



**Staff Recommendation**

December 9, 2024

Item 7

**Action Item:**

**Consideration and Approval of Disbursement of Funds to Support  
Adaptative Management and Resilience of Kelp Forests**

Pike Spector, Biodiversity Program Manager

**Recommended Action:** Authorization to disburse up to \$775,000 to support adaptative management and resilience of kelp forests through the following projects:

- 7a. Up to \$250,000 to Woods Hole Oceanographic Institution to assess the impact of commercial and recreational harvest on giant and bull kelp in California.
- 7b. Up to \$525,000 to the University of California, Santa Cruz to strategically map giant and bull kelp genomic diversity in California.

**Location:** Statewide

**Strategic Plan Goals and Objectives:** Goal 3: Enhance Coastal and Marine Biodiversity; Objective 3.2 Restore and Protect Kelp Ecosystems; Target 3.2.1 and associated actions

**Equity and Environmental Justice Benefits:** Project outcomes will improve management of kelp forest ecosystems, support durability and climate resilience for nearshore ecosystems, and advance the Harvest Framework of the Kelp Restoration and Management Plan. Because kelp forests are home to many culturally important species, the restoration of these ecosystems enhances access to marine recreational opportunities, such as recreational fishing and SCUBA diving. Further, healthy kelp forests provide enhanced protections for culturally important species and may facilitate harvest by California Native American tribes.

**Findings and Resolution:**

Staff recommends that the Ocean Protection Council (OPC) adopt the following findings:

“Based on the accompanying staff report and attached exhibit(s), OPC hereby finds that:

1. The proposed projects are consistent with the purposes of Division 26.5 of the Public Resources Code, the California Ocean Protection Act;
2. The proposed projects are consistent with the Budget Act of 2024, which included a \$27 million Greenhouse Gas Reduction Fund appropriation for ocean protection and resilience to climate change; and
3. The proposed projects are not ‘legal projects’ that trigger the California Environmental Quality Act (CEQA) pursuant to Public Resources Code section, section 15378.”

Staff further recommends that OPC adopt the following resolution pursuant to Sections 35500 *et seq.* of the Public Resources Code:

“OPC hereby approves the disbursement of up to \$775,000 to support adaptative management and resilience of kelp forests in California through the following projects:

- Up to \$250,000 to Woods Hole Oceanographic Institution to assess the impact of commercial and recreational harvest on giant and bull kelp in California.
- Up to \$525,000 to the University of California, Santa Cruz to strategically map giant and bull kelp genomic diversity in California.

This authorization is subject to the condition that prior to disbursement of funds, Woods Hole Oceanographic Institution and the University of California, Santa Cruz shall submit for the review and approval of the Executive Director of the OPC detailed work plans, schedules, staff requirements, budgets, and the names of any contractors intended to be used to complete the projects, as well as discrete deliverables that can be produced in intervals to ensure the projects are on target for successful completion. All projects will be developed under a shared understanding of process, management, and delivery.”

### **Executive Summary:**

Staff recommends that OPC approve the disbursement up to \$775,000 to two projects that advance immediate information needs to support adaptative management and resilience of kelp forests in California. This includes up to \$250,000 to fund the first-ever assessment of commercial and recreational harvest for giant and bull kelp across the state of California. Utilizing satellite imagery and advanced modeling, researchers will develop new tools to quantify the impact that canopy harvest may have on the future recovery and resilience of kelp forests in California. This project will support the development of the [Kelp Restoration and Management Plan](#), which will inform a Harvest Framework for giant and bull kelp and fill a critical knowledge gap by quantifying the impact that recreational and commercial kelp canopy harvest may have on overall kelp productivity, biomass, and resilience. This project will provide important information necessary to inform adaptative management and recovery of California’s kelp forests.

Staff additionally recommends the disbursement of up to \$525,000 to fund a project that will provide a comprehensive analysis of genetic diversity in giant and bull kelp populations in California. Researchers will create a novel geospatial database and GIS map that will incorporate previously completed projects and leverage new tissue samples to create a systematic understanding of kelp population persistence with an emphasis on genetic diversity. Results from this project will be used to identify locations where genetics may be driving patterns of kelp persistence or loss under current and future ocean conditions. This will support strategic planning for future kelp forest restoration projects and provide invaluable insight into the role that genetics may play in conferring climate resilience for giant and bull kelp.

## Project Summary:

### Background:

California's iconic kelp forests are among the most productive and biodiverse ecosystems on the planet. Giant kelp, which dominate in southern and central California, and bull kelp, which dominate in northern California, are both foundational species that provide habitat and serves as an important food source for marine life. Kelp forests are also culturally important to California Native American tribes and contribute to California's coastal economy.

For decades, commercial kelp harvest has occurred in state waters. While the majority of large-scale operations have been phased out, some kelp harvest activities continue to occur. The California Department of Fish and Wildlife (CDFW) has designated 87 administrative kelp beds for the purposes of managing commercial kelp harvest, [these beds can be closed to harvest by CDFW depending on the availability of kelp](#). In 2022 the [California Fish and Game Commission closed all bull kelp harvest in Sonoma and Mendocino](#) until at least 2026, citing to the collapse of bull kelp populations.

Contemporary harvest of giant and bull kelp in California is driven by use in aquaculture (as a food for species such as abalone) and in commercial and industrial applications (e.g., fertilizers and cosmetic and food stabilizers). Commercial mechanical harvest for giant kelp occurs via boat, harvesters are only allowed to remove the top three feet from the surface to minimize impacts to individual kelp. Bull kelp harvest is limited to hand-harvest only, with regulations that allow for harvest of the entire individual. [See the Giant and Bull Kelp Enhanced Status Report for more information](#). Given the alarming declines in both giant and bull kelp populations, an improved understanding of the impact from harvest on the health and resilience of kelp forest ecosystems will strengthen the state's management of these activities.

In 2021, OPC released a [Kelp Action Plan](#) that contains proactive strategies and opportunities to address the kelp crisis. The Kelp Action Plan, in conjunction with OPC's [2020-2025 Strategic Plan](#)

---

supported the creation of the [Kelp Restoration and Management Plan](#) (KRMP), which was launched in 2022 and is anticipated to be implemented in 2027. The KRMP will be California’s first ecosystem-based fishery management plan and will contain a framework for the adaptive management of kelp harvest and a toolkit of restoration options.

To advance priorities in the Kelp Action Plan and support development of the KRMP, OPC has invested more than \$10 million since 2019 to monitoring kelp forest health ([2020 Kelp Recovery and Research Program](#); [2024 Accelerating Kelp Research and Restoration Program](#)), improving understanding of kelp loss and persistence, and testing the efficacy of potential kelp restoration approaches. Yet, knowledge gaps remain around the impacts that commercial and recreational kelp harvest may have on the recovery and resilience of giant and bull kelp and the communities they support, as well as the role that genetics may play in promoting kelp resilience under changing ocean conditions.

To address these needs, the recommended projects will provide the first assessment of the impacts of commercial and recreational harvest on giant and bull kelp using cutting edge tools, and will create a novel database of genetic diversity for giant and bull kelp to inform future restoration success.

### **Project Summaries:**

To inform adaptive management and future restoration of kelp in California, OPC staff recommend funding the following two projects that fill immediate information needs by developing the first assessment of the impacts of commercial and recreational harvest on giant and bull kelp, and creating a novel database of genetic diversity for giant and bull kelp to assess the role genetics may play in future restoration success and resilience to climate change.

#### **7a. Commercial and recreational harvest impact on giant and bull kelp in California**

The most accurate assessment of kelp canopy area utilizes remote sensing and satellite-derived datasets spanning the last 40 years for giant and bull kelp surface canopies. Researchers affiliated with the Woods Hole Oceanographic Institute and the [Santa Barbara Channel Long Term Ecological Research](#) program have developed novel tools to assess the extent of giant and bull kelp surface-canopy. Visualized on the open-source platform [Kelpwatch.org](#), satellite imagery is used to understand the status and trends of canopy-forming kelps in California. However, there is no current methodology that can quantify the impact that commercial and recreational canopy harvest may have on the future recovery and resilience of kelp forests in California. Routine estimation of kelp canopy biomass is more challenging than solely estimating surface canopy, because biomass includes submerged kelp blades, fronds, and stipes that are not readily detectable by satellite observations. Uncertainties related to linking surface canopy to biomass include differences in water depth (which result in differences in plant lengths), tide (which alter

---

the visibility of kelp at the ocean surface), and differences in forest density. Further, giant kelp biomass is extensive throughout the water column and on the surface. Conversely, bull kelp biomass is concentrated at the surface only. These structural differences make it even more difficult to link surface canopy biomass to a whole individual kelp's biomass. However, recent technological advances support improved capabilities to accurately monitor and assess canopy biomass.

The project will consist of four complementary tasks to determine the impact that commercial and recreational kelp canopy harvest will have on the resilience of kelp forests in the future:

- Using remote sensing data, develop a mathematical model for the relationship between bull kelp canopy biomass and below water biomass (this relationship already exists for giant kelp).
- Assess seasonal changes in bull and giant kelp canopy abundance.
- Assess impacts of harvest on bull and giant kelp using analytical models to quantify the affects that canopy removal has on kelp canopy abundance and resilience.
- Forecast giant and bull kelp harvest potential.

Results from this project will provide a quantifiable assessment of the impacts that harvest may have on the resilience and recovery of kelp canopies across the state of California, which is pivotal for identifying appropriate management measures for harvest allowance as part of the KRMP.

### **7b. Strategic mapping of giant and bull kelp genomic diversity in California**

Restoration of kelp forest ecosystems in California relies on a robust understanding of the ecological interaction between kelp forest organisms, ocean conditions, and their impacts on biology. Contemporary kelp restoration techniques focus on grazer suppression and kelp enhancement. Kelp enhancement utilizes outplanting lab-grown kelps, or releasing captive-bred kelp spores into the environment. However, breeding kelps in captivity for eventual release does not take into consideration the potential for these kelps to inbreed, which could result in a loss of genetic diversity in out-planted kelps or spores. This reduction in genetic diversity may hinder the ability of restored kelp forests to survive under changing ocean conditions.

Researchers from the University of California, Santa Cruz will create a novel geospatial database and associated GIS map that will incorporate previously completed projects to identify patches of resilient giant and bull kelp populations and their associated genetic diversity. Further, the team of researchers will sample genetic tissue from giant and bull kelps from priority locations across the state identified by OPC and CDFW staff to fill gaps identified in the geospatial database and associated GIS map and to identify associations between genetics and climate and environmental tolerance. Results from this project will inform future kelp restoration projects by providing a comprehensive understanding of the role that genetics play in conferring climate resilience in

giant and bull kelp and ensuring that restoration efforts are durable and resilient to future ocean conditions.

### **Equity and Environmental Justice Benefits:**

Undisturbed kelp forests are some of the most biodiverse ecosystems on the planet and are home to many important and iconic species. California Native American tribes have relied on kelp forests since time immemorial, harvesting culturally relevant species including giant and bull kelp. California's kelp forests are critical to supporting both subsistence and recreational harvest of economically important species. Kelp forests additionally bolster coastal economies through tourism and recreation. Adaptive management, including harvest frameworks, are essential to ensuring the resilience and persistence of California's iconic kelp forests, and associated economic, cultural, and health benefits for coastal communities. Future kelp restoration projects must be informed by the best available science to ensure their success for future generations to come.

### **About the Grantees:**

#### **7a. Commercial and recreational harvest impact on giant and bull kelp in California**

Woods Hole Oceanographic Institution is world-renowned research campus affiliated with the highly esteemed Massachusetts Institute of Technology which supports cutting-edge marine science. The principal investigator (PI) at Woods Hole Oceanographic Institute is a world leader in the development of novel tools that utilize satellite imagery for the assessment of kelp canopy extent and persistence. The PI has published over a dozen peer-reviewed manuscripts on the use and application of satellite imagery for kelp canopy quantification and is one of the lead PIs for the [Santa Barbara Coastal Long Term Ecological Research](#) network, which hosts the satellite imagery that will be utilized to assess the impacts of commercial and recreational harvest on giant and bull kelp. The PI has a proven track record of supporting state agencies' research efforts and has contributed to many relevant projects.

#### **7b. Strategic mapping of giant and bull kelp genomic diversity in California**

The University of California Santa Cruz supports leading-edge marine science and has been deeply involved in research projects that support science needs for the state of California. The two principal investigators (PIs) at the University of California Santa Cruz have extensive experience with analyzing and modeling genetics in the context of conservation and restoration planning, and have extensive familiarity with geospatial databases, data streams, and relevant ecological knowledge. Further, the PIs have a proven track record of supporting state agencies' research efforts and has contributed to relevant projects.

**Project Timeline:**

To support the development of the KRMP Harvest Framework, the harvest impact assessment project (7a) will commence in January 2025 and end in March 2027. The kelp genetic mapping project (7b) will begin in early 2025 and complete in late 2027.

**Project Financing:**

Staff recommends that the Ocean Protection Council (OPC) authorize encumbrance of up to \$775,000 to support adaptative management and resilience of kelp forests in California.

|  |                  |
|--|------------------|
| <b>Ocean Protection Council</b>  | <b>\$775,000</b> |
| 7a. Assessment of biomass, production, and harvest impact for canopy-forming kelps in California | \$250,000        |
| 7b. Strategic mapping of giant and bull kelp genomic diversity in California                     | \$525,000        |
| <b>TOTAL</b>   | <b>\$775,000</b> |

The anticipated source of funds will be the Budget Act of 2024, Greenhouse Gas Reduction Fund appropriation to OPC (Fiscal Year 2024/2025), which authorizes the distribution of funds for discretionary projects that advance ocean protection and resilience. The proposed disbursement and anticipated projects support the purpose of this appropriation to inform and advance the restoration and resilience of marine wildlife and ocean and coastal ecosystems, specifically the restoration and resilience of kelp ecosystems in California.

**Consistency with the California Ocean Protection Act:**

The proposed project is consistent with the Ocean Protection Act, Division 26.5 of the Public Resources Code, because it is consistent with trust-fund allowable projects, defined in Public Resources Code Section 35650(b)(2) as projects which:

- Eliminate or reduce threats to coastal and ocean ecosystems, habitats, and species.
- Improve the management of fisheries and/or foster sustainable fisheries.

- Allow for increased public access to, and enjoyment of, ocean and coastal resources, consistent with sustainable, long-term protection and conservation of those resources.
- Improve management, conservation, and protection of coastal waters and ocean ecosystems.
- Provide monitoring and scientific data to improve state efforts to protect and conserve ocean resources.
- Protect, conserve, and restore coastal waters and ocean ecosystems.
- Provide funding for adaptive management, planning coordination, monitoring, research, and other necessary activities to minimize the adverse impacts of climate change on California's ocean ecosystem.

### **Compliance with the California Environmental Quality Act (CEQA):**

The proposed project is not a 'legal project' that triggers the California Environmental Quality Act (CEQA) pursuant to Public Resources Code section 21068 and Title 14 of the California Code of Regulations section 15378. If the project were determined to be a 'legal project' under CEQA, it is categorically exempt from review under the California Environmental Quality Act ("CEQA") pursuant to 14 Cal. Code of Regulations Section 15306 because the project involves only data collection, research and resource evaluation activities that will not result in a serious or major disturbance to an environmental resource.