for flood resilience, and conservation and restoration of headlands, coasts, and bays, Sonoma County can greatly strengthen the resilience of its aquatic ecosystems.
7. **Support and increase regenerative agricultural practices** that can help strengthen efforts throughout the county to adapt to climate, reduce risks, and sequester and store carbon at a meaningful scale. Regenerative agricultural practices applied to croplands and vineyards would provide significant climate resilience benefits to soils, reduce water usage, improve water quality, protect and restore native species and aquatic areas, provide for wildlife and genetic corridors, protect and restore riparian corridors, increase food security, and serve as a buffer from other hazards such as flooding, wildfire, and heat.

How to Use the Lands Strategy

The sections below outline the function and structure of the Land Strategy and its intended use.

WHO SHOULD USE THE STRATEGY?

County agencies are intended to be the primary user group of the Lands Strategy. However, given the need for tribal governments and public, private, non-profit, and other agencies and organizations to work together to advance climate resilience in the county, the Lands Strategy also contemplates its use by other government entities, private landowners, farmers, grazers, grape growers, non-profits, and others. The transformative and significant changes needed to advance the climate resilience of Sonoma County's natural and working lands will require individual and collective actions by these agencies and organizations. To support the use by a range of actors, the Lands Strategy provides different entry points or approaches to advance action, including project concepts, geographic recommendations, potential funding sources, criteria to guide project planning and design, and indicators to measure progress. This comprehensive content offers a diversity of opportunities for County agencies and partners to advance climate resilience either individually or collectively in a way that can result in a comprehensive, landscape-scale approach. The following sections describe the content of the Lands Strategy in more detail.

RESILIENCE DEFINITION AND LAND STRATEGY OBJECTIVES

In Chapter 1 *(Introduction to the Sonoma County Climate-Resilient Lands Strategy)* and Chapter 2 *(Climate Resilient Lands Strategy Process)*, the Lands Strategy provides a definition of climate resilient natural and working lands found on pages 14-15 and Lands Strategy objectives on page 15. The definition of climate resilient natural and working lands was developed with the Lands Strategy Technical Advisory Committee (TAC) and Implementation Advisory Group (IAG) and includes important concepts and characteristics that should be included in projects that are designed and implemented to advance climate resilience. The Lands Strategy definition and objectives include prioritizing climate justice, sustainability, and biodiversity as well as designing and siting projects at a landscape scale to increase connectivity and provide for redundancy and vertical and horizontal migration corridors to enable climate adaptation.

PROJECT CONCEPTS

Chapter 3 *(Climate Hazards)* and Chapter 4 *(Climate-Resilient Lands and the Sonoma County Landscape System)* offer context that the Lands Strategy used to develop project concepts at two scales. The first is the countywide or landscape and watershed scale. The priority landscape and watershed-scale project concept recommendations can be found in the countywide findings section that begins on page 54. In this section, principles for both landscape-scale and watershed-scale resilience are defined and those principles are followed by priority landscape-scale or watershed-scale project concepts that apply countywide. The second scale of project concepts is the ecoregion scale. The ecoregions section of the Lands Strategy begins on page 66. The ecoregions describe the ecological and social characteristics of sub geographies within Sonoma County and provide an opportunity for more specific project concepts designed to address land use, ecological, demographic, and governance characteristics present within each ecoregion. The ecoregions also include a set of indicators to consider when planning, designing, and implementing projects to ensure that projects are locally relevant and responsive within each ecoregion.

Both scales of project concepts respond to Sonoma County's opportunities and challenges as identified by stakeholder and community engagement, the research and assessment conducted for the Lands Strategy (and outlined in detail with Chapters 3 and 4), and the County's risks, priorities, assets, and natural and community characteristics. Landscape-scale, watershed-scale, and ecoregion specific project concepts

that are being recommended and prioritized by the Lands Strategy are described in Appendix A. Each project concept outlines the locations where the concept should be implemented, with some being applicable at the landscape or watershed scale and others applying to specific ecoregions. These project concepts can be used as an entry point for a project to be applied in a specific location. For example, conservation and restoration of riparian corridors is a significant priority of the Lands Strategy. Project proponents who wish to advance a riparian conservation and restoration project can begin by using the project concept in Appendix A, Concept O on page 188 as a template to expand upon, in addition to using the funding sources, partners, indicators, and ecoregions to ensure new riparian corridor projects fit into a comprehensive county approach to climate resilience. As projects are implemented, the Lands Strategy could be updated to add additional project concepts or refine existing concepts to incorporate lessons learned, advance new opportunities, or adapt to changing priorities or conditions.

PROJECT LOCATIONS

Chapter 5 *(Sonoma County Ecoregions)* provides details on the ecological, land use, demographic, and governance characteristics within Sonoma County and identifies the critical assets and services within each ecoregion. The Lands Strategy recognizes that balancing countywide recommendations with the reality that the risks, characteristics, conditions, opportunities, and challenges facing Sonoma County's natural and working lands are different depending on their location. The coastal bluffs in the western portion of the county and the mountains in the eastern part of the county include different vegetative communities, habitats, land uses, populations, and demographics, and also face different risks. How climate justice, sustainability, community risks and priorities, and the availability of resources are considered also depends on these different conditions and characteristics. To address these differences, the Lands Strategy uses the EPA's Level IV Ecoregions for Sonoma County. The Lands Strategy also applies other geospatial data to identify the additional characteristics, including County land use designations and Metropolitan Transportation Commission's Equity Priority Communities data, as well as information from Ag + Open Space's Vital Lands Initiative, Sonoma Water's Climate Adaptation Plan, and data on parks and trails from Regional Parks. Collectively, this informs the most significant hazards and consequences within each ecoregion, the predominant habitat types and vegetative communities, the mix of land uses, and the presence of community characteristics that make community members more vulnerable to climate risk. Within each ecoregion, the Lands Strategy offers details on the natural and working lands assets and services, the land use and demographic considerations, and the priority project concepts. Please refer to pages 66 to 112 for these details.

PROJECT PLANNING, DESIGN, IMPLEMENTATION, AND MONITORING

Chapter 6 *(Project Planning, Design, and Implementation)* provides a framework and process for the County and other implementors to plan for, select, design, and implement new resilience-related projects, including recommendations related to project design, funding, and engagement. These categories are described in more detail below.

Engagement: The Lands Strategy includes a blueprint for successful engagement and partnerships during project development and implementation. The Team envisions that County-led projects will incorporate robust engagement and partnerships; they will also be carried out in the context of active and ongoing program-level engagement and partnerships. For example, the County will continue to work with local Native American tribes to strengthen partnership in planning, developing, and implementing projects to improve climate resilience in our shared landscape (for more discussion on this, see page 126). Effective future engagement and partnerships with communities, landowners, businesses, nonprofits, scientists, and other stakeholders will be critical to the success of individual projects and the Lands Strategy overall. While the Lands Strategy is not a regulatory document or a project as defined by CEQA, projects that are

ultimately implemented out of the Strategy should include robust engagement, participatory processes, and may need to comply with any applicable permitting requirements and CEQA review.

Funding: To advance climate resilience throughout the county's natural and working lands, additional funding and financing will be necessary. The Lands Strategy includes local, state, and federal funding and financing sources and approaches and highlights which ones are the best match for the different project concepts recommended in the Strategy. The funding and financing sources and approaches can be found on pages 116-122, including a comprehensive table on page 122 and additional details in Appendix D.

Project design: To guide design of projects and promote projects that meet the objectives of the County, the Lands Strategy includes screening criteria that are intended for use early in the project planning and design process. These screening criteria can assist project proponents and designers in considering critical issues such as advancing food security, increasing local jobs that pay a living wage, reducing risk to critical county assets, and increasing climate resilience for disadvantaged communities. While these issues are often referred to as "co-benefits," the Lands Strategy includes the screening criteria to emphasize the need to include these issues early in project design as core benefits and not as add-ons. While not every project will meet all screening criteria and there is no expectation that they do so, projects should be planned and designed to meet as many of the screening criteria as possible. These screening criteria, if used to guide project planning and design, will contribute to achieving the climate resilience definition, objectives, and principles identified in the Lands Strategy.

Project monitoring: To ensure that the Strategy is accountable and measurable, the Lands Strategy outlines indicators which are included at several scales. The primary countywide indicators—at a landscape or watershed scale— are detailed in Appendix F and designed to provide a way to identify desired outcomes and measure progress toward the resilience of the natural and working lands. Indicators at this scale focus on measurable factors for which data exist or is easy to obtain. There are also indicators in the Lands Strategy for the land types, such as forests and wetlands and for the ecoregions. These indicators are at a more refined scale and refer to specific land types or sub geographies or ecoregions. The data for these indicators are not always available and are more aspirational rather than measurable. The different scales of indicators are intended to provide a way to identify desired outcomes and to measure progress over time. As data and information increases, additional indicators could be added to the countywide indicators to increase the County's ability to measure and communicate progress. Beyond the listed indicators, the Lands Strategy also includes performance criteria on pages 115-116 that are designed for use toward the end of project design to assess how well each project addresses a more limited and measurable set of key criteria.

Hikers Near Jenner, Sonoma County.

I. Strategy Overview

Sonoma County, comprising over 1.1 million acres (1,500 square miles) and with a population of approximately 488,000 people, hosts a diverse landscape with coastal geography, varied topography, and microclimates that collectively support an array of ecological zones, plant and animal species, working lands, waters, and communities (Ag + Open Space, 2021a). Located at the heart of the California Floristic Province, a globally recognized biodiversity hotspot, Sonoma County encompasses a multitude of vegetative communities and northern California habitats (Sonoma County Community Foundation & Sonoma Water, 2010), ranging from aquatic ecosystems to agricultural lands to developed areas. Lands within Sonoma County have a high degree of climatic variation that ranges from a marine climate on the coast, and a coastal warm climate inland, in addition to a variety of topographic and geologic landscapes (Sonoma Veg Map, 2020). While these conditions currently support a range of habitat and species diversity, these habitats and species are also vulnerable to dramatic and rapid climate changes.

To increase climate resilience throughout Sonoma County, the County of Sonoma (hereafter referred to as "the County") and its partners must act now to conserve, manage, and restore the natural and working lands that support Sonoma County's social, ecological, and economic health. This critical Climate Resilient Lands Strategy ("Lands Strategy") focuses on achieving climate resilience by preserving and enhancing the benefits provided by the county's natural and working lands—such as clean water, clean air, food security, parks and trails, biodiversity, and the ability to adapt to changing conditions. Natural and working lands also play a significant role in climate resilience. Healthy lands can reduce risks to wildfire, flood, drought, and heat, in addition to providing strengthened protection for the county's communities, critical infrastructure, and treasured forests, croplands, vineyards, grasslands, coastal areas, riparian habitats, and parks that are so integral to the county's ecological, social, and economic stability. This stability provides direct benefits to the communities, workers, and others who rely on a healthy and safe county for their livelihoods and wellbeing, food security, housing, and more. With its mix of forests, riparian corridors, grasslands, crops, vineyards, and grazing lands, Sonoma County has a great opportunity to improve the capacity of these lands to contribute to climate resilience, mitigation, and adaptation. Improving this capacity directly benefits the communities, workers, and others who rely on a healthy and safe county for their livelihoods and wellbeing, improving food security, protecting existing housing, and providing for jobs and working lands. By maximizing the resilience of natural systems and working landscapes in a way that prioritizes resilience, equity, and sustainability, the County can achieve multiple objectives in a way that is effective, efficient, and adaptable.

Animals Grazing at Taylor Mountain Regional Preserve, Sonoma County.

The state of California recognizes the power of natural and working lands to improve climate resilience through two recent major initiatives: the Natural and Working Lands Climate Smart Strategy, released in 2021, and the Pathways to 30x30, released in April 2022. California has been designated as one of the world's 36 biodiversity hotspots, and within the state, Sonoma County is specifically recognized for its high biodiversity. Sonoma County is also known around the world for its vineyards, croplands, and dairy products. Sonoma County's farms and ranches are critical to food security within the county and the livelihood of small farmers, farmworkers, local grocers, and many others who rely on the county's working lands.

The County of Sonoma—working with the state of California, local Native American tribes, and partners within the county that include Resource Conservation Districts (RCDs), other public entities, land trusts, farmers, grape growers, grazers, private landowners, businesses, and local organizations—has a once in a lifetime opportunity to increase the resilience of Sonoma County's natural and working lands, reduce climate risks, increase ecological and community resilience, and contribute the health and adaptability the whole county. To help the County work toward achieving these critical goals, the purpose of the Lands Strategy is to provide non-regulatory guidance that will help the County comprehensively assess climate risks and move toward implementing the following actions:

- Restore the resilience benefits of natural and working lands to protect biodiversity, ecosystem health, reduce climate risks, and, where possible, sequester and store carbon.
- Protect carbon storage by preventing the conversion and loss through deforestation, degradation of wetlands or riparian corridors, or land use type conversion.
- Reduce the frequency and intensity of climate risks to the county's natural and built assets.
- Provide other ecological and community benefits including clean air and water, abundant and equitably accessible green spaces, and increased trust and capacity among the public, private, tribal, and other partners necessary to achieving the Strategy's outcomes.
- Identify opportunities to integrate work across County agencies to strengthen climate resilience.

II. Opportunities to Strengthen Resilience

The County and its partners have completed a range of climate adaptation, mitigation, and resilience work within Sonoma over the last 10 years. In addition, a significant number of non-County organizations within Sonoma County work on natural and working lands issues. Collectively, these efforts have resulted in a number of unique opportunities and challenges. The County will need to address these challenges to develop and implement a coordinated, countywide strategy. Table 2 below highlights key opportunities and challenges throughout the county.

Table 2. Key opportunities and challenges to strengthen resilience in Sonoma County.

Theme	Opportunities	Challenges
Capacity, coordination, and funding	• High-quality and high-functioning nonprofit, public agency, research, and land trust organizations that work on Sonoma County climate issues (e.g., Sonoma Water, Sonoma Ecology Center, Regional Parks, Pepperwood Preserve, University of California Cooperative Extension Sonoma County, and more). • High-resolution, high-quality data on much of the lands and waters in the	• Lack of coordinated action among multiple partners. • Critical work is being done by organizations that rely on grant funding and donations, with few ongoing stable funding sources.

Theme	Opportunities	Challenges
	county, including through the Sonoma County Veg Map.	
Current land use patterns	• Sonoma County has historically used urban growth boundaries, zoning, and greenbelts to protect its natural and working lands and provide benefits to communities. • Significant amount of undeveloped land with high-quality habitat, biodiversity, diverse landscape mosaics, and a wide variety of elevation types and landforms. • Large proportion of conserved and protected land across all ecoregions. • Potential for increasing opportunities for home gardening and farming in urban and rural residential areas to increase food security.	• Natural and working lands have been altered and degraded by development, pesticide use, and invasive species, as well as lack of management, staff and financial resources, and community and organizational capacity. • Lands also face increasing risks from climate change, and the network of protected lands is fragmented and separated by significant gaps. • Natural and working lands have faced and continue to be at considerable risk from wildfire, heat, drought, sea level rise, and long-term flooding.
Governance structure	• Unique governance approaches of Ag + Open Space and the Regional Climate Protection Authority (RCPA) that offer an opportunity to take action more directly and across sectors and to leverage resources and capacity.	• Lack of staff and capacity to carry out needed work in a timely manner (e.g., engagement, outreach, planning and implementation). • County agencies operate at different levels of capacity related to climate adaptation, mitigation, and resilience.
Local communities and workers	• Many communities, workers, and others rely on and contribute to the robust economy and lands of Sonoma County and are committed to strengthening its resilience. • The use of regenerative farming practices could improve the health and safety of local communities and workers by reducing exposure to chemicals and pesticides.	• Farmworkers are being exposed to wildfire smoke, an increasing number of high-heat days, and air quality degradation. • A lack of climate resilience qualities exists in both urbanized and rural areas, exposing communities in parts of Sonoma County to high risks and fewer resources to respond to those risks. • A lack of affordable housing increases pressure on community members, workers, the land, and its resources.
Partnership	• Great potential for partnerships among local Native American tribes, RCDs, farmers, farmworkers, local business owners, environmentally aware community members, and government. • Many tribal communities are willing to partner and have significant ecological and cultural knowledge of the lands and waters of Sonoma County.	• Many organizations are already part of existing collaborations and partnerships and have limited capacity and bandwidth for new, climate resilience-focused efforts. • Organizations have various degrees of technical capacity related to adaptation, mitigation, and resilience.
Small landowner partnership and coordination	• Many small natural and working landowners are committed to applying ecological principles on their properties.	• Implementing new practices (some of which may be technically complex) can be difficult for small property owners with limited resources and capacity.

III. Lands Strategy Project Team and Engagement Approach

The Lands Strategy was led by a team with representatives from Ag + Open Space and the Climate Division and funded by both the Climate Division and Ag + Open Space. This team met weekly to coordinate engagement and outreach, identify data and information sources, and provide input on direction and desired outcomes.

It was critical for the project team to engage a broad range of organizations to ensure the Lands Strategy was informed by a diversity of perspectives and the expertise of local partners from other County agencies and outside organizations. The project team started by forming a Technical Advisory Committee (TAC) and an Implementation Advisory Group (IAG) to advise the project team on data sources, social and ecological indicators, project types, and existing projects and policies within the county. Over the course of the project, the TAC met five times and the IAG met four times, with two of the meetings being held jointly.

In addition to these advisory groups, the County and the project team conducted outreach and engaged with a range of organizations and community and issue area representatives. Topic areas discussed included climate equity, just transition, worker rights and health, and agroecological farming practices. The project team also initiated engagement with local Native American tribes through an informal consultation. The County invited all five federally recognized, local Native American tribes in Sonoma County to participate, and four tribes participated and provided their insights and priorities for the Lands Strategy. The County and tribes intend to continue and strengthen this partnership. For meeting agendas see Appendix B. In addition to the engagements and consultations described above, the County held a 30-day public comment period in June and July 2022 and a public workshop in June 2022. More details on the engagement process and outcomes are in Chapter 2.

IV. Strategy Objectives and Defining Resilience in Sonoma County

To guide implementation of the Lands Strategy, it is critical to have a clear definition of resilient lands and objectives for how the County and its partners will use this document. Through work with the TAC and IAG, the project team developed the definition and objectives below to guide this Lands Strategy.

Climate Resilient Lands Definition

Through this Lands Strategy, the county is working to build resilience into its natural and working landscapes, which encompass a diverse array of public and private uplands, soils, forests, chaparral, rangelands, coastal areas (including estuaries and oceans), riparian habitat, urban green spaces, wetlands, farms, and vineyards. A resilient landscape system is one that can:

1. **Adapt and offer protection** to ecosystems and communities from extreme events and increasing climate risks.
2. **Provide critical ecological, economic, and social functions and benefits**—such as habitat for native species, improved agricultural production, methane reduction, carbon sequestration, clean water

and air, food access and security, and more—to the county's human, built, and natural communities and systems.

3. **Reduce risk** to the county's natural, human, and built communities, with a priority on underserved and under-resourced communities.
4. **Promote equitable distribution of benefits** to the county's residents, with a focus on underserved and under-resourced communities.

Climate Resilient Lands Objectives

To promote continued resilience of the natural and working lands system, the County should work with communities and public and private landowners to help develop adequate financial and personnel resources, institutional capacity, and infrastructure for sustainable management and maintenance of the landscape system over time. Collectively, the county's natural and working lands will serve as an adaptable and redundant system that is integrated into the County's water, mobility, housing, and public health systems and institutions to provide resilience, sustainability, and capacity over the next century and beyond. Building on the County's goals for climate resilience, this Lands Strategy aims to support the County in working toward addressing the following objectives:

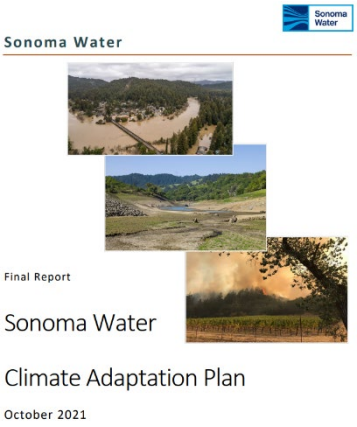
- Conserve, manage, and restore as much of the county as possible across public, private, natural, developed, and agricultural lands.
- Focus early actions on areas with the greatest potential for climate risk reduction and biodiversity enhancement, and where possible, promote carbon sequestration opportunities.
- Provide a forum for coordinated action on climate resilience in Sonoma County.
- Reduce fragmentation of the natural lands system by adding to conserved spaces, increasing connections and corridors, and working with private landowners to develop shared management strategies.
- Partner with local Native American tribes within Sonoma County to recognize and elevate traditional ecological knowledge and preserve tribal cultural resources and tribal cultural properties.
- Identify funding and financing strategies within the county, state, federal, and private funding to advance this innovative and bold plan.
- Prioritize equity and climate justice approaches that are measurable and clear.

Community Hike at Taylor Mountain Regional Preserve, Sonoma County.

V. Existing Efforts and Plan Alignment

The Lands Strategy is informed by many recent plans and efforts in the county, region, and state related to climate change and resiliency. The project team worked with the TAC and IAG to identify the most relevant and recent resources. Since the Strategy is both multi-hazard and multi-issue, there were a significant number of high-quality, recent documents and resources to support this work and serve as a strong foundation for this strategy. A few key resources reviewed in developing this Lands Strategy are summarized below. Most resources reviewed related to Sonoma County itself (Table 3); however, the state of California also has a wide range of planning, policy, and programs related to climate adaptation, mitigation, and resilience of natural and working lands (Table 4). Sonoma County's resources and needs are closely aligned with the state of California climate resilience priorities, particularly the Natural and Working Lands Climate Smart Strategy and Pathways to 30x30, both of which are highlighted below in Table 3. A full list of work reviewed for this project is included in Appendix C.

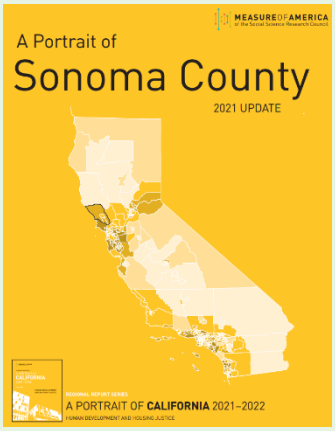
Table 3. Existing efforts related to Sonoma County.

Sonoma County–Specific Efforts
Sonoma County Ag + Open Space Vital Lands Initiative Ag + Open Space's Vital Lands Initiative, adopted in 2021, provides a vision for the conservation of Sonoma County's open spaces, biodiversity, agriculture, parks, trails, and wide range of natural communities, such as forests, rivers, and grasslands. The Vital Lands Initiative provides a clear summary of the current state of conservation in Sonoma County, including that Ag + Open Space has conserved over 122,000 acres of land, or the equivalent of 12% of Sonoma County's total acreage. Built on a significant amount of community engagement, it was important when developing this Lands Strategy to understand key themes from this engagement; these themes are discussed further in Section II below. These and other comments, as well as the goals and priorities of Vital Lands, were considered in the development of the Lands Strategy. 
Sonoma Water Climate Adaptation Plan Sonoma Water's Climate Adaptation Plan (CAP), adopted in 2021, is another important recent planning initiative. Specific to Sonoma Water's assets and services, the CAP includes climate objectives and climate change scenarios for temperature, flooding, wildfire, drought, sea level rise, and extreme precipitation, which were considered while developing the assessment and recommendations for project types to increase climate resilience. Sonoma Water's CAP also includes a summary of findings related to most significant risks to Sonoma Water's core functions: water supply, flood management, and sanitation. There were several relevant actions recommended in the CAP that this Lands Strategy also identifies as priorities, including developing and implementing a regional flood management strategy and improving watershed management with a focus on healthy headwaters. 

Sonoma County–Specific Efforts

Portrait of Sonoma County

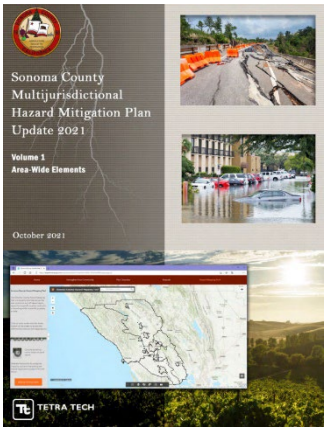
The Portrait of Sonoma County was updated in 2021 and provides an overview of the demographic characteristics of Sonoma County. The document is a summary of the data and information available about the people who live within Sonoma County and highlights demographic, health, and quality of life factors, such as life expectancy, access to knowledge, and a decent standard of living. In addition to the characteristics of the people within the county, the portrait includes a summary of the challenges people face in Sonoma County, which includes wildfires, the COVID-19 pandemic, the affordable housing shortage, economic insecurity, and disproportionate harm falling on communities of color. The information in the Portrait of Sonoma County, as well as the Metropolitan Transportation Commission's Equity Priority Communities data, informed the project locations, approach, engagement, planning, design, and implementation.



Sonoma County Multijurisdictional Hazard Mitigation Update 2021

In 2021, the County completed an update to its Multijurisdictional Hazard Mitigation Plan (HMP) (Permit Sonoma, 2021b). The County is using the HMP to help establish priorities for hazard mitigation. In developing this Lands Strategy, the project team assessed these priorities to ensure alignment with the recommendations and priorities being developed for the Lands Strategy. Relevant objectives related to retrofitting, purchasing, mitigating, and relocating structures in high-hazard areas; preventing or discouraging new development in hazardous areas; and considering the impacts of natural hazards in all planning mechanisms that address current and future land uses within the planning area.

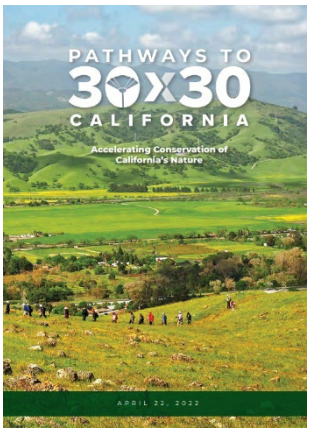
The HMP also included a survey of the community. One question asked which hazards people were most concerned about. Respondents ranked wildland fire first, followed by climate change and drought. Other relevant concerns included loss of development and vineyard expansions, damage to forests from the wildfires, as well as wildfire concerns related to development expansion and a lack of forest management.



Sonoma County RCPA's Climate Mobilization Strategy

The RCPA's Climate Mobilization Strategy details actions that could be taken within Sonoma County to reduce greenhouse gases significantly by 2030. Adopted by the RCPA Board of Directors in 2021, the strategy focuses on solutions that are resilient, equitable, and transformative. Within the Climate Mobilization Strategy, the RCPA organized policy strategies in relation to four key initiatives: decarbonization, carbon sequestration and ecosystem services, resilience and adaptation, and equity and community engagement. The Climate Mobilization Strategy provides broad findings and recommendations that are useful as a starting point when considering project types and priorities for this Lands Strategy, and it served as a helpful resource for developing carbon sequestration and greenhouse gas emissions projects.

Table 4. Existing efforts related to the state of California.

Statewide Efforts	
Natural and Working Lands Climate Smart Strategy 2021 The state of California continues to be a leader in climate resilience, and the Draft Natural and Working Lands Climate Smart Strategy, which the state released for public comment in October 2021 and has yet to finalize, is an example of this leadership. The strategy includes an assessment of the benefits of the state's different landscape types, recommended priority actions and approaches, and profiles for different regions in the state (California Natural Resources Agency, 2021). The state's approach for considering the climate resilience potential of its various types of natural and working lands, as well as its consideration of opportunities to address climate change, informed the approach of this Lands Strategy in considering ecoregions, project types, and recommended actions.	
Pathways to 30x30 California 2022 The state released the Pathways to 30x30 California strategy in April 2022. The report provides a range of actions designed to result in 30% of California's lands being conserved by 2030. This goal translates specifically to six million acres of land and half a million acres of coastal waters. Currently, California has conserved 24% of its lands and 16% of its coastal waters; the strategy provides clear objectives for how California can reach its 30x30 targets and articulates the benefits of increased protection of land and waters. The 30x30 strategy also includes principles for advancing justice, equity, diversity, and inclusion. These principles provided support for the approach outlined in the Lands Strategy of including social indicators, as well as screening and performance criteria to ensure that climate equity and justice are built into the County's approach to project engagement, planning, design, and implementation.	

VI. Engagement Process

The County coordinated a robust engagement process to ensure it considered multiple stakeholder perspectives during the development and refinement of the Lands Strategy. The Lands Strategy also draws upon the findings of the Vital Lands Initiative engagement process. The sections below summarize the County's engagement philosophy and the County's engagement approach while developing this strategy. Figure 2 highlights the main groups engaged throughout the development process, all of which are described in more detail in the sections that follow.

Figure 2. Groups engaged during strategy development.

Technical Advisory Committee (TAC)	Implementation Advisory Group (IAG)	Tribal Representatives	External Stakeholders
• Provided insights and feedback regarding the best available science, data sources, information gaps, areas of uncertainty, climate projections, and project types. • Included representatives from organizations such as Sonoma Ecology Center, the Carbon Cycle Institute, Ag + Open Space, Sonoma Water, and more.	• Provided insights and feedback regarding County priorities, assessment and prioritization criteria and processes, and project implementation recommendations. • Included representatives from organizations such as Permit Sonoma, the Sonoma RCPA, Sonoma Land Trust, and more.	• Provided input regarding critical tribal land resilience priorities, risks from climate change to tribal lands and cultural resources, and strategies for ongoing tribal engagement. • Included representatives from the Dry Creek Rancheria Band of Pomo Indians, the Federated Indians of Graton Rancheria, the Lytton Band of Pomo Indians, and the Kashia Band of Pomo Indians.	• Provided feedback on community priorities, potential project types and locations, and effective strategies for ongoing public engagement and feedback. • Included representatives from organizations such as North Bay Jobs with Justice, Pepperwood Preserve's Native Advisory Council, Red H Farm, and more.

Engagement Philosophy

Throughout development of the Lands Strategy, the project team engaged diverse members of the broader community to deepen understanding of both technical and cultural aspects of resilience and land management. This engagement helps identify data sources, connect to the best available science, offer input and advice on recommended resilience actions, and ensure County agencies and outside organizations can use the outcomes of the Strategy to advance their own priority actions. The County strove to provide a forum that allowed partners to:

- **Share ideas and information** regarding existing efforts and knowledge so the Lands Strategy builds on and leverages existing work, rather than replicating other efforts, to help develop a countywide approach to resilient natural and working lands.
- **Offer feedback and engage in conversation** on components of the Lands Strategy to ensure it reflects the priorities and needs of agencies, organizations, and communities in the county.
- **Strengthen relationships and trust** between the partners and the County to promote future collaboration on or funding of priorities and projects identified through the Lands Strategy. Engagement activities also helped identify partnerships that could allow different priorities to be implemented together more efficiently and effectively by finding shared issues and key geographies for priority action.

Existing Engagement Efforts

As mentioned earlier, the Lands Strategy is built on the foundation of many recently adopted plans and processes that identify community priorities and interests. With input from the TAC and IAG, the project team identified the following engagement processes as most relevant and useful for insights into the County's views and priorities on natural and working lands and climate resilience. For a summary of the work that reviewed for the Lands Strategy, see Appendix C.

Vital Lands Initiative Engagement

In developing the Vital Lands Initiative, Ag + Open Space conducted an extensive public engagement process. Beginning in 2017, it held over 150 meetings and workshops, which allowed for receiving input from over 600 community members. Ag + Open Space also coordinated closely with the public, local Native American tribes, technical advisors, and the Ag + Open Space Board of Directors, Fiscal Oversight Commission, and Advisory Committee. To ensure opportunities to engage Spanish-speaking populations, Ag + Open Space created a Spanish-language website and associated outreach material, in addition to providing simultaneous translation services at meetings and conducting specific outreach meetings to Latinx groups throughout the county.

The extensive community meetings held for the Vital Lands Initiative provided useful feedback that the project team drew upon in developing the Lands Strategy. (See Appendix B of the Vital Lands Initiative for a summary of findings from this process). Table 5 below highlights major themes from the Vital Lands Initiative engagement, in addition to detailing actions taken to address comments that arose from this previous engagement.

Table 5. Key themes from Vital Lands Initiative public engagement and how the Lands Strategy addresses these themes.

Theme	Actions Taken in Lands Strategy to Address Comments
The importance of connected conservation corridors for both recreational and wildlife purposes.	Indicators, as well as screening and performance criteria to prioritize projects, described within this strategy focus on the importance of habitat connectivity and corridors.
The need of the agricultural community for new and additional tools for agricultural protection, as well as increased agricultural diversity.	The project types described in the strategy present examples of potential tools and frameworks—with a focus on restorative agriculture and agroecological frameworks—the agricultural community could use to strengthen protection and resilience of agricultural lands.
The opportunity for using education of the public to increase understanding of the importance of protection and management of natural and working lands.	Development of this strategy included an extensive public engagement process to learn from the community regarding their priorities for resilient lands. The final chapter of this strategy also outlines how the County will continue to engage the public throughout strategy implementation.
The critical role of vegetation and fuels management in promoting resilient landscapes.	The ecoregions and project types presented in the strategy highlight the importance of diverse vegetative habitats, as well as fuels management and other proactive land management strategies, in strengthening landscape resilience.
The need for a clear prioritization process (including linkages to funding opportunities) for projects that strengthen resilience of natural and working lands.	This strategy includes a detailed decision-making process that will help the County prioritize climate-resilient lands projects.
The importance of public access to both urban and rural open space for communities throughout the county.	Indicators, as well as screening and performance criteria, within this strategy emphasize the importance of public access for urban and rural open space. Proposed project types also underscore the key role open spaces play in strengthening landscape resilience.

Other County of Sonoma Engagement Efforts

Extensive stakeholder engagement was conducted as part of two other recent initiatives: development of the Sonoma Water Climate Adaptation Plan (CAP) in 2021 and the Sonoma County Multijurisdictional HMP, led by Permit Sonoma and also adopted in 2021.

For the Sonoma Water CAP, Sonoma Water engaged contractors, Sonoma Water customers, partners, other state and federal agencies, research institutions, and the public as part of its engagement process. Sonoma Water held in-person meetings with stakeholders prior to the COVID-19 pandemic, as well as a series of targeted virtual engagement and individual meetings throughout the pandemic to discuss the vulnerability and risk assessment conducted for the CAP, as well as development of the adaptation strategy and preparation for the CAP. (See Sonoma Water's 2021 Stakeholder Engagement Plan for details regarding the various stakeholder groups engaged.)

For the HMP, Permit Sonoma established a stakeholder steering committee to provide guidance throughout the engagement process. The committee included representatives from partner organizations, as well as citizens and other stakeholders in the planning area. The steering committee held nine meetings in 2020 and 2021. These meetings allowed the committee to work through a range of topics, including the planning process, how to identify hazards of concern, plan objectives, and identified projects. (For a detailed summary of public engagement, see Appendix A of the Multijurisdictional HMP.)

Technical Advisory Committee

The project team formed a TAC to bring together experts in Sonoma County to help the project team identify the best data sources and data and information gaps, discuss areas of uncertainty, and assist the team with selecting downscaled hazard projections and scenarios to ensure recommended projects are robust and adaptable. A critical component of the TAC's work was to review and refine recommended projects, provide input on the decision-making process for designing and prioritizing projects, and ensure the County could maximize benefits and reduce negative externalities. The TAC included representatives from a variety of County government agencies, research organizations, and nonprofits (see box to the right), and the project team engaged with the TAC through a series of five virtual working meetings.

TAC Members

- Rob Bamford, Northern Sonoma County Air Pollution Control District
- Caitlin Cornwall, Sonoma Ecology Center
- Torri Estrada, Carbon Cycle Institute
- Susan Haydon, Sonoma Water
- Valerie Quinto, Sonoma Resource Conservation District
- Lisa Micheli, Pepperwood Preserve
- Melanie Parker, Sonoma County Regional Parks
- Allison Schichtel, Sonoma County Ag + Open Space
- Sam Veloz, Point Blue Conservation Science

During discussions with the TAC, the group affirmed the importance of considering and prioritizing critical County assets, equity, and marginalized communities within the context of this Lands Strategy and actions the County could take to strengthen the resilience of its lands. The TAC also provided extensive feedback regarding climate and hazard projections and helped direct the project team toward many relevant resources that subsequently were used while developing this strategy. Table 6 below summarizes additional key themes raised by the TAC and how these themes are reflected in the Lands Strategy.

Table 6. Key themes raised by the TAC and how the Lands Strategy addresses these themes.

Theme	Actions Taken to Address Comments
The importance of having specific, scientifically grounded indicators to assess resilience.	The social and physical indicators of climate resilience used to inform the Lands Strategy were revised extensively based on TAC feedback. TAC feedback on the indicators also helped inform development and identification of the screening and prioritization criteria that are part of this strategy's decision-making framework.
The communities and institutions that manage and are dependent upon natural and working lands must be reflected in defining resilience for Sonoma County. Having strong and high-capacity communities and institutions is a key component of resilience.	The Lands Strategy's resilience definition now reflects TAC feedback, in addition to identifying indicators, screening, and prioritization criteria that can help the assess how well potential projects may be addressing these issues.
Issues of worker health and safety (e.g., farmworker exposure to risk) are integral to considering social resilience of lands.	The Lands Strategy now includes additional indicators, as well as prioritization criteria, related to worker health and safety.
Food security is a critical issue and important indicator of resilience for the County.	The Lands Strategy now includes additional indicators and prioritization criteria related to food security; this theme is also now reflected in the definition of resilience.
Regenerative agriculture and agroecological practices are increasingly emerging as innovative techniques for advancing resilience of agricultural lands.	Recommended project types include a strong focus on regenerative and agroecological farming practices.

Implementation Advisory Group

In addition to the TAC, the project team also formed an IAG comprised of local agencies and organizations that hold a wealth of critical knowledge and are working on resilience projects and efforts (see box to the right). An important characteristic of this group is that the project team selected participants to represent agencies and organizations that will ultimately be the end users of the Lands Strategy. The purpose of the IAG was to advise the project team on available data and resources, identify County priorities, and provide input on assessment, evaluation, and project implementation recommendations. Their participation helped ensure that the Lands Strategy is not redundant to the work of their organizations but serves to integrate their work into the plan in a way that results in robust and implementable actions. By working in partnership with the IAG through a series of four working meetings, the project team worked to ensure the Lands Strategy will advance the goal of integrating the County's resilience work and positioning the County for funding and financing by building a vision that is shared and aligned across agencies, organizations, and sectors.

IAG Members

- Dee Swanhuyser (Taking Action for Living Systems)
- John Mack (Permit Sonoma)
- BC Capps (Sonoma RCPA)
- Sashi Sabaratnam (UC Cooperative Extension)
- Eamon O'Byrne (Sonoma Land Trust)
- Tom Gardali (Audubon Canyon Ranch)
- Danielle D'amour (Sonoma Wine and Grape)
- Representatives from the Federated Indians of Graton Rancheria

Like the TAC, the IAG provided feedback on the overall approach to the Lands Strategy, as well as detailed comments that helped shape the direction of the indicators, screening, and prioritization criteria. The IAG also affirmed the utility of analyzing the County's resilience and determining project types according to ecoregions (see Appendix A for more detail). Table 7 below summarizes additional key themes raised by the IAG and how these themes are reflected in the Lands Strategy.

Table 7. Key themes raised by the IAG and how the Lands Strategy addresses these themes.

Theme	Actions Taken to Address Comments
Clearly defining the different components of a resilience system is necessary to demonstrate the various factors that will constitute natural and working lands resilience within the County.	The strategy's definition of resilience now incorporates comments of the IAG and delineates the various aspects of a resilient landscape.
U.S. EPA Level IV ecoregions of California provide a useful data source for determining ecological zones within Sonoma County.	This affirmed the project team's approach and underscored the importance of defining project types and priorities based on EPA's ecoregions data.
In determining ecoregions and project types, it is important to consider some of the detailed and precise data available for different areas, such as that through EPA's ecoregions, as well as the Sonoma Veg Map.	The strategy includes detailed examination of existing data regarding the diversity of vegetation present in various ecoregions.
The potential of creating management strategies for biodiversity and carbon sequestration is an important factor in considering how natural lands may be able to strengthen resilience.	The project types described within this plan reflect potential practices that could help reduce methane and increase carbon sequestration potential.

Tribal Engagement

Local Native American tribes throughout the region are critical partners for the County's approach to climate-resilient lands. To identify tribal priorities and opportunities for aligned approaches and future partnerships, the County initiated engagement with representatives from the Dry Creek Rancheria Band of Pomo Indians, the Federated Indians of Graton Rancheria, the Lytton Band of Pomo Indians, and the Kashia Band of Pomo Indians. (Note that the County sent a request for participation to all five federally recognized tribes; however, only four were able to participate.) The tribal representatives worked with the County to identify common objectives and shared experiences, and raised many important themes related to this Lands Strategy, which are listed below. The box to the right provides details on actions the County has taken and will take to address tribal feedback.

- Local Native American tribes have considerable experience and expertise to draw upon in designing strategies and projects to strengthen resilience of natural and working lands. The County should continue to determine proactive strategies for tribal engagement through its efforts to advance resilience throughout Sonoma County.
- Local Native American tribes and tribal representatives should be included early on in project development to identify critical assets and issues related to natural land resilience.
- A list of land features and values that are important to tribes, and a list of acknowledged high-priority tribal cultural resources and tribal cultural properties, could be useful in considering potential priorities for landscape resilience and determining potential climate resilience projects.

Actions Taken to Address Local Native American Tribal Feedback

Collaboration with tribes informed the County's development of indicators, screening and prioritization criteria, and project types. For instance:

- The County added indicators and screening criteria related to including tribal engagement, furthering tribal access, and considering tribal priorities and cultural resources.
- Moving forward, the County will hold regular meetings with tribes regarding Lands Strategy implementation to continue discussing themes that are important to the tribes, as well as details related to projects the County will implement based on the strategy.
- Future meetings will also help identify potential opportunities for federal funding related to tribal land resilience, elevate tribal knowledge, and experience and ensure prioritization of critical issues for the tribes.

- Tribal representatives expressed concerns regarding issues of access (including ingress and egress) to tribal lands through state and county roads and how these roads could be impacted during disasters. It is important for the County to consider and prioritize the resilience of this infrastructure to ensure the safety of the tribes and their resources.
- The County should consider creating clear indicators of how to prioritize tribal cultural properties, resources, and infrastructure in concert with other indicators of resilience. The County should also be transparent regarding the process they will use to continue collaboration with the tribes.

Additional Stakeholder Engagement

To ensure broad representation of stakeholders and elevate perspectives from underrepresented communities such as equity experts, agricultural workers, farmers, and tribal communities throughout Sonoma County, the project team coordinated two stakeholder focus groups and additional targeted, smaller meetings with key stakeholder representatives. These focus groups and meetings included representatives from the following entities:

- Ag + Open Space Advisory Committee
- Greenbelt Alliance
- LandPaths
- Municipal Advisory Councils
- North Bay Jobs with Justice
- Outdoor Afro
- Pepperwood Preserve's Native Advisory Council
- Red H Farms
- Sonoma County Regional Parks
- Sonoma County Community Development Commission

In the meetings, the project team provided stakeholders with an overview of the Lands Strategy and its development process, and requested feedback on the strategy goals, hazards, example projects, and the prioritization and decision-making process. Table 8 below summarizes key themes highlighted by the focus groups.

Table 8. Key themes raised by the Focus Groups and how the Lands Strategy addresses these themes.

Theme	Actions Taken to Address Comments
It is important to bring climate resilience benefits to areas that do not currently enjoy them. The County should design projects with the most vulnerable populations in mind. Additionally, the design of new open spaces, parks, and trails should be transparent and actively include the community in the planning and decision-making process.	Many of the project type concepts and their designs stemmed directly from comments heard at the stakeholder meetings. These comments informed final development of indicators and screening and prioritization criteria, including many related to providing benefits to underserved and under-resourced communities.
The County needs to design outreach regarding the Lands Strategy and its subsequent projects in clear, common language. To promote ongoing outreach, education, and participation, the County could partner with community organizations.	The Lands Strategy recommends continuing to prioritize public engagement early in project design as projects move forward from the strategy. The Lands Strategy also recommends continued collaboration with the groups engaged and other relevant community organizations throughout the implementation of this strategy.
Climate efforts should focus on systemic rather than individual change. Similarly, natural and agricultural lands and the people are not separate; they are one	The Lands Strategy now reflects a more robust consideration of how to consider natural and working land resilience benefits in the context of developed

Theme	Actions Taken to Address Comments
system, and the County should consider them in that way.	areas.
The County should consider how to protect and advocate for workers on natural and working lands whose jobs are threatened by climate change and additional social factors.	The Lands Strategy now includes additional indicators, as well as prioritization criteria, related to worker health and safety.
Transitioning from standard farming practices to more regenerative and ecologically based practices can be difficult and costly. Additionally, it can be difficult for small farmers to access the resources that they need for resilience-focused projects. Providing technical assistance (e.g., grant-writing assistance, implementation support) is a critical tool the County could design in partnership with the communities it intends to serve and engage.	The Lands Strategy now includes many recommendations and project types related to promoting regenerative and ecologically based practices.
Peer-to-peer learning among land managers, farmers, and others involved in resilience efforts in Sonoma can be a useful way to provide more technical assistance and grow capacity. RCDs could take a more active role in peer-to-peer learning.	The Lands Strategy now includes specific project types and recommendations related to promoting peer-to-peer learning.

Next Steps

As implementation of the Lands Strategy moves forward, the County will conduct ongoing community outreach and engagement to help ensure that community members, organizations, public agencies, and private landowners—as well as farmers, farmworkers, and community organizations working on climate justice and the rights of the underserved—are included in the scoping, planning, design, and implementation phases of each project. The County will use ongoing stakeholder engagement to adaptively manage and update the Lands Strategy as needed.

VII. Planning Horizon

The Lands Strategy is intended to be broad enough to guide climate resilience projects in the near and mid-term and flexible enough to be adapted as conditions change to consider actions to address long-range climate projections. For the purposes of the Lands Strategy, near-term is within 10 years and mid-term is 10 to 30 years. Since the Lands Strategy is designed to serve as a basis for the County to consider ongoing actions to conserve, manage, and restore as much of the county as possible to address the great needs and risks that climate change poses, the planning horizon for the Lands Strategy is long-range, which is 30 to 100 years. While the recommended near-term actions will focus on areas with the greatest potential to reduce current and projected climate risks, preserve native species and biodiversity to allow them to adapt and persist, and reduce carbon where possible, there are many additional actions included in the Strategy that can be taken as opportunity arises, funding becomes available, or priorities shift.

In addition to the availability of resources, new findings will continue to emerge related to climate science and best practices for managing lands during extreme drought conditions, including reducing wildfire risks, and the projects that are implemented in the next five to 10 years will provide us with information that can be used to improve future project designs. These uncertainties and future opportunities are best addressed by a Lands Strategy that keeps open as many options as possible and provides the landscape the best chance to adapt by conserving and restoring large, interconnected, and diverse lands, while

preserving and supporting agriculture uses that promote regenerative practices to sustain the land through a range of potential futures.

Where appropriate in the project types, the Lands Strategy makes recommendations for near-term actions, and then potential adaptation measures for the mid-range and long-term resilience and sustainability of the lands. Additionally, some project types are programs, planning, or policy actions, and these will also have a near-term, mid-range, and long-range trajectory as they advance from scoping and planning to design and implementation. As projects continue to advance from the Lands Strategy, the County should revisit and revise it to ensure it remains relevant to the County and its partners.

VIII. System-Wide Findings

The impacts of climate change on Sonoma County's natural and working lands are not anticipated to be uniform and will vary based on some of the vulnerability characteristics that are both inherent to specific vegetation communities, as well as those present in the management and condition of the ecosystem and agricultural lands (Weiskopf et al., 2020). Certain natural communities, species, agricultural types, and human communities are more likely to readily adapt to a changing climate based on existing resilience characteristics, while others will be more sensitive due to existing or underlying factors and stressors.

Landscape-Scale Resilience

At a landscape scale, components of the natural and working lands system will have different climate risk thresholds; however, changes or shifts of any one component of the system could have system-wide implications. This interconnectivity is evident when looking at vegetation communities, in which the dominant constituents are highly sensitive to extreme temperatures. Changes due to climate change could result in potential mismatches between plants and pollinators, causing reduced plant reproduction success (Gérard et al., 2020). Plant species may respond by shifting laterally or vertically to habitat or climate regimes that are more suitable but may be restricted by landscape fragmentation or reach the edge of their geographic ranges (Ackerly et al., 2020). Some studies suggest that generalist species may more readily adapt to changes, while specialist and endemic species may be less resilient (Gérard et al., 2020).

Due to the interconnected nature of how the lands will respond to climate change, it is important to consider the entire system rather than one species or small geographies when developing principles for climate resilience. Strategic conservation planning should provide ways for species and natural communities to adapt and shift by conserving and restoring areas that are larger and more connected, include buffers, and provide for vertical and horizontal movement. A climate-resilient landscape is one that can provide multiple benefits for the natural and human environments by accommodating shifts in habitat for a range of species, preserving biodiversity, restoring ecosystem health, managing environmental stressors, and incorporating climate-smart management practices of both natural and working lands. Ultimately, climate adaption strategies implemented at a landscape scale should recognize the interdependences of the different elements of the landscape and provide space, connections, redundancies, and opportunities to continue to adapt to future conditions.

Landscape-scale conservation, management, and restoration principles should include the following:

- **Protect areas of high native biodiversity.** Studies indicate that biodiversity has a positive correlation with climate-resilient land qualities (Hisano et al., 2018).
- **Protect large and intact landscapes.** Larger areas offer greater opportunity for species range shifts and mitigate geographic edges (Lehikoinen et al., 2021).
- **Restore habitat connectivity.** Fragmented landscapes increase risk of species loss and reduce movement of native species, migration during disasters, and gene transfer on the landscape (Hilty et al., 2020).
- **Conserve landscape mosaics.** Lands supporting networks of streams, wetlands, and riparian and upland areas reduce risk of monoculture failure and increase persistence of biodiversity (Bay Area Council, 2019).
- **Protect landscapes with topographic complexity.** Topographic diversity provides opportunities for adaptation and range shift (Ackerly et al., 2020).

- **Restore degraded lands and manage lands for climate adaptation.** Restoring lands to healthy conditions will increase carbon sequestration and storage, increase opportunities for adaptation, and reduce wildfire, flood, and heat risks (California Natural Resources Agency, 2021).
- **Provide climate resilience through regenerative agricultural practices.** Sustainable and regenerative agricultural practices used for croplands, vineyards, and grazing lands can provide climate, biodiversity, and social benefits. Using water and soil management practices to increase soil organic matter can lead to increased carbon sequestration, increased primary productivity, and improved soil moisture (Lal et al., 2011).

Watershed-Scale Resilience

Watersheds are a critical and interconnected systems that support all functions of life and ecology. The water supply protected within Sonoma County's watershed system will greatly affect the ability of ecosystems to adapt to changing conditions. The impacts on the landscape, natural resources, and human communities are already apparent. As of August 2022, the National Integrated Drought Information System showed 100% of Sonoma County in severe drought. Based on the 2020 crop report, low rainfall and excessive heat contributed to widespread reductions in agricultural production and values (Sonoma County, 2020a). Furthermore, despite proactive and aggressive measures to improve water use efficiency, water levels in the county's primary water storage reservoirs continue to dip under target levels (Wyant, 2022). Much of California is prone to periods of drought conditions, a regional phenomenon that can be traced back to more than 1,000 years (California Department of Water Resources, 2022b). However, in the past two years, the southwestern United States has endured what scientists are characterizing as the driest drought in the past 1,200 years, which was partially attributed to anthropogenic climate trends (Williams et al., 2022).

The severity and intensity of drought conditions due to rising temperatures and increased evapotranspiration, as well as the cascading impacts of prolonged droughts, are anticipated to put increased demands on water resources throughout Sonoma County. Adding to this demand, a number of water bodies in the county are already highly stressed and degraded due to anthropogenic causes, including development/increased impervious surfaces, road crossings, water quality issues, vegetation removal, diversions, dams, channelization, and flow managed for other purposes.

Watershed management principles to improve resilience should include:

- **Focusing on headwaters.** Conservation measures should protect rivers and streams at their origins by restoring headwater stream functions and conditions.
- **Restoring degraded natural systems.** Reconnect historical floodplains by slowing flow velocities through increased surface roughness, improving sediment capture, and stabilizing natural systems; restore and enhance seasonal wetlands and mesic meadows by improving infiltration and recharge (Nifong & Taylor, 2021).
- **Limiting development within floodplains.** Development and disturbance in the floodplain reduce the health of rivers and streams, decrease biodiversity, increase flood and fire risk, and place downstream ecosystems at risk (Jackson et al., 2019).
- **Managing forests in watersheds.** Manage tree cover (e.g., shading/temperature stabilization), slope stabilization, and soil moisture. Prioritize post-fire mitigation activities within impacted riparian/forested stream systems, in addition to fuel management in post-burn areas to remove burned material and control invasive species (e.g., a recent Coastal Conservancy grant issued to Dry Creek Rancheria).

- **Using vegetation to improve hydraulic residence times.** Slowing and storing water in vegetation and soils reduces flood risk and erosion, improves water quality, and increases native species' access to water. Vegetation in agricultural ditches was found to improve water and nutrient retention (Nifong & Taylor, 2021).
- **Integrating stormwater management into stream restoration efforts.** Combining stormwater management with stream restoration in urban settings can improve water quality, reduce channel erosion, and lower flood, fire, and heat risk (Lammers et al., 2020).
- **Avoiding piecemeal, small-scale stream restoration.** Increasing climate resilience requires restoration at both landscape and watershed scales. Small, site-specific actions that are disconnected from a larger system approach will not provide the scale of benefits necessary.

Selecting watershed conservation and restoration actions to improve resilience should involve evaluating the overall benefits of the action to the entire system. Furthermore, management decisions based on future climate scenarios should include downscaled modeling and, where available, existing monitoring data.

Priority Landscape- and Watershed-Scale Project Recommendations

To prepare for climate change and better position the natural and working lands within Sonoma County to adapt or withstand changes in climate, the County and partner agencies and organizations should prioritize conservation strategies that protect existing areas of high biodiversity, areas of high topographic complexity, current and historic ecological connections including riparian corridors, headwater streams, climate refugia habitats, and native vegetative communities. While climate change will result in shifts and loss of species ranges, the natural and working lands will have a better chance to withstand or adapt if they are conserved and managed to reduce non-climatic stressors, such as land use conflicts, pollution, loss of area, invasive species, loss or alteration of water sources, and soil erosion or degradation. The County and partner agencies and organizations should consider adding climate resilience to their missions and objectives and ensure that it is one of the primary factors considered when using limited land management and conservation dollars.

Specifically, within Sonoma County lands supporting headwaters, wide riparian and stream corridors, climate refugia, species range edges, unique soils, and horizontal and vertical transition zones should be prioritized for conservation. This approach would contribute to the long-term sustainability of natural and working landscapes and resources, including groundwater and soils, as well as reduce risks from fire, flood, and heat throughout Sonoma County. Focusing on these lands for conservation also would provide resilience benefits that encompass both the more remote areas of the county and the valleys rich in biodiversity and with denser human populations.

Prioritizing the conservation of riparian and stream corridors will likely require the reconfiguration of the current shorelines and restoration of upland transition zones, as well as the relocation of some current land uses within these corridors. Forested riparian areas provide a multitude of climate resilience benefits, including serving as important corridors for wildlife and plant species, protecting water and groundwater supplies, providing shade for temperature control and reduced evapotranspiration, decreasing soil erosion, mitigating high flow events, providing water quality benefits, and acting as natural or nature-based fire breaks. Additionally, the County should prioritize conservation and purchase of lands within and adjacent to forests and forests systems with headwater streams to assemble large, contiguous areas of conserved forest lands that can be well-managed over time. The County can implement climate-focused management and stewardship of forest lands to increase biodiversity and reduce fire risk, including allowing for a broader array of fire management strategies across more of the land including prescribed burns and grazing. Additional actions the County could take include landscape scale

approaches to addressing fire risk, such as protecting and restoring broad riparian corridors and resilient community corridors and buffers between forests and more densely populated areas.

Conservation strategies in Sonoma County have traditionally been focused on reducing development pressure and retaining grazing uses and farmlands. While these objectives remain important, the lens of climate resilience should be prioritized as a critical factor, and traditional conservation easements should include conditions, assistance, and support for regenerative practices, preservation and restoration of native species and diverse habitats, and strategies to support and protect groundwater and soil health. Conservation must begin to include climate resilience as a priority and advance the recommendations described above through additional funding sources, new partnerships, and explicitly stating climate resilience as a top priority.

Building upon the principles for landscape- and watershed-scale resilience described above, the following is a list of recommendations for priority actions. The recommendations below are actions that should be prioritized at the countywide scale, listed in alphabetical order:

BRING CLIMATE RESILIENCE TO PEOPLE MOST AT RISK

Why? Engagement for the Lands Strategy included organizations representing underserved and underresourced communities and workers. Representatives of these organizations shared the concern that underserved and underresourced populations were going to experience climate risks most acutely and would not be adequately engaged in the process to identify solutions. Representatives also observed that disadvantaged populations have less access to climate-resilient lands and their benefits. It is true that climate risks and resilience are not distributed equally (American Forests, n.d.). Disadvantaged and marginalized communities and populations are often the first to experience climate-related risks and have fewer climate-resilient characteristics in their communities (U.S. EPA, 2021). In Sonoma County, based on the data and findings analyzed for this Lands Strategy, many of these populations are located in developed lands, which have fewer naturally occuring and climate-resilient characteristics.

What? There are several projects recommended in the Lands Strategy that will provide climate-resilient benefits and reduce risks to disadvantaged and marginalized populations. For the projects recommended by this Strategy that will contribute to bringing climate resilience to those most at risk, see Appendix A: Project Concepts. The most relevant projects include Resilient Community Corridors, Resilient Buffer Zones, Support Regenerative Agricultural Practices, Urban Stream Restoration, and Green Infrastructure for Climate Resilience. Details on these projects are in Appendix A: Project Concepts.

Andy's Unity Park, Southwest Santa Rosa (Sonoma County Regional Parks)

Who? There are a number of agencies and organizations that could lead projects to increase the climate resilience of the lands within which disadvantaged and marginalized populations live and work. Given the

importance of these projects to reducing risk and increasing resilience to communities, workers, critical physical and ecological assets, and the economy, the County should prioritize taking the lead on securing funding, identifying partners, developing inclusive planning and design processes, and implementing these projects with private, nonprofit, educational, and other institutions. Prioritizing funding assistance for lower income communities that are most likely to experience disproportionate climate impacts will be critical.

CONSERVE AND MANAGE FORESTS

Why? Forests make up approximately 50% of the land within Sonoma County. Forests are the most important climate asset and risk within the county. Healthy forests are the best natural defense against wildfires. Fire-resistent forest characteristics include older and larger trees, the presence of biodiversity and a landscape mosiac, stand and landscape complexity, and predominance of native species, as well as larger, connected areas of forestlands and other land types such as native grasslands, riparian corridors, and wetlands. Healthy forests store water in soils, roots, canopy and ground cover, and leaves, reducing the impacts of drought (Braatz, 2012). They also provide for healthy riparian corridors that reduce flooding, erosion, and runoff, as well as impacts from drought, by slowing and storing water in the landscape. Healthy forests provide climate benefits to the entire county, and not just to adjacent lands. These countywide, landscape-scale benefits include reducing the effects of high-heat days and nights (particularly for forest in or near urban areas), serving as fuel breaks to communities across the county, and diverting water for environmental benefit that would otherwise create runoff, flooding, and erosion to downstream land uses.

Healthy, robust, and connected forests can sequester and store significant amounts of carbon. This sequestration and storage happens in layers, starting at the soils and root systems and moving up through the ground cover, leaves, and canopies. While many types of land can store and sequester carbon, forests have been found to have the second-largest potential (behind wetlands) for carbon sequestration if properly managed for that purpose (Fargione et al., 2018). Therefore, forests should be conserved to prevent conversion of these habitats to other land uses such as agriculture or development uses. Healthy forests also better resist wildfires, which contribute greatly to carbon emissions. In 2020, the estimated carbon emissions from California's wildfires was 111.7 million metric tons, more than any economic sector except for transportation (Morris, 2020). Additionally, according to Chapter 7 (Agriculture, Forestry, and Other Land Uses (AFOLU)) of the International Panel on Climate Change (IPCC)'s sixth Assessment report, deforestation accounts for 45% of total AFOLU CO_2 emissions (IPCC, 2022).

What? Conserve existing healthy forests and conserve, manage, and restore degraded forests in high-fire-risk zones. Prioritize conserving areas that increase the size of protected forestlands, provide connections with other conserved land, include aquatic lands and riparian corridors, and include topographic diversity and species complexity. Use climate-resilient forest management practices and test approaches including tree clustering and spacing that mimics historical ecological patterns. Implement the use of prescribed burns (including in coordination with local Native American tribes on tribal lands in areas with traditional cultural burns), grazing, and non-native species removal and fuel load thinning to benefit ecological resources and climate resilience. Introduce complexity and diversity of age and species to monocultural, dense forest stands. Conserve, manage, and restore the landscape to enable a protected mosaic of

different land types that will provide risk reduction, genetic transfer, wildlife migration, and the ability for habitats, wildife, and vegetation to shift and adapt to new climate conditions (Kelsey, 2019).

For the projects recommended by this strategy that will contribute to conserving and managing forests for climate resilience, see Appendix A: Project Concepts. The most relevant projects are Adaptive Forest Management and Conservation Forestry, Fuels Treatment and Post-Fire Forest Restoration, Conserve and Restore Areas for Biodiversity, Prioritize Soils and Water, and Develop and Implement a Strategic Vision.

Fire Manager Using Prescribed Fire to Maintain the Landscape (National Park Service).

Who? Ag + Open Space should work closely with Regional Parks, Sonoma Water, RCDs, land trusts, local Native American Tribes and other community-based organizations in Sonoma County to identify priority actions to increase the climate resilience of Sonoma County. These partners, and others, should develop a common strategic vision to guide conservation, management, and restoration priorities and identify leads for each action and funding sources that can be used to implement the vision in phases based on the most urgent risk reduction and most significant resilience benefits.

CONSERVE AND RESTORE NATIVE GRASSLANDS

Why? Grasslands are referred to as herbaceous by the Sonoma County Vegetation Map. This vegetation type is frequently used as grazing land in Sonoma County and, at 25% of land cover, grasslands make up a significant percentage of the county's lands. Both the amount of acreage and the potential for improved management make grasslands an important climate resilience priority. Both the TAC and IAG identified grasslands and grazing lands as having agricultural and ecosystem value, presenting opportunities to increase climate resilience, and presenting concerns related to climate impacts. During stakeholder engagement that included agricultural representatives, concerns were raised regarding the challenges of being in agriculture in a high-cost area like Sonoma County. Based on these discussions, it was clear that grasslands represent an opportunity to increase climate benefits, are at risk from climate change, and are an important land type and land use in retaining agricultural uses and limiting the shift of these lands to high-intensity uses.

If managed for climate benefits, grasslands can provide the county with a range of benefits. The climate benefits of ecologically managed grasslands include healthy soils, water retention and filtration,

biodiversity, landscape mosaics and connectivity, wildlife and genetic corridors in response to climate hazards and climate change, and wildfire and flood risk reduction. As part of a larger, connected network of open spaces and ecosystems, grasslands can improve the health of adjacent vegetation types and native species, and provide space and topographic variety to support adaptation to future climate. Additional benefits include retaining lands for agricultural purposes, supporting local farmers, and providing for jobs and food security within the county.

Grasslands and grazing lands managed using regenerative practices can sequester and store carbon above and below the ground, with the majority of carbon storage occuring belowground and in the soils. The carbon potential is sensitive to management strategies, and degraded grasslands often emit rather than sequester carbon. The role that grasslands can play in carbon sequestration and storage can be an important contributor to the County's overall carbon reduction goals. Restoring and managing these areas to return them to native grasslands can significantly increase their carbon potential because native grasslands provide perennial cover, have deep root systems, and increase water storage and filtration—all significant factors for sequestration and storage potential (Ontl & Janowiak, 2017).

What? There are several projects recommended in the Lands Strategy that are intended to advance the conservation and restoration native grasslands. These projects include Climate-Resilient Rangeland Management Program, Carbon Banking and Carbon Sequestration Planning, and Support for Regenerative Agricultural Practices. For more detail on these projects, please see Appendix A: Project Concepts.

Dickson Ranch, Sonoma County.

Who? The County should provide support to existing organizations and programs designed to manage grasslands for climate resilience, biodiversity, and ecological health. Partners in this effort include Ag + Open Space, Sonoma County's RCDs, and Regional Parks as it relates to management and restoration potential on their lands. For more detail on the implementation and funding recommendations, please see Chapter 6: Planning, Design, and Implementation.

DEVELOP PARTNERSHIPS TO INCREASE CLIMATE RESILIENCE

Why? While the County must take a leadership role in advancing this Lands Strategy, it will require actions from a range of agencies, organizations, private businesses, private landowners, farmers, grazers, agricultural organizations, community organizations, and local Native American tribes. Particpants in the engagement for the Lands Strategy made it clear that there is widespread interest and concern regarding

the climate resilience benefits and risks to that natural and working lands. A large number of organizations are already working on these issues at smaller geographic scales, or related to a particular climate hazard or focused on a specific issue. Bringing these organizations together for the purposes of developing this Lands Strategy demonstrated the potential power that ongoing partnerships could have on advancing projects and programs out of the strategy, engaging in ongoing consultatation with local Native American tribes on climate resilience issues and priorities, and designing and convening a standing Lands Strategy working group.

What? There are several initiatives and processes the Lands Strategy recommends to advance projects, increase capacity, build trust, and share the benefits and responsiblities of taking action to build climate resilience of the natural and working lands to benefit the entire county. The recommended projects include Create Sonoma Climate Resilient Lands Strategy Working Group, Initiate Ongoing Climate Resilience Consultation with local Native American tribes, and Develop and Implement a Strategic Vision. For details on these projects, please see Appendix A: Project Concepts.

Volunteers at Saddle Mountain Open Space Preserve, Sonoma County.

Who? The County's Climate Action and Resiliency Division and Ag + Open Space should work together to advance the partnerships described above, as well as exploring opportunities for additional and new public-private partnerships that would bring together existing agencies with landowners, non-profits, and others throughout the County working on climate resilience. One consistent theme from input received by the TAC, IAG, and other stakeholders was the lack of coordination and capacity to advance climate resilience in Sonoma County. Establishing these partnerships will help build that coordination and capacity, advance the scale of action necessary to reduce the risks to the county and its natural and working lands, and realize the potential benefits from these lands. Please see Chapter 6: Planning, Design, and Implementation for recommendations on implementation and funding for this effort.

INCREASE AND CONNECT THE AMOUNT OF CONSERVED LANDS

Why? While focusing on specific types of ecosystems is important, given their unique climate resilience potential, it is also critical to expand the size of conserved lands, increase the connections between these lands, and reduce the current fragmented nature of Sonoma County's conserved areas. Engagement with the TAC and IAG, as well as other stakeholders, identified the need for increased connections, larger conservation areas, and space for climate adaptation and migration. These issues are reflected in the indicators recommended during the engagement for the Lands Strategy, which can be found in Chapter 6: Planning, Design, and Implementation.

Large areas of conservation provide a number of benefits, including a broader range of management strategies that are not limited by adjacent land uses, buffers and zones for species to migrate and adapt as climate changes, fewer non-climate stressors and shocks that usually lessen climate resilience and

adaptability, and a range of topographic, climatic, and biologic conditions that also support the adaptation and preservation of native species. For example, as sea levels rise, wetlands will need space to move inland and to higher ground to prevent being permanently innundated by high water. Riparian corridors and streams can better provide for native species when they have wide, forested buffers that reduce erosion, keep the waters cool, and resist floods and fire. Non-climate stressors on these systems—such as urban and pesticide runoff from adjacent land uses and encroaching land uses that limit management strategies needed to respond to climate change—can result in more signficant effects from climate change. By increasing the size of conserved lands, connecting management practices across different jurisdictions and owners, and adding corridors between fragmented lands, Sonoma County can acheive the scale of change necessary to improving climate resilience through its natural and working lands.

Protected Farmland in Sonoma County.

What? To realize the climate resilience potential from its natural and working lands, Ag + Open Space, land trusts and other entities in the county will need to prioritize conservation, mangement, and restoration actions based on climate benefits and climate risks. Historically, Ag + Open Space has used conservation easements and conservation actions to reduce development in agricultural and rural areas and for preserving ecosystems and habitat. There are also opportunities for the County to collaborate with local Native American tribes to determine potential processes and opportunities for creating tribal cultural use easements on regional lands within tribes' ancestral territories.

While these actions will remain important, it is also important to add a climate lens to conservation, management, and restoration projects and efforts from this point on. With both significant potential and significant risk associated with these decisions, and large-scale actions necessary, climate resilience should be one of the most important factors guiding these decisions. This Lands Strategy has specfic project recommendations to advance conservation for the purposes of climate resilience, including Climate Smart Land Conservation, Strategic Land Aquistion, Carbon Banking and Carbon Sequestration Planning, Conserve and Restore Areas for Biodiversity, and Conserve and Restore Headlands, Coasts, and Baylands. For further details, please see Appendix A: Project Concepts.

Who? The County should work with strategic partners to advance this large-scale action, including Ag + Open Space, Sonoma Water, Regional Parks, land trusts, large landowners and private businesses, and Native American tribes. For details on implementation and funding, please see Chapter 6: Planning, Design, and Implementation.

MAKE SONOMA COUNTY A SPONGE

Why? Sonoma County's Baylands, coastal areas, and rivers and streams provide a range of climate-resilient benefits throughout the entire county. Members of the TAC and the IAG, as well as those who participated stakeholder engagement for the Lands Strategy, consistently brought up the importance of aquatic areas and healthy soils. The critical nature of Sonoma County's water resources was also clear when reviewing documents such as Ag + Open Space's Vital Lands Initiative and Sonoma Water's Climate Adaptation Plan.

The climate-resilient benefits provided by aquatic ecosystems such as wetlands, rivers, and streams include the ability to capture and store water in the ecosystem, releasing it slowly to rivers, streams, and adjacent soils (Madgwick, 2022). Aquatic habitats can also provide cooling of 1 to 3 degrees Fahrenheit during the summer heat (Zhang et al., 2022). Healthy wetlands and healthy headlands can also work in tandem to reduce flood risks, erosion, and runoff, providing enough space and connectivity throughout the watershed to reduce overtopping and erosive forces. These watershed systems can also serve as firebreaks if the riparian corridor is wide enough, healthy soils are present, native vegetation is present, and the vegetation is dense. Wetlands and coastal habitats can also provide flood protection to adjacent land uses, as can healthy riparian corridors. Aquatic habitats are also one of the most adaptable land types and, if provided the space, topographic, and hydrologic conditions, will shift and move to areas where they are better able to adapt and persist. In addition to these climate benefits, wetlands and aquatic habitats host incredible biodiversity and provide support for all adjacent vegetation types. Conserving, managing, and restoring the county's aquatic habitats, including its Baylands, coasts, rivers, and streams, will be critical if Sonoma County is to increase its climate resilience, provide for adaptation, and reduce climate risks.

Healthy wetlands and aquatic habitats also provide the most carbon sequestration and storage per acre of any ecosystem type, including forests, storing 33% of the world's carbon (Valach et al., 2021).

What? This Lands Strategy includes projects that would advance the conservation and restoration of headlands, coastal areas, and Baylands. These projects include Nature-Based Approaches to Shoreline Management, Design and Planning for Flood Resilience, Tidal Marsh Habitat Opportunities, and Conserve and Restore Headlands, Coasts, and Baylands. Please see Appendix A: Project Concepts for more details on these projects.

Laguna de Santa Rosa, Sonoma County.

Who? Sonoma Water should partner with Ag + Open Space and the other land trust organizations to coordinate action to ensure high-priority aquatic areas and soil conservation and restoration efforts can find the funding and support necessary for implementation. Please see Chapter 6: Project Planning, Design, and Implementation for more detailed recommendations on implementation and funding for aquatic areas and soils projects.

SUPPORT AND INCREASE REGENERATIVE AGRICULTURAL PRACTICES

Why? Agricultural uses can provide significant climate resilience benefits to the county if managed with that purpose. Agricultural lands make up approximately 22% of Sonoma County's lands, providing opportunity at a scale that could make a difference in the Sonoma County's ability to adapt to climate change, reduce risks, and sequester and store carbon at a meaningful scale. If managed to enhance climate resilience, agricultural lands hold an important place on the continuum of natural to working lands and can provide many critical climate benefits. Agricultural lands are also important to prioritize due to their role as sources of employment, cultural resource, food supplies, and a critical economic engine for Sonoma County. During the engagement for the Lands Strategy, many members of the TAC and IAG, as well as stakeholders representing agricultural interests, expressed a need to prioritize managing agricultural lands and to consider the climate impacts on small farmers and farmworkers. These concerns are reflected in the indicators that were developed for the Lands Strategy, which are located in Chapter 6: Planning, Design, and Implementation.

Regenerative practices applied to agricultural lands provide significant climate resilience benefits to soils, reduce water usage, improve water quality, protect and restore native species and aquatic areas, provide for wildlife and genetic corridors, protect and restore riparian corridors, increase food security, and serve as a buffer from other hazards such as flooding, wildfire, and heat. Such practices also eliminate or reduce some non-climate stressors such as pesticides, erosion, and runoff.

Regenerative agricultural practices also provide tools for agricultural lands to increase carbon sequestration and storage. Regenerative practices reduce soil disturbance, provide for perennial ground cover and a diversity of crops, and protect and restore native species and habitats, andcan store and sequester carbon at potentially significant rates (Health Care Without Harm, 2020).

What? While there are signficant climate benefits associated with regenerative agricultural practices, many farmers and ranchers lack the resources, information, or incentive to shift away from more traditional agricultural practices. While programs and support for these practices already exist, as well as the opportunity for peer-to-peer learning and for scaling up existing programs, the scale of change necessary will require additional resources and support. Projects recommended by the Lands Strategy to advance action on supporting and increasing regenerative agricultural practices include Climate-Resilient Agricultural Program, Carbon Banking and Carbon Sequestration

Mustard Cover Crop.

Planning, Climate Smart Land Conservation, and Climate-Resilient Rangeland Management Program. For more details on these projects, please see Appendix A: Project Concepts.

Who? The County, Ag + Open Space, UC Cooperative Extension, and the RCDs should work together to scale up existing programs, identify additional resources and support to fill gaps, and evaluate the need to develop one countywide, robust program to support this shift in practice. For recommendations on implementation and funding for this action, please see Chapter 6: Planning, Design, and Implementation.