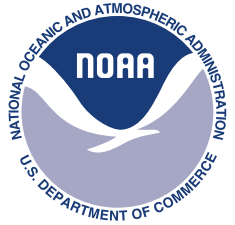
MONTEREY BAY

STATE OF THE SANCTUARY REPORT

NOAA ocean SERVICE

NATIONAL MARINE SANCTUARIES ™

MONTEREY BAY



The National Marine Sanctuary Program

The National Marine Sanctuary Program, a network of 13 marine protected areas, encompasses marine and freshwater resources from Washington State to the Florida Keys and from Lake Huron to the Gulf of Mexico, American Samoa, and places in between. The National Oceanic and Atmospheric Administration's National Ocean Service has managed marine sanctuaries since the passage of the Marine Protection, Research, and Sanctuaries Act of 1972. Title III of the Act is now called the National Marine Sanctuaries Act.

Today, our marine sanctuaries contain deep ocean gardens, near-shore coral reefs, whale migration corridors, deep-sea canyons, and underwater archaeological sites. They range in size from one-quarter square mile in Fagatele Bay, American Samoa, to more than 5,300 square miles off Monterey Bay, California — one of the largest marine protected areas in the world. Together, these sanctuaries protect nearly 18,000 square miles of coastal and open ocean waters and habitats. While some activities are managed to protect resources, certain multiple uses, such as recreation, commercial fishing, and shipping, are allowed to the extent that they are consistent with a sanctuary's resource protection mandates. Research, education, and outreach activities are other major components in each sanctuary's program of resource protection.

The National Marine Sanctuary Program is a world leader in effective management, placing a primary emphasis on the protection of living marine resources and our nation's submerged cultural resources.

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Front Cover: Rocky reef and kelp forest at Point Lobos State Park.
Photographer: Kathy deWet-Oleson

Back Cover: A curious harbor seal, *Phoca vitulina*, investigates the photographer.
Photographer: Kathy deWet-Oleson

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The Monterey Bay National Marine Sanctuary

The Monterey Bay National Marine Sanctuary is the largest of thirteen marine sanctuaries administered by the Commerce Department's National Oceanic and Atmospheric Administration (NOAA). The Sanctuary extends from Marin County to Cambria, encompassing nearly 300 miles of shoreline and 5,322 square miles of ocean extending an average distance of twenty miles from shore. At its deepest point the Sanctuary reaches a depth of 10,663 feet (more than two miles). It is home to numerous mammals, seabirds, fishes, invertebrates, and algae in a remarkably productive coastal environment. Within its boundary is a rich array of habitats, from rugged rocky shores and lush kelp forests to one of the largest underwater canyons in North America. These habitats abound with life, from tiny microscopic plants to enormous blue whales. With its great diversity of habitats and life, the Sanctuary is a national focus for recreation, research, and education.

Mission

To understand and protect the coastal ecosystem and submerged cultural resources of central California.

Vision

To sustain the biodiversity, productivity, and aesthetic qualities of central California's coastal ecosystem.

For More Information

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By updating the management plan we can ensure that Sanctuary resources are optimally protected.
Photographer: Kip Evans

Executive Summary

The dissemation of this "State of the Sanctuary" document signals the beginning of public involvement in the management plan review process. The concept of preparing such a report is the direct outgrowth of public comments received at other sites undergoing the same review process. Many people asked that staff prepare an overview on the current status of the Sanctuary to use as a basis for continued discussions and to help guide appropriate recommendations for revising the management plan. This document discusses our state of knowledge about the living and non-living resources of the Monterey Bay National Marine Sanctuary and issues affecting its management.

The Sanctuary staff have accomplished many of the tasks and implemented many of the original programs identified in our original 1992 management plan. For example, the Sanctuary worked with industry, conservation groups, and other government agencies to further protect the natural resources and coastline from commercial vessels carrying petroleum products and hazardous materials by moving their traffic regime farther offshore. The Sanctuary, working with the community and other agencies, created the Water Quality Protection Program, which addresses urban runoff, marina and boating activities, and runoff from rural and agricultural lands. Finally, the Sanctuary's designation prohibited offshore oil and gas development from occurring in the Outer Continental Shelf off central California.

This report provides insight into our research and education programs. These programs provide training opportunities for marine science teachers and students as well as public awareness campaigns targeting urban runoff. Our research program broadens the knowledge of this area's resources through our Site Characterization work and distributes the knowledge through our annual *Ecosystem Observations* report. It has also helped coordinate important seafloor mapping activities and aerial surveys of kelp canopy cover.

Many opportunities lie ahead for the Sanctuary. New resource issues have emerged in the public consciousness, such as the effects of desalination facilities, coastal erosion, introduction of non-native species, and the impact of fishing activities in the ecosystem. Other opportunities, such as multicultural education programs, shipwrecks and other submerged cultural resources, and construction of a Sanctuary visitor center, wait to be addressed. With this report, Sanctuary staff hope to catalyze public interest in the review of our existing management plan. The report also highlights emerging issues the Sanctuary is likely to face. It is our hope that this overview will encourage you to learn more and become involved in shaping the future management of this national treasure.

Management Plan Review

Management plans are sanctuary-specific planning and management documents. These plans describe regulations and boundaries; outline staffing and budget needs; set priorities and performance measures for resource protection, research, and education programs; and guide the development of the future budget and management activities. Management plan review is required by law for all national marine sanctuaries, ensuring they will continue to best conserve, protect, and enhance their nationally significant living and cultural resources.

The Monterey Bay National Marine Sanctuary's Management Plan dates back to when the site was designated in 1992. Since then significant scientific discoveries and resource issues have emerged. With input from the public, Sanctuary staff will determine whether current issues and threats to the resources are the same now as when the initial management plan was developed and whether the management put in place at that time is protecting current Sanctuary resources. The review will address management of the site's natural and cultural resources; concurrent local, state, and federal management authorities; present and potential uses; and socio-economic considerations. During the review the Sanctuary will also evaluate whether or not to change the general framework for operation and management, the specific regulations for the site, and the exact boundaries of the Sanctuary and management zones within it.

The review will be a community-based process that will provide numerous opportunities for public input over the course of the next two to three years. Ultimately, this public review process ensures that the Monterey Bay National Marine Sanctuary will protect, conserve, and enhance its marine resources better for current and future generations.

How To Get Involved

Public participation is vital to the management plan review. During the review process we strongly encourage members of the public, agencies, and businesses to take part in the update of the Sanctuary management plan. Many of you live near or have interest in one of the most remarkable stretches of coast and ocean in the world. This is your chance to provide input regarding the future of your Sanctuary.

The designation of the Sanctuary in 1992 has allowed for protection against offshore oil and gas development. Photographer: Kip Evans

The population of the northern elephant seal, *Mirounga angustirostris*, is increasing throughout the Sanctuary. There are breeding colonies at Año Nuevo, Point Piedras Blancas, and Big Sur beaches. Photographer: Kip Evans

SCUBA diving is a popular way to enjoy the beauty of the Sanctuary.
Photographer: MBNMS

Steady winds make Monterey Bay an ideal place for sailboats. Photographer: MBNMS

Management plan review begins with a series of scoping meetings in late 2001 and early 2002. These public meetings will help define issues to be addressed during the plan's update. Following the scoping period, staff will present the key issues to the Sanctuary Advisory Council (SAC). The SAC holds public meetings on the first Friday of every other month, starting in February. These meetings provide a forum, in addition to the scoping process, where the public is encouraged to attend and speak on issues related to the Sanctuary. Let us know your concerns at the public meetings so we know what issues need to be addressed.

After the scoping meetings, Sanctuary staff will review all comments and work with the SAC to prioritize issues that will be addressed in the review. The Sanctuary will then develop tailored action plans to address priority issues. These will form the foundation of the new draft management plan. We will also be soliciting public comment after the release of the Draft Management Plan and Draft Environmental Impact Statement.

Sanctuary staff will provide notice of each public meeting through various media outlets, including local papers, listserves, our web site, and, when appropriate, the *Federal Register*. To be added to our mailing list for updates and notices regarding the management plan review, as well as other Sanctuary activities, please write to: Monterey Bay National Marine Sanctuary, 299 Foam Street, Monterey CA, 93940 or send an e-mail to: montereybayplan@noaa.gov. You may also call our office at (831) 647-4201 and tell us you want to be involved.

Background

Purpose

National marine sanctuaries are special places — coastal and undersea counterparts to our national parks that are protected for their natural and/or cultural significance. Much of the central California coast has been designated as a national marine sanctuary, the Monterey Bay National Marine Sanctuary, because its unique biological, geological, oceanographic, and cultural features make it one of the richest and most diverse marine environments in the world.

The primary role of a marine sanctuary is to protect its ecosystem's natural and cultural features while allowing people to use and enjoy the ocean in a sustainable way. Sanctuaries also provide for research and education programs that promote understanding and stewardship of our oceans.

Designation History

In 1977 the State of California nominated Monterey Bay and nine other locations along the Pacific Coast for consideration as national marine sanctuaries. Based on favorable public response, three of these sites were declared active candidates for designation — Monterey Bay, Channel Islands, and Point Reyes-Farallones Islands. This process led to the designation of Channel Islands National Marine Sanctuary in 1980 and the Point Reyes-Farallones Islands National Marine Sanctuary (later renamed Gulf of the Farallones National Marine Sanctuary) in 1981. In 1983 NOAA removed Monterey Bay from its list of active candidates, recognizing that similar marine environments were already protected by California's two new sanctuaries and that a sanctuary of Monterey Bay's size would impose a heavy administrative burden on a program with limited resources.

The citizens of central California, however, would not give up on the idea of a sanctuary for their region. Following five years of grassroots campaigning along with the dedicated support of Congressman Leon Panetta, Congress directed NOAA to reinstate Monterey Bay as an active candidate for sanctuary status in 1988. After another four years of public meetings and preparation of several detailed planning documents, the Monterey Bay National Marine Sanctuary was officially designated on September 18, 1992.

Sanctuary Description

The Monterey Bay National Marine Sanctuary is the largest national marine sanctuary and second largest marine protected area in the United States (the recently designated Northwest Hawaiian Islands Coral Reef Reserve is the largest). It spans 5,322 square miles of ocean, stretching nearly 300 miles (about one-fourth of the California coast). By surface area, the Sanctuary represents about 30 percent of the area protected in the National Marine Sanctuary Program; however, by volume, because of its depth, it protects two-thirds of all the marine and coastal waters in the national system.

The Sanctuary is also a junction of geographic ranges for many species. These overlapping regions contribute to the wide variety of plants and animals living here. The Sanctuary boasts a vast diversity of marine life, with 33 species of marine mammals, 94 species of seabirds, 345 species of fishes, 4 species of sea turtles, thousands of species of invertebrates, and more than 450 species of marine algae. It is also home to 26 species that receive special protection under the Endangered Species Act. Federally-listed threatened or endangered species include 6 species of large whales, the southern sea otter, Steller's sea lion, Guadalupe fur seal, California Brown Pelican, California Clapper Rail, Western Snowy Plover, Marbled Murrelet, 4 species of sea turtles, 6 species of salmon or steelhead, and the tidewater goby.

Congress designated the Sanctuary in 1992, as a result of widespread public support and activism.
Photographer: Brad Damitz

The ocean sunfish, *Mola mola,* feeds on jellyfish in the open ocean areas of the Sanctuary. Photographer: MBNMS

Agriculture is a major industry in the counties that border the Sanctuary. Photographer: MBNMS

Some of the best surf breaks in the world are found within the boundaries of the Sanctuary. Photographer: Kip Evans

Cultural resources abound as well. Archeologists estimate that within Sanctuary waters lie at least 225 documented shipwrecks or lost aircraft and 718 historic sites.

Regional Context

Five counties (Marin, San Mateo, Santa Cruz, Monterey, and San Luis Obispo) border the Sanctuary and two (San Francisco and Santa Clara) are directly linked to it. Each is diverse in terms of population and economic base. The northern region borders Marin County and the San Francisco Peninsula area. Growth along the coast has been somewhat constrained by limited water availability, few access roadways, and strong environmental advocacy. However, due to the rapid growth of the technology sector, the inland Silicon Valley area exerts significant development pressure south and westward, toward the coast. Santa Cruz and Monterey Counties are also facing significant growth challenges, particulary in the Santa Cruz, Salinas, and Monterey urban areas. Agriculture and tourism are the leading industries in these counties. San Luis Obispo County, the most southern county, has an economy focused on agriculture, tourism, and education. These counties face significant economic and developmental challenges in addressing population growth. Limited infrastructure to accommodate the coastal population growth, a lack of labor for growing companies, a growing gap between the wealthy and other residents, and environmental pressures comprise the main influences on urban expansion.

Human Use

There is a rich history of human use of central California's marine resources, beginning with the Native Americans and continuing to the present. Today the Sanctuary's spectacular scenery, moderate climate, abundance of marine life, and relatively clean ocean waters all draw large numbers of divers, kayakers, boaters, fishermen, surfers, tidepoolers, and bird and mammal watchers. Coastal tourism, agriculture, and commercial fisheries are all pillars of the regional economy with direct links to the Sanctuary.

Tourism is one of the most significant industries, with a total travel spending revenue in 1998 of $9 billion for the seven counties directly tied to the Sanctuary. (This figure includes destination spending, air fares, and travel arrangements). Santa Clara leads in total spending at $3.2 billion, followed by San Mateo at $2.2 billion and Monterey at $1.6 billion. Nearly 29 million visitors travel to the Sanctuary counties every year, and approximately two-thirds of this is leisure- and recreation-related. Two of the main reasons given for travel to the coastal region are its natural and scenic beauty and recreational opportunities. Travel spending continues to grow each year, and it increased by an average

of 5 to 10 percent for all counties from 1992 to 1998.

Agriculture is also an important industry in the Sanctuary region and is a national leader in the production of artichokes, strawberries, and salad greens. It was valued at $3.65 billion for the region (including inland counties Santa Clara and San Benito) in 1999. Monterey County, valued at $2.9 billion, is by far the most significant producer in the region and ranks third highest statewide.

The fishing industry constitutes a relatively small portion of the overall economy, both regionally and statewide. However, the Sanctuary recognizes the inherent value of the commercial and recreational fishing industry as a key component to the economic, historical, and cultural fabric of the region. Most fishes caught within the Sanctuary are landed at one of five main ports: Princeton /Half Moon Bay, Santa Cruz, Moss Landing, Monterey Bay, or Morro Bay. More than 1,000 commercial vessels fish within the Sanctuary annually, and more than 80 percent of the commercial landings are composed of squid, rockfishes, Dover sole, anchovy, mackerel, sardines, sablefish, albacore, and salmon. In 1997 marine fisheries for the counties of Marin, San Mateo, Santa Cruz, Monterey, San Luis Obispo, and San Francisco were valued at a total of $53 million, led by San Francisco at more than $19 million and Monterey at more than $14 million.

Other Sanctuary-related industries include aquaculture, kelp harvesting, sand mining, and commercial shipping. The rich biodiversity and close proximity of the deep sea also provide unparalleled research opportunities for approximately twenty-five marine science facilities.

County	2000 Population	Percent Change 1990-2000
Marin	247,289	7.5%
San Mateo	707,161	8.9%
Santa Cruz	255,602	11.3%
Monterey	401,762	13.0%
San Luis Obispo	246,681	13.6%
TOTAL	1,858,495	10.9% (avg.)

Residents and visitors use the Sanctuary for a wide variety of recreational activities.
Photographer: Brad Damitz

Sanctuary Management Activities and Operations

Overview

The Sanctuary's staff and budget have grown from one person in Monterey with $450,000 to about twenty individuals working in Half Moon Bay, Santa Cruz, Monterey, and Cambria and a budget of $2.5 million. The Sanctuary remains enormous in physical size as well as the scope and diversity of issues with which it contends. Limited staff and resources continue to compel the Monterey Bay National Marine Sanctuary to actively seek out partnerships to help fulfill its mission to understand and protect central California's marine and coastal ecosystems and cultural resources. This well-established practice of reaching out and involving local communities continues today.

A major focus of the Sanctuary staff has been to demonstrate and develop *connections* — among components of the ecosystem, between human activity and the natural marine environment, and between a healthy economy and business community and a healthy environment. The programs to meet these mandates are:

Sanctuary staff, Watsonville Mayor Oscar Rios, and local students participate in an Earth Day 2000 watershed clean-up along the Pajaro River.
Photographer: MBNMS

NOAA Environmental Heros

Environmental Hero awards are given out by NOAA each year to honor citizens around the U.S. for their efforts to "protect and preserve" the nation's marine and coastal environments. The Monterey Bay National Marine Sanctuary has given out the award to the following citizens and organizations:

1998
California State University - Moss Landing Marine Laboratories

1999
Rachel Saunders, Center for Marine Conservation
Brian Baird, California Resources Agency

2000
Mark Silberstein, Elkhorn Slough Foundation

Research and Monitoring, that strives to understand how the components of the ecosystem *connect* to each other, how the biological communities function naturally, how human activities affect the natural system, and how the ecosystem changes over time due to natural perturbations and human-induced factors.

Resource Protection, that *connects* positive human behavior and activities with a healthy ecosystem; this program, which has fixed functions but which must also respond constantly to developing problems and concerns, focuses on altering or preventing human activities that may adversely affect Sanctuary resources.

Education and Outreach, to *connect* people who live on land to the marine environment by teaching about the value of a natural coastal ecosystem; how human activities can affect it; the nexus between a viable economy and a healthy ecosystem; and what individuals, groups, and businesses can do to understand and protect this ecosystem.

Program Support, internally *connecting* the operation of the Sanctuary, to effectively provide services and equipment for professional staff and help meet the needs of the public.

Implementing the Sanctuary's Management Plan

Overview of Current Efforts — Existing Sanctuary Program Accomplishments

Implementing the Sanctuary's management plan is an ongoing effort. Some components of the plan are already in place while many others, already identified, must still be done. The Sanctuary's existing programs — Research, Resource Protection, Education and Outreach, and Program Support — have accomplished and will continue to accomplish important things in implementing the management plan. The significant accomplishments of the Sanctuary's existing programs are summarized below.

Research

The Research Program's focus has been on science for resource management: determining information gaps, developing collaborative studies to improve understanding of issues, and interpreting research for decision makers. Much of the credit for the Sanctuary Research Program belongs to the world-renowned and extremely collaborative research community in central California. For example, approximately 20 research institutions are represented on the Sanctuary Research Activity Panel, which wrote the first-ever Sanctuary Research Plan in the mid-1990s. Many members

also contributed text and bibliography files to a web-based Site Characterization that summarizes existing information on the Sanctuary's natural resources. In turn, the Sanctuary has been able to demonstrate the need for research to address specific resource management issues and provide a method for applying scientific results to public policy; this has resulted in several multi-million dollar efforts to map Sanctuary habitats, monitor nearshore ecosystems, and model ocean circulation.

Through Sanctuary funding, writing issue reviews, building collaborations, providing research platforms, and obtaining grants, the Research Program has achieved notable success in:

Monitoring beach-cast (dead or stranded) birds and marine mammals; krill in Monterey Bay; gray whale migrations; kelp canopies; rocky shores; and water quality in Elkhorn Slough.

Characterizing pinniped rookeries; seafloor habitats in the nearshore, offshore, and in formerly restricted military zones; and even management issues such as marine zoning regulation and kelp harvesting.

Providing extensive information in technical reports available on the web; at symposia coordinated with the Sanctuary Education Program and local governments; and through numerous technical advisory committees.

Studying tidal erosion in Elkhorn Slough; distribution of introduced species; sea lion deaths caused by harmful algal blooms; fishery impacts from trawling and gillnet by-catch; coastal erosion; impacts of ship groundings and oil spills; and human use effects in kelp forest and rocky shore systems.

Much more research is needed than has been completed, especially as public and resource management needs are clarified through Sanctuary advisory groups and in coordination with the Sanctuary Resource Protection Program. For example, while habitat mapping has improved since 1992, most of the habitats and distribution and abundance of key species have yet to be mapped or measured. Moreover, we have relatively few data on how human activities are changing the Sanctuary ecosystem through time. An ecosystem monitoring program, the Sanctuary Integrated Monitoring Network (SIMoN), has been developed and is in the process of being initiated.

Resource Protection

A key objective of the existing management plan is to ensure that human activities in the Sanctuary do not adversely affect natural resources, including habitat. This is accomplished through a variety of approaches, including collaborative planning efforts to prevent and reduce human impacts; regulations, permits, and enforcement efforts; and helping to educate the public and Sanctuary users about how they can minimize or eliminate harmful behavior.

Intertidal monitoring helps detect long-term changes to coastal habitats. Photographer: MBNMS

The wolf-eel, *Anarrichthys ocellatus*, searches for prey along the rocky seafloor.
Photographer: Dan Gotshall

Regulations

To protect its natural wonders, activities that could harm the health of the Sanctuary are prohibited. Uses compatible with the goals of resource protection are allowed, but may be regulated. The following activities are prohibited within the Sanctuary:

1. Exploring for, developing, or producing oil, gas, or minerals (with the exception of a limited amount of jade from a small authorized area).

2. Discharging or depositing any materials (with the exception of fish, chumming materials, or bait used or resulting from traditional fishing operations; engine exhaust; and water and effluent incidental to vessel operations, e.g., deck wash down and gray water but excluding oily bilge wastes).

3. Discharging or depositing any material that originates outside the Sanctuary that subsequently enters the Sanctuary and injures Sanctuary resources (with the exceptions noted in #2).

4. Altering the seabed or constructing any structures on the seabed (unless incidental to anchoring vessels; aquaculture, kelp harvesting, or traditional fishing operations; installation of navigation aids; or construction or repair of breakwaters, jetties, docks, or piers).

5. Taking any marine mammal, sea turtle, or seabird (unless authorized by the Marine Mammal Protection Act (MMPA), the Endangered Species Act (ESA), or the Migratory Bird Treaty Act (MBTA)).

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The Sanctuary's long coastline, which includes stretches of urbanization, creates many complex threats to and opportunities for maintaining a healthy coastal ecosystem. A key goal is to actively prevent damage to the resources. The Resource Protection Program has accomplished or has underway some important elements of the management plan, such as:

- A permit program to review planned activities that may harm Sanctuary resources and to issue permits or other authorizations with specific measures needed to minimize impacts.
- Coordinated review of other agency permits for point sources of pollution.
- A Water Quality Protection Program that has developed and partially implemented three plans to improve or protect water quality as well as plans to strengthen coordinated regional water quality monitoring by government agencies and citizen groups.
- Strategies, now approved at the international level, to move large commercial ships farther offshore and use north-south transit lanes to reduce threats of spills from large vessels.
- Participation in research and a long-range management plan for Highway 1 to reduce impacts from landslide repair and disposal activities.
- Establishment of a Pilot Interpretive Enforcement Program including a NOAA Office of Law Enforcement officer assigned to focus exclusively on Sanctuary enforcement issues.
- Development of a cooperative enforcement agreement with state agencies.
- Coordination and regular enforcement patrols by NOAA's Office of Law Enforcement.
- A hazardous material/emergency response program for events such as spills and vessel groundings.
- Collaborative educational products and outreach on resource protection issues such as water quality, jet skis, boating, and vessel traffic.

None of the above initiatives is complete or fully implemented due to resource limitations. To further the program goals, the Sanctuary's resource protection initiatives rely heavily on partnerships with federal, state, and local agencies and on collaborative efforts with the public, environmental groups, businesses, and industries. In addition, a Conservation Working Group composed of approximately fifteen representatives of conservation organizations and agencies advises the Sanctuary Advisory Council and staff about important conservation matters.

The Sanctuary may issue a permit to allow an activity that is otherwise prohibited, provided it can find, among other things, that adverse impacts will only be short-term and negligible. However, in no instance can the Sanctuary permit new oil and gas development, offshore disposal of primary treated sewage, or designation of a new dredge disposal site.

Education and Outreach

The Sanctuary's education and outreach efforts help connect people to the marine environment with the goal of promoting public understanding of our national marine sanctuaries and empowering citizens with the knowledge necessary to make informed decisions that lead to the responsible stewardship of aquatic ecosystems.

Partnerships and collaboration have played a key role in the development and implementation of the Sanctuary's educational efforts. The Sanctuary Education Panel, composed of marine educators representing twenty organizations and schools, is a prime example of how the Sanctuary works with the regional community to shape the Sanctuary's educational focus.

The Education and Outreach Program has accomplished or has underway some important elements of the management plan, such as:

Increasing public awareness of the Sanctuary through a variety of techniques, including:

- Public lectures and forums and annual *Sanctuary Currents* Symposium.
- Anniversary celebrations and a variety of public events.
- Interpretive signs and displays at state parks, beaches, and interpretive facilities.
- Educational products and materials including books, brochures, posters, maps, newsletters, annual reports, videos, and an extensive web site.
- Support of volunteer programs, including BAY NET, Save Our Shores, and Friends of the Elephant Seal, aimed at raising awareness of the Sanctuary.

Providing education addressing specific issues that may threaten Sanctuary resources by:

- Developing a variety of water quality programs and products to address urban runoff.
- Providing public outreach to promote stewardship of endangered species, fragile habitats such as tidepools, and protected species such as marine mammals.
- Developing and distributing educational materials to mariners on shipping lanes.

Providing educational opportunities for teachers and students by:

- Developing school curricula.
- Organizing teacher workshops.
- Providing shipboard and submersible "teacher-in-the-sea" opportunities.
- Hosting an annual High School Student Summit.

Regulations (cont.)

6. Possessing any historical resources, or any marine mammal, sea turtle, or seabird (except for valid law enforcement or as authorized by the MMPA, ESA, or MBTA).

7. Flying motorized aircraft below a height of 1,000 feet above any of four specific zones of the Sanctuary (except for valid law enforcement purposes).

8. Operating motorized personal watercraft, except within four established zones. (Motorized personal watercraft means any motorized vessel less than fifteen feet in length, capable of exceeding fifteen knots, and with the capacity to carry not more than the operator and one other person.)

9. Attracting white sharks by any means within state waters of the Sanctuary.

10. Interfering with, obstructing, or preventing an investigation in connection with enforcement of the Sanctuaries Act or any regulation or permit issued under the Act.

This is a summary of the activities prohibited by the National Marine Sanctuary Program regulations and is intended for easy reference only. The summary does not include all exemptions or other activities regulated within the Sanctuary under other local, state, or federal authorities. The full text of the regulations is published at 15 CFR Part 922.

The Sanctuary participates in many events to help raise community awareness about ocean issues. Photographer: MBNMS

The Sanctuary's boat is used to help support enforcement, research, and education programs. Photographer: Kip Evans

- Supporting the development of S.E.A. Lab, a residential marine science program.

Much of the initial education and outreach effort focused around Monterey Bay, although the Sanctuary recently hired education staff in San Simeon and Half Moon Bay to expand our efforts. Currently education staff are investigating the feasibility of establishing a Sanctuary visitor center and completing a multicultural education plan, initially with a Hispanic outreach component, to guide and enhance the Sanctuary's outreach programming.

Program Support

Critical to the Sanctuary's successful operation is an effective program to support our three mandated purposes — resource protection, research and monitoring, and education and outreach.

Important parts of the Program Support function that are already in place are:

- Computer system and associated network.
- Rudimentary GIS (geographic information system).
- Shared NOAA aircraft with the Channel Islands National Marine Sanctuary.
- One patrol boat.
- Diving program.
- A Sanctuary Advisory Council, including education, research, conservation, and business and tourism working groups.
- Non-profit foundation to support Sanctuary activities and projects.

Community Involvement

The citizens of central California are very politically and socially engaged on issues affecting their communities and surrounding environment, including the ocean. The Sanctuary owes its existence largely to the dedication and determination of thousands of local citizens and elected officials who strongly advocated for its designation. To this day, public participation is integral to nearly every aspect of management and operation — from participating in the Sanctuary Advisory Council and its working groups, to volunteering for one of many organizations that help the Sanctuary achieve its education and research missions, to attending community festivals and symposia.

Sanctuary Advisory Council

Establishing a Sanctuary Advisory Council (SAC) for the purpose of advising the Sanctuary manager on policy issues affecting the Sanctuary was clearly identified in the Sanctuary's 1992 management plan. As local involvement in the Sanctuary was an ardent vision by the community in 1992, the management plan directed the Sanctuary to consult with all interested groups and agencies to ensure that the council was representative of a broad-based constituency. The SAC comprises twenty voting members and four non-voting members, each representing various stakeholders. Since its establishment in March 1994, the group has played a vital role in many decisions affecting the central California coast. To date it has held fifty-nine regularly scheduled SAC meetings, all open to the public.

The Sanctuary management plan envisioned that the SAC would advise the Sanctuary manager on:

- The effectiveness of interagency agreements for surveillance and enforcement.
- The effectiveness of the Sanctuary regulations in providing adequate resource protection.
- The review of research and education proposals.
- Helping establish priority research and education needs.
- The issuance of research and education permits.
- Raising public awareness of the Sanctuary and advising on the development of a local constituency.
- Enhancing communication and cooperation among all interests involved in the Sanctuary.
- Establishing and operating information and education facilities to increase public awareness and appreciation of the resources and qualities of the Sanctuary.
- Commenting to appropriate federal, state, or local government on proposed actions, plans, and projects in areas outside the Sanctuary but affecting the Sanctuary.
- Rules and conditions for all forms of public recreation.
- An overall plan for the use, development, and maintenance of Sanctuary lands and buildings.
- Recommendations on criteria and terms and conditions for Sanctuary permits and authorizations.

NOAA formally established the SAC in 1994. The SAC Charter incorporated the existing ad-hoc conservation, education, and research groups as formal working groups and renamed them the Conservation Working Group, the Sanctuary Education Panel, and the Research Activity Panel, respectively. More recently the SAC created an informal Business and Tourism Activity Panel and, by

Sanctuary Advisory Council Membership

User and Interest Groups:

Agriculture
At-large (three seats)
Business/Industry
Conservation
Diving
Education
Fishing
Recreation
Research
Tourism

Government Members:

Association of Monterey Bay Area Governments
California Coastal Commission
California Department of Fish and Game
California Environmental Protection Agency
California Resources Agency
California State Parks
Ports and Harbors
U.S. Coast Guard

Non-Voting Members:

Monterey Bay Natl. Marine Sanctuary
Gulf of the Farallones Natl. Marine Sanctuary
Channel Islands Natl. Marine Sanctuary
Elkhorn Slough Natl. Estuarine Research Reserve

Purposes of SAC and Working Groups

Sanctuary Advisory Council – to provide advice and recommendations to the Sanctuary Superintendent and NOAA on issues and activities affecting the Sanctuary.

Conservation Working Group – to coordinate the efforts of existing organizations and help promote and achieve comprehensive and long-lasting stewardship of the Sanctuary through continued oversight and advocacy.

Research Activity Panel – to help promote a comprehensive understanding of existing research activities and institutions, review program proposals, advise on research priorities, provide scientific advice and objective information, and assist in the implementation of programs to increase our scientific understanding of the Sanctuary.

Sanctuary Education Panel – to help promote a comprehensive understanding of existing education activities and organizations, review program proposals, advise on educational priorities, and assist in implementation of programs to increase understanding and stewardship of the Sanctuary.

Business and Tourism Activity Panel – to strengthen economic partnerships with the Sanctuary and provide a forum for local businesses to discuss Sanctuary-related issues.

motion on June 1, 2001, made it a formal working group.

The Sanctuary goals to promote research, education, and resource protection are a major focus for the SAC, and members work diligently to promote public stewardship. The SAC has proven to be a powerful voice for the general public, responding to citizen concerns, ideas, and needs. It provides a public forum for its constituents, working to enhance communications and provide a conduit for bringing the concerns of user groups and stakeholders to the attention of the Sanctuary Superintendent and NOAA. The issues that SAC members have addressed over the years are as diverse as the members themselves. Most often SAC members are able to reach agreement on a course of action or a recommendation to the Sanctuary Superintendent. However, there are times when individual members may not reach unanimous agreement. This is part of the deliberative process. To view the minutes from past meetings, visit http://www.mbnms.nos.noaa.gov/Intro/advisory/advisory.html.

Volunteers

The Sanctuary benefits directly from the activities of hundreds, if not thousands, of dedicated volunteers who do everything from providing advice and guidance to cleaning up beaches; sampling local streams; surveying local beaches for dead or stranded birds and marine mammals; and conducting outreach to local user groups, residents, and visitors. At this time Sanctuary staff coordinate the SAC and its working groups, the Beach COMBERS program, Urban Watch, and the Citizen Watershed Monitoring Network. All other volunteer programs are associated with existing conservation groups or programs; the Sanctuary provides them with training and support.

Monterey Bay Sanctuary Foundation

Incorporated in 1995, the Monterey Bay Sanctuary Foundation is a nonprofit (501(c)(3)) public benefit corporation whose goal is to promote protection and public understanding of the Sanctuary. Over the past several years the Foundation has been instrumental in promoting research, education, and enforcement initiatives for the Sanctuary. Some of these efforts include: cosponsoring the *Sanctuary Currents* Symposium and a public lecture series, developing educational posters and maps, and providing fiscal coordination for a variety of water quality and resource monitoring programs. The Foundation also solicits and administers grants, donations, and other revenues to support Sanctuary programs.

Accomplishments

The Sanctuary's current management plan was developed during the late 1980s and early 1990s. As such, it focused on issues important to the public during that time, such as threats to resources from oil and gas development, the transport of hazardous materials along the coast, personal watercraft use in coastal waters, and point and non-point source pollution. Some of the main issues the Sanctuary has addressed to date include:

Partnerships. The Sanctuary actively seeks out partnerships with other agencies, organizations, and individuals to help implement many of its research, education, and resource protection programs. Partnerships help reduce inefficiency and jurisdictional overlap, maximize resources, and ensure that a broader spectrum of interests are included in Sanctuary management.

Water quality plans. Working with a wide array of community members and agencies, we have identified priority strategies to address water quality problems in four general areas. These strategies are part of four detailed action plans addressing urban runoff, marinas and boating activities, regional monitoring and data sharing, and agriculture and rural lands. The plans are being implemented through the pooling of existing staff from various agencies and groups, grant funding, and volunteers.

Vessel traffic. Working with industry, conservation groups, and government agencies, the Sanctuary helped develop a new voluntary vessel traffic regime that places large commercial ships — some carrying hazardous materials and petroleum products — farther offshore in order to safeguard Sanctuary resources. The regime also realigns traffic entering the ports of San Francisco and Long Beach/Los Angeles.

Oil and gas development. Upon designation the Sanctuary prohibited the exploration, development, or production of gas or minerals (later amended to except jade collection) within its boundary.

Jade collection. After years of discussion with jade collectors and the SAC, the Sanctuary revised its prohibition on mineral extraction regulations to allow limited jade collecting in certain areas of the Sanctuary.

Site characterization. The Sanctuary expanded upon the knowledge base of the area's natural resources by completing an online Site Characterization of the Sanctuary's resources and habitats. Supplemental information is continually added to this characterization.

Harbor dredge disposal. Upon designation the Sanctuary prohibited the establishment of new dredge disposal sites (other than those already in existence) within its boundaries. Two sites off Moss Landing were identified in 1992. Since then Sanctuary staff have allowed use of two other sites, one each at Santa Cruz and Monterey Harbors, that pre-existed Sanctuary designation in 1992.

Emergency response. The Sanctuary has worked with state and federal emergency response agencies

Some Major Issues Addressed by the SAC

- Jade collecting
- White shark chumming
- Vessel traffic safety
- Development of the Water Quality Protection Program
- Kelp harvesting and management
- Fiberoptic cables
- Moving ATOC (Acoustic Thermometry of Ocean Climate) out of the Sanctuary
- Diver partnership program
- Support of the Sanctuary Integrated Monitoring Network (SIMoN)
- Interpretive signage on the Sanctuary
- Elimination of proposed user fees
- Support for additional resources to implement the management plan
- Providing comments on national reauthorization language and other national policy issues

Schools of common dolphins, *Delphinus delphis,* forage throughout the Sanctuary.
Photographer: Kip Evans

Volunteer Programs

BAY NET: a field interpretive program associated with The Ocean Conservancy that enhances public awareness and understanding of the Sanctuary and its wildlife, policies, and programs.

Beach COMBERS: Sanctuary program that trains volunteers to sample selected sections of beaches for dead or stranded birds and marine mammals on a monthly basis. Data gathered help identify potential problems in the offshore areas, such as oil spills and harmful algal blooms.

Beach Watch: long-term monitoring project of the Farallones Marine Sanctuary Association. Every four weeks, participants survey beaches in San Mateo and Marin counties for dead or stranded birds and marine mammals. Data gathered help identify potential problems in the offshore areas, such as oil spills and harmful algal blooms.

Coastal Cleanup: each year hundreds of volunteers participate in beach cleanups throughout the Sanctuary. Divers, organized by the dive group CenCAL, also conduct at least two Monterey Harbor cleanups every year.

Friends of the Elephant Seal: docent program dedicated to educating people about elephant seals and other marine life and to teaching stewardship for the ocean off the central coast of California. *(continued on p. 18)*

to update its emergency response plan. Over the years the Sanctuary has responded to a variety of incidents, including vessel groundings, airplane crashes, oil spills, and a variety of toxic and sewage spills. In the past two years alone, the Sanctuary has paid about $100,000 to remove the remains of three stranded or sunken vessels.

Information dissemination. The Sanctuary produces three newsletters and an annual *Ecosystem Observations* report and organizes (with local government) a high-profile symposium each year. The site has also produced numerous educational pieces, such as brochures that describe the Sanctuary and its programs and target specific issues such as water quality. Most information produced by the Sanctuary is put on its web site.

Seafloor mapping. Although precise maps of the Sanctuary are required for effective resource management, only recently have we moved beyond basic bathymetry and oceanographic charts. Many seafloor habitats within the Sanctuary have only recently been characterized and mapped by investigators from the U.S. Geological Survey, NOAA, and Monterey Bay Aquarium Research Institute (MBARI) using high-resolution acoustic imagery. The seafloor imagery has been interpreted and formatted as a GIS layer to be used for both resource management and to address basic science questions. Despite the efforts by these and other groups, however, details of the geology and morphology of much of the seafloor are still largely unknown.

Kelp surveys. Aerial surveys of kelp canopy cover are being conducted on a yearly basis by the Sanctuary and the California Department of Fish and Game (CDFG). More precise maps of kelp communities and bottom habitat on the Monterey Peninsula have also been produced using hyperspectral data, multibeam bathymetry data, and GIS and provide information on kelp canopy, sub-canopy, kelp types, and seafloor topography. Data from these programs indicate that kelp typically occurs on rocky ridges of the seafloor and is highly variable.

Tidepool conservation. In response to public concern, a citizen-based Point Pinos Tidepool Task Force was established, in which the Sanctuary participates. The Task Force decided to focus on three main initiatives: improving public awareness about tidepool conservation through both signage and on-site volunteer interpreters; and conducting research about the role of human impact in changes that occur in rocky intertidal communities.

Shark chumming. With urging from many local user and interest groups and the SAC, the Sanctuary promulgated a new regulation to prohibit attracting white sharks in state waters of the Sanctuary.

Student summits and teacher training. The Sanctuary works with educational institutions regularly to provide training opportunities for marine science teachers and students interested in marine science.

Seabird by-catch. Sanctuary Beach COMBER data were used by the National Marine Fisheries Service

(NMFS) and the CDFG to identify the scope of by-catch with the nearshore halibut gillnet fishery. CDFG moved the fishery out to a depth of 60 fathoms due to seabird by-catch concerns, especially regarding Common Murres.

Kelp management. Through a rigorous public process, the Sanctuary provided recommendations to the CDFG on its five-year kelp management plan for waters in the Sanctuary. The Sanctuary's 1992 Management Plan identified kelp harvesting as possibly requiring future regulations.

Limited monitoring efforts. The Water Quality Protection Program has evaluated information on existing water quality management programs and monitoring efforts in the region in order to establish a baseline for improved integration among programs. The program has also hired a citizen watershed monitoring network coordinator to help orchestrate the standardization of volunteer monitoring efforts.

Habitat protection for salmonids. In cooperation with NMFS, the Sanctuary sponsored a symposium focused on issues surrounding the decline of salmonids in central California. It also developed a new educational salmonid poster and is working on related curricula for schools.

Sanctuary satellite offices. The Sanctuary's main office was established in Monterey shortly after designation. Since then, as envisioned in the management plan, the program has hired new staff to set up offices in Half Moon Bay, Santa Cruz, and Cambria.

Issues and Opportunities

Since 1992 new issues have emerged as high-profile items in the public consciousness. Sanctuary staff have already heard from the public that the Sanctuary should be involved in and address some of these items. Others, such as visitor centers, are items the public feels the Sanctuary should implement.

Beach closures/contaminated runoff. Water quality issues continue to be a high-profile issue in areas throughout the Sanctuary. Beaches used for swimming, diving, and surfing are closed regularly due to high levels of coliform bacteria. Water quality problems are numerous and complex, from aging municipal sewer systems, to urban and agriculture runoff, to ports and harbors.

Coastal erosion. As more areas of the coast become developed, the pressure to protect valuable coastal properties increases. Poorly planned erosion control structures can cause even more erosion of adjacent beaches, possibly displacing Sanctuary resources, and can lead to diminished beaches.

Commercial, submerged cables. The rapid expansion of Internet technology has created a sudden demand for proposals to install submerged fiberoptic cables in the Sanctuary. This phenomenon has involved the development of a national policy that, in draft form, allows cables to be installed in the

Volunteer Programs (con't.)

Sanctuary Citizen Watershed Monitoring Network: coalition of twenty trainee groups that sample water pollution in coastal waters and watersheds.

Sanctuary Stewards: volunteers trained by Save Our Shores to become skilled marine educators, community organizers, and resident experts on the Sanctuary's resources and issues facing Sanctuary management.

Urban Watch: volunteers trained to sample urban storm drains during the dry season.

More than one hundred Snapshot Day volunteers annually monitor the health of rivers and streams in the Sanctuary's watershed.
Photographer: Bridget Hoover

Beach closures have become a major water quality issue in the Sanctuary. Photographer: Brad Damitz

Commercial fishing boats moored near Wharf 2 in the Monterey Harbor. Photographer: Brad Damitz

Sanctuary.

Coordinated volunteer programs. There are numerous volunteer groups performing many important functions throughout the Sanctuary. However, at this time there is no one organization coordinating these efforts or helping provide them with the means to protect Sanctuary resources.

Desalination. The demand for an already overtaxed fresh water supply continues to increase with the growing population of California's coastal communities, and more communities are exploring the feasibility of desalination plants to augment fresh water supplies. Discharge of hypersaline brine water and piping construction may result in impacts to the seabed.

Fisheries issues. The Sanctuary does not currently manage any aspect of commercial or recreational fisheries. However, the Sanctuary and members of the public have concerns about the effects of certain fishing activities on Sanctuary resources, habitats, and the overall ecosystem. Many fishermen and their supporters do not want the Sanctuary to regulate fishing activities.

- **Rockfish.** In January 2001 several environmental groups filed a petition with the U.S. Secretary of Commerce to list the bocaccio (a local rockfish) as a threatened species under the Endangered Species Act. According to NMFS, bocaccio numbers have declined 98 percent since 1969. Canary and other types of rockfish may be similarly depleted.
- **Live fish fisheries.** Some scientists believe that this relatively new, yet common nearshore fishery will deplete certain fish populations because it targets mainly small, immature nearshore fishes. More relevant life history information, including data on the status of target fish populations, is needed to help manage this emerging fishery. This fishery has created user conflicts with recreational fishers.
- **Anadromous fishes.** Several central California runs of chinook salmon, coho salmon, and steelhead have been placed on the federal list of endangered and threatened species since 1994. We are very close to losing coho salmon from coastal streams entering the Sanctuary. The only remaining streams in the Monterey Bay area that have adult coho runs in most years are Scott and Waddell creeks (in northern Santa Cruz County). These fishes have been lost from the larger San Lorenzo River and Soquel Creek watersheds, but a recovery plan is underway.

Funding for ecosystem monitoring (SIMoN). Sanctuary staff have developed an ambitious and comprehensive ecosystem monitoring plan, but there is currently no regular funding to implement this important long-term monitoring effort.

Intertidal use. Many local communities have expressed great concern about humans trampling over and collecting intertidal life. There have been some accomplishments with improving tidepool use at Point Pinos, one of the most popular, easily accessible, and historically important tidepool areas on

the California coast. In the last few years, increasing numbers of Pacific Grove residents have raised concerns about the high level of human use and associated impacts to the tidepools. A newly created coalition was very successful in advocating for stronger protection of tidepool resources.

Introduced species. The introduction of exotic species that out-compete native species in marine and coastal environments is a great concern to the health of local ecosystems. The impacts of these invaders have been well documented in areas like San Francisco Bay but have been less studied in the Sanctuary.

Multicultural education. California's demographics are changing rapidly. For example, nearly half of Monterey County residents identify themselves as Hispanic. The need to develop targeted educational materials for our changing communities is critical.

Noise. The impact of sound — from above and below the water's surface — on Sanctuary resources continues to be a public concern. Projects like ATOC, the Navy's Low Frequency Acoustics, and recent concerns over the expansion of a Navy bombing range in Big Sur have only heightened concern.

Sanctuary Advisory Council (SAC). The decision-making authority of the superintendent and staff in relationship to the SAC remains an issue of discussion among a few council members and several community members. Some believe the SAC should have more of a management, rather than advisory role. The majority of the current and past SAC members have been satisfied with the advisory role, and the Sanctuary sees great value in the current design and relies on the SAC for important matters.

Sanctuary management and coordination. Since designation the northern portion of the Monterey Bay National Marine Sanctuary has been under some form of co-management with the Gulf of the Farallones National Marine Sanctuary. The management plan review for these sanctuaries will explicitly consider this arrangement.

Soft bottom communities. From one of the few direct investigations of communities inhabiting the soft bottom, it appears that there has been a decrease in invertebrate species diversity and abundance in an area offshore of Moss Landing over the past thirty years. Researchers suggest that global changes in climate may be affecting this local community. Although larger trends are not currently understood, new efforts have begun to characterize regional soft bottom communities better.

Submerged cultural resources. Due to competing priorities, we have not significantly investigated and inventoried the shipwrecks within the Sanctuary. Staff recently began preparing a catalog with descriptions of these important cultural resources.

Visitor centers. We have installed various informational signs and kiosks in communities adjacent to the Sanctuary, but there is no one interpretive visitor center to connect students, teachers, visitors, and local residents to the Sanctuary or interpret its resources.

Marine pollution and debris are a problem for many of the Sanctuary's inhabitants, including this California sea lion, *Zalophus californianus*, whose neck is entangled in a baseball cap.
Photographer: Brad Damitz

The black and yellow rockfish, *Sebastes chrysomelas*. Photographer: Dan Gotshall

Implementation Success for the Monterey Bay National Marine Sanctuary Management Plan

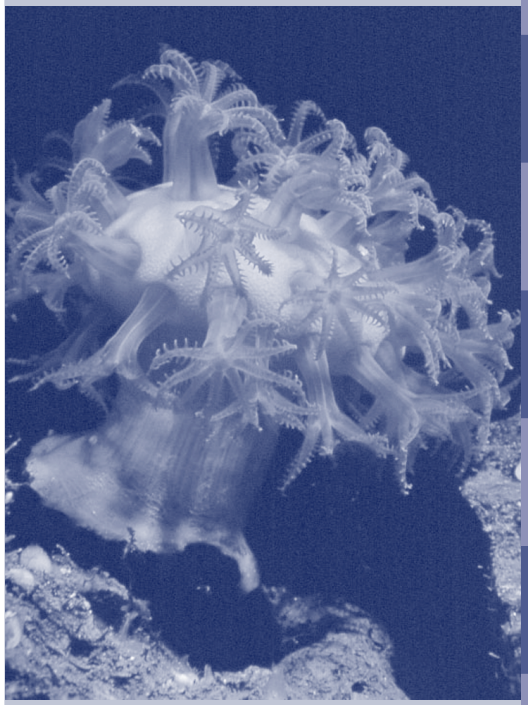
Since designation the Sanctuary has made substantial progress in implementing specific portions of its management plan. However, resource limitations and the need to respond to immediate and emerging threats have prevented the Sanctuary from fully achieving the ambitious plan set forth by the public and NOAA in 1992. The following matrix summarizes the relative degree of success the Sanctuary has had in implementing the plan to date.

	Completed	Implemented and Ongoing	Partially Implemented	Not Implemented
Resource Protection				
Goals and Responsibilities				
Conduct spill drill with other agencies to assess regional spill response	○			
Work with US Coast Guard to define Sanctuary role in spills			○	
Develop Sanctuary emergency response plan			○	
Encourage Sanctuary users to respect sensitive resources			○	
Provide relevant information about Sanctuary regulations and policies		○		
Collaborate with public, private users to promote compatible use			○	
Monitor levels of use to identify and control degradation				○
Monitor commercial and recreational use; encourage other agencies similarly			○	
Publicize information on commercial & recreational activities			○	
Consult with other agencies to protect Sanctuary resources		○		
Develop educational materials re: Sanctuary resources, protection needs		○		
Develop, fund cross-deputized enforcement officers to report to Sanctuary			○	
Provide boats to state, federal enforcement officers				○
Construct dedicated radio transmitter				○
Use NOAA aircraft for surveillance			○	
Evaluate enforcement effectiveness by 1995	○			
Develop civil penalty schedule; issue violation notices			○	
Review, comment on point source water quality permits (from WQ MOA)		○		
Develop Water Quality Protection Program (non-point source; from WQ MOA)			○	
Develop guidelines or regulations for vessel traffic routing		○		
Develop guidelines or regulations for kelp harvesting			○	

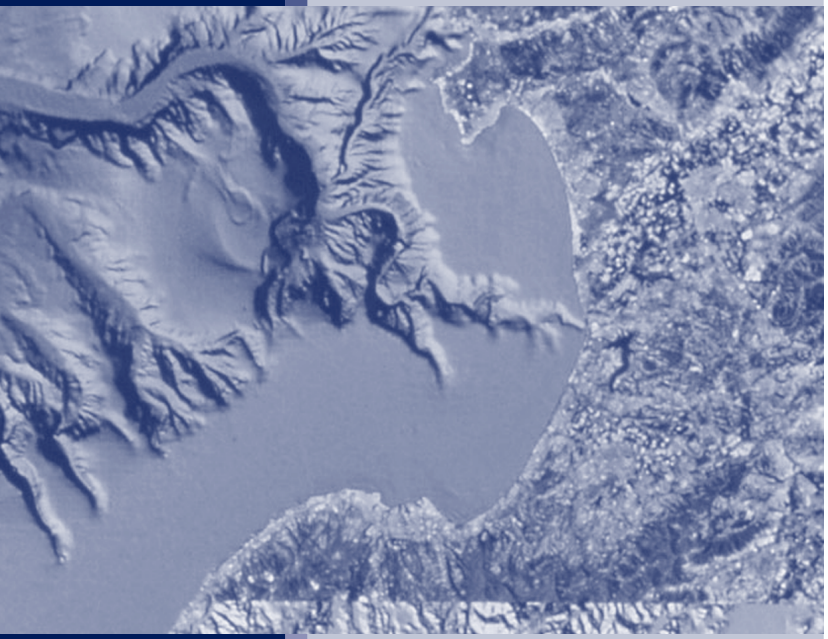
	Completed	Implemented and Ongoing	Partially Implemented	Not Implemented
Education and Outreach				
Goals and Responsibilities				
Provide public with information on Sanctuary goals, wise use of resources			○	
Broaden support for Sanctuary by offering programs suited to visitors			○	
Get feedback on effectiveness of education programs				○
Collaborate with other organizations to provide interpretive services, volunteer programs			○	
Incorporate research results into outreach materials, programs		○		
Create public awareness of National Marine Sanctuary System, its purpose and intent		○		
Conduct, coordinate outreach at coastal parks, facilities			○	
Administration				
Goals and Responsibilities				
Establish Sanctuary Advisory Council and working groups		○		
Develop partnerships with other federal, state, and local agencies		○		
Effective review, approval of permits and related legal materials		○		
Hire critical staff for first two years of operation	○			
Develop Sanctuary office in Monterey Bay region		○		
Provide necessary equipment (boats, buoys) needed to implement Management Plan			○	
Establish visitor center(s) in Sanctuary region				○

Research	Completed	Implemented and Ongoing	Partially Implemented	Not Implemented
Goals and Responsibilities				
Establish framework, procedures so that research responds to management needs		○		
Incorporate research results into interpretive/education programs		○		
Focus, coordinate data collection on physical, geological, biological elements			○	
Encourage studies that integrate research among habitats, communities			○	
Initiate monitoring program to assess environmental change and causes			○	
Predict environmental changes that would result from changes in human activity			○	
Encourage information exchange among research organizations		○		
Evaluate effectiveness of research program, integration with resource protection and education				○
Build coastal and ocean circulation models in Sanctuary			○	
Determine the abundance, distribution, and interaction processes of living resources			○	
Assist with information dissemination, build models of currents in Sanctuary			○	
Complete understanding of trophic dynamics to help assess management				○
Complete predictive studies, e.g., effect of fishing on prey stocks				○
Close gaps in knowledge about physical, biological resources in Sanctuary			○	
Identify historical uses of Sanctuary and its resources				○
Conduct field research of archaeological, historical resources				○
Implement comprehensive water quality monitoring program			○	
Evaluate special monitoring programs from Management Plan				○
Prepare annual research plan			○	
Make research results available		○		
Determine the transport of discharges and materials from sources to sinks				○

The leatherback turtle, *Dermochelys coriacea*, surfaces for a breath of air. Sanctuary research staff have participated in a project to place satellite tags on leatherbacks found in Monterey Bay. These turtles, born off Indonesia, come to this area as part of a multi-year migration across the Pacific Ocean. Photographer: Bill Douros



A mushroom coral, *Anthomastus ritteri*, feeds on the rich soup of plankton with its extended arms.
Photographer: Dave Wrobel (c) 1995 MBARI



The Monterey Canyon is one of the distinguishing characteristics of the Sanctuary. Photographer: ©1997 MBARI

Scientific understanding of the Sanctuary's resources has increased since its designation in 1992. Photographer: MBNMS

Sanctuary Resources

Since 1992 our understanding of the Sanctuary and its resources has improved significantly. An inventory of Sanctuary habitats and ecosystem processes began with the Final Environmental Impact Statement/Management Plan designation document (available at http://www.mbnms.nos.noaa.gov/Intro/eis/eis.html). That was followed in 1995 by a Site Characterization (http://www.mbnms.nos.noaa.gov/sitechar/index.html) that identifies Sanctuary natural resources more thoroughly.

Since these two important documents were completed, many new efforts have been initiated to monitor and understand the resources and processes of the Sanctuary better. Staff, in partnership with scientists from more than thirty regional research institutions, are using traditional and new technological applications to provide an unparalleled view of this aesthetically, economically, and ecologically important marine protected area. This section will highlight recent advances in our knowledge of the Sanctuary and the current status of its environments, habitats, key living marine resources, and cultural resources.

Environmental Conditions

The Sanctuary sits on the eastern edge of the northeast Pacific Ocean, a region that experiences large variations of the atmosphere and ocean that can strongly affect environmental conditions. Wind-driven upwelling supplies the upper ocean along the central California coast with important nutrients. Two areas of coastal upwelling are present in the Sanctuary: one near Point Año Nuevo and a stronger upwelling center south of Point Sur. Nutrients supplied by upwelling, along with sunlight, fuel the production of plankton — the basis of the Sanctuary's biological riches. Changes in oceanographic processes (including chemical, biological, and physical) can and do affect the Sanctuary's living resources. Toxic algal blooms and dramatic fluctuations in fisheries show that living resources in our Sanctuary are vulnerable to such changes.

Approximately 676 square nautical miles of submerged canyon exist in the Sanctuary. The canyon floor and waters within the canyon provide unique habitat beyond the continental shelf in waters more than 656 feet (200 meters) deep. The waters of the bay support oceanic species of fishes, birds, and marine mammals. The upwelling of nutrient rich waters supports most of the primary productivity for the entire bay.

Seasonal variations throughout the northeast Pacific are common and lead to climate anomalies. The most familiar anomalies, El Niño and La Niña, tend to last about a year and reoccur about every two to seven years. The 1997-98 El Niño event, now recognized as the strongest of the century, affected Sanctuary ecosystems more than any other natural phenomenon in recent history. Studies of that event contributed to our understanding of the biogeochemical effects of El Niño in coastal ecosystems. With advances in predictive abilities, scientists are now able to quickly record, map, and follow the progression of sea surface temperature changes and ultimately determine their impacts.

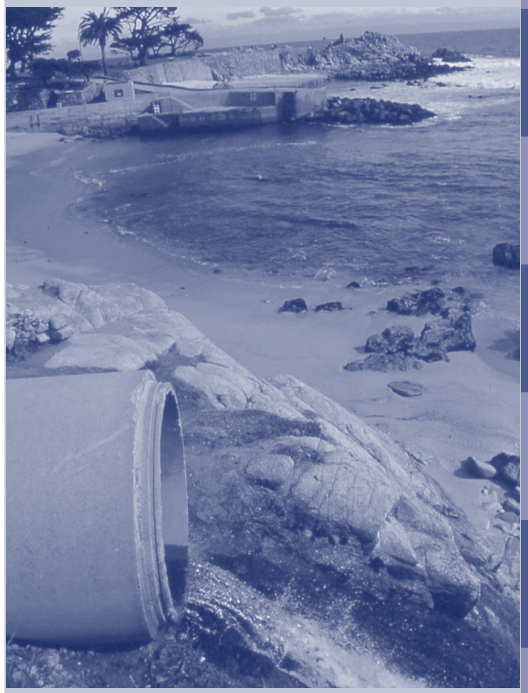
Water Quality

Water quality is a key element that unites all Sanctuary resources. The Sanctuary is adjacent to nearly 300 miles of California's coast, with eleven major watershed areas draining over 7,000 square miles, ranging from relatively pristine conditions to heavily agricultural and urbanized areas. When the Sacramento and San Joaquin rivers draining to San Francisco Bay are included, there are approximately 35,000 square miles in the Sanctuary's watersheds. These areas receive rainfall and irrigation water, picking up a variety of pollutants, ultimately delivering them to streams, rivers, wetlands, and the Sanctuary. Working collaboratively with a variety of agencies and partners, the Sanctuary's Water Quality Protection Program has been identifying watershed contaminants and developing and carrying out plans to reduce these sources.

Highly elevated nitrate levels are evident in a number of the watersheds draining to the Sanctuary, including the Pajaro, Elkhorn Slough, and Salinas watersheds. These nutrients can lead to algal blooms and reduced oxygen concentrations. In addition, sedimentation from a variety of land use activities in surrounding watersheds can smother riverine and aquatic habitats, burying the spawning grounds of anadromous species such as steelhead and salmon. Sediment also acts as a carrier for persistent pesticides such as DDT and toxaphene. Although no longer in use, ongoing deposition continues via erosion, and elevated levels of these compounds have been seen in several local estuaries and sloughs as well as in sea otter tissues.

Contaminants from urban runoff sampled in the region indicate that levels here are similar to those throughout the country, and substances found include oil and grease, metals, detergents, and suspended solids. In addition, another important problem in urbanized regions is bacterial contamination of local beaches. Each year more than a dozen beaches along the Sanctuary are periodically either closed or posted as unsafe for human contact due to high levels of coliform bacteria. Bacterial contamination is due to a variety of sources such as overflows, clogs, and leaching from aging sewage pipelines in the region as well as other sources of contamination reaching the storm drain

Stormdrains flow straight to the ocean — make the connection! Photographer: Kip Evans



A stormdrain outfall pipe discharges into the ocean near Lover's Point in Pacific Grove. Photographer: Holly Price

Elkhorn Slough, the largest estuary in the Sanctuary, is a bird watcher's paradise.
Photographer: MBNMS

The diverse rocky intertidal habitat is rich in life.
Photographer: Kip Evans

system. However, local communities lack precision in identifying causes of most beach closures in the Sanctuary.

In addition, populations of naturally occurring toxic algae occasionally grow to very high concentrations (blooms) in the Sanctuary and produce extremely potent biotoxins. These events, termed harmful algal blooms, have led to significant mortalities in marine mammal and seabird populations, including forty-seven sea lion deaths in 1998.

Habitats

The Sanctuary contains many diverse biological communities, ranging from rocky shores and lush kelp forests in the nearshore to one of the deepest offshore underwater canyons in North America.

Coastal Wetlands

Wetlands and estuarine environments provide nursery grounds for many fishes, birds, and marine mammals and are of great ecological importance. There are several estuarine or slough habitats within the Sanctuary. The largest and best understood estuary in the Sanctuary is Elkhorn Slough, which is also a National Estuarine Research Reserve. Elkhorn Slough provides habitat for a variety of ecologically, commercially, and recreationally important species.

Nearshore

Perhaps the best-studied habitat within the Sanctuary is the rocky intertidal. The numerous studies conducted in the Sanctuary have been summarized and documented in a recent technical report. In general, scientists found that rocky shores of central California have relatively high biodiversity. When compared to higher latitude North American sites, both the percent cover of bare rock substrate and the between-site variability in community structure are high. Some of this variability can be attributed to large-scale oceanographic features. Other findings suggest that the recovery rates after disturbances vary with tidal height and species assemblage and that human trampling has seriously impacted some sites. Scientists also documented a species trend consistent with global warming in one location (http://bonita.mbnms.nos.noaa.gov/Research/techreports/Rockyshores99/index.htm).

One of the most recognizable elements of the nearshore environment is the kelp community. The Sanctuary's rocky nearshore environment is characterized by forests of giant kelp (*Macrocystis pyrifera*) and bull kelp (*Nereocystis leutkeana*) that occur on rocky substrates at depths of two to more than thirty meters. It has long been known that kelp populations in the Sanctuary exhibit seasonal patterns of abundance, with maximum surface canopies in summer and minimum canopies in winter.

Interestingly, studies during the 1997-98 El Niño event found that giant kelp populations along central California were minimally affected by that event, whereas the majority of giant kelp in southern California was removed. This disparity was most likely due to the cooler ocean temperatures and higher nutrients along central California.

Nearshore soft bottom areas, composed of loose sand and mud sediments, are the most extensive bottom habitats in the Sanctuary and one of the least studied. Two major groups of invertebrates are found in this habitat: 1) the infauna, which live buried within the sediment (about 90 percent of all the bottom-dwelling organisms); and 2) the epifauna, which live on or move over the bottom. Both groups are unevenly distributed throughout the bay.

The subtidal invertebrate fauna of the shallow offshore waters are found in far greater numbers than are the intertidal fauna. For example, the sandy intertidal habitat has only twenty-nine species whereas the subtidal habitat includes more than 400 species. However, less is known about these subtidal species. The dominant invertebrates in shallow subtidal waters are worms, clams, snails, and crabs.

Pelagic Zone

In the open waters of the Sanctuary, food webs are supported almost entirely by phytoplankton (tiny plants). Zooplankton (tiny animals) are the major food source for pelagic vertebrates, and their abundant populations draw many birds, fishes, and whales to the area. The pelagic zone in the Sanctuary has historically, and currently, supported finfish (e.g., Pacific sardine and salmon) and squid fisheries, with a sizable commercial and sport catch that competes with marine mammals and birds for the same prey.

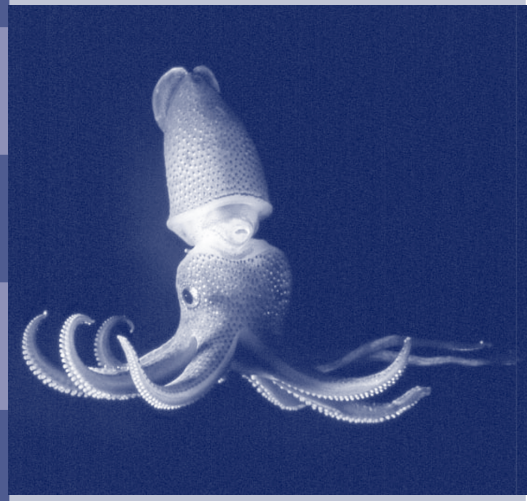
The midwater environment is by far the largest habitat in the Sanctuary and the largest biological habitat on the planet. This habitat and its inhabitants are currently being studied with ROVs to develop a dynamic model of the midwater community. The goal is to understand the basic composition and structure of the midwater community and its natural patterns of variability. Initial data show positive coupling between the seasonal cycles of productivity by phytoplankton and the abundance cycles of gelatinous predators (jellyfish) that feed on phytoplankton grazers. In addition, gelatinous predator abundance has been shown to link closely with seasonal intrusions of the California Undercurrent (more info at http://www.mbari.org/rd/1998Projects/pdf/98midwater.pdf).

Other efforts are focused on understanding how oceanographic processes, such as wind, currents, and upwelling, influence pelagic and midwater communities. The 1997-1998 El Niño event led to remarkable declines in coastal upwelling, phytoplankton growth, and krill abundance in Monterey Bay.

Studying Offshore Communities

At the time of Sanctuary designation, midwater and benthic communities of the Monterey Canyon were virtually unstudied. With recent technological advances, scientists have been able to explore the depths with submersibles, remotely operated vehicles (ROVs), and autonomous underwater vehicles (AUVs). For this reason, we are learning more about the deep sea and its creatures. Because of the vast size and remoteness of midwater and deep seafloor environments, scientists are almost certain to encounter previously unidentified species on visits to new locations. For example, over the past year repeated MBARI midwater ROV surveys at set locations and depths have identified numerous gelatinous organisms that are likely previously unidentified species. Species of clams and worms have evolved to exploit these unique environments by using symbiotic relationships with bacteria that generate energy from the breakdown of typically toxic compounds like sulfur seeping up from the seafloor, rather than from sunlight.

Major advances have been made in studying mid-water habitats through the use of ROVs.
Photographer: Marv White, ©1996 MBARI



A mid-water squid, *Histioteuthis spp.*
Photographer: Steven Haddock, ©2000 MBARI

California sea lions, *Zalophus californianus,* are the most common pinnipeds found in the Sanctuary. Photographer: Brad Damitz

Surprisingly, whale populations in Monterey Bay during the summer of 1998 were the highest ever recorded. Researchers believe that the bulk of the whale population moved into the coastal upwelling zone in search of what little krill was available — these centers became the only food source available.

Living Marine Resources

Marine Mammals

The Sanctuary has one of the most diverse and abundant assemblages of marine mammals in the world, including six species of pinniped (seals and sea lions), twenty-six species of cetacean (whales, dolphins, and porpoises), and one species of fissiped (sea otter). California sea lions are the most common pinnipeds in the Sanctuary, and their numbers continue to increase. During the El Niño event in 1997-1998, more sea lions were observed at Año Nuevo Island than ever before, and the number of pups born also increased. Probably the fastest growing population of marine mammals in the Sanctuary is the northern elephant seal, with haul-out sites at Año Nuevo, Point Piedras Blancas, and Big Sur beaches. The most dramatic increase in its population has occurred at beaches near Point Piedras Blancas: from less than 24 individuals in 1990 to approximately 8,000 in 2001.

A common cetacean visitor to the Sanctuary, the gray whale, has increased in number over the years (approximately 2.5 percent per year), resulting in the 1994 delisting of the California stock (or Eastern North Pacific stock) from the federal list of endangered and threatened species. Researchers will continue to monitor the California stock until 2004. In 1999, however, there was a dramatic increase in the number of stranded gray whales on beaches along their migration route from Mexico to Alaska. Aerial surveys indicated that fewer pregnant females migrated south and fewer calves migrated north. Researchers don't know whether these changes are the result of a short-term shift in the cetacean's environment or whether they signal a long-term change in the population. It is suspected that the gray whale population has neared or reached its carrying capacity. Scientists studying the gray whale's primary prey (benthic amphipods) have reported a decrease in these small crustacean populations in the northern Bering Sea from what they were a decade ago.

Recent counts of the southern sea otter have made population trends difficult to interpret. In the late 1990s sea otter numbers consistently declined, but in the spring of 2000 there was an apparent 10.9 percent increase from the spring 1999 counts. Surveys from fall 2000 reported a 4.7 percent decrease in adults from the previous fall, but pup production was up 22 percent. In the spring of 2001, the total count fell by 156 otters. On a longer time scale, the sea otter population has increased by approximately 2.9 percent since Sanctuary designation in 1992.

Of the Sanctuary's marine mammal populations, we know a great deal about many of the pinnipeds

and the southern sea otter, but we know very little about most of the cetaceans. One of the most important ecological questions that needs more study is the relationship between prey resources and marine mammal populations. Monterey Bay itself has become an active feeding area for many large cetaceans, most of which are protected. Quite rare species, such as sperm whales and northern Pacific right whales, have been seen on canyon edges well within the bay and along the Big Sur coast.

Seabirds and Shorebirds

Sanctuary waters are among the most heavily used by seabirds worldwide. Ninety-four species of seabird are known to occur regularly within and in the vicinity of the Sanctuary, and approximately ninety species of tidal and wetland bird occur on the shores, marshes, and estuaries bordering Sanctuary waters. Their success depends, in part, on fluctuating marine conditions — specifically El Niño. As highly visible predators, birds can be used as accurate and immediate gauges to the timing and intensity of both relatively short- and long-term oceanographic anomalies.

Fishes

The status of commercial and recreational fisheries, including the status or health of fish populations, is influenced by numerous social, economic, environmental, and biological variables. The Sanctuary does not regulate fisheries; however, it does play a role in protecting fishery habitat and conducting research on fishes and fisheries.

In 1997 researchers examined the status of fish stocks in the Sanctuary from 1980 to1995 (http://www-csgc.ucsd.edu/communication/announce042.html). About 200 species are typically caught in commercial and recreational fisheries in the Sanctuary, and most are landed at one of the five main ports. From 1980 to 1995 reported commercial catches increased or were stable for about 17 percent of the species frequently harvested in this region. Reported catches declined for about 10 percent of the frequently harvested species. Catches, and thus population status, of other species are either unknown or highly variable. Fishery managers are concerned about declining fish stocks and continue to reduce harvest guidelines for many species (e.g., long-lived rockfishes).

Endangered and Threatened Species

Of the more than 116 federally listed threatened or endangered species (55 percent of all species nationwide) in California, twenty-six reside within the Sanctuary. Of these twenty-six species, nine species and/or anadromous fish populations have been placed on the federal list of endangered and threatened wildlife since Sanctuary designation in 1992. These new listed species include the Western Snowy Plover

The southern sea otter, *Enhydra lutris nereis,* can be commonly sighted grooming or feeding in the Sanctuary's kelp forests. Photographer: MBNMS

The American Avocet, *Recurvirostra americana*, patiently searches for food in estuarine areas of the Sanctuary.
Photographer: Greg Smith

The threatened Western Snowy Plover, *Charadrius alexandrinus nivosus*, nests along beaches and dunes. Photographer: Greg Smith

Kayaking is an exciting way to get a first-hand glimpse of the wonders of the Sanctuary.
Photographer: Kip Evans

(threatened), the Marbled Murrelet (threatened), winter and spring runs of chinook salmon (endangered), fall/late fall run of chinook salmon (candidate), central California coho salmon (threatened), and central and south/central California steelhead (threatened). Two species bring a hopeful sign for the future: the gray whale (Eastern North Pacific or California stock) was delisted in June 1994; and the American Peregrine Falcon was removed as a threatened species in August 1999. Other threatened or endangered species with an increasing population trend include the blue whale, humpback whale, sperm whale, southern sea otter, California Condor, and the tidewater goby.

Cultural and Historical Resources

The coastal lands of central California are rich in archaeological history. We still have a lot to learn about the full historical significance of these resources, but Sanctuary staff continue to gather information about shipwrecks in the Sanctuary. The California State Lands Commission (SLC; http://shipwrecks.slc.ca.gov/) and the Channel Islands National Marine Sanctuary (http://www.cinms.nos.noaa.gov/shipwreck/mbnms.html) have created separate data inventories of shipwreck sites off the California coast. The SLC has documented 226 shipwrecks off the coasts of Marin, San Mateo, Santa Cruz, Monterey, and San Luis Obispo Counties in state waters. In addition, we recently began a project to characterize shipwrecks within the Sanctuary, including a summary of the shipping routes and types of coastal settings that were conducive to maritime activities and trade and an assessment of known ship losses. Supporting research for this project comes from archival materials, existing databases, and an oral survey with the support of the diving community. This information will be included in the Site Characterization and incorporated into NOAA's Archeological Site Database ("NOAA's Arch").

The Future of the Resources

The Sanctuary is committed to further characterization and a greater understanding of its resources and processes. After two years of development in collaboration with local research and management communities, the Sanctuary Integrated Monitoring Network (SIMoN) program was initiated in the spring of 2001. SIMoN is a comprehensive, long-term monitoring program that takes an ecosystem approach to identifying, understanding, and tracking changes to the Sanctuary. It will provide resource managers with the information needed for effective decision making and make possible an unparalleled basic understanding of this complex and important marine environment. SIMoN will

facilitate the critical but often overlooked communication among researchers, resource managers, educators, and the public. We will use SIMoN to collate and analyze existing monitoring data collected throughout central California by researchers, agencies, and the public; and we hope to conduct new monitoring to fill critical gaps in knowledge. Finally, NOAA's National Marine Sanctuary Program will use SIMoN as a model monitoring program for other marine sanctuaries.

In addition to studying natural resources, the effects of human activities on these resources must be understood. A major issue that has arisen, and will continue to be a challenge, surrounds the impacts of increased population growth and user conflicts. For example, concerns recently addressed by the Sanctuary include the use of kelp canopy resources (harvesting), rocky shore areas (collecting and trampling effects), and growing marine mammal populations and their use of coastal habitat. Resource management decisions must be based on both sound scientific and sociological data.

Beach COMBERS

In 1997 a volunteer beach monitoring program (Beach COMBERS: Coastal Ocean Mammal/Bird Education and Research Surveys) was established to obtain information on rates of stranding for all Sanctuary marine birds and mammals. In addition, mortality events are detected, causes of mortality events are assessed, and oil and tar deposition is monitored. Some success stories to date include the discovery of banded birds from as far away as Hawaii; detection of unusually high numbers of dead adult harbor seals in localized areas; and a high deposition of Common Murres (a diving seabird), which led to the discovery of a previously unrecognized threat of gillnet mortality for Common Murres, harbor porpoise, and sea otters. The Beach COMBERS program has recently been expanded to Cambria, in the southern Sanctuary region.

Left: Beach COMBERS volunteers play a key role in helping collect information about the health of Sanctuary resources. Photographer: Greg Smith

Highlights on the Status of Sanctuary Resources Since Designation in 1992

Some trends are the direct result of Sanctuary regulations and programs, while others are due to the programs and regulations of other agencies.

Improved Natural Resources

American Peregrine Falcon removed from threatened status in 1999.

Sea otter population has increased by 2.9 percent (1992-2001).

Gray whale population has increased 2.5 percent per year; removed from the endangered species list in 1994.

Elephant seal population has increased by 1,900 percent; new colony at Piedras Blancas.

Reduction of bird and mammal by-catch from gillnet fishery.

Improved bird and mammal habitat through designation of "jet ski" zones.

Fewer overflight disturbances on bird colonies.

Reduced damage to rocky shores, kelp forests from road reconstruction.

Improved management of kelp harvesting.

Safe access to former offshore Ft. Ord exclusion zone.

Cleaner water quality in harbors and in runoff from some urban areas.

Sardine, squid, and anchovy fisheries, kelp harvesting are healthy and sustainable.

Decreased threat of oil spill impacts with prohibitions on oil development and shipping lanes moved further offshore.

Degraded Natural Resources

Nine species or populations placed on federal list of endangered or threatened wildlife.

More invasive species in Elkhorn Slough (27 new invertebrates since 1992).

Loss of spawning habitat for coho salmon and steelhead.

Marsh loss in Elkhorn Slough.

Increased sewage spills and closed beaches due to pollution.

Some water flowing into the Sanctuary has been identified as high priority because of toxic hot spots.

More sea walls replacing natural coastal habitats.

More coastal development contribuiting to the loss of coastal habitats and increases in pollution.

Increased human-made sound in the sea.

Many rockfish populations "overfished."

Improved Understanding

Characterization of Elkhorn Slough habitats.

Tidal erosion in Elkhorn Slough.

Processes of marine bio-invasions.

Characterization of rocky shore and kelp resources.

Characterization of some midwater and deep-sea communities.

Status and effectiveness of marine zones.

Rates of beachcast seabirds and marine mammals.

Links among oceanography, krill, birds, and mammals.

Seafloor bathymetry and habitat mapping.

Ocean circulation, upwelling, and El Niños.

Assessment of harmful algal blooms.

Improved and extended water quality monitoring efforts.

Initiation of an integrated ecosystem monitoring network (SIMoN) to characterize resources and habitats better while identifying and tracking natural and human-induced changes.

Still Poorly Understood

Estuarine habitats other than Elkhorn Slough.

Sediment transport in the Big Sur coast region.

Characterizations of invertebrates in offshore soft-bottom habitats.

Dynamics and characterization of Big Sur Canyon complex.

Status or health of midwater and deep-sea organisms.

Causes of harmful algal blooms.

Life history characteristics of most nearshore fishes.

Cultural and historical resources.

Long-term (hundreds to thousands of years) changes to habitats, communities, and resources.

Impacts to benthic habitats from seafloor cables.

Impacts of visitors on rocky shore communities, birds, and marine mammals.

Population dynamics and critical needs of sea turtles in the Sanctuary.