



Informational Item

December 9, 2025

Item 6a

Information Item:
**Save the Waves Coalition: Climate Vulnerability
of California's Natural Surfing Capital**

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Location: Santa Cruz

Strategic Plan Goals and Objectives: Objectives 1.1: Build Resiliency to Sea-Level Rise, Coastal Storms, Erosion and Flooding; Objective 1.3: Improve Understanding of Climate Impacts on California's Coast and Ocean; and Objective 4.6: Enhance California's Sustainable Coastal Tourism Economy

Exhibits:

Exhibit A: [Climate Vulnerability of California's Natural Surfing Capital](#)

Exhibit B: [Video: What is the Value of a Wave?](#)

Executive Summary:

Climate change and rising sea levels are transforming California's coastline, threatening not only critical habitats and infrastructure but also the surf breaks that define much of the state's coastal culture and economy. With funding from the Ocean Protection Council (OPC), [Save The Waves Coalition](#) recently completed an evaluation (Exhibit A) of how sea level rise (SLR) and coastal adaptation strategies will affect the surf breaks, recreation economy, and community access of Santa Cruz, a designated World Surfing Reserve. OPC approved funding for this two-year pilot project in January 2023. Through a partnership with [Black Surf Santa Cruz](#), the project examined and highlighted the importance of equitable and inclusive adaptation planning to ensure all communities can access and benefit from Santa Cruz's coastal resources. At the completion of the project, findings showed that SLR will reduce surf quality and could eliminate some of area's most iconic waves, while nature-based approaches such as managed retreat offer the most effective path to sustain both surfability and the local coastal economy that relies on it.

Background

Santa Cruz is often considered the birthplace of modern surfing on the U.S. mainland and remains one of the most renowned surfing destinations in the world. Designated as the first World Surfing Reserve in 2011, the region’s seven-mile stretch of coastline includes 31 surf breaks that are central to Santa Cruz’s economy, culture, and identity. Surfing in this region generates significant economic activity through tourism, local spending, and the broader surf industry, while also providing immeasurable non-market value to residents and visitors. Yet, these same surf breaks are increasingly threatened by SLR, coastal erosion, and shoreline armoring that alter sediment dynamics and wave quality. Despite surfing’s global visibility and its status as California’s official state sport, few studies have quantified how climate change could affect individual surf breaks or the coastal economies they sustain.

To address this gap, OPC supported two local Santa Cruz non-profits for this project. Save The Waves Coalition, an international nonprofit dedicated to protecting surf ecosystems through conservation, advocacy, and policy, led this pilot project to assess the physical, economic, and social vulnerability of surf breaks to SLR and evaluate how adaptation strategies can sustain them over time. The project also partnered with Black Surf Santa Cruz, a community nonprofit that works to make ocean recreation more inclusive and accessible for Black, Indigenous, and People of Color (BIPOC) communities. Through this partnership, the project not only advanced the science of surf break vulnerability but also elevated diverse voices and perspectives in shaping California’s approach to equitable coastal adaptation.

Vulnerability of Surf Breaks to the Impacts of Sea Level Rise

To evaluate how rising seas will affect the physical persistence and function of surf breaks in Santa Cruz, the project team completed a Surf Break Vulnerability Assessment integrating long-term oceanographic datasets, coastal geomorphic analysis, and local surf conditions. The model incorporated 28 years of National Oceanic and Atmospheric Administration tidal records, wave buoy data from the National Data Buoy Center, and detailed mapping of backshore characteristics to calculate the proportion of daylight hours each surf break remains “surfable” under existing and projected SLR scenarios. “Surfability” is defined as the overlap between suitable tide levels, wave heights, and swell directions. This analysis was ground-truthed through consultation with an expert panel of 18 local surfers with extensive local knowledge of the region.

Results show a pronounced decline in surfable conditions: approximately 29% reduction with one foot of SLR, 57% reduction with two feet, and 77% reduction with three feet, beyond which most breaks become functionally lost. The study also modeled four adaptation strategies—expanded revetments, seawalls, sand management, and managed retreat—by adjusting backshore-water interactions in the surf zone. Nature-based strategies, particularly managed retreat, sustained the

highest surfability across all SLR scenarios, while sand management provided moderate near-term benefits that diminished beyond two feet of rise. In contrast, hard armoring approaches such as seawalls and revetments increased wave reflection and reduced surfable area, accelerating the long-term loss of wave quality.

Economic Assessment of the Surfing Economy

The project’s economic assessment examined how surfing supports Santa Cruz’s economy today and how that value may shift as sea levels rise in the future. Using travel-cost modeling, public surveys, and cellphone-based mobility data, the study captured both the market value of visitor spending and the non-market value of recreation itself, such as the time and resources people are willing to invest to ride a wave. The economic assessment’s findings found that the surfing economy in Santa Cruz is worth \$150.2 million per year in total economic activity, while visitor surf trips alone generate an estimated \$44.5 million annually. Visitor trips, surf schools, equipment sales, and related spending together form a thriving local economy, while proximity to high-quality surf breaks enhances coastal property values and quality of life. The report underlines how deeply surfing is woven into Santa Cruz’s economic and cultural identity and highlights the importance of protecting these resources as sea levels rise.

As sea levels rise, however, that foundation becomes increasingly vulnerable. Fewer surfable hours mean fewer trips, less spending, and reduced recreation value. Without adaptation, the local surf economy could face steep declines as more visitors rely on fewer waves and surfing resources, and some breaks may disappear altogether. In contrast, nature-based adaptation strategies, particularly managed retreat, could help sustain wave surfability, maintaining both the experience for surfers and the economic vitality of Santa Cruz. This work represents one of the first efforts in California to link shoreline adaptation choices directly to the future of recreation-based coastal economies.

Equity and Access: Partnership with Black Surf Santa Cruz

A central component of the project involved a partnership with Black Surf Santa Cruz to explore equity in coastal recreation and to better understand the barriers that prevent full access to surfing and beach environments. Through community focus groups, participants described experiences of exclusion, economic hardship, and physical inaccessibility that collectively limit participation in surfing within Santa Cruz. Social dynamics such as localism and cultural hostility were identified as major deterrents to inclusion, while the high costs of equipment, lessons, and parking further constrain access for these communities and other historically excluded groups. Participants also noted that limited public transportation and inadequate coastal infrastructure

present persistent barriers to reaching surf breaks, particularly for residents in inland and low-income communities.

The study emphasizes that inclusive programming, improved coastal infrastructure, and more equitable permitting for surf schools and events are critical to ensuring that all Californians can safely and confidently enjoy ocean recreation. By integrating these perspectives, the project demonstrates how climate adaptation and coastal access planning can advance both environmental resilience and social equity.

Next Steps

This pilot study demonstrates both the value of California’s surfing resources and a robust methodology for evaluating how SLR will affect surf breaks, coastal economies, and community access. The framework developed in Santa Cruz can now be adapted to other regions, creating opportunities for local governments, agencies, and nonprofit partners to invest in similar assessments along their coastlines. The findings also position Save The Waves and partner organizations to continue advancing surf break protection and equity within local and statewide adaptation planning.