# Collaborative Conservation Planning for the Gaviota Region


**Authored by:**
Pol Carbó Mestre | Lauren Harris | Alexandra Martin | Alissa Patterson
Alessandra Puig-Santana | Katherine Rosencrance

**Faculty Advisor:** Kelly Caylor
**External Advisors:** Carrie Schloss & Cris Sandoval
**Client:** The Nature Conservancy

**March 2023**

A Group Project submitted in partial satisfaction of the requirements for the degree of Master of Environmental Science and Management for the Bren School of Environmental Science & Management.

UC SANTA BARBARA Bren School of Environmental Science & Management

JAMES S. BOWER FOUNDATION Re-envisioning.

The Nature Conservancy

# Signature Page

As authors of this Group Project report, we archive this report on the Bren School's website such that the results of our research are available for all to read. Our signatures on the document signify our joint responsibility to fulfill the archiving standards set by the Bren School of Environmental Science & Management.

Pol Carbó Mestre ______________________

Lauren Harris _________________________

Alexandra "Ali" Martin ___________________

Alissa Patterson _______________________

Alessandra Puig-Santana ________________

Katherine Rosencrance __________________

The Bren School of Environmental Science & Management produces professionals with unrivaled training in environmental science and management who will devote their unique skills to the diagnosis, assessment, mitigation, prevention, and remedy of the environmental problems of today and the future. The school's guiding principle is that analyzing environmental problems requires quantitative training in multiple disciplines and an awareness of the physical, biological, social, political, and economic consequences of scientific or technological decisions. The Group Project is required of all students in the Master of Environmental Science and Management (MESM) Program. The project is a year-long activity in which small groups of students conduct focused, interdisciplinary research on a specific environmental issue's scientific, management, and policy dimensions. This Group Project Final Report is authored by MESM students and has been reviewed and approved by:

Dr. Kelly Caylor _________________________

# Acknowledgments

The Gaviota Region is part of the homeland and traditional territory of the Chumash, the Indigenous peoples who were the first inhabitants of the Gaviota Region and persist here today (Timbrook, 1990). The Gaviota Region is culturally and spiritually significant to the Chumash people, who integrate the region's unique resources into everyday life (Sonneborn, 2006) (Appendix A). The Chumash territory once encompassed 7,000 square miles from Malibu to Paso Robles to the western edge of the San Joaquin Valley (*Santa Ynez Band of Chumash Indians*, 2022). It is our responsibility to acknowledge the sovereignty and the traditional territories of the Chumash people, the treaties used to remove them, and the histories of dispossession that have allowed for the growth of the institutions in this region. We pay our respects to the Chumash communities in the past, present, and future, for they hold the memories, traditions, and culture of this area and have been the caretakers of this land for time immemorial. We want to acknowledge that institutions in this land require actions and reparations. Creating a more inclusive environment between organizations and the local Chumash community will encourage a more prosperous regional conservation plan for the Gaviota Region.

We want to thank Mia Lopez from the Coastal Band of Chumash Nation, Teresa Romero from the Santa Ynez Band of Chumash Indians, Eleanor Fishburn (nee Arellanes) from the Shmuwich people (Barbareño Band of Chumash Indians), and Mona Olivas Tucker, Scott Lathrop, and Wendy Lucas from the yak titʸu titʸu yak tiłhini (Northern Chumash Tribe) for their time and sharing their knowledge for the improvement of our group project.

This project would not have been possible without the assistance provided by these individuals. We are incredibly grateful for their guidance and support throughout this process.

**Client and Advisory Committee:**
Dr. Kelly Caylor (Bren)
Dr. Cris Sandoval (UCSB)
Carrie Schloss (The Nature Conservancy)
Dr. Mark Reynolds (The Nature Conservancy)
Dr. Elizabeth Hiroyasu (The Nature Conservancy)

**Special Thanks To**
Dr. Ashley Larsen (Bren)
Dr. Bruce Kendall (Bren)
All the interviewees

**Funding Provided By:** James S. Bower Foundation

# Table of Contents

# Abstract

The Gaviota Region of Southern California encompasses a myriad of diverse cultures and organizations, including the Chumash Indigenous people, a strong ranching and agricultural community, residential communities, and an array of private, governmental, and non-profit institutions. Within this region lies the Jack and Laura Dangermond Preserve (JLDP). It is owned and managed by The Nature Conservancy (TNC), one of the largest non-profit environmental organizations in the world. As one of the most effective and efficient environmental protection organizations globally, the JLDP can potentially anchor conservation protection and management actions spanning the entire Gaviota Region. This project aims to create a decision-making framework to assist JLDP, local agencies, stakeholders, and rightsholders in setting collaborative priorities and developing a region-wide conservation management plan. Our primary deliverable is an interactive tool that combines data gathered from stakeholder agency interviews and data regarding the characteristics of the Gaviota Region. We conducted 23 interviews with regional stakeholders to assess their conservation priorities. In addition, we combined numerous spatial data sets to represent the conservation values of the region — namely, biodiversity, water, climate resilience, and soil health. We analyzed a matrix of priority scores for given conservation values and incorporated it into spatial analyses for this region. These analyses formed the basis for our spatial planning tool and allowed us to determine our spatial priorities based on the reported priorities of Gaviota's stakeholders and rightsholders.

# Objectives

The overall goal of this project is to create a decision-making framework for the Gaviota Region. Identifying and analyzing the conservation values of different stakeholders and rightsholders is critically important to evaluate gaps of knowledge, conservation opportunities, and trade-offs within the region for a successful regional conservation plan. This project will advance TNC's long-term conservation management plan and improve its relationship with other regional stakeholders and rightsholders. Listed below are the three objectives of this project:

1. Identify high-priority conservation values for JLDP and neighboring stakeholders and rightsholders within the Gaviota Region
2. Quantify the importance of various conservation values based on stakeholder and rightsholder input
3. Highlight areas in the Gaviota Region in the interactive planner that provide opportunities for conservation action and collaboration

# Project Significance

Identifying the conservation priorities between stakeholders and rightsholders allows for collaboration to preserve the Gaviota Region effectively. Our project will create a baseline for community collaboration that allows stakeholders and rightsholders to visualize similarities and differences in conservation practices easily. Currently, there is a need for more collaboration on a regional scale between agencies of the Gaviota region. The creation of a decision support tool can allow on-the-ground decision-making by nonprofits, Indigenous communities, farmers, ranchers, government agencies, and other landowners. The benefits of a decision support tool are that it allows for more project accountability, transparency in decision-making, and increased community participation. Additionally, our tool will help stakeholders and rightsholders decide where to focus their efforts in an interactive and user-friendly format. It is important to note that our decision-making tool only partially covers the full spectrum of potential conservation opportunities and does not encompass all of the stakeholders and rightsholders within the region. Our tool can help facilitate collaboration between different agencies that rely on the unique characteristics of the Gaviota region.

Regional planning can facilitate effective conservation investments between agencies, indigenous communities, and other stakeholders (Pressey & Bottrill, 2009). TNC has created an extensive conservation plan with targeted goals for JLDP; however, many other stakeholders and rightsholders within the Gaviota Region have their own purposes, resources, and funds beyond TNC's reach. Stakeholder and rightsholder involvement allows for the development of adaptive management practices using scientific information in combination with local knowledge and experiences of climate change (Conde & Lonsdale, 2004). Through listening to the views of others, stakeholders and rightsholders can build a shared understanding of each other's conservation priorities (Conde & Lonsdale, 2004). Research has shown that collaborative management efforts are critical to developing a successful conservation plan (Freitas et al., 2020). Therefore, it is essential to understand the preferences and opinions of each stakeholder agency and rightsholders within the region (Haddaway et al., 2017; Lees et al., 2021). Collaborative management efforts have been shown to successfully protect, preserve, and conserve natural resources, especially culturally significant resources (Freitas et al., 2020; Winter et al., 2021). For example, the inclusion of various voices in conservation priority setting has led to successful conservation management plans for the Arapaima fish and Freshwater turtle in the Amazon and throughout the Hawaiian islands (Freitas et al., 2020; Winter et al., 2021).

A mixed-method approach and multi-benefit analysis can provide valuable insights into conservation preferences and priorities, informing decision-making and resource allocation to benefit all regional stakeholders and rightsholders. One key benefit of this approach is that it can help unite different stakeholder and rightsholder preferences and identify areas of shared interest. By identifying common ground, it is possible to develop a more collaborative and coordinated approach to conservation efforts in the region, reducing conflicts and increasing the chances of success (Winter et al., 2021). It is essential to prioritize collaboration and stakeholder engagement in conservation efforts to ensure a sustainable future for the Gaviota Region.

Our team utilized publicly available data provided by the Conservation Biology Institute, TNC, and CalEnviroScreen in the Gaviota Region to conduct a multi-benefit analysis and evaluate the alignment of conservation goals and preferences across the region. Through conversations with various stakeholders and rightsholders and the analysis of quantitative data, we will identify conservation preferences and common themes to highlight opportunities for collaboration.

# Background

## The Nature Conservancy - Jack and Laura Dangermond Preserve

The Nature Conservancy (TNC) acquired the Jack and Laura Dangermond Preserve (JLDP) in 2017 through a donation made by Jack and Laura Dangermond (Butterfield et al., 2019). The preserve comprises 24,460 acres of land surrounding Point Conception, California, a biological boundary zone between Northern and Southern California, bringing together diverse marine, coastal, and terrestrial ecoregions (Butterfield et al., 2019). JLDP has a rich cultural history extending back nearly 9,000 years when the Chumash developed two significant villages near Point Conception (Butterfield et al., 2019). The Chumash people have a deep connection to the land and sea in the area — the offshore reefs and tar seeps used for caulking canoes and baskets were valuable resources they integrated into their daily lives (Butterfield et al., 2019). The Chumash people no longer reside within the JLDP, however, in 2020, TNC and the Santa Ynez Band of Chumash Indians (Elders Council) agreed upon a Memorandum of Understanding that set up the foundational steps for working on projects together (Butterfield et al., 2019).

JLDP provides protection and preservation for a number of important natural resource values, including habitat connectivity. Models suggest that the preserve provides crucial connectivity between public and private lands as well as from the Vandenberg Air Force Base to the west (Butterfield et al., 2019). The Preserve is situated in the midst of ranchlands, low-density residential lands, and the Vandenberg Air Force Base, but it is also part of a larger area called the Gaviota Region. While some organizations within the region have goals that are aligned similarly to TNC's (the Land Trust of Santa Barbara County and Gaviota Coast Conservancy) the future of land conservation in the region varies greatly (Butterfield et al., 2019). A regional decision-making tool would provide TNC with the unique opportunity to explore collaborative conservation actions. However, this process requires input from stakeholders and rightsholders throughout the entire Gaviota Region. Indigenous rightsholders have rights that are recognized and protected by the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). These rights include the right to self-determination, the right to participate in decision-making processes that affect them, the right to their own cultural, spiritual, and religious practices, the right to their own traditional lands, territories and resources, and the right to live free from discrimination and oppression (United Nations General Assembly, 2007).

## The Gaviota Region

The Gaviota Region (Figure 1) is an irreplaceable component of Southern California's natural resources. It serves as a "biogeographic transition zone," meaning it contains a unique climate where Northern California's cool, moist weather mixes with Southern California's dry, warm weather to create a gradient of conditions that promote biodiversity (McGinnis, 2008). This region of California is considered a "climate refugia," as it is an area that supports ecological resilience during periods of climate disturbance (McGinnis, 2008). Endangered species can seek refuge and disperse in the Gaviota Region during extreme climatic events (McGinnis, 2008). Despite changes in the relative climate and landscape, the Gaviota region enables the persistence of valued ecological and socio-cultural resources (McGinnis, 2008). The region encompasses 215,000 acres, including 43 watersheds in the Santa Ynez mountains and 73 acres of undeveloped coastline (McKenna et al., 2021).

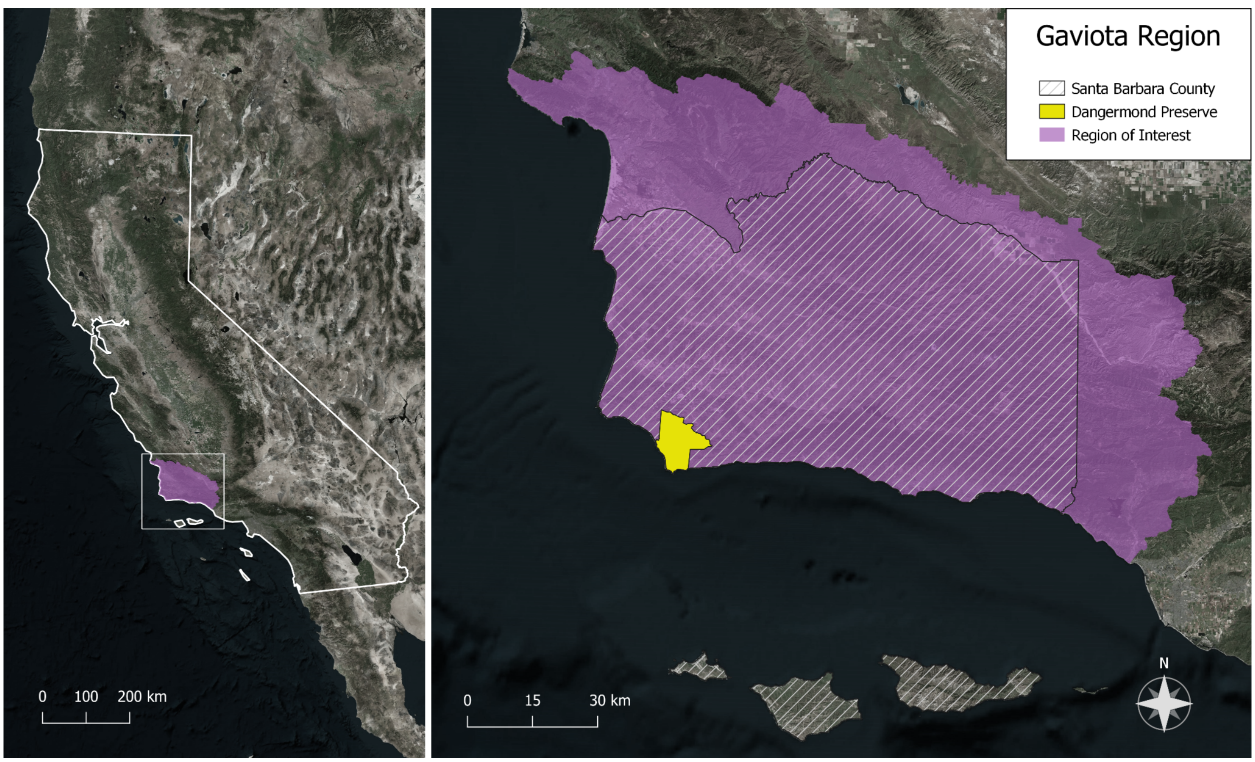



**Figure 1.** Map of the Gaviota Region. **Left:** Inset map shows the region of interest in the context of California. **Right:** Borders delineating Dangermond Preserve, Santa Barbara County, and the region of interest.

The Gaviota Region has a culturally rich history dating back 9,000 years and is home to thousands of archaeological sites representing the diversity of human settlements on the preserve (Butterfield et al., 2019). These sites are crucial resources that provide information on human history's social, political, and technological changes. Important relics such as rock art sites, cemeteries, and lithic scatters are culturally significant to the Chumash (Butterfield et al., 2019). The Chumash continue to utilize traditional sacred knowledge to protect and regenerate natural resources (*Santa Ynez Band of Chumash Indians*, 2022).

This region also constitutes over 200 years of Spanish and Mexican history and contains remnants of California ranch history (McKenna et al., 2021). Cattle ranching in Gaviota dates to the mission era in 1770, during the Spanish arrival (Butterfield et al., 2019). When the United States obtained California following the Mexican-American war in 1850, land grants were permitted, and owners of these grants started constructing ranches within the Gaviota Region (Butterfield et al., 2019).

However, regional conservation priorities go beyond the JLDP, as land within the Gaviota Region is managed by different agencies. The prominent landowners of the Gaviota Region include Vandenberg Space Force Base, Federal and State Agencies, and non-governmental agencies such as TNC (McKenna et al., 2021). However, stakeholders and rightsholders in the region should be included regardless of land ownership. By establishing a conservation framework using decision-making tools, we can better understand how to protect the Gaviota Region given various conservation priorities and organizational input.

## Biological Significance

Conservation International considers the California Floristic Province along the western coastline as one of the 36 listed biodiversity hotspots in the world. (*California Floristic Province | CEPF*, 2022). Hotspots are defined by Myers et al. (2000) as areas that have 0.5% or 1,500 of the world's 300,000 plant species as endemic and have lost at least 70% of their primary vegetation. Though the Gaviota Region only makes up a small part of the hotspot, it still carries a great amount of biological significance. Approximately 1,400 plant and animal species are found on the Gaviota Coast, including 24 federally- or state-listed endangered and threatened species and another 60 species of rare and special concern — including but not limited to steelhead trout, red-legged frogs, and white-tailed kites (Butterfield et al., 2019; McGinnis, 2008).

Areas with high biodiversity, like specific sites within the Gaviota Region, often provide many ecosystem goods and services (Hooper et al., 2005). In addition, biodiversity promotes system stability and productivity. A stable system is more likely to remain unchanged given various perturbations in management, climate, or other stressors (Tilman et al., 2006). Biodiversity is likely an important component of climate resiliency, and with the looming threat of climate change, it must be protected (Oliver et al., 2015). In addition to the functional benefits of biodiversity, there is also a strong intrinsic value. In his impactful 1985 publication, Soulė argues that one normative postulate for conservation biology is that biodiversity has intrinsic value (Soulé, 1985). This view holds that species have value, not based on their utility to humans but on their evolutionary history and existence. This argument establishes a right for species to persist in the face of anthropogenic environmental changes. Given the Gaviota Region's significant biological and functional status, it is crucial that we focus on these characteristics when discussing the framework for a regional management plan.

## Water Resources in the Region

California's freshwater supply depends on surface water, snowpack, and groundwater (Georgakakos et al., 2012). Freshwater resources in the Gaviota Region must be protected to safeguard ecosystem functioning, community persistence, and the livelihoods of ranchers and farmers. Santa Barbara County contains four significant watersheds (Santa Maria, San Antonio Creek, Santa Ynez, and the South Coast) that cover 3,326 square miles, all managed by varying stakeholders and with different land use purposes (Dudek, 2019). These watersheds provide much of the groundwater supply for the region.

In Santa Barbara county, 46% of the drinking water comes from groundwater resources (*Where Your Water Comes From | Santa Barbara County, CA - Official Website*, 2021). Groundwater is also a critical resource for farmers, ranchers, businesses, and homes within the Central Coast (*California Water 101*, 2020). Rural areas and underrepresented communities often solely rely on groundwater for their water needs, which means they are the first to be affected by changes in groundwater supply (Foster et al., 2000). Groundwater supplies are replenished through precipitation and snow melt that seeps through the cracks and crevices beneath the land's surface (*What Is Groundwater?,* 2022). Groundwater resources are an important source of freshwater, especially during drought and water scarcity.

Important ecosystem processes such as erosion control, water filtration, and providing water for habitat depend on clean water from watersheds (Bork, 2017).The southern California steelhead *(Oncorhynchus mykiss)* and other federally protected fish species are supported by one of the state's largest watersheds, the Santa Maria watershed (ForestWatch, 2019). The viability of the watershed is crucial to the recovery of the southern California steelhead (Bork, 2017). The southern California steelhead is an important indicator of water health in the region's rivers (Lakoff, 2016). Their cultural significance to the Chumash people dates back over 10,000 years and has played an important role in supporting ecosystems that physically and spiritually support the Chumash (*The Importance of the Southern California Steelhead to Chumash Culture*, 2022). Clean and healthy water supports other vulnerable species, such as the California red-legged frog *(Rana draytonii)* and the California tiger salamander

(*Ambystoma californiense)*. Water quality and availability are crucial for the Gaviota region's safe drinking water, agriculture, and ecosystem functioning.

## Agricultural Significance

The Gaviota region's unique microclimate weather allows for fertile soils that facilitate prime conditions for various agricultural activities. The Gaviota Region has a rich history of ranching and agricultural production dating back to the 18$^{th}$ century (Butterfield et al., 2019). Cattle grazing has been the mainstay of agriculture for centuries (Kester, 2017). Over time, farmers began producing a diverse array of crops, such as wine grapes, beans, coffee, fruits, and nuts, in the region (Kester, 2017). Agriculture is an important and culturally significant local industry. In Santa Barbara County, 67,774 acres of farmland are considered Prime Agricultural Farmland (Chabanova, 2020). Prime Agricultural Farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops (Carver & Yahner, 1997). It produces the highest yields with minimal energy inputs and economic resources (Carver & Yahner, 1997). Farming this land creates the least environmental damage (Carver & Yahner, 1997). California's prime agricultural farmland is at risk of land use change to urban development (Schiffman, 1983). From 2001 to 2016, 465,900 acres of California's agricultural land was converted to development or compromised (American Farmland Trust, 2023). Within this same period, 319,000 acres of Prime Agricultural Land has been developed or compromised (American Farmland Trust, 2023). The California Coastal Act currently protects Prime Agricultural Land from being converted and establishes boundaries separating urban and agricultural areas (Schiffman, 1983). The conservation management of the Gaviota Region must respect the region's ranching and agricultural priorities, both past and present.

Healthy soils play an important role in sustainable agriculture and cultivation. Soil health is dynamic and consists of physical, chemical, and biological factors (Hatten & Liles, 2019). Maintaining healthy, fertile soil also provides numerous ecosystem services such as carbon sequestration, energy provision, erosion control, and flood mitigation (Dube et al., 2022). Identifying fertile, productive soil areas can aid in future carbon storage efforts and agricultural success.

## Climate Resilience in the Region

Resiliency is defined as the ability of a system to return to its previous state after a perturbation without losing its function and ecosystem services (Côté & Darling, 2010). The Gaviota Region is a climate refugia, meaning it is an area known to be a "hot spot" for threatened biodiversity and serves as a source from which species can retreat and expand given climatic disturbance (McGinnis, 2008). However, climate change and anthropogenic activity increase the frequency and intensity of extreme weather patterns and natural disasters (von Stackelberg, 2018). The increased stress on ecosystems is often cumulative, so efforts to reduce individual stressors can be important to promote resilience to climate change (He & Silliman, 2019). Maintaining climate resiliency requires local and regional community collaboration and engagement that involves all stakeholders and rightsholders in the region (Galatowitsch et al., 2009). Climate resilience can be strengthened by identifying priority areas for conservation, reducing pollution exposure, improving air quality, and promoting public access to natural resources.

## Natural Threats to the Region

### Wildfire

Wildfire is critical in shaping global biome distributions (Batllori et al., 2013). However, climate change and anthropogenic development are expected to increase the severity of wildfire regimes significantly. Wildfires are one of California's most frequent natural disasters and have caused damage to the environment, the economy, and the livelihood of many Californians (US EPA, 2016). From 2009 to 2018, 3,356 fires were recorded (Buechi et al., 2021). This number is 1.4 times greater than the per-decade average number of fires between 1979-2009 (Buechi et al., 2021). The total area burned for the 2009-2018 decade was 7.08 million acres, 1.6 times larger than the per-decade average number of acres from 1979-2009 (Buechi et al., 2021). The estimated total cost of wildfire damage in 2018 was $148.5 billion, with $27.7 billion in capital loss, $32.2 billion in health costs, and $88.6 billion in indirect costs (Wang et al., 2021). Climate change and land use are expected to increase aridity and drought risk, thus contributing to increased fuel aridity, a longer fire season, and increased wildfire activity (Dong et al., 2022).

Along with climate change, the combination of human activity and highly flammable, nonnative vegetation in California exacerbates the risk of wildfires. Santa Barbara County, in particular, is at a high risk of catastrophic wildfires due to sundowner winds, which occur in the Santa Ynez mountains that trend east to west toward Santa Barbara county (Kolden & Abatzoglou, 2018). These winds are similar to Santa Ana winds, producing dry conditions favorable for intense wildfires (Kolden & Abatzoglou, 2018).

The Gaviota Region of Santa Barbara County is considered a Very High Fire Hazard Severity Zone (*Fire Hazard Severity Zones Map*, 2023). Since 1890, more than 5.89 million acres of land along the Central Coast of California have been burned by fire (Potter, 2017). Much of California's chaparral vegetation has adapted to fire disturbances and is dependent on fire to flourish (Rundel, 2018). Such short fire intervals threaten the persistence of chaparral ecosystems because they prevent shrub regeneration and can potentially lead to nonnative species displacing endemic species (Schwartz et al., 2018). Wildfire management plans and prescribed burns can help manage the severity and size of fires in the Gaviota region.

### Drought

California's decades-long droughts have detrimental effects on the western United States water supply. Climate change and anthropogenic impacts are expected to increase the intensity of droughts (Public Policy Institute of California, 2023). Increased temperatures and dry climates increase evaporation, which reduces water availability for human use and ecosystem functioning (Public Policy Institute of California, 2023). Prolonged drought can result in the exacerbation of groundwater water supplies. Groundwater is a critical source of freshwater for ecosystems, hydrologic processes, and agricultural production (P.-W. Liu et al., 2022). Exacerbation of groundwater can further disrupt water bodies such as lakes, wetlands, rivers, and streams (Barlow & Reichard, 2010). This can lead to a shortage of available freshwater, falling water tables, streamflow depletion, drying wells, and hazards such as land subsidence and wastewater intrusion (P.-W. Liu et al., 2022). The impacts of drought are also predicted to worsen since groundwater dependence and depletion are increased during periods of drought, and natural groundwater recharge is decreased, creating a positive feedback loop (P.-W. Liu et al., 2022). There is also a socioeconomic aspect surrounding water access due to climate change. Increased water stress can lead to waterborne infections, reduced access to safe drinking water and sanitation, and reduced food security which are catalysts for socioeconomic inequities (Stigter et al., 2023). Protecting freshwater resources in the Gaviota Region can help safeguard ecosystem functioning, increase community persistence, and benefit the livelihoods of ranchers and farmers.

### Climate Exposure and Flooding

Extreme weather events in California are expected to be more frequent in the future due to climate change (*Extreme Weather*, 2019). Increased temperatures, prolonged heat waves, and low precipitation are expected to be followed by severe storms and flooding (*Extreme Weather*, 2019). Average annual temperatures have increased by more than 1-2 degrees Fahrenheit throughout California (Mulkern, 2022). By the year 2500, average daily temperatures are expected to increase by almost 6 degrees Fahrenheit (Mulkern, 2022). Warmer air holds more moisture, increasing the intensity of severe storms such as atmospheric river events (Zhong, 2023). Floods and mudslides are a result of these catastrophic storms and severely impact communities, the environment, and the economy (Zhong, 2023).

These natural disasters already disproportionately affect people from lower socio-economic backgrounds (Mulkern, 2022). Climate-vulnerable communities such as migrant farm workers, the elderly, young children, and people with chronic illnesses are at an increased risk of health effects from extreme climate events (Mulkern, 2022). The Gaviota Region is an area with highly significant climate refugia, however, not all land cover throughout the region is characterized by such resilience. Many areas are at a high risk of increasing temperatures, heat waves, and frequent floods, which has significant implications for the biota that require the unique conditions of the Gaviota region to thrive.

## Diversity, Equity, and Inclusion (DEI) and Environmental Justice (EJ)

Environmental issues are often framed in the context of the natural ecosystem. However, it is critical to understand how the same environmental issues and management decisions affect the communities disproportionately affected in Santa Barbara County. We have decided to look into three perspectives targeting environmental justice, diversity, equity, and inclusion: pollution (health threats), demographics (with health outcomes included), and isolation from nature.

### Pollution

Environmental pollution is most commonly framed in the context of natural resources. However, public health concerns such as exposure to air pollution, water contamination, and hazardous waste disproportionately affect low-income communities and people of color (Tessum et al., 2021). These communities often live near highways, factories, waste treatment plants, and other sources of direct and indirect pollution (Brender et al., 2011). Environmental justice studies have shown that race is the major determinant in an individual experiencing disproportionate environmental health exposures (Mascarenhas et al., 2021; Mohai et al., 2009). In 1987, “Toxic Wastes and Race in the United States'' was published by the United Church of Christ (UCC) Commission for Racial Justice, which found that race was the most significant factor in determining where commercial hazardous waste treatment, storage, and disposal facilities were located in the United States (United Church of Christ Commission for Racial Justice, 1987; Mascarenhas et al., 2021). In 1992, the EPA reinforced these findings through the “Environmental Equity: Reducing Risks for All Communities'' report, which highlighted how racial minorities and low-income populations are disproportionately exposed to lead, selected air pollutants, hazardous waste facilities, contaminated food and water sources, and agricultural pesticides (EPA, 1992). These intentional and unintentional decisions have exposed communities to environmental pollution, significantly increasing the risk of negative health outcomes leading to chronic illnesses, cancers, or death

(Vrijheid, 2000). Addressing these human health threats requires a commitment to environmental justice and equity by all regional stakeholders and rightsholders. This includes thinking critically about the systemic issues that have resulted in disproportionate pollution exposure, involving communities in decision-making processes, and investing in solutions that will benefit the most vulnerable.

## Human Health Outcomes and Demographics

The consequences of land-use change, climate change, and the deterioration of ecosystem services severely threaten the health of humans, leading to chronic health conditions and diseases (S. Myers & Patz, 2009). Anthropogenic changes subject the human body to heavy metals, radiation, endocrine-disrupting chemicals, and pollutants in air, food, and water (S. Myers & Patz, 2009). Exposure to these environmental pollutants significantly increases the risk of respiratory problems, cardiovascular disease, and other health issues such as cancer and low birth rate (Brender et al., 2011). Poor air quality is the greatest environmental threat to public health (Friedrich, 2018). In 2016, diseases related to airborne pollutants contributed to 65% of all life-years lost to environmentally related deaths and disabilities (Friedrich, 2018). Exposure to these pollutants is not distributed equitably. Communities of color are disproportionately exposed to pollution hazards and are most likely to suffer from environmentally-related illnesses (Mott, 1995). These communities often have fewer economic and social resources for long-term healthcare (Min et al., 2021).

The first step to creating a more equitable world is identifying where future investments can have the greatest impact (Jones et al., 2021). Demographic and geographic data from the census is essential for identifying vulnerable populations, accessibility and service gaps, planning, relief responses, and implementing programs (Jones et al., 2021). Including demographic data is critical for evolving conservation away from deeply-rooted colonial ideas of natural resources management and progressing toward environmental justice. Marginalized communities need to be included in the conservation planning of Santa Barbara County. Our interactive planner's DEI and EJ layer displays socioeconomic data such as education, housing, race, linguistic isolation, poverty, and unemployment. Not only are people of color and low-income communities most likely to live in close proximity to environmental hazards, but they are also more likely to live far from open spaces (Rowland-Shea et al., 2020). By incorporating socioeconomic data into the decision-making tool, we can help shed light on who is experiencing environmental inequities and where resources can be concentrated in Santa Barbara County. Identifying areas of environmental inequity can help planners and policymakers create solutions such as educational interventions and effective health regulations that minimize the health equity gap. We hope to catalyze conservation planning that considers environmental equity in the Gaviota Region.

### Isolation from Nature

It is well-established that time spent in nature benefits human health and well-being; access to nature can improve physiological and psychological welfare due to the better air quality and increased physical activity and socialization (Hartig et al., 1991; Keniger et al., 2013; Tyrväinen et al., 2014). However, in addition to living in closer proximity to environmental hazards, people of color and low-income communities are also more likely to live far from open spaces resulting in accessibility disparities between demographic groups (Rowland-Shea et al., 2020). Part of the issue is the supply of nature, which is the spatial distribution of natural environments compared to marginalized populations (Colley et al., 2022). For these marginalized populations, the supply of nature is often lower than it is for the general population, meaning they have less access to natural spaces. They are often more densely housed, and therefore their nearby natural spaces will also tend to be more crowded — but visitors report receiving less value from crowded trails and natural spaces (Sever & Verbič, 2019). Additionally, disparities in trail and natural space access are highly correlated to income (Estabrooks et al., 2003). Given the link between income and other factors such as race, disability, and education (Akee et al., 2019; Banks et al., 2017; Tamborini et al., 2015), it is probable that several risk factors are at play when determining the ability of marginalized groups to access natural spaces. A study in New England has found that conservationists can help minimize the gap in outdoor access between marginalized and non-marginalized groups by incorporating environmental justice criteria such as income and race into the environmental planning process (Sims et al., 2022). This study found that communities in the lowest income quartile had fewer protected areas compared to the most affluent quartile. Additionally, they show a significant difference in the areas prioritized for protection when considering environmental justice criteria in land planning. To promote environmental justice, areas of low outdoor access for marginalized groups must be emphasized so that regional planning can better serve these communities.

## Regional Conservation Designs

While small-scale, species-specific conservation plans are valuable in some scenarios, regional conservation plans provide a more powerful, overarching influence (Steidl et al., 2009). When referring to a “regional” design, Pressey et al. (2013) describe it as “any spatial extent that provides a broad perspective for decisions about individual conservation areas.” Broad-scale conservation plans allow for the opportunity to affect a more comprehensive range of organisms and landscapes. Regional conservation plans better balance conservation goals and realistic stakeholder values than smaller-scale projects (Steidl et al., 2009). Pressey et al. (2013) detail three main advantages of regional conservation plans. First, they integrate connectivity and complementarity between smaller areas, ensuring a collaborative effort more significant than the individual parts. Second, managers can use spatial analyses to substitute specific land areas for others based on threats or costs. Third, regional designs can produce valuable information for other project objectives to a similar extent, e.g., land use planning and integrated coastal management (Steidl et al., 2009).

## What is a conservation decision-making tool?

Within the field of conservation planning, land managers are faced with the challenge of making decisions given limited resources and time. A conservation framework is a unified collection of tools and principles that can be used to organize and oversee the planning and administration of a conservation initiative or undertaking (Schwartz et al., 2018). Essentially, conservation frameworks are designed to clarify and efficiently produce an answer to a conservation problem. Decision-making tools are included in this "framework" to set realistic goals and outline specific activities that must be completed to reach important steps within the agencies' objectives (Schwartz et al., 2018). JLDP and all of the other regional organizations will be able to utilize the conservation tools developed in this project to save time and effort in producing a regional management plan.

A greenprint is a specific decision-making tool that helps land managers decide based on common priorities in a specific region. While our team will not be completing a greenprint, we are largely influenced by past work done by TNC and other organizations through their greenprint goals and methodology. The Bay Area Greenprint website provides a comprehensive description of how greenprints function. It details how greenprints share information about the benefits of interconnected ecosystems — be it a public park, privately owned parcel, or any open space. Once an assessment is made for each land area, the greenprint allows users to specify their priorities to see what other resources might overlap. All the information in the greenprint is shared in an easily accessible one-stop tool. Different components include wildlife conservation, water resource management, outdoor recreation, and preserving Indigenous land. Greenprints are often shared in their first steps as an interactive map that includes data from every agency/organization in the region. Examples of other successful greenprints include Pajaro Compass and the Santa Barbara Conservation Blueprint.

The Santa Barbara Conservation Blueprint (SB Blueprint) focuses on conservation values within Santa Barbara County, similar to our interactive planner. Prepared by Conservation Biology Institute and Ag Innovations, the SB Blueprint consists of a report and an interactive "Atlas" (*SBC Atlas*, 2016). Our project largely builds on the work and data provided by the SB Blueprint. While the Atlas provides users with a portal to over 500 publicly available conservation-related datasets, our interactive map can also display conservation values with real stakeholder analyses included. Additionally, unlike SB Blueprint, our interactive map can include visualization for a layer specifically focused on diversity, equity, inclusion, and environmental justice in the region. The SB Blueprint provides valuable information to organizations operating throughout the region. Our planner and stakeholder analyses introduce additional elements that enhance the achievement of similar conservation goals.

### Why make a regional decision-making tool?

Decision-making tools can benefit the region economically, socially, and environmentally. The link between planning and actions must often be clarified in conservation management. Land managers may agree on a large-scale plan, but the local implementation of direct action may prove difficult (Pressey et al., 2013). Additionally, a lack of rightsholder and stakeholder inclusivity and engagement restricts implementation (Mills et al., 2014). Given limited resources, having a well-rounded tool that diverse agencies can use increases the opportunity for the best protection and investment. Our decision-making tool will streamline conservation processes because it considers stakeholder preference and directly pinpoints areas of high conservation priority.

Including stakeholder and rightsholder input provides benefits for both practical and democratic reasons (Vogler et al., 2017). Practically, inviting all stakeholders to be involved creates an environment of collaboration that reduces the likelihood of conflict. Varying perspectives can provide the most inclusive cultural and societal solutions. Democratically, fostering a sense of inclusivity helps different groups to form trusting and equitable relationships. Successful stakeholder engagement reduces the marginalization of under-represented groups while providing benefits for everyone involved (Vogler et al., 2017).

## Analytic Hierarchy Process

A method called Analytic Hierarchy Process (AHP) was developed by Saaty (1987) to organize and analyze complex decisions. The AHP process provides a method to quantify the conservation values of a region given a variety of stakeholder opinions. AHP analyses are beneficial in regional planning because communicating priorities quantitatively can ensure more effective and efficient implementation of conservation programs (Cumming et al., 2022; Knight et al., 2008).

AHP analyses utilize pairwise comparisons of specific criteria within a hierarchy. The output is a value “weight” for each criterion created by estimating the impact of alternatives on the overall objective (Kablan, 2004). To maximize the inclusivity and representativeness of the entire region, the AHP should give every stakeholder and rightsholder a chance to voice their opinion regarding their priorities. We utilize the AHP to quantify and evaluate the specific priorities of each stakeholder and group subset in the Gaviota Region. By doing this, we can spatially represent the exact areas of conservation importance within the region.

## Stakeholders and Rightsholders

A useful regional decision-making tool demonstrates the intersection of all stakeholders' conservation priorities (Harris-Lovett et al., 2019). This conservation planning approach allows private, governmental, non-profit, and Indigenous organizations to find common ground to efficiently protect and conserve a region (Vantaggiato & Lubell, 2020).

For the Gaviota Region, a variety of public and private stakeholders and rightsholders result in a range of shared goals, from biodiversity and habitat conservation to agricultural land use. These numerous and diverse values allow us to create a more robust tool that will help guide multi-benefit, multi-stakeholder collaboration that contributes to the overall resiliency of the region.

Interviewees

- Cachuma Resource Conservation District (Interview 08/15/22)
- Good Land Organics Farm/Fringe Coffee (Interview 08/17/22)
- The Nature Conservancy - The Jack and Laura Dangermond Preserve (Interview 08/18/22)
- Las Varas Ranch (Interview 08/19/22)
- Gaia Farm (Interview 08/22/22)
- California Department of Fish and Wildlife (Interview 08/30/22)
- Santa Barbara County - Planning and Development Department (Interview 09/06/22)
- White Buffalo Land Trust (Jalama Canyon) (Interview 09/07/22)
- Restoration Oaks Ranch and Santa Barbara Blueberries (Interview 09/08/22)
- City of Goleta - Sustainability Office (Interview 09/13/22)
- Santa Barbara County Parks Department (Santa Rosa Park, Lake Cachuma, Nojoqui Falls Park, Jalama Beach County Park) (Interview 09/14/22)
- United States Fish and Wildlife Service (Interview 09/19/22)
- Vandenberg Air Force Base (Interview 09/27/22)
- Land Trust for Santa Barbara County (Arroyo Hondo Preserve) (Interview 09/28/22)
- Santa Barbara Botanic Garden (Interview 09/30/22)
- Santa Ynez Band of Chumash Indians - Environmental Office (Interview 10/17/22)
- Gaviota Coast Conservancy (Interview 10/21/22)
- California Wildlife Conservation Board (Interview 10/27/22)

- YTT Northern Chumash Council (Interview 10/28/22)
- California Rangeland Trust (Interview 11/09/22)
- Barbareño Band of Chumash Indians (Interview 11/11/22)
- Coastal Band of Chumash Nation (Interview 11/14/22)
- National Oceanic and Atmospheric Administration - Office of National Marine Sanctuaries West Coast Region (Interview 11/17/22)

# Methodology

## Qualitative Methods

An integral component of the decision-making tool is input from stakeholders and rightsholders. To identify and analyze the conservation priorities of diverse stakeholders and rightsholders in the Gaviota Region, we conducted interviews and follow-up surveys from August 2022 to January 2023. Interviews were used to collect stakeholder and rightsholder terminology, transcribed using Sonix software, and analyzed using Dedoose, a qualitative data analysis software (*Dedoose*, 2021; *Sonix*, 2023). A preliminary analysis of the interviews was used to create an initial Google Forms survey that was sent to only four interview participants. The purpose of the preparatory survey was to test how the AHP methodology works and how to use it for different stakeholders; particularly, how to prevent Chumash voices from being suppressed due to less representation. Once the interview process and testing of AHP commenced, the finalized survey was created using the analysis results of all 23 interviews. We utilized the grounded theory and Q-method to develop the interview and survey questions (Charmaz, 2001; Herrington & Coogan, 2011). These methods aim to identify patterns, keep researcher bias at a minimum, and avoid preconceived hypotheses of respondents' answers.

### Participants

Interview and survey participants were recruited by email from our stakeholders and rightsholders list. All respondents have a direct connection to the Gaviota Region and are associated with various farms, ranches, government agencies, Indigenous communities, and non-profit organizations. Consent for the surveys was asked during the interviews. Due to the nature of our questions, we received an exemption from the Institutional Review Board's approval. In compliance with UCSB's Office of Research Human Subjects Committee, respondents answered interview and survey questions on behalf of their affiliated agency, organization, or business rather than based on personal opinion.

## Design, Procedure, and Data collection

We performed literature reviews to identify which methods are best used for conservation and natural resources-related qualitative research. Through the literature review, we found that the grounded theory and Q-method are the most commonly used methods for natural resources-related qualitative research (Braun, 2021; Gordillo et al., 2019; Hammes et al., 2016; Lan et al., 2022; Lee, 2022; X. Liu et al., 2019; Mahlalela et al., 2022; Nieuwenhuis et al., 2022; Rastogi et al., 2013; Seabrook-Davison et al., 2010; Shi et al., 2019; Yang et al., 2022). Grounded theory is a widely accepted sociological approach for exploratory studies (Braun, 2021). Grounded theory was used throughout the data collection and analysis process. While the Q-method was primarily used for analysis and writing the surveys. Open-ended interviews were conducted to collect information about the Gaviota Region's stakeholders and rightsholders and their terminology regarding their relationships with the land. The open-ended questions were formed using both grounded theory and Q-method.

Grounded theory is participatory research that facilitates the exploration of patterns. This helps shape further data collection to gather the information that fits the categories. The grounded theory encourages researchers to follow leads obtained through their early analysis to find new data instead of pursuing preconceptions (Charmaz, 2001). Similarly to grounded theory, Q-method reveals the implicit subjectivities of participants and allows them to express themselves without conforming to pre-assigned categories set by the researchers (Rastogi et al., 2013). The basic framework of grounded theory includes collecting qualitative data through interviews, conceptualizing participant statements' meanings, and coding them by clustering them into categories known as parent codes. One distinctive feature of grounded theory is that data collection, coding, and analysis coincide. They build off each other, allowing researchers to code and categorize data during the initial stages of data collection (Charmaz, 2001). Although all interviews followed the same structure, questions were tailored based on the organization type. Additional questions were improvised based on information shared by the participants. The following are examples of questions asked to all interviewees.

*Example interview question 1: Can you please give us a brief history of your organization and its work in the Gaviota Region?*

*Example interview question 2: How do you use your data to accomplish conservation priorities for your agency?*

*Example interview question 3: What is [name of organization] relationship with neighboring agencies, organizations, etc.? What do collaborations look like?*

The Q-method guided our in-depth data analysis and survey formulation. The basic framework of the Q-method includes developing the statements that reflect the diversity and complexity of the topic under study, selecting the participants, narrowing down the original statements to create a survey that has participants rank the statements, interpreting and analyzing using qualitative data analysis software (Rastogi et al., 2013). Interview recordings were transcribed and edited using the transcription software, Sonix (*Sonix*, 2023). The transcripts were uploaded to the qualitative data analysis software, Dedoose.

## Dedoose Qualitative Data Analysis

We used the Dedoose application for qualitative data analysis to codify and quantify themes from the interviews. Each interviewee was associated with an organization-type descriptor (nonprofit, Indigenous, farm/ranch, or government). We used the software to highlight interviewees' answers and frequently used terms, also known as coding to find common themes in conservation priorities. This was done by manually selecting specific words and clustering similar answers into categories. We used Dedoose analytics to generate summary statistics of priority categories and which organization type was most associated with that code. The Dedoose data analysis allowed us to determine self-identifying conservation priorities of the regional stakeholders and rightsholders. The conservation priorities resulting from the Dedoose analysis were the basis for what was included in our surveys and tool.

## Final Survey

The finalized survey was also created on Google Forms but sent to all 23 stakeholders and rightsholders we interviewed. 21 out of 23 interviewees responded to the final survey. The survey consisted of multiple-choice and open-ended questions (see Appendix B. for the full survey). Table 1 and Table 2 (below) show the definitions of the conservation priorities and DEI/EJ terms we included for the participants' reference in the survey.

**Table 1:** Definitions of the DEI/EJ terms included in the survey.

| Priority | Definition |
|---|---|
| Diversity | Presence of differences that may include race, gender, religion, sexual orientation, ethnicity, nationality, socioeconomic status, language, (dis)ability, age, religious commitment, or political perspective |
| Equity | Promoting justice, impartiality, and fairness within the procedures, processes, and distribution of resources by institutions or systems |

| | |
|---|---|
| Inclusion | An outcome from creating environments in which any individual or group can be and feel welcomed, respected, supported, and values as a fully participating member |
| Environmental Justice | Fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies |

**Table 2:** Definitions of the conservation priorities included in the survey.

| Priority | Definition |
|---|---|
| Biodiversity | All components supporting diversity including connectivity, fauna suitability, rare and threatened species locations, and locations of wetlands |
| Water | Water resources including wetlands, waterways, groundwater, and watershed health |
| Soil | Soil suitability for use in plant cultivation, agriculture, and ecosystem health |
| Climate Resilience | Areas functioning as refugia from climate change |

The first section of the survey provided an overview of our project goals and a description of the target deliverable, an interactive map. Additionally, we asked each person filling out the form to provide their organization name and email address. To help us subset our data, we also asked each participant to check a box as to which type of organization they represented (Government, nonprofit, farmer/rancher, Indigenous group, or other). Respondents were allowed to check as many boxes as they like to describe their organization type. If the organization chose “other” we provided a write-in area so they could add their preferred identity.

The second section of the survey was a series of multiple-choice questions intended to provide pairwise comparison results for use in the AHP analysis. The interview transcripts and Dedoose analysis summary statistics rendered a set of 4 conservation priorities that came up most in the interviews. The resulting conservation values were soil health, water resources, biodiversity, and climate resilience (see Table 2). To get the pairwise results, we asked participants, “Which conservation value does your organization prioritize?” with a follow-up question of “How much more important is this value?” This section had 12 questions (six comparing each value to another and six asking to rate its importance). Participants could rate importance on a scale from 1 (equal relative importance) to 9 (extreme relative importance).

The third section of the survey included two open-ended questions asking participants to share which metrics they would like to see visualized in our tool to represent environmental justice and diversity, equity, and inclusion. The fourth section included two open-ended questions on how useful the respondents perceived our tool will be to their organization and other comments they wished to share. The open-ended questions were also analyzed using Dedoose.

## Quantitative Methods

### Analytic Hierarchy Process

Using the responses from the survey detailed in Appendix B, we conducted an AHP using the `ahpsurvey` package in R (Cho, 2019). To process the data for compatibility with this package, we converted the binary choice answers (i.e. water vs. biodiversity) into a score of 1 or -1 (i.e. 1 correlates to water and -1 to biodiversity). Then, for each comparison set, we multiplied the columns for the 1/-1 value and the score provided by the survey respondents. This produced a data frame where columns were comparison pairs and rows were responses with values from -9 to 9, which was fed into the `ahp` and `ahp.mat` functions in the `ahpsurvey` package (Cho, 2019). This produced a table of aggregated preference scores (the geometric mean of all individual preference scores per each criterion) and their standard deviations, a comparison matrix per individual (a matrix comparing pairwise criteria based on one individual's response), and a preference score (an individual's overall preference for one criterion) and consistency ratio (a measure of inconsistency within the response or overall) per individual and per paired comparison. We then scaled the values of each aggregated preference by multiplying all aggregated preferences by a single factor so that the total sums to one.

To analyze differences between organizations of various types, we subsetted the data and performed an AHP for each subset. We used four different subsets (farm/ranch, government, non-profit, and Indigenous groups) based on self-identification within the survey. Respondents were allowed to self-identify as more than one type, so subsets may have respondents who repeat across groups. This subsetting process produced aggregated preferences for each priority for each organization type. All aggregated preferences for a given organization sum to one following a rescaling of values within subsets for comparison across subsets. The rescaled individual preferences were used to calculate the variance within each group. We also recorded the consistency ratios per group and per criterion, recorded as a mean and standard deviation.

### Interactive planner

Spatial data representing conservation values, environmental threats, and environmental justice indicators were processed using the Environmental Evaluation Modeling System (EEMS). Developed by Sheehan and Gough (2016), EEMS is a tree-based, fuzzy logic modeling framework for environmental decision support that allows one to combine data from different sources and numerical domains. This tool has been implemented in the ArcGIS ModelBuilder environment. The versatility of this framework allowed us to integrate metrics of different types and capture them in a single spatial layer with complex environmental outputs, such as multi-benefit areas. The Santa Barbara County region has several datasets based on this framework allowing us to build up our project based on Open Data practices. EEMS is used on web applications across California, and its results are available on several online repositories, including EEMS Online, Data Basin, and the Santa Barbara Blueprint. By using EEMS, we successfully created 7 layers and adapted 4 additional ones from existing studies. These layers were organized according to three main axes: natural resources, environmental threats, and DEI/EJ. The metrics employed to characterize each layer were derived from a review of commonly used measures found in the literature. The remaining layers were obtained from existing studies that contained data that fit within the three axes. The layers defining each axis are as follows:

- Natural resources: water resources, soil, biodiversity, and resilience.
- Environmental threats: droughts, flooding, wildfires, and climate exposure.
- Equity issues: pollution, isolation from nature, and demographics.

After integrating the conservation values into a uniform grid system for our region of interest and processing them with EEMS, we developed a Shiny application using R to display the results interactively. This web planner is designed to determine the extent of overlap between natural resources, natural hazards, and social values and to pinpoint areas that align with desired conservation objectives or environmental initiatives.

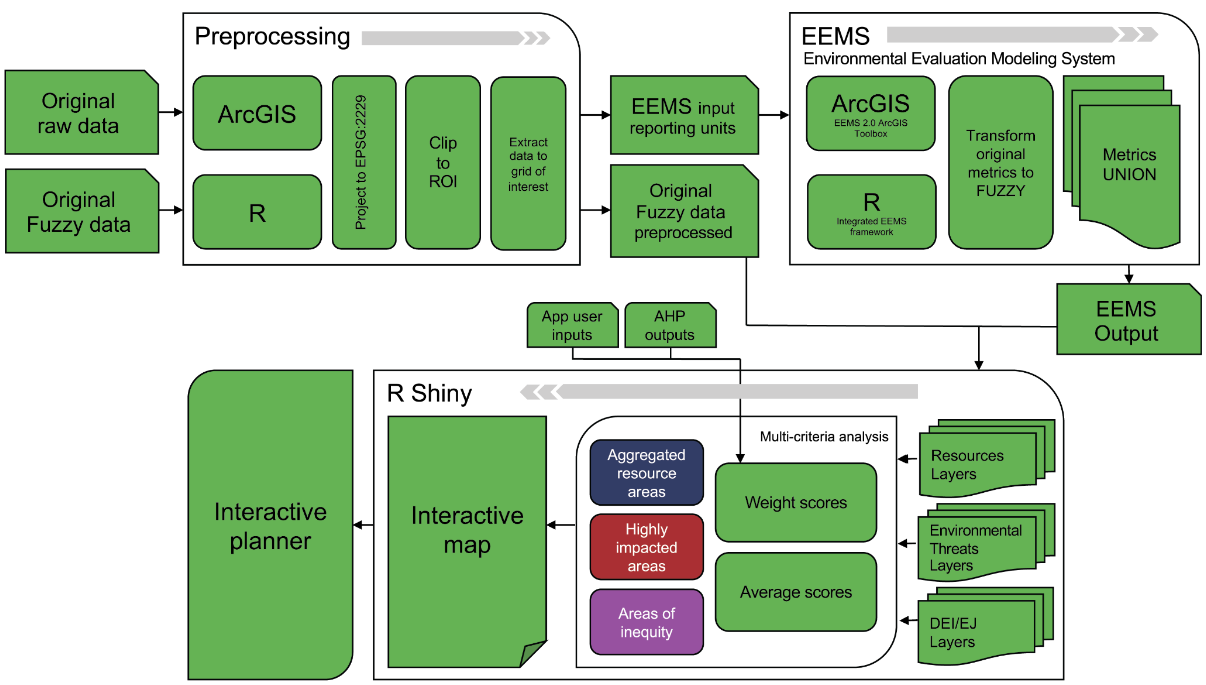



**Figure 1.** Diagram illustrating the workflow to create the interactive planner, including the three main steps of preprocessing, EEMS, and Shiny app creation.

### Data sources

Environmental variables were collected from several open-source databases, including Data Basin and Santa Barbara County Conservation Blueprint Atlas, and were developed by TNC, the Conservation Biology Institute (CBI), the Federal Emergency Management Agency (FEMA), and California Department of Water Resources (DWR). The layers representing biodiversity, water resources, climate resilience, climate exposure, and soil health were directly reused from existing works, while the rest (DEI/EJ, threats) were created based on metrics hosted in different repositories.

We acquired data from various sources, such as the Conservation Biology Institute, FEMA, and the Department of Water Resources, to create our "threats" layers. The data included information pertaining to different climate projections available for our region of interest. Specifically, the droughts and flooding layers integrated data from the MIROC-esm RCP 8.5 and CCSM4 RCP 8.5 climate scenarios, while the wildfire layer consisted of the CNRM-CM5 and MIROC5 scenarios. Developments in the CNRM-CM5 model produce a more realistic representation of the mean recent climate (Voldoire et al., 2013). The CCSM 4 RCP 8.5 represents the Community Climate Modeling System version 4 with the highest emission scenarios going forward. Similarly, the MIROC-esm RCP8.5 utilizes many components to project a high emissions scenario for the future, serving as an effective tool for assessing potential physical climate risk (Schwalm et al., 2020). For ease in development, we kept the model information the same in our outputs as in the data we were provided. Within the interactive planner, users can assess the potential future threats to the region by toggling between the two climate scenarios available for droughts, flooding, and wildfire. Alternatively, they can choose to display the average values of both scenarios.

In the agricultural layer provided by Conservation Biology Institute, we decided to manipulate some of their aggregated metrics. Most of the stakeholders we interviewed for our project were focused on soil health metrics rather than actual agricultural or grazing land for cattle. For this reason, we removed the “grazing land” metric that was originally included in the layer to tailor our results to the responses of the stakeholders. Other metrics that we decided to keep within the agriculture layer are detailed in the table below. Tables 3-5 summarize all of the metrics used to compile the layers and the data sources for each dataset.

**Table 3.** Reused layers from existing studies.

| Layer | Data source | Notes |
|---|---|---|
| Biodiversity | Created by CBI, available at Santa Barbara County Conservation Blueprint Atlas | Based on wetlands/riverine systems, fauna suitability, rare and threatened species, analysis of projected vegetation, and connectivity data |

| | | |
|---|---|---|
| Water resources | Created by CBI, available at Santa Barbara County Conservation Blueprint Atlas | Based on wetlands, waterways, groundwater, and watershed assessments data |
| Climate Resiliency | Created by The Nature Conservancy, available at TNC's Resilient Land Mapping Tool | Resilience Score is determined by the area's capacity to maintain species diversity and ecological function as the climate changes |
| Climate exposure | Created by California Department of Fish and Wildlife, available at Data Basin | Based on aridity and climate. Climate factors include maximum temperature, minimum temperature, and precipitation. The change was calculated compared to the historical period, 1971-2000. Ensemble-based on CanEMS2 and HadGEMS2ES models. |
| DEI/EJ: Pollution | Pollution Burden percentile: CalEnviroScreen 3.0 from OEHHA (Office of Environmental Health Hazard Assessment) | A combination of environmental pollutants (ozone, PM 2.5, lead risk, diesel PM, drinking water contaminants, pesticides, toxic releases from facilities, traffic) and human exposure to those effects (cleanup sites, groundwater threats, hazardous waste generators and facilities, impaired water bodies, solid waste sites, and facilities). |
| DEI/EJ: Demographics | Population Characteristics percentile: CalEnviroScreen 3.0 from OEHHA (Office of Environmental Health Hazard Assessment) | A combination of socioeconomic factors (education, housing, linguistic isolation, poverty, unemployment) and health outcomes from exposures to environmental hazards (asthma, cardiovascular disease, low birth weight in infants). |
| DEI/EJ: Isolation from Nature | Underserved Populations for Trail/Open Space Access, Underserved Trail Populations layer from Santa Barbara Blueprint and CBI | A combination of trail scarcity and population density. Areas of low equity are areas with high trail scarcity and high population density. |

**Table 4.** Details of metrics used in creating new layers.

| Layer | Metrics | Data source | Notes |
|---|---|---|---|
| Droughts | (1) Projected change in total precipitation (2010-2039 vs.1981-2010); (2) Historical (1981-2010) Recharge (mm); (3) Recharge projections (mm); (4) Projected change in climatic water deficit (2010-2039 vs.1981-2010), | Created by CBI, available at Santa Barbara County Conservation Blueprint Atlas | For each metric, data from CCSM4 RCP 8.5 and MIROC-esm RCP 8.5 models were included. |
| Wildfires | (1) Relative Probability of Fire Ignition, Santa Barbara County, 2020-2050; (2) Relative Probability of Large Fires, Santa Barbara County, 2020-2050 | Created by CBI, available at Santa Barbara County Conservation Blueprint Atlas | For each metric, data from MIROC5 and CNRM-CM5 (GCM and RCP 8.5) models were included |
| Flooding | (1) FEMA risk zones (100-Year Floodplains); (2) FEMA risk zones (500-Year Floodplains); (3) DWR Awareness (100-Year Floodplains); (4) Runoff projections (mm) (2010-2039) | (1, 2) created by FEMA, and (3) DWR, acquired upon request; (4) Created by CBI, available at Santa Barbara County Conservation Blueprint Atlas | For each runoff metric, data from CCSM4 RCP 8.5 and MIROC-esm RCP 8.5 models was included. |
| Soil Health | (1) Historical (1981-2010) Total Precipitation; (2) Farmland Mapping and Monitoring Program (FMMP); (3) SSURGO Irrigated Capability Class Soils; (4) SSURGO Non-Irrigated Capability Class Soils;(5) SSURGO CA Storie Index | Created by CBI, available at Santa Barbara County Conservation Blueprint Atlas | Modified from CBI's "Agricultural Areas of Importance" layer. Used an average across metrics with no weights included. |

### Preprocessing

The layers for the interactive planner were created by combining existing metrics from various spatial data sources. The original resolutions of most of these metrics were higher than the desired final resolution, which was reduced for two reasons: (1) with higher resolution (smaller pixel size), the computational requirements of the interactive planner would be too high, resulting in increased buffering time and slowed performance of the app. (2) To ensure accuracy and prevent data distortion, the resolution of the layers in the planner must be at least as high as the lowest resolution of any metric or layer included in the planner. Therefore, we chose a 2000 x 2000 foot (609.6 x 609.6 meters) cell size based on a previous work by the Conservation Biology Institute for similar areas of conservation interest in Santa Barbara (Brooking Gatewood et al., 2017). The extent of our area of interest was limited to the Santa Barbara County boundary. All layers were reprojected to EPSG:2229.

The EEMS is implemented in the ArcGIS ModelBuilder environment, which requires an input vector data file with a reporting unit feature for each metric. Therefore, we created a vector-based grid of regular square polygons clipped to our area of interest. Depending on the source data type format, we applied different methods to include information about the metric of interest in each cell. We used zonal statistics and NA interpolation for raster data to ensure overlap between the raster and grid layer. For vector data, we extracted the data using attribute joining by location. The preprocessing was done using QGIS 3.28 and ArcGIS 10.3, and later implemented in R for easy reproducibility (R version 4.1.2).

### Environmental Evaluation Modeling System

The available version of EEMS, EEMS 2.0 ArcGIS Toolbox, is only compatible with python 2.6 and can only be used with ArcGIS versions 10.1, 10.2, and 10.3. The data used in this tool was extracted from the pre-processed reporting unit file. A fuzzy conversion was applied to each metric, with values ranging from -1 to 1, indicating the lowest and highest representation of the attribute of interest, respectively. The range was set from 0 to 1 by implementing EEMS into R code posteriorly. When necessary, thresholds were set on the original data, and a simple linear interpolation was used to perform the conversion. Afterward, the metrics were combined into one final layer, with the choice of thresholds and union methods varying depending on the attribute and layer being created (Sheehan et al., 2016). The following table summarizes the EEMS data transformations used for each layer.

**Table 5**. Details of the EEMS data transformation.

| Layer | Metric | Thresholds and other operations | Union | Notes |
|---|---|---|---|---|
| Droughts | Change in precipitation | False threshold = 0 (positive values excluded); true threshold = highest negative value | Average | Water stress is represented on a scale ranging from 0 to 1, where 0 represents no stress difference between historical values and projections (i.e., water availability is not worsening), and 1 represents the highest water stress increase in the future (i.e., future droughts will be more prevalent in those areas). |
| | Change in recharge | false threshold = 0 (positive values excluded); true threshold = highest negative value | | |
| | Change in Water Deficit | False thresholds = 0 (negative values excluded); true threshold = highest positive value | | |
| Wildfires | Probability of fire ignition | No thresholds were included. Value down-weighted to 60%. | Maximum value | Fire occurrence was represented on a scale where 0 means zero chances of wildfires occurring |

| | | | | |
|---|---|---|---|---|
| | Probability of large fires | No thresholds were included | | (assuming uncertainty) and 1 is the highest fire probability occurrence. |
| Flooding | Flooding risk areas | Flooding areas were classified into 3 categories: 100-Year Floodplains, 500-Year Floodplains, and areas not affected or limited affected. A risk score was calculated based on the percentage of area affected by cell and a specific weight for each category.  Areas of high risk (100-Year Floodplains) are given a double value, while areas with no risk won't contribute to calculate the flooding score. 500-Year Floodplains received no additional weighting. | Average | Flooding risk is represented on a scale where 0 is a relatively low chance of being affected by flooding events and 1 the highest chance of being affected. |
| | Runoff projections | No thresholds were included | | |
| Soil Health | Significance as an agricultural resource | No thresholds were included | Average | To adhere to the soil health definition provided in the background section, we removed grazing lands from the original layer provided by CBI. |
| Reused layers from existing works were directly transformed to fuzzy without setting thresholds. | | | | |

The EEMS framework was converted into R code to improve reproducibility. The results were validated against the ones obtained from the EEMS 2.0 ArcGIS Toolbox. The integration of the EEMS framework into R is not comprehensive and is limited to the modeling aspects used in this study. However, despite this limitation, the use of a single coding format for all data processing streamlined the process and created a uniform pipeline, facilitating the creation of most of the layers.

### Shiny application

The creation of the interactive planner was based on Shiny. Shiny is an R package enabling interactive applications to execute R code on the backend. The first stage of implementing the planner was the preparation of the data inputs, which consisted of three vector data files, one for each of the planner’s axes — natural resources, environmental threats, and DEI/EJ issues — containing each of the scores from the

EEMS outputs. The app's architecture consists of the read-in of specific attributes and their representation on a map using Leaflet, an open-source JavaScript library used to build web mapping applications, accessible through the respective R package. This package enables the map to be interactive, allowing users to zoom in and out and pan around the map, and toggle between different layers.

The planner has multiple tabs that allow users to interact with spatial information. The layers defining each axis can be represented individually or aggregated by theme, where highly represented values correspond to a score of 1 and non-represented values to 0. The default aggregated assessment is based on average values, but the planner allows for flexibility in assessment generation. This is achieved by recalculating the aggregated values based on specific weights on a scale from 0 to 10, with which the user can interact. For instance, on the natural resources axis, users can display a multi-benefit conservation assessment and adjust the aggregated values according to their conservation priorities. Additionally, users can select predefined weights to represent priorities by organization type based on the AHP results. These predefined weights and their spatial outputs can then be compared between two stakeholder/rightsholder groups or between a stakeholder/rightsholder group and the users own custom weights. Furthermore, the planner includes interactive elements, such as buttons and drop-down menus, that allow users to control all the interactive options. These elements enable users to select areas of interest and generate summaries of the represented data, among other things.

Finally, the app underwent thorough testing and refinement to ensure that it was user-friendly and easy to navigate. A significant focus during the testing phase was enhancing the computational efficiency to decrease buffering times when recalculating the multi-benefit assessments and displaying the data.

The following link directs to the GitHub repository containing the code and R shiny contents required to run the Interactive Planner.

https://github.com/gp-endangermond/interactive-planner-GP

# Results

## Transcript Analysis Results

As mentioned previously, the transcript analysis was done using the qualitative data analysis software, Dedoose. We coded respondents' answers and clustered them into categories of main themes, or parent codes. In total, there were 13 subcodes, also known as child codes used during the transcript analysis process. All of the child codes were put into one of three parent codes: conservation (agriculture, biodiversity, vulnerable species, climate resilience, soil, and water), equity (cultural resources and public access), and threats (development, fragmentation, invasive species, pollution/toxicity, and wildfire).

Below is a summary statistics graph of all 13 child codes. The graph breaks down how many responses we received for each code and the percentage of responses from each organization type. Each respondent was only counted once per code despite if they mentioned the same code multiple times during their interview. The top three conservation priorities that stakeholders and rightsholders mentioned the most in the interviews are water, climate resilience, and biodiversity. Public access is the top code associated with equity and invasive species had the most responses for threats. Government organizations had responses with the most codes at 11 out of 13 while nonprofits had the second most at 10 out of 13 codes. This suggests that government and nonprofit organizations may approach priorities broadly while farms, ranches, and Indigenous communities have more specialized foci.

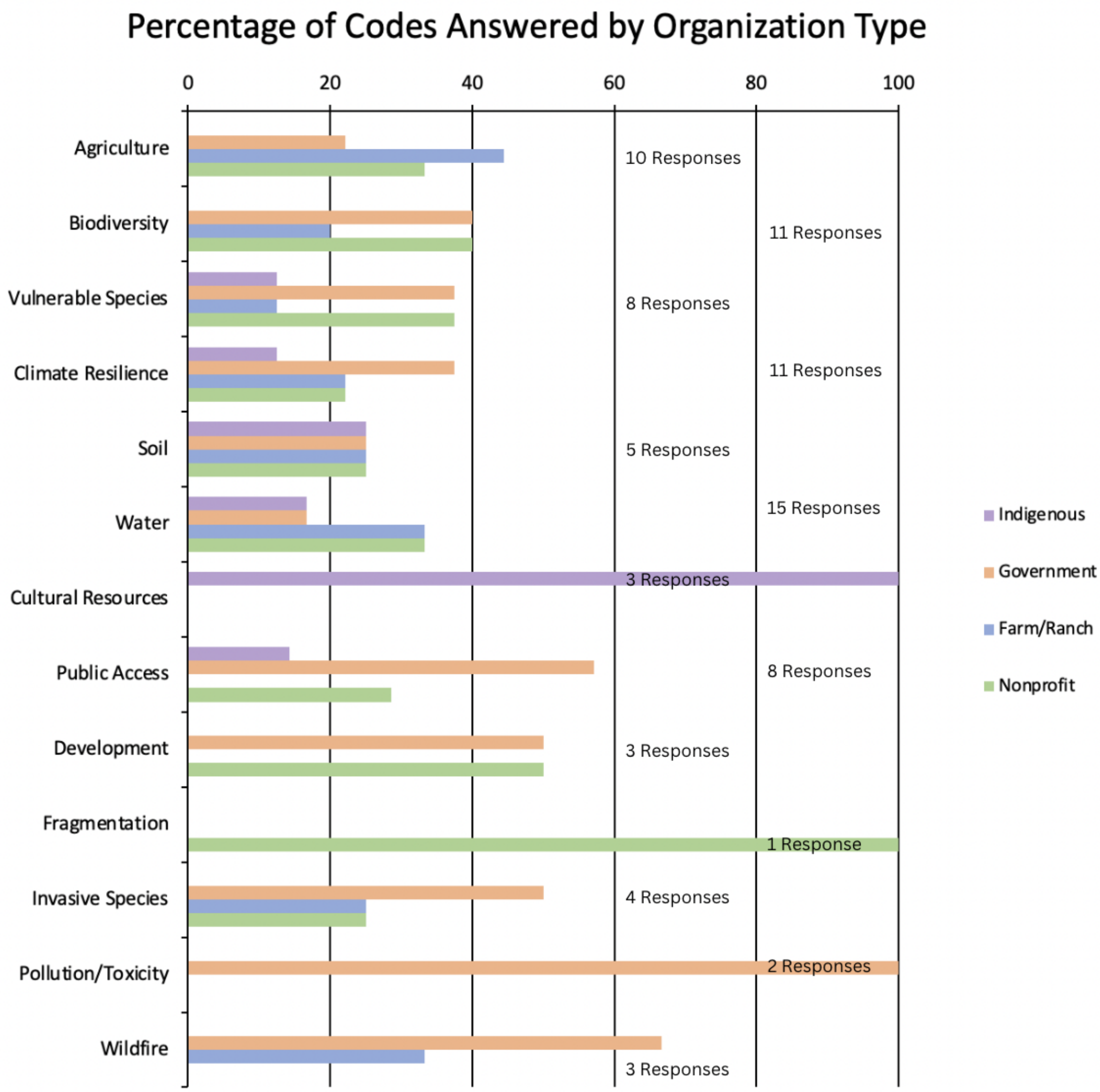



**Figure 1.** Overall Dedoose transcript analysis summary statistics. Individual codes with the percentages of responses by organization type from all 23 transcripts.

## Open-ended Survey Questions Analysis Results

While organization type was preassigned to interviewees for the transcript analysis, we allowed those who participated in the final survey to self-identify their organization type(s). One respondent described their organization as Indigenous, government, and nonprofit while another respondent chose Indigenous and nonprofit. One respondent identified as being with a farm/ranch and government organization. Three respondents described their organization as a farm/ranch and a nonprofit. This resulted in four additional organization-type descriptors for a total of eight. Respondents were only counted for one organization type each. Dedoose was used to analyze the four open-ended questions in the final survey and generate the summary statistics below.

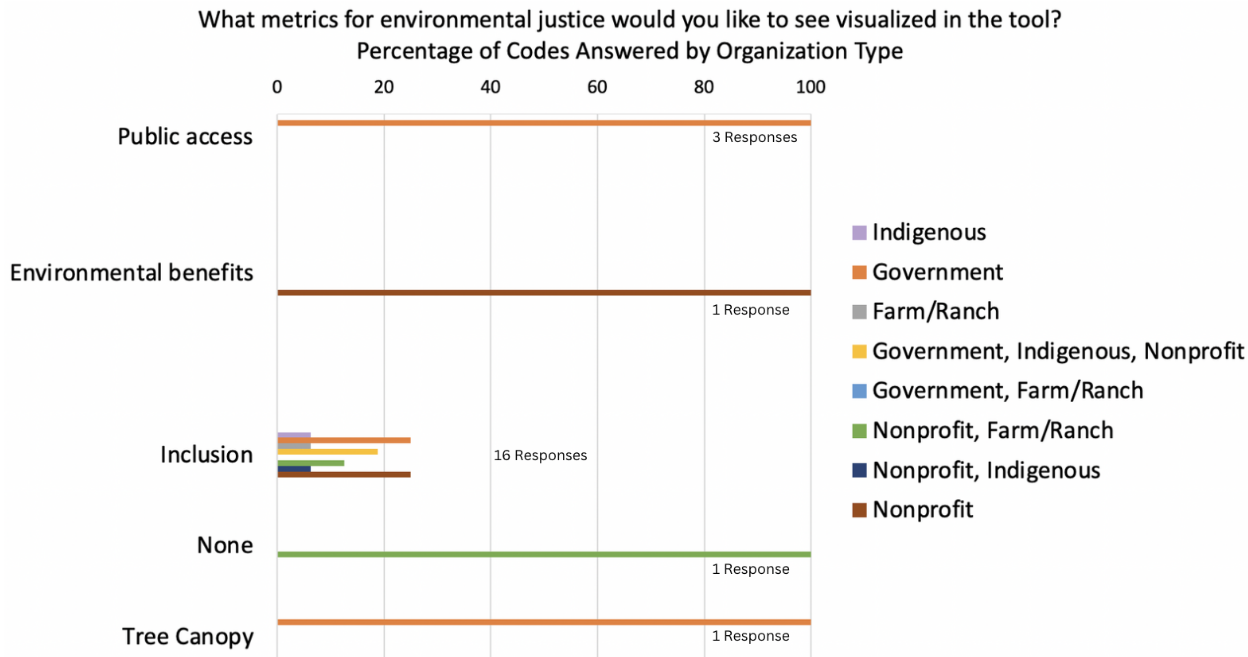



**Figure 2.** Dedoose codes and analytics for the survey question, "What metrics for environmental justice would you like to see visualized in the tool?" with the percentages of responses by organization type.

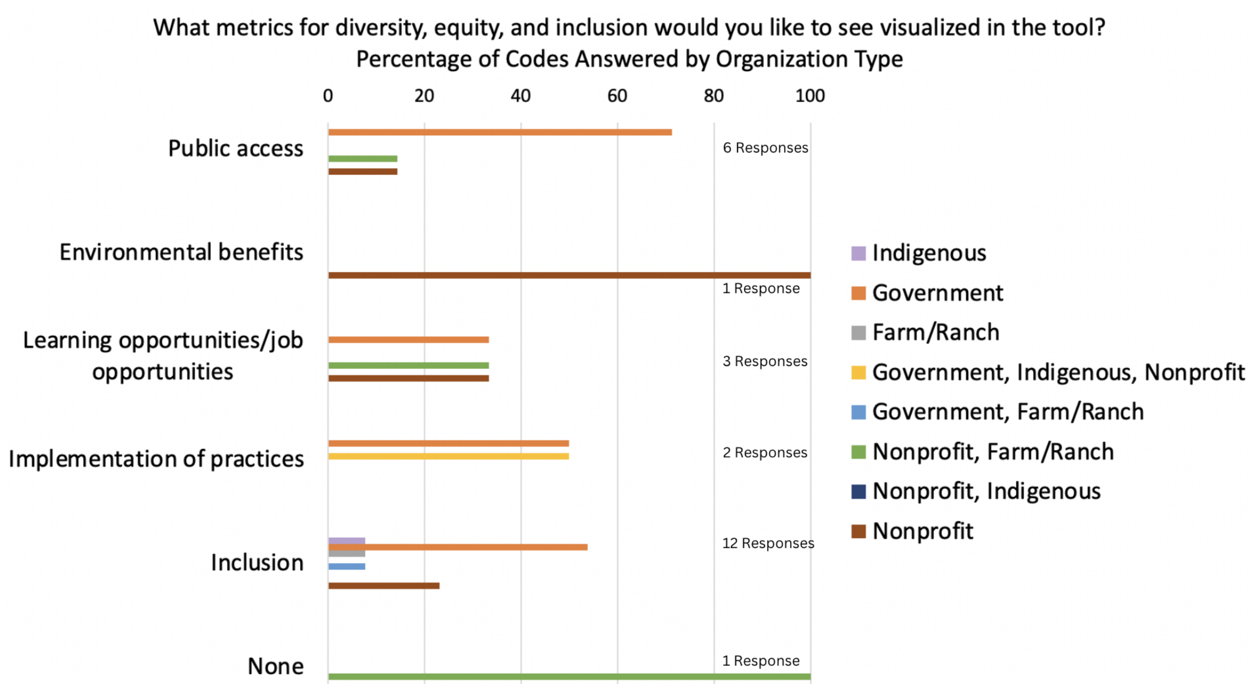


**Figure 3.** Dedoose codes and analytics for the survey question, “What metrics for diversity, equity, and inclusion would you like to see visualized in the tool?” with the percentages of responses by organization type.

Respondents were only counted once per code except for inclusion. The inclusion code was used to encompass an array of answers using subcodes for the environmental justice and diversity, equity, and inclusion questions. Therefore, organizations could be coded for inclusion multiple times to best represent their answers. For the environmental justice question, inclusion represents respondents wanting to see metrics for the following child codes: inclusion of local indigenous community members, minority youth, health burden, pollution burden, socioeconomic background, work in underserved communities, and diversity. Inclusion for the diversity, equity, and inclusion question represents respondents wanting to see metrics for the following child codes: identify new partners, funding, collaboration with indigenous communities, volunteer participation, socioeconomic background, and disadvantaged farmers/ranchers.

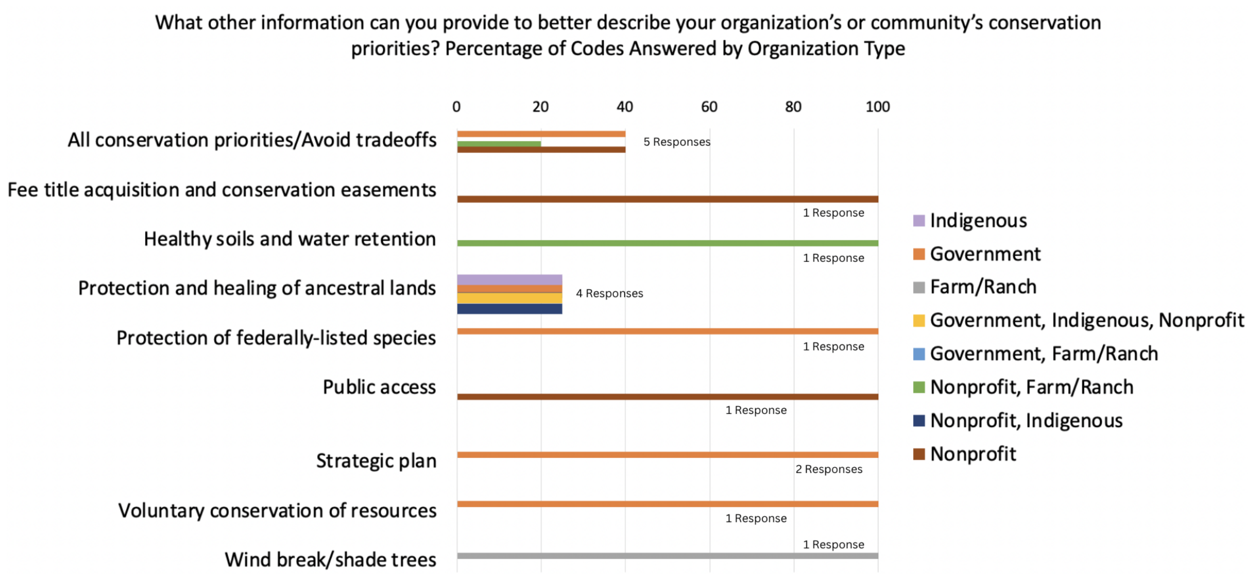



**Figure 4.** Dedoose codes and analytics for the survey question, “What other information can you provide to better describe your organization’s or community’s conservation priorities?” with the percentages of responses by organization type. Five respondents who identified as having government or nonprofit in their descriptor expressed that all natural resources should be prioritized together and tradeoffs should be avoided. Four respondents who identified as having Indigenious, government, or nonprofit in their descriptor communicated the protection and healing of the region’s land.

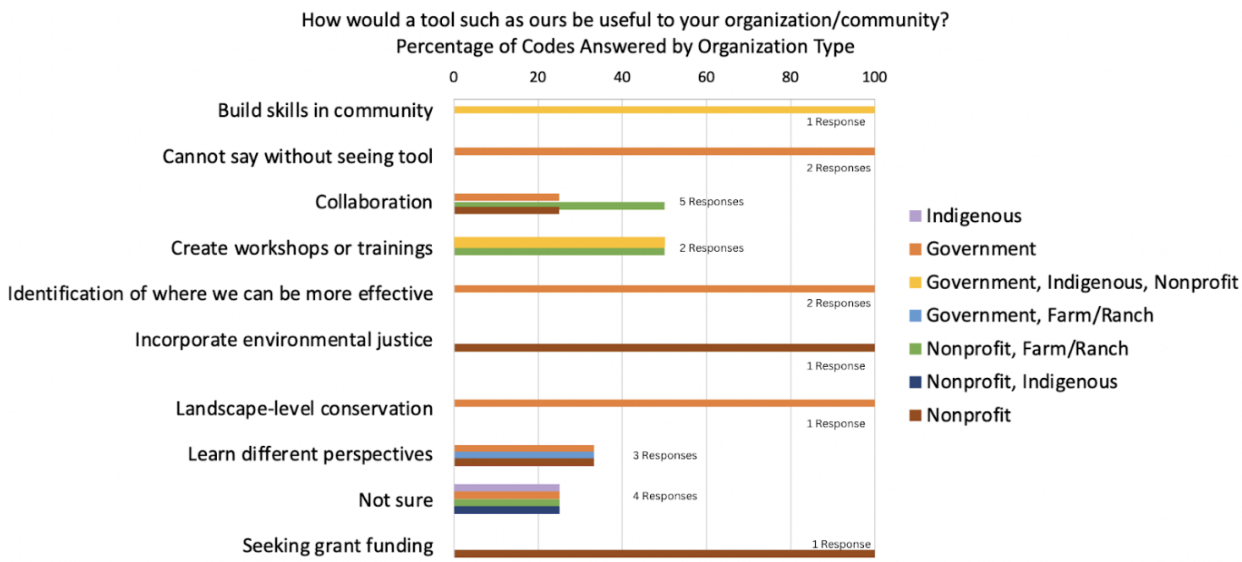



**Figure 5.** Dedoose codes and analytics for the survey question, "How would a tool such as ours be useful to your organization/community?" with the percentages of responses by organization type.

We were pleased to learn that no respondents definitively said that our tool would not be useful to their organization or community. Aside from the respondents who are not sure how our tool would be useful to their organization or community, collaboration and learning different perspectives warranted the most responses. Five respondents who identified as government, nonprofit, or nonprofit farm/ranch conveyed that our tool could help their organization with collaboration.

## AHP Results

We calculated and scaled the aggregated weights for each organization type based on their self-identification in the final survey (Table 1, Table 2). The AHP for all organizations that participated in the survey placed biodiversity as the highest priority (0.316), followed by water (0.281), climate resilience (0.233), and finally soil (0.170). Comparatively, government organizations had an identical order of priorities but with increased relative importance for biodiversity (0.373) and decreased relative importance for soil (0.115). Non-profit groups held biodiversity (0.272) and water (0.273) as nearly equal and of the highest importance, followed closely by soil (0.258), and then climate resilience (0.196). Farms and ranches listed soil as the most important priority above all else (0.460). This was the highest aggregated preference even across all subsets. The second highest priority for farms and ranches is water resources (0.350). The lowest priorities for farms and ranches are climate resilience (0.097) and biodiversity (0.093), with a large decrease in priority compared to soil and water. Surveyed Indigenous Chumash groups in the region consider climate resilience their highest priority (0.356) and are the only group with climate resilience as the main priority. The next highest priorities for the Indigenous respondents are biodiversity (0.266), then water (0.215), then soil (0.163).

The consistency ratio for an AHP reflects the consistency of pairwise weighting for a given individual's preferences. For the sake of privacy, no individual consistency ratios have been reported here, and we have opted to instead share a mean and standard deviation of the consistency ratios per group (Table 2). Responses with consistency ratios over 0.05 are generally regarded as having significant inconsistencies. All subsets in this analysis had consistency ratios well above 0.05 or 0.1, indicating high inconsistency of responses in each group.

Variances were calculated based on the individual preferences values within each group and conservation priority (Table 2). Higher aggregated preference values tend to be associated with higher variances, with a notable exception for farm/ranch organizations and soil priority. Associations of high priority with low variance indicate that a subset has a strong preference for a given priority. Low variance also indicates that we have higher confidence that a preference is shared across the rest of the unsampled population.

The evenness of aggregated preferences within groups can be visualized through boxplots showing the distribution of responses per group and per conservation priority (Figure 1). Nonprofits and Indigenous groups appear to have the highest evenness across aggregated preferences, and government organizations and farms and ranches have more variability across aggregated preferences. The evenness of aggregated preferences within a group can provide insight into which partners are best for various endeavors. Groups with high variability are best suited to partner on projects that cater to their highest conservation priority, and groups with higher evenness are likely to be good partners for more general conservation activities.

**Table 1.** A list of survey respondents and the type(s) of the organization they self-identify as. Subsets are based on these identities.

| Organization | Type |
|---|---|
| U.S. Fish and Wildlife Service | Government |
| Gaia Farm | Non-profit organization, Farm/Ranch |
| The Regents of the University of CA-Las Varas, Fire Safe Council Ranch | Government, Farm/Ranch |
| California Rangeland Trust | Non-profit organization |
| CDFW | Government |
| County of Santa Barbara, Planning and Development Department, Long Range Planning Division | Government |
| Frinj Coffee Inc | Farm/Ranch, CA Corporation |
| White Buffalo Land Trust | Non-profit organization |
| Cachuma Resource Conservation District | Government |
| Wildlife Conservation Board | Government |
| Gaviota Coast Conservancy | Non-profit organization |
| Santa Barbara Botanic Garden | Non-profit organization |
| Santa Ynez Chumash | Indigenous tribe/agency/organization |
| Santa Barbara Blueberries / Restoration Oaks Ranch / Wild Farmlands Foundation | Non-profit organization, Farm/Ranch |
| Coastal Band of the Chumash Nation | Government, Non-profit organization, Indigenous tribe/agency/organization |
| Vandenberg Space Force Base, Lompoc, CA | Government |
| County of Santa Barbara Community Services Department | Government |
| Barbareno Band of Chumash Indians | Non-profit organization, Indigenous tribe/agency/organization |
| NOAA Office of National Marine Sanctuaries West Coast Region | Government |
| City of Goleta | Government |
| The Nature Conservancy | Non-profit organization |

**Table 2.** Scaled aggregated preferences for each priority from the analytic hierarchy process for the overall and subsetted organizations. The number of respondents within that subset (respondents may repeat within subsets) is given by “n”. The variance is calculated from the rescaled individual preferences, which are not included to maintain respondent privacy.

| Organization Type | Priority | Aggregated Preference | Variance | Consistency Ratio (mean ± standard deviation) |
|---|---|---|---|---|
| All (n = 21) | Biodiversity | 0.316 | 0.072 | |
| | Water | 0.281 | 0.043 | |
| | Soil | 0.170 | 0.039 | |
| | Climate Resilience | 0.233 | 0.032 | 0.2671 ± 0.65 |
| Government (n = 11) | Biodiversity | 0.373 | 0.066 | |
| | Water | 0.289 | 0.055 | |
| | Soil | 0.115 | 0.010 | |
| | Climate Resilience | 0.222 | 0.017 | 0.1296 ± 0.14 |
| Non-profit (n = 9) | Biodiversity | 0.272 | 0.061 | |
| | Water | 0.273 | 0.019 | |
| | Soil | 0.258 | 0.031 | |
| | Climate Resilience | 0.196 | 0.016 | 0.4121 ± 0.99 |
| Farm/Ranch (n = 4) | Biodiversity | 0.093 | 0.014 | |
| | Water | 0.350 | 0.052 | |
| | Soil | 0.460 | 0.019 | |
| | Climate Resilience | 0.097 | 0.005 | 0.2048 ± 0.11 |
| Indigenous (n = 3) | Biodiversity | 0.266 | 0.000 | |
| | Water | 0.215 | 0.011 | |
| | Soil | 0.163 | 0.020 | |
| | Climate Resilience | 0.356 | 0.062 | 1.1261 ± 1.68 |

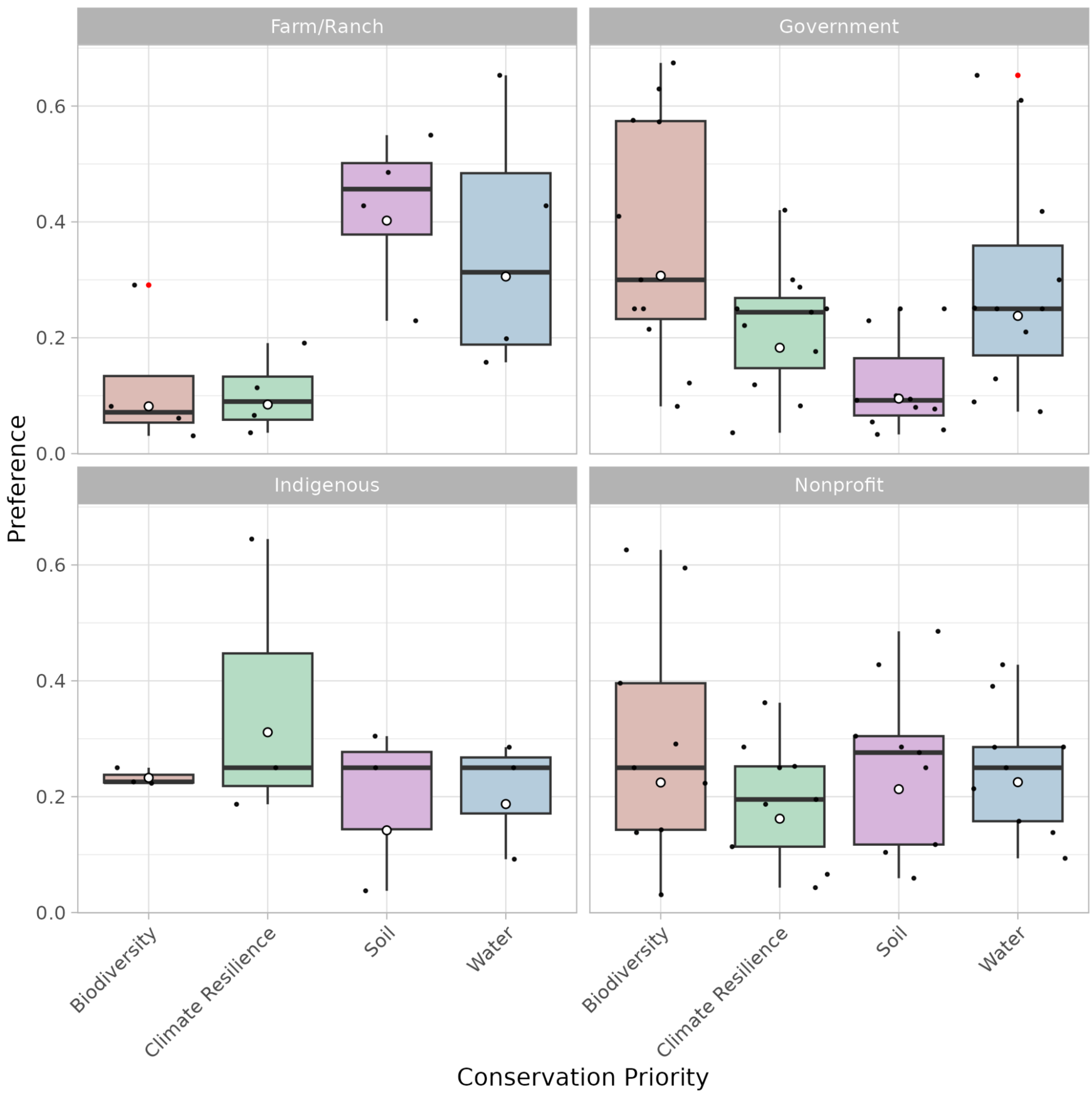



**Figure 6.** Boxplot of individual preferences by group and by conservation priorities. Bold lines in boxes represent the median, box ends represent the interquartile range, and vertical lines represent the minimum and maximum. Filled points are individual data points and red points are outliers. Hollow points represent the unscaled aggregated preference.

# Planner Results

## Resources (Conservation Values)

All four conservation priorities (biodiversity, climate resilience, soil health, and water resources) were visualized in QGIS to display separate visualizations. All maps were created in QGIS using graduated symbology with the “natural breaks (Jenks)” scale and 5 classes. The final map results showing combined metrics for each priority are seen below in Figures 7-10.

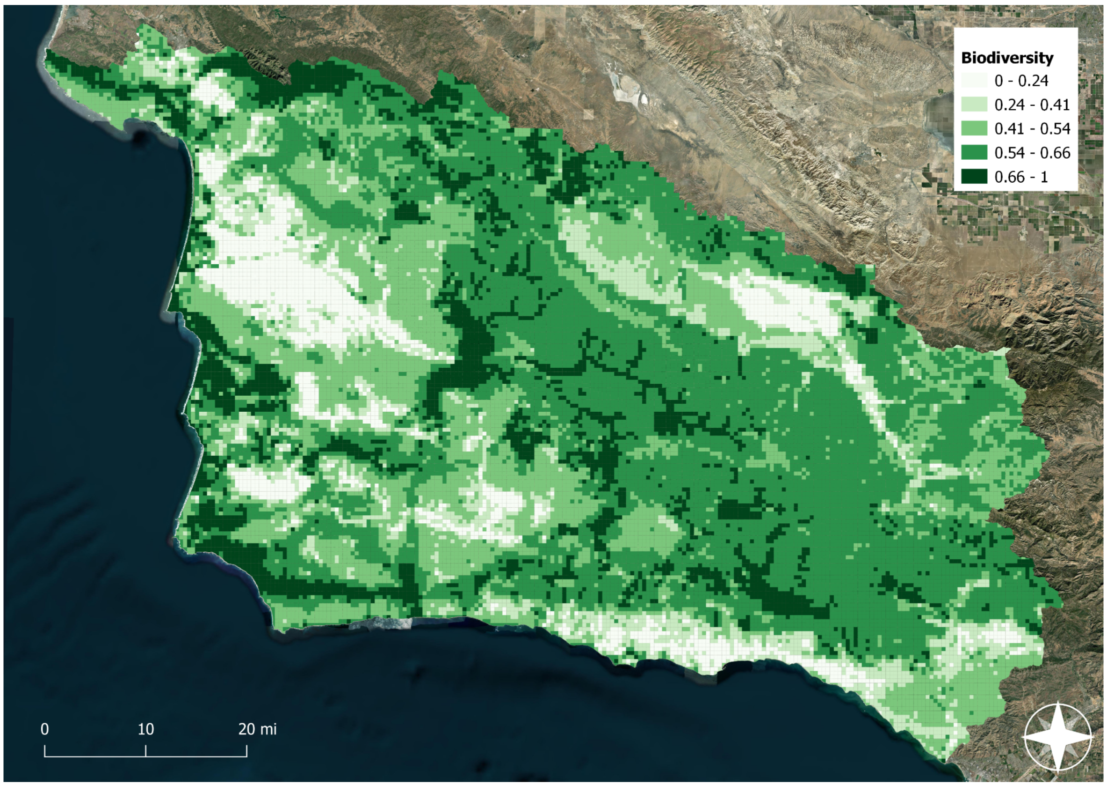



**Figure 7.** Biodiversity values within the Gaviota Region. Darker areas indicate land with higher biodiversity.

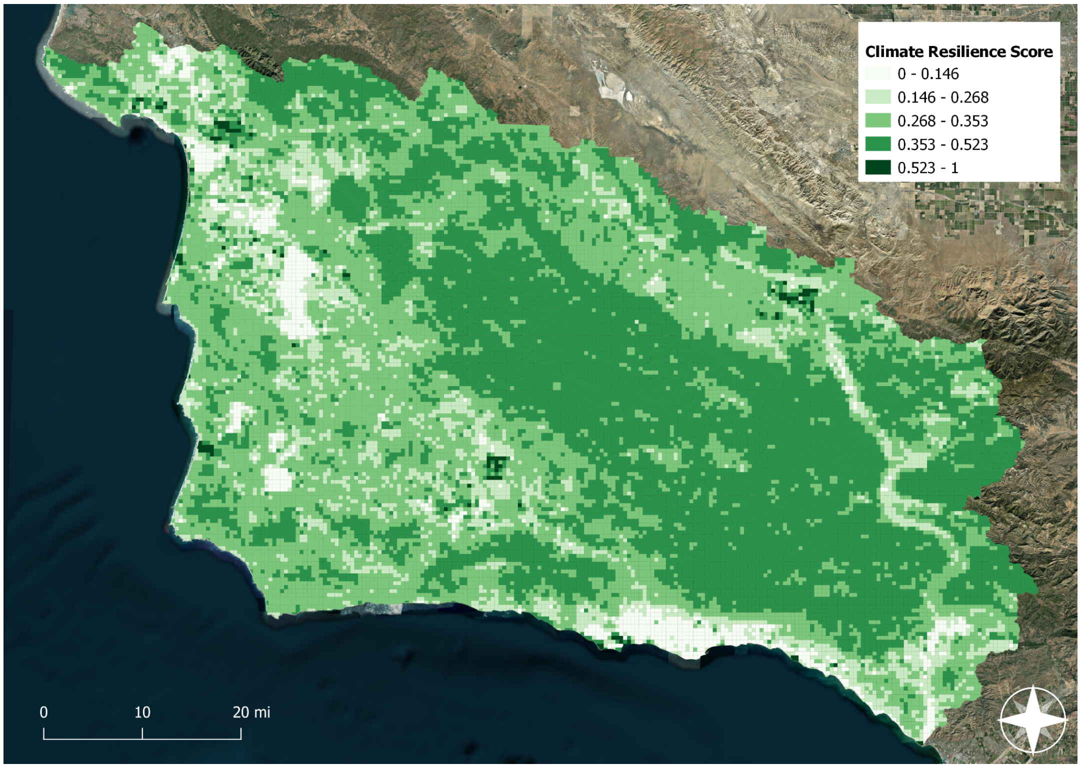


**Figure 8.** Climate resilience values within the Gaviota Region. Darker areas indicate land with higher climate resilience scores.

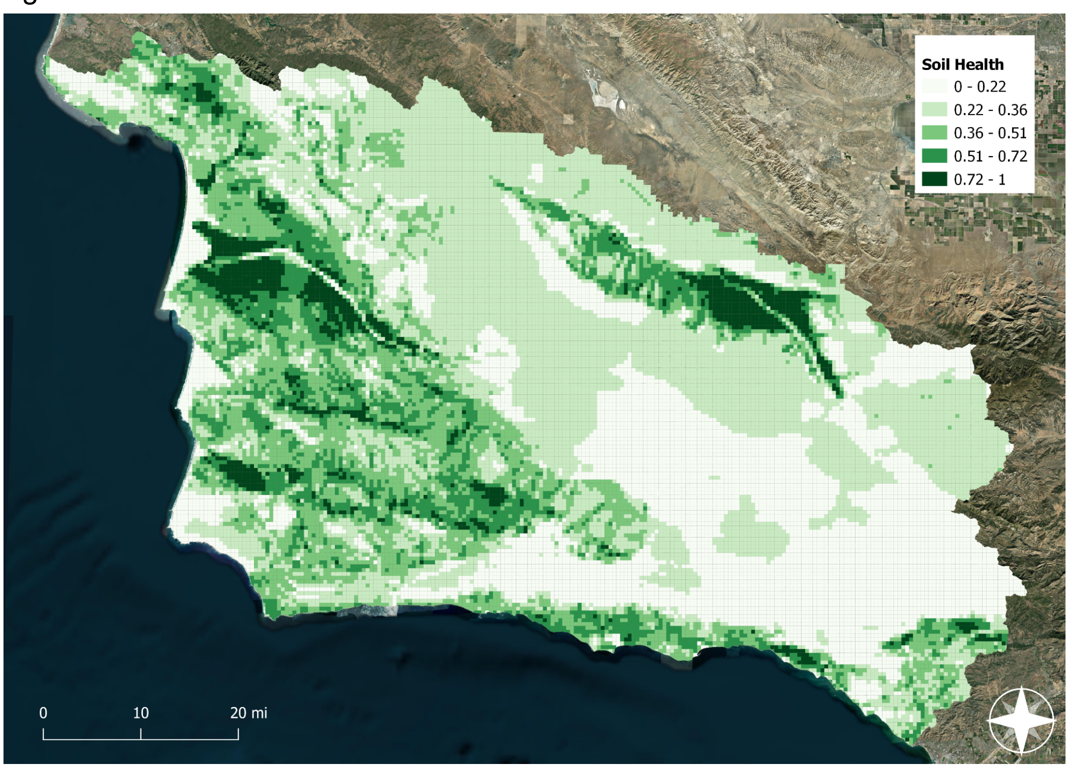


**Figure 9.** Soil health within the Gaviota Region. Darker areas indicate land with better soil health from historical precipitation and soil class, among other metrics.

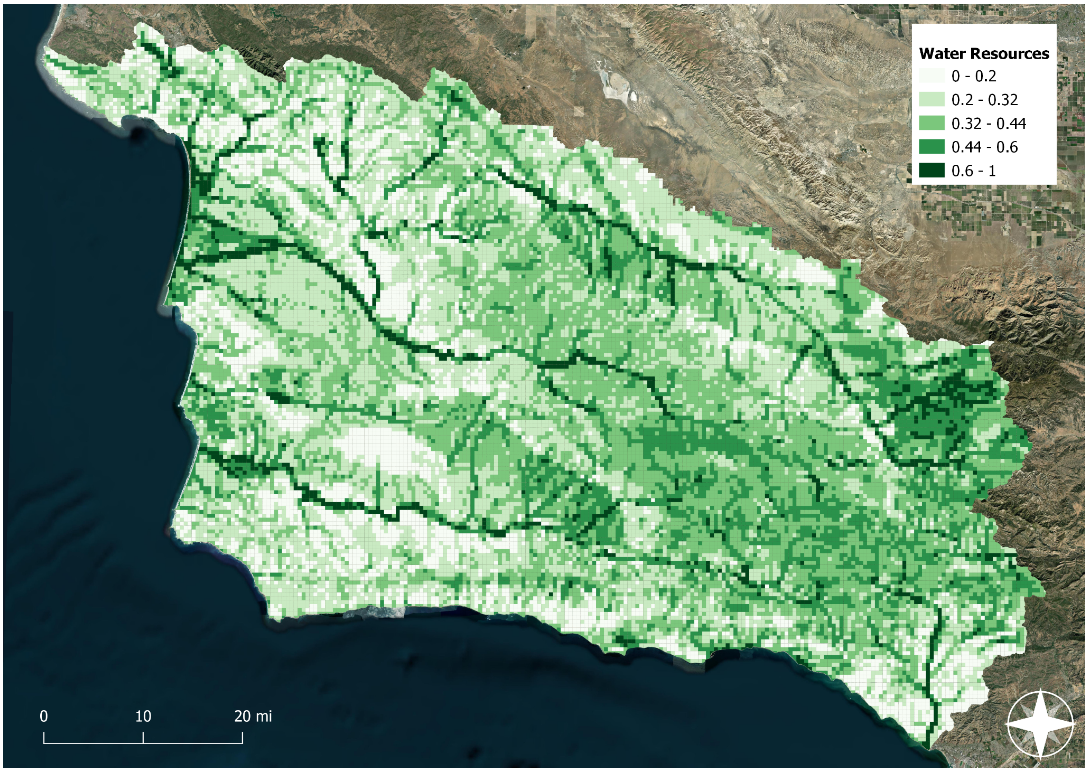



**Figure 10.** Water resources within the Gaviota Region. Darker areas indicate land with significant water resource value.

## Threats

Threats are visualized similarly to the resource conservation values. All final maps were produced in QGIS using graduated symbology and the “natural breaks (Jenks)” scale with 5 classes. Each threat figure displays one of the four threat categories (flood, drought, climate, and wildfire) created by combining several metrics detailed in the methodology. The threat results included here were developed using the average of two climate scenarios, MIROC-esm RCP 8.5 and CCSM4 RCP 8.5 for droughts and flooding, and CNRM-CM5 and MIROC5 for wildfire. Users will be able to toggle between climate scenarios in the final interactive planner. Finalized maps for all 3 threats are shown below in Figures 11-14.

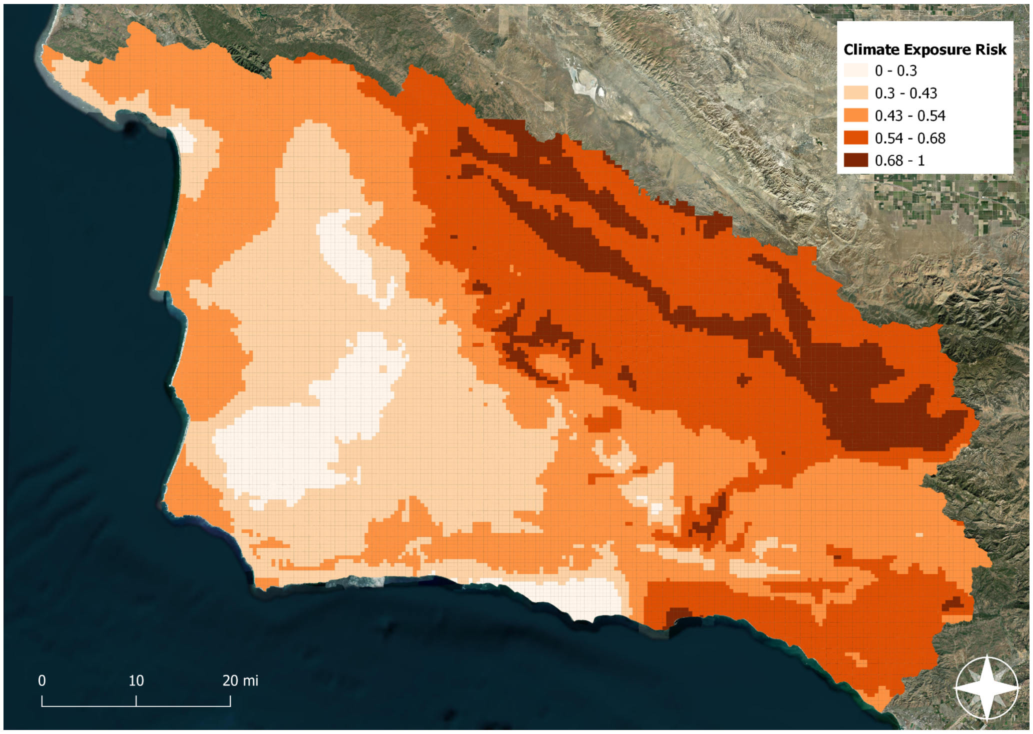



**Figure 11.** Climate threats to the Gaviota Region. Darker areas indicate land more susceptible to climate exposure in the future.

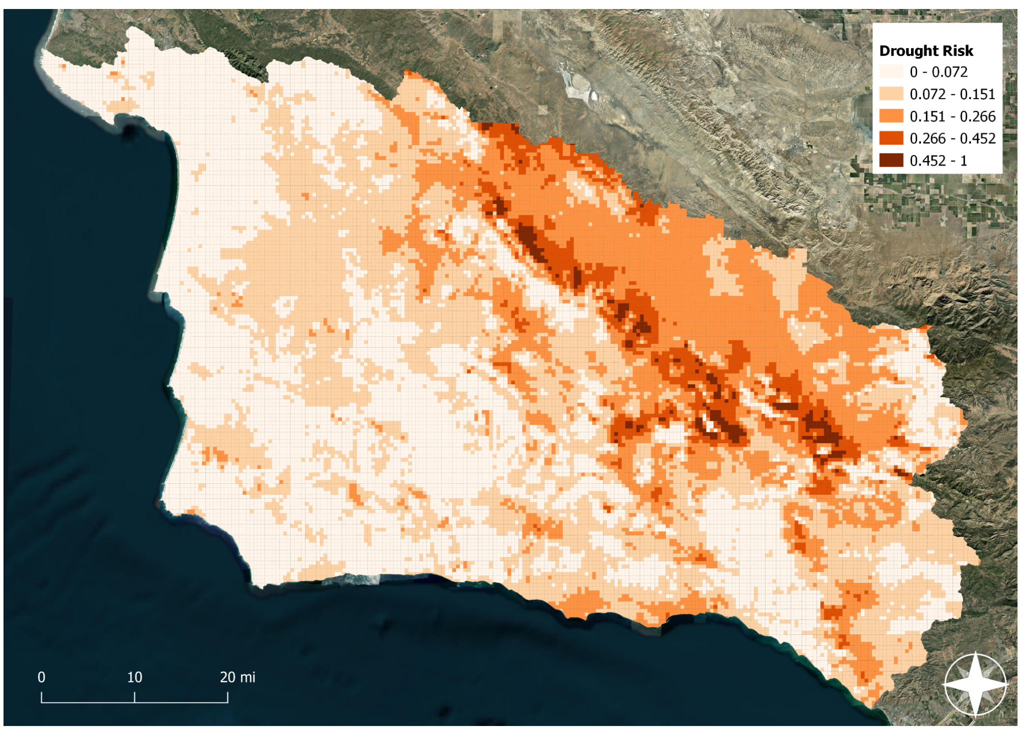



**Figure 12.** Drought threat in the Gaviota Region. Darker orange areas indicate areas at higher risk for drought given the average of two climate scenarios (MIROC-esm RCP 8.5 and CCSM4 RCP 8.5).

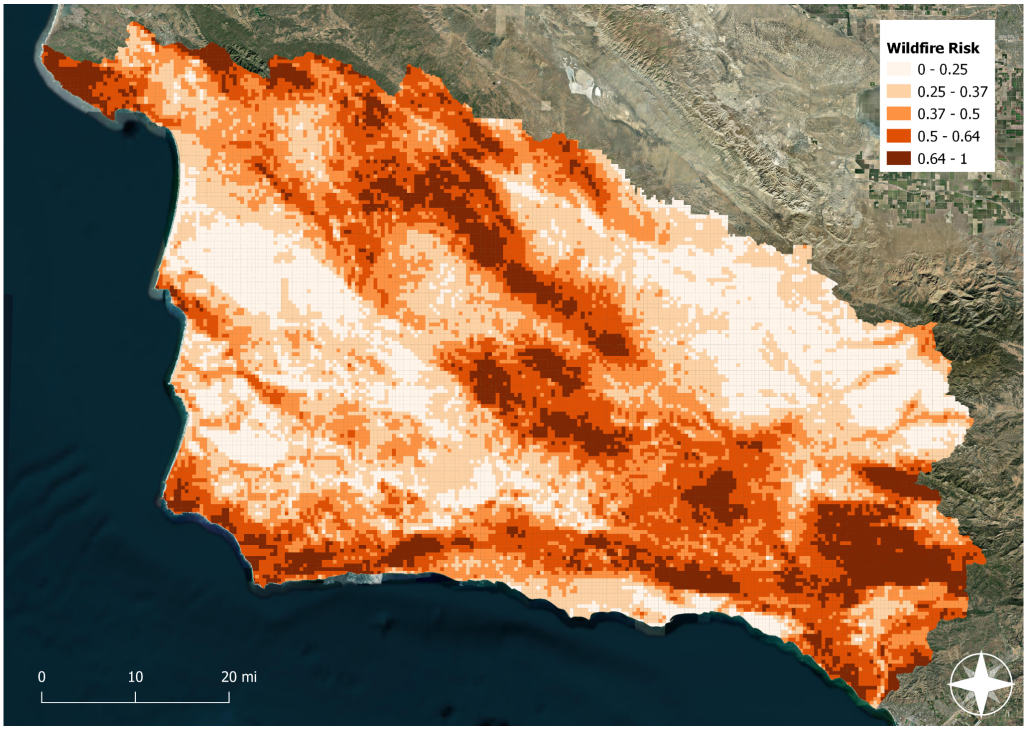



**Figure 13.** Wildfire threat in the Gaviota Region. Darker areas indicate land that is at a higher risk of wildfire occurrence given the ensemble climate projections we used (CNRM-CM5 and MIROC5).

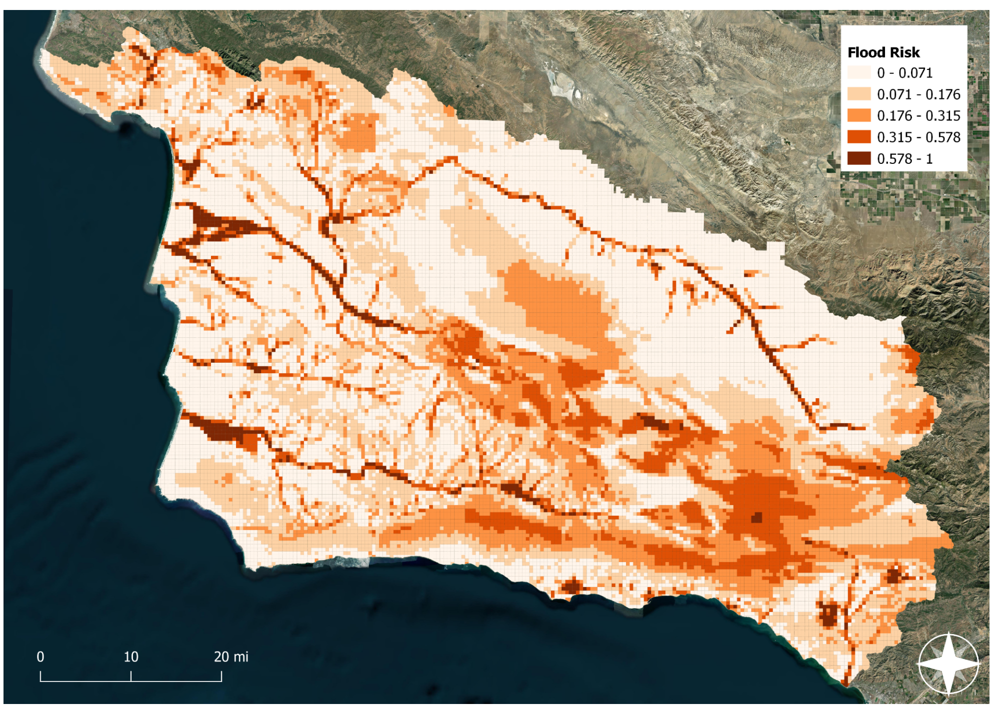



**Figure 14.** Flood threat in the Gaviota Region. Darker orange areas indicate land that is at a higher risk for flooding, given the average of two climate scenarios (MIROC-esm RCP 8.5 and CCSM4 RCP 8.5).

## Diversity, Equity, and Inclusion/ Environmental Justice

DEI/EJ results are visualized similarly to the resource conservation values and threats. All final maps were produced in QGIS using graduated symbology and the “natural breaks (Jenks)” scale with 5 classes. Each DEI/EJ figure displays one of the three categories (pollution, inequity, and isolation from nature) created by combining several metrics detailed in the methodology. Finalized maps are seen below in Figures 15-17.

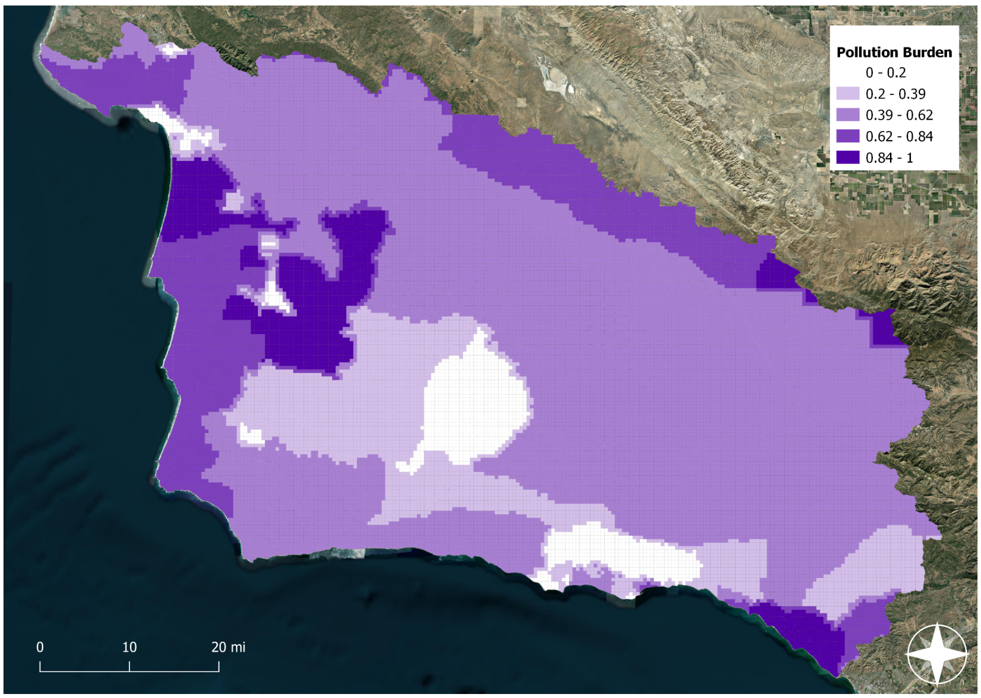



**Figure 15.** Pollution burden for the Gaviota Region. Darker purple areas indicate locations that have a higher exposure to pollution.

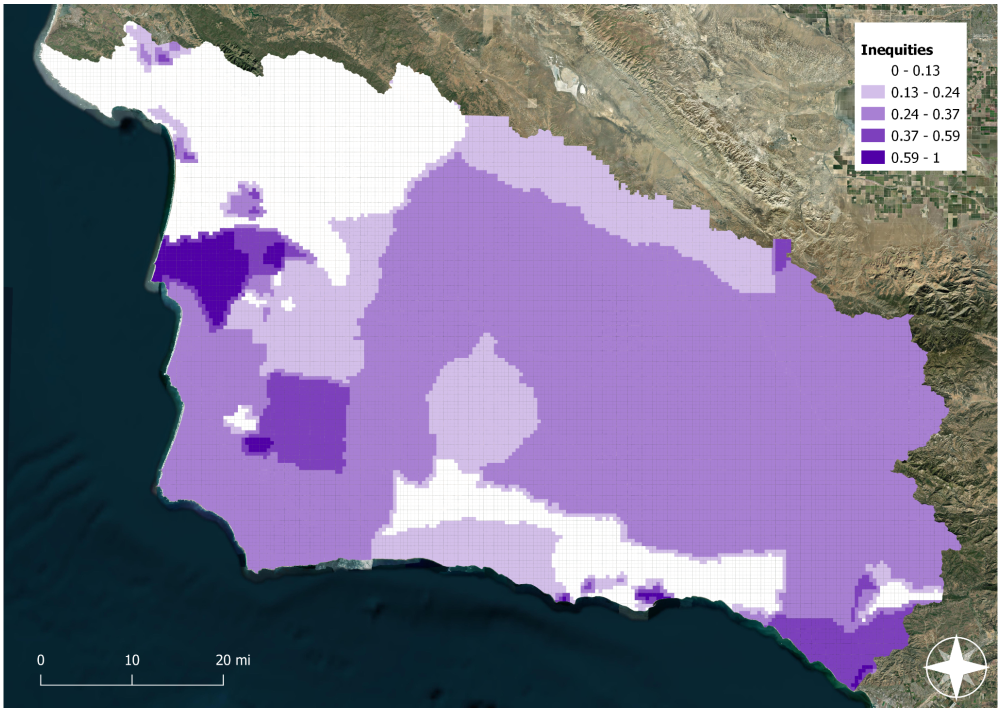



**Figure 16.** Inequity in the Gaviota Region. Darker purple areas indicate locations with higher inequities. Data includes socioeconomic factors (education, housing, linguistic isolation, poverty, unemployment) and health outcomes from exposures to environmental hazards (asthma, cardiovascular disease, low birth weight in infants).

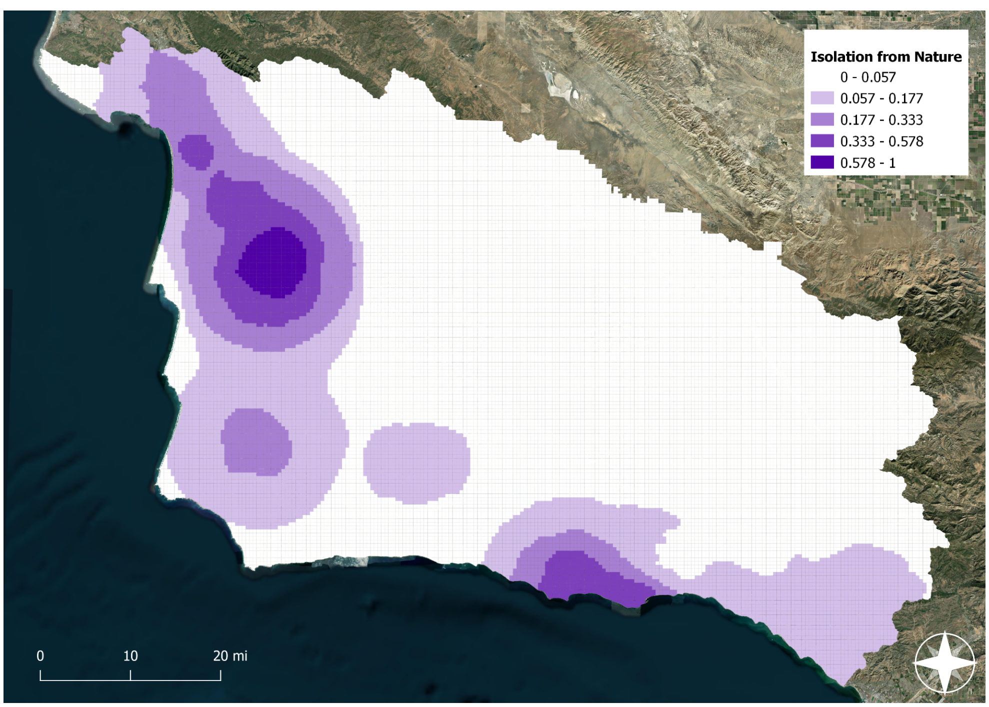



**Figure 17.** Isolation from Nature in the Gaviota Region. Darker purple areas indicate higher isolation (decreased access) to nature.

# Discussion

## Management Actions

Regional conservation planning is a dynamic and complex process that requires collaboration among stakeholders with diverse interests and values. In recent years, modern planning tools have emerged as important mechanisms in engaging stakeholders and promoting effective decision-making in conservation planning (Pressey et al., 2007). Pressey et al. (2007) highlight the importance of using modern planning tools for stakeholder collaboration in regional conservation planning. The researchers argue that these tools can help to improve the quality of information available to decision-makers, facilitate stakeholder engagement and communication, and provide a platform for collaborative decision-making. They conclude that, although conservation practices suffer from various challenges, if scientists communicate effectively with stakeholders, explain their motives transparently, and engage in long-term collaborations, they will have the best chance of success (Pressey et al., 2007). Overall, the use of modern planning tools for stakeholder collaboration in regional conservation planning represents a promising approach for promoting effective and inclusive decision-making. These conclusions support the usefulness of our report and interactive map. The interactive planner that we are providing to TNC is easily shareable among stakeholders. They can effectively and simply communicate their motives and goals by displaying priorities on the map. Although long-term collaboration is not guaranteed, our deliverables were produced using stakeholder input with transparency in mind. The use of our tool will therefore increase conservation success.

For example, if TNC leaders at the Jack and Laura Dangermond Preserve wish to prioritize biodiversity conservation in the entire region while considering some resources and excluding others, they can visualize how biodiversity merges with lower-priority resources to identify aggregate hotspots on the planner. Based on those results, they can attempt to acquire land, set up a restoration project, or collaborate with other stakeholders or rightsholders to develop a specialized workforce to take conservation action. Having the specific parcel-level data on hand will streamline the entire process.

For each axis, the layers that constitute them can be displayed in an aggregated way to show the overlap in natural resources, environmental threats, or equity issues. If the user chooses to display results based on the AHP-weighted resources, they can visualize priority areas according to specific stakeholder groups in the region. With the polygon-creation tool, any organization could focus on a specific location to visualize important conservation characteristics. Pinpointing these high (or low) priority areas is essential in conservation planning, especially on the regional level.

While each individual stakeholder or rightsholder in the region has their own goals, they are all similar in that they have limited time and resources to achieve those goals. Similar analyses of landscape-level conservation actions have produced cross-level coordination models that recommend a tiered system in conservation planning (Doyle-Capitman et al., 2018). These findings, while suggesting a similar collaborative approach, conclude that the success of landscape conservation efforts depends on engaging and involving local stakeholders and rightsholders in decision-making processes. If their needs and perspectives are neglected, then this can result in unrealized conservation goals and wasted resources (Doyle-Capitman et al., 2018). Our interactive planner includes information on a variety of stakeholder opinions within the AHP-weighted components. By including this information, we ensure, to some extent, that local stakeholders and rightsholders' opinions have been considered.

JLDP specifically has a crucial role in future regional management for Gaviota. First, it is home to the largest preserved natural area on the coast. The Nature Conservancy has the duty to protect and preserve this land from future natural and human-caused threats, as land conservation is the organization’s main mission. Second, The Nature Conservancy’s values are rooted in collaboration and inclusion (*Who We Are*, 2023). Regional management provides an avenue for conservation and collaboration to be highlighted. JLDP has already laid the foundation for working with the Santa Ynez Band of Chumash Indians, an important rightsholder group for the region. Our interactive planner and AHP analysis will provide JLDP with an opportunity to expand their partnerships on a larger scale to include farmers and ranchers, government organizations, and other nonprofits.

## Stakeholder and Rightsholder Collaboration

The AHP analysis is a useful tool for incorporating people's preferences in social decisions such as conservation (Derak et al., 2023; Lima et al., 2022; Strager & Rosenberger, 2006; Trialfhianty et al., 2022). The results from the AHP are also relevant when deciding how each AHP participant should allocate their conservation resources when partnering with others such as TNC. The metric of evenness of aggregated preferences within groups or individual responses relays the position of a group or respondent along an axis ranging from a generalist partner to a specialist partner. Generalist partners would be ideal for multifaceted projects and include aspects of many different conservation priorities. Specialist partners are more suited to partner on projects which are specific to their highest-rated conservation priority. For example, a nonprofit group is an ideal partner for a generalist conservation project, and farms and ranches (especially those surveyed here) are well-suited to partner on projects regarding soil health.

## Equity and Justice

Historically, conservation projects have been focused on preserving natural resources, often at the expense and exclusion of local communities that care about the local environment and depend on them for their livelihoods (Friedman et al., 2018; *Partnering with Indigenous People and Local Communities*, 2023). Additionally, conservation efforts have often been driven by a particular set of values and worldviews that do not necessarily align with the needs and perspectives of all communities. Systemic racism has historically placed underrepresented communities at the frontlines of environmental inequities (Rowland-Shea et al., 2020).

Conserving biological diversity and human social and cultural values were viewed as separate processes by mainstream "western" scientists; however, humans are labeled as one of the most important agents for shifting ecological systems and biodiversity (Shultis & Heffner, 2016). These methods are heavily informed by scientific principles and are characterized by conflicts surrounding territory and natural resource management (Martin et al., 2016). Western approaches to conservation management excludes local communities from the decision-making process of conservation initiatives and constrains efforts to develop holistic environmental solutions (Hutton et al., 2005). Institutionalized "western" values of nature can pose as barriers that prevent consideration of indigenous values and knowledge (Martin et al., 2016). Cultural recognition is important in conservation practices because it respects identities and cultural differences among agents (Martin et al., 2016). Recognizing the different ways in which people maintain and steward the land could be beneficial in creating a holistic conservation management plan(Martin et al., 2016). Traditional ecological knowledge is based on intimate relationships with the land that are passed down from generation to generation (Gadgil et al., 1993).  Tribal nations should play a significant role in these management decisions. Knowledge co-produced by scientists and local Indigenous communities results in strategies that are better adapted to highly variable local conditions (Reyes-García & Benyei, 2019). The Chumash people have been stewards of the land for thousands of years using cultural practices that help maintain ecological integrity. We recognize the painful challenges of colonialism, forced resettlement, and exclusion from natural resource decisions that have undermined the ability of Indigenous people to manage their lands and waters (*Partnering with Indigenous People and Local Communities*, 2023).

An example of an environmental management plan that failed to recognize cultural knowledge is a case study of Canaima National Park in Venezuela, the ancestral land of the Pemon Indigenous people. Since the park's establishment in 1962, the Pemon people have been advocating for territorial rights and self-determination (Martin et al., 2016) Conflicting land use demands arose as the park was established without consent or consultation. The Pemon's traditional practices of slash-and-burn agriculture and savannah burning were deemed as detrimental to watershed and soil conservation by park managers. The Park's designation was intended to protect the Pemon's territory, but they still viewed it as a threat to their existence (Martin et al., 2016). Misrecognition has been at the core of conservation conflicts. The failure to recognize cultural values and practices led to the exclusion of the Pemon people.

To ensure inclusive goals are being met, the voices of local communities should be amplified, relationships should be built and maintained, and the perspectives of underrepresented communities should be better understood. This is achieved through investing in management opportunities in communities of color and systematically including diverse perspectives in policy-making and community engagement (Rowland-Shea et al., 2020). The recognition of differing knowledge as central to ecological conservation is one step to achieving community collaboration (Martin et al., 2016) One example of successful collaboration between indigenous groups and scientists is the restoration of the Elwha River in Washington State (Ogar et al., 2020). The partnership of the Lower Elwha Tribe and the scientific community allowed for the return of salmon, shorebirds, and other species to the River. Intercultural conservation methods also pose their own set of challenges.  It is challenging to work across different knowledge systems to come up with inclusive environmental solutions (Ogar et al., 2020). However, effective conservation practices promote improved social outcomes alongside improved ecological integrity, enhanced biodiversity, and natural disaster resiliency. Beneficial conservation strategies are more likely to be accomplished when protected areas adopt co-management regimes, engage a diverse group of local agents, reduce economic inequalities, and maintain cultural and livelihood outcomes (Raymond et al., 2022).

We hope that our group project makes progress toward satisfying the needs of underrepresented and marginalized communities. The combination of community opinions and values together with spatial data representing barriers to equity from pollution, isolation from nature, and other related demographic information is a first step to pinpointing the who, what, and where of future environmental justice actions. Social science in conservation management plans can facilitate more socially-equitable and inclusive conservation decisions and improve socioeconomic outcomes (Niemiec et al., 2021).

## Recommendations

Our project covers an expansive area with diverse stakeholders and rightsholders who graciously shared their unique perspectives with our team. Despite our limited time, we interviewed 23 stakeholders and rightsholders from the Gaviota Region's nonprofit organizations, government agencies, Indigenous communities, and farming and ranching communities. Although their perspectives differ, all 23 interviewees expressed profound adoration for the Gaviota Region's biological and cultural importance. The majority of the stakeholders and rightsholders we interviewed self-identified as government or nonprofits, four as Indigenous, and four with the farming and ranching communities. We believe that this is a strong start to understanding the broad strokes of conservation priorities within these groups. In our final analysis, we represented 21 stakeholders and rightsholders. We recommend that The Nature Conservancy should continue strengthening and broadening the connections we built during this project by expanding upon stakeholder and rightsholder involvement. Future JLDP studies analyzing stakeholder and rightsholder priorities should focus on increasing the number of respondents for each organizational subset. This will bolster the representation of Indigenous rightsholders, ranchers, and farmers and provide more insight and conservation effectiveness.

There is no "one size fits all" approach to conservation management. However, collaboration can be the key to solving complex environmental problems. For example, 143 members representing 29 state agencies, 24 universities, six federal agencies, three non-governmental organizations, and two tribal nations came together in 2015 to form the Eastern Spotted Skunk Cooperative Study Group (CSG). They aimed to share ideas and facilitate collaborative planning, funding, outreach, monitoring, and research opportunities to enhance their practices in protecting the Eastern Spotted Skunk (Jachowski & Edelman, 2021). Since the formation of the study group, the CSG has made significant progress toward achieving its primary goals. These goals have collectively produced a better understanding of Eastern Spotted Skunk distribution, ecology, and status through expert and citizen science, a widely endorsed conservation plan for the species, and research outputs that have significantly advanced our understanding of the species and how to manage it (Jachowski & Edelman, 2021). With such diverse stakeholders and rightsholders in the Gaviota Region, the JLDP can look to the CSG as an example of successful collaborative management.

The AHP analysis would also benefit from including more stakeholders and rightsholders, especially those of more varied backgrounds than those we surveyed here, such as non-commercial landowners, scientists, businesses, and community leaders. Additionally, one should address the issue of high consistency ratios, but removing inconsistent responses is not recommended. Therefore, we recommend providing the respondents with real-time feedback about whether or not their response contains logical inconsistencies above a certain threshold. This feature should not prevent submission, but should instead act as a warning to highlight circular reasoning in responses. This will likely impact the scores received from the participants. However, it may result in more robust and internally consistent answers. We also recommend limiting the number of extraneous questions in the survey to avoid response fatigue.

A few stakeholders were hesitant to be interviewed, which may have stemmed from our affiliations with UC Santa Barbara and The Nature Conservancy. The relationships built between TNC, Bren students, rightsholders, stakeholders, and community members should continue from project to project, especially those with Indigenous people and community members. We spoke with Indigenous community members from four different Chumash bands. All of them expressed overall disappointment with the lack of inclusion of Indigenous people in the conservation planning of the Gaviota Region. Several of them shared disappointment with lack of access to the JLDP for Chumash and that the JLDP does not have an employee designated for communication and collaboration with Indigenous communities. We also received valuable feedback from an Indigenous community member who felt their collaboration with Bren Students on Dangermond Preserve projects was repetitive and extractive. In their future conservation projects, we recommend that the JLDP make a stronger effort in collaborating with Chumash, especially with non-federally recognized Chumash bands. We hope that our project will foster more inclusion of the Chumash and continuity of all relationships for future regional projects.

As we are only setting the stage for a regional management plan, we do not have any specific management actions to recommend. This tool provides insight into the important metrics that make up the Gaviota region and the priorities of neighboring groups. We hope various groups collaborate based on common goals and opportunities presented in the interactive map. We recommend that TNC, provided with this information, can use it to benefit the region and improve collaboration with new and existing partnerships. Focus groups and scheduled monthly or bi-annual meetings with regional rightsholders and stakeholders are simple actions that can strengthen JLDP's relationships.

## Bren-Specific Recommendations

As academics and natural resource managers, we must ask ourselves what conservation, preservation, restoration, and access work is on stolen land. We recommend TNC, the Bren School, local agencies, and stakeholders think critically about the systemic issues that have placed Indigenous people and community members outside traditional management plans. As a group project team at the Bren School of Environmental Science & Management, we recommend that all place-based group project teams invite an Indigenous external advisor. UC Santa Barbara and the JLDP are placed on sacred Chumash territory, so it is crucial to include Chumash people in future projects involving the Gaviota Region. Through our interviews, we learned that more than half a dozen Chumash members across four bands do not feel adequately included in the conservation decisions of this region. Additionally, they have expressed frustration with the Bren School's lack of facilitation of the relationships between themselves and the JLDP projects. The Bren School encourages a holistic and interdisciplinary approach to environmental management and should welcome the incorporation of traditional ecological knowledge. Thus, we recommend that future Dangermond group projects require an external advisor from the Chumash community to ensure they are included in discussions of their land as a sign of respect. Additionally, we believe a portion of the group project budget should be allocated to compensate an individual for their time as long as their job duties do not include external advising. This compensation should also extend to interviewees and non-Indigenous external advisors who are not already paid by their employers for their advisorship in order to recognize the time and effort they are providing. This is especially important for Chumash community members, as they have historically not been financially or formally acknowledged for their traditional ecological knowledge. Including Chumash community members in future group projects will serve as a catalyst to healing the relationship between the Chumash and the Bren School. Advocating for the Chumash is at the heart of this team and the legacy we hope to leave behind.

Regarding group project logistics, we recommend that the Bren School make a more stringent rubric for the Group Project Selection committee to ensure that all group projects are equitable, just, and work on dismantling the systems that have led to disproportionate community threats. A solution to this gap in group projects is creating an "Environmental Justice, Diversity, Equity, and Inclusion Manager" as a role within the Group Project team that can view and work on the project through this lens. The Bren School is dedicated to solving real-world environmental problems while creating a community of inclusivity; therefore, we deem it necessary to have actionable items that will include all voices and create just solutions.

# References

Akee, R., Jones, M. R., & Porter, S. R. (2019). Race Matters: Income Shares, Income Inequality, and Income Mobility for All U.S. Races. *Demography*, *56*(3), 999–1021. https://doi.org/10.1007/s13524-019-00773-7

American Farmland Trust. (2023). *California Data and Statistics*. Farmland Information Center. https://farmlandinfo.org/statistics/california-statistics/

Banks, L. M., Kuper, H., & Polack, S. (2017). Poverty and disability in low- and middle-income countries: A systematic review. *PLOS ONE*, *12*(12), e0189996. https://doi.org/10.1371/journal.pone.0189996

Barlow, P. M., & Reichard, E. G. (2010). Saltwater intrusion in coastal regions of North America. *Hydrogeology Journal*, *18*(1), 247–260. https://doi.org/10.1007/s10040-009-0514-3

Batllori, E., Parisien, M.-A., Krawchuk, M. A., & Moritz, M. A. (2013). Climate change-induced shifts in fire for Mediterranean ecosystems. *Global Ecology and Biogeography*, *22*(10), 1118–1129. https://doi.org/10.1111/geb.12065

Bork, K. (2017, July 31). *Fish, flows, and 5937 – legal challenges on the Santa Maria River*. California WaterBlog. https://californiawaterblog.com/2017/07/30/fish-flows-and-5937-legal-challenges-on-the-santa-maria-river/

Braun, A. C. (2021). Encroached by pine and eucalyptus? A grounded theory on an environmental conflict between forest industry and smallholder livelihoods in Chile. *Journal of Rural Studies*, *82*, 107–120. https://doi.org/10.1016/j.jrurstud.2021.01.029

Brender, J. D., Maantay, J. A., & Chakraborty, J. (2011). Residential Proximity to Environmental Hazards and Adverse Health Outcomes. *American Journal of Public Health*, *101*(S1), S37-52.

Brooking Gatewood, Frank Davis, John Gallo, Sharyn Main, Joseph McIntre, Anna Olsen, Greg

Parker, Dustin Pearce, Steve Windhager, & Chet Work. (2017). *Santa Barbara County Conservation Blueprint: Creating a Landscape of Opportunity.* (p. 114).

Buechi, H., Weber, P., Heard, S., Cameron, D., & Plantinga, A. J. (2021). Long-term trends in wildfire damages in California. *International Journal of Wildland Fire*, *30*(10), 757–762. https://doi.org/10.1071/WF21024

Butterfield, H. S., Reynolds, M., Gleason, M. G., Merrifield, B. S., Cohen, B. S., Heady, W. N., Cameron, D., Rick, T., Inlander, E., Katkowski, M., Riege, L., Knapp, J., Gennet, S., Gorga, G., Lin, K., Easterday, K., Leahy, B., & Bell, M. (2019). *Jack and Laura Dangermond Preserve: Integrated Resources Management Plan*. 116.

*California Floristic Province | CEPF*. (2022). Critical Ecosystem Partnership Fund. https://www.cepf.net/our-work/biodiversity-hotspots/california-floristic-province

*California Water 101*. (2020, June 22). Water Education Foundation. https://www.watereducation.org/photo-gallery/california-water-101

Carver, A. D., & Yahner, J. D. (1997, August 4). *Defining Prime Agricultural Land and Methods of Protection*. Agronomy Guide: Purdue University Cooperative Extension Service. https://www.extension.purdue.edu/extmedia/ay/ay-283.html

Chabanova, N. (2020, May 3). *Agriculture Industry in Santa Barbara County*. SantaBarbaraYP. https://www.santabarbarayp.com/articles/7/agriculture-industry-in-santa-barbara-county

Charmaz, K. (2001). Grounded Theory: Methodology and Theory Construction. In *International Encyclopedia of the Social & Behavioral Sciences*. https://www-sciencedirect-com.proxy.library.ucsb.edu:9443/topics/neuroscience/grounded-theory

Cho, F. (2019). *ahpsurvey: Analytic Hierarchy Process for Survey Data* (0.4.1). https://CRAN.R-project.org/package=ahpsurvey

Colley, K., Irvine, K. N., & Currie, M. (2022). Who benefits from nature? A quantitative intersectional perspective on inequalities in contact with nature and the gender gap outdoors. *Landscape and Urban Planning*, *223*, 104420. https://doi.org/10.1016/j.landurbplan.2022.104420

Conde, C., & Lonsdale, K. (2004). Engaging Stakeholders in the Adaptation Process. In *Adaptation Policy Frameworks for Climate Change: Developing Strategies, Policies and Measures*. Cambridge University Press. https://www.preventionweb.net/files/7995_APF.pdf#page=52

Côté, I. M., & Darling, E. S. (2010). Rethinking Ecosystem Resilience in the Face of Climate Change. *PLOS Biology*, *8*(7), e1000438. https://doi.org/10.1371/journal.pbio.1000438

Cumming, G., Campbell, L., Norwood, C., Ranger, S., Richardson, P., & Sanghera, A. (2022). Putting stakeholder engagement in its place: How situating public participation in community improves natural resource management outcomes. *GeoJournal*, *87*(2), 209–221. https://doi.org/10.1007/s10708-020-10367-1

*Dedoose* (Version 9.0.17). (2021). SocioCultural Research Consultants, LLC. www.dedoose.com

Derak, M., Silva, E., Climent-Gil, E., Bonet, A., López, G., & Cortina-Segarra, J. (2023). Multicriteria analysis of critical areas for restoration in a semiarid landscape: A comparison between stakeholder groups. *Journal of Environmental Management*, *336*, 117545. https://doi.org/10.1016/j.jenvman.2023.117545

Dong, C., Williams, A. P., Abatzoglou, J. T., Lin, K., Okin, G. S., Gillespie, T. W., Long, D., Lin, Y.-H., Hall, A., & MacDonald, G. M. (2022). The season for large fires in Southern California is projected to lengthen in a changing climate. *Communications Earth & Environment*, *3*(1), Article 1. https://doi.org/10.1038/s43247-022-00344-6

Doyle-Capitman, C. E., Decker, D. J., & Jacobson, C. A. (2018). Toward a model for local stakeholder participation in landscape-level wildlife conservation. *Human Dimensions of Wildlife*, *23*(4), 375–390. https://doi.org/10.1080/10871209.2018.1444215

Dube, B., White, A., Ricketts, T., & Darby, H. (2022). Valuation of Ecosystem Services from

Improved Soil Health in Vermont. *The University of Vermont*, *1*. https://agriculture.vermont.gov/sites/agriculture/files/documents/Water_Quality/PES/Valuation%20of%20soil%20health%20ecosystem%20services_VTPESTask5_V1.pdf

Dudek. (2019). *Santa Barbara County Integrated Regional Water Management Plan: Updated 2019*. County of Santa Barbara Public Works. https://www.countyofsb.org/2471/2019-IRWM-Plan

EPA. (1992). Reducing Risk for all communities. https://www.epa.gov/sites/default/files/2015-02/documents/reducing_risk_com_vol1.pdf

EPA. (2016). *California Prepares for Increased Wildfire Risk to Air Quality From Climate Change* (California) [Overviews and Factsheets]. United States Environmental Protection Agency: Climate Change Adaptation Resource Center. https://www.epa.gov/arc-x/california-prepares-increased-wildfire-risk-air-quality-climate-change

Estabrooks, P. A., Lee, R. E., & Gyurcsik, N. C. (2003). Resources for physical activity participation: Does availability and accessibility differ by neighborhood socioeconomic status? *Annals of Behavioral Medicine*, *25*(2), 100–104. https://doi.org/10.1207/S15324796ABM2502_05

*Extreme Weather*. (2019). UCLA Institute of the Environment & Sustainability. https://www.ioes.ucla.edu/project/extreme-weather/

*Fire Hazard Severity Zones Map*. (2023). Office of the State Fire Marshal. https://osfm.fire.ca.gov/divisions/community-wildfire-preparedness-and-mitigation/wildfire-preparedness/fire-hazard-severity-zones/fire-hazard-severity-zones-map/

ForestWatch. (2019, October 25). Environmental Groups Seek Protections for Endangered Steelhead in the Santa Maria River. *Los Padres ForestWatch*. https://lpfw.org/environmental-groups-seek-protections-for-endangered-steelhead-in-santa-maria-river/

Foster, S., Chilton, J., Moencg, M., Cardy, F., & Schiffler, M. (2000). *Groundwater in rural development*. The World Bank. https://doi.org/10.1596/0-8213-4703-9

Freitas, C. T., Lopes, P. F. M., Campos-Silva, J. V., Noble, M. M., Dyball, R., & Peres, C. A. (2020). Co-management of culturally important species: A tool to promote biodiversity conservation and human well-being. *People and Nature*, *2*(1), 61–81. https://doi.org/10.1002/pan3.10064

Friedman, R. S., Law, E. A., Bennett, N. J., Ives, C. D., Thorn, J. P. R., & Wilson, K. A. (2018). How just and just how? A systematic review of social equity in conservation research. *Environmental Research Letters*, *13*(5), 053001. https://doi.org/10.1088/1748-9326/aabcde

Friedrich, M. J. (2018). Air Pollution Is Greatest Environmental Threat to Health. *JAMA*, *319*(11), 1085. https://doi.org/10.1001/jama.2018.2366

Gadgil, M., Berkes, F., & Folke, C. (1993). Indigenous Knowledge for Biodiversity Conservation. *Ambio*, *22*(2/3), 151–156.

Galatowitsch, S., Frelich, L., & Phillips-Mao, L. (2009). Regional climate change adaptation strategies for biodiversity conservation in a midcontinental region of North America. *Biological Conservation*, *142*(10), 2012–2022. https://doi.org/10.1016/j.biocon.2009.03.030

Georgakakos, A. P., Yao, H., Kistenmacher, M., Georgakakos, K. P., Graham, N. E., Cheng, F.-Y., Spencer, C., & Shamir, E. (2012). Value of adaptive water resources management in Northern California under climatic variability and change: Reservoir management. *Journal of Hydrology*, *412–413*, 34–46. https://doi.org/10.1016/j.jhydrol.2011.04.038

Gordillo, F., Elsasser, P., & Günter, S. (2019). Willingness to pay for forest conservation in Ecuador: Results from a nationwide contingent valuation survey in a combined “referendum” – “Consequential open-ended” design. *Forest Policy and Economics*, *105*, 28–39. https://doi.org/10.1016/j.forpol.2019.05.002

Haddaway, N. R., Kohl, C., Rebelo da Silva, N., Schiemann, J., Spök, A., Stewart, R., Sweet, J. B., & Wilhelm, R. (2017). A framework for stakeholder engagement during systematic reviews and maps in environmental management. *Environmental Evidence*, *6*(1), 11. https://doi.org/10.1186/s13750-017-0089-8

Hammes, V., Eggers, M., Isselstein, J., & Kayser, M. (2016). The attitude of grassland farmers towards nature conservation and agri-environment measures—A survey-based analysis. *Land Use Policy*, *59*, 528–535. https://doi.org/10.1016/j.landusepol.2016.09.023

Harris-Lovett, S., Lienert, J., & Sedlak, D. (2019). A mixed-methods approach to strategic planning for multi-benefit regional water infrastructure. *Journal of Environmental Management*, *233*, 218–237. https://doi.org/10.1016/j.jenvman.2018.11.112

Hartig, T., Mang, M., & Evans, G. W. (1991). Restorative Effects of Natural Environment Experiences. *Environment and Behavior*, *23*(1), 3–26. https://doi.org/10.1177/0013916591231001

Hatten, J., & Liles, G. (2019). Chapter 15—A ‘healthy’ balance – The role of physical and chemical properties in maintaining forest soil function in a changing world. In M. Busse, C. P. Giardina, D. M. Morris, & D. S. Page-Dumroese (Eds.), *Developments in Soil Science* (Vol. 36, pp. 373–396). Elsevier. https://doi.org/10.1016/B978-0-444-63998-1.00015-X

He, Q., & Silliman, B. R. (2019). Climate Change, Human Impacts, and Coastal Ecosystems in the Anthropocene. *Current Biology*, *29*(19), R1021–R1035. https://doi.org/10.1016/j.cub.2019.08.042

Herrington, N., & Coogan, J. (2011). Q methodology: An overview. *Research in Teacher Education*, *1*(2), Article 2. https://doi.org/10.15123/uel.8604v

Hooper, D. U., Chapin III, F. S., Ewel, J. J., Hector, A., Inchausti, P., Lavorel, S., Lawton, J. H., Lodge, D. M., Loreau, M., Naeem, S., Schmid, B., Setälä, H., Symstad, A. J., Vandermeer, J., & Wardle, D. A. (2005). Effects of Biodiversity on Ecosystem

Functioning: A Consensus of Current Knowledge. *Ecological Monographs*, *75*(1), 3–35. https://doi.org/10.1890/04-0922

Hutton, J., Adams, W. M., & Murombedzi, J. C. (2005). Back to the Barriers? Changing Narratives in Biodiversity Conservation. *Forum for Development Studies*, *32*(2), 341–370. https://doi.org/10.1080/08039410.2005.9666319

Jachowski, D. S., & Edelman, A. J. (2021). Advancing Small Carnivore Research and Conservation: The Eastern Spotted Skunk Cooperative Study Group Model. *Southeastern Naturalist*, *20*(sp11), 1–12. https://doi.org/10.1656/058.020.0sp1102

Jones, M., Moeller, E. A., Meara, J. G., & Juran, S. (2021). The importance of geographic and demographic data from census for locating and mapping vulnerable populations. *Statistical Journal of the IAOS*, *37*(1), 13–17. https://doi.org/10.3233/SJI-200760

Kablan, M. M. (2004). Decision support for energy conservation promotion: An analytic hierarchy process approach. *Energy Policy*, *32*(10), 1151–1158. https://doi.org/10.1016/S0301-4215(03)00078-8

Keniger, L. E., Gaston, K. J., Irvine, K. N., & Fuller, R. A. (2013). What are the Benefits of Interacting with Nature? *International Journal of Environmental Research and Public Health*, *10*(3), Article 3. https://doi.org/10.3390/ijerph10030913

Kester, A. (2017, April 27). *Saving The Gaviota Coast*. Odyssey Online: Antioch University, Santa Barbara. https://odyssey.antiochsb.edu/features/sb-local/saving-the-gaviota-coast/

Knight, A. T., Cowling, R. M., Rouget, M., Balmford, A., Lombard, A. T., & Campbell, B. M. (2008). Knowing But Not Doing: Selecting Priority Conservation Areas and the Research–Implementation Gap. *Conservation Biology*, *22*(3), 610–617. https://doi.org/10.1111/j.1523-1739.2008.00914.x

Kolden, C. A., & Abatzoglou, J. T. (2018). Spatial Distribution of Wildfires Ignited under Katabatic versus Non-Katabatic Winds in Mediterranean Southern California USA. *Fire*, *1*(2), Article 2. https://doi.org/10.3390/fire1020019

Lakoff, A. (2016). The Indicator Species: Tracking Ecosystem Collapse in Arid California. *Public Culture*, *28*(2 (79)), 237–259. https://doi.org/10.1215/08992363-3427439

Lan, H., Ma, X., Qiao, W., & Ma, L. (2022). On the causation of seafarers' unsafe acts using grounded theory and association rule. *Reliability Engineering & System Safety*, *223*, 108498. https://doi.org/10.1016/j.ress.2022.108498

Lee, J. (2022). Managing conflict by mapping stakeholders' views on ecotourism development using statement and place Q methodology. *Journal of Outdoor Recreation and Tourism*, *37*, 100453. https://doi.org/10.1016/j.jort.2021.100453

Lees, C. M., Rutschmann, A., Santure, A. W., & Beggs, J. R. (2021). Science-based, stakeholder-inclusive and participatory conservation planning helps reverse the decline of threatened species. *Biological Conservation*, *260*, 109194. https://doi.org/10.1016/j.biocon.2021.109194

Lima, M. L., Barilari, A., Massone, H. E., & Pascual, M. (2022). Incorporating local researchers′ and decision makers′ preferences for groundwater resources management in a spatial multi-voiced decision model. *Journal of Environmental Management*, *302*, 113954. https://doi.org/10.1016/j.jenvman.2021.113954

Liu, P.-W., Famiglietti, J. S., Purdy, A. J., Adams, K. H., McEvoy, A. L., Reager, J. T., Bindlish, R., Wiese, D. N., David, C. H., & Rodell, M. (2022). Groundwater depletion in California's Central Valley accelerates during megadrought. *Nature Communications*, *13*(1), Article 1. https://doi.org/10.1038/s41467-022-35582-x

Liu, X., Zhou, J., Xue, Y., & Qian, S. (2019). Analysis of property management ecological behavior in China based on the grounded theory: The influencing factors and the behavior model. *Journal of Cleaner Production*, *235*, 44–56. https://doi.org/10.1016/j.jclepro.2019.06.300

Mahlalela, L. S., Jourdain, D., Mungatana, E. D., & Lundhede, T. H. (2022). Diverse stakeholder perspectives and ecosystem services ranking: Application of the Q-methodology to

Hawane Dam and Nature Reserve in Eswatini. *Ecological Economics*, *197*, 107439. https://doi.org/10.1016/j.ecolecon.2022.107439

Martin, A., Coolsaet, B., Corbera, E., Dawson, N. M., Fraser, J. A., Lehmann, I., & Rodriguez, I. (2016). Justice and conservation: The need to incorporate recognition. *Biological Conservation*, *197*, 254–261. https://doi.org/10.1016/j.biocon.2016.03.021

Mascarenhas, M., Grattet, R., & Mege, K. (2021). Toxic Waste and Race in Twenty-First Century America: Neighborhood Poverty and Racial Composition in the Siting of Hazardous Waste Facilities. *Environment and Society*, *12*, 108–126. https://doi.org/10.3167/ares.2021.120107

McGinnis, M. V. (2008). Protecting climate refugia areas: The case of the Gaviota coast in southern California. *Endangered Species Update*, *25*(4), 103–110.

McKenna, P., Brown, M., & Kern, D. (2021). Vision fot the Gaviota Coast. *Gaviota Coast Conservancy*. https://www.gaviotacoastconservancy.org/vision_document/

Mills, M., Álvarez-Romero, J. G., Vance-Borland, K., Cohen, P., Pressey, R. L., Guerrero, A. M., & Ernstson, H. (2014). Linking regional planning and local action: Towards using social network analysis in systematic conservation planning. *Biological Conservation*, *169*, 6–13. https://doi.org/10.1016/j.biocon.2013.10.015

Min, E., Piazza, M., Galaviz, V. E., Saganić, E., Schmeltz, M., Freelander, L., Farquhar, S. A., Karr, C. J., Gruen, D., Banerjee, D., Yost, M., & Seto, E. Y. W. (2021). Quantifying the Distribution of Environmental Health Threats and Hazards in Washington State Using a Cumulative Environmental Inequality Index. *Environmental Justice*, *14*(4), 298–314. https://doi.org/10.1089/env.2021.0021

Mohai, P., Pellow, D., & Roberts, J. T. (2009). Environmental Justice. *Annual Review of Environment and Resources*, *34*(1), 405–430. https://doi.org/10.1146/annurev-environ-082508-094348

Mott, L. (1995). The Disproportionate Impact of Environmental Health Threats on Children of

Color. *Environmental Health Perspectives*, *103*, 33–35. https://doi.org/10.2307/3432341

Mulkern, A. C. (2022, January 13). *California Presents Plan to Prevent Extreme Heat Deaths*. Scientific American. https://www.scientificamerican.com/article/california-presents-plan-to-prevent-extreme-heat-deaths/

Myers, N., Mittermeier, R. A., Mittermeier, C. G., da Fonseca, G. A. B., & Kent, J. (2000). Biodiversity hotspots for conservation priorities. *Nature*, *403*(6772), Article 6772. https://doi.org/10.1038/35002501

Myers, S., & Patz, J. (2009). Emerging Threats to Human Health from Global Environmental Change. *The Annual Review of Environment and Resources*.

Niemiec, R. M., Gruby, R., Quartuch, M., Cavaliere, C. T., Teel, T. L., Crooks, K., Salerno, J., Solomon, J. N., Jones, K. W., Gavin, M., Lavoie, A., Stronza, A., Meth, L., Enrici, A., Lanter, K., Browne, C., Proctor, J., & Manfredo, M. (2021). Integrating social science into conservation planning. *Biological Conservation*, *262*, 109298. https://doi.org/10.1016/j.biocon.2021.109298

Nieuwenhuis, E., Cuppen, E., & Langeveld, J. (2022). The role of integration for future urban water systems: Identifying Dutch urban water practitioners' perspectives using Q methodology. *Cities*, *126*, 103659. https://doi.org/10.1016/j.cities.2022.103659

Ogar, E., Pecl, G., & Mustonen, T. (2020). Science Must Embrace Traditional and Indigenous Knowledge to Solve Our Biodiversity Crisis. *One Earth*, *3*(2), 162–165. https://doi.org/10.1016/j.oneear.2020.07.006

Oliver, T. H., Heard, M. S., Isaac, N. J. B., Roy, D. B., Procter, D., Eigenbrod, F., Freckleton, R., Hector, A., Orme, C. D. L., Petchey, O. L., Proença, V., Raffaelli, D., Suttle, K. B., Mace, G. M., Martín-López, B., Woodcock, B. A., & Bullock, J. M. (2015). Biodiversity and Resilience of Ecosystem Functions. *Trends in Ecology & Evolution*, *30*(11), 673–684. https://doi.org/10.1016/j.tree.2015.08.009

*Partnering with Indigenous People and Local Communities*. (2023). The Nature Conservancy. https://www.nature.org/en-us/about-us/who-we-are/how-we-work/community-led-conservation/

Potter, C. (2017). Fire-climate history and landscape patterns of high burn severity areas on the California southern and central coast. *Journal of Coastal Conservation*, *21*(3), 393–404. https://doi.org/10.1007/s11852-017-0519-3

Pressey, R. L., & Bottrill, M. C. (2009). Approaches to landscape- and seascape-scale conservation planning: Convergence, contrasts and challenges. *Oryx*, *43*(4), 464–475. https://doi.org/10.1017/S0030605309990500

Pressey, R. L., Cabeza, M., Watts, M. E., Cowling, R. M., & Wilson, K. A. (2007). Conservation planning in a changing world. *Trends in Ecology & Evolution*, *22*(11), 583–592. https://doi.org/10.1016/j.tree.2007.10.001

Pressey, R. L., Mills, M., Weeks, R., & Day, J. C. (2013). The plan of the day: Managing the dynamic transition from regional conservation designs to local conservation actions. *Biological Conservation*, *166*, 155–169. https://doi.org/10.1016/j.biocon.2013.06.025

Public Policy Institute of California. (2023). *Droughts in California*. Public Policy Institute of California. https://www.ppic.org/publication/droughts-in-california/

Rastogi, A., Hickey, G. M., Badola, R., & Hussain, S. A. (2013). Diverging viewpoints on tiger conservation: A Q-method study and survey of conservation professionals in India. *Biological Conservation*, *161*, 182–192. https://doi.org/10.1016/j.biocon.2013.03.013

Raymond, C. M., Cebrián-Piqueras, M. A., Andersson, E., Andrade, R., Schnell, A. A., Battioni Romanelli, B., Filyushkina, A., Goodson, D. J., Horcea-Milcu, A., Johnson, D. N., Keller, R., Kuiper, J. J., Lo, V., López-Rodríguez, M. D., March, H., Metzger, M., Oteros-Rozas, E., Salcido, E., Sellberg, M., … Wiedermann, M. M. (2022). Inclusive conservation and the Post-2020 Global Biodiversity Framework: Tensions and prospects. *One Earth*, *5*(3), 252–264. https://doi.org/10.1016/j.oneear.2022.02.008

Reyes-García, V., & Benyei, P. (2019). Indigenous knowledge for conservation. *Nature Sustainability*, *2*(8), Article 8. https://doi.org/10.1038/s41893-019-0341-z

Rowland-Shea, J., Doshi, S., & Edberg, S. (2020, July 21). The Nature Gap. *Center for American Progress*. https://www.americanprogress.org/article/the-nature-gap/

Rundel, P. W. (2018). California Chaparral and Its Global Significance. In E. C. Underwood, H. D. Safford, N. A. Molinari, & J. E. Keeley (Eds.), *Valuing Chaparral: Ecological, Socio-Economic, and Management Perspectives* (pp. 1–27). Springer International Publishing. https://doi.org/10.1007/978-3-319-68303-4_1

Saaty, R. W. (1987). The analytic hierarchy process—What it is and how it is used. *Mathematical Modelling*, *9*(3), 161–176. https://doi.org/10.1016/0270-0255(87)90473-8

*Santa Ynez Band of Chumash Indians*. (2022). Santa Ynez Band of Chumash Indians. https://www.santaynezchumash.org

*SBC Atlas*. (2016). Santa Barbara County Conservation Blueprint Atlas. https://sbcblueprint.databasin.org/

Schiffman, I. (1983). Saving California farmland: The politics of preservation. *Landscape Planning*, *9*(3), 249–269. https://doi.org/10.1016/0304-3924(83)90006-0

Schwalm, C. R., Glendon, S., & Duffy, P. B. (2020). RCP8.5 tracks cumulative CO2 emissions. *Proceedings of the National Academy of Sciences*, *117*(33), 19656–19657. https://doi.org/10.1073/pnas.2007117117

Schwartz, M. W., Cook, C. N., Pressey, R. L., Pullin, A. S., Runge, M. C., Salafsky, N., Sutherland, W. J., & Williamson, M. A. (2018). Decision Support Frameworks and Tools for Conservation. *Conservation Letters*, *11*(2), e12385. https://doi.org/10.1111/conl.12385

Seabrook-Davison, M. N. H., Ji, W. J., & Brunton, D. H. (2010). Survey of New Zealand Department of Conservation staff involved in the management and recovery of threatened species. *Biological Conservation*, *143*(1), 212–219. https://doi.org/10.1016/j.biocon.2009.10.005

Sever, I., & Verbič, M. (2019). Assessing recreational values of a peri-urban nature park by synthesizing perceptions and preferences of trail users. *Journal of Environmental Psychology*, *63*, 101–108. https://doi.org/10.1016/j.jenvp.2019.04.010

Sheehan, T., & Gough, M. (2016). A platform-independent fuzzy logic modeling framework for environmental decision support. *Ecological Informatics*, *34*, 92–101. https://doi.org/10.1016/j.ecoinf.2016.05.001

Sheehan, T., Gough, M., & Strittholt, J. (2016). *An introduction to the principles of fuzzy logic, and an overview of the Environmental Evaluation Modeling System (EEMS) framework. EEMS v2.0 Manual.* Conservation Biology Instittute.

Shi, D., Wang, L., & Wang, Z. (2019). What affects individual energy conservation behavior: Personal habits, external conditions or values? An empirical study based on a survey of college students. *Energy Policy*, *128*, 150–161. https://doi.org/10.1016/j.enpol.2018.12.061

Shultis, J., & Heffner, S. (2016). Hegemonic and emerging concepts of conservation: A critical examination of barriers to incorporating Indigenous perspectives in protected area conservation policies and practice. *Journal of Sustainable Tourism*, *24*(8–9), 1227–1242. https://doi.org/10.1080/09669582.2016.1158827

Sims, K. R. E., Lee, L. G., Estrella-Luna, N., Lurie, M. R., & Thompson, J. R. (2022). Environmental justice criteria for new land protection can inform efforts to address disparities in access to nearby open space. *Environmental Research Letters*, *17*(6), 064014. https://doi.org/10.1088/1748-9326/ac6313

*Sonix*. (2023). Sonix, Inc. https://sonix.ai/

Sonneborn, L. (2006). *The Chumash*. Lerner Publications.

Soulé, M. E. (1985). What Is Conservation Biology? *BioScience*, *35*(11), 727–734. https://doi.org/10.2307/1310054

Steidl, R. J., Shaw, W. W., & Fromer, P. (2009). A Science-Based Approach to Regional

Conservation Planning. In A. X. Esparza & G. McPherson (Eds.), *The Planner's Guide to Natural Resource Conservation: The Science of Land Development Beyond the Metropolitan Fringe* (pp. 217–233). Springer. https://doi.org/10.1007/978-0-387-98167-3_12

Stigter, T. Y., Miller, J., Chen, J., & Re, V. (2023). Groundwater and climate change: Threats and opportunities. *Hydrogeology Journal*, *31*(1), 7–10. https://doi.org/10.1007/s10040-022-02554-w

Strager, M. P., & Rosenberger, R. S. (2006). Incorporating stakeholder preferences for land conservation: Weights and measures in spatial MCA. *Ecological Economics*, *57*(4), 627–639. https://doi.org/10.1016/j.ecolecon.2005.05.015

Tamborini, C. R., Kim, C., & Sakamoto, A. (2015). Education and Lifetime Earnings in the United States. *Demography*, *52*(4), 1383–1407. https://doi.org/10.1007/s13524-015-0407-0

Tessum, C. W., Paolella, D. A., Chambliss, S. E., Apte, J. S., Hill, J. D., & Marshall, J. D. (2021). PM2.5 polluters disproportionately and systemically affect people of color in the United States. *Science Advances*, *7*(18), eabf4491. https://doi.org/10.1126/sciadv.abf4491

*The Importance of the Southern California Steelhead to Chumash Culture*. (2022). Wishtoyo Chumash Foundation. https://www.wishtoyo.org/sh-steelhead-chumash-culture

Tilman, D., Reich, P. B., & Knops, J. M. H. (2006). Biodiversity and ecosystem stability in a decade-long grassland experiment. *Nature*, *441*(7093), Article 7093. https://doi.org/10.1038/nature04742

Timbrook, J. (1990). Ethnobotany of chumash indians, California, Based on Collections by John P. Harrington. *Economic Botany*, *44*(2), 236–253. https://doi.org/10.1007/BF02860489{\i{}United Church of Christ Commision for Racial Justice}. (1987). Toxic Wastes and Race in the United States. https://www.ucc.org/wp-content/uploads/2021/03/toxic-wastes-and-race-at-twenty-1987-2007.pdf

Trialfhianty, T. I., Muharram, F. W., Suadi, Quinn, C. H., & Beger, M. (2022). Spatial multi-criteria analysis to capture socio-economic factors in mangrove conservation. *Marine Policy*, *141*, 105094. https://doi.org/10.1016/j.marpol.2022.105094

Tyrväinen, L., Ojala, A., Korpela, K., Lanki, T., Tsunetsugu, Y., & Kagawa, T. (2014). The influence of urban green environments on stress relief measures: A field experiment. *Journal of Environmental Psychology*, *38*, 1–9. https://doi.org/10.1016/j.jenvp.2013.12.005

United Church of Christ Commission for Racial Justice. (1987). *Toxic Waste and Race in the United States*. https://www.nrc.gov/docs/ML1310/ML13109A339.pdf/

United Nations General Assembly. (2007). *The United Nations Declaration on the Rights of Indigenous Peoples*.

Vantaggiato, F., & Lubell, M. (2020). *Learning to Collaborate: Lessons Learned from Governance Processes Addressing the Impacts of Sea Level Rise on Transportation Corridors Across California*. https://doi.org/10.7922/G2ZS2TSX

Vogler, D., Macey, S., & Sigouin, A. (2017). *Stakeholder Analysis in Environmental and Conservation Planning*. *7*, 5–16.

Voldoire, A., Sanchez-Gomez, E., Salas y Mélia, D., Decharme, B., Cassou, C., Sénési, S., Valcke, S., Beau, I., Alias, A., Chevallier, M., Déqué, M., Deshayes, J., Douville, H., Fernandez, E., Madec, G., Maisonnave, E., Moine, M.-P., Planton, S., Saint-Martin, D., … Chauvin, F. (2013). The CNRM-CM5.1 global climate model: Description and basic evaluation. *Climate Dynamics*, *40*(9), 2091–2121. https://doi.org/10.1007/s00382-011-1259-y

von Stackelberg, K. (2018). Ecosystem Resilience on Human Terms. *Integrated Environmental Assessment and Management*, *14*(5), 598–600. https://doi.org/10.1002/ieam.4073

Vrijheid, M. (2000, June). *Health effects of residence near hazardous waste landfill sites: A review of epidemiologic literature.* https://doi.org/10.1289/ehp.00108s1101

Wang, D., Guan, D., Zhu, S., Kinnon, M. M., Geng, G., Zhang, Q., Zheng, H., Lei, T., Shao, S., Gong, P., & Davis, S. J. (2021). Economic footprint of California wildfires in 2018. *Nature Sustainability*, *4*(3), Article 3. https://doi.org/10.1038/s41893-020-00646-7

*What is Groundwater?* (2022). The Groundwater Foundation. https://groundwater.org/what-is-groundwater/

*Where Your Water Comes From | Santa Barbara County, CA - Official Website*. (2021). [Water Wise in Santa Barbara County]. https://www.countyofsb.org/2382/Where-Your-Water-Comes-From

*Who We Are*. (2023). The Nature Conservancy. https://www.nature.org/en-us/about-us/who-we-are/

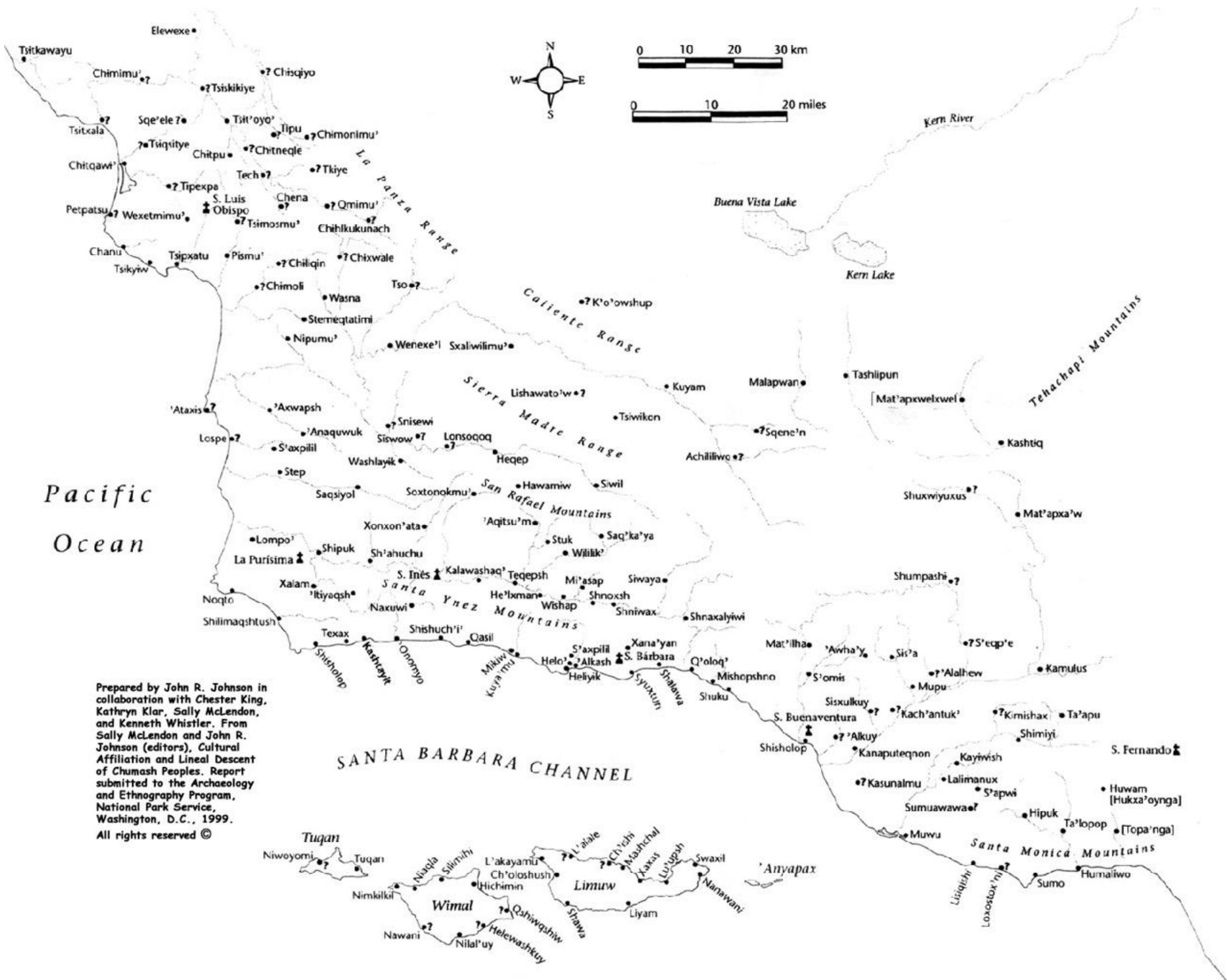
Winter, K. B., Vaughan, M. B., Kurashima, N., Giardina, C., Quiocho, K., Chang, K., Akutagawa, M., Beamer, K., & Berkes, F. (2021). Empowering Indigenous agency through community-driven collaborative management to achieve effective conservation: Hawai‘i as an example. *Pacific Conservation Biology*, *27*(4), 337–344. https://doi.org/10.1071/PC20009

Yang, J., Su, K., Zhou, Z., Huang, Y., Hou, Y., & Wen, Y. (2022). The impact of tourist cognition on willing to pay for rare species conservation: Base on the questionnaire survey in protected areas of the Qinling region in China. *Global Ecology and Conservation*, *33*, e01952. https://doi.org/10.1016/j.gecco.2021.e01952

Zhong, R. (2023, January 3). How Climate Change Is Shaping California’s Winter Storms. *The New York Times*. https://www.nytimes.com/2023/01/03/climate/california-flood-atmospheric-river.html

# Appendix

## Appendix A. Map of Indigenous Territories




## Appendix B. Survey

[survey: Understanding conservation priorities]

Section 1 of 4

# Questionnaire: Understanding conservation priorities

Thank you for participating in this questionnaire! The purpose of this questionnaire is to understand your organization's or community's conservation priorities for the Gaviota Region. In order to quantify varying perspectives, we will use your answers from this survey to weigh different conservation criterion relative to one another and identify common high-priority areas for conservation action in the region. This analysis will be visualized in an interactive tool which we intend to distribute to Gaviota region stakeholders and rights holders. This tool will highlight the priorities the user selects based on their organizations' preferences with the threats (flooding, droughts, climate exposure, and wildfires) to the natural resources (biodiversity, water, soil, and climate resilience) on a map. Additionally, the user will be able to visualize the priorities of government agencies, non-profit organizations, Indigenous communities and nations, and farmers and ranchers. The goal for this tool is to foster collaboration across a range of voices for successful and inclusive conservation management.

The multiple choice and rating questions in section 2 will provide the weights for the analysis mentioned above. The long answer questions in sections 3 and 4 will inform the tool design and the types of data included to benefit equity and environmental justice.

The information you provide will help us complete our Bren capstone group project. More information can be found here:

- https://bren.ucsb.edu/projects/evaluating-regional-conservation-opportunities-jack-and-laura-dangermond-preserve.

If you have any questions, comments, or concerns please contact the team:

- gp-endangermond@bren.ucsb.edu.

Thank you!

Alessandra, Alissa, Ali, Lauren, Kat, and Pol

Email *

Short answer text

Organization *

Short answer text

Type of organization (check all that apply) *

- [ ] Government
- [ ] Non-profit organization
- [ ] Indigenous tribe/agency/organization
- [ ] Farm/Ranch
- [ ] Other...

Section 2 of 4

Pairwise comparisons

Please choose which option you prioritize between the pairs of conservation criteria and then rank the relative importance of the option you chose compared to the option that you did not choose.

We understand that these terms are very broad. For the purposes of this survey, please refer to the following definitions:

1. **Biodiversity**: all components supporting diversity including connectivity, fauna suitability, rare and threatened species locations, and locations of wetlands
2. **Water**: water resources including wetlands, waterways, groundwater, and watershed health
3. **Soil**: soil suitability for use in plant cultivation, agriculture, and ecosystem health
4. **Climate Resilience**: areas functioning as refugia from climate change

Which conservation value does your organization prioritize? *

○ Biodiversity

○ Water

How much more important is it? *

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Equal Importance | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | Extreme Relative Importance |

Which conservation value does your organization prioritize? *

- ◯ Biodiversity
- ◯ Soil

How much more important is it? *

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Equal Importance | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Extreme Relative Importance |

Which conservation value does your organization prioritize? *

- ◯ Biodiversity
- ◯ Climate resilience

How much more important is it? *

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Equal Importance | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Extreme Relative Importance |

Which conservation value does your organization prioritize? *

- ◯ Water
- ◯ Soil

How much more important is it? *

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Equal Importance | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Extreme Relative Importance |

Which conservation value does your organization prioritize? *

- ◯ Water
- ◯ Climate Resilience

How much more important is it? *

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Equal Importance | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Extreme Relative Importance |

Which conservation value does your organization prioritize? *

- ◯ Soil
- ◯ Climate Resilience

How much more important is it? *

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Equal Importance | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Extreme Relative Importance |

Section 3 of 4

Diversity, Equity, Inclusion, and Environmental Justice

We understand that these terms are very broad. For the purposes of this survey, please refer to the following definitions:

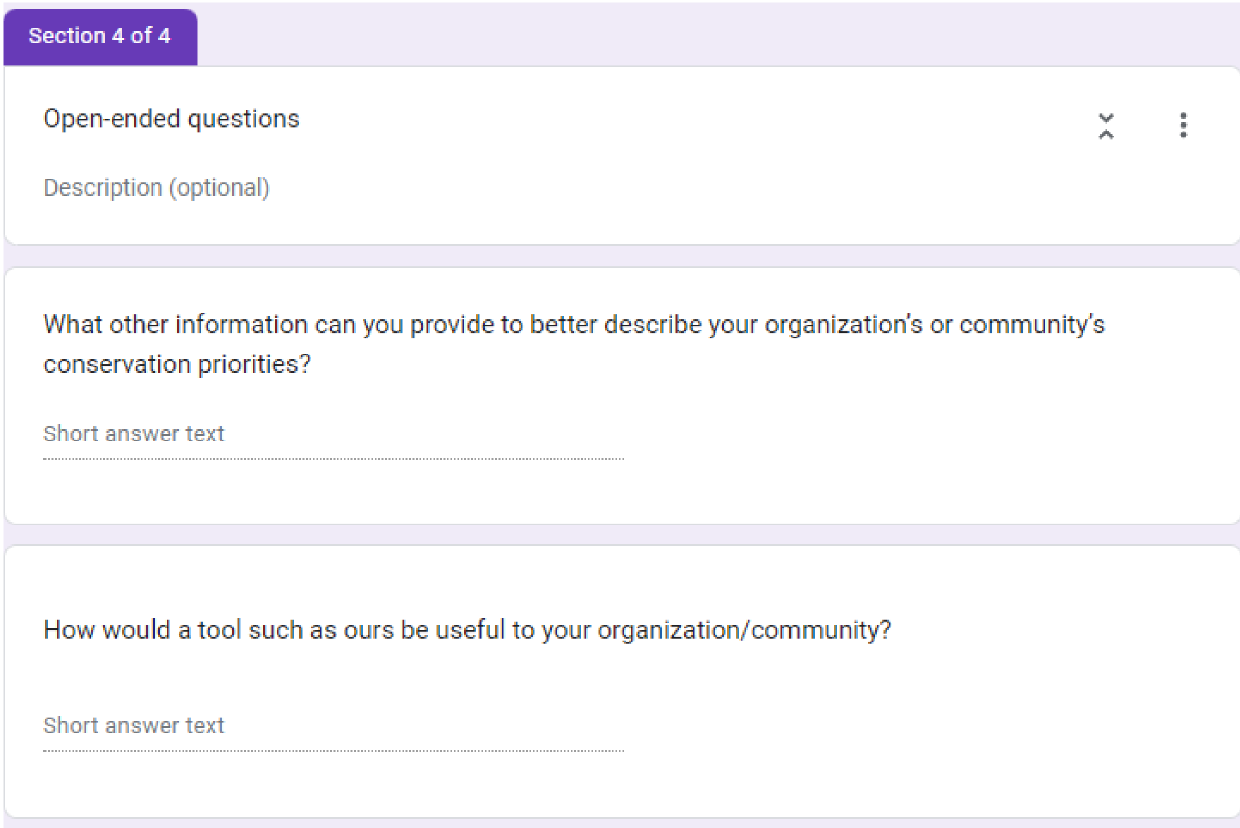
- **Diversity:** Presence of differences that may include race, gender, religion, sexual orientation, ethnicity, nationality, socioeconomic status, language, (dis)ability, age, religious commitment, or political perspective.
- **Equity:** Promoting justice, impartiality and fairness within the procedures, processes, and distribution of resources by institutions or systems.
- **Inclusion:** An outcome from creating environments in which any individual or group can be and feel welcomed, respected, supported, and valued as a fully participating member.
- **Environmental justice:** Fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

What metrics for environmental justice would you like to see visualized in the tool?

Long answer text

What metrics for diversity, equity, and inclusion would you like to see visualized in the tool?

Long answer text



Section 4 of 4

Open-ended questions

Description (optional)

What other information can you provide to better describe your organization's or community's conservation priorities?

Short answer text

How would a tool such as ours be useful to your organization/community?

Short answer text

# Appendix C. Round One Interview questions

**Nonprofit organizations:** California Rangeland Trust* (Blueprint contributor), Gaviota Coast Conservancy, Land Trust for Santa Barbara County* (Blueprint creator) (Arroyo Hondo Preserve), Los Padres Forest Watch, White Buffalo Land Trust (Jalama Canyon)

1. Can you please give us a brief history of your organization and its work in the Gaviota Region?
2. *Can you go more in-depth about the contributions made to the SB Blueprint?* OR Are you familiar with the SB Blueprint?
    a. What data do you feel is missing from the SB Blueprint?
    b. Why?
    c. Are there local data sets that you know of that are not included?
    d. Is there any data that is currently in creation that you hope to see included in the Conservation Blueprint?"
3. What are the conservation priorities of your agency?

4. What systems are in place to successfully protect the Gaviota Region's natural resources (water, habitat connectivity, climate resilience, fire prevention, agricultural lands, flora, and fauna)?
    a. Are there particular species that are prioritized?
5. What are your biggest conservation concerns specifically for Santa Barbara county?
6. How do you use your data to accomplish conservation priorities for your agency?
    a. What types of data are collected?
    b. What types of metrics or measures are used from each dataset or data type?
7. We see that your organization is already producing BLANK data. Are there any new data sets you are planning on producing or releasing soon?
    a. What types of metrics or measures are used from each dataset or data type?
8. What other organizations is your organization collaborating with?
    a. How?
    b. How are data shared between organizations?
    c. Are they leveraged in the same way?
9. How are diversity, equity, and inclusion incorporated into the conservation work that your organization does?
    a. What data are used to reflect this?
    b. How is environmental justice included in the conservation work that your organization does?
    c. Why is it or why is it not included in planning?
10. What are future conservation goals for this organization?

**Governmental:** California State Parks (Gaviota State Park, El Capitán, Gaviota State Park), City of Goleta, Department of Fish and Wildlife, Los Padres National Forest (Forest Service), Cachuma Resource Conservation District* (Blueprint partner)

1. Can you please give us a brief history of your agency's work in the Gaviota Region?
2. *Can you go more in-depth about the contributions made to the SB Blueprint?* OR Are you familiar with the SB Blueprint?
    a. What data do you feel is missing from the SB Blueprint?
    b. Why?
    c. Are there local data sets that you know of that are not included?
    d. Is there any data that is currently in creation that you hope to see included in the Conservation Blueprint?"
3. What are the conservation priorities of the agency?

4. What systems are in place to successfully protect the Gaviota Region's natural resources (water, habitat connectivity, climate resilience, fire prevention, agricultural lands, flora, and fauna)?
    a. Are there particular species that are prioritized?
5. What are your biggest conservation concerns specifically for Santa Barbara county?
    a. What tactics do your partner ranches in SB county use to help mitigate these concerns?
6. How do you use your data to accomplish conservation priorities for your agency?
    a. What types of data are collected?
    b. What types of metrics or measures are used from each dataset or data type?
7. We see that you are all already producing data. Are there any new data sets you are planning on producing or releasing soon?
    a. What types of metrics or measures are used from each dataset or data type?
8. What is this agency's relationship with neighboring agencies? Collaborations?
9. How is diversity, equity, and inclusion incorporated into the conservation work that your agency does?
    a. What data are used to reflect this?
    b. How is environmental justice included into the conservation work that your organization does?
    c. Why is it or why is it not included in planning?
10. What are future conservation goals for this organization?

**Farms and Ranches:** Alisal Ranch, Apple Creek Ranch, Baroda Farms, Crimson Farms LLC, The Cultured Abolone, Dos Pueblos Orchid Farm, El Chorro Ranch, Flag is Up Farm, Folded Hills - Winery Ranch, Gaia Farm, Good Land Organics Farm, Hanson Ranch (blueprint participant), High Meadow Ranch, Las Varas Ranch, Nojoqui Creek Farms, Nojoqui Horse Ranch, Parks Ranch, Rancho Guacamole, Rancho San Lorenzo, Rancho Tajiguas, Reagan Rancho del Cielo, Restoration Oaks Ranch, Rock Front Ranch, Santa Barbara Blueberries, Santa Barbara Lavender, San Lucas Ranch, Tutti Frutti Farms, White Buffalo Land Trust (Jalama Canyon), Williams Ranch (two locations)

1. Can you please give us a brief history of your farm/ranch?
    a. When did it start?
    b. Who was the founder?
    c. What was the intent of the ranch/farm at its founding?
    d. How has it evolved?
    e. What it is now?
    f. How have you seen your practices change over time based on environmental factors?

2. What makes the Gaviota Region farming and ranching community unique?
3. What are your (the farm/ranch's) biggest priorities right now? (maybe add a follow up like conservation//natural resource use)
    a. What are your biggest concerns for your farm right now?
    b. What are your concerns and priorities for the future?
4. Do you use any sustainable or regenerative agriculture practices?
    a. What are they?
    b. How did your farm/ranch learn these practices?
    c. Are there any sustainable practices you wish you could incorporate into your farming/ranching but don't have the capacity to?
        i. If so, would you be open to partnering with an organization that could help you implement these practices?

5. What organizations do you work with?
    a. Who do you trust to work with?
    b. What sources of information do you trust about making decisions regarding your farm/ranch?
    c. Why do you choose to partner with them?
    d. Who do you explicitly choose not to seek information from and why?
    e. What actions or communication would you like to see more of from the Gaviota Region's land agencies and non-profit organizations?

6. What are your highest environmental concerns (ex: water availability, climate change)?
7. What makes the Gaviota Region farming and ranching community unique?
8. What records do you keep for your farm?
    a. How do those records help you make decisions for your farm?
    b. What other information do you seek out or wish you had access to help you make decisions?
    c. What data about your operation would you be willing to collect and possibly share if it helped your farm? (plant diversity, crop production, rainfall, etc.)
    - And if so, would you be able to contribute to the conservation decision support tool?

**Indigenous groups:** Coastal band of Chumash Nation, Santa Ynez Band of Chumash Indians, Barbareño Band of Chumash Indians, YTT Northern Chumash Band

1. Can you please tell us about your ancestors' connection to the Gaviota Region?
2. What is the current generation's connection to the Gaviota Region?
3. What do you think the future generations' connection to the Gaviota Region will be?

4. What are the most significant natural resources of the Gaviota Region for the Chumash?
5. How has INSERT INDIGENOUS GROUP been involved in local environmental/conservation work and decision making?
6. Have the Chumash been adequately included in conservation decisions in the Gaviota Region?
7. Are you familiar with the SB Blueprint?
    a. What data do you feel is missing from the SB Blueprint?
    b. Why?
    c. Are there local data sets that you know of that are not included?
    d. Is there any currently created data that you hope to see included in the Conservation Blueprint?"
8. Does the INSERT INDIGENOUS GROUP have specific conservation priorities (ex. Water, native plants)? If so, what are they?
9. What systems are in place to successfully protect the Gaviota Region's natural cultural resources (water, habitat connectivity, climate resilience, fire prevention, agricultural lands, flora, and fauna)?
    a. Are there particular species that are prioritized?
10. What would the INSERT INDIGENOUS GROUP like to see for the Dangermond (Humqaq) Preserve? // Would the INSERT INDIGENOUS GROUP like to see it given back to the Chumash? // should this land be left as it is or open to the public? How would you visualize using the land?
11. How would you like us to incorporate Chumash voices and perspectives in our tool and report?
12. Does the INSERT INDIGENOUS GROUP use or collect data in any way?
13. What is the INSERT INDIGENOUS GROUP's relationship with neighboring agencies/organizations/other tribal bands? Collaborations?
14. What are the future goals for the INSERT INDIGENOUS GROUP?