STAFF SUMMARY FOR APRIL 13-14, 2016

11. NORTH CENTRAL COAST MARINE PROTECTED AREA

Today's Item **Information** ☒ **Action** ☐

Receive presentation on north central coast marine protected areas baseline data collection results and five-year management review.

Summary of Previous/Future Actions

- Adoption of the north central coast MPA network — Aug 5, 2009; Woodland
- **Presentation NCC MPA 5 Year Review** — **Apr 13-14, 2016; Santa Rosa**

Background

In 2009, FGC adopted 25 new and revised MPAs and six special closures along the north central California coast that went into effect May 1, 2010. Following adoption of each regional MPA planning process, regional baseline monitoring data is collected through a baseline data collection project within the first 5 years. MPA baseline data establishes a benchmark of ocean conditions and human activities against which future changes can be measured. Regional baseline data collection is followed by a transition to long-term monitoring. The north central coast region is the second of four regions to complete a regional MPA baseline program. Implemented through a partnership between Ocean Protection Council (OPC), California Ocean Science Trust (OST), DFW, and California Sea Grant, regional data collection and monitoring began in 2010 with the selection of 11 projects representative of the north central coast region's ecosystems and human uses.

In 2015, OST and DFW collaborated with OPC and local researchers to develop a report to disseminate a summary of regional monitoring results from the baseline period. The report, titled *State of the California North Central Coast Report: A Summary of the Marine Protected Area Monitoring Program 2010-2015* (Exhibit 4) was released in November 2015 (Exhibit 1). The release followed extensive community outreach by OST, working in coordination with DFW and OPC (see summary in Exhibit 2). DFW has also completed its management review of the north central coast for FGC consideration (Exhibit 3). Today, OST and DFW will jointly present an overview of the north central coast monitoring efforts and a 5-year management review and recommendations (Exhibit 4).

Significant Public Comments (N/A)

Recommendation *DFW staff:* DFW is not recommending regulatory changes based on the Baseline Program data, but has developed non-regulatory management recommendations in the focal areas of monitoring and research, enforcement and compliance, and policy and permitting (Exhibit 3).

Exhibits

1. Report: State of the California North Central Coast Report, dated November 2015
2. OST memo on North Central Coast Community Engagement, dated March 30, 2016
3. DFW memo, Management Review of North Central Coast MPAs, received April 5, 2016
4. Presentation by OST and DFW

Motion/Direction (N/A)

State of the California North Central Coast

A Summary of the Marine Protected Area Monitoring Program 2010-2015

This document, the **State of the California North Central Coast: A Summary of the Marine Protected Area Monitoring Program 2010-2015** (State of the Region report), provides a summary of the results from the North Central Coast Marine Protected Area Baseline Program (Baseline Program) and other assessments from monitoring over the first five years of marine protected area (MPA) implementation in California's North Central Coast region. It is designed to share highlights and learning from the Baseline Program and to serve as a guide to the full portfolio of scientific reports that have been developed over the last five years. This summary State of the Region report is designed to inform potential management recommendations from the first five years of MPA implementation in the region, and will be provided to the California Fish and Game Commission in Spring 2016.

This report was produced by the California Ocean Science Trust in partnership with California Department of Fish and Wildlife and Ocean Protection Council. We acknowledge and are deeply appreciative of the work and input on the part of many partners and collaborators in the region, including the academic, agency, consulting and citizen scientists who conducted the work upon which this report is built. We have aimed to depict this collaborative effort throughout this document and on OceanSpaces.org.

oceanSPACES: The online community tracking California's ocean health

Everything in this summary report can be explored in more depth on OceanSpaces.org. Dive into the State of the North Central Coast page on OceanSpaces.org for the full portfolio of scientific reports and analyses from the first five years of MPA monitoring in this region.

OceanSpaces is California's digital home for MPA monitoring data and results. It houses hundreds of data packages, projects, and synthesis products—a collective body of scientific knowledge to make science-informed decisions for our coasts and oceans.

As you explore this document, use the interactive links and icons provided to delve deeper. Connect to a wealth of resources available on OceanSpaces using your phone or tablet, and join the online community to engage with the science and track the health of California's oceans.

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Summary and Key Findings

A network of marine protection

California is home to a statewide network of marine protected areas (MPAs) designed to meet the goals of the Marine Life Protection Act (MLPA), including protecting marine habitats and ecosystems, improving sustainable human use of our ocean, and protecting California's marine natural heritage. The MPAs are designed and managed, to the extent possible, as a network. Collectively, they can serve as a living laboratory for understanding and supporting ocean health, and exploring the effects of existing and emerging stressors.

Monitoring, research, and evaluation support adaptive management of MPAs. This report summarizes findings from the North Central Coast MPA Baseline Program (Baseline Program) and other monitoring activities in the region, and is a guide to the numerous resources that inform our understanding of the region, all available on OceanSpaces.org. Results of baseline monitoring provide a rigorous foundation for science-informed decision making by the California Fish and Game Commission and many other state and federal partners.

New partnerships working to achieve MPA network goals

In California, implementing the MPAs has motivated a coordinated approach to ocean resource management, stretching across jurisdictions, communities, academic disciplines, and institutions. Since 2010, university scientists, K-12 students, state and federal agencies, fishermen, volunteer divers, and non-profit organizations, among many others, have collaborated to deepen our knowledge of this region. The result is an unprecedented understanding of the state of the North Central Coast, and a set of relationships that will serve California for years to come.

A changing and dynamic ocean environment

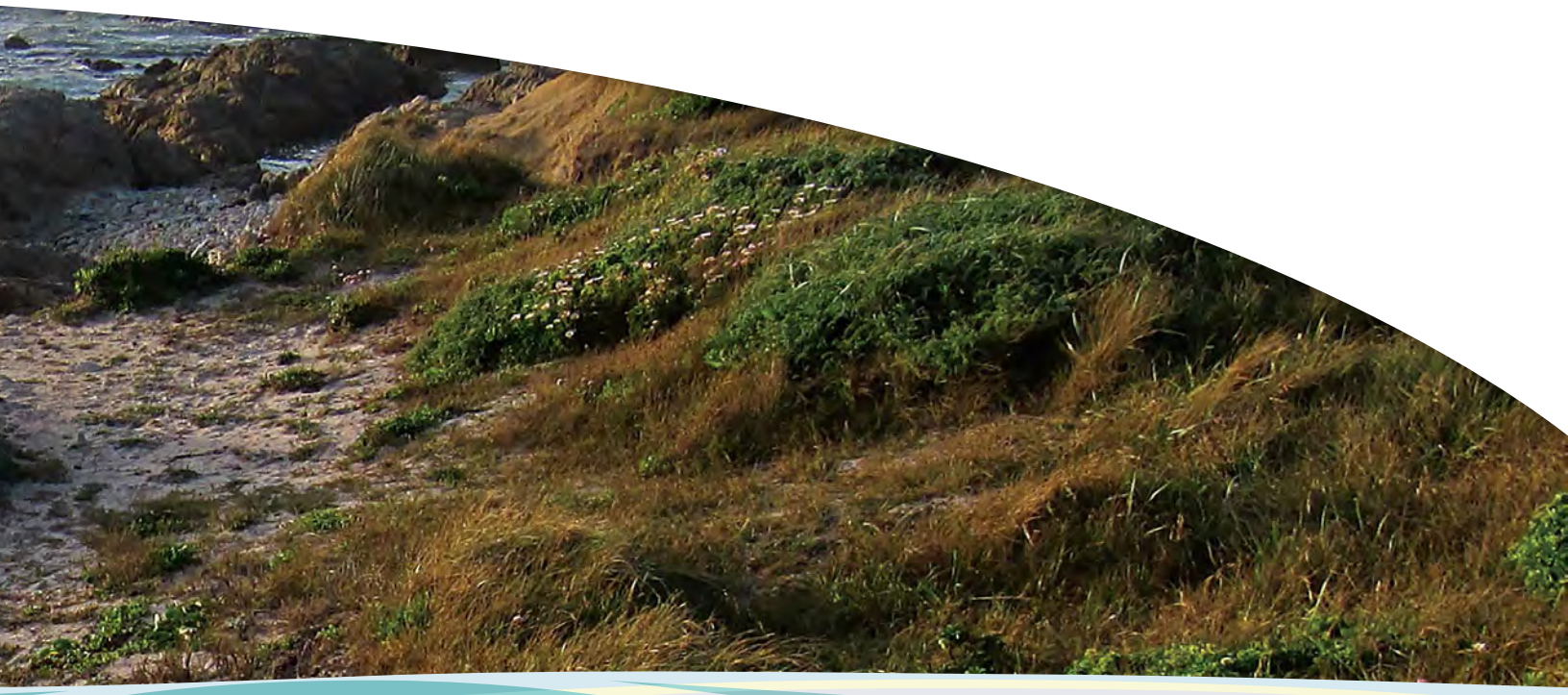
Variability in the ocean environment impacts marine life and coastal communities. The region's ecosystems are particularly shaped by upwelling, freshwater runoff, and Pacific Ocean influences (like the El Niño Southern Oscillation and the Pacific Decadal Oscillation). At the same time, climate change and associated changes in ocean chemistry are impacting the ocean environment, including changes in temperature, sea level, and ocean acidificaton and hypoxia.

Long-term monitoring will be critical to help determine and mitigate the effects of climate change, which will affect the ability of the MPA network to meet the goals of the MLPA.

A comprehensive benchmark

Establishing a benchmark of ocean conditions and human activities against which future changes can be measured is an important time stamp, providing a starting point for a long-term monitoring program.

- Strong upwelling events in 2008 and 2010 led to increases in phytoplankton, a vital resource for marine food webs.
- Researchers documented over half-a-million seabirds; nearly 99% breed adjacent to MPAs, 83% of which breed on the Farallon Islands alone.
- Thousands of invertebrates and fish were observed in mid-depth and deep water ecosystems. Combining biological surveys and seafloor maps revealed important life history patterns and population distributions for many species, including commercially important rockfishes and lingcod.
- Patterns in commercial fisheries are driven by many factors including natural population cycles, policy change, management action, and economics. The Dungeness crab fishery has been particularly important to the North Central Coast in recent years.



- Recreational abalone harvesters contribute significantly to the coastal economy. The number of charter fishing trips decreased by more than half from 2000-2009, then began rebounding.
- Baseline monitoring demonstrated how academic, citizen, and agency scientists can collaborate to survey beaches and surf zones, rocky intertidal ecosystems, and kelp forests, to provide cost-effective, long-term monitoring of these ecosystems.

Connections enhance learning and new tools

A suite of projects through the Baseline Program brought together data and partnerships across multiple programs, generating new insights about ecological and human linkages across the region, and piloting new tools to support long-term monitoring.

Long-term monitoring hints at initial changes

It can take many years to see the impacts of MPAs and understand regional trends. However, data from long-term monitoring programs in the region provide us with a glimpse of recent changes.

- Long-term monitoring at Stornetta Ranch revealed that the establishment of the Sea Lion Cove MPA marked the beginning of a sharp increase of red abalone there, which has continued through 2015.
- Remotely operated vehicle (ROV) surveys inside and outside MPAs throughout the region in 2015 found increased abundances of some rockfishes and lingcod. Several hundred brown rockfish were observed in 2015, in contrast to only five individuals seen in 2009 and 2011.
- Surveys in 2014-2015 found shrunken kelp forests, followed by high sea urchin densities surpassing anything seen in the region in the past 10 years, leading researchers to examine the role of changing ocean conditions and the mass sea star die off.

MPA monitoring data inform a range of resource management decisions

MPAs are living laboratories, serving as tools for understanding ocean health in the face of sudden events, long-term trends, and climate change.

- In 2011 a severe invertebrate die-off occurred along the Sonoma Coast, resulting in thousands of dead abalone washing ashore. Rapid response by state agencies, researchers, and citizens, led to nimble management actions and thorough documentation of the event.
- In 2013 a mysterious wasting syndrome caused a mass die-off of sea stars across the west coast. Long-term monitoring programs, state resource managers, and baseline MPA monitoring gave California an early start on tracking the progression of the outbreak.
- MPA monitoring data provides knowledge of changing ecological conditions that is essential to track and respond to the effects of ocean acidification and hypoxia.

Strategic investments build long-term durability

Baseline monitoring generated novel scientific findings, strengthened partnerships, and developed new tools and approaches. Together, we are using this foundation to build scientifically rigorous, partnership-based long-term MPA monitoring in the North Central Coast and statewide.

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Setting the Scene

North Central Coast State of the Region: By the Numbers

Baseline MPA monitoring in the North Central Coast has shown what it means to take a partnerships approach to MPA monitoring. A vast array of partners have come together to produce the data and science that underpin the State of the Region report, and make these resources available to everyone:

$4+ million investment in this region by the State

$1+ million leveraged by monitoring partners

20+ government, academic, private, non-profit, fishing, and citizen science groups forming partnerships, and investing time and resources.

11 baseline monitoring projects and peer reviewed technical reports

800+ monitoring sites

85 data packages

25+ interactive web map layers on MarineBIOS using baseline data

8 reports on monitoring methods development and science integration

6 products describing management and environmental context

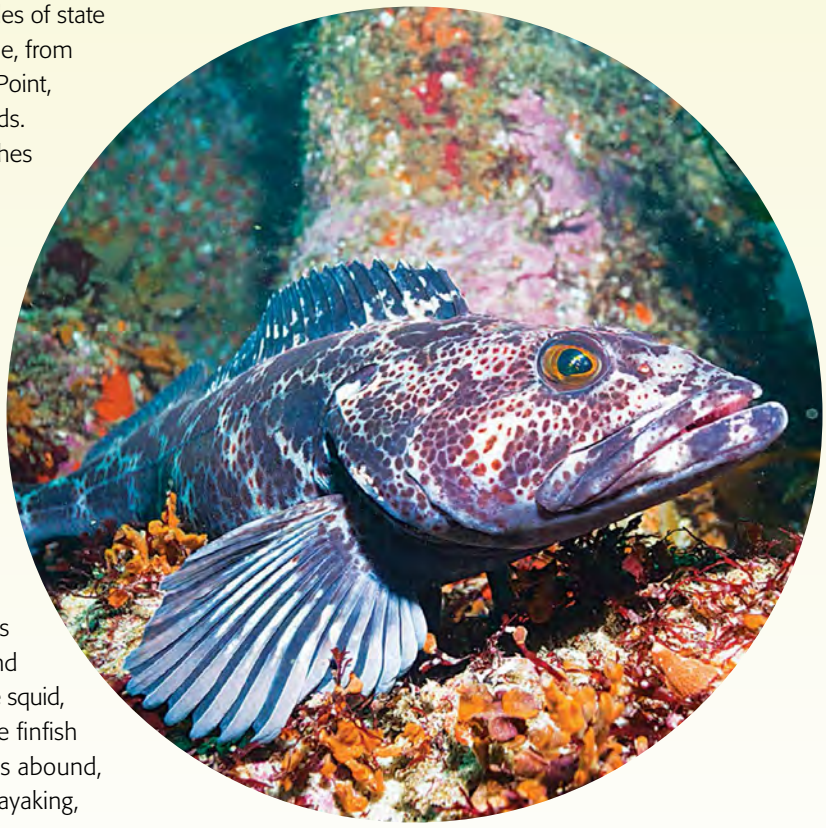
30 outreach and education documents

And 1 online platform that brings it all together.

Explore more at oceanSPACES.org

The North Central Coast Region

The North Central Coast Region covers 763 square miles of state waters and extends about 470 miles along the coastline, from Alder Creek just north of Point Arena, south to Pigeon Point, and includes the state waters around the Farallon Islands. The region hosts diverse ecosystems, from sandy beaches and rocky headlands, to kelp forests and rocky reefs. These ecosystems support thousands of species, including marine mammals, seabirds, sea turtles, fishes, invertebrates, and marine algae, and provides habitat for numerous threatened or endangered species, including black abalone, Chinook salmon, leatherback sea turtles, Steller sea lions, and Marbled Murrelets.



The region is among the most biologically productive marine areas in the world, due in part to its position within the California Current Large Marine Ecosystem (CCLME) with its persistent upwelling of cold, nutrient-rich water. Coastal communities depend on the region's waters for productive fisheries, recreational activities, and tourism. Major commercial fisheries in the region include squid, Dungeness crab, California halibut, salmon, nearshore finfish (rockfish), and sea urchins. Recreational opportunities abound, from fishing rockfish and salmon, to abalone diving, kayaking, wildlife watching, and beach walking.

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California's MPA Network

The MLPA, passed by the California legislature in 1999, directs the State to develop, evaluate, and adapt California's system of MPAs to meet six key goals.

GOALS OF THE MARINE LIFE PROTECTION ACT

(1999, Chapter 10.5 of the California Fish & Game Code, §2850–2863)

1. To protect the natural diversity and abundance of marine life, and the structure, function and integrity of marine ecosystems.
2. To help sustain, conserve and protect marine life populations, including those of economic value, and rebuild those that are depleted.
3. To improve recreational, educational, and study opportunities provided by marine ecosystems that are subject to minimal human disturbance, and to manage these uses in a manner consistent with protecting biodiversity.
4. To protect marine natural heritage, including protection of representative and unique marine life habitats in California waters for their intrinsic value.
5. To ensure that California's MPAs have clearly defined objectives, effective management measures and adequate enforcement and are based on sound scientific guidelines.
6. To ensure that the state's MPAs are designed and managed, to the extent possible, as a network.

The North Central Coast regional MPA network, implemented in 2010 following a science-based and stakeholder driven planning process, covers about 20% of state waters in the region. Most of the network allows certain types of take, but 11% is designated as no-take reserves. By reducing other stressors, MPAs can help buffer these diverse ecosystems against long-term climate change impacts.

Introduction to MPA Monitoring

The goal of MPA monitoring is to evaluate progress toward MLPA goals and to provide data that can inform MPA management decisions. As outlined by the State's MPA Monitoring Framework, monitoring consists of assessing ecosystem conditions and trends, together with management effectiveness evaluations.

Establishing a benchmark through baseline monitoring

Establishing a benchmark of ecological and socioeconomic conditions in the region at the time of MPA implementation sets the stage for a comparison of these baseline results with future monitoring results. This allows us to track changes inside and outside of MPAs over time, providing the necessary information to evaluate the effects of MPA management and network design. Managers learn from these evaluations and improve management approaches over time through a process of adaptive management.

Baseline monitoring in the North Central Coast

Baseline monitoring began in this region in 2010 with the North Central Coast MPA Baseline Program an investment of $4 million by the State. This Baseline Program was implemented through a partnership among California Ocean Protection Council (OPC), California Ocean Science Trust, California Department of Fish and Wildlife (CDFW), and California Sea Grant.

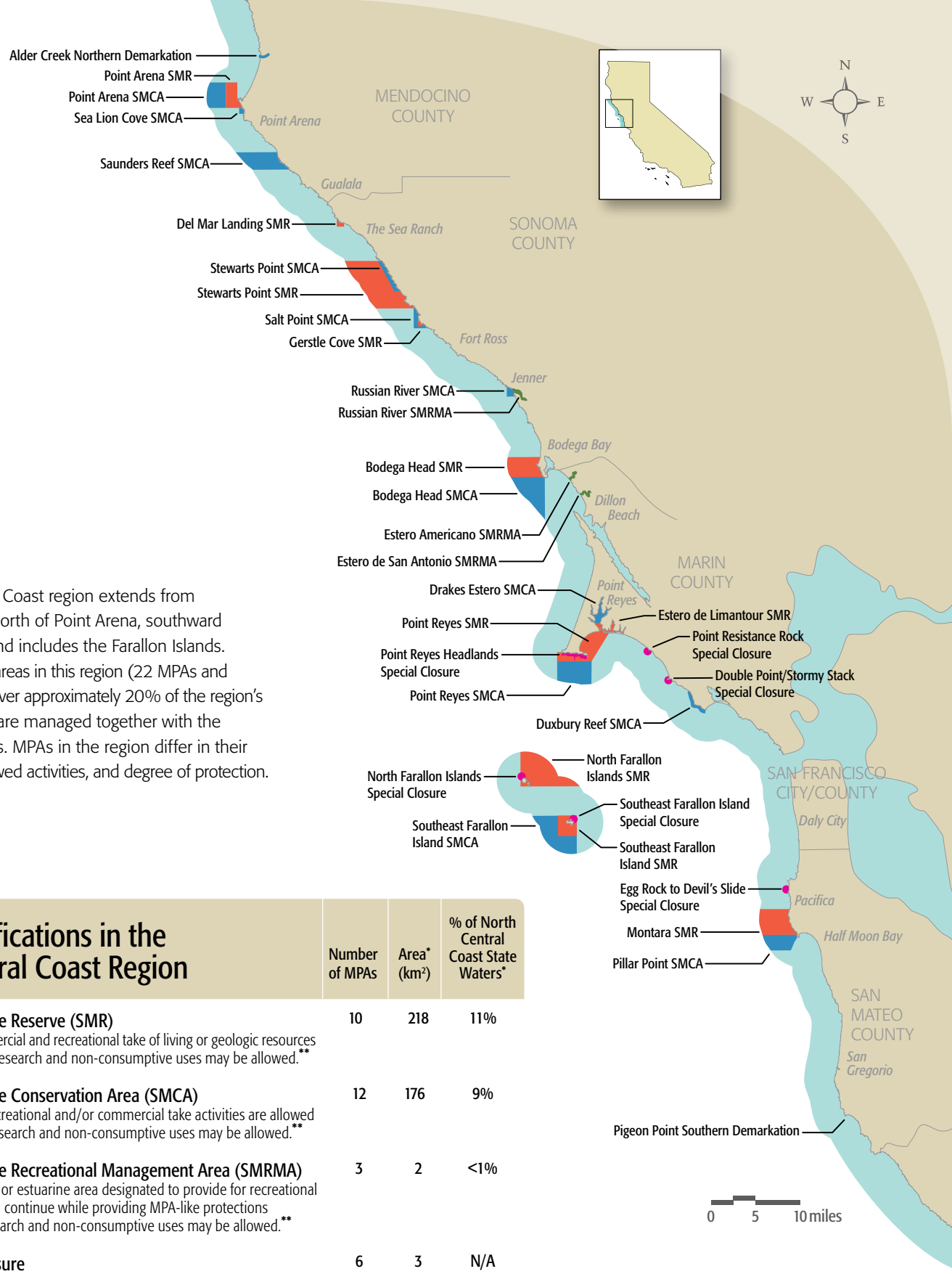
Eleven projects, selected through a competitive process that included peer review of all proposals, encompass a breadth of ecosystems and human uses in the region. These projects collected data from 2010-2012, providing a snapshot of the region. Additional state and private investments in 2013 and 2014 secured a deeper understanding of the region through new research that linked findings across projects.

Establishing a comprehensive benchmark of ecosystem conditions and human uses in the region also requires an understanding of the broader oceanographic, socioeconomic, and management context of the region, which has been contributed by a variety of monitoring partners.

The scientific learning from baseline monitoring in the North Central Coast is designed to inform potential management recommendations from the first five years of MPA implementation in the region. This State of the Region summary report is anticipated to be delivered to the California Fish and Game Commission in Spring 2016.

A partnership-based approach

The California Collaborative Approach: Marine Protected Areas Partnership Plan, adopted by the OPC in 2014, recognizes that implementing, monitoring, and managing California's network of MPAs requires many forms of collaboration. This is certainly the case for MPA monitoring in a region as large and diverse as the North Central Coast. The data and results that form our understanding of the state of the region come from partnerships among more than 20 academic institutions, state and federal partners, non-profit organizations, fishermen, and citizen groups. Through these collaborations, we have developed a better understanding of the region, while laying important groundwork for future monitoring. Working together across communities, organizations, and disciplines, helps us to expand the value, relevance, and efficiency of MPA monitoring.



The North Central Coast region extends from Alder Creek, just north of Point Arena, southward to Pigeon Point, and includes the Farallon Islands. The 25 protected areas in this region (22 MPAs and three SMRMAs) cover approximately 20% of the region's State waters, and are managed together with the six special closures. MPAs in the region differ in their classifications, allowed activities, and degree of protection.

MPA Classifications in the North Central Coast Region

	Number of MPAs	Area* (km²)	% of North Central Coast State Waters*
State Marine Reserve (SMR) An area where all commercial and recreational take of living or geologic resources is prohibited. Scientific research and non-consumptive uses may be allowed.**	10	218	11%
State Marine Conservation Area (SMCA) An area where select recreational and/or commercial take activities are allowed to continue. Scientific research and non-consumptive uses may be allowed.**	12	176	9%
State Marine Recreational Management Area (SMRMA) A non-terrestrial marine or estuarine area designated to provide for recreational hunting opportunities to continue while providing MPA-like protections subtidally. Scientific research and non-consumptive uses may be allowed.**	3	2	<1%
Special Closure An area adjacent to seabird rookeries or marine mammal haul-out sites, where access or boating activities are restricted.***	6	3	N/A
California State Waters			

* Numbers for area and percent represent rounded values.

** Research within MPAs is allowed pursuant to obtaining a California Department of Fish and Wildlife issued Scientific Collecting Permit.

*** These small closures (300' and 1,000') often overlap with other MPA's and provide additional protection in sensitive areas.

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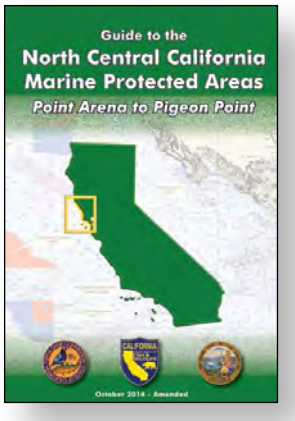
MPA Management in the North Central Coast

MPA monitoring is one of many aspects of natural resource management, which also includes outreach and education, enforcement and compliance, and policy and permitting. Understanding the broader history and current context of ocean resource management informs accurate interpretation of monitoring results, and highlights areas for continued improvement.

Outreach and education



Public outreach efforts in the region, led by CDFW, have focused on increasing public awareness and understanding of the region's MPA locations and regulations. Information has been made available through traditional CDFW venues (such as sport and commercial fishing regulatory publications, notice of regulatory changes, newsletter posts, and press releases), interpretive signs installed at key coastal access points, and via the web and blogs. The CDFW MPA website offers site-specific maps, boundaries, regulations, and MPA Overview Sheets for each MPA. The mobile version of the MPA page allows users to track their location and regulations in real time from their web-enabled devices. Partnerships are also a key component of the CDFW's outreach efforts in the region.

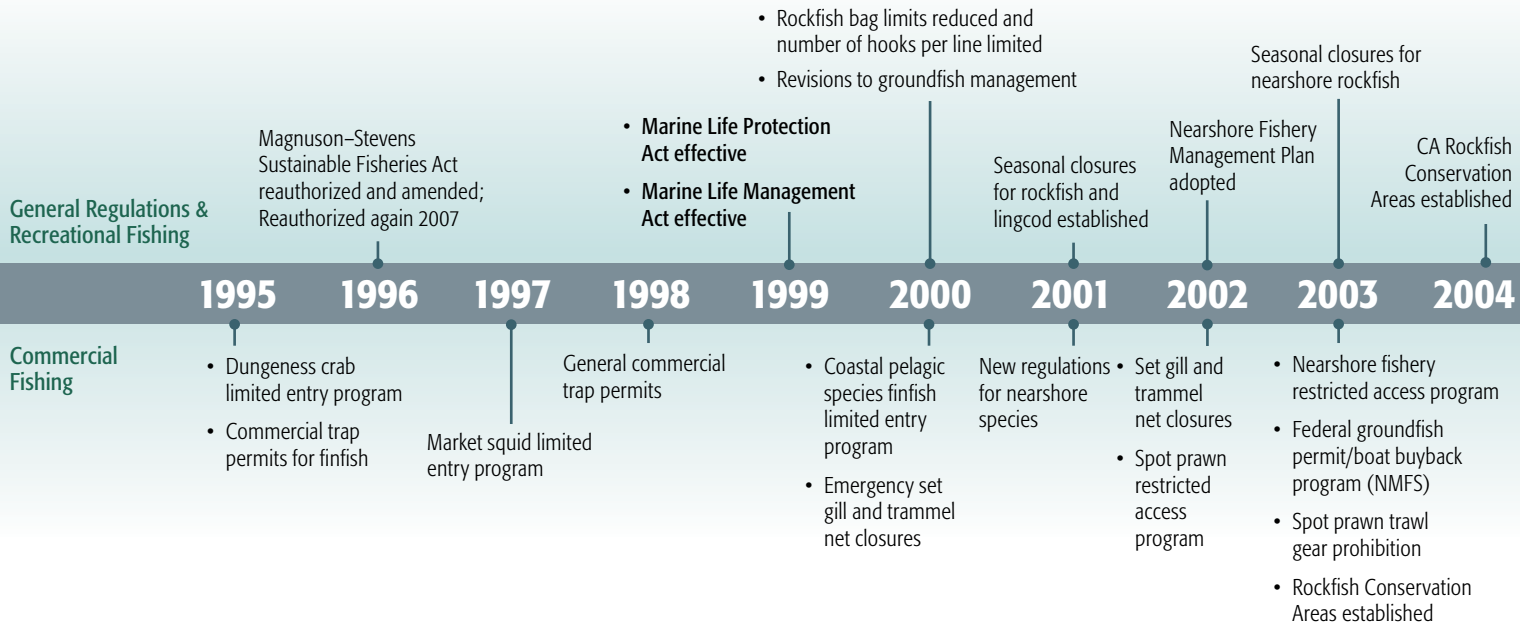
Enforcement and compliance

MPA effectiveness is influenced by enforcement of, and compliance with, MPA regulations. Understanding patterns of violations allows targeted approaches to educate a diverse constituency, enforce regulations, and interpret monitoring results. CDFW is the primary agency responsible for enforcing MPA regulations, with 14 enforcement officers in the North Central Coast, and occasional assistance from California State Parks, National Parks Service, the U.S. Coast Guard, and the National Oceanic and Atmospheric Administration.

Over time, an understanding of enforcement and compliance patterns will be important in interpreting the results of ecological monitoring, and in determining the overall effectiveness of MPAs in the region in meeting the goals of the MLPA. Records of CDFW citations from January 2010 to December 2014 in the North Central Coast show approximately 215 violations in the MPAs (6% of the total violations in the region), occurring within 14 of the 25 MPAs. Of these 215 violations, 47% occurred in Sonoma County, and 39% in Montara SMR. Some violations may be attributed to a lack of knowledge about MPA boundaries and regulations, further emphasizing the important links among outreach, education, and compliance.

Better technology and community support will increase compliance through improved surveillance systems, detection, and interdiction. The CDFW-Law Enforcement Division is advancing finer resolution analyses, to determine specific violation types and strategically plan continued enforcement efforts. Find out more at: http://wildlife.ca.gov/Conservation/Marine/MPAs.

Regulations Affecting Ocean Resources



THE MPA COLLABORATIVES NETWORK: A LOCAL VOICE IN MPA MANAGEMENT

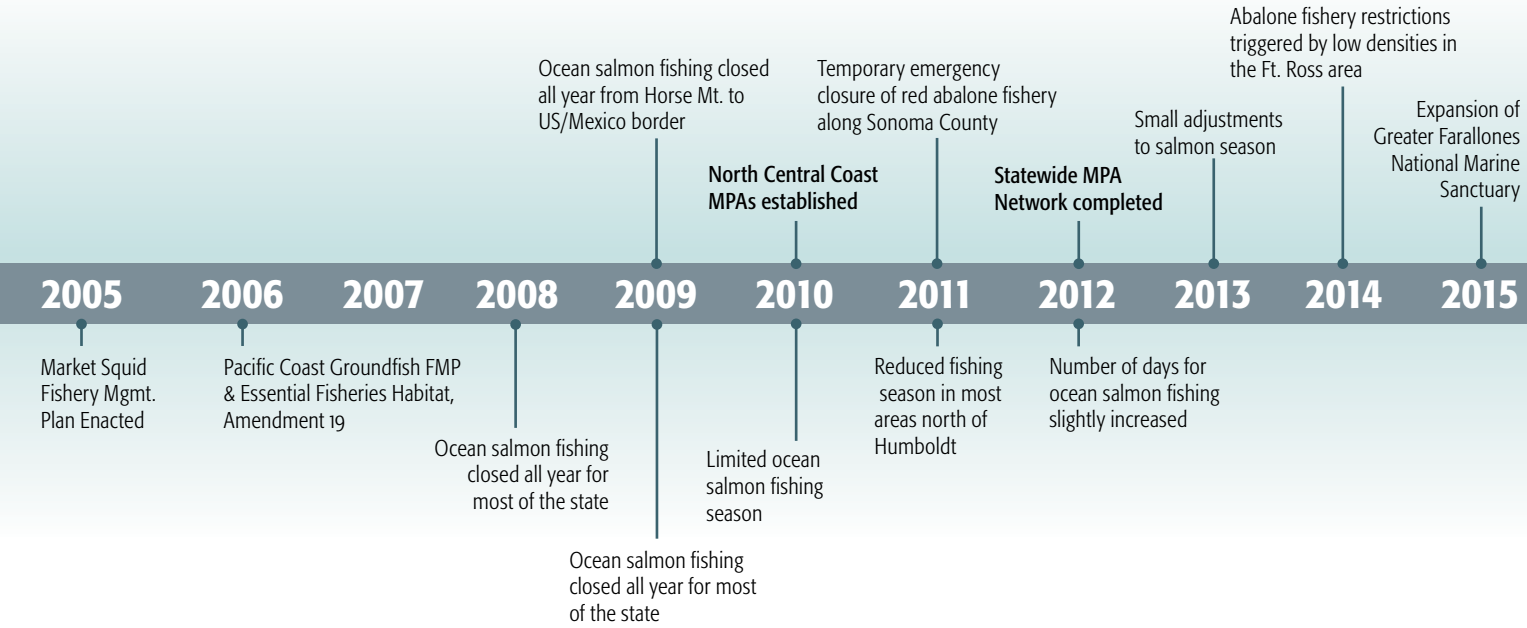
Recognizing the opportunity to engage, support, and learn from local coastal communities, a network of MPA Collaborative groups along the California Coast was established. These Collaboratives provide a forum for diverse stakeholders to support stewardship of the region's MPAs at a county level. By bringing together representatives from governmental agencies (city, county, state, federal, and tribal), environmental organizations, fishing groups, academic institutions, and others, MPA Collaboratives are building partnerships in MPA enforcement, monitoring, education, and outreach at the local level.

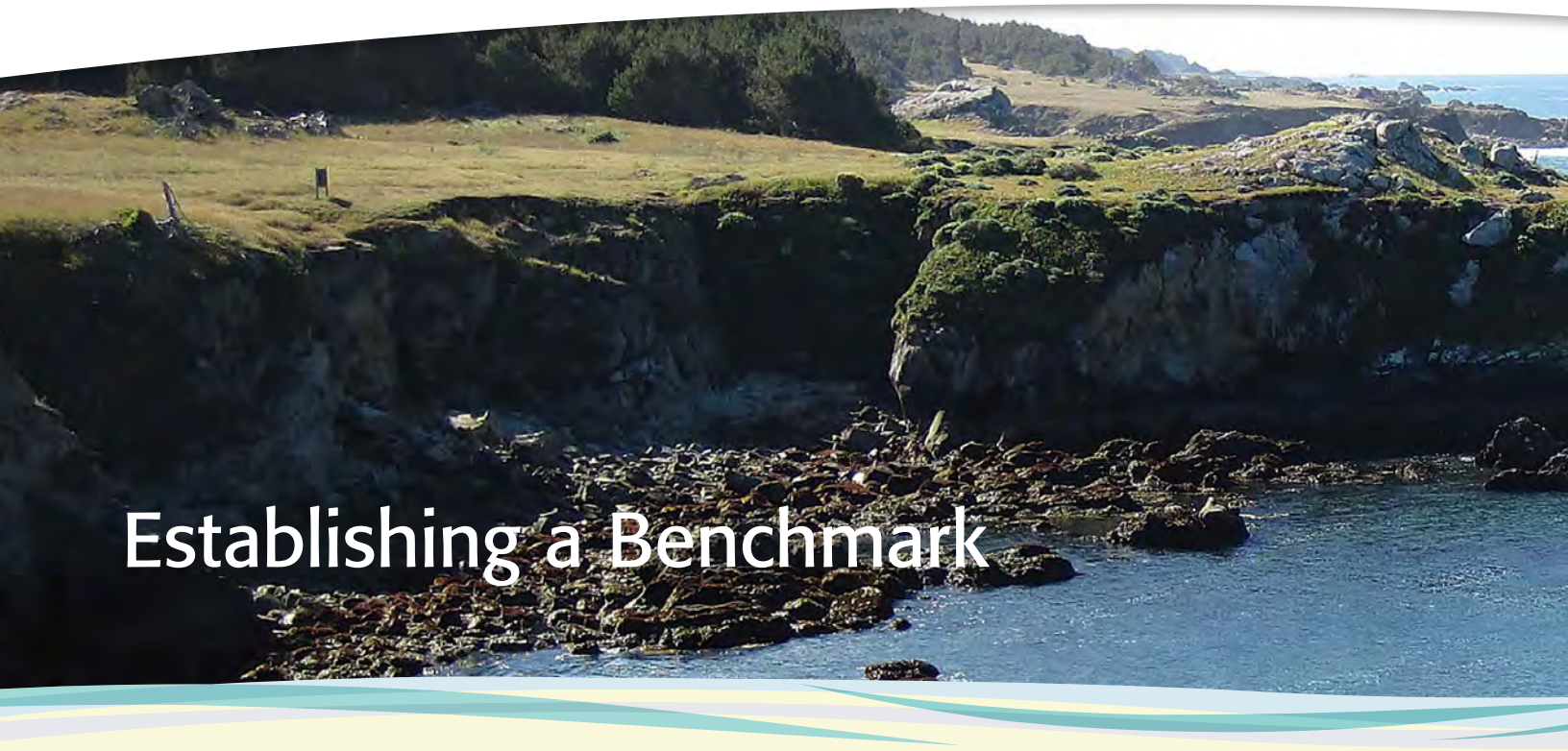
There are four active MPA Collaboratives in the North Central Coast Region: San Mateo, Sonoma, Mendocino, and the Golden Gate (representing both Marin and San Francisco Counties). Each Collaborative works with state partners to advance local priorities, activities, and projects. Collaborative projects in this region have included:

- An offshore MPA ambassador and boat captain outreach program for the Greater Farallones;
- An MPA brochure designed with fishermen and docents, for Marin and San Francisco MPAs; and
- A Sonoma County MPA video focusing on K-12 MPA education, the science of marine protection, the history of fishing and tribal uses in Sonoma, and fun uses of MPAs

MPA COLLABORATIVE NETWORK

In the North Central Coast MPA Region



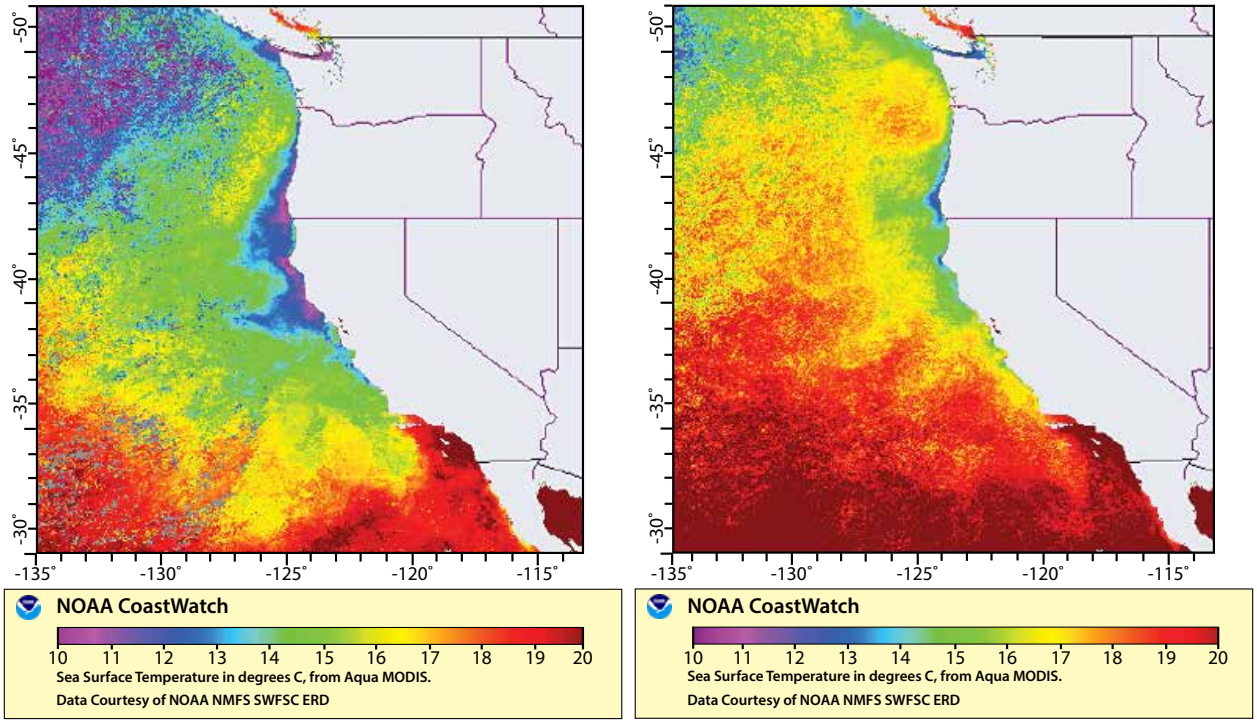


Establishing a Benchmark

Environmental Context

Observed ecological and human use patterns are driven in part by environmental variability and a changing climate. An important goal of MPA monitoring is to understand changing oceanographic patterns and their implications for MPA effectiveness.

Environmental conditions in the North Central Coast vary in response to three primary drivers: upwelling, freshwater runoff, and Pacific Ocean influences. The wind-driven coastal upwelling of cold, nutrient-rich waters and the patterns of freshwater runoff from the land combine to create a clear seasonality in the region.



Monthly average sea surface temperature for July 2011 (left) and July 2015 (right). Figure from North Central California MPAs: CeNCOOS Report on Environmental Conditions 2010-2015 (Largier et al 2015).

The large-scale conditions in the Northeast Pacific Ocean combine with these seasonal drivers to create large year-to-year differences in conditions.

The Central and Northern California Ocean Observing System (CeNCOOS) worked with regional partners to reveal important environmental fluctuations in the last five years, including:

- High freshwater runoff in early 2011, followed by low winter runoff persisting from 2012 to present, caused by the major, multi-year drought being experienced in California.
- Strong upwelling index in 2012, 2013 and 2014, with colder than usual water during upwelling season in 2012 and 2013.
- Anomalously warm surface waters in 2014 and 2015, and anomalously high sea levels in late 2014 and early 2015.
- A strong El Niño developing in 2015

The complex and dynamic oceanographic conditions highlight the importance of coupling environmental and ecological data collection and analyses. Efforts are underway to coordinate long-term ecological and oceanographic monitoring programs to understand the drivers and causes of observed changes.

Ecological Conditions and Human Uses

The North Central Coast MPA Baseline Program developed the first thorough characterization of the ecological and socioeconomic conditions of the region, creating a benchmark against which future MPA performance can be measured.

Linking to existing CDFW programs

CDFW operates long-standing monitoring programs that contribute important data and results for MPA monitoring. Kelp forest canopy coverage data have been collected using multispectral aerial imagery within variable time periods and regions from 1989 to present, and deepwater visual surveys of MPAs using a remotely operated vehicle (ROV) have been conducted since 2000. Each of these projects provides important historical context. The Baseline Program project that used aerial imagery to map habitats also used these kelp canopy data to develop maps of kelp persistence in the region, providing a deeper understanding of the patterns of variation over time. New ROV surveys are being conducted in the North Central Coast throughout 2015, as part of CDFW's statewide effort to continue monitoring existing sites and establish new monitoring sites.

North Central Coast Benchmark — Hig

The results of 11 projects that comprise the Baseline Program are summarized in a Snapshot Report, released in 2013. Together, these projects blanketed the region, describing all Ecosystem Features present in the region, producing peer-reviewed technical reports, and delivering 85 publicly available data packages.

SOFT BOTTOM INTERTIDAL & BEACH

ROCKY INTERTIDAL

ESTUARINE & WETLAND ECOSYSTEMS

SOFT-BOTTOM INTERTIDAL & BEACH ECOSYSTEMS

- Kelp wrack, which supports a rich diversity of invertebrates and terrestrial birds, is four times greater on pocket beaches than long beaches.
- Due to geography and physical attributes, beach conditions varied widely throughout the year and across the region but were similar inside and outside MPAs.
- Academic and citizen scientists can collaboratively survey birds, sand crabs, surfperch, kelp wrack, and human uses to provide cost-effective, long-term monitoring of beaches.

ROCKY INTERTIDAL ECOSYSTEMS

- The region's rocky shores are teeming with life: researchers documented 256 rocky intertidal species across 19 monitoring sites.
- Most sites are dominated by attached red algae, mussels, and barnacles, with littorinid snails and limpets gliding over them.
- Select species of surfgrass, algae, mussels, and snails characterize the region's distinct rocky intertidal communities. These, together with other ecologically important species such as sea stars, could serve as indicators of change.

ESTUARINE & WETLAND ECOSYSTEMS

- Eelgrass bed coverage varies from 7% in Drakes Estero SMCA to 42% in Estero de San Antonio SMRMA. This habitat serves as vital nursery grounds and refuge for many species, including Dungeness crabs.
- Estuaries and wetlands contain a high diversity of habitats, from saltmarsh to mudflats, which in turn support a high biodiversity including shorebirds, fishes, and invertebrates.
- Ocean Imaging generated imagery at a resolution of 1-2 meters. High-resolution imagery like this can serve as an important tool for monitoring habitat shifts.

KELP & SHALLOW ROCK ECOSYSTEMS (0-30 M)

- Divers documented the cover or abundance of 129 species of fish, invertebrates, and algae.
- Kelp forests in the region support high abundance of blue rockfish and red sea urchins both inside and outside MPAs.
- Academic and citizen surveys produced similar results, and both are playing an important role in our understanding of ecosystem condition.

NON-CONSUMPTIVE USES

- People from North Central Coast counties make more than 22-million trips per year to their local coast, and coastal recreation contributes $1.2 billion annually to Bay Area economies.
- The most popular coastal activities were scenic enjoyment, going to the beach, photography, biking or hiking, and watching seabirds and other marine life from shore.

ghlights from Baseline Data Collection


KELP & SHALLOW ROCK


NON-CONSUMPTIVE USES


MID–DEPTH ROCK


SOFT BOTTOM SUBTIDAL


NEARSHORE PELAGIC


CONSUMPTIVE USES

MID-DEPTH ROCK ECOSYSTEMS (> 30-100 M) & SOFT BOTTOM SUBTIDAL ECOSYSTEMS

- Thousands of invertebrates, over 8,400 fish, and a variety of substrates were observed in the mid-depth and deep water ecosystems. A third of these fish were observed near the South Farallon Islands.
- Researchers identified 13 species of fish and invertebrates as potential indicators for long-term monitoring using underwater cameras, including lingcod, rock crabs, and plumose anemones.
- Taken together, biological surveys and seafloor maps have revealed important life history information about several fished species, including rockfishes and lingcod.

NEARSHORE PELAGIC ECOSYSTEMS

- Researchers documented over half-a-million seabirds, nearly 99% of which breed adjacent to MPAs, and 83% of which breed on the Farallon Islands alone.
- Long-term data from the U.S. Fish and Wildlife Service show positive trends in some species, such as a 379% increase in Common Murres from 1989 to 2012.
- Two strong upwelling events in 2008 and 2010 led to increases in phytoplankton productivity.
- Monitoring seabirds, which forage offshore and breed on land, can provide important insights into pelagic ecosystems, potentially acting as an indicator for systems that are challenging and costly to monitor.

For a complete list of North Central Coast MPA Baseline Program projects, go to page 26.

CONSUMPTIVE USES

- Annual commercial landings for fisheries of interest averaged 7.9 million pounds and $18 million in ex-vessel revenue from 1992-2013, with notable increases in the Dungeness crab fishery since 2009.
- Annual commercial revenue per Dungeness crab fisherman more than tripled, rising to $131,577 per fisherman after 2010. This is likely because of a peak in the natural cycle of Dungeness crabs, and increased fishing effort by both California and out-of-state fishermen.

- Charter fishing anglers dropped by more than half from 2000-2009, largely due to fishery restrictions (e.g., the 2008-2009 salmon closures) and the recent economic declines after the salmon fishery reopened in 2009. Charter fishing rebounded after the closure, but generally has not reached pre-closure levels.
- Recreational abalone harvesters contribute significantly to the coastal economy, spending an average of $1,000 per harvester on their sport in 2010, with Fort Ross and Timber Cove as the most popular sites.

Explore more of the Baseline Program monitoring results in the Regional Snapshot report, shown here.

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Broadening Participation in MPA Monitoring

A partnerships approach to MPA monitoring means broadening participation beyond conventional academic science. The Baseline Program explored the potential role for local experts and citizen science, through collaboration with three different existing programs (LiMPETS, Beach Watch, and Reef Check California) and one novel project working with recreational anglers.

- The LiMPETS (Long-term Monitoring Program and Experiential Training for Students) program brought 3,300 North Central Coast K-12 students from 60 schools to the coast, where they surveyed sandy beach and rocky intertidal ecosystems. The collaboration provided useful data, and feedback that can help improve the role of student volunteers in long-term monitoring of coastal ecosystems.

- Since 1993, adult volunteers in the Beach Watch program have conducted more than 14,000 surveys on 39 beaches in the region, collecting data on birds, marine mammals, and human activities. The resulting long-term data set provides a foundational understanding of the dynamic context of bird and mammal populations over the past 20 years.

- Highly trained volunteer divers with Reef Check California conducted yearly surveys of kelp and shallow rock ecosystems in the North Central Coast starting in 2006. This program was developed with rigorous academic input, collaboration with CDFW, and training from the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO), and provides a publicly available data set for the region.

- Scientists at UC Davis, Sonoma State University, and UC Santa Barbara collaborated with CDFW and 49 recreational anglers to design and implement a novel protocol for surveying surf zone fishes. They developed a catch-and-release method that collects data compatible with CDFW ongoing monitoring, creating a cost-effective approach for expanding surf perch surveys.

Connecting the Dots

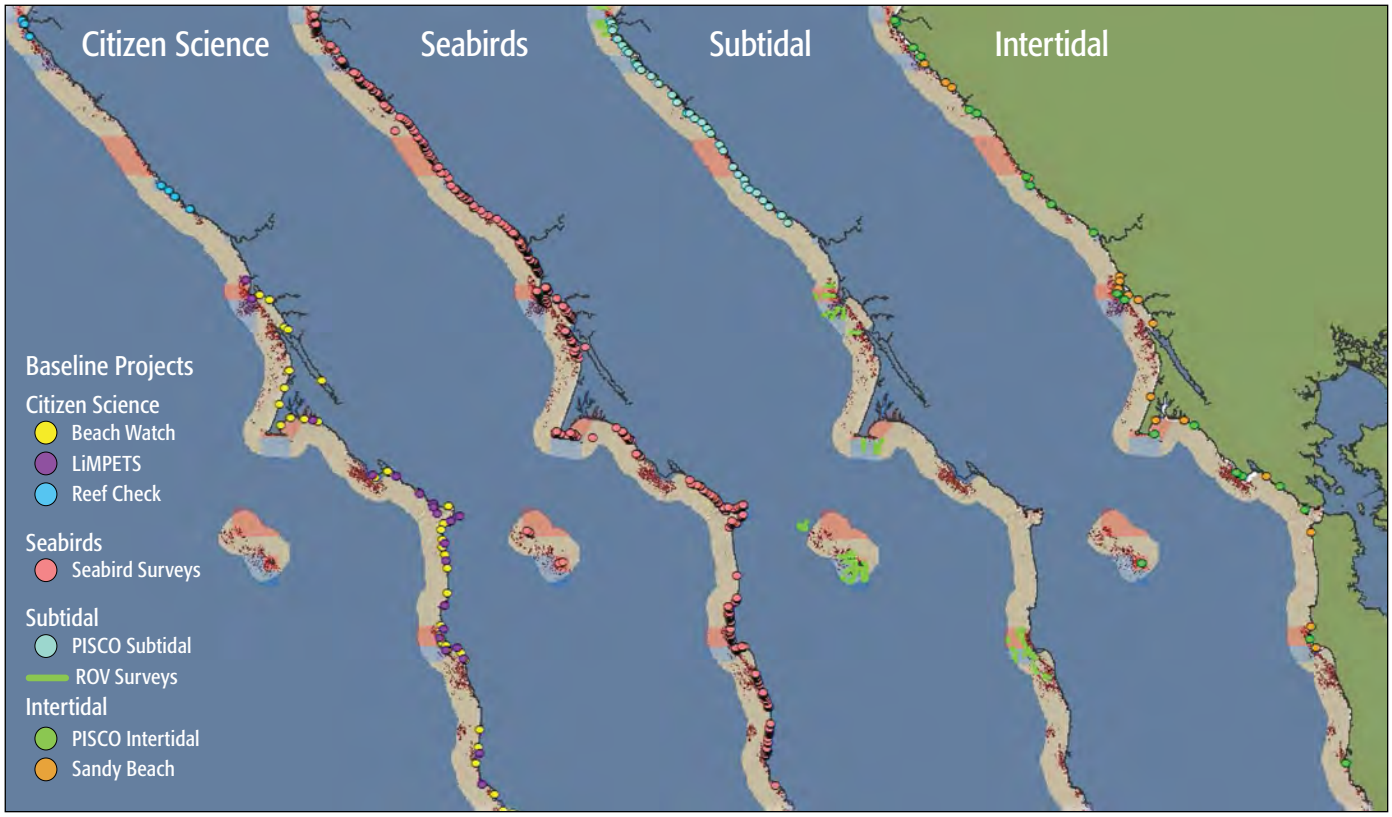
A particular challenge of MPA monitoring is bringing together data from a wide diversity of projects, to develop an integrated view of these complex, interconnected systems. Mulitple collaborations among the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO), CDFW, Ocean Science Trust, and many others, produced several such integrative projects, which have added depth to our understanding of the region in the initial five years since MPA implementation.

Connections among ecosystems: kelp forests, rocky intertidal zones, bays and sandy beaches

Sandy beach ecosystems rely on inputs of beach wrack — tangled piles of washed up seaweed and sea grasses — from kelp forests, rocky intertidal habitats, and estuaries and bays. New analyses revealed the particular importance of these local productive habitats for supplying the wrack, while wind, waves, and beach characteristics also play a role. These connections among habitats and ecosystems are an important consideration in effective management of the regional MPA network.

Layering patterns of biodiversity

Different Ecosystem Features are necessarily monitored in different ways, and linking the resulting data sets presents a technical challenge. Researchers explored ways to reveal meaningful patterns across baseline monitoring projects, and identified species richness (the total numbers of species found during surveys) as a common currency. They then tested approaches to mapping this metric across diverse projects and geographies to get a broad view of biological richness patterns across the region.



Distribution of Baseline Program biological sampling sites, aligned to visualize monitoring efforts and cross connections throughout the region. Map from Integrating Spatial Data into Marine Protected Area Monitoring and Management (Williams et al 2015), an integration project of Ocean Science Trust, CDFW, and CSUMB. See page nine for MPA designations.

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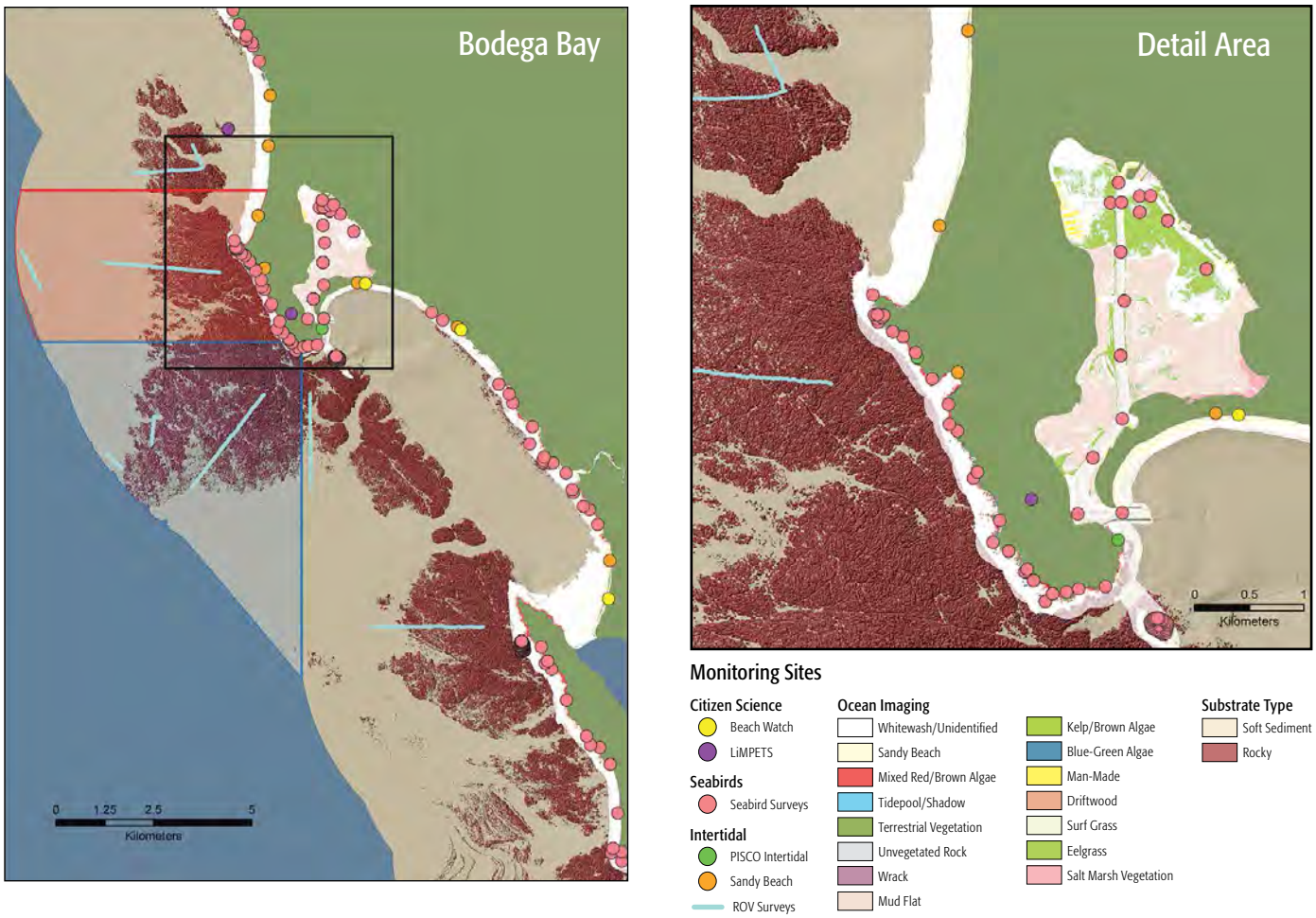

Example of the synthesis of CSCMP seafloor mapping, Baseline Program habitat mapping, and biological monitoring data in Bodega Bay, CA. Figure from Integrating Spatial Data into Marine Protected Area Monitoring and Management (Williams et al 2015).

Taking geographic patterns into account

The geology and structural complexity of the seafloor is an important factor in the distribution of habitats for marine plants, algae, and animals. A team of researchers and managers explored the complementary resources of the seafloor data from the California Seafloor and Coastal Mapping Program (CSCMP) and the biological data from the Baseline Program. They identified Point Arena, Bodega Bay, and Half Moon Bay as locations with strong potential for deepening our understanding of the region by linking these data sets. Linking seafloor habitats with overlying biological data in these locations sets the stage for coordinating future efforts.

Linking ecology and human use of fished populations

Connecting fisheries data (e.g., commercial logbook and landings information, rockfish catches by charter boat anglers) with ecological data about fish populations collected by MPA monitoring projects (e.g., fish abundance) can help us understand the utility of these data for informing fisheries and MPA management. Researchers identified ways that these data can be tied together, identified mismatches, and highlighted ways to align spatial, temporal, and species-level data collection to allow deeper analyses.

Exploring Initial Changes

Baseline monitoring focused on conditions in the North Central Coast at the time of MPA implementation. However, we can also gain valuable insights from programs that have collected data at specific locations for many years. Significant changes in marine life populations are not expected within five years, but some initial changes provide early hints of how ecosystems may change into the future.

Promising signs at Stornetta

Prior to MPA implementation, Stornetta Ranch was a *de facto* reserve until it was opened for coastal access and recreational fishing in 2004. Long-term monitoring data from CDFW and the Multi-Agency Rocky Intertidal Network (MARINe) show that the total population declined, as did the population of red abalone that were of legal size to collect for recreational fishing. The establishment of the Sea Lion Cove SMCA added protection for the marine communities, and 2010 marks the beginning of a dramatic increase in both legal-sized and total number of red abalone, which has continued through 2015. This increase in legal-sized red abalone means there are more large, highly reproductive females, and could lead to documented "MPA spillover effects," in which high abalone populations in a reserve start to populate the areas outside of the reserve.

Rockfish on the rise?

Initial observations from the CDFW deep water ROV surveys in 2015 revealed some notable trends in several species of fish and invertebrates. Throughout both fished and non-fished sites in the region, researchers observed increased abundances of canary, china, and brown rockfishes, as well as lingcod, as compared to surveys in 2009 and 2011. The most striking of these changes was in the number of brown rockfish, increasing from five to several hundred throughout all sites in the region. The drivers of these trends are uncertain, and researchers are conducting further analyses to reveal any site or MPA specific changes.

Unexpected Kelp forest declines

Recent surveys from Reef Check California found surprisingly reduced kelp forests, followed by high sea urchin densities surpassing anything seen in the region over the past ten years of data collection. Researchers are examining the potential role of unusually warm waters in leading to decreased kelp (an important food supply), driving hiding urchins out into the open to search for food. The disappearance of urchin predators due to the sea star wasting syndrome may also play a role, and continued monitoring and assessments will help clarify the causes of these changes.

Fishing opportunities continue

Commercial and recreational fisheries can fluctuate in response to a multitude of factors. Aggregated CDFW commercial fishery data from 1992 through 2013 found that after a dip through the late 2000s, the total landings and ex-vessel revenue, as well as the number of fishermen and landings per fisherman, increased between 2010-2013. Landings and revenue reached levels comparable to those in the 1990s, largely due to increases in the Dungeness crab trap and market squid fisheries.

CDFW records for recreational fisheries (including fishing from private vessels, charter vessels, beaches, and piers) show that the number of fishing trips and fish caught decreased to a low in 2008, increased in 2009, and for charter and private vessels, continued to rebound through 2013.

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Informing Ocean Management Decisions

The wealth of knowledge about this region from MPA monitoring is useful for a wide range of ocean resource management decisions. From tracking the effects of a changing climate to managing fisheries, MPA monitoring results are being put to work to serve California broadly.

Tracking the Impacts of a Changing Climate

Climate change has profound implications for ocean health, fishing industries, recreation, and other human uses. The MPAs are living laboratories, an important resource for understanding ocean health in the face of a changing climate. What we learn about climate change from MPA monitoring can benefit ocean resource management in other arenas, such as fisheries. It is also important to incorporate an evolving understanding of climate change into MPA management, as we track progress toward MLPA goals. Many state, federal, academic, and other partners, such as the Greater Farallones National Marine Sanctuary (GFNMS), Ocean Science Trust, CDFW, and California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA) are working together on this challenge.

Building Coupled Ocean Acidification and MPA Monitoring Programs

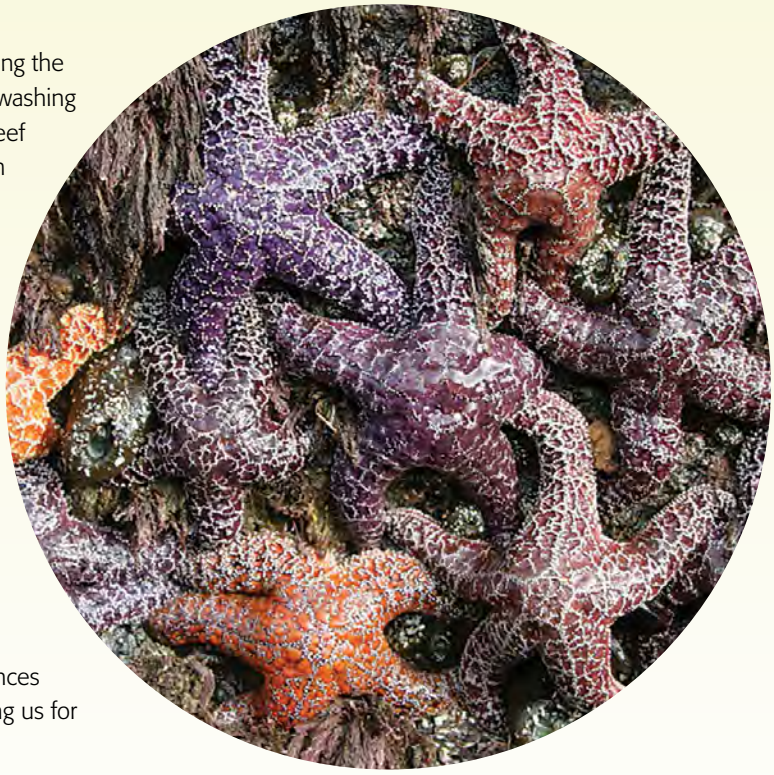
The West Coast Ocean Acidification and Hypoxia (OAH) Science Panel explicitly recognizes the region-wide value of the ecological data produced through MPA monitoring. These data create a crucial pathway to inform cross-jurisdictional adaptation and mitigation strategies to ameliorate impacts and enhance ecosystem resilience.

Linking Natural Resource and Water Quality Management

Water quality information provides important context for understanding the drivers of ecosystem condition and for interpreting trends. In the 1970s, the State Water Resources Control Board (SWRCB) established water quality protection areas, called Areas of Special Biological Significance (ASBS), throughout California. Nine of these ASBSs were established in the North Central Coast, and they are monitored and maintained for water quality by the SWRCB. Ocean Science Trust, SWRCB, and UCSC are exploring collaborations to coordinate data collection activities across programs. Leveraging resources, capacity, and expertise across water quality and MPA monitoring programs will increase our understanding of ecosystem condition and trends, and will result in more efficient and cost-effective monitoring programs.

Alerting Decision-makers to Unexpected Events

In 2011, a severe invertebrate die-off event occurred along the Sonoma Coast, resulting in thousands of dead abalone washing ashore. Monitoring projects led by CDFW, PISCO, and Reef Check led to nimble management responses by the Fish and Game Commission, and contributed to a thorough accounting of population changes before and after the die-off. The timely data collection, made possible by the already-existing network of collaborating government, academic and citizen science researchers, ensured that we have this event on record to understand the causes and examine future population dynamics.



Starting in 2013, a wasting syndrome caused a mass die-off of sea stars across the West Coast. Long-term monitoring programs, including CDFW, MARINe, PISCO and LiMPETS, gave California an early start on tracking progression of the outbreak. Today, the data allow us to explore the causes and assess the ecological consequences of this die-off on the marine community, better preparing us for capturing and learning from future events.

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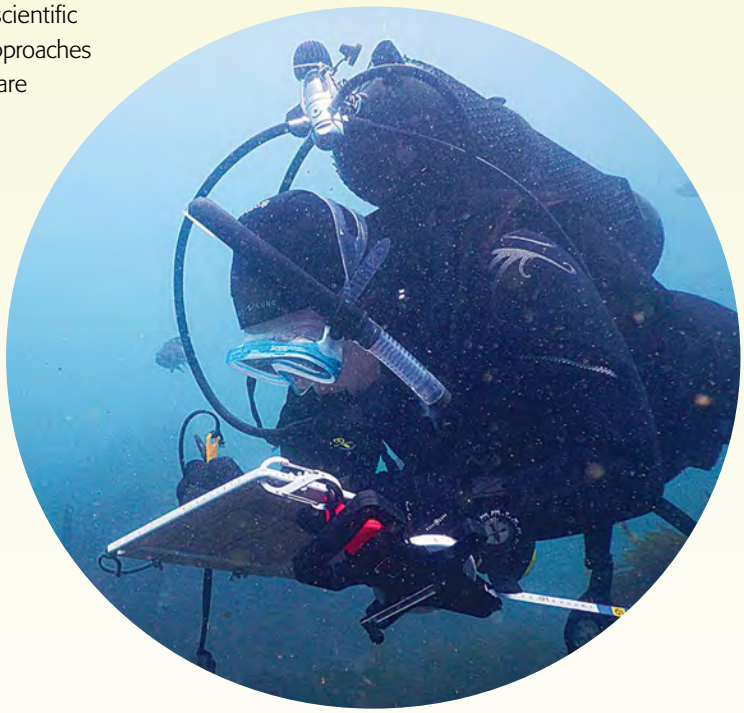
Looking Forward: Planning for Long-Term Monitoring

Learning from Baseline Monitoring

Baseline monitoring has provided California with novel scientific findings, strengthened partnerships, and new tools and approaches that have established a strong foundation. Together we are well positioned for the next phase of MPA monitoring in the North Central Coast and statewide.

In addition to what we have learned from the last five years, long-term MPA monitoring will take into account capacity in the region and the priorities of CDFW and other state partners. MPA monitoring results can be integrated across regions to inform statewide MPA network evaluation.

Baseline monitoring focused on indicators and focal species listed in the North Central Coast MPA Monitoring Plan. Scientific results and lessons learned from these projects will help us to hone our approach to the next phase, as we develop coordinated long-term monitoring in the region.



Testing New Methods and Tools

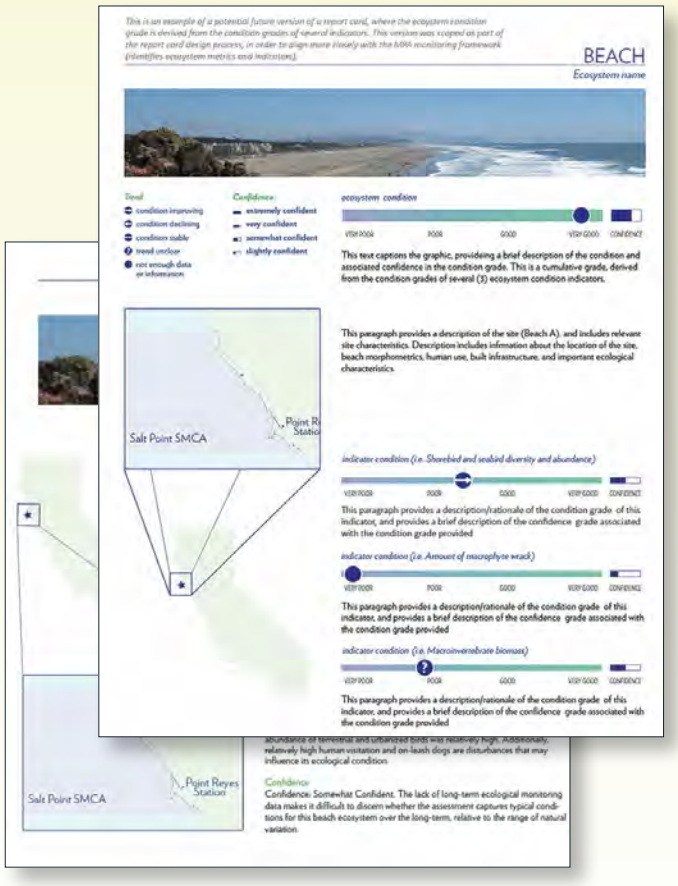
As management and policy needs change within the fluid landscape of technological advances, changing environmental drivers, and rapid ecological responses, new tools can help address future decision-making challenges.

Updating new indices of ocean condition

The Multivariate Ocean Climate Indicator (MOCI) is a climate index developed during the Baseline Program to assess the impacts of climatic variables on ecological changes. Researchers are building on this progress to streamline the metrics, create publicly available quarterly updates, and expand the methods along the California coast.

Piloting a report card for ecosystem health

Ecologists and managers collaborated to develop a process for assessing the condition, or health, of California's marine ecosystems using expert judgment. In a recent case study, experts used baseline monitoring data from the beach and surf zone project, together with data from local and federal agencies, to test the process and pilot a report card for communicating results. Through this work, we have developed an approach that concisely displays the results of monitoring and could be used to communicate results broadly. We will continue to refine this process and tool, together with state partners and experts.



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Filling in the nearshore "White Zone"

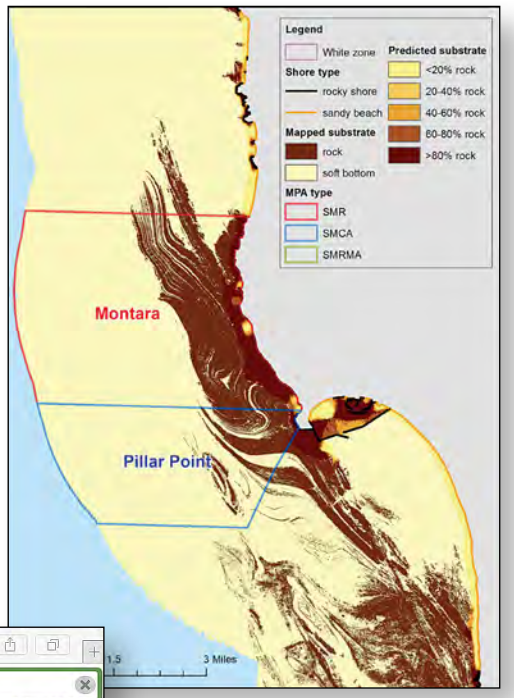
The State's investment in the California Seafloor and Coastal Mapping Program created a wealth of benthic habitat data, yet there remains a key data gap in shallow water (<10m) due to navigational hazards and the challenges of operating in dense kelp forests. This area has been called the "White Zone" due to its common representation on maps as a white space. Researchers and managers developed new methods to leverage the existing data to create predictive maps of seafloor characteristics in the white zone.

These predictive maps support a range of management efforts, such as population modeling, and setting expected rates of population change within MPAs to better evaluate MPA performance. The complete set of maps for the North Central Coast is publicly available through the CDFW web mapping and geographic information system (GIS) data distribution platform, MarineBIOS, and the newly developed methods are now being applied to the white zones across the whole state.

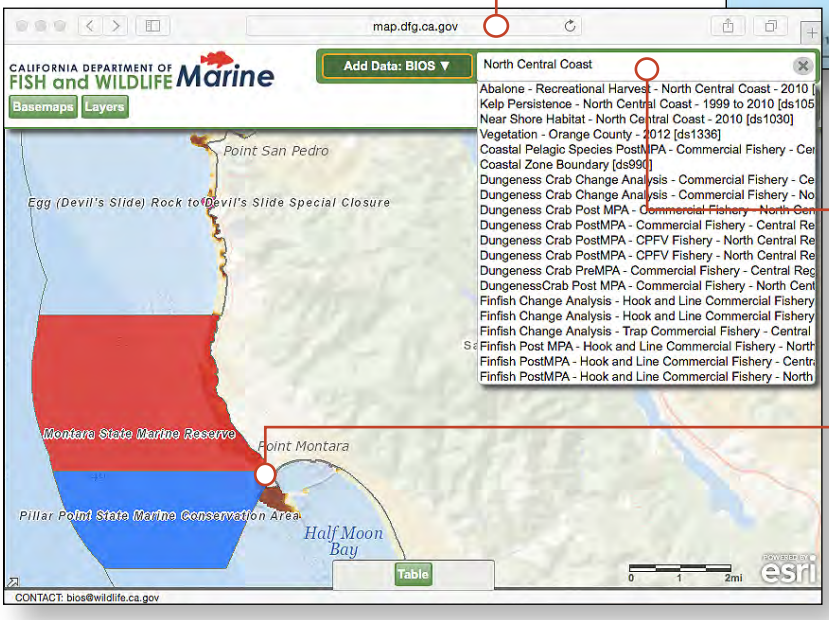
Figure shown at right is from the North Central Coast MPA Baseline Program Integration: Filling in the Nearshore "White Zone" (Saarman et al 2015).

Interactive Mapping

CDFW is working with Ocean Science Trust, PISCO, interns from California State University Monterey Bay (CSUMB), and many others to bring in new data sets as map layers on MarineBIOS. This site will continue to be updated with new layers as they become available, to provide publicly available data and searchable maps of monitoring results, regulatory boundaries, and relevant marine resource planning data. It's a great place for looking up the boundaries and regulations of marine protected areas or investigating the attributes of benthic and intertidal habitat information.



Visit CDFW's public, interactive map and data access service at:
https://map.dfg.ca.gov/marine



Search for North Central Coast monitoring data in the BIOS data catalog, to add layers to your map or download source GIS data.

Use a variety of interactive map and data tools to explore habitats, MPA boundaries, and resource management features, and add layers to explore overlaps (MPAs and "white zone" layers shown here).

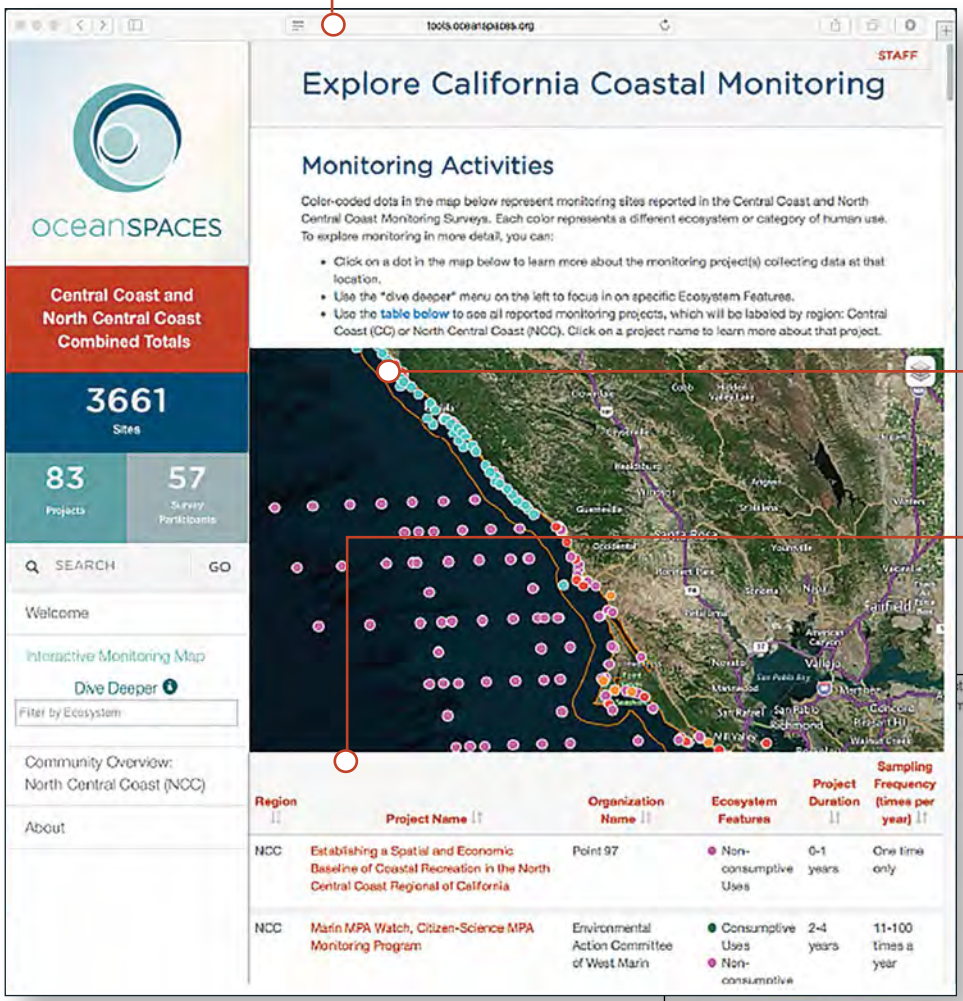
Building Partnerships and Leveraging Existing Capacity

The North Central Coast Monitoring Survey is providing a detailed picture of the current monitoring capacity in the region. The results help identify the geographic and temporal coverage of monitoring activities inside and outside of the region's MPAs, and the compatibility of those activities with the metrics and priorities outlined in the North Central Coast MPA Monitoring Plan. The survey results are publicly available through an interactive Dashboard, an online platform to learn about and connect with the monitoring community.

Results will help Ocean Science Trust, CDFW, OPC, and partners design and implement a partnership-based plan for cost-effective, long-term MPA monitoring.

Learn about the monitoring community.

Visit the interactive dashboard of monitoring programs in the North Central Coast at: http://tools.oceanspaces.org



Explore monitoring programs by ecosystem feature or by zooming in to the area of interest on the map.

Find out details about each project through the sortable table.

Learn about the types of organizations conducting monitoring in your region.

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NORTH CENTRAL COAST MPA BASELINE PROGRAM PROJECTS

1. **Baseline Characterization of Sandy Beach and Surf Zone Ecosystems** (Sonoma State University, UCSB, UC Davis)
2. **Baseline Characterization of Birds, Mammals and Human Uses** (Beach Watch)
3. **Baseline Characterization of Rocky Intertidal Ecosystems** (PISCO, UCSC)
4. **Baseline Characterization of Rocky Intertidal and Sandy Beach Systems** (LiMPETS)
5. **Baseline Characterization of Kelp Forest Ecosystems** (PISCO, UCSC)
6. **Baseline Characterization of Kelp Forest Ecosystems** (Reef Check California)
7. **Baseline Characterization of Soft and Rocky Deep Water Ecosystems** (CSUMB, IfAME, MARE, NPS)
8. **Baseline Characterization of Nearshore-foraging Seabirds** (USFWS, Point Blue Conservation Science)
9. **Baseline Characterization of Human Uses** (EcoTrust)
10. **Nearshore Habitat Mapping Using Multispectral Aerial Imagery** (Ocean Imaging)
11. **Characterization and Indicators of Oceanographic Conditions** (Farallon Institute)

TABLE OF ACRONYMS

CDFW	California Department of Fish and Wildlife
CeNCOOS	Central and Northern California Ocean Observing System
CSCMP	California Seafloor and Coastal Mapping Program (also known as CSMP)
CSUMB	California State University, Monterey Bay
GFNMS	Greater Farallones National Marine Sanctuary
IfAME	Institute for Applied Marine Ecology
LiMPETS	Long-term Monitoring Program and Experiential Training for Students
MARE	Marine Applied Research and Exploration
MARINe	Multi-Agency Rocky Intertidal Network
MLPA	Marine Life Protection Act
MPA	marine protected area
NPS	National Park Service
OAH	ocean acidification and hypoxia
OEHHA	Office of Environmental Health Hazard Assessment
OPC	Ocean Protection Council
PISCO	Partnership for Interdisciplinary Studies of Coastal Oceans
ROV	remotely operated vehicle
SMCA	State Marine Conservation Area
SMR	State Marine Reserve
SMRMA	State Marine Recreational Management Area
SWRCB	State Water Resources Control Board
UCSB	University of California Santa Barbara
UCSC	University of California, Santa Cruz
USFWS	United States Fish and Wildlife Service

Citation: State of the California North Central Coast: A Summary of the Marine Protected Area Monitoring Program 2010-2015. California Ocean Science Trust and California Department of Fish and Wildlife. California, USA. November 2015.

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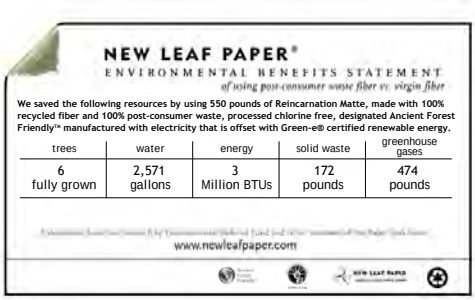

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MEMORANDUM

TO:	**Mike Yaun, Interim Executive Director, California Fish and Game Commission**
CC:	**Susan Ashcraft, Interim Deputy Director, California Fish and Game Commission**
FROM:	**Michael DeLapa, Interim Executive Director, California Ocean Science Trust**
DATE:	**March 30, 2016**
REGARDING:	**North Central Coast Community Engagement: Sharing the *State of California North Central Coast* Report for Marine Protected Areas**

California Ocean Science Trust, California Department of Fish and Wildlife (CDFW,) and California Ocean Protection Council (OPC), developed a comprehensive State of the Region Report (*State of the California North Central Coast: A Summary of the Marine Protected Area Monitoring Program 2010-2015*). The State of the Region Report includes a wide portfolio of products developed by the North Central Coast MPA Baseline Program and partners from 2010-2015. The report was developed to provide a comprehensive science foundation to inform the California Fish and Game Commission's five-year management review of the region's MPAs, and serve as a resource to the public.

Ocean Science Trust and its partners are committed to developing and maintaining an engaged community to support MPA monitoring and management. Community involvement is important to ensuring that data collected to inform decision making reflects local knowledge, expertise, and priorities. All North Central Coast reports, data, and outreach products are shared publicly on OceanSpaces.org/nccsotr.

Working in coordination with CDFW and OPC, Ocean Science Trust initiated community engagement efforts throughout the North Central Coast in early 2015 to:

- (Re)introduce Ocean Science Trust to members of the North Central Coast ocean community and continue to support and maintain open lines of communication with key leaders.
- Learn about the most effective ways to connect and communicate with key audiences (e.g., tribal governments, fishing communities, environmental organizations, citizen scientists, academic institutions, etc.), including how local community members would like to receive baseline results and reporting.
- Provide the North Central Coast ocean community with a status of ongoing monitoring, evaluation, and adaptive management of North Central Coast MPAs.
- Present the State of the Region Report to help audiences build understanding and awareness of MPA monitoring data/results from the baseline period.
- Explore local priorities for long-term monitoring, including the potential role of partnerships.

Over the past twelve months, Ocean Science Trust and its partners designed and implemented a suite of formal and informal engagement strategies, including:

- Conducting tribal outreach (for additional details, see the Tribal Engagement Summary, attached to the Memo titled *Summary of the North Central Coast State of the Region Report,* submitted to the Fish and Game Commission on January 28, 2016).
- Identifying and subsequently working with a group of "key communicators" (i.e., leaders with access to key constituencies across diverse local ocean communities).
- Conducting informal informational interviews with community leaders.
- Attending local community events.
- Presenting at the Western Society of Naturalists meeting.
- Hosting a series of community gatherings and small group discussions throughout the North Central Coast.
- Utilizing traditional media and social media to promote baseline results.
- Releasing a North Central Coast Monitoring Survey and interactive results dashboard.

Each of these activities is described below.

Engaged with North Central Coast Tribes: Ocean Science Trust is deeply invested in establishing an open dialogue with North Central Coast tribes, and exploring opportunities to collaborate and partner on shared areas of interest related to MPA monitoring. Please see the Tribal Engagement Summary for a full discussion of tribal engagement efforts in this region from 2013-2015.

Key Communicators: Guided by existing relationships and contacts in the region, as well as information gathered during initial scoping interviews conducted in late 2013, Ocean Science Trust developed a list of 35+ active key communicators to support local engagement efforts. These individuals have direct access to our primary target audiences, and are willing to play a liaison role to disseminate information and encourage involvement in community discussions. Key communicators have helped to inform appropriate communications tools and mechanisms, identify local events to attend to share baseline results and build relationships, and provide feedback on materials development. Key communicators have also highlighted the State of the Region Report via e-newsletter articles, blogs, and social media posts in an effort to share key findings with their constituents. Ocean Science Trust maintains regular communication with this group, providing progress updates and soliciting support.

Informational Interviews: In Spring 2015, Ocean Science Trust conducted informal interviews with key communicators to (re)introduce Ocean Science Trust and the baseline program, learn how to engage with the local community, explore existing research and monitoring activities in the region, and identify community-led events that might be appropriate for Ocean Science Trust to participate in to share baseline results. Twenty-six informational interviews captured perspectives from a range of key

audiences, including tribal, state and local government, fishing (commercial and recreational), citizen science, academic, and environmental nonprofit organizations.

Attended Local Community Events: Prior to the completion and release of the North Central Coast State of the Region Report, Ocean Science Trust attended three local, community-led events. Participation in these events offered Ocean Science Trust an opportunity to share resources and timelines for North Central Coast baseline reporting, announce the upcoming release of the State of the Region Report, and engage informally to learn about local community priorities for monitoring. The three events Ocean Science Trust attended were:

- *Discover the Coast* at Point Arena, hosted by the Bureau of Land Management (August 1, 2015)
- *Success Stories for California Marine Life*, movie and discussion series hosted by The Bay Institute and Aquarium of the Bay (September 17, 2015)
- *First Annual Half Moon Bay "Fish and Fleet" Festival*, hosted by the Half Moon Bay Fishing Association (September 27, 2015)

Presented at the Western Society of Naturalists (WSN) Meeting: The WSN meeting is an annual gathering of scientists and graduate students with a general focus on marine ecology. Over 600 attendees participated in the November 2015 meeting, which was hosted by Ocean Science Trust and included a specific focus on "Marine Science Informing Management". This theme provided the opportunity to showcase some of the work produced for the North Central Coast State of the Region report, including:

- 22 talks in MPA sessions, and 15 talks in Long-Term Monitoring sessions
- 7 talks specific to the North Central Coast research, monitoring, and management (presented by CDFW, Ocean Science Trust, and North Central Coast MPA Baseline Program researchers)
- 3 posters specific to the North Central Coast research, monitoring, and management (presented by CDFW and Ocean Science Trust)
- 3 exhibitor tables distributing the State of the Region Report and information on the complete portfolio of supporting documents (presented by CDFW, OPC, and Oceanspaces)
- North Central Coast MPA Baseline Program projects presented during the Plenary presentation

Hosted Community Gatherings and Small Group Discussions: A series of formal and informal gatherings were convened throughout the North Central Coast to continue building relationships with members of the local ocean community and share baseline reporting.

Community Gatherings - Ocean Science Trust, in coordination with CDFW and OPC, held a series of community gatherings throughout the North Central Coast to share the results of the North Central Coast MPA Baseline Program and related assessments. Members of the North Central Coast ocean community were invited to gather in an informal setting to: learn about the recently released North Central Coast State of the Region Assessment, including how baseline results may be useful to community interests; provide insights on how to make the baseline results widely accessible to the local ocean community; and begin discussing monitoring activities beyond 2015, including opportunities for partnership building and broadening the knowledge base that informs MPA monitoring in the region.

Small Group Discussions - Ocean Science Trust also met with community leaders over informal, one-on-one conversations (or "cups of tea") as another opportunity to learn about monitoring interests and priorities. These conversations also provided a venue to discuss specific projects and/or key findings of baseline monitoring results, as well as ways to maintain an open line of communication with key audiences.

A Summary of Key Themes (http://bit.ly/NCC_keythemes) from these meetings was shared with attendees, as well as on OceanSpaces.org, to help inform future community engagement and long-term MPA monitoring.

Additional details:

- Community gatherings were held in three locations:
  - Gualala *(December 1, 2015)*
  - Bodega Bay *(December 2, 2015)*
  - Half Moon Bay *(December 3, 2015)*
- More than 120 community members attended these events, including tribal members, commercial and recreational fishermen, citizen scientists, environmental organizations, educational institutions, researchers, and community members with general interest in the MPA monitoring and ocean health.
- Nine "cups of tea" were held with local community members to discuss MPA monitoring in-depth.

Communicated Broadly through Traditional Media and Social Media Platforms: Radio and newspaper coverage, coupled with social media, offered additional mechanisms to broadly share baseline results. Details include:

- Radio broadcasts
  - KQED *(December 1, 2015)*
  - KCBS *(Dec 7, 2015)*
- Newspaper articles
  - Daily Journal Local News
  - Press Democrat
  - Marin Independent Journal
  - Independent Coast Observer
  - Half Moon Bay Review
  - San Mateo Daily Journal
- Social media coverage
  - The State of the Region Report and stories, in addition to information about the community gatherings, were shared in blogs, e-newsletters, Facebook posts, Tweets, community calendars, email listservs, and other venues. Information was additionally shared via the website OceanSpaces.org and the MPA Collaborative Network.
  - OceanSpaces.org, the website which hosts the State of the Region Report and portfolio of products, served as a well-used resource for the public. Analytics describing site visitation as of January 5, 2015 include:

- 1460 pageviews (across the seven pages the comprise the Assessment)
- 665 downloads of the report *State of the California North Central Coast: A Summary of the Marine Protected Area Monitoring Program 2010-2015* and portfolio products, from the landing website (www.OceanSpaces.org/nccsotr)
- Visitors reached the site from a number of channels, including Direct links, Google searches, Oceansciencetrust.org, OceanSpaces Newsletter, Yubanet.com, Facebook, Twitter, and OPC.ca.gov.

Conducted a Monitoring Survey and Released the Monitoring Survey Results Dashboard: In August 2015, Ocean Science Trust released the North Central Coast Monitoring Survey. The survey is designed to identify the geographic and temporal coverage of monitoring activities inside and outside of the region's MPAs, as well as assess the compatibility of those monitoring activities with the metrics and priorities outlined in the North Central Coast MPA Monitoring Plan. Ocean Science Trust, CDFW, and OPC will use the publicly available survey results to help design and implement a partnership-based plan for long-term monitoring inside and outside North Central Coast MPAs. Details include:

- The Monitoring Survey (http://bit.ly/NCC_monitoringsurvey) was launched on August 2015. As of March 2016, the survey was completed by 14 organizations, with 21 projects, and a total of 2096 sampling sites across all North Central Coast projects. The survey will remain live indefinitely, allowing new programs to participate as they are developed to maintain an up-do-date record of current capacity.
- The Monitoring Survey Results Dashboard (http://tools.oceanspaces.org/) provides live updates of any new survey results, allowing an accurate representation of monitoring activities taking place within the region.

State of California
Department of Fish and Wildlife

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Memorandum

Date: March 24, 2016

To: Mike Yaun
Acting Executive Director
California Fish and Game Commission

From: Charlton H. Bonham
Director

Subject: Management Review of the North Central Coast Marine Protected Areas

Overview

On August 5, 2009, the Fish and Game Commission (Commission) adopted 25 new and revised north central coast marine protected areas (MPAs) and six special closures that were implemented into regulations on May 1, 2010. This region is part of a statewide network of 124 MPAs designed to meet the goals of the Marine Life Protection Act (MLPA), including protecting marine populations, habitats and ecosystems, improving sustainable human use of our ocean, and protecting marine natural heritage. The north central coast MPAs encompass approximately 152 square miles or 20 percent of state waters between Alder Creek near Point Arena (Mendocino County) and Pigeon Point (San Mateo County), including state waters surrounding the Farallon Islands. As provisions in the MLPA require monitoring, research, and evaluation to facilitate adaptive management, the purpose of this memorandum is to transmit the Department of Fish and Wildlife's (Department) management review of the north central coast MPAs to the Commission.

The north central coast region is the second of four regions to complete a MPA baseline monitoring program. The North Central Coast MPA Baseline Program (Baseline Program) is a partnership between the Department, Ocean Science Trust (OST), Ocean Protection Council (OPC), and California Sea Grant. The Baseline Program in the north central coast included 11 projects selected to monitor a broad range of species, habitats, human uses, and patterns of ocean currents in the region. Data collected from these projects, and additional monitoring over the first five years of MPA implementation in the region, provides the State with a characterization of the habitats, biological communities, socioeconomic conditions, and initial changes since the new and revised MPAs were implemented. To inform management recommendations from the first five years of MPA implementation in the region, a State of the California North Central Coast (State of the Region) report was developed in November 2015. The report provides a summary of the Baseline Program and includes other related materials from other monitoring activities during the first five years of MPA implementation in the region (http://oceanspaces.org/nccsotr).

Scientific Learning from Baseline Monitoring
Based on monitoring over the first five years of MPA implementation in the region, the north central coast MPAs contain a variety of representative marine habitats and ecosystems with distinct biological communities which contribute to achieving the ecological goals of the MLPA. Environmental conditions in the region fluctuate from year to year. However, the last several years have been marked with exceptional and unusual oceanographic conditions, demonstrating the value of monitoring to detect changes to biological communities beyond those directly resulting from MPAs.

In 2011, a harmful algal bloom event caused a severe invertebrate die-off along the Sonoma County coast, and led to a temporary emergency closure of the red abalone fishery by the Commission. Beginning in 2013, a mass die-off of sea stars caused by a wasting syndrome took place across the North American west coast. In 2013-2014 an unusual persistent ridge of atmospheric high pressure in the northeastern Pacific Ocean led to an enormous mass of unusually warm ocean water known as – "The Blob" – setting sea temperature records. The 2015-16 El Niño event is presently maintaining temperature anomalies similar to the 1982-1983 and 1997-1998 El Niño events.

Recreational and commercial fishermen reported the loss of some traditional fishing grounds, traveling farther to fish, and increased fishing pressure in the remaining open fishing areas due to MPAs. However, socioeconomic data demonstrated that fishing continues to be an integral part of the north central coast ocean economy, along with scenic enjoyment, photography, wildlife viewing, and research charters.

Management Recommendations
California's MPAs are designed, and managed, to the extent possible, as a statewide network. Management from the perspective of the statewide network is informed by lessons and best practices from the statewide, regional and local scales. While regulatory changes based on the Baseline Program data are not recommended at this time, opportunities exist to continue to improve the MPA Management Program through four focal areas: monitoring and research, enforcement and compliance, outreach and education, and policy and permitting. Based on experience gained over the last five years implementing and managing the north central coast MPAs and input from partners, Tribes and Tribal governments, and stakeholders, the Department has the following management recommendations:

<u>Monitoring and Research</u>

- Continue to support a partnership-based monitoring approach to leverage capacity across the state and establish cost-effective and sustainable long-term MPA monitoring and research through the Statewide MPA Monitoring Program.
- Continue to work closely with partners to adapt and draw from regional activities to establish a Statewide MPA Monitoring Program that gathers sufficient information to evaluate the efficacy of the statewide MPA network relative to the MLPA goals.

- Develop improved approaches to communicate monitoring results and information to broad audiences about the efficacy of the MPA network relative to the MLPA goals.
- Explore with partners how MPA science and management can align with other management efforts such as fisheries, water quality, and climate change.

Enforcement and Compliance

- Utilize available technology to make regulatory activities more efficient and effective, including identifying areas of high priority.
- Maintain and enhance cooperative interagency MPA enforcement efforts to improve efficiency.
- Continue to explore new and emerging technology options for increased MPA enforcement efficiency. Identify metrics to be collected in the field to better track MPA compliance.
- When appropriate, change or adopt regulations to simplify or clarify specific language to improve compliance.

Outreach and Education

- Continue to work with partners throughout the state to improve compliance and build public awareness and understanding of California's MPA network through outreach, education, communication, and interpretation activities.
- Continue to communicate directly with the public on a regular basis, and develop outreach materials and resources focused on regulation compliance.
- Coordinate with partners to leverage resources, prioritize accurate, consistent, and cohesive key messages across MPA signage, communication mechanisms, and audiences to support MPA management priorities.
- Work with partners on educational programs that support MPA goals, with special focus on statewide strategies and broadening outreach efforts to unaware communities, including ocean users that indirectly impact marine resources.

Policy and Permitting

- Continue to provide biological data and expertise to inform the Commission's policy, adaptive management, and regulatory decision-making processes.
- Implement an updated MLPA Master Plan for MPAs to shift the focus of programmatic MPA guidance from planning to managing the MPA network.
- Continue planning with the MPA Statewide Leadership Team to increase coordination between permitting agencies and improve governance.
- Continue to work with OPC's Science Advisory Team to develop an ecological impact assessment tool to identify potential cumulative impacts prior to issuing a scientific collection permit within MPAs.

Adaptive management, as defined by the MLPA (Section 2852(a), Fish and Game Code) is an ongoing process which seeks to improve management by learning from program actions such as monitoring, evaluation, and other management actions that affect the MPA network. For example, regulatory adjustments have been recommended by the Department and adopted by the Commission to improve boundary accuracy and clarify regulatory language to improve network compliance and enforceability. Adaptive management coupled with a commitment to a partnership-based approach will continue to set the foundation for managing California's MPA network.

If you have any questions or need additional information, please contact Dr. Craig Shuman, Regional Manager of the Marine Region, at (805) 568-1246.

ec: Craig Shuman, D. Env, Region Manager
Marine Region
Craig.Shuman@wildlife.ca.gov

Mike Stefanak, Assistant Chief
Law Enforcement Division
Mike.Stefanak@wildlife.ca.gov

Bob Puccinelli, Captain
Law Enforcement Division
Robert.Puccinelli@wildlife.ca.gov

Becky Ota, Program Manager
Marine Region
Becky.Ota@wildlife.ca.gov

Stephen Wertz,
Senior Environmental Scientist
Marine Region
Stephen.Wertz@wildlife.ca.gov

Adam Frimodig, Environmental Scientist
Marine Region
Adam.Frimodig@wildlife.ca.gov

State of the California North Central Coast Summary of the Marine Protected Area Monitoring Program 2010-2015

Dina Liebowitz, California Ocean Science Trust

North Central Coast Marine Protected Area Five-year Management Review

Steve Wertz, California Department of Fish and Wildlife

Fish and Game Commission Meeting

Santa Rosa, California

April 13, 2016

CALIFORNIA OCEAN SCIENCE TRUST

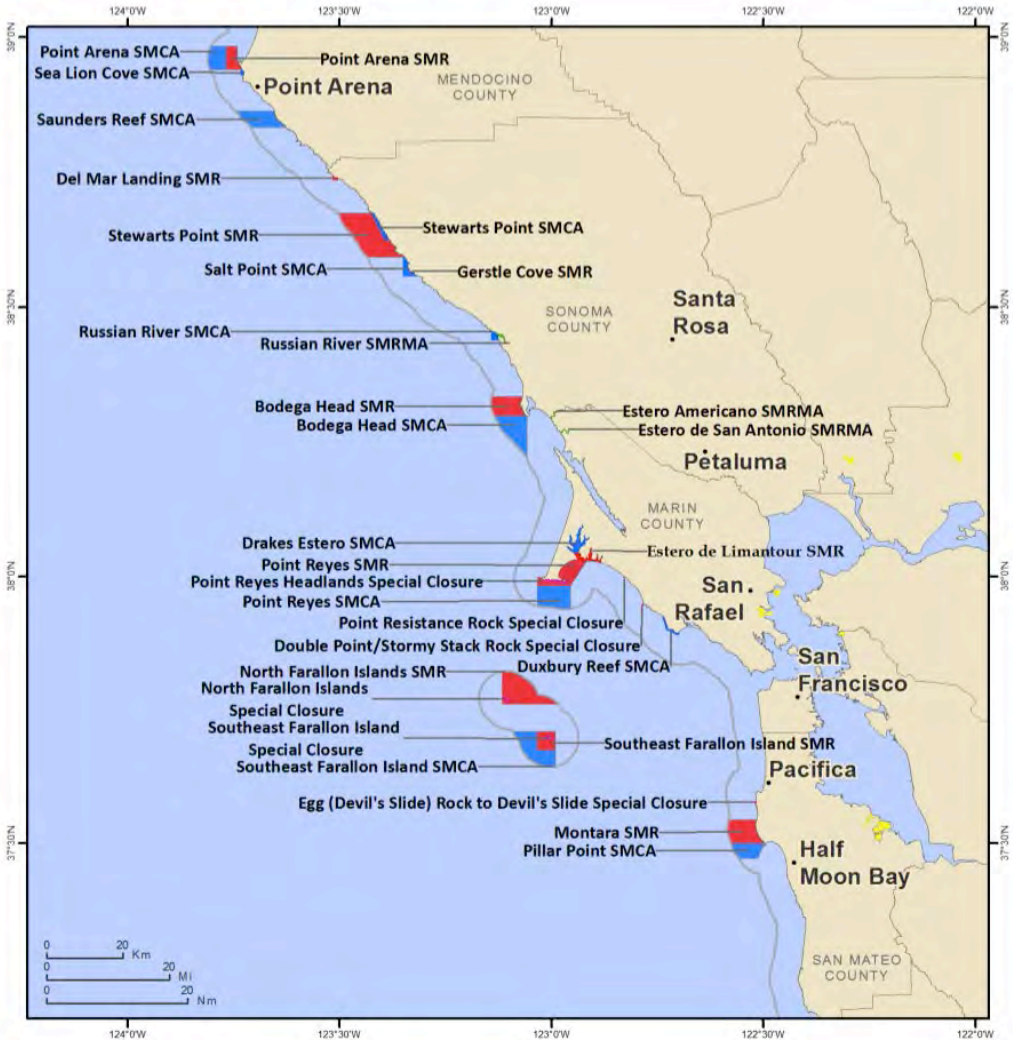
CALIFORNIA DEPARTMENT OF FISH & WILDLIFE

Sea Grant California

CALIFORNIA OCEAN PROTECTION COUNCIL

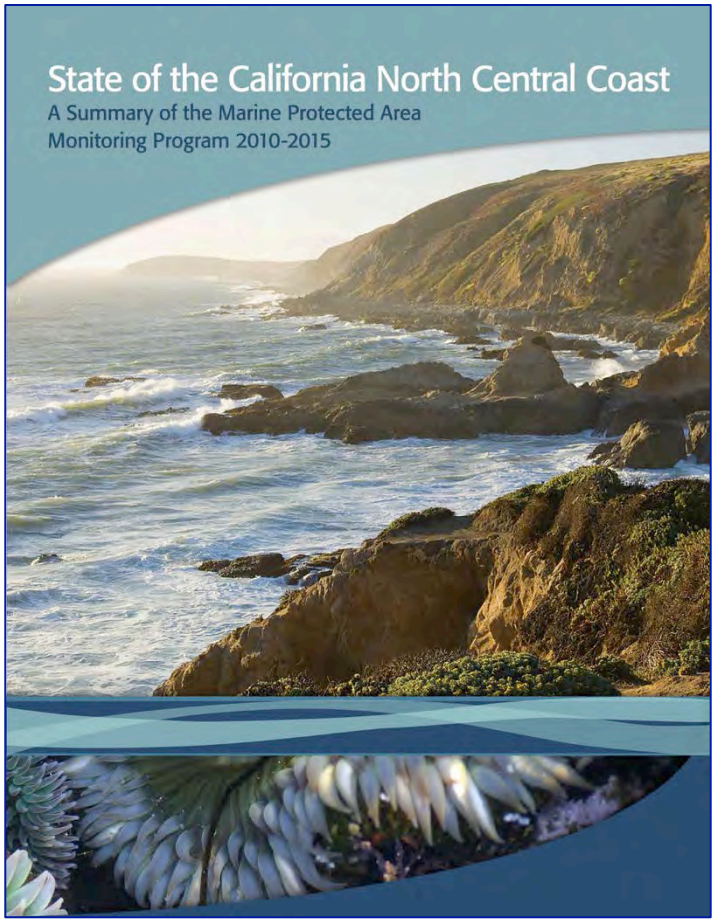
North Central Coast Region

- Marine protected areas (MPAs) implemented May 1, 2010
- Alder Creek to Pigeon Point
  - 763 square miles
  - 20 percent
- Re-designed network
  - 22 marine protected areas
  - 3 state marine recreational management areas
  - 6 special closures



MPA Baseline Program: Context

- Purpose of MPA baseline monitoring
  - Setting a benchmark
  - Science informing management
- State of the California North Central Coast
- Foundation for the Statewide MPA Monitoring Program



Highlights from the Baseline Program

- First comprehensive benchmark of conditions
  - 11 Baseline Program projects (ecological and socio-economic)
  - 800+ monitoring sites
  - Publicly available data
- Highly diverse ecosystems, serving multiple functions
- Commercial and recreational uses integral to the region
- Insights through connecting across projects

Learning from the Baseline Program

- Collaborations built a foundation for success

  20+ partnering organization

  Citizen Science projects
  education and data

- Monitoring network captured unexpected events

  Harmful algal blooms

  Sea star wasting event

- Environmental context helped interpret changes

Sharing Results and Building Communities

Report and data publicly accessible

- Websites viewed > 1460 times
- > 665 reports downloaded

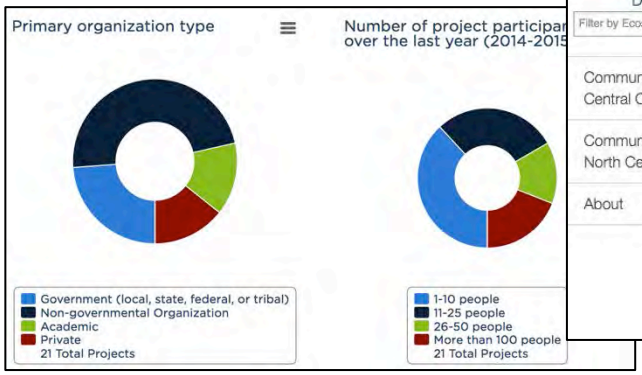
Broad community engagement

- Tribal outreach
- Local events, science meetings
- Community gatherings (>120 people)
- Radio, newspaper, social media

LEARN MORE AT oceanSPACES.org

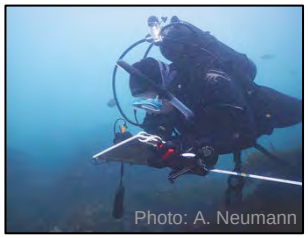
Sharing Results and Building Communities

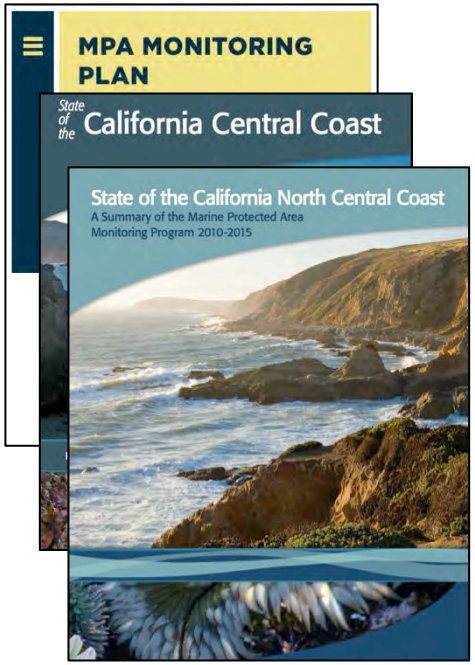
Monitoring survey and interactive dashboard connect local capacity

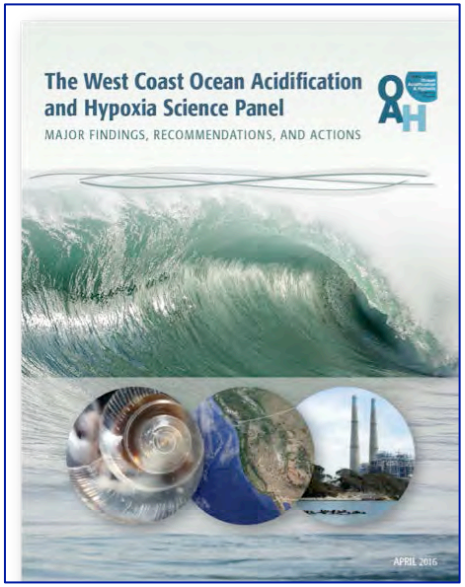


Planning for Long-Term Monitoring

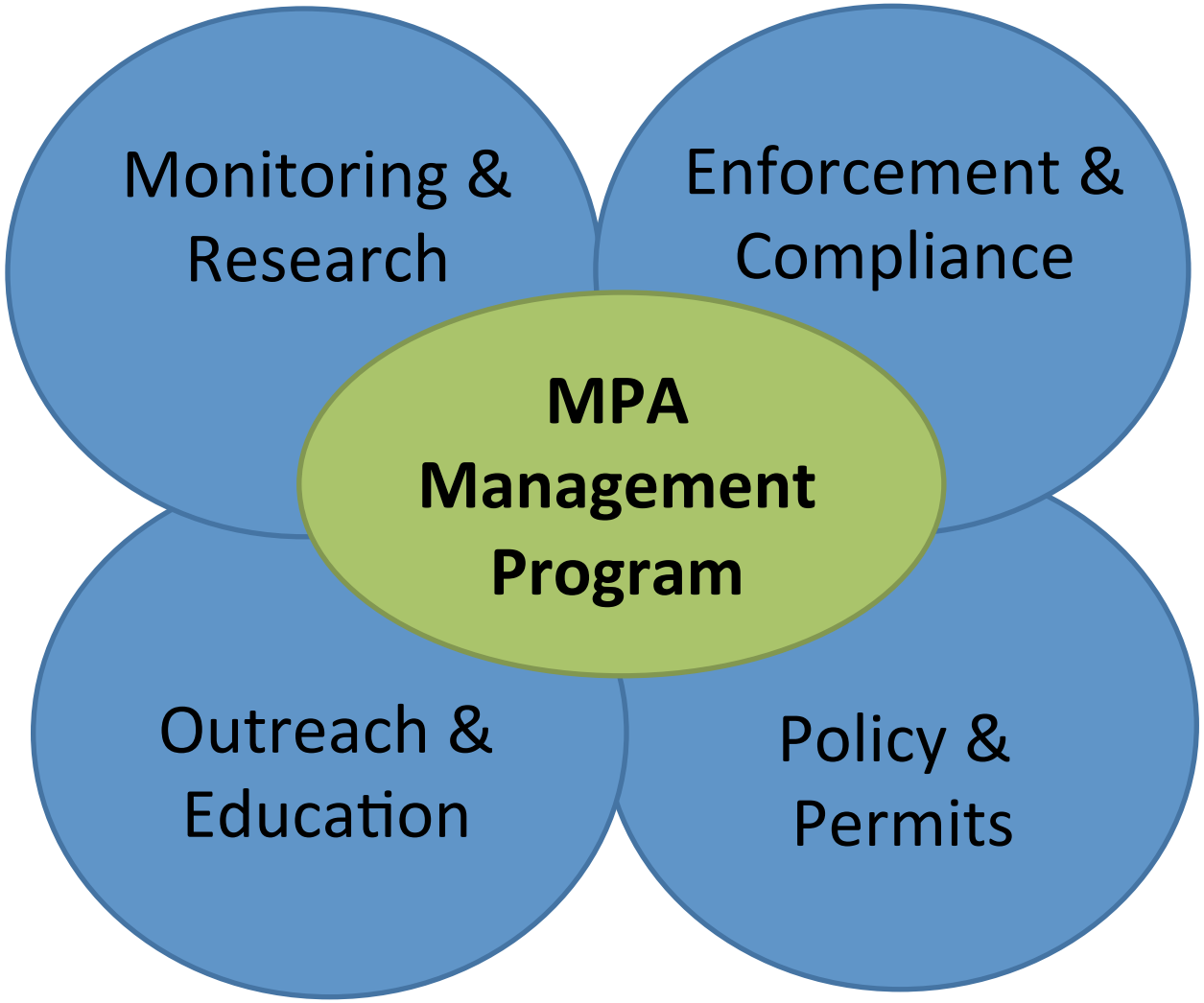
- Leveraging partnerships and local capacity
- Building on regional Baseline Programs for development of the Statewide Program
- Informing a range of ocean issues (e.g., climate, OAH, fisheries, HABs)





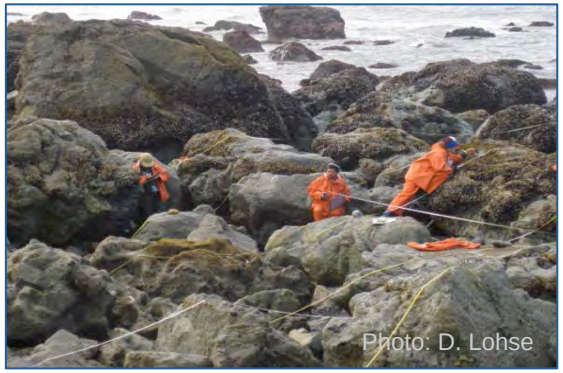


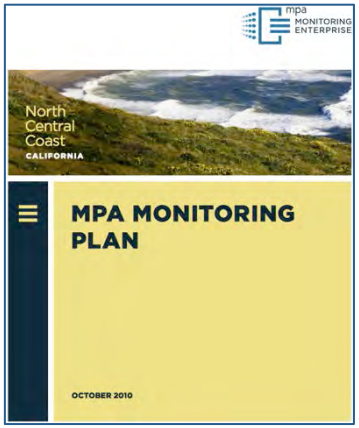
Management Activities

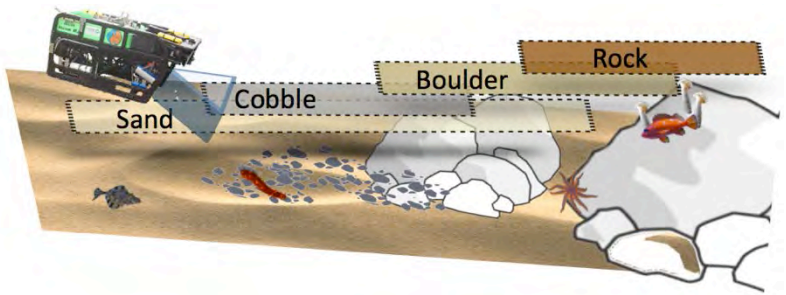


Monitoring and Research

- Partnership-based approach to monitoring and research
- Apply regional lessons learned to statewide monitoring program
- Inform fisheries management, water quality, and climate change







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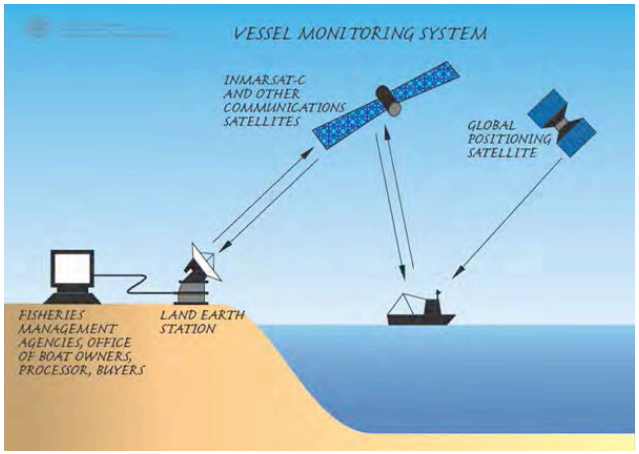
Enforcement and Compliance

- Explore available technology
- Develop a centralized record management system
- Maintain interagency enforcement efforts

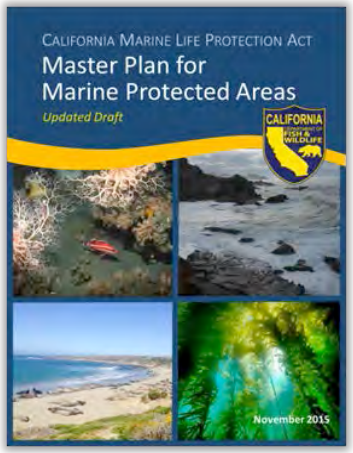


Outreach and Education

- Coordinate consistent and accurate messaging
- Collaborate with programs that support MPA goals
- Communicate MPA regulation information

Policy and Permitting

- Implement the updated MLPA Master Plan for MPAs
- Support Ocean Protection Council's Partnership Plan
- Engage with MPA Statewide Leadership Team



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CALIFORNIA STATE LANDS COMMISSION

CALIFORNIA Water Boards

NATIONAL MARINE SANCTUARIES
WEST COAST REGION

MPA COLLABORATIVE NETWORK

A Fish-eye View of MPAs

Questions

Dina Liebowitz, California Ocean Science Trust
dina.liebowitz@oceansciencetrust.org

Steve Wertz, California Department of Fish and Wildlife
stephen.wertz@wildlife.ca.gov

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