



CORDELL BANK, GULF OF THE FARALLONES AND MONTEREY BAY
NATIONAL MARINE SANCTUARIES

JOINT MANAGEMENT PLAN REVIEW

DRAFT

Proposed Cross-cutting Action Plan: Ecosystem Monitoring

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Working Group Members

National Marine Sanctuary Contact

Kimberly Benson, National Marine Sanctuary Program Science Team

National Marine Sanctuary Staff

Julie Barrow, West Coast Communications Liaison

Andrew DeVogelaere, Monterey Bay National Marine Sanctuary Research Coordinator

Steve Lonhart, Sanctuary Integrated Monitoring Network Scientist

Dale Roberts, Cordell Bank National Marine Sanctuary Marine Scientist

Jan Roletto, Gulf of the Farallones National Marine Sanctuary Research Coordinator

Paul Orlando, National Marine Sanctuary Program Science Team

Outside Experts

Ben Becker, Pt. Reyes National Seashore

Lydia Bergen, University of California, Partnership for Interdisciplinary Studies of Coastal Oceans

Mark Carr, University of California, Partnership for Interdisciplinary Studies of Coastal Oceans

Don Croll, University of California, Center for Integrated Marine Technology

Gwen Heistand, Gulf of the Farallones Sanctuary Advisory Council

Carol Keiper, Cordell Bank Sanctuary Advisory Council

Shannon Lyday, Farallones Marine Sanctuary Association

Bill McMillon, Cordell Bank Sanctuary Advisory Council

Steven Morgan, Bodega Marine Laboratory

Bill Sydeman, Point Reyes Bird Observatory

Goals of Ecosystem Monitoring

The ecosystem monitoring for the California joint sanctuary management plan review is defined as activities to 1) determine the current and anticipate the future status of sanctuary resources; 2) understand the limits of variation in resources; 3) detect temporal and spatial changes in resources; and 4) identify potential agents of change. Undertaking ecosystem monitoring requires long-term comprehensive assessments and broad scale integration of data collected in a wide variety of habitats (e.g., coastal interface, subtidal, continental shelf, shelf break, and deep water) and in areas that directly influence them (e.g., watershed, estuaries, coastal currents). Such assessments and integration can only be achieved through coordination with multiple partners focused on a variety of resources and geographic scales. Because the three sanctuaries of Cordell Bank, Gulf of the Farallones, and Monterey Bay have contiguous boundaries, they protect and manage many of the same habitats types and living resources, some of which range throughout the combined area. As such, the sanctuaries should consider each other primary partners in monitoring efforts to evaluate the status and trends of these shared resources. Coordination among the three sanctuaries to promote, conduct, integrate, and synthesize data from ecosystem monitoring activities is the most effective and efficient means to improve availability of information for resource conservation and management across the region.

Introduction

The legislation establishing the National Marine Sanctuary System requires that long-term monitoring of sanctuary resources be supported, promoted, and coordinated (16 U.S.C. 1431). Sanctuaries also promote data collection to assess resource or environmental change with respect to implemented management actions. The suite of monitoring information required by sanctuary management includes data from within the sanctuary and from areas outside the boundaries that influence sanctuary waters.

For the most part, individual sanctuaries work independently to develop monitoring programs and partnerships to inform their management concerns. These programs typically rely on substantial support from other government, private, and academic institutions at the federal, state, and local levels. The program designs are often only indirectly influenced by sanctuary management responsibilities.

The three California sanctuaries of Cordell Bank, Gulf of the Farallones, and Monterey Bay are unique in the sanctuary system because they share contiguous boundaries. Each sanctuary was designated as a distinct management entity, but the established boundaries between the three are political constructs that do not coincide necessarily with ecological transitions. As such, the three sanctuaries share many common resources, ecosystems, and management concerns. Through the joint management plan process, the three sanctuaries have the opportunity to form an integral partnership to improve monitoring of shared and similar interests. Coordination of monitoring activities across the three sanctuaries allows for integrated monitoring at scales that are more appropriate ecologically. Such coordinated programs will be beneficial to assess shared ecosystems, large-scale processes, and migratory species, where data from a single sanctuary could be spatially insufficient and potentially misleading.

The combined areas of Cordell Bank, Gulf of the Farallones, and Monterey Bay NMSs also represent a substantial portion of California coastal waters. Regional sanctuary monitoring coordination across this extensive area will help promote sanctuary management concerns as a driver for large-scale monitoring initiatives and partnerships. The data collected from coordinated efforts will be useful at the local and regional scale, with the potential for influencing resource management actions throughout a substantial portion of the West Coast.

Addressing the Issue

Most of the monitoring data that informs sanctuary management are not financed, collected, or analyzed by the sanctuaries. Instead, sanctuaries support and promote these activities indirectly by issuing required sanctuary permits; providing vessel time, staff support, and equipment; and coordinating the interests and information of outside agencies and partners. They also assist to secure outside funding that can be directed toward projects that address sanctuary information needs (e.g., SIMoN).

Such indirect support is appropriate to the mandate and capacities of the sanctuary program. Sanctuaries do not have the expertise or the personnel resources to collect and analyze the variety of information required for their management needs. Such expertise is accessible through partnerships with various research institutions. However, effective resource management requires a holistic view, which sanctuaries are uniquely positioned to achieve. To inform their resource management mandate, sanctuaries must synthesize and integrate information from disparate research and monitoring projects. They have the further responsibility of interpreting and applying available scientific knowledge for resource managers and the public. Thus, coordination of ecosystem monitoring efforts requires strategic action on various sanctuary-specific programmatic levels.

Recommended strategies focus on coordinating existing activities, identifying opportunities for additional coordination, and establishing the administrative infrastructure, advisory panels, and oversight mechanisms required to support, direct, and evaluate coordinated monitoring across the three sanctuaries.

Because many of the monitoring requirements common to the three sanctuaries undergoing the joint management plan review overlap with the interests of Channel Islands and Olympic Coast National Marine Sanctuaries, the strategies recommended in this proposed action plan should serve as a model for expanded coordination of appropriate monitoring activities across all five of the West Coast sanctuaries. The strategies are also consistent with efforts of the System Wide Monitoring program (SWiM) to improve collection, evaluation, and interpretation of monitoring information throughout the system of sanctuaries. Thus, these activities promote system and regional integration across the program as well as improving ecosystem conservation and management in the combined area of the three sanctuaries. The order of presentation for these recommendations generally reflects a chronological sequence, which establishes a logical priority of activities.

- XC-EM 1. Coordinate targeted existing monitoring activities.
- XC-EM 2. Establish a joint internal monitoring coordination team.
- XC-EM 3. Identify shared monitoring needs.
- XC-EM 4. Establish a joint research activities panel.
- XC-EM 5. Establish an external review panel.
- XC-EM 6. Develop a regional West Coast technical assistance center.

It should be noted that the tasks outlined in this action plan represent a considerable amount of additional effort for the sanctuaries concerned. Staffing at the three sanctuaries currently varies considerably. With the inclusion of SIMoN personnel, Monterey Bay has seven individuals supporting research and monitoring activities. The other two sanctuaries do not have separate research coordinators; the research coordinator at Gulf of the Farallones also acts in that capacity for Cordell Bank, which has only one part-time research staff focused on its resources. Since cross-cutting activities build on the activities and capacities of the individual sanctuaries, success of this cross-cutting plan is contingent on additional staffing. Some increased staffing may be warranted to fulfill sanctuary-specific research and monitoring needs; however, those additions are most appropriately addressed in the site-specific research and monitoring action plans. The increased staffing recommended in the strategies of this action plan represent personnel needs and technical expertise required to fulfill the goal of coordinated ecosystem monitoring.

STRATEGY XC-EM 1—Coordinate Targeted Existing Monitoring Activities

Overview

Priority activities for initiation of ecosystem monitoring within the region should be centered on coordination of existing sanctuary specific monitoring programs that assess similar ecosystems in at least two of the three sanctuaries. Recommendations center on coordination of targeted programs that monitor condition in the coastal interface and pelagic/offshore. Surveys of beach cast marine mammals and seabirds monitor offshore mortality events and are, thus, included in pelagic/offshore activities.

These priorities are not based on an inventory of common monitoring programs, but represent quick successes that were identified by the group as key opportunities to promote coordinated efforts. The coordination channels and activities established to support these targeted efforts will serve as a model for additional monitoring coordination. Other existing or newly emerging monitoring activities, not identified in this action plan, represent potential opportunities for additional coordination. Assessment of such opportunities is addressed in Strategy XC-EM 2.1 and XC-EM 3.

XC-EM 1. Coordinate activities among the sanctuaries to promote efficiency and effectiveness of targeted existing monitoring activities.

1.1. Coordinate coastal interface monitoring activities.

1.1.1. Investigate opportunities and initiate coordination of joint sanctuary rocky intertidal monitoring programs with other large-scale rocky intertidal monitoring efforts.

- Initiation: Year 1
- Duration: Ongoing
- Products: Plan for coordinated rocky intertidal monitoring
- Partners: PISCO, MARINE LABS, NPS, SCCWRP, BML, Tenera Inc., MMS, Kinetic Labs

1.1.2. Develop regional sanctuary education/outreach monitoring event(s) to promote the importance of monitoring, disseminate monitoring data, and improve understanding of marine conservation and management. Events should focus on collection and use of data from volunteer monitoring efforts in sandy beach, rocky intertidal, and estuarine systems.

- Initiation: Year 1
- Duration: Ongoing
- Products: Outreach and education materials/curricula to promote awareness of monitoring activities and disseminate monitoring data; Sanctuary monitoring activities and lesson plans for collected data during annual monitoring events (e.g., Snapshot Water Quality Monitoring Event); site selection and implementation of LiMPETS; Quality assessment/quality control procedures and data collection standards
- Partners: Community Outreach Working Group, SNAPSHOT, LiMPETS, Beach Watch, Beach COMBERS, FMSA, GLOBE, Jason Foundation for Education.

- 1.2. Coordinate pelagic/offshore monitoring activities.
- 1.2.1. Conduct a coordination workshop for Beach COMBERS and Beach Watch.
- Initiation: Year 1
 - Duration: Ongoing
 - Products: Coordination plan for joint reporting; volunteer training, coordination, and enrichment opportunities; and data collection, management and metadata standards; plan for completion of the NOS/Special Projects Office project; coordinated revision and reprinting of the field guide; plan for shared study skin collection.
 - Partners: SIMoN, NMSP, COASST
- 1.2.2. Conduct a workshop to develop a coordinated plan for sanctuary marine mammal and seabird survey activities to supplement the National Marine Fisheries Service 5-year surveys (per recommendations developed during the Marine Mammal/Seabird Workshop in December 2002).
- Initiation: Year 1
 - Duration: Ongoing
 - Products: Plan for ongoing 5-year sanctuary marine mammal/seabird monitoring surveys to coordinate with and supplement NMFS 5-year surveys; joint shiptime requests or contracts to ensure consistent availability of appropriate survey platforms.
 - Partners: NMFS, CINMS, OCNMS, CIMT, NPS, PRBO, SIMoN
- 1.2.3. Workshop to develop a plan for expanding appropriate methodologies for monthly and annual marine mammal, seabird, and trophic structure surveys across all three sanctuaries.
- Initiation: Year 1
 - Duration: Ongoing
 - Products: Coordinated plan for monthly and annual surveys; assessment of platform requirements/availability
 - Partners: CIMT, PRBO, NMFS, CINMS, OCNMS, NPS, NCCOS (circulation pattern assessments), SIMoN
- 1.2.4. Facilitate expansion of CalCOFI transect lines through Gulf of the Farallones and Cordell Bank., and continuation in Monterey Bay.
- Initiation: Year 1
 - Duration: Ongoing
 - Products: Plan for population of CalCOFI transects in Cordell Bank and Gulf of the Farallones
 - Partners: CalCOFI, MBARI, NMFS, ACCEO (aka PaCOS), NCCOS, SIMoN, UCSC

STRATEGY XC-EM 2—Establish a Joint Internal Monitoring Coordination Team

Overview

Coordination of monitoring activities among the sanctuaries requires an administrative infrastructure to identify and act on cross boundary opportunities, collaborate with large-scale initiatives, and interpret the results for resource managers and public audiences across the region. Adequate science staff must exist at each of the sanctuaries to support sanctuary specific and initiate cross-boundary activities. A research coordinator at each sanctuary is recommended as the minimum research staff required to support cross-boundary activities. The need for additional support to fulfill the tasks outlined in this action plan should be evaluated and could be achieved by sharing personnel resources among the three sanctuaries. The combined science staff of the three sanctuaries would constitute an internal monitoring coordination team responsible for facilitating monitoring coordination by participating in biannual meetings, establishing a communications system, assessing common platform and equipment needs, producing joint reports, and integrating with regional education and outreach activities.

- XC-EM 2. Establish a joint internal team comprised of science staff at each of the sanctuaries to coordinate monitoring activities and administration among the three sanctuaries. The team should serve as a model, which could be expanded to include the participation of all West Coast sanctuaries.
- 2.1. Review the monitoring recommendations set forth by the sanctuary specific working groups during the joint management plan review process. Priority common monitoring recommendation should be developed as cross-boundary monitoring activities. Lower priority activities and sanctuary specific recommendation should be used to inform the assessment of monitoring needs activities outlined in Strategy XC-EM 3.
 - Timeframe: Year 0
 - Product: monitoring plans and proposals
 - Partners: CBNMS, GFNMS, MBNMS, NMSP, SIMoN
 - 2.2. Establish avenues to improve communications among the sanctuaries and sanctuary partners.
 - Initiation: Year 1
 - Duration: Ongoing
 - Products: Sanctuary listserv, development of joint projects, research plans and proposals
 - Partners: SIMoN
 - 2.3. Identify common needs for monitoring platforms and equipment and evaluate opportunities for shared ownership and joint contracting.
 - Timeframe: Year 1
 - Products: Report of needs and plan for contracting, acquisition, and maintenance; building on the NMS Small Boat Report
 - Partners: Administrative working group, SIMoN, CINMS, OCNMS, West Coast Regional Manager, NMSP special assistant for vessel support
 - 2.4. Institute joint reporting of monitoring activities through an annual “state of the sanctuaries” report for cross-cutting monitoring activities among the three sanctuaries based on the SIMoN report.
 - Initiation: Year 2
 - Duration: Ongoing
 - Product: State of the sanctuaries report
 - Partners: SIMoN, SWiM, NMSP, NODC

- 2.5. Establish biannual meetings of the research coordinators to facilitate communication, interactions, and planning coordination. Topics should include, but not be limited to, research and monitoring schedules, ship time requests, and annual operating plans. One meeting should be arranged to coincide with the annual national research coordinators meeting to encourage the participation of research coordinators from Channel Islands, Olympic Coast, and Hawaiian Island Humpback Whale NMSs and the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve.

- Initiation: Year 1
- Duration: Ongoing
- Products: Various plans and strategies for coordination (e.g., shiptime proposals, science annual operating plans, requests for proposals)
- Partners: CINMS, OCNMS, HIHWNMS, NWHICRER NMSP

- 2.5.1. The research coordinator at Gulf of the Farallones currently has joint responsibility for coordinating research activities at Cordell Bank NMS. To ensure that the research needs of each of these sanctuaries are properly address and fully represented in cross-cutting ecosystem monitoring activities, a full time research coordinator should be in place at each of the sanctuaries. Therefore, a research coordinator should be hired for Cordell Bank NMS.

- Initiation: Year 1
- Duration: Ongoing
- Products: position description, new FTE or FTE equivalent contractor at Cordell Bank NMS
- Partners: NMSP

- 2.6. Evaluate cross boundary utilization of existing staff and need for additional staff or shared staff to provide support for research, monitoring, information management, GIS, reporting, and education/outreach connections across the three sanctuaries. The evaluation should consider all staffing requirements to fulfill the tasks outlined in this action plan, and make recommendations for additional sanctuary specific staff or shared staffing resources where appropriate. Priority consideration should be given to data management and GIS support for Cordell Bank and Gulf of the Farallones to address tasks outlined in XC-EM 3.5.

- Timeframe: Year 1
- Product: Staffing plan for each sanctuary and shared staffing strategy
- Partners: Administrative working group, SIMoN, CINMS, OCNMS, West Coast Regional Manager, NMSP, NCCOS

STRATEGY XC-EM 3—Identify Shared Monitoring Needs

Overview

In addition to coordination of existing monitoring programs, cross boundary ecosystem monitoring activities should identify shared monitoring needs throughout the region and facilitate the development or expansion of appropriate monitoring activities. Because each sanctuary is an independent management entity responsible for evaluating the condition of its resources, cross-boundary ecosystem monitoring activities should be based on a comparison of the individual needs of each sanctuary.

In 2000, Monterey Bay NMS conducted a workshop to define priorities for a Sanctuary Integrated Monitoring Network (SIMoN). This resulted in a comprehensive assessment of monitoring activities and priorities in the Monterey Bay sanctuary. Similar assessments must be conducted for Cordell Bank and Gulf of Farallones NMSs to provide the foundation for further cross-boundary initiatives. The SIMoN workshop, materials, and information management infrastructure will serve as a model to facilitate assessments in the other two sanctuaries. Once the needs of each sanctuary are identified and compared, the benefits that can be achieved by coordination should be used to determine the appropriate level of coordination and establish priorities among common monitoring efforts.

XC-EM 3. Assess monitoring needs with respect to management concerns and responsibilities at each of the sanctuaries.

- 3.1. Translate the activities and results for the 2000 SIMoN workshop into a process to identify monitoring requirements for Cordell Bank and Gulf of the Farallones.
 - Timeframe: Year 1
 - Product: Workshop process and template of monitoring needs
 - Partners: NMSP, SIMoN
- 3.2. Conduct monitoring needs assessment workshops for Cordell Bank and Gulf of the Farallones.
 - Timeframe: Year 2
 - Product: Monitoring needs matrices for Cordell Bank and Gulf of the Farallones
 - Partners: NMSP, SIMoN, NPS, USFW, USGS, California Fish & Game, UC Davis and Berkley, SFU, BML, California Academy of Science
- 3.3. Evaluate and identify ongoing funding opportunities to support regional and larger scale ongoing monitoring activities.
 - Timeframe: Year 2
 - Products: New partnerships; funding mechanisms; recommendation for a regional funding coordinator
 - Partners: SIMoN, NMSP, NCCOS, NMFS, FMSA, Monterey Bay Sanctuary Foundation
- 3.4. Combine and merge monitoring needs across all three sanctuaries and recommend evaluation of monitoring needs across all West Coast sanctuaries.
 - Timeframe: Year 3
 - Products: Regional monitoring needs report, West Coast monitoring needs report
 - Partners: NMSP, SIMoN, OCNMS, CINMS

- 3.5. Establish and populate “SIMoN style” databases at Cordell Bank and Gulf of the Farallones for cataloguing, accessing, and visualizing monitoring activities. SIMoN staff at Monterey Bay is currently producing an operational cataloguing, access, and visualization system for monitoring projects at MBNMS. NODC is assisting SIMoN in system development and with efforts to translate the system into a transferable model for development of similar information management systems at other sanctuaries.
- Initiation: Year 2
 - Duration: Ongoing
 - Product: Populated SuperSIMoN, or individual SIMoN compatible databases at Cordell Bank and Gulf of the Farallones
 - Partners: NMSP, SIMoN, NODC, SeaMAP, IOOS
- 3.5.1. The transferable “SIMoN model” will provide a general framework, knowledge, and advice, but implementation of the model at Cordell Bank and Gulf of the Farallones will require additional technical expertise to adapt the model to sanctuary-specific needs and develop fully operational systems. Therefore, staffing should be expanded to support GIS and data management requirements at the two sanctuaries. Hiring should be phased with system development, with a GIS specialist and data manager initially sharing responsibility for the early activities at both sanctuaries. If full implementation warrants, dedicated staff should be hired for each sanctuary.
- Initiation: Year 2
 - Duration: Ongoing
 - Products: position descriptions, new FTEs or FTE equivalent contractors at Cordell Bank and Gulf of the Farallones
 - Partners: NMSP, SIMoN, NODC

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STRATEGY XC-EM 4—Establish a Joint Research Activities Panel

Overview

To assist the joint internal team with ongoing coordination of existing activities and identification of emerging opportunities, a joint research advisory panel (JRAP) should be established consisting of representatives from permanent RAP working groups of each of the sanctuary advisory councils (SACs). Two of the sanctuaries SACs do not currently have RAPs, and it is not within the authority of the sanctuaries to establish SAC working groups. However, sanctuaries should encourage the SACs to establish RAPs to advise and inform the management activities of the individual sanctuaries and participate in cross-boundary monitoring coordination.

XC-EM 4. Establish a joint research activities panel (JRAP) to advise and identify opportunities for coordinated monitoring activities.

4.1. Work with the SACs to expand research representation and recommend that sanctuary specific RAPs be established as a permanent working group of the SACs at Cordell Bank and Gulf of the Farallones.

- Initiation: Year 1
- Duration: Ongoing
- Products: Increases research representation on the SACs; recommendation for RAPs at Cordell Bank and Gulf of the Farallones
- Partners: MBNMS, NMSP

4.2. Establish avenues for communications among the RAPs for posting agendas and minutes for sanctuary-specific and joint meetings.

- Initiation: Year 2
- Duration: Ongoing
- Product: RAP listserv
- Partners: SIMoN

4.3. Institute biannual meetings of a subgroup of (~10) representatives from all three sanctuary specific RAPs.

- Initiation: Year 2
- Duration: Ongoing
- Product: meeting summaries, recommendations, joint proposals and research plans
- Partners: NMSP, NCCOS

STRATEGY XC-EM 5—Establish an External Review Panel

Overview

To ensure efficiency, effectiveness, and credibility of cross-boundary ecosystem monitoring activities, the program must be reviewed periodically by independent and objective experts in the fields of monitoring and information management. An external review panel should be established to conduct a review of the cross-boundary ecosystem monitoring activities prior to the next management plan review.

XC-EM 5. Establish a standing external monitoring review panel (ERP) to advise the sanctuaries and joint RAP and evaluate the efficiency and effectiveness of the ecosystem monitoring activities.

5.1. Work with the joint RAP to define the purpose and secure members of the ERP.

- Timeframe: Year 3
- Product: Statement of purpose, structure, and responsibilities for ERP
- Partners: NMSP SWiM panel

5.2. Establish avenues for communications among the sanctuaries, RAPs, and ERP.

- Initiation: Year 3
- Duration: Ongoing
- Product: ERP listserv
- Partners: SIMoN

5.3. Convene a formal review meeting of the Joint RAP and ERP every five years to complete a program review and identify priority opportunities for program coordination, expansion, and development based on a review monitoring needs and current activities.

- Timeframe: Year 4
- Product: Joint monitoring program review and recommendations for additional ecosystem monitoring coordination, expansion, and development and strategies for implementation
- Partners: NMSP SWiM panel, SIMoN, RAPs

STRATEGY XC-EM 6—Develop a Regional West Coast Technical Assistance Center

Overview

The technical requirements to support long-term monitoring coordination across the region exceed the collective resources of the three sanctuaries. However, the common needs to support integrated activities can serve as a justification for regional coordination and technical support personnel. Personnel could be located at individual sanctuaries or other appropriate institutions but would constitute a sanctuary technical assistance center to support individual sanctuaries and facilitate cross-boundary activities. Support should logically extend to encompass the technical needs of all the West Coast sanctuaries. Establishment of such a center would create a regional monitoring infrastructure that could to serve as a model for large-scale coordination within the sanctuary system.

XC-EM 6. Develop of a Regional West Coast technical assistance center to provide support for the sanctuaries (e.g., large-scale coordination, data archiving, metadata, statistical analysis, and information management).

6.1. Evaluate technical staff support needs common to all West Coast sanctuaries.

- Timeframe: Year 1
- Product: Technical support plan including justification and responsibilities of regional support team and position descriptions for regional science director and research, data management, and GIS support
- Partners: SIMoN, OCNMS, CINMS, West Coast Regional Manager, NMSP special assistant for vessel support, NODC, CIMT, IOOS, PISCO, MMUG, NCCOS, UC Santa Cruz and Davis, SFSU, BML, NURP, ACT

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Index of Acronyms

ACCEO	Alliance for California Current Ecosystem Observation
ACT	Alliance for Coastal Technologies
BML	Bodega Marine Laboratory
CalCOFI	California Cooperative Oceanic Fisheries Investigations
CBNMS	Cordell Bank National Marine Sanctuary
CIMT	Center for Integrated Marine Technology
CINMS	Channel Islands National Marine Sanctuary
COASST	Coastal Observation And Seabird Survey Team
COMBERS	Coastal Ocean Mammal/Bird Education and Research Surveys
FMSA	Farallones Marine Sanctuary Association
GFNMS	Gulf of the Farallones National Marine Sanctuary
GLOBE	Global Learning and Observation to Benefit the Environment
HIHWNMS	Hawaiian Islands Humpback Whale National Marine Sanctuary
IOOS	Integrated Ocean Observing Systems
LiMPETS	Long-term Monitoring Project and Experiential Training for Students
MARINE	Multi-Agency Rocky Intertidal Network
MBARI	Monterey Bay Aquarium Research Institute
MBNMS	Monterey Bay National Marine Sanctuary
MMS	Minerals Management Service
MMUG	Marine Mapping User Group
NCCOS	National Centers for Coastal Ocean Science
NMFS	National Marine Fisheries Service
NMS	National Marine Sanctuary
NMSP	National Marine Sanctuary Program
NODC	National Oceanographic Data Center
NPS	National Park Service
NURP	National Undersea Research Program
NWHICRER	North West Hawaiian Islands Coral Reef Ecosystem Reserve
OCNMS	Olympic Coast National Marine Sanctuary
PaCOS	Pacific Coastal Observing System
PBRO	Point Reyes Bird Observatory
PISCO	Partnership for Interdisciplinary Studies of Coastal Oceans
RAP	Research Activities Panel
SAC	Sanctuary Advisory Council
SCCWRP	Southern California Coastal Water Research Project Authority
SFU	San Francisco State University
SIMoN	Sanctuary Integrated Monitoring Network
SNAPSHOT	Snapshot Water Quality Monitoring Event
SWiM	System-Wide Monitoring
UC	University of California
UCSC	University of California Santa Cruz
USFW	US Fish and Wildlife Service
USGS	US Geological Service

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