



Informational Item
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Item 8a

Information Item: **Update on Implementation of OPC's Kelp Action Plan**

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Location: Statewide

Strategic Plan Goals and Objectives: Goal 3: Enhance Coastal and Marine Biodiversity;
Objective 3.2: Restore and Protect Kelp Ecosystems

Executive Summary

In 2021, OPC released an [Action Plan for Protecting and Restoring California's Kelp Forests](#). This Action Plan, developed in close collaboration with the California Department of Fish and Wildlife (CDFW) as a proactive and preliminary response to climate-driven kelp loss across the state, summarized state-supported kelp research and restoration initiatives, highlighted key knowledge gaps, and outlined top priorities for action in four key focal areas: research and monitoring, policy development, restoration, and community engagement.

Over the last two years, guided by the Action Plan, OPC and CDFW have worked with partners across the state to complete critical pilot work, fill knowledge gaps, deepen engagement with coastal communities and California Native American tribes, and lay the groundwork for a statewide, ecosystem-based [Kelp Restoration and Management Plan](#) (KRMP). The KRMP, which is currently being developed by CDFW in partnership with OPC, will guide the management, protection, and restoration of kelp forests into the future.

This informational item serves to provide a snapshot of kelp forest health in California two years after the publication of the Action Plan, outline progress and lessons learned through the implementation of the Action Plan, and describe next steps for development of the KRMP.

For more in-depth information on the status of kelp research, monitoring, and restoration efforts, as well as the development of management strategies for canopy-forming kelp species in

California, please refer to the comprehensive CDFW and OPC [report](#) submitted to the California Fish and Game Commission Marine Resources Committee meeting in November 2023.

Background

Two canopy-forming kelp species, bull kelp (*Nereocystis luetkeana*) and giant kelp (*Macrocystis pyrifera*), occur in California. Bull kelp dominates the cooler waters of northern California, while giant kelp dominates southern California’s nearshore waters. Central California provides a unique transitional environment where both species co-exist.

California’s kelp forests provide a variety of critical ecological functions and ecosystem services. Kelp serves as habitat for a diverse community of invertebrates, fishes, marine mammals, and birds, and kelp is an important food source for many marine herbivores. Furthermore, kelp is critical to the well-being of California’s coastal residents and our state’s multi-billion-dollar ocean economy. For example, many coastal tribes rely on kelp for food, medicine, and ceremony. Kelp forests also support important fisheries and offer unparalleled opportunities for diving, kayaking, surfing, and wildlife viewing.

Kelp Forest Status and Trends

In recent years, California has experienced climate-driven declines in kelp forest extent across its coastline (Figure 1), with some regions and localized areas exhibiting severe and persistent loss that has led to significant negative impacts on culturally and economically important species, biodiversity, and coastal communities.

North Coast (California/Oregon Border to San Francisco Bay): In this region, specifically in Sonoma and Mendocino counties, more than 95% of bull kelp canopy was lost from 2014-2019 due to a marine heat wave that brought with it a “perfect storm” of changing ocean conditions including warm, nutrient-poor waters and an explosion in kelp-eating purple sea urchin populations. Recovery since the heat wave has been extremely limited and since 2015, kelp canopy has remained critically low in Sonoma and Mendocino counties. As of September 2023, total kelp canopy coverage along the north coast remains at less than 10% of the historical average.

Central Coast (San Francisco Bay to Point Conception): In contrast to the region-wide devastation observed on the north coast between 2014-2019, patterns of bull kelp and giant kelp canopy on California’s central coast are more complex. In recent years, declines have been isolated to the Monterey Peninsula, while other locations in the Central Coast have persisted at normal levels and in some places even increased (e.g. Santa Cruz and San Mateo counties). From January to September 2023, however, canopy coverage appeared to decline dramatically across the entire region. Whether this represents the onset of a long-term trend or is simply due to extreme storm

events this year remains to be seen, but this year’s data so far present cause for concern and warrant more targeted monitoring, including assessment of natural recovery in Spring 2024.

South Coast (Point Conception to California/Mexico border): The giant kelp-dominated south coast region has also experienced some declines since the onset of the marine heat wave, though not to the degree of loss observed on the north coast. As on the central coast, extreme storm events in early 2023 resulted in widespread dislodgement of kelp. While canopy data through September 2023 shows abnormally low kelp cover for several areas within southern California, observations of growing subsurface kelp suggest that the full extent of kelp presence has yet to be captured in the dataset. Like the central coast, data from the remainder of this year as well as monitoring of early spring growth next year will provide more insights into kelp health in Southern California. Specific areas of concern in this region include San Diego County and San Miguel Island.

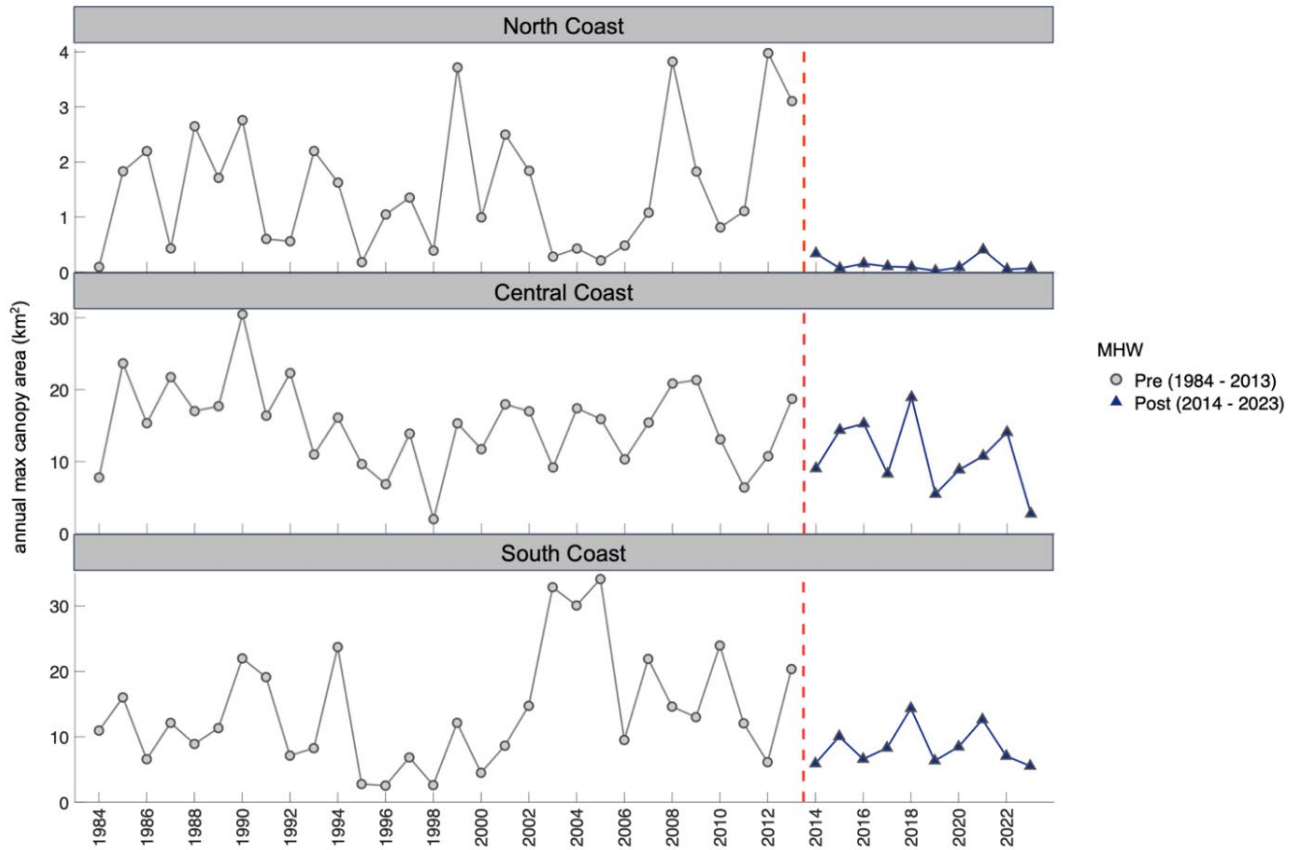


Figure 1: Landsat derived regional canopy data canopy from 1984 through September 2023 (Q3). Data are typically derived from the 4th quarter in each year, except for 2023, in which data collection is ongoing through the end of the year. This may result in showing less canopy in this figure than what may be observed in the complete year of 2023. The red dashed line indicates the onset of the MHW in 2014. Data source: Santa Barbara Coastal Long-Term Ecological Research (SBC LTER).

Learning by Doing: Outcomes of Pilot Work

Since the publication of the Kelp Action Plan in 2021, OPC has made unprecedented investments (approximately \$10 million total, including funding being considered for disbursement at this Council meeting) to restore and protect kelp forest ecosystems and enhance the resilience of the coastal communities they support. As climate change is predicted to increase the frequency and severity of disturbances, such as marine heat waves, these efforts to “learn by doing” are helping California chart a path to resilience. Together, these investments are directly supporting ambitious kelp restoration efforts while simultaneously advancing understanding of effective restoration techniques and tools, enabling resource managers to develop solutions to the kelp crisis, and fostering meaningful partnerships with tribes and coastal communities.

Major outcomes and lessons learned across all four focal areas of the Kelp Action Plan include:

Research and monitoring

- Teams from universities across California, as well as community scientists, have [conducted subtidal monitoring of kelp forest habitats](#) as part of California’s marine protected area (MPA) monitoring program.
- Researchers at UCLA are developing a [novel approach to high-resolution kelp canopy monitoring](#). This new methodology will rely on remote sensing and machine learning to produce seasonal (twice-yearly) kelp canopy maps for the entire coast of California.
- Scientists from California State University Monterey Bay and Reef Check California [discovered that intertidal areas may play a far more important role as a source for purple sea urchin populations](#) than previously thought.
- Researchers at UC Irvine [found that some populations of giant kelp are more resistant to heat stress than others](#). These results will help managers ensure restoration efforts are climate-ready by identifying which kelp populations might survive best in a warming ocean.
- An interdisciplinary team from UC Davis, UC San Diego, and Sonoma State University [developed sophisticated models to improve understanding of bull kelp dispersal and recruitment](#).
- A consortium of scientists from the University of Wisconsin-Milwaukee, UC Santa Cruz, and the University of Southern California [established a “seed bank” of more than 1,700 bull kelp genotypes from 14 sites across the state](#). This collection, the first of its kind, will help preserve the genetic diversity of this vulnerable species into the future.

Policy development

- A team of researchers from UC Santa Barbara and UC Santa Cruz used cutting-edge modeling techniques to create a first-of-its-kind [restoration guide](#). This guide will help resource managers, funders, and other restoration practitioners make science-based decisions about when and where kelp restoration might have the best chance of success.
- CDFW released an [Enhanced Status Report](#) for Giant Kelp and Bull Kelp. This key document provides a comprehensive overview of both species, current management and monitoring efforts, and future management needs.
- As a precautionary measure, the California Fish and Game Commission temporarily closed commercial harvest of bull kelp in Sonoma and Mendocino counties for three years.
- The development of a [statewide, ecosystem-based, adaptive Kelp Restoration and Management Plan](#) (KRMP) began in 2023. CDFW, in partnership with OPC, are using a multi-pronged approach, consisting of a Community Working Group, Science Advisory Committee, and meaningful tribal engagement to ensure the development of the KRMP is

informed by the best available science and community perspectives across the state of California.

Restoration

- An unprecedented, partnership-based restoration effort on the north coast [directly engaged commercial red urchin fishermen to restore kelp](#) at two sites in Mendocino County. Over the course of two years, fishermen removed nearly 50,000 pounds of purple urchin from the restoration sites, and while limited, kelp regrowth was documented within one urchin removal area.
- Scientists from Moss Landing Marine Labs [developed a novel, low-cost technique for culturing bull kelp year-round](#). When scaled, these methods could greatly improve the feasibility of future bull kelp enhancement efforts.
- Teams from Moss Landing Marine Labs and UC Irvine [conducted kelp outplanting experiments](#) using gravel inoculated with kelp spores. Results were mixed, and this approach may not work well along California’s rugged, wave-swept coast.
- [California has emerged as a global leader in kelp restoration](#), with OPC and CDFW engaging with restoration practitioners from around the world to share best practices and lessons learned.

Community engagement

- Community-led urchin culling efforts at Caspar Cove in Mendocino County and Tanker Reef in Monterey County have successfully engaged recreational divers in kelp restoration. Preliminary results suggest recreational divers can effectively reduce urchin densities, so long as effort is coordinated, focused, and consistent. However, long-term effects on kelp recovery and persistence, the scalability of this restoration method, and potential risks to the marine environment are still being actively investigated.
- To inform the KRMP, as well as kelp protection and restoration efforts more broadly, OPC and CDFW held early listening sessions in summer 2023 with California Native American tribes to learn more about tribal priorities for restoration, protection, and management.

Development of a Long-Term Kelp Restoration and Management Plan

To address the catastrophic loss of kelp across the state, and to adaptively manage these vital marine ecosystems, CDFW and OPC have prioritized the development of a statewide, ecosystem-based KRMP. The goal of the KRMP is to develop a robust, adaptive, climate-ready approach to managing, protecting, and restoring giant and bull kelp forest ecosystems statewide.

The KRMP will include a cohesive kelp management strategy consisting of three core components: 1) a harvest management framework and other Fishery Management Plan (FMP) elements required by the Marine Life Management Act (MLMA); 2) an innovative framework for ecosystem-based management (EBM) of kelp forests; and 3) a Restoration Toolkit. The integration of EBM approaches and a Restoration Toolkit into the traditional FMP framework will facilitate a robust, adaptive, climate-ready approach to managing the State’s kelp forest ecosystems in the face of changing ocean conditions. These two components are entirely novel and reflect the need for innovative solutions to the climate crisis – to date, no state fishery management plan has attempted to incorporate these considerations.

To develop the KRMP, CDFW, with support from OPC, has adopted a multi-pronged approach to ensure that the final document is informed by best available science, meaningful tribal consultation, and the diverse perspectives of California’s coastal communities.

Science Advisory Committee: The Science Advisory Committee is an independent body tasked with providing scientific expertise on all aspects of the KRMP to ensure timely and effective integration of the best available science. This committee is composed experts from across California and representing a broad scope of disciplines, including natural and social sciences, economics, and local and traditional knowledge.

Community Working Group: This body, assembled in 2023, is composed of 22 individual members representing non-governmental conservation organizations (NGOs), divers, fishermen, local businesses, commercial harvesters, and tribal governments. Group members are tasked with sharing information about the KRMP development with their broader community networks, as well as gathering and sharing their communities’ perspectives, interests, and feedback.

Tribal engagement: A top priority for CDFW and OPC is to provide California Native American tribes the opportunity to inform the design and development of the KRMP’s process and outcomes, including opportunities for co-management. Pathways for tribal engagement identified to date include listening sessions, formal government-to-government consultation, and tribal representation on the Community Working Group and Science Advisory Committee.

Charting a Course to Resilience

California has made great strides in implementing the Kelp Action Plan, but as evidenced by persistent kelp declines in certain areas across the state, there is still a great deal of work to be done. As climate change continues to threaten California’s kelp forests, OPC and CDFW are doubling down on kelp research, restoration, and community engagement. Remote sensing, academic and community-led subtidal surveys, and innovative modeling techniques are improving our real-time understanding of kelp forest health across the state. Strategic research investments

are filling knowledge gaps and providing resource managers with a portfolio of potential solutions to the kelp crisis. An ambitious, “learn by doing” approach to kelp restoration is solidifying California as a global leader in this emerging discipline and providing a lifeline to some of the most vulnerable parts of our coast. Finally, a science-based and community-driven KRMP will provide long-term strategies for ensuring the resilience of our iconic kelp forests into the future.