

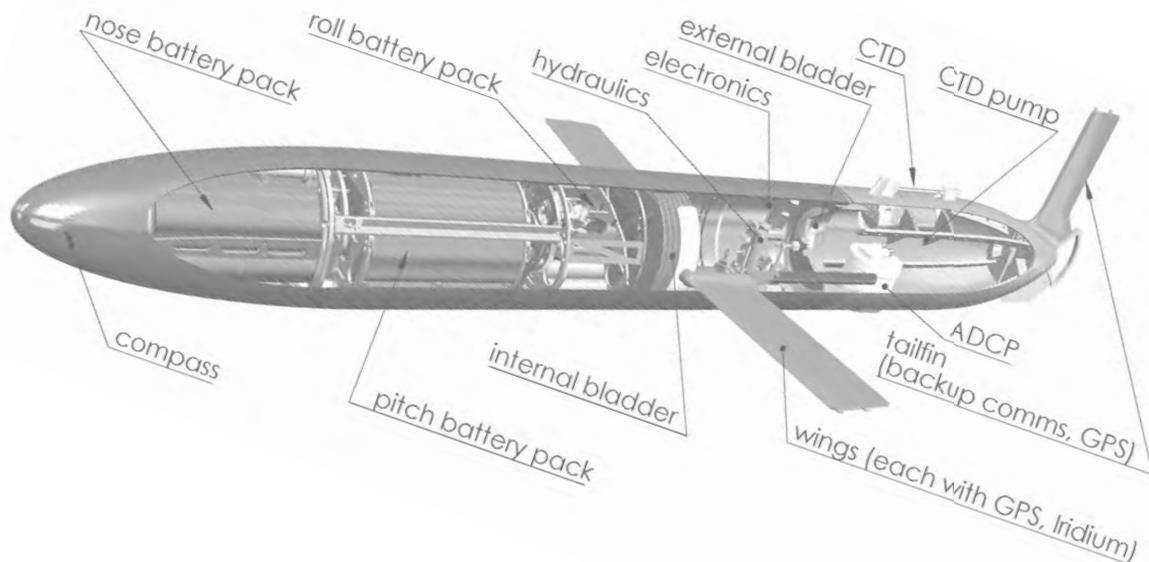
# CATALYZING OCEAN OBSERVING IN CENTRAL & NORTHERN CALIFORNIA

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CeNCOOS Strategic &  
Implementation Plan (2026–2030)

## About the Strategic Plan

The Central and Northern California Ocean Observing System (CeNCOOS) Strategic and Implementation Plan (2026–2030) represents our renewed dedication to maintaining and enhancing critical ocean observations that directly support ocean and weather forecasting accuracy, human safety, maritime security, ecosystem services, and economic prosperity. This plan reaffirms our commitment to the fundamental monitoring infrastructure and information products that communities, industries, and government agencies depend on daily for life-saving information and economic decision-making. This plan prioritizes the sustained collection of ocean data that has proven indispensable for protecting lives and livelihoods.





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## Executive Summary

### Vision

*Prosperity and safety catalyzed by ocean observations, data, and information.*

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### Mission

*Deliver high-quality ocean and coastal data and information for improved decision-making.*

## Guiding Principles

- Produce integrated, high-quality ocean data to enhance human safety, improve ocean and weather forecasts, sustain ocean habitats and resources, and expand California’s ocean-based economy.
- Support wise management and sustainable use of estuaries, coasts, and ocean resources in Central and Northern California.
- Facilitate collaboration between marine experts and ocean information users to strengthen data collection, decision-making, and conservation of the marine environment, species, and ecosystem services.
- Foster nimble public-private partnerships to efficiently advance stakeholder-driven, science-based, and regionally-focused solutions.
- Maintain our vibrant partnerships with Southern California Coastal Ocean Observing System (SCCOOS) to address California’s statewide needs and priorities, and with the neighboring Northwest Association of Networked Ocean Observing Systems (NANOOS) to address West Coast needs.
- Provide coordinated and transparent data collection and delivery across disciplines, adhering to the principles that make data findable, accessible, interoperable, and reusable (FAIR) with collective benefit, authority to control, responsibility, and ethics (CARE).
- Improve technology readiness, evaluating and adopting promising technologies that improve sustainability and cost-effectiveness of our operations to safeguard lives and livelihoods.

## Core Capabilities

- **Observations:** Utilizing high-frequency radars, shore stations and moorings, autonomous vehicles, animal tagging and telemetry, ships, imaging, passive acoustic monitoring, and genomics such as environmental DNA to span broad time and space domains.
- **Data integration and discovery:** Delivering data and information, including data from non-CeNCOOS funded sources, to foster access, analysis, and synthesis.
- **Real-time ocean data for accurate forecasts:** Assimilating observations into models for emergency response, dynamic management, ecosystem analysis, and forecasts.
- **Fit-for-purpose data and information products:** Translating observations and other data into useful information to improve decision-making.
- **Scientific, technical, and operational expertise:** Identifying and meeting the regional needs for ocean information, including thorough testing and adoption of promising new technology.



## Rising to Meet the Challenges

Our region's ocean, coasts, and estuaries represent an economic, cultural, and ecosystem services engine. CeNCOOS stands at the intersection of oceanography, economy, and society, collecting and delivering ocean intelligence to document changes and provide information needed to realize economic growth and national security advantages. Our real-time and long-term ocean observations provide the critical data foundation to make informed decisions, optimize operations, and identify new advancement opportunities.

CeNCOOS will accelerate the region's capacity to observe, and be resilient to, changing ocean conditions through five high-level strategies:



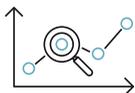
### STRATEGY 1



#### GOVERNANCE

Improve the reach and effectiveness of ocean observing systems through coordination, partnership, engagement, and excellence.

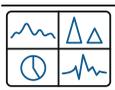
### STRATEGY 2



#### OBSERVATIONS

Collect ocean and coastal observing data to provide vital information for society.

### STRATEGY 3



#### DATA MANAGEMENT & CYBERINFRASTRUCTURE

Provide ready access to information through a public portal and automated data services.

### STRATEGY 4



#### MODELING & ANALYSIS

Deliver ocean models that integrate individual observations and generate information at the scales required for decision-making.

### STRATEGY 5



#### ENGAGEMENT & PRODUCTS

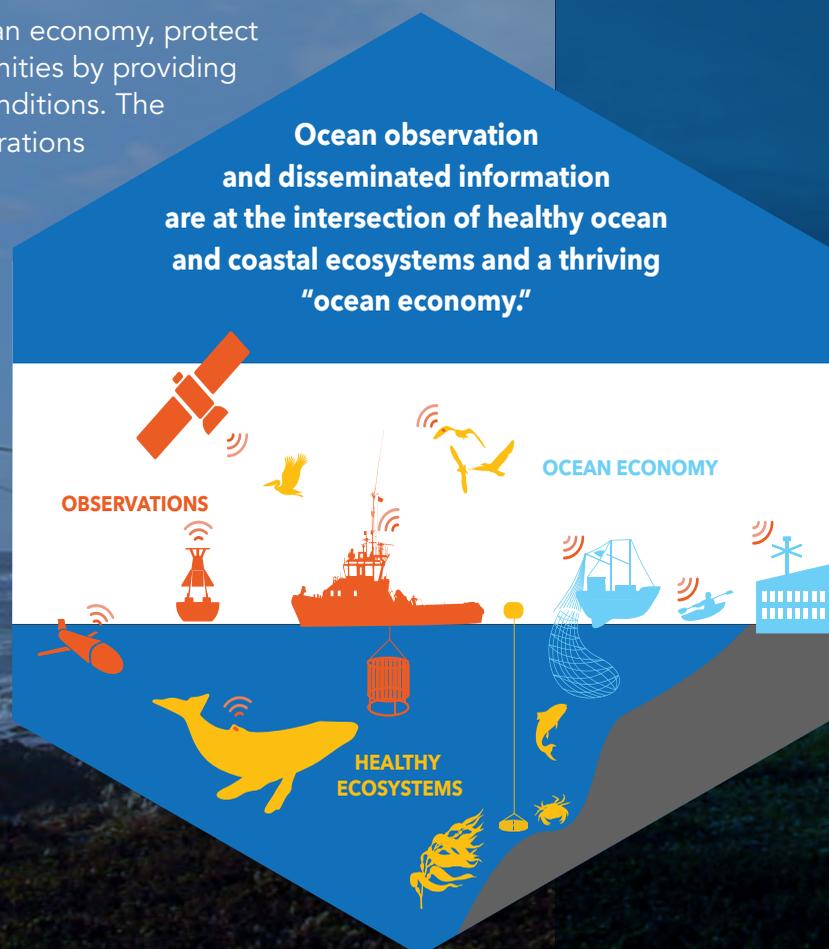
Engage ocean data users to create accessible, integrative, and valuable information products.

## Why Ocean Observing Matters

The productivity and success of Central and Northern California's coastal systems and economies depends on comprehensive ocean observing systems. Ocean and weather forecasts rely on ocean temperature, ocean currents, and condition monitoring to predict devastating atmospheric rivers, coastal storms, and fog events that impact millions of Californians. As our coastal ocean experiences widespread changes—increasing temperatures, changing chemistry, persistent marine heatwaves, and intensifying El Niño events—maintaining these observation systems becomes even more critical.

The economic stakes are substantial. Our ocean observations bring vital insights to the decision-making that drives California's \$51.3 billion maritime economy. This includes commercial shipping that moves \$500 billion in goods annually through our ports, fishing industries that sustain coastal communities, and tourism operations that rely on accurate ocean forecasts. The Port of Oakland is the fifth busiest port in the US and is susceptible to both sea level rise and increased storm intensity—conditions that put highways and rail lines at risk. The state's marine sector has shown strong growth, employing over 511,000 people in 2021 and generating \$51.3 billion in gross domestic product (GDP). Tourism and recreation is the largest of California's six ocean-dependent sectors, accounting for 39% of the ocean economy's GDP (\$17.6 billion), 75 percent of its employment (368,000), and 46 percent of its wages paid (\$8.7 billion).

Ocean observations safeguard the ocean economy, protect human lives, and build resilient communities by providing early warning systems for hazardous conditions. The US Coast Guard search and rescue operations depend on real-time current data and forecasts to locate and save people in distress. Harmful algal bloom (HAB) detection protects public health by alerting communities to contaminated seafood and unsafe swimming conditions. Port operations rely on tide and current data to safely manage cargo movements, while coastal tourism businesses depend on forecasts derived from ocean observations to ensure visitor safety and operational planning.



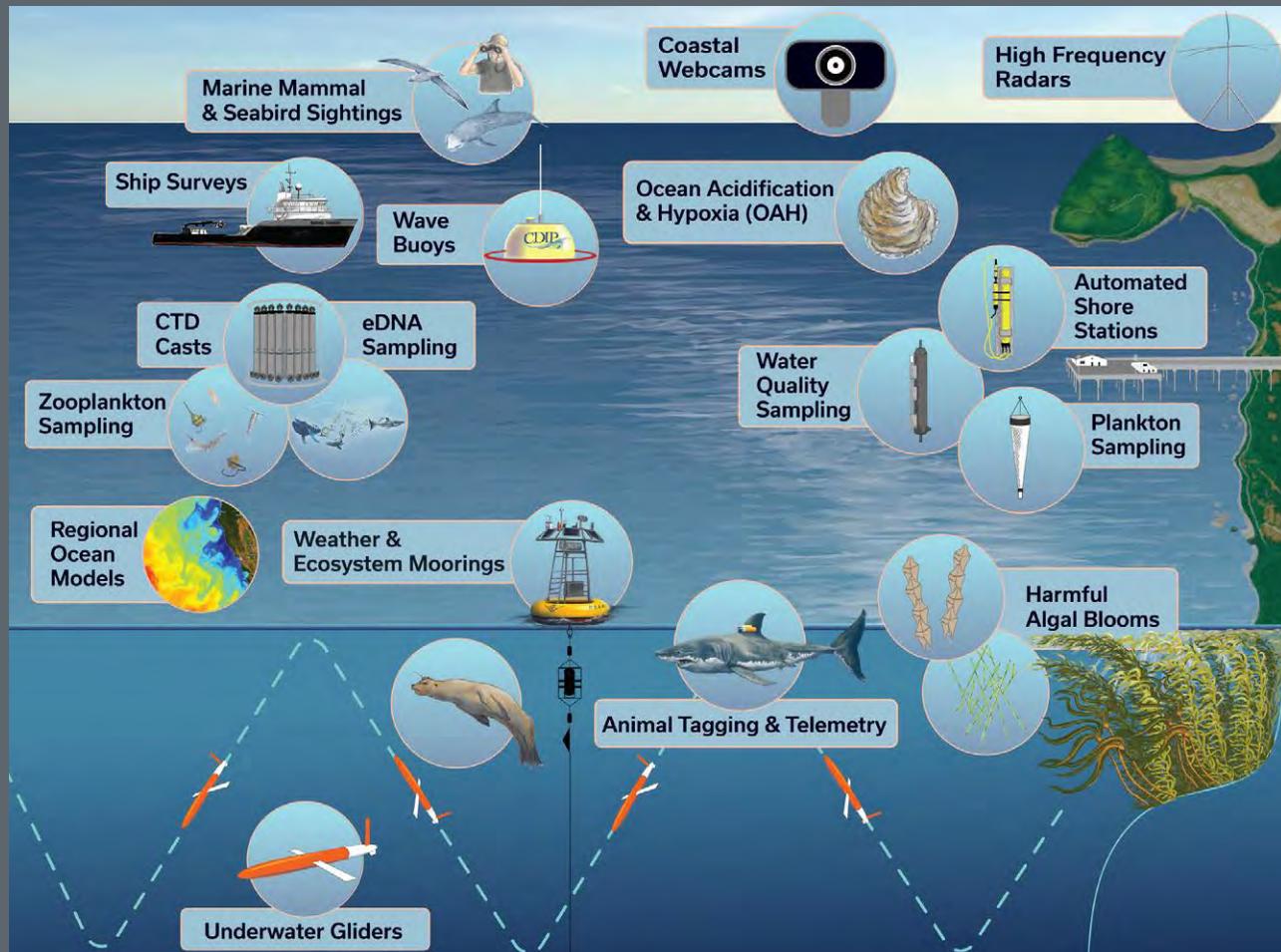
## How We Work

CeNCOOS is a leader in providing ocean observations for accurate weather forecasts, enhanced public safety, economic prosperity, and ecosystem health along the Central and Northern California coast. CeNCOOS drives collaboration, uniting a wide array of investigators, technical experts, students, and institutions in maintaining and advancing these core observational systems. This comprehensive system provides transformative capabilities that simultaneously protect human lives through improved forecast accuracy, enable economic growth through optimized marine operations, and support place-based management for fisheries, marine protected areas (MPA), ocean energy industry lease areas, and other managed spaces.

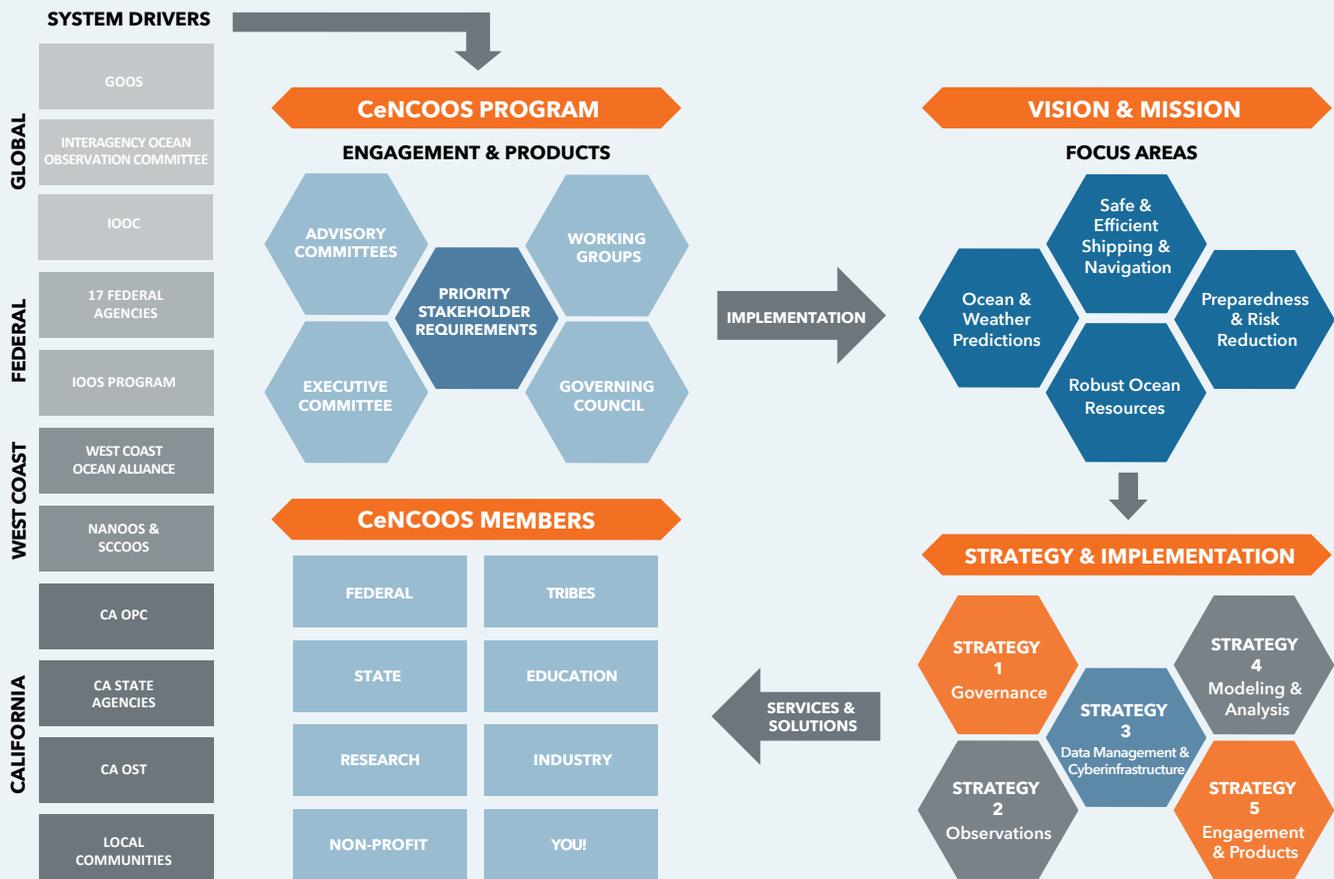
Through integrated public-private partnerships that leverage collaborative relationships with university marine stations, non-profits, private-sector entities, along with federal and state agencies, CeNCOOS maintains a

comprehensive ocean observing network. The system receives annual federal allocations through National Oceanic and Atmospheric Administration's (NOAA) US Integrated Ocean Observing System (IOOS), which are then distributed through subawards to partner institutions that contribute specialized research capabilities, infrastructure, and expertise.

With SCCOOS, CeNCOOS is developing a comprehensive, statewide data catalog, facilitating access to over 2,000 observational and model datasets, serving as the essential information pipeline that connects raw ocean measurements to tangible benefits for coastal communities. Users spanning scientists, resource managers, decision-makers, maritime industries, emergency responders, students, and engaged citizens rely on our core observations daily—a testament to how fundamental ocean data underpins public safety, economic vitality, and environmental stewardship throughout our region.



# CeNCOOS ORGANIZATION



## CeNCOOS Governance

CeNCOOS maintains the continuity of our valued services by assessing emerging priorities, and increasing representation among its partnerships, which serve a core mission to better inform issues facing the region’s many marine users. In order to realize continuous improvement, and effectively serve the broadest community of stakeholders, CeNCOOS remains dedicated to representative engagement to ensure that our systems are serving information needs and access.

A Governing Council provides oversight and serves to help in setting priorities according to principles set out in a Framework for Decision-Making. The Council consists of at least two members from each of the following categories, as well as three at-large seats:

- Academic and/or research organization
- Industry or for-profit corporation
- Federal government
- State government
- Local, regional, or tribal government or agency
- Nonprofit organizations
- Community representatives (1–3)

CeNCOOS also maintains advisory committees, task teams, and working groups aligned with the major areas of emphasis established by regional stakeholders and/or the national IOOS program. These areas of emphasis can include observations, modeling, data management and communications, products, and education and outreach.

## Harnessing Ocean Partnerships

Partnerships power CeNCOOS. From observations to end-user application, CeNCOOS relies on its many contributors to meet demands for information and to empower decision-makers with the best available information as they address regional challenges. We work closely with state, regional, national, tribal, and international groups to identify, develop, and deliver data and information products useful for improving ocean stewardship—including research, analysis, and education to strengthen and support all levels of ocean policy formation. We are committed to reliable provision of sustained observations that enable tracking of marine systems and how they change over time and space, while simultaneously leveraging partnerships and resources to respond nimbly and effectively to emerging challenges and opportunities.

Our shared investment in ocean observation infrastructure creates a powerful information ecosystem where data flows seamlessly between sensors and decision-makers across California's ocean-based economy—transforming raw measurements into life-saving alerts, cost-saving route adjustments, and competitive advantages for our maritime partners.



## CeNCOOS and IOOS

Now entering its third decade of operation, CeNCOOS was established in 2004 following earlier regional efforts that laid the groundwork for coordinated coastal observation. The Center for Integrated Marine Technologies (CIMT), which focused on the Monterey Bay region, preceded CeNCOOS and included the establishment of the M0 mooring built by Monterey Bay Aquarium Research Institute (MBARI) along with the “Wind to Whales” program. At the same time, the vision of building a broader US coastal observing system emerged.

With subsequent investments, including the Coastal Observation Technology System (COTS) in CIMT at the University of California, Santa Cruz, and the Center for Integrative Coastal Observation, Research and Education (CICORE), CeNCOOS was born. With its first coordinator in 2004, its establishment included several demonstrations by regional coastal ocean observing systems to coordinate and improve knowledge, expertise, and efforts, establishing a Central and Northern California regional component of IOOS. Today, CeNCOOS has more than 60 member organizations including many state and federal agencies throughout central and northern California. Defined approximately as the region extending from Point Conception north to the California-Oregon border, CeNCOOS spans some of the nation’s most pristine, productive, and treasured coastlines.

Date	Event
1916–1925	Shore station programs established (Scripps Pier, Pacific Grove, and Farallon Islands)
1949	California Cooperative Fisheries Investigations (CalCOFI) established
1950s–1970s	Bodega Head, Trinidad Bay, and Granite Canyon initiated
1988	Mooring 1 (M1) deployed in Monterey Bay
1997–2002	Pre-CeNCOOS observing coordination entities (e.g., Wind-to-Whales, CIMT, Innovative Coastal-Ocean Observing Network (ICON), CICORE, Monterey Bay Crescent Ocean Research Consortium (MBCORC))
1999	First IOOS strategy launched: <i>An Integrated Ocean Observing System: A Strategy for Implementing the First Steps of a U.S. Plan</i>
2001–2003	Coastal timeseries established at the marine stations of the University of California (UC) and California State University’s Council on Ocean Affairs, Science & Technology (COAST) (UC San Diego, UC Irvine, UC Los Angeles, UC Santa Barbara, UC Santa Cruz, UC Berkely, UC Davis, Moss Landing Marine Labs, San Francisco State University, et al.)
2004	Statewide High Frequency Radar network expands by 40+ stations under Coastal Ocean Currents Monitoring Program (COCMP)
2004	CeNCOOS & SCCOOS are established
2004	Applied California Current Ecosystem Studies (ACCESS) Program established
2006	Trinidad Head Line surveys established
2007	CeNCOOS Glider program initiated
2008	Harmful Algal Bloom Monitoring and Alert Program (HABMAP) initiated
2009	Integrated Coastal and Ocean Observation System Act of 2009 (ICOOA Act) codifies operational practices for IOOS
2013	NANOOS, the Alaska Ocean Observing System (AOOS), CeNCOOS, and SCCOOS established ocean acidification (OA) monitoring at shellfish farms
2019	First CeNCOOS Strategic Plan
2019	CA Marine Protected Area (MPA) Dashboard & CA Imaging Flowcytobot Network initiated
2020–2025	Second CeNCOOS Strategic Plan released
2021	Statewide “California Ocean Observing Systems Data Portal” launched
2024	Joint SCCOOS-CENCOOS-CalCOFI meeting
2022–2029	Infrastructure and Coastal Resilience investment delivery
2025	HAB Data Assembly Center (DAC) & CA Ocean Acidification and Hypoxia Portal launched

## CeNCOOS and IOOS (continued)



CeNCOOS is part of the national IOOS, housed within the NOAA National Ocean Service (NOS). IOOS comprises 11 Regional Associations, of which CeNCOOS is one. IOOS represents coastal ocean observing interests for 17 federal agencies. The IOOS Association is a nonprofit organization that helps guide and advance IOOS strategies with the 11 regional associations, the IOOS Program Office.

While CeNCOOS is independent from government, it is closely aligned with federal priorities to provide public access to observations, integrate data from federal and non-federal sources, and develop new decision-support tools for federal, tribal, state, local, and private sector decision-makers. A key facet of the framework's success is the ability for regions to tailor their activities to regional needs while also connecting to a larger, interoperable system.

### Certified Regional Coastal Ocean Observing System

CeNCOOS is a NOAA Regional Coastal Ocean Observing System (RCOOS) and is recognized as meeting federal standards for data gathering and management. Accordingly, data from CeNCOOS's many individual providers are thereby contributed in a standardized way to a greater catalog, with certain liability protections. The function of an RCOOS in integrating information is essential. It allows for transparency and trust in exchanging critical information for data management, information dissemination, and decision-making needs, thus enabling CeNCOOS to use the power of big data to solve challenges.



## Drivers of the Observing System

The interconnected nature of the ocean demands a global-to-regional approach. The Global Ocean Observing System (GOOS), for which IOOS is a Regional Alliance, plays the essential role of coordinating distributed observing systems to deliver data to users with informational needs spanning understanding climate variation, maintaining operational services, and safeguarding ocean health, with an increasing focus on coastal areas and regional seas. GOOS expert panels for physics, biogeochemistry, and biology and ecosystems recommend Essential Ocean Variables to be measured by all observing systems. GOOS synthesizes observations across requirements and continues to provide guidance on observing-system design to the global observing communities. GOOS strategic priorities include:

- Engagement and partnership from observations to end users
- Innovation, capacity-building, and good governance
- Integrated, fit-for-purpose observing system

## Federal and National Drivers

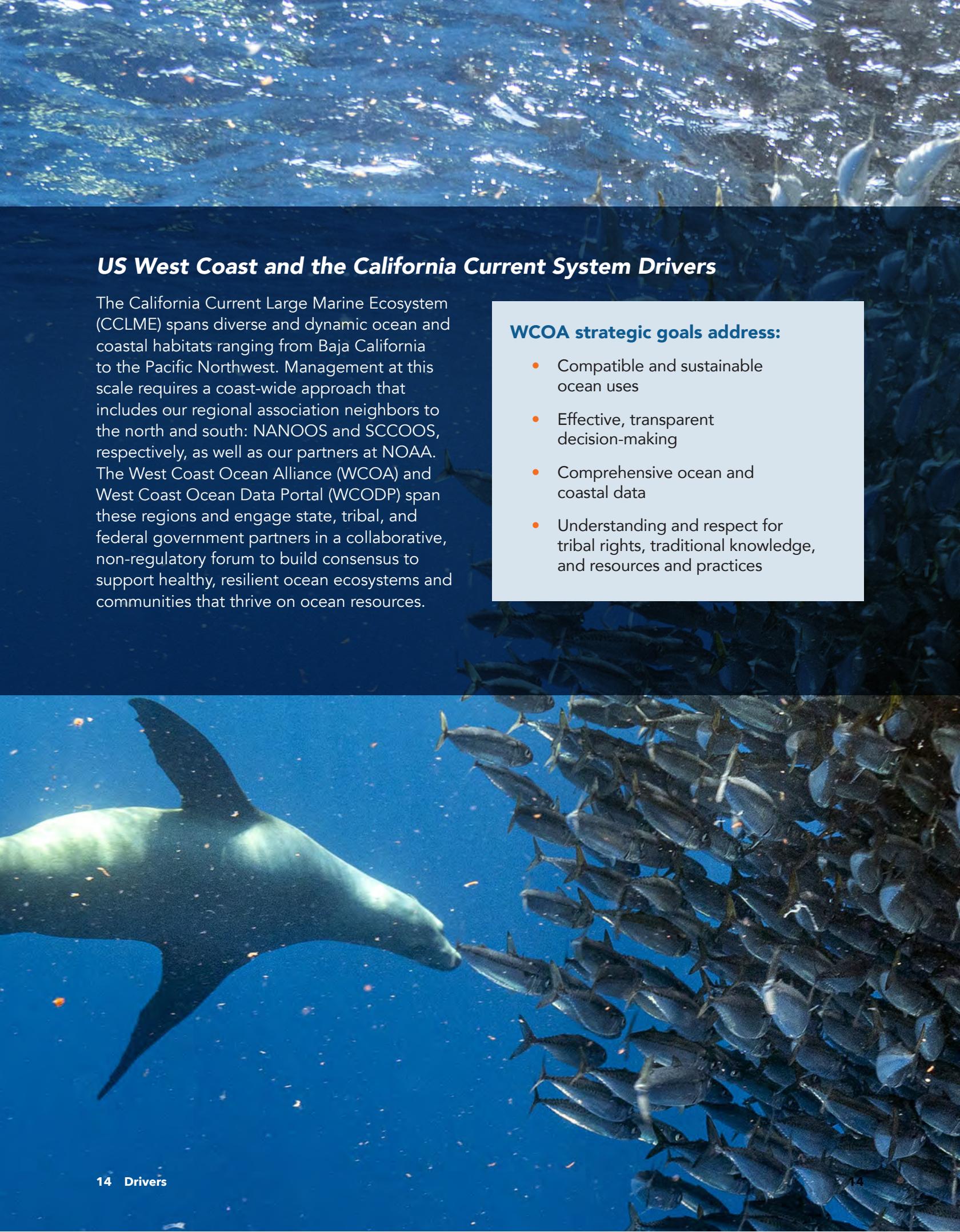
Through several major acts, the US Federal Government is committed to strengthening maritime security, revitalizing maritime commerce, and investing in resilient ocean infrastructure. By strengthening domestic fisheries, expanding aquaculture, and investing in sustainable resource management, US fisheries and aquaculture continue to contribute more than \$200 billion annually to the economy and support over 17 million jobs.

IOOS is America's vital ocean intelligence network, leveraging innovation and advancing cost-effective technologies, including artificial intelligence, to efficiently analyze and deliver information to understand and manage the ocean for sustainability and informed decision-making. By supporting safe navigation and reducing port delays, IOOS helps protect over \$1.5 trillion in annual maritime trade and 2.4 million jobs, fueling America's economic growth and global competitiveness. In addition, IOOS' delivery of real-time ocean data helps commercial and recreational fishers make informed decisions.

### IOOS goals include the following:

- Sustain long-term, high-quality observations
- Deliver standardized, reliable, and accessible data
- Support model predictions to address user requirements
- Provide integrated, user-driven products and tools
- Increase effectiveness via partnerships, stakeholder engagement, and investment in Enterprise Excellence



An underwater photograph showing a large school of fish, likely salmon, swimming in clear blue water. A shark is visible on the left side of the frame, swimming towards the school of fish. The water is bright blue, and there are some small orange particles floating around.

## US West Coast and the California Current System Drivers

The California Current Large Marine Ecosystem (CCLME) spans diverse and dynamic ocean and coastal habitats ranging from Baja California to the Pacific Northwest. Management at this scale requires a coast-wide approach that includes our regional association neighbors to the north and south: NANOOS and SCCOOS, respectively, as well as our partners at NOAA. The West Coast Ocean Alliance (WCOA) and West Coast Ocean Data Portal (WCOOP) span these regions and engage state, tribal, and federal government partners in a collaborative, non-regulatory forum to build consensus to support healthy, resilient ocean ecosystems and communities that thrive on ocean resources.

### WCOA strategic goals address:

- Compatible and sustainable ocean uses
- Effective, transparent decision-making
- Comprehensive ocean and coastal data
- Understanding and respect for tribal rights, traditional knowledge, and resources and practices

## State of California Drivers

Created by the California Ocean Protection Act in 2004, the Ocean Protection Council (OPC) helps protect, conserve, and maintain healthy coastal and ocean ecosystems and the economies they support for current and future generations. OPC aims to advance science-based decision making and leads coordinated policy efforts to safeguard marine life, habitats, and livelihoods. As a cabinet-level state policy body nested within the California Natural Resources Agency, OPC works across many state agencies and serves as the leader on coastal and ocean policy in California.

### OPC strategic goals include (see 2026–2030 Strategic Plan — California Ocean Protection Council):

- Build resilience to climate change
- Maximize community benefits and stewardship
- Safeguard coastal and marine biodiversity
- Enable a sustainable blue economy that protects oceans

California Ocean Science Trust (OST) strengthens the bridge between scientific research and sound ocean management. Created by state legislation, OST supports and brings world-class science and innovation together with state and federal policymakers to accelerate progress toward a healthy and resilient coast and ocean. OST delivers on their mission by drawing resources to solutions-oriented multidisciplinary science, supporting graduate education at the science-policy nexus, and delivering science advice to state policymakers.

## Tribal Government Drivers

The California Native American tribes along the central and northern California coast are stewards of their coastal and marine environments, as they have been since time immemorial. As tribes are active stewards and have deep knowledge of marine and coastal environments, they can provide firsthand accounts of changing local conditions. Further, tribes are sovereign nations, whose ancestral, cultural, and spiritual connections to natural resources are reflected in their inherent governance systems and establish the foundation for their commitments to sustainability. Partnerships among resource managers and California Native American tribes help increase regional capacity to address shared concerns and responsibilities for the ocean.



## Focus Areas

### ***Focusing Capabilities to Address Regional Priorities***

High-priority information needs of the region are established by regional stakeholders and collaboratively addressed by key global, national, regional, and state organizations. CeNCOOS addresses these needs through the advancement of four Focus Areas:

1

#### **Ocean & Weather Predictions**

Weather forecasts depend on ocean observations for critical data—including real-time observations—necessary to understand and predict the complex interactions between the ocean and atmosphere. The ocean both stores and releases heat in ways that drive weather every day, with modes that can influence conditions over weeks, months, and years. Waves transfer energy between the atmosphere and ocean, and can drive coastal inundation and flooding.

Our ocean observations capture these dynamics through several tools: a network of high-frequency radars (HFRs) detect surface currents; buoys measure ocean weather conditions and waves; and robotic gliders measure conditions from the depths of the ocean and provide real-time observations of local conditions and alongshore patterns/trends. For example, tracking ocean conditions across these tools helps meteorologists predict the occurrence of atmospheric rivers and or drought conditions across the western US.

Without ocean data provided by CeNCOOS and other regional ocean observing systems, longer-term forecasts would be less reliable beyond a few days, as atmospheric models alone cannot account for the ocean's enormous influence on weather systems.

#### **Key successes:**

- The National Weather Service automatically ingests CeNCOOS data to improve its weather forecasts, including for extreme events such as atmospheric rivers and drought.
- CeNCOOS and SCCOOS are building a statewide Total Water Level (TWL) flood forecast system to improve flood preparedness, and the forecasts are available online for homeowners, coastal businesses, lifeguards, and recreational users.
- CeNCOOS generates real-time data from numerous ocean temperature sensors to forecast and track heatwaves and assess other unusual conditions as they occur.
- CeNCOOS data is assimilated into the West Coast Ocean Forecast System (WCOFS), supporting a forecast on ocean temperature, informing decision-makers of potential marine heatwave conditions.

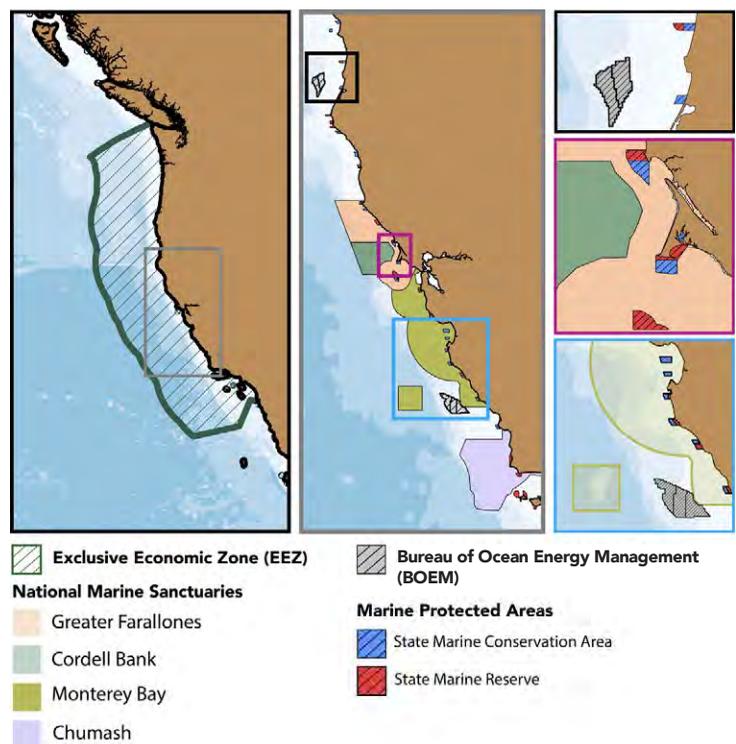


## 2 Safe and Efficient Shipping & Navigation

CeNCOOS observations provide crucial data that support safe and efficient shipping and navigation in several key ways. Real-time reporting and forecasting of winds, waves, and surface currents help captains avoid or prepare for dangerous conditions. We contribute to a network of vessel automatic identification system (AIS) observations that support marine domain awareness and assist Vessel Traffic Services. Municipalities and ports are increasingly impacted by wind, waves, and water level, and monitoring helps measure impact and forecast risk. Our network of HFR systems along the coast provides near real-time surface current mapping that can estimate the trajectories of ocean waters, and inform search and rescue operations for the US Coast Guard.

### Key successes:

- CeNCOOS HFR sensors provide detailed information on surface currents that are used in search and rescue operations by the US Coast Guard.
- CeNCOOS contributes to the production and delivery of AIS ship route/location data to improve port security and better track traffic along the California coast.
- WCOFS provides information on current and future conditions to help maritime operators navigate safely and efficiently.



CeNCOOS partners with managers and researchers from National Marine Sanctuaries, BOEM, and California MPAs to produce curated information products to support such place-based management needs.



### 3

## Preparedness & Risk Reduction

Easy and timely access to reliable information helps mitigate risks and enables quick responses to environmental threats, such as contaminant spills, coastal flooding, and harmful algal blooms. CeNCOOS supports this by providing federal, state, and municipal users with state-of-the-art data, tools, and training. This observational data feeds into trajectory prediction models that incorporate ocean current data, wind patterns, and other characteristics to calculate the most probable trajectories of potential spills and other predictive capabilities. New observations of wind, waves, and water are informing coastal flood risk reduction. CeNCOOS contributes to a new National Harmful Algal Blooms Observation Network (NHABON), including the operation of automated underwater microscopes that can detect toxin-producing species in real time.

### Key successes:

- CeNCOOS, together with SCCOOS, operates a network of Imaging FlowCytobots (IFCBs) underwater microscopes to identify and quantify harmful phytoplankton using artificial intelligence. We provide near real-time information on the presence and abundance of HABs to experts and managers.
- SCCOOS and CeNCOOS synthesize model output, near real-time observations, and public health alerts to provide a regular California HAB Bulletin, an assessment and outlook of recent toxic algal blooms.

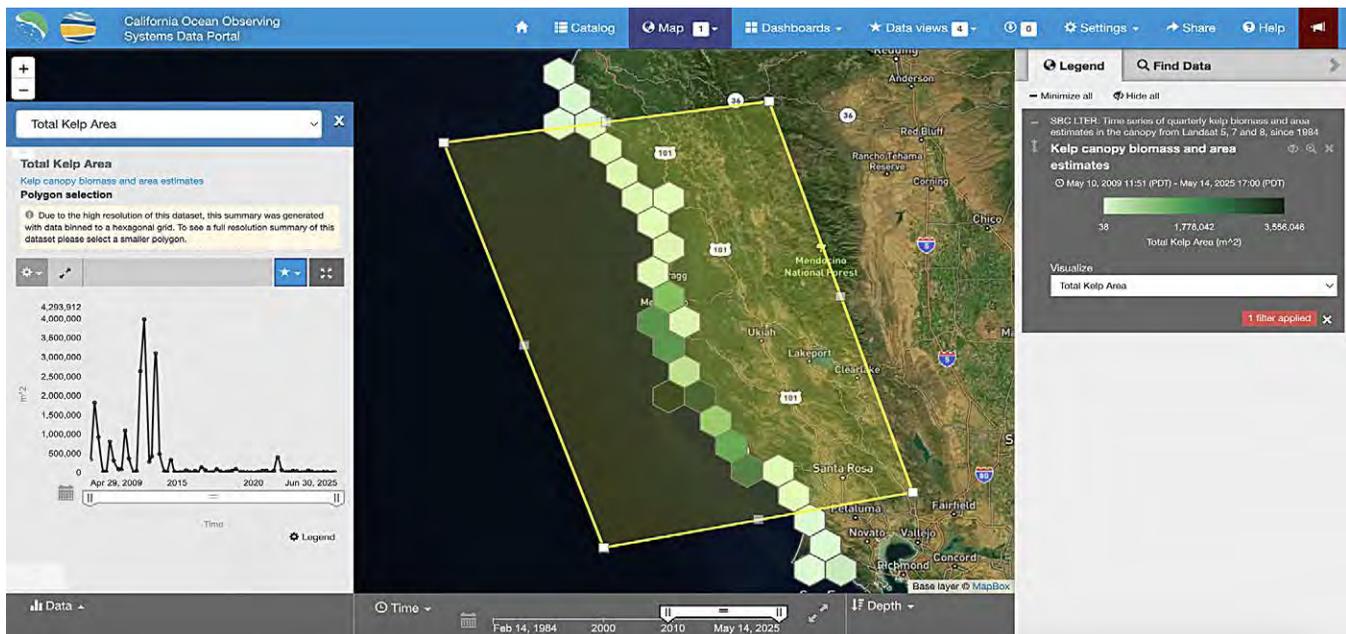
## 4

## Robust Ocean Resources

The prosperity and well-being of coastal communities depend on healthy ecosystems and living resources. Due to ongoing pressures in coastal California, the need for well managed resources is more important now than ever. CeNCOOS supports this need by making information from a number of sources accessible to state and federal resource managers who require harmonized and relevant information to facilitate adaptive management and condition tracking, e.g. the California Department of Fish and Wildlife (CDFW). Ships provide integrated snapshots of ocean ecosystems to inform fisheries management, while innovative, autonomous platforms provide efficient tools to understand complex ecosystems. This work is achieved in part by integrating data from many sources and systems across physics, biogeochemistry, biology, and ecology. Information is then processed for delivery to specific end-user needs, such as informing state assessment and management of the MPA network, fisheries stocks, aquaculture practices, and protected species.

## Key successes:

- CeNCOOS long-term monitoring data enable resource managers from California state entities to understand the factors and stressors affecting marine ecosystems and organisms, such as kelp forests and abalone.
- CeNCOOS works with managers at every level of government to ensure the highest-quality data and information is included in fisheries and ecosystem assessments.
- CeNCOOS operates real-time observing systems to support aquaculture operations across the state, providing ocean weather information for day-to-day decision making such as operations timing around optimal environmental conditions and seawater intake treatments.
- Oyster Dashboards provide a user-friendly web interface for shellfish growers to access information on local water quality conditions.
- CeNCOOS contributes to the generation of estimates of ocean conditions such as ocean heat, upwelling, and seasonality, including indicators for managed spaces.



The CalOOS Data Portal displaying total kelp area in Sonoma and Mendocino counties (Northern California) April 2009 through June 2025 from the Santa Barbara Coastal Long Term Ecological Research (SBC LTER) Project. This dataset is a collaborative project with UC Santa Barbara, UCLA, and Woods Hole Oceanographic Institution.

# Strategies

## CeNCOOS Strategic Priorities 2026–2030

Our efforts are guided by five strategies that leverage cutting-edge solutions, including artificial intelligence, to address critical needs for real-time ocean information services. We work with partners to increase efficiency and reduce costs in translating observations to actionable information, while achieving the highest standards of operational oceanography through innovative solutions.



### **STRATEGY 1: Improve the reach and effectiveness of ocean observing systems through coordination, partnership, engagement, and excellence.**

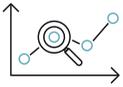
Our Program Office consists of a small, expert team including the CeNCOOS Director, Deputy Director, Technical Manager, Data and Information Manager, Place-Based Management Data Specialist, and Engagement Specialist. Program oversight and risks are managed through consultation and prioritization with our Governing Council. To improve the reach and effectiveness of CeNCOOS, the Program Office will implement this strategy built on the foundations of coordination, partnership, engagement, and excellence. Engagement will be achieved through user-centered design processes, sector-specific data tools, and regular needs assessments that ensure CeNCOOS products directly address stakeholder requirements.

The Program Office exemplifies operational excellence by implementing continuous improvement processes that maintain the highest standards across all activities, such as operational awareness dashboards to identify and resolve data stream issues. These efforts will be amplified through communications that illustrate the value of ocean observations to a wide array of audiences, using compelling success stories and accessible information products. By optimizing resources through collaboration and cost-sharing, the Program Office functions as both the catalyst and backbone for the entire network—maximizing collective impact while ensuring the reliable delivery of critical ocean intelligence that California’s communities and industries depend upon.





- ❑ **Objective 1.1:** Oversee the operation of the observing system through managing system governance, operations, Data Management and Cyberinfrastructure (DMAC), products, and engagement.
  - ✓ *Metric:* Continually track and annually review metrics progress for tracking and performance evaluation documenting achievement over time.
- ❑ **Objective 1.2:** Develop observing system strategies, implementation plans, and pursue opportunities to build out advanced and robust observing systems.
  - ✓ *Metric:* Regional observing strategies, plans, and reports are jointly developed, supported, and addressed by partners.
- ❑ **Objective 1.3:** Coordinate the observing system through continual engagement with national, regional, state, local, tribal, and private sector, including through hosting and attending conferences, community meetings, and workshops.
  - ✓ *Metric:* Host and attend regional and national meetings to communicate our work, solicit feedback on priorities, and strengthen partnerships.
- ❑ **Objective 1.4:** Advance Standards for scientific excellence by leading communities of practice and serving on committees, attending conferences, and engaging senior leadership across ocean science organizations.
  - ✓ *Metric:* Program Office staff serves on committees and maintains leadership positions.
- ❑ **Objective 1.5:** Partner with new observing practitioners to make every stage of the data creation and sharing process more broadly relevant and accessible.
  - ✓ *Metric:* New data sources are prioritized, including water-levels, waves, AIS, sound and imaging data, and made publicly available through a centralized CalOOS Data Portal, as well as via public servers and repositories.
- ❑ **Objective 1.6:** Provide workforce development opportunities by hosting training, fostering data ambassadors, and improving access to educational tools that utilize ocean observing data.
  - ✓ *Metric:* Host and contribute to portal and technical training.
- ❑ **Objective 1.7:** Improve service delivery to ensure NOAA, NOS, and IOOS commitments are fully realized.
  - ✓ *Metric:* Strengthen partnerships with organizations linking our work to key economic sectors and coastal community decision-makers.
- ❑ **Objective 1.8:** Gather, document, and share requirements for information for NOAA and NOS and other entities.
  - ✓ *Metric:* Contribute to metrics gathering efforts and identify opportunities to deliver requirements across NOAA.
- ❑ **Objective 1.9:** Manage fiscal and programmatic administration, including an annual work plan and semi-annual progress reporting, annual program/subsystem review, and implementation of extramural projects that add value to CeNCOOS objectives.
  - ✓ *Metric:* Grant administration milestones are regularly met and reporting conveys our progress.

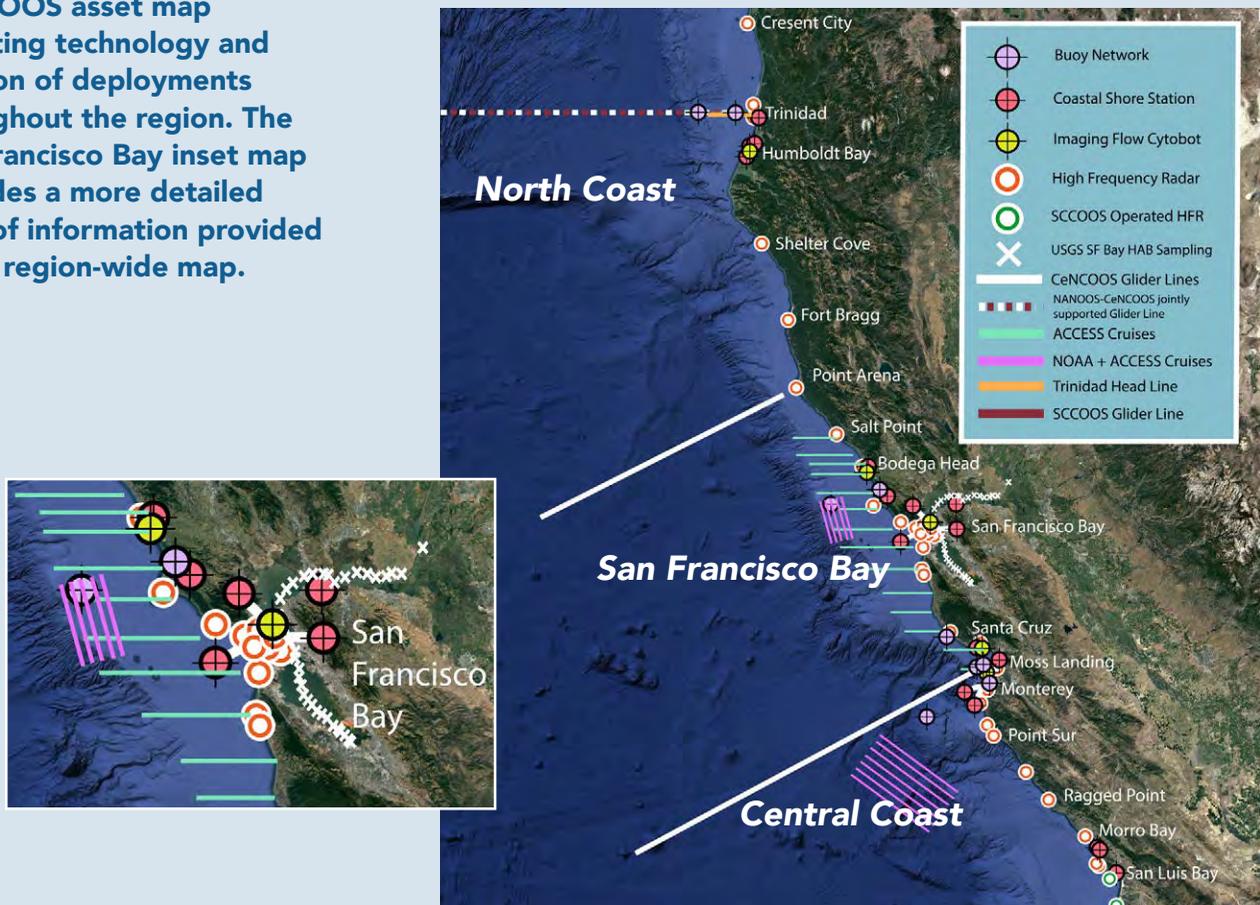


## STRATEGY 2: Collect ocean and coastal observing data to provide vital information for society.

Our observations span the high-tide line to the Exclusive Economic Zone (EEZ) boundary, using an array of sensors and platforms, from estuaries and coasts to the open ocean. We connect users to data via the HFR network; more than two dozen coastal stations and moorings; autonomous vehicles including gliders; animal tagging and telemetry; and many other platforms and sensors. Ship-based efforts such as from the Applied California Current Ecosystem Studies (ACCESS), California Cooperative Fisheries Investigations (CalCOFI), and the Trinidad Head Line (THL) also contribute to the observing data integrated for fisheries and aquaculture. CeNCOOS collects and serves physical, biogeochemical, biological, and ecosystem data and information (IOOS Core Variables; see top of Page 23), and continues to build these capabilities through networks of experts, instruments, and data infrastructure.

Technological advancements are leading California into a new generation of public safety and preparedness. Recent CeNCOOS and IOOS investments are proving critical to the California Harmful Algal Bloom Monitoring and Alert Program (CalHABMAP) and NHABON. The variety of platforms allowing in-situ biogeochemical sensing is rapidly expanding to include gliders and other long-range/long-endurance autonomous vehicles. The Marine Biodiversity Observation Network (MBON) and the Animal Telemetry Network (ATN) are advancing understanding of living resources. This includes eDNA sequencing, imaging, ocean sound monitoring, artificial intelligence and machine learning, cost-effective technology, and data analytics, which hold great promise enhancing delivery of data relevant to safety and commerce. Our investments in water level information, wave buoys, and webcams enhance coastal preparedness and public safety.

**CeNCOOS asset map depicting technology and location of deployments throughout the region. The San Francisco Bay inset map provides a more detailed view of information provided in the region-wide map.**



## PHYSICS

- Bathymetry
- Bottom character
- Currents
- Heat flux
- Ice distribution
- Salinity
- Sea level
- Surface waves
- Stream flow
- Temperature
- Wind speed and direction

## BIOGEOCHEMISTRY

- Acidity
- Colored dissolved organic matter
- Contaminants
- Dissolved nutrients
- Dissolved Oxygen
- Ocean color
- Optical properties
- Pathogens
- Partial pressure of CO<sub>2</sub>
- Total suspended matter

## BIOLOGY AND ECOSYSTEMS

- Biological vital rates
- Coral species and abundance
- Fish species/abundance
- Invertebrate species and abundance
- Marine mammal species/abundance
- Microbial species/abundance/activity
- Nekton diet
- Phytoplankton species/abundance
- Sea birds species/abundance
- Sea turtles species/abundance
- Submerged aquatic vegetation species/abundance
- Sound
- Zooplankton species/abundance

❑ **Objective 2.1:** Sustain measurements of physics, including the surface current mapping network, to support safety and navigation.

✓ *Metric:* Operate 31 HF radar sites in the CeNCOOS region with >90% uptime.

❑ **Objective 2.2:** Maintain a fleet of ocean-going autonomous gliders to provide near real-time observations of subsurface and open-ocean processes and drivers to improve weather and ocean forecasts and prediction.

✓ *Metric:* Continuously occupy three glider transects for over 300 days per year.

❑ **Objective 2.3:** Provide consistent high-quality ocean, coastal, and estuarine observations to understand short-term variation (weather) and long-term changes (climate) to inform water quality and fisheries indicators.

✓ *Metric:* Recapitalize observing systems, including coastal moorings, to ensure system resilience.

❑ **Objective 2.4:** Monitor coastal flooding and inundation using webcams, wave buoys, and water level sensors.

✓ *Metric:* Contribute to a revised statewide coastal flooding and inundation forecast system.

❑ **Objective 2.5:** Support commercial and recreational fishing and aquaculture development to reduce the seafood deficit by delivering real-time data for optimizing operations.

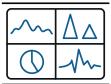
✓ *Metric:* California aquaculture businesses are provided with marine information needed to improve operations.

❑ **Objective 2.6:** Continue to support and expand HAB environmental monitoring through the implementation of HABMAP; this includes the sampling and monitoring of phytoplankton, domoic acid, and adding nutrients, as well as ship-based deployment of underwater microscopes and Solid Phase Adsorption Toxin Tracking (SPATT).

✓ *Metric:* Shellfish closures and marine mammal stranding events are informed by environmental HAB monitoring programs.

❑ **Objective 2.7:** Make network improvements and fill gaps in observations, sensors, samplers, and platforms to better support ocean-based economic sectors and improve ocean intelligence.

✓ *Metric:* Maturing, innovative, and efficient observing approaches are integrated to better support evolving regional, state, and national priorities; these approaches can include AIS and webcams for maritime safety, security, water level, and waves, plus webcams for hazard preparedness and risk reduction.



### **STRATEGY 3: Provide ready access to information through a public portal and automated data services.**

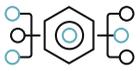
Ocean and coastal data are complex. CeNCOOS is recognized in the ocean observation community as a trusted leader in turning raw data into actionable insights that support decision making. This depends on advancing practices for data quality, interoperability, and discoverability. CeNCOOS follows the FAIR and CARE data principles in handling information, by adopting metadata standards, machine-readable data formats, standard vocabularies (e.g. variable names), and other best practices. These data management practices help ensure that all elements of the regional observing system are findable, accessible, interoperable, and reusable. CARE standards help ensure the collective benefit, authority to control, responsibility, and ethics in data sharing. These complement the FAIR principles, which focus on data management and sharing, such as by recognizing sovereignty and social considerations.

CeNCOOS data are primarily disseminated through the California Ocean Observing Systems Data Portal ([data.caloos.org](http://data.caloos.org)), providing public access to over 1,000 datasets. The unification of SCCOOS and CeNCOOS data into a single portal framework provides unparalleled access to ocean information for California. In addition, the archival of data and metadata is achieved through NOAA's National Centers for Environmental Information (NCEI). Ongoing innovations in CeNCOOS data management systems include streamlined access to observations in the areas of biology and ecosystems data.

- ❑ **Objective 3.1:** Develop and maintain a resilient, scalable, machine-readable Data Management and Cyberinfrastructure (DMAC) backbone to support comprehensive data needs and enhanced system robustness through continuous hardware/software maintenance.
  - ✓ *Metric:* Documented Portal uptime performance exceeding 99%, demonstrated system resilience.
- ❑ **Objective 3.2:** Implement FAIR and CARE DMAC practices including through real-time data processing, delayed mode data processing, archiving, and calibration practices and documentation.
  - ✓ *Metric:* Investigator and partner data streams are integrated into open data servers (e.g. DataONE, OBIS, GBIF).
- ❑ **Objective 3.3:** Improve data quality by following standardization and quality assurance practices, quality control procedures, including from the Quality Assurance/Quality Control (QA/QC) of Real-Time Oceanographic Data (QARTOD) system in the portal.
  - ✓ *Metric:* Any new sensor-based data stream ingested by CeNCOOS has QARTOD applied and additional QARTOD flags are implemented and specialized QC protocol instituted as needed.
- ❑ **Objective 3.4:** Provide adequate storage capacity to ensure the durability and long-term security of CeNCOOS data.
  - ✓ *Metric:* Sufficient storage capacity is provided to accommodate archival and expanding data volumes.
- ❑ **Objective 3.5:** Archive CeNCOOS and partner data at trusted data repositories.
  - ✓ *Metric:* Archival is automated, including for recovered or post-processed data and metadata to trusted repositories, including NCEI.

- ❑ **Objective 3.6:** Streamline access to information on high-priority issues and from additional observing assets through developing and improving standardization and submission pipelines.
  - ✓ *Metric:* Track and document improved data access and download statistics demonstrating more than a doubling of CeNCOOS data uses.
- ❑ **Objective 3.7:** Maintain and enhance the CalOOS Data Portal and related data discovery and visualization to better serve specific decision-making needs in partnership with SCCOOS.
  - ✓ *Metric:* Improvements are scoped annually with delivery tied to training and engagement to improve user capabilities and awareness.
- ❑ **Objective 3.8:** Improve data visualizations to better assess physical, chemical, biological, and ecosystems data from across various spatial and temporal scales into a single resource, the CalOOS Data Portal.
  - ✓ *Metric:* Portal dashboard capabilities, website compatibility, and figure exportability is enhanced.
- ❑ **Objective 3.9:** Engage with data providers and stakeholders to deliver curated information and provide value-added tools to ensure data reaches stakeholders in relevant, useful formats.
  - ✓ *Metric:* Provide portal user training, track and address portal training feedback, and respond to data requests.





## **STRATEGY 4: Deliver ocean models that integrate individual observations and generate information at the scales required for decision-making.**

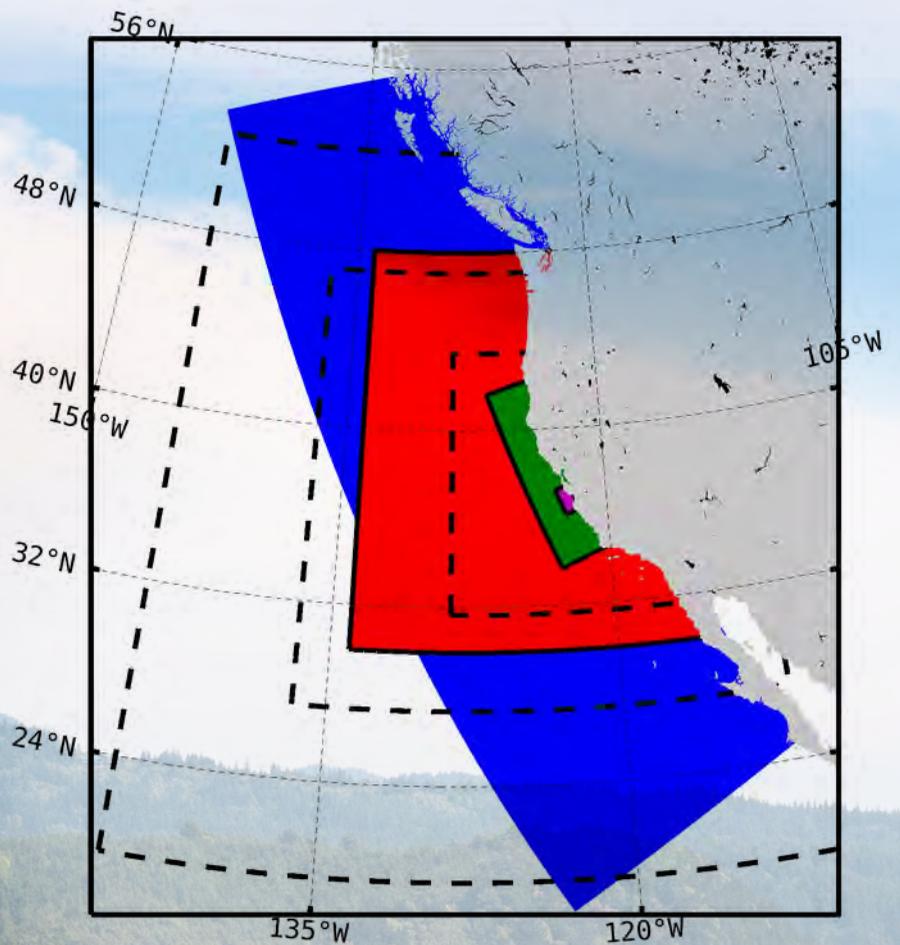
Society requires information that spans a wide range of time and space scales to understand past, present, and possible future conditions. Many stakeholders need forecasts of future ocean and weather conditions to inform decisions today. To meet these evolving needs, CeNCOOS supports physical and ecosystem models that integrate diverse observational data streams to represent changing ocean conditions over large spatial domains. These models serve to improve everyday decision-making, while also supporting observing-system evaluation studies designed to understand the value of existing assets and to prioritize new investment in observational capacity.

CeNCOOS supports modeling efforts to generate stakeholder-relevant products. The underlying physical models include the West Coast Regional Ocean Modeling System (West Coast ROMS) operating in both nowcast and hindcast modes and the West Coast Operational Forecast System (WCOFS), which are developed and maintained through partnerships with NOAA, NANOOS, SCCOOS, and other partners. The underlying physical models—West Coast ROMS, Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS), and WCOFS—are used to drive higher level ecosystem models that predict ocean biogeochemistry, including changes in ocean acidification and hypoxia—Regional Oceanic Modeling System coupled online to the Biogeochemical Elemental Cycling (ROMS-BEC) and a customized version of the North Pacific Ecosystem Model for Understanding Regional Oceanography (ROMS-NEMURO)—to predict harmful algal bloom events (California-Harmful Algae Risk Mapping, referred to as C-HARM) and to support assessment of fisheries stocks and marine mammals. CeNCOOS interacts with and serves many local-scale ocean models. For example, the San Francisco Bay Operational Forecast System (SFBOFS) is a system developed to serve the San Francisco Bay maritime communities by serving forecasts of water levels, currents, water temperature, and salinity out to 48 hours, four times per day.

CeNCOOS also supports weather models, including COAMPS, also used as a boundary condition for the West Coast ROMS. New high-resolution ROMS outputs are improving model realism at the coast and allowing, for example, for identification of the connectivity of MPAs and other near-shore policy information needs. CeNCOOS provides the important function of linking model data providers to their end-user communities to tailor local and regional modeling output, addressing specific user requirements.

- ❑ **Objective 4.1:** Support operational regional atmospheric, oceanographic, biogeochemical, and ecosystem models at multiple scales, including coasts and estuaries, to provide essential marine information.
  - ✓ **Metric:** Operate a regional atmospheric model (COAMPS), a West Coast ROMS with hindcast and nowcasts and related ROMS-NEMURO biogeochemical and ecosystem model and deliver outputs.
- ❑ **Objective 4.2:** Improve data assimilative, physical-biogeochemical-ecosystem models, and model-derived analytics by linking model resources and expertise with end-user community needs.
  - ✓ **Metric:** Conduct end user consultation, model expert inputs, and systems analysis to define and form data streams and lifecycle planning for new information products that take advantage of COAMPS, West Coast ROMS-NEMURO (North Pacific Ecosystem Model for Understanding Regional Oceanography), and WCOFS.
- ❑ **Objective 4.3:** Improve access to model output and data, including biogeochemical and biological model data through the CalOOS Data Portal and customized information products.
  - ✓ **Metric:** Biogeochemical models, including ROMS-BEC, ROMS-NEMURO and harmful algal bloom models through C-HARM, are made available in the portal for onward use in tailored products.
- ❑ **Objective 4.4:** Provide accessible information about models, how they work, their limitations, and outputs available.
  - ✓ **Metric:** CeNCOOS's model webpage (<https://www.cencoos.org/observations/models-forecasts/>) is improved and model usage is tracked and increases.

Various ocean and atmospheric models are used for different applications and vary in resolution and spatial extent. The domains of CeNCOOS-related ocean models include: blue box (WCOFS, 4 km resolution, operated by NOAA), red box West Coast ROMS (approximately 10 km resolution, operated by UCSC), green box Central and Northern CA nest (CNCA, nested in WCOFS, 773 m resolution, UCSC operated), purple box Monterey nest (nested in WCOFS, 153 m resolution, UCSC operated), and three nested black open fill boxes a regional Coupled Ocean / Atmosphere Mesoscale Prediction System (COAMPS, atmospheric model, operated by the US Naval Research Laboratory).





### **STRATEGY 5: Engage ocean data users to create accessible, integrative, and valuable information products.**

CeNCOOS engages ocean information users to develop and maintain value-added information products and tools to deliver actionable information on regional ocean physics, biogeochemistry, biology, and ecosystems. Our partners range from citizen scientists and principal investigators to large programs and federal agencies. These partners contribute data to support information and product development and provide feedback on system priorities. Delivering information solutions for this diverse membership requires strong communication, consultation, and collaborative approaches—including public-private partnerships.

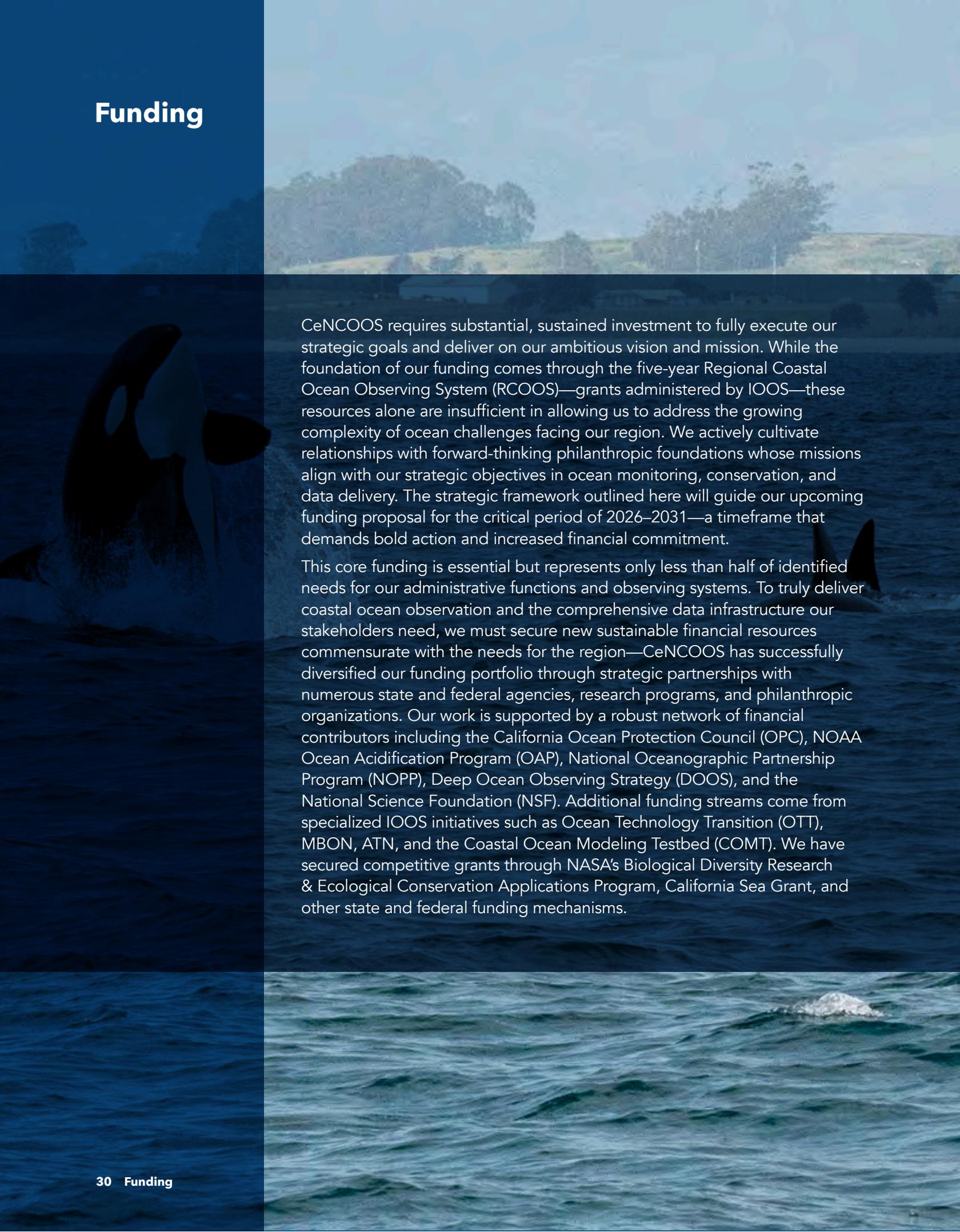
CeNCOOS delivers information to our end users through our website ([cencoos.org](http://cencoos.org)) and portal ([caloos.org](http://caloos.org)). The CalOOS Data Portal provides access to the regional data portal and catalog that connects users to over 2,000 data streams—many of which are real-time. The portal offers multiple ways to visualize data, including through an interactive map, various plotting capabilities, synthesized dashboards, and curated “Data Views” where a user can generate a page with multiple time-series and custom descriptive text. The CeNCOOS DMAC system also supports a web-based data sharing platform called the Research Workspace that allows data providers to collaboratively share data files, run analyses, and compile metadata. The CeNCOOS website, social media platforms, and quarterly newsletter provide our broadest outreach and allow CeNCOOS to bridge science communication, data discovery, education materials, outreach, and feedback.

- ❑ **Objective 5.1:** Actively engage our members and stakeholders to understand, document, and share ocean information needs and how those needs change over time.
  - ✓ *Metric:* Evolving stakeholder needs for ocean information are documented and tracked.
- ❑ **Objective 5.2:** Develop and serve “core products” derived from key long-term monitoring assets to expand use and awareness of backbone observing stations.
  - ✓ *Metric:* Develop and expand integrated tools from assets including to track heat, acidification, and climate variability.
- ❑ **Objective 5.3:** Co-design and develop high-priority decision-support tools for applications including the following: aquaculture and fisheries; shipping and navigation; tourism and safety; and resource management.
  - ✓ *Metric:* High-priority decision support tools are assessed to ensure end-user needs are satisfied.

- ❑ **Objective 5.4:** Maintain and continually improve information products to enhance the delivery of weather and ocean information to communicate current and forecast conditions through information solutions.
  - ✓ *Metric:* Surface current information from HFR and models are utilized through model-based navigation tools and mobile applications (e.g. BayCurrents and West Coast Currents mobile apps).
- ❑ **Objective 5.5:** Improve preparedness for emergency response and management.
  - ✓ *Metric:* Emergency response and coastal management agencies are provided with high-quality, automatically updated information.
- ❑ **Objective 5.6:** Promote CeNCOOS products and tools to the public, especially educators, to equip the next generation with knowledge and expertise to support addressing our priorities.
  - ✓ *Metric:* Marine educators are empowered by CeNCOOS data and information services to use real-time data from their local ocean systems to expand awareness and understanding.



# Funding



CeNCOOS requires substantial, sustained investment to fully execute our strategic goals and deliver on our ambitious vision and mission. While the foundation of our funding comes through the five-year Regional Coastal Ocean Observing System (RCOOS)—grants administered by IOOS—these resources alone are insufficient in allowing us to address the growing complexity of ocean challenges facing our region. We actively cultivate relationships with forward-thinking philanthropic foundations whose missions align with our strategic objectives in ocean monitoring, conservation, and data delivery. The strategic framework outlined here will guide our upcoming funding proposal for the critical period of 2026–2031—a timeframe that demands bold action and increased financial commitment.

This core funding is essential but represents only less than half of identified needs for our administrative functions and observing systems. To truly deliver coastal ocean observation and the comprehensive data infrastructure our stakeholders need, we must secure new sustainable financial resources commensurate with the needs for the region—CeNCOOS has successfully diversified our funding portfolio through strategic partnerships with numerous state and federal agencies, research programs, and philanthropic organizations. Our work is supported by a robust network of financial contributors including the California Ocean Protection Council (OPC), NOAA Ocean Acidification Program (OAP), National Oceanographic Partnership Program (NOPP), Deep Ocean Observing Strategy (DOOS), and the National Science Foundation (NSF). Additional funding streams come from specialized IOOS initiatives such as Ocean Technology Transition (OTT), MBON, ATN, and the Coastal Ocean Modeling Testbed (COMT). We have secured competitive grants through NASA’s Biological Diversity Research & Ecological Conservation Applications Program, California Sea Grant, and other state and federal funding mechanisms.

## A view of CeNCOOS beyond 2030

- 1. Expanded use of autonomous platforms and systems:** CeNCOOS has new platforms such as long-range, long-endurance autonomous underwater vehicles (AUVs), gliders, and uncrewed surface vessels (USVs) operating for weeks or months at a time, delivering unparalleled data on physics, biogeochemistry, biology, and ecosystems variables, reaching previously inaccessible or under-sampled regions.
- 2. Delineate and document data quality / processing levels:** CeNCOOS has systems in place that distinguish between various levels of data processing and quality including data suitable to understand ocean weather (e.g. day-to-day changes such as those experienced during a heatwave) vs. ocean climate (e.g. year-to-year changes such as those related to El Niño).
- 3. Broader adoption of accessible ocean technology:** CeNCOOS has more cost-effective, small, and energy-efficient sensors deployed in greater numbers, measuring more variables simultaneously.
- 4. Enhanced artificial intelligence and machine learning:** CeNCOOS built upon our leading experience with underwater microscopes, to add new real-time data processing and anomaly detection, with systems that can adaptively sample/process based on detected phenomena—including examples from physics, biogeochemistry, biology, and ecosystems, as well as forecasting.
- 5. Integrated observing for place-based management:** CeNCOOS has established automated tools for use of data from multiple sources including models, satellites, in situ platforms, and shore-based facilities, providing seamless data including for tracking managed and protected species and related marine life, harmful algal bloom risks, and ecosystem changes.
- 6. Public-private partnerships:** Increased long-term collaboration between research institutions, government agencies, and commercial ventures sharing infrastructure costs.
- 7. Preparedness and prosperity:** Communities are empowered by ocean information to make improved decisions.

The extent of these developments will depend on funding priorities, technological advances, and international cooperation over the coming years.

# Conclusion



## ***CeNCOOS Strategic Priorities 2026–2030***

Society is highly dependent on ocean data and information: from daily use of weather forecasts, to longer views of precipitation and drought, to managing resources from aquaculture, fisheries, shipping lanes, and ports. CeNCOOS's combined expertise of academic institutions and private-sector innovators throughout our region allows for continuous improvement of our observing capabilities to meet escalating demands for ocean intelligence. Our network represents an essential part in California's resilience, prosperity, and sustainable future. The sustained ocean observing systems maintained by CeNCOOS function as vital economic catalysts in an increasingly uncertain world. Our data touches the work of hundreds of thousands of California jobs and underpins food security and natural hazard resilience.

CeNCOOS proudly serves as a custodian for monitoring some of the world's most spectacular and productive coastline—from the rugged grandeur of Big Sur to California's renowned wine country shores to the ancient coastal redwood forests. California's coastal waters represent a cornerstone of our state's economic prosperity, ecological health, and cultural identity. For our densely populated coastal communities, the ocean is not merely a backdrop—it is a critical lifeline. Maritime industry, resource management agencies, and researchers across private and public sectors recognize that comprehensive and sustained ocean observations are not optional luxuries but essential infrastructure that powers daily decision-making with life-saving and economy-sustaining impacts.



# Appendices

## I. Acronyms

Acronym	Definition
<b>AIS</b>	Automatic Identification System
<b>ATN</b>	Animal Telemetry Network
<b>BOEM</b>	Bureau of Ocean Energy Management
<b>CARE</b>	Collective benefit, Authority to control, Responsibility & Ethics
<b>CCLME</b>	California Current Large Marine Ecosystem
<b>CeNCOOS</b>	Central & Northern California Ocean Observing System
<b>C-HARM</b>	California-Harmful Algae Risk Mapping
<b>CIMT</b>	Center for Integrated Marine Technologies
<b>CINMS</b>	Channel Islands National Marine Sanctuary
<b>COAMPS</b>	Coupled Ocean/Atmosphere Mesoscale Prediction System
<b>COMT</b>	Coastal Ocean Modeling Testbed
<b>COTS</b>	Coastal Observation Technology System
<b>EEZ</b>	Exclusive Economic Zone
<b>EOV</b>	Essential Ocean Variable
<b>FAIR</b>	Findable, Accessible, Interoperable & Reusable
<b>GOOS</b>	Global Ocean Observing System
<b>HAB</b>	Harmful Algal Bloom
<b>HFR</b>	High Frequency Radar
<b>IFCB</b>	Imaging FlowCytobot
<b>IOOC</b>	Interagency Ocean Observation Committee
<b>IOOS</b>	Integrated Ocean Observing System
<b>MBARI</b>	Monterey Bay Aquarium Research Institute
<b>MBON</b>	Marine Biodiversity Observation Network
<b>MPA</b>	Marine Protected Area
<b>NANOOS</b>	Northwest Association of Networked Ocean Observing Systems
<b>NCEI</b>	National Centers for Environmental Information
<b>NOAA</b>	National Oceanic & Atmospheric Administration
<b>NOPP</b>	National Oceanographic Partnership Program
<b>NOS</b>	National Ocean Service
<b>OAH</b>	Ocean Acidification & Hypoxia
<b>OBIS</b>	Ocean Biodiversity Information System
<b>OPC</b>	Ocean Protection Council
<b>OSPR</b>	Oil Spill Prevention & Response
<b>OST</b>	Ocean Science Trust
<b>OTT</b>	Ocean Technology Transition
<b>ROMS-BEC</b>	Regional Oceanic Modeling System coupled online to the Biogeochemical Elemental Cycling
<b>ROMS-NEMURO</b>	Regional Oceanic Modeling System coupled online to the North Pacific Ecosystem Model for Understanding Regional Oceanography
<b>SAROPS</b>	Search & Rescue Optimal Planning System
<b>SCCOOS</b>	Southern California Coastal Ocean Observing System
<b>SPATT</b>	Solid Phase Adsorption Toxin Tracking
<b>WCOA</b>	West Coast Ocean Alliance
<b>WCODP</b>	West Coast Ocean Data Portal
<b>WCOFS</b>	West Coast (Ocean) Operational Forecast System model
<b>WROMS</b>	World Register of Marine Species

## II. Governing Council Members

Member	Member Organization	GC Seat Designation	Last Elected
<b>Eric Bjorkstedt</b>	California Polytechnic State University, Humboldt, CA	Research	2016
<b>Scott Humphrey</b>	Marine Exchange of the San Francisco Bay Region, San Francisco, CA	Industry	2016
<b>Jaime Jahncke</b>	Point Blue Conservation Science, Bolinas, CA	Non-profit	2019
<b>Mary Miller</b>	San Francisco Exploratorium, San Francisco, CA	Educator	2016
<b>Alexander Parker</b>	The California Maritime Academy, Vallejo, CA	Educator	2014
<b>Andrew DeVogelaere</b>	Monterey Bay National Marine Sanctuary, Monterey, CA	Federal govt	2014
<b>Francisco Chavez</b>	Monterey Bay Aquarium Research Institute, Moss Landing, CA	Research	2014
<b>Laura Rogers-Bennett</b>	California Department of Fish and Wildlife	State	2014
<b>Lynn deWitt</b>	NOAA Southwest Fisheries Science Center, Monterey, CA	Federal govt	2014
<b>Dean Wendt</b>	California Polytechnic State University, San Luis Obispo, CA	At-Large	2020
<b>John Largier</b>	University of California Davis, Bodega Bay, CA	At-Large	2015
<b>Liz Whiteman</b>	California Ocean Science Trust, Oakland, CA	Non-profit	2015
<b>Raphael Kudela</b>	University of California Santa Cruz, Santa Cruz, CA	At-Large	2015
<b>Justine Kimball</b>	Ocean Protection Council, Sacramento, CA	State	2020
<b>Rosa Laucci</b>	Tolowa Dee-ni' Nation	Community	2022

### III. Joint Strategic Advisory Committee Members

Member	Member Organization
<b>Maria Brown</b>	Greater Farallones National Marine Sanctuary (retired)
<b>Mariela de la Paz Carpio-Obeso</b>	State Water Resource Control Board
<b>Jeff Crooks</b>	Tijuana River National Estuarine Research Reserve
<b>Jenn Eckerle</b>	California Ocean Protection Council
<b>Tom Ford</b>	Santa Monica Bay Restoration Commission
<b>Steven Goldbeck</b>	San Francisco Bay Conservation and Development Commission
<b>Phyllis Grifman</b>	University of Southern California (USC) Sea Grant
<b>John Haskins</b>	Elkhorn Slough National Estuarine Research Reserve
<b>Scott Humphrey</b>	Marine Exchange of San Francisco Bay Region
<b>Grant Humphries</b>	Farallon Institute
<b>David Manning</b>	Sonoma County Water Agency
<b>Greg McGowan</b>	California Depart.of Fish & Wildlife, Oil Spill Prevention and Response (OSPR)
<b>Chris Mobley</b>	Channel Islands National Marine Sanctuaries
<b>Shauna Oh</b>	California Sea Grant
<b>Heather Schlosser</b>	US Army Corps of Engineers
<b>Craig Shulman</b>	California Dept. of Fish and Wildlife
<b>Paula Sylvia</b>	Aquaculture & Blue Technology Port of San Diego
<b>Laura Terriquez</b>	Orange County Sanitation District
<b>Jon Warrick</b>	US Geological Survey
<b>Chad Whalen</b>	CODAR Ocean Sensors
<b>Liz Whiteman</b>	Ocean Science Trust
<b>Susan Zaleski</b>	Bureau of Ocean Energy Management (BOEM)
<b>Vanessa Zubkowsky-White</b>	California Department of Public Health

## IV. Critical Global, Federal, State Mandates and Influences

Realizing the many benefits of ocean observing requires that the ongoing science, plans, models, and forecasts generated contribute to knowledge for society. CeNCOOS maintains close partnerships with regional, state, federal, and global observing partners to augment ocean observing capacity, facilitate infrastructure sharing, promote best practices, build capacity, foster diversity, and develop innovative technologies and approaches. Through close coordination with our partners, we ensure that decisions are supported by the highest-quality observational information possible.

Global	Federal	State
<ul style="list-style-type: none"> <li>• United Nations – Decade of Ocean Science for Sustainable Development (2021–2030)</li> <li>• United Nations – Framework Convention on Climate Change</li> <li>• United Nations – Convention on Biological Diversity</li> <li>• Global Ocean Observing System (GOOS) – The Framework for Ocean Observations (FOO)</li> <li>• The International Union for Conservation of Nature (IUCN) Green List of Protected and Conserved Areas</li> <li>• Group on Earth Observations (GEO)</li> </ul>	<ul style="list-style-type: none"> <li>• Integrated Coastal Ocean Observing System Act</li> <li>• Magnuson-Stevens Act</li> <li>• Marine Mammal Protection Act</li> <li>• National Ocean Policy</li> <li>• Federal Ocean Acidification Research and Monitoring Act (FOARAM Act)</li> <li>• The Weather Research and Forecasting Innovation Act (Weather Act)</li> <li>• National Environmental Policy Act (NEPA)</li> <li>• Endangered Species Act (ESA)</li> </ul>	<ul style="list-style-type: none"> <li>• California Ocean Protection Act</li> <li>• California Coastal Act</li> <li>• Marine Life Protection Act and the Marine Life Management Act</li> <li>• California Environmental Quality Act (CEQA)</li> </ul>

## V. Photo Credits

Page #	Photo Description / Credits
<b>Cover</b>	Aerial View of Rachel Carson Ship – Todd Walsh © 2014 MBARI
<b>2</b>	Spray 2 Glider Schematic – Daniel Rudnick, Scripps Institution of Oceanography
<b>3</b>	Point Arena Lighthouse – Adobe Stock
<b>4</b>	Anchovies swimming in Monterey Bay – Adobe Stock
<b>5</b>	Glider deployment from the R/V North Wind – Eric Bjorkstedt California State Polytechnic University, Humboldt
<b>6</b>	Tomales Bay – Ed Anderson, Hog Island Oyster Co
<b>7</b>	High Frequency Radar – John Largier, Bodega Marine Lab
<b>7</b>	Ocean Economy Graphic – Scott Design Inc.
<b>8</b>	CeNCOOS Observing Graphic – Kelly Lance Design
<b>9</b>	CeNCOOS Organogram Figure – Scott Design Inc.
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<b>10</b>	Lake Natoma Dam – Adobe Stock
<b>11</b>	Urchins in the intertidal – Adobe Stock
<b>11</b>	CeNCOOS Timeline – Scott Design Inc.
<b>12</b>	IOOS Regional Map – IOOS Association
<b>13</b>	Oakland Outer Harbor Aerial View – Adobe Stock
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<b>14</b>	Sea Lion Hunting in Sardine Bait Ball – Adobe Stock
<b>15</b>	Lat (“Seaweed”) – Rosa Laucci, Tolowa Dee-ni’ Nation
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<b>16</b>	Waves Crashing on Capitola Wharf – Henry Ruhl
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<b>17</b>	Map of National Marine Sanctuaries and Marine Protected Areas within the CeNCOOS Region – CeNCOOS
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<b>20</b>	Team lowers CTD Cast into Monterey Bay – 2025 © MBARI, Alexandra Boutros
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<b>29</b>	CeNCOOS Team at Marine Exchange of the SF Bay Region’s Annual Meeting – Credit N/A
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<b>31</b>	Point Arena Rocks – Adobe Stock
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<b>33</b>	Serene Ocean Water – 2025 © MBARI, Alexandra Boutros
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**CENTRAL & NORTHERN  
CALIFORNIA OCEAN  
OBSERVING SYSTEM**

**Central and Northern California Ocean Observing System  
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