



Section I

Introduction

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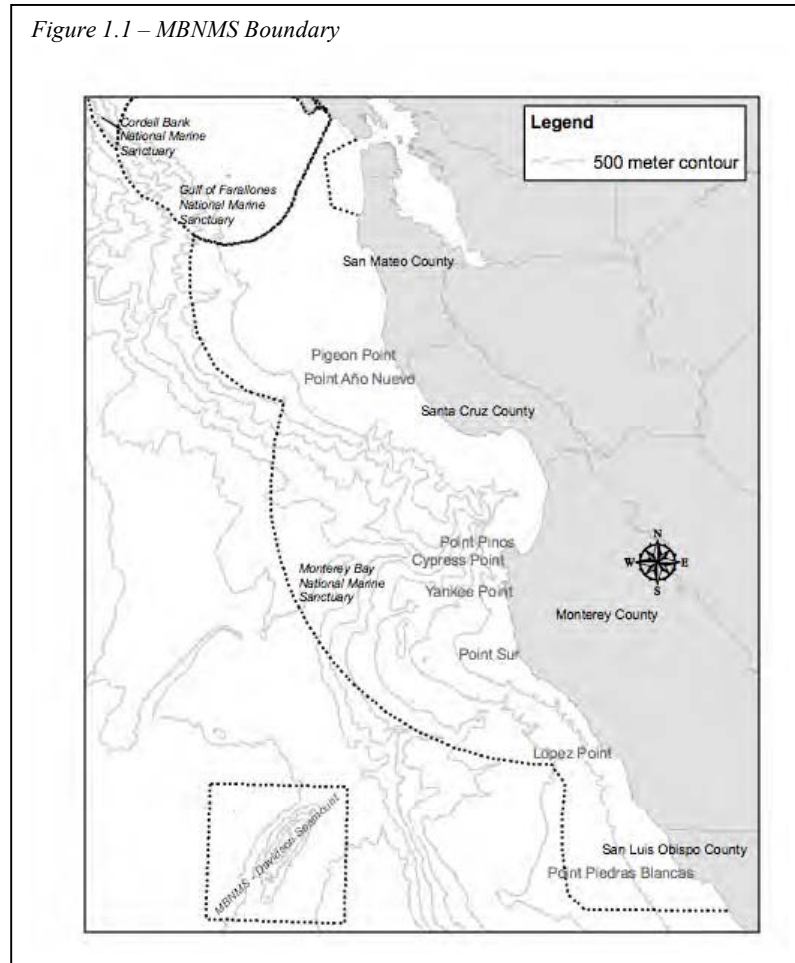
Background

The Monterey Bay National Marine Sanctuary (MBNMS), designated in 1992, is a federally protected marine area offshore of California's central coast. Stretching from Marin County to Cambria, the MBNMS encompasses a shoreline length of 276 miles and 5,322 square miles of ocean, extending an average distance of twenty-five miles from shore. At its deepest point, the MBNMS reaches down 10,663 feet (more than two miles). The MBNMS encompasses a range of habitats from sandy beaches to rocky intertidal areas to open ocean, as well as the nation's largest kelp forest and submarine canyon. Its highly productive biological communities host one of the

highest levels of marine biodiversity in the world, including twenty-six threatened and endangered species. The MBNMS is adjacent to one of the largest urban concentrations in North America with several population centers of approximately 8 million people living within fifty miles of its shoreline, many who rely on MBNMS resources for pleasure or work.

This management plan is a revision of the original management plan adopted with MBNMS designation in 1992 and is focused on how to best understand and protect the resources of the MBNMS. By centering around issues, this management plan is structured differently from the original 1992 management plan, and provides guidance to the public and the National Marine Sanctuary Program as to how the MBNMS will address the priority resource management issues, challenges, and opportunities of the future. This plan was developed with extensive public input from twenty public scoping meetings, over 12,000 written comments, twenty Sanctuary Advisory Council meetings, and sixty-eight meetings of volunteer working groups, offering input and recommendations regarding which issues the MBNMS must address and how to address them. The invaluable time provided by members of the public and government agencies to offer advice and guidance to the MBNMS in public meetings alone totals well over 8,000 hours in the development of this plan.

Figure 1.1 – MBNMS Boundary



There are many marine resource management issues confronting the MBNMS. The action plans that make up this management plan provide strategies to understand the issues, understand the coastal and marine environments which comprise the marine sanctuary, and address those issues through education and outreach, research and monitoring, collaborative planning and management efforts, and regulation and enforcement where necessary. All actions are addressed in partnership with the local, state and other federal agencies, as well as the many stakeholders that have an interest in the MBNMS.

This management plan is comprised of twenty-three action plans guiding the MBNMS for at least the next five years, beginning in 2008. The action plans are grouped into four main marine management themes: Coastal Development, Ecosystem Protection, Water Quality and Wildlife Disturbance. Each section contains several action plans that address issues that were determined to be a priority for the MBNMS to address through the public scoping process and prioritization by the Sanctuary Advisory Council (SAC). Two additional management themes, Partnerships and Opportunities, as well as Operations and Administration, are comprised of action plans and strategies addressing how the MBNMS will function and operate, and work with our partners in providing the services necessary to implement the mandates outlined in the National Marine Sanctuaries Act as well as address the priority marine management issues.

Each action plan details the management action and provides an estimated cost to fully implement the action plan. The action plans also contain mechanisms to evaluate the performance of the MBNMS in addressing the goals and a description of the products and services necessary to accomplish those goals.

This section provides background on the National Marine Sanctuary Program (NMSP), the MBNMS, and the management plan review process. It describes the organic act establishing the NMSP and the administrative hierarchy within which the program resides. Next, it details the history, mission, goals, and accomplishments of the MBNMS. Finally, this section introduces the fundamental steps of the management plan review process concluding with development of the new management plan.

Overview of the National Marine Sanctuary Program

The NMSP resides within the Department of Commerce, managed by the National Ocean Service (NOS) in the National Oceanic and Atmospheric Administration (NOAA). The NMSP oversees a system of thirteen national marine sanctuaries and one marine national monument encompassing marine and freshwater resources from Washington State to the Florida Keys, from Massachusetts to American Samoa, and from Lake Huron to the Northwestern Hawaiian Islands.

The national marine sanctuaries system contains many unique and special marine features, including kelp forests, nearshore coral reefs, areas for whale feeding, reproduction and migration, deep-sea canyons and underwater archaeological sites. The sites range in size from one-quarter square mile in Fagatele Bay, American Samoa to more than 135,000 square miles in the Northwestern Hawaiian Islands, the largest marine protected area in the world. Together, these sanctuaries protect nearly 18,000 square miles of coastal, open ocean and Great Lake waters and habitats.

The NMSP provides oversight and coordination among the thirteen sanctuaries by setting priorities for addressing resource management issues and directing program and policy development. The NMSP also has responsibility for ensuring that the management plan prepared for each sanctuary is consistent with the National Marine Sanctuaries Act, addresses current threats and management strategies, and provides a general budget to estimate expenditures for program development, operating costs, and staffing.

On an annual basis, the NMSP reviews and adjusts funding priorities and requirements to reflect resource management needs at each of the thirteen sanctuaries. The NMSP also monitors the effectiveness of the management plan, makes recommendations to promulgate regulatory changes where necessary and monitors intra- and inter-agency agreements.

The National Marine Sanctuaries Act

The National Marine Sanctuaries Act, as amended, (NMSA) (16 U.S.C. §1431 et seq.) is the law that governs the NMSP. The NMSA authorizes the Secretary of Commerce to designate as national marine sanctuaries areas of the marine environment or Great Lakes with special national significance due to their conservation, recreational, ecological, historical, scientific, cultural, archeological, educational, or aesthetic qualities. Additionally, the NMSA established the NMSP as the federal program charged with managing national marine sanctuaries. The primary objective of the NMSA is to protect marine resources. The NMSA also directs the NMSP to facilitate all public and private uses of those resources compatible with the primary objective of resource protection.

The purposes and policies of the NMSA are:

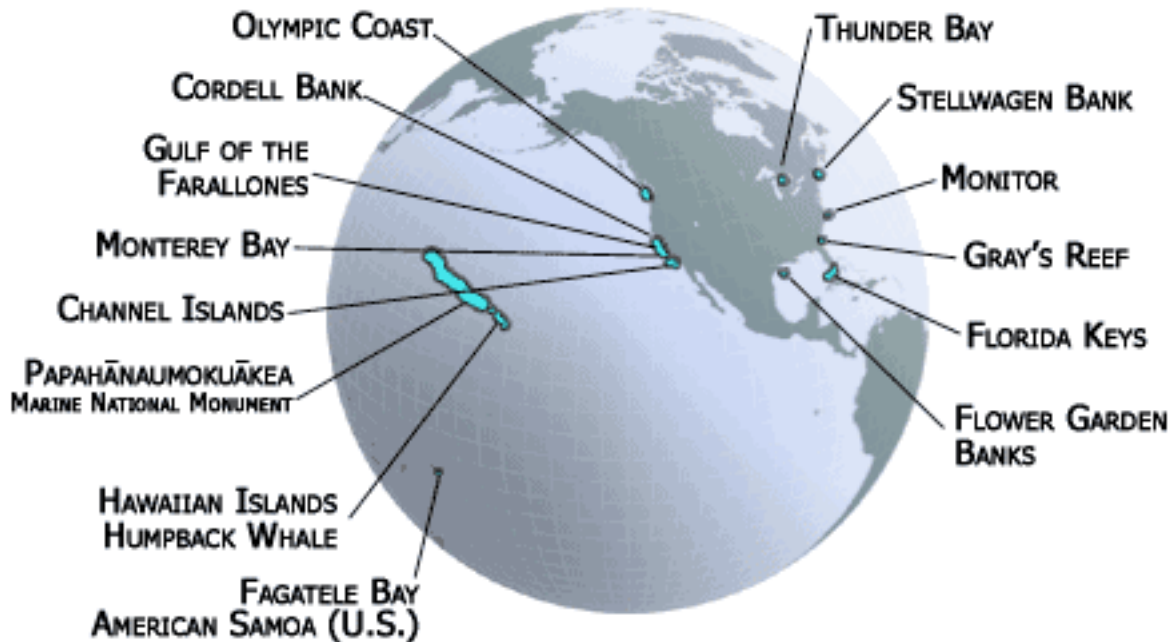
1. To identify and designate as national marine sanctuaries areas of the marine environment which are of special national significance and to manage these areas as the National Marine Sanctuaries Program;
2. To provide authority for comprehensive and coordinated conservation and management of these marine areas, and activities affecting them, in a manner that complements existing regulatory authorities;
3. To maintain the natural biological communities in the national marine sanctuaries, and to protect, and, where appropriate, restore and enhance natural habitats, populations, and ecological processes;
4. To enhance public awareness, understanding, appreciation, and wise and sustainable use of the marine environment, and the natural, historical, cultural, and archeological resources of the National Marine Sanctuaries Program;
5. To support, promote, and coordinate scientific research on, and long-term monitoring of, the resources of these marine areas;
6. To facilitate to the extent compatible with the primary objective of resource protection, all public and private uses of the resources of these marine areas not prohibited pursuant to other authorities;
7. To develop and implement coordinated plans for the protection and management of these areas with appropriate federal agencies, state and local governments, Native American tribes and

organizations, international organizations, and other public and private interests concerned with the continuing health and resilience of these marine areas;

8. To create models of, and incentives for, ways to conserve and manage these areas, including the application of innovative management techniques; and
9. To cooperate with global programs encouraging conservation of marine resources.

A complete version of the NMSA is available from the NMSP website at www.sanctuaries.nos.noaa.gov.

Figure 1.2 – National Marine Sanctuary System



Ecosystem-Based Management in the NMSP

The NMSA states that a purpose and policy of the NMSA is to “maintain for future generations the habitat, and ecological services, of the natural assemblage of living resources that inhabit [Sanctuaries]” (16 U.S.C. 1431 et seq., §301(a)(4),(C)) and “while the need to control the effects of particular activities has led to enactment of resource-specific legislation, these laws cannot in all cases provide a coordinated and comprehensive approach to the conservation and management of the marine environment” (16 U.S.C. 1431 et seq., §301(a)(3)). As such, the thirteen national marine sanctuaries and one marine monument subscribe to a broad and comprehensive management approach that is in keeping with the NMSA’s primary objective of resource protection. This approach differs from the various national and local agencies and laws directed at managing single or limited numbers of species or specific human activities within the ocean. Ecosystem-based management serves as a framework for addressing long-term protection of a wide range of living and non-living marine resources, while allowing multiple uses of the Sanctuary that are compatible with resource protection. These ecosystems managed by the NMSP span diverse geographic, administrative, political and economic boundaries, and the need for strong partnerships among resource agencies, non-governmental interests, members of the public and scientific community, user groups and conservationists is essential.

Monterey Bay National Marine Sanctuary

Designation

The MBNMS was established for the purpose of resource protection, research, education and public use. Its natural resources include our nation's largest contiguous kelp forests, one of North America's largest underwater canyons and the closest-to-shore, deep ocean environment off the continental United States. It is home to some of the most diverse and productive marine ecosystems in the world, including a vast diversity of marine life, with 33 species of marine mammals (it's one of the best places in the world to view elephant seals, sea otters, and a huge variety of whales and dolphins), 94 species of seabirds, 345 species of fish, four species of sea turtles, 31 phyla of invertebrates, and more than 450 species of marine algae. It is the "Serengeti of the Sea." It is also home to 26 species that receive special protection under the Endangered Species Act. Federally-listed threatened or endangered species include six species of large whales, the Southern sea otter, Steller sea lion, Guadalupe fur seal, California brown pelican, California clapper rail, western snowy plover, marbled murrelet, four species of sea turtles, six species of salmon or steelhead, and the tidewater goby. The MBNMS is also a meeting place for the geographic ranges of many species. It lies at the southern end of the range for some species, like the Steller sea lion, occurring from central California north to Alaska and Japan; and it lies at the northern end of the range for others, like giant kelp, occurring from San Francisco to Baja California, Mexico.

The MBNMS includes one of four major coastal upwelling regions worldwide. Coastal upwelling occurs along the western edges of continents, where winds from the northwest drive oceanic surface waters away from shore due to the Coriolis effect. These shallow, relatively warm waters are replaced by deep, colder and nutrient rich waters driving high primary productivity, allowing phytoplankton to bloom, which in turn support zooplankton, providing a key prey resource for higher-order predators such as fishes, birds, and whales. Globally, these upwelling regions rival the productivity of tropical rain forests, and account for nearly 95 percent of the annual global production of marine biomass, in spite of only representing 0.1 percent of the ocean's total surface area.

There are a variety of potential resource threats and opportunities within the MBNMS due to the sensitivity of habitats and species in the region, the long stretch of adjacent populated coastline with several urban centers along the MBNMS's shoreline, and the multiple uses of the marine environment. MBNMS research and monitoring programs evaluate the status and health of marine species, habitats and ecosystems, provide critical information to resource managers, and coordinate activities with the array of world-class research institutions in the region. Resource protection activities use a variety of means to reduce or prevent detrimental human impacts, including collaborative planning and management efforts, regulations and permits, emergency response activities, and enforcement. Education and outreach is used as a critical element in enhancing understanding and stewardship of this national treasure, utilizing tools ranging from public events and interactive teacher workshops to extensive written materials.

Cultural resources abound as well and are protected by MBNMS regulations. Archeologists estimate approximately 445 reported vessel (shipwrecks or aircraft) losses within the waters of the MBNMS, and 718 historic sites line its shores.

History

As directed congressionally by the Oceans Act of 1992, the MBNMS was officially established in 1992 by authority of the Secretary of Commerce under the NMSA. This designation was achieved 15 years after it was first nominated by the State of California for consideration as a national marine sanctuary. During this period, many site analyses and meetings were conducted to determine whether this region met the designation criteria required by the NMSA, that is,

- A "the area is of special national significance due to its resource or human-use values,
- A. existing state and federal authorities are inadequate to ensure coordinated and comprehensive conservation and management of the area, including resource protection, scientific research, and public education,
 - B. designation of the area will ensure comprehensive conservation and management, including resource protection, scientific research, and public education,
 - C. the area is of a size and nature that will permit comprehensive and coordinated conservation and management."

Under the 1988 reauthorization of the NMSA, NOAA was directed to designate Monterey Bay as a national marine sanctuary. On August 3, 1990, NOAA released the DEIS/MP for the proposed MBNMS and published proposed regulations. NOAA held public hearings and published the Final Management Plan and Environmental Impact Statement in June of 1992. The MBNMS final regulations were published in the Federal Register on September 18, 1992.

Goals and Accomplishments

The MBNMS Program's goals are to:

1. Enhance resource protection through comprehensive and coordinated conservation and management tailored to the specific resources that complements existing regulatory authorities
2. Support, promote and coordinate scientific research on, and monitoring of, the site-specific marine resources to improve management decision-making
3. Enhance public awareness, understanding, and wise use of the marine environment through public interpretive and recreational programs
4. Facilitate, to the extent compatible with the primary objective of resource protection, multiple uses of these marine areas not prohibited pursuant to other authorities

Four program areas generally divide the administration of the MBNMS: research and monitoring, resource protection, education and outreach, and program operations. Following is a description of these areas and accomplishments since MBNMS designation.

Research and Monitoring

The research and monitoring program's focus is 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 research in the MBNMS belongs to the world-renowned and extremely collaborative research community in

central California. For example, approximately twenty research institutions are represented on the MBNMS Research Activity Panel, which wrote the first-ever MBNMS Research Plan. Many members also contributed text and bibliography files to a web-based Site Characterization that summarizes existing information on the MBNMS's natural resources. In turn, the MBNMS identified the need for research to address specific resource management issues and provided a method for applying scientific results to public policy. This resulted in several multi-million dollar efforts to map MBNMS habitats, monitor nearshore ecosystems, and model ocean circulation.

Through MBNMS funding, writing issue reviews, building collaborations, providing research platforms, and obtaining grants, the research and monitoring program achieved notable success in:

Monitoring beach-cast seabirds and marine mammals, seabirds, marine mammals, and 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 MBNMS 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 gill net by-catch; coastal erosion; impacts of ship groundings and oil spills; and human use effects in kelp forest and rocky shore systems

As public and resource management needs are clarified through MBNMS advisory groups and in coordination with the MBNMS resource protection program, it becomes evident more research and monitoring is needed than has been completed. Habitat mapping has improved since 1992, yet most of the habitats and distribution and abundance of key species have not been mapped or measured. Moreover, little data exists on how human activities are changing the MBNMS ecosystem through time. The MBNMS initiated its ecosystem monitoring program, the Sanctuary Integrated Monitoring Network (SIMoN), in 1999 with grant funding awarded in 2001. After hiring staff and developing the infrastructure, the website for SIMoN was launched in 2003 which provides the public, decision makers and the research community with monitoring data and an integrated view of data collecting efforts.

Resource Protection

A key objective of the management plan is to ensure that human activities in the MBNMS do not adversely affect natural resources, including habitats. This is accomplished through a variety of approaches, including collaborative planning efforts to prevent and reduce human impacts, regulations, permits, and enforcement efforts. Management efforts also involve helping to educate the public and MBNMS users about how they can minimize or eliminate harmful behavior. The resource protection program also administers the Conservation Working Group

(CWG), which was originally formed to focus the knowledge and talent of local, regional, and national conservation groups on the designation process for the Monterey Bay National Marine Sanctuary. The CWG now works to serve as a forum for conservation issues, identify resource protection needs, and provide advice, views, and factual information on resource protection, Sanctuary management, and other issues in response to requests from staff, the SAC and associated working groups, and other appropriate parties.

The MBNMS's long coastline, including four harbors and several urban areas, creates multiple, complex threats to a healthy coastal ecosystem. A key goal is to actively prevent damage to the resources, thereby avoiding crisis situations apparent elsewhere in the country. The resource protection program accomplished many important objectives such as:

- A Water Quality Protection Program developed and partially implemented three plans to improve or protect water quality (related to urban runoff, harbors and marinas, and agriculture and rural lands) 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 vessel traffic such as container ships, bulk product carriers, and tankers

- Participation in research and a long-range management plan for Highway 1 reducing impacts from landslide repair and disposal activities

- Establishment of an Interpretive Enforcement Program, including a NOAA Office of Law Enforcement officer assigned to focus exclusively on MBNMS enforcement issues

- Development of a cooperative enforcement agreement with state agencies

- 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, motorized personal watercraft (MPWCs), boating, and vessel traffic

- Development of a permit program to review planned activities that may harm MBNMS resources and to issue permits or other authorizations with conditions to minimize impacts

- Coordinated review of projects, plans and permits of other agencies to minimize impacts

Education and Outreach

The MBNMS's education and outreach efforts help connect people to the marine environment. The education program's goal is to promote public understanding of our national marine Sanctuaries and empower citizens with the knowledge necessary to make informed decisions leading to the responsible stewardship of aquatic ecosystems. Partnerships and collaboration have played a key role in the development and implementation of the MBNMS's educational efforts. The MBNMS Education Panel, comprised of marine educators representing twenty organizations and schools, is a prime example of how the MBNMS works with the regional community to shape the MBNMS's educational focus. The Education and Outreach Program has accomplished or has underway several important objectives of the management plan.

Increasing public awareness of our sanctuaries through a variety of techniques, including:

Public lectures and forums and the annual MBNMS 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

Operation of MBNMS’s Team Ocean Conservation Education Action Network (OCEAN) and support of volunteer programs, including Bay Net, Save Our Shores, and Friends of the Elephant Seal

Providing education to address specific issues that may threaten MBNMS 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 like tidepools, and protected species such as marine mammals

Developing and distributing educational materials on shipping lanes to mariners

Providing educational opportunities for teachers and students by:

Developing school curricula

Organizing teacher workshops

Providing shipboard and submersible “teacher-in-the-sea” opportunities

Coordinating teacher-led intertidal monitoring programs for high school students

Supporting the development of Camp SEA (Science, Education, and Adventure) Lab, a residential marine science program

Program Operations

Critical to the MBNMS’s successful operation is an effective program to support the research, resource protection, education, and outreach efforts.

Important parts of the program operations function already in place include:

Budget & Annual Operating Plan development & tracking

A 67ft research vessel and a 30ft patrol boat for enforcement, research, monitoring, and buoy maintenance

Computer systems and associated networks

Geographic information systems (GIS)

A diving program for enforcement, research and monitoring

Support and operation of the Sanctuary Advisory Council

Media and public relations

Management Plan performance measures

Non-profit foundation to support MBNMS activities and projects

One main office and two smaller field offices

Public Participation and the Sanctuary Advisory Council

The citizens of central California are very politically and socially engaged on issues affecting their communities and the surrounding environment, including the ocean. The MBNMS 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 permeates nearly every aspect of Sanctuary management and operation, from participating in the MBNMS Advisory Council and its working groups, to volunteering for one of many organizations helping the MBNMS achieve its education and research missions, to participating in community festivals and symposia.

Establishing the Sanctuary Advisory Council (SAC) for the purpose of advising the superintendent on policy issues affecting the MBNMS was identified in the MBNMS's 1992 Management Plan and one of the MBNMS' first accomplishments. As local involvement in the MBNMS was a vision by the community in 1992, the Management Plan directed the MBNMS to consult with all interested groups and agencies to ensure that the SAC was representative of a broad-based constituency. The SAC is comprised of eighteen voting members with alternates, and six non-voting members representing various stakeholders. Since its establishment in March 1994, the group has played a vital role in many decisions affecting the central California coast. The SAC also has four standing working groups:

Conservation Working Group: coordinates the efforts of existing organizations and helps promote and achieve comprehensive and long-lasting stewardship of the MBNMS through continued oversight and advocacy.

Research Activity Panel: promotes a comprehensive understanding of existing research activities and institutions, reviews research proposals, advises on research priorities, provides scientific advice and objective information, and assists in the implementation of programs to increase our scientific understanding of the MBNMS.

Sanctuary Education Panel: promotes a comprehensive understanding of existing education activities and organizations, reviews program proposals, advises on educational priorities, and assists in implementation of programs to increase understanding and stewardship of the MBNMS.

Business and Tourism Activity Panel: strengthens economic partnerships with the MBNMS and provides a forum for local businesses to discuss MBNMS-related issues.

Monterey Bay National Marine Sanctuary Setting

Human Environment

Regional Context

Five counties border the Monterey Bay National Marine Sanctuary (MBNMS): Marin, San Mateo, Santa Cruz, Monterey and San Luis Obispo. Two additional inland counties, Santa Clara and San Benito, have watersheds which drain directly into the MBNMS. Each is diverse in terms of population and economic base. The northern region borders Marin County and the San Francisco Peninsula. This includes San Mateo County and Santa Clara County, an inland county home to the San Jose metropolitan area commonly known as Silicon Valley due to the large concentration of high technology businesses. 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 Silicon Valley area exerts significant development



pressure to the south and westward toward the coast. In the southern region, Monterey County faces significant growth challenges. Agriculture is the leading industry, followed by tourism. San Luis Obispo County’s economy focuses 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 constraints to urban expansion.

Socio-Economic Environment

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 MBNMS'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 MBNMS.

Travel and tourism is one of the most significant industries, with total travel-spending revenue in 2003 of \$5.9 billion for the five counties adjacent to the MBNMS. San Mateo leads in total spending at \$2.0 billion, followed by Monterey at \$1.8 billion, and San Luis Obispo at \$930 million. (Source: Dean Runyan and Associates) Two of the main reasons given for travel to the coastal region are its natural and scenic beauty and recreational opportunities. Agriculture is also an important industry in the MBNMS region and the area is a national leader in the production of artichokes, strawberries, and salad greens. In 1999, it was valued at \$3.65 billion for the region, including the inland counties of Santa Clara and San Benito. Monterey County, valued at \$2.44 billion, is by far the most significant producer in the region and ranks third highest statewide. Other MBNMS-related industries include aquaculture, kelp harvesting, and commercial shipping. The adjacent San Francisco Harbor is the largest harbor on the U.S. Pacific Coast with millions of tons of cargo passing through the Golden Gate annually.

The fishing industry constitutes a relatively small portion of the overall economy, both regionally and statewide. However, it reflects an important component to the historical, economic, and cultural fabric of the region. Most fish caught within the MBNMS are landed at one of five main ports: Princeton /Half Moon Bay, Santa Cruz, Moss Landing, Monterey Bay, or Morro Bay/Avila/Port San Luis. More than 600 commercial vessels fish within the MBNMS annually, and more than 80 percent of the commercial landings by weight are comprised of squid, rockfishes, Dover sole, anchovy, mackerel, sardines, sablefish, albacore, and salmon. In 2003, ex-vessel revenues for all species within the MBNMS totaled almost \$16.6 million dollars paid to commercial fishers in California. Additional revenue is also generated from the businesses associated with fishing operations, including marinas, maintenance operations, and equipment.

The rich biodiversity and close proximity of the deep sea also provide unparalleled research opportunities for approximately twenty-five marine science facilities that, in 2004, employed almost 2,000 people in staff and researchers with a combined budget of over \$200,000,000. This includes government agencies, public and private university research institutions, and private facilities such as the Monterey Bay Aquarium and the Monterey Bay Aquarium Research Institute.

Human History and Resource Use

Humans settled in the vicinity of MBNMS at least 10,000 years ago. At the time of Spanish arrival in the early 1700's, about forty Native American tribes populated coastal areas from San Francisco Bay to Point Sur, consuming acorns, terrestrial plants and animals, intertidal invertebrates, fish, and marine mammals. The Spanish called the Indians "Costanoans," meaning "coast dwellers." Today they are known as the Ohlone, meaning "people of the west." Shell midden piles left by the Costanoans have been found at most substantial drainages and shorelines

between Morro Bay and Monterey Bay, comprised primarily of remains of abalone, California mussels, clams, snails, chitons, limpets, and other invertebrate groups. The quantity of shells suggests that Costanoan Indians were "a principal control of animal population sizes" in the intertidal zone in some areas. Costanoans also used fire to manage terrestrial vegetation for purposes such as enhancing growth and preparing plants for harvest.

Spanish settlements arose in the late 1700's, and they began to exploit both natural resources and the Ohlone. They established a pastoral lifestyle and an extensive network of missions that relied heavily on livestock. Sweeping changes in the resulting landscape included greatly enlarged pasturelands throughout fertile drainages of the MBNMS and incidental importation of many exotic grasses and other plants. The Spanish also hired imported Russian or local Indian hunters to hunt sea otters. These valuable pelts were exported to Asia, Europe, and the Americas. Sea otters became scarce around Monterey Bay by the late 1800's. The Spanish harvested abalone for trade with northwest coast Indians. Indian populations plummeted after establishment of the Missions due to introduced diseases, cultural dissolution, and exploitation by the Spanish and later the Mexicans. Many European traders and explorers of the late 1700's wrote of the remarkable abundance and richness of wildlife in the Monterey Bay area. French explorer Jean Francoise de La Perouse, the first foreign visitor to the Spanish outposts, wrote his ships were "surrounded by pelicans and spouting whales. There is not a country in this world which more abounds in fish and game of every description."

New England whalers often hunted along the central coast in the late 1700's and early 1800's, feeding a voracious east coast market for oil, baleen and meat. Portuguese whalers from the Azores, originally brought to Monterey Bay as crew on the deep-water ships, settled in Monterey Bay by the 1850's. The Portuguese worked in shore-whaling operations begun by Yankee whaler John Davenport, which targeted humpbacks and gray whales, though other species were also captured. As the price of whale oil decreased due to the production of kerosene in the 1880's, shore whaling died out. A brief resurgence in whaling occurred along the California coast in the 1900's, including a short-lived Norwegian-style and -owned modern whaling operation between 1919-1926 in Moss Landing.

In the 1850's, ethnic Chinese settled in Monterey to harvest kelp and to fish for abalone, squid and shark. These products were dried and shipped to San Francisco and China. This industry helped feed California's burgeoning Gold Rush population. By 1900, abalone were so scarce the commercial harvest was banned, and the Chinese turned to other fisheries, especially as market demand from San Francisco increased. The construction of the San Francisco/Monterey railway in the 1860's allowed for rapid transport of fresh fish. Genovese Italian immigrants established fishing settlements around Monterey Bay in the 1870's, providing a variety of fresh fish to the San Francisco markets via railroad. Sicilian fishermen followed in 1906, and soon focused on the sardine fishery. The sardine fishery peaked from 1910-1930, collapsed in the 1930's, and has not yet recovered to its former size. Several other ethnic groups harvested MBNMS natural resources during this century, including Japanese hard-hat abalone divers (1900-1941), Vietnamese gillnet fishermen (1979-present), and offshore foreign (Russian, Polish and others) fishing fleets. All adapted to become part of the multicultural population that continues to utilize the resources of this biologically rich region. (Adapted from MBNMS Site Characterization, 1996.)

Physical Environment and Natural Habitats

Regional Geography

The MBNMS contains one of the world's most geologically diverse and complex seafloors and continental margins. The MBNMS is located on a plate boundary that separates the North American Plate from the Pacific Plate, and is marked by the San Andreas Fault system. This is an active tectonic region with common occurrences of earthquakes, submarine landslides, turbidity currents, flood discharges and coastal erosion. It is also a region of extensive natural and economic resources.

Coastal topography varies greatly, encompassing steep bluffs with flat-topped terraces and pocket beaches to the north; large sandy beaches bordered by cliff and large dune fields mid-MBNMS; and predominately steep, rocky cliffs to the south. Low- to high-relief mountain ranges and broad, flat-floored valleys are prevalent farther inland.

The Santa Cruz and Gabilan mountain ranges dominate the topography in the northern and central half of the region. Two major rivers (San Lorenzo and Pajaro Rivers) and a major creek (Scott Creek) enter Monterey Bay from these highlands through well defined valleys. Elkhorn Slough, an old river estuary occupied today only by tidal salt marshes, extends inland from Moss Landing for more than six miles. The broad, extensive Salinas Valley, the Gabilan Range, and the northern Santa Lucia Range are the dominant topographic features in the southern half of the region; the Salinas River is the major drainage system. South of Monterey, the west flank of the Santa Lucia Range drops abruptly into the ocean. Here, the valleys of the Carmel and Little Sur Rivers are dominant topographic features. From Point Sur to Morro Bay, many streams and creeks drain the southern Santa Lucias and cut the steep western face of the mountain range.

The watersheds of much of northern and central California, including the Central Valley, drain into the San Francisco Bay and Sacramento-San Joaquin Delta, which contain most of the state's remaining coastal wetlands. More than a third of the state's land mass drains from the Central Valley, Sierra Nevadas, and Cascade range into the bay, which is the largest estuary on the west coast of North America.

Geology

The MBNMS is within the active North American-Pacific plate boundary along the western margin of the San Andreas Fault system. The San Gregorio-Palo Colorado and Monterey Bay fault zones are the main southeast-northwest trending fault zones in the MBNMS. The San Gregorio-Palo Colorado fault zone is mapped as largely an offshore fault crossing nearly the entire MBNMS from offshore Partington Point in the Big Sur coast to north of Montara Point near Half Moon Bay, California. This fault zone is considered active with a 10 percent probability of an earthquake of magnitude 6.7 or greater by 2032. The formation and linear shape of the Carmel Submarine Canyon is attributed to this fault zone. The Monterey Bay fault zone lies primarily offshore between the cities of Monterey and Santa Cruz and is approximately six to nine miles wide. It consists of a number of relatively short fault segments potentially affecting local submarine physiography.

Continental shelf (less than 400 feet water depth) sediments of the northern portion of the MBNMS vary from sand-dominated near shore and at the shelf edge to mud and silt-dominated in mid-shelf areas. The thickest accumulations of modern sediments are in mid-shelf regions. These sediment accumulation patterns determine biological habitats. In dynamic areas with high sediment deposition, organisms that are adapted to shifting substrate are found. Organisms that depend on shelter and steady algal growth are found on rocky substrate that does not experience major changes regularly. Bluff erosion, dune erosion, and sediment input from rivers and streams are the most significant sediment sources to the continental shelf in the MBNMS. The greatest concentrations of coarse-sand deposits have been found on the southern Monterey Bay shelf and on the shelf off the Big Sur coast. Submarine canyons, common to the MBNMS, are thought to contribute sediment to the deep sea. Erosion is greatest in winter months, especially during El Niño years. Beaches tend to rebuild whereas sand dunes and cliffs continuously retreat. The organisms that inhabit beaches are adapted for life in a continually changing environment, while sand dune communities transform as the dunes and cliffs retreat from the water's edge. The highest erosion rates are found on dunes in southern Monterey Bay.

Oceanography

Oceanographic processes in the MBNMS are influenced largely by the California Current. The California Current is an eastern boundary current that has been generally characterized as a broad, shallow, slow southward moving current, exhibiting high spatial and temporal variability. The California Current is the eastward portion of the clockwise North Pacific Gyre and transports cool water with low salinity towards the equator. Associated with the coastal surface flow is an undercurrent moving in the direction of the North Pole, the California Undercurrent, also referred to as the Davidson Current.

The California Current has many semi-stationary jets and eddies. Satellite imagery has shown cold filaments approximately thirty miles wide, extending approximately 150 miles offshore. The importance of these features, which represent the highly variable oceanographic weather of the California Current, lies in their offshore transport of cool, nutrient-rich water from depths to the surface, referred to as upwelling. The surface and intermediate depth water masses in the MBNMS are a mixture of Pacific Subarctic water having low salinity and cool temperatures and the warmer, saltier Pacific Equatorial water. The proportion of the types of water changes as does the strength of the northward flowing Davidson Current. Nearshore surface temperatures vary from 46°F during winter and early spring to 62°F during fall. Nearshore surface salinities vary from 34.0 psu (practical salinity units) when upwelling is strong to 33.2 psu otherwise. Streams and rivers can have large local effects on salinity.

There are three oceanic seasons in the Monterey Bay area during which upwelling, wind relaxation, and winter storm conditions prevail: the "upwelling period" from early spring to late summer when cool surface waters are found in the MBNMS; the "oceanic period" from late summer to early fall; and the "Davidson Current period" from late fall to late winter. Those descriptions may be useful to describe the changing hydrographic conditions along the MBNMS, but in reality these periods overlap extensively and do not recur with clockwork punctuality. The timing reflects changes in local winds and external effects such as El Niño and other long-term weather shifts. Within the coastal regime, sea surface flow undergoes a seasonal reversal. During the late fall and winter the direction is primarily poleward while equatorward flow

dominates during the spring and summer. The equatorward flow is coupled with the intensification of northwesterly winds that generally parallel the central California coastline. The sudden strengthening of the northwesterly winds, usually in March-May, may result in the "spring transition" in which upwelling commences and local sea surface temperatures fall by as much as 5°F within a few days. During late fall, the North Pacific High weakens and migrates southward and the thermal low disappears. The surface flow reverses to poleward.

When winds are strong from the northwest, water from the surface to about 165 feet has an offshore component. The sea surface is lowest along the coast and tilts upward by about eight inches across the width of the California Current (620 miles). Surface waters that moved seaward, are replaced by deeper upwelled waters that flow shoreward and upward. Although the seasonal changes in the MBNMS are important, longer-term inter-annual variations, principally "El Niño" events, also affect local physical and biological systems. El Niño is a warming of nearshore waters of the Eastern Pacific, caused by relaxation of the trade winds in the equatorial Pacific. Cessation or weakening of the trade winds allows the sea surface, which usually tilts upward by about one mile from east to west, to relax. This is accomplished as an eastward propagating pulse or Kelvin wave that takes several months to transit the equatorial Pacific. The wave propagates poleward along the coast of Central and North America and eventually is observed locally as warmer surface waters and higher than normal sea level. Local temperature anomalies up to 5°F and sea level anomalies of up to eight inches occur more or less periodically at intervals of three to five years.

Tides, the periodic rise and fall of the seas, are caused by the earth rotation, and the gravitational pull of the moon, the sun, and other celestial bodies. The MBNMS tides follow a mixed semidiurnal tidal pattern with two high-water and low-water phases per day. The tides are mixed because consecutive highs and lows have different tidal height. The internal tide in the Monterey Submarine Canyon is one of the remarkable oceanographic effects caused by the presence of the canyon cutting across the middle of Monterey Bay. Large internal underwater waves measuring up to 393 feet were recorded within three miles of the Monterey Canyon head. Energy lost upon breaking at the head of the Canyon leads to tidal rectification and promotes a net up-canyon flow, whose effects are similar to wind-driven upwelling. Internal waves may contribute up to 30 percent of the nutrients assimilated by phytoplankton during periods when upwelling is absent, and perhaps 10 percent of the required nutrients during periods of upwelling. The Canyon acts as a deep water conduit bringing offshore waters and organisms directly into the Bay and at the same time acts as a sediment drain.

Habitats

Rocky Shores

Rocky shores are one of the MBNMS's most accessible habitats, and, at low tide, a wide diversity of beautiful and intriguing organisms are exposed. Hermit crabs scurrying across tide pools have captivated the imagination of countless young children. The distribution of organisms in zones provide the perfect laboratory for young biologists. The accessibility of organisms attracted early marine ecologists to developed experimental field biology influencing the study of ecology well beyond the marine realm. Approximately 56 percent of the MBNMS coast is rocky shore habitat. Particularly in central California, rocky shores are one of the most diverse, most studied, and best understood biological regions of the world.

Figure S-2: Rocky Intertidal Zone



In general, the MBNMS has four zones of rocky intertidal organisms associated with different tidal heights. The splash zone is usually exposed to air and has relatively few species. The periwinkle, *Littorina keenae*, is used in some cases as an indicator of this zone, and microscopic algae are common in winter months when large waves produce consistent spray on the upper portions of the rocky shore. The high intertidal zone is exposed to air for long periods twice per day. The barnacle, *Balanus glandula*, and red algae, *Endocladia muricata* and *Mastocarpus papillatus*, are used as indicators of this zone. However, these species are also found in other areas of the rocky shore. The mid-intertidal zone is exposed to air briefly once or twice per day and has many familiar organisms. At wave-exposed sites, the mussel, *Mytilus californianus*, can dominate this zone. The low intertidal zone is exposed only during the lowest tides, and the presence of the seagrass *Phyllospadix* is a good indicator of the mean lower low water tide level (0.0 feet). This zone is also where sponges and tunicates are most common.

Zones will form at different distances from the sea when there is no tidal height difference. Zones will form within zones, and zones will expand with increasing wave exposure. So, while dramatic and extensively referred to, zonation patterns are highly variable. The mechanisms that determine zonation patterns are often broken down into the categories of physical and biological

factors, and it is a combination of these that determines each site's biological characteristics. Within zones, patchily distributed organisms are common. Indeed, rocky shores are sometimes referred to as mosaics of patches undergoing succession after a variety of possible disturbance events and times. Disturbances that open up space for colonization are caused by waves, predation on mussels, wave-tossed rocks and logs, substratum weathering and exfoliation, and human collection and trampling. Disturbances are common enough that some species persist as fugitives, dispersing from one patch to another, as the dominant competitors crowd them out.

Kelp Forests

Kelp provides a unique and diverse habitat utilized by numerous species, including marine mammals, fishes, other algae, and vast numbers of invertebrates. Hugging the rocky coastline just beyond breaking waves, several species of kelp cling to hard substrates with their tenacious holdfasts and lend added vertical structure to the rocky reef habitat. Although some individual kelps can persist for up to three years, the overall structure of the kelp forest is very dynamic. Kelp canopy cover varies seasonally. It is thickest in late summer and thins or disappears in winter when large swells and old age combine to remove weakened adults. During the following spring, the next generation takes advantage of the thin canopy cover

and increase in available light to grow rapidly. When coupled with upwelling, which brings cold, nutrient-rich waters to the surface, these conditions allow some species of kelp to grow up to twelve inches per day. The measured productivity (per square foot of sea floor) of a kelp forest is among the highest of any natural community in the world



Like terrestrial forests, kelp forests consist of layers. In central California, the two primary canopy-forming species in kelp forests are giant kelp, *Macrocystis pyrifera*, and bull kelp, *Nereocystis luetkeana*. Both of these seaweeds are brown algae (Phaeophyta). While both can be found within the same kelp forest, giant kelp is more typical of the Monterey Bay area and bull kelp is more common north of Santa Cruz and along the Big Sur coastline. The understory is the layer three to six feet above the bottom and is dominated by stalked brown algae such as *Pterygophora californica* and *Laminaria setchellii*. The lowest layer, turf algae, consists of several red algae, including corallines. These layers support a rich assemblage of fishes and invertebrates.

Some vertebrates, such as sea otters and many fishes, reside within kelp forests. Other vertebrates, such as seabirds, harbor seals, sea lions, and even gray whales will visit kelp forests while foraging for food. Giant kelp and other algae support large populations of benthic

invertebrates, which in turn attract higher-order predators. Scuba divers are also attracted to kelp forests and their rich invertebrate fauna, making dive sites in Monterey Bay and along the Big Sur coast among the most scenic in the world. And while kelp forests are used by dozens of seabirds and marine mammals, and hundreds of fishes and algae, it is the hundreds of invertebrate species that make this system so rich and diverse.

Kelp forests and their associated flora and fauna are also important resources to humans. The complex canopies serve as nurseries for juvenile rockfishes, providing refuge during vulnerable stages of the life cycle. As these rockfish grow, some leave the kelp forest for deeper waters and support commercial and recreational fisheries. Kelp forests and their associated marine life are also an important part of the aesthetic experience that attracts visitors to Monterey Bay from all over the world. In addition, kelp is itself a resource, harvested as food for abalone farms and as a source of algin, an emulsifying and binding agent used in ice cream, toothpaste, and cosmetics.

Sandy Bottoms

Most of the ocean floor in the MBNMS is covered with sand or mud. Waves and currents create sand waves and ripples, and organize sediment particles in different group sizes. The lack of hard substrate and the shifting sand prevents algae from settling, and therefore these vast sandy plains stretching in all directions appear to be lifeless deserts. However, many organisms live in the sand. There are two broad zones, including a shallow region dominated by crustaceans and a deeper area dominated by more sedentary polychaete worms. The crustacean zone continues up into the surf zone and intertidal beach zone, areas where sediment is constantly moving around. The main crustacean groups include those that burrow into the sand and those that are active on the surface of the sandy floor. All burrow into the seafloor and flourish in wave disturbed sandy bottoms. Here only few animals live in relatively permanent burrows or tubes. Most live close to the seafloor surface and do not burrow deeply. Benthic fishes are also less abundant in the crustacean zone than farther offshore.

Estuaries

An estuary is a coastal body of water that connects a watershed to the open ocean. The resulting mix of land, fresh and salt water creates a mosaic of habitats and communities, changing from terrestrial to marine over small distances. By their very nature, estuaries are highly variable, affected by both marine and terrestrial processes. Environmental variables influencing the communities found within an estuary include tides, salinity, temperature, currents, sediment type, and dissolved oxygen. Unlike purely marine or freshwater habitats, which have relatively stable salinities and temperature ranges, an estuary is subject to dramatic changes in both temperature and salinity. The dramatic changes in temperature and salinity can stress the flora and fauna that make the estuary their home. As the tide flows in, fresh and salt water mix to form a gradient, which can move up and down the estuary over the course of a day. Some animals burrow into the soft sediments to seek refuge from these fluxes. Other animals thrive, having broad physiological tolerances that evolved in response to these stressors. Some environmental variables change spatially as well as over time, and influence the distribution of animals.

At the head of an estuary, where fresh water enters the system, salinity is very low, tidal influence is minimal, and the currents are dominated by watershed input and flow down stream. In the upper reaches of an estuary there is more of a marine influence, which leads to higher

salinities and deposition of fine marine sediments. Topography of the area, as well as the extent and pattern of channels, determine the degree of the marine influence. In the middle reaches, sand may be present and mixed in with the fine mud, and water is generally brackish (salinity 18-25 parts per thousand). At the lower reaches, the marine influence dominates the system, with more sand, high flow patterns dominated by the tides, and salinities near marine levels. At the mouth of an estuary, there is usually little mud on the bottom, but fine sediments suspended in the water column can make turbid plumes that are clearly visible from the surface and extend out into the open ocean.

Beyond the communities of invertebrates and fishes that spend most or all of their time underwater, terrestrial communities add to the tremendous diversity of an estuary. Estuary habitats and communities include mudflats, eelgrass beds, salt marshes, beaches, coastal dunes, coastal maritime chaparral, and oak woodlands. Many birds use estuaries as important rest or feeding stops while migrating along the Pacific flyway. Partially within the MBNMS, Elkhorn Slough serves an important role in sustaining both resident and migratory birds, which utilize the resources generated by this highly productive ecosystem. Elkhorn Slough, designated in 2000 as a Globally Important Bird Area by the American Bird Conservancy, is a must-see site for avid bird watchers and visitors to Monterey Bay. In addition, the Elkhorn Slough National Estuarine Research Reserve is one of twenty-six National Estuarine Research Reserves established nationwide as field laboratories for scientific research and estuarine education. The Reserve is administered by the National Oceanic and Atmospheric Administration and managed by the California Department of Fish and Game and is the only National Estuarine Research Reserve contiguous with a National Marine Sanctuary.

Submarine Canyons

Submarine canyons are prominent geomorphic features within the MBNMS. The Monterey Canyon is the largest of these submarine features and is similar in size to the Grand Canyon in Arizona. Submarine canyons share physical characteristics with onshore river valleys. Submarine canyons are erosional features carving into the seafloor and exposing older, underlying strata in canyon walls. Submarine canyons can have sinuous channel axes and may also have a number of branching channels. The positions of some channels coincide with geologic faults, like Carmel Canyon.

The deepest and largest submarine canyon on the coast of North America is the Monterey Canyon in the center of Monterey Bay. It is 292 miles long, approximately 7 miles wide at its widest point, and has a maximum rim to floor relief of 5577 feet. Numerous smaller canyons also exist in the MBNMS and incise the continental shelf and slope. Canyons terminating at the shoreline are thought to be active and are the major sediment transport conduits to the deep sea. The heads of Monterey Canyon, Carmel Canyon, and Partington Canyon reach the modern-day shoreline whereas most of the other canyons within the MBNMS terminate near the continental shelf edge. Much of the sediment carried by longshore currents ends up in the axes of active submarine canyons. Approximately 14,125,000 cubic feet of sand as well as large volumes of finer grained material descend into Monterey Canyon each year. The organic material associated with these sediments provides nutrients to deep-sea organisms. Submarine landslides from canyon walls are also deposited in the canyons. Sand, gravel, mud, and skeletal remains of marine mammals have been observed in the axis of Monterey Canyon.

Submarine canyon sediment transport events are thought to be episodic. Potential triggering events include storms, earthquakes, moderate sea and surf conditions, tidal fluctuation, and flooding rivers. The frequency of these events is not well known. Repeat bathymetric mapping using high-resolution tools and installation of instruments in the canyons enable scientists to determine locations where deposition and erosion take place and to quantify the frequency and intensity of sediment transport events. Submarine canyons in MBNMS are also ecologically important to many species of fish. Canyons provide habitat for larger sized rockfish that seem to prefer structures of high relief such as boulders, vertical walls, and ridges. The cover and protection offered by submarine canyons allow pockets of rockfish populations to flourish, in contrast to more exposed areas where the populations are more easily fished. Monitoring programs in the sanctuary study the habitat use of rockfish in submarine canyons. These programs typically used manned and remotely operated submersibles to map the substrate type and quantify the amount of rock habitat available to fish.

Deep Sea

The deep sea is a dark and cold environment which includes a variety of habitats from the midwater to the abyss that are populated by a wide array of animals, specially adapted to live under the tremendous water pressure and low level of oxygen of this harsh environment. The mesopelagic zone starts at 656 feet below the surface and extends to about 3300 feet. Available light, nutrients and dissolved oxygen diminishes and water pressure increases. Mesopelagic fish and some macroinvertebrates have large and elaborate eyes that allow them to see under low-light conditions. The bathypelagic zone starts below 3300 feet and extends to the seafloor. This cold realm of total darkness and immense pressure is poor in nutrients and dissolved oxygen. Unlike mesopelagic fishes, bathypelagic fishes typically have small eyes or no eyes at all. To adapt to life in an environment with no other light than bioluminescence, they developed other senses to find mates and food, and to escape predators.

Bioluminescence is the production of visible light by living organisms. Most of the species living in the deep sea are bioluminescent. They possess organs called photophores, which produce light from chemical reactions. This elaborate adaptation may provide many advantages in the deep sea. Deep-sea inhabitants may use bioluminescence for attracting and capturing prey, for escaping from predators by scaring them or creating a diversion, or for communication.

Figure S-3: Mystery Mollusk at Davidson Seamount



Plant life, including phytoplankton, needs light to thrive and is absent in the deep sea. After sunset, many small mesopelagic fishes and zooplanktons, including krill, feed on phytoplankton

by migrating from the deep sea to the surface layer. At dawn, they return to the deep sea. This daily vertical migration to the surface may provide protection from surface water predators relying on sight to hunt. The range and intensity of the vertical migration varies seasonally and among species.

The distribution of benthic communities appears to be patchy, and the specific species assemblages differ at various sites between years and among seasons. Benthic invertebrate communities below 6500 feet in depth are not as well known as the sedimentary invertebrate communities of the continental shelf. The most abundant large invertebrates are sea cucumbers. It appears the dominant invertebrates in terms of abundance are infaunal and are all deposit feeders. Specialized benthic invertebrates feed on marine snow, which is the minute debris left over from animals, plants, and non-living matter that sinks from the surface layer to the deep sea. Other abundant invertebrate groups include anemones, brittle stars, sea pens, and sea stars.

In the late 1980s, scientists discovered cold seeps deep in the axial valley of the Monterey Canyon 10,500 feet below the ocean surface. Cold seeps are sites where sulfide or methane-rich fluids are released from the sea floor. Specialized chemosynthetic communities are often associated with cold seeps. Chemosynthetic communities, unlike the other deep sea communities that depend on food sinking from the above water column, rely on chemical energy from the fluid released from the sea floor. On earth, most of the food web starts with plants depending on sunlight as a primary energy source. In cold seeps, bacterial mats, at the base of the food web, use the chemical energy in a similar way plants use the energy from the sunlight. The concentrations of sulfide, methane, and other chemical constituents, the mechanism regulating fluid flow and the biological communities differ among the cold seeps within the MBNMS.

Cold seep communities are composed of species found only in cold seep areas and include vesicomyd clams and vestimentiferan worms basing all or most of their nutrition on chemosynthetic production by bacteria. They include species of anemones, brachyuran and anomuran crabs, gastropods, and soft corals utilizing seep-derived production but are also found in different habitats in the MBNMS. The ecology of cold seep communities is poorly understood. Seep communities, similar to seamounts (underwater mountains), can be viewed as isolated oases in a relatively energy-poor deep seafloor landscape. A variety of species of cosmopolitan benthic fauna appear to benefit from foraging at cold seeps. The extent to which chemosynthetic production at these underwater oases fuels secondary productivity by the local non-seep biological assemblage is unknown. Little or no information is available concerning ecological processes that influence demographic rates of biological populations at cold seeps. Predation, competition, and disturbance likely play a major role, but few hypotheses regarding these population processes have been addressed.

Open Ocean

Although oceans cover 70 percent of the Earth's surface, only 5 percent consists of what one might consider typical marine ecosystems, like coral reefs or kelp forests for example. The remaining 65 percent make up the open ocean ecosystem, which typically lies well offshore where the water depth is greater than 330 feet. The Pacific Ocean, one of four major ocean basins, accounts for nearly half of the total ocean surface area and is twice as large as the

Atlantic Ocean. The waters of MBNMS are part of the eastern Pacific Ocean. The eastern Pacific waters are cooler and more nutrient rich than the western Pacific waters found along the coast of Asia.

Open ocean waters are 13,100 feet deep on average, and in the Pacific basin reach a maximum depth of 36,000 feet. However, in the upper 330 feet of the photic zone, sunlight drives photosynthesis that is highly productive and teems with life. In the eastern Pacific, recirculation of nutrients from deeper waters drives phytoplankton to bloom, which in turn feed zooplankton and their predators.

Oceanic surface currents generated by sustained winds transport water, nutrients, and sometimes organisms across large distances. As these currents collide with continents, they are diverted along the edge of the landmass. In the North Pacific Ocean, the north-south continental boundary currents are also acted upon by the Earth's rotation and produce a clockwise pattern of flow called a gyre. The major north-south flow along the eastern Pacific (western U.S.) is called the California Current, even though it begins in Alaska and extends down to Baja California. The California Current, which is usually located several miles offshore, strongly influences the pelagic ecosystem. Several agencies and research groups are studying the physical, chemical, and biological properties of this system, and how atmospheric conditions influence oceanic conditions, which in turn affect productivity.

Seamounts

Seamounts have been defined as steep geologic features rising from the seafloor with a minimal elevation of 3300 feet and with a limited extent across the summit. This definition is not strictly adhered to, and steep undersea mountains are often referred to as seamounts regardless of size. Seamounts have a variety of shapes, but are most often conical with a circular, elliptical, or more elongate base. They usually have volcanic origins. It has been estimated that more than 30,000 seamounts over 1,000 meters tall are found in the Pacific Ocean, approximately 800 are in the Atlantic Ocean, and an unknown number exist in the Indian Ocean. Seamounts create complex current patterns influencing sea life above them. Commercially valuable fish species often concentrate around relatively shallow seamounts. Current-topography interactions on seamounts include semi-stationary eddies (Taylor columns), internal wave reflection, tidally induced currents and eddies, trapped waves, and eddies shed downstream. Currents over seamounts have been measured up to nineteen inches per second, or 0.9 knots. Evidence for concentrations of fish and zooplankton over seamounts due to enhanced primary productivity is sparse. Some even suggest that productivity over seamounts is more influenced by the physical prevention of zooplankton diurnal migrations to deep water, making the zooplankton more vulnerable to predation. The proximity of the seamount summit to the seasurface is likely an important variable that could influence water column productivity, but this has not yet been definitively addressed. Though relatively close to shore and one of the largest seamounts on the west coast, Davidson Seamount is apparently relatively pristine. Davidson Seamount has large assemblages of corals and sponges adjacent to each other and never seen at other seamounts. Many of these species are rare or new to science.

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 pinnipeds (seals and sea lions), twenty-six species of cetaceans (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 isolated Big Sur beaches. The most dramatic increase in their population has occurred at beaches near Point Piedras Blancas, from 400 adults in 1991 to over 5,000 in 1999.

A common cetacean and visitor in 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. 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 there were fewer pregnant females that migrated south, and fewer calves migrated north. Researchers do not know whether these changes are the result of a short-term shift in their 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) reported a decrease in these small crustacean populations in the northern Bering Sea from what they were a decade ago.

Recent counts of the California sea otter have made population trends difficult to interpret. In the late 1990's, 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. On a longer time scale, however, the sea otter population has increased by approximately 10 percent since Sanctuary designation in 1992.

Although we know a great deal about many of the pinnipeds and the California sea otter, we know very little about most cetaceans. One of the most important ecological questions that needs more study is the relationship between the prey resources and the 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 North Pacific Right Whales have been seen on canyon edges well within the bay. Research on the whales as well as tourist whale watching has increased since 1992 in the bay. However, we know relatively little about marine mammal ecology at the northern and southern borders of the Sanctuary, although the MBNMS anticipates expansion of research outward from the ports and research institutes bordering Monterey Bay.

Seabirds & Shorebirds

Sanctuary waters are among the most heavily utilized by seabirds worldwide. Ninety-four species of seabirds are known to occur regularly within and near the Sanctuary. Approximately ninety species of tidal and wetland birds regularly occur on the shores, marshes and estuaries bordering on Sanctuary waters. Their success depends, in part, on fluctuating marine conditions, specifically El Niño.

Recently, researchers in central California had a unique chance to prepare specific studies of the response of seabirds to an El Niño event at the Southeast Farallon (SEFI) and Año Nuevo (ANI) Islands. This was due to the advance forecast of the dispersion of the 1997-1998 El Niño to the temperate northern Pacific. SEFI is located approximately fifty-six miles north of ANI (home of the Rhinoceros Auklet) and supports core populations of Brandt's and Pelagic Cormorants, Common Murres, Cassin's Auklets, and Pigeon Guillemots in central California. During the non-breeding season, individuals disperse to the north and south. While seabird breeding at these sites in 1997 was relatively unaffected by El Niño, things were different in 1998. Egg laying dates were delayed for Common Murres and Cassin's Auklets. Breeding populations were much reduced for all five seabird species from SEFI. Moreover, for those that attempted reproduction, success was poor. El Niño's influence on Rhinoceros Auklets on ANI was apparent as well. Changes in normal prey availability and diet may help explain reduced productivity in this species. As highly visible upper trophic level 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 and is characterized by constant change. The MBNMS does not manage fisheries, however, it does play a role in protecting fishery habitat and conducting research on fish and fish populations as well as providing advice and recommendations to federal and state fishery managers. In 2002, researchers examined the status of fish populations in the Sanctuary from 1981-2000. (Starr et al., 2002) About 200 species are typically caught in commercial and recreational fisheries in the Sanctuary, and most are landed at one of five main ports: Princeton/Half Moon Bay, Santa Cruz, Moss Landing, Monterey Bay, and Morro Bay/Avila/Port San Luis. More than 80 percent by weight of the commercial fish landings at these five harbors are comprised of squid, rockfishes, Dover sole, anchovy, mackerel, sardines, sablefish, albacore, and salmon. In the last twenty years, catches of some pelagic species have increased (mainly sardine and squid), but landings of many other species have decreased. Regulatory restrictions have led to shorter seasons and lower quotas. (Ibid). The population status of a many species harvested in the MBNMS is unknown.

Invertebrates

Invertebrate species in the MBNMS include squid, sponges, anemones, jellies, worms, corals, tunicates, snails, octopus, clams, and arthropods such as barnacles, crabs, and spot prawns. Thousands of various species of invertebrates populate the MBNMS. Most invertebrate species are not harvested commercially, with the exception of squid, spot prawn, and Dungeness crab,

rock crab, and octopus. Various types of invertebrates are found in all habitats from the sandy beach to intertidal, mid-water, and deep sea.

Algae

Algae forms one of the primary components in the marine food web by converting solar energy using chlorophyll. The marine algae found in the MBNMS is some of the most diverse in the world, from microscopic phytoplankton to seaweed and surfgrasses to giant kelp, which can be found over sixty feet into the photoactive zone and can grow up to ten inches a day.

Species of Special Concern (or Endangered and Threatened Species)

More than 55 percent of all species federally listed as threatened or endangered reside in California. Twenty-four of these reside within the Sanctuary. Of these twenty-four species, nine species and/or anadromous fish populations inhabiting the Sanctuary 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 (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 showing an increasing population trend include the blue whale, humpback whale, sperm whale, southern sea otter, California condor (slowly), and tidewater goby.

Table 1. ESA-listed endangered and threatened species under the jurisdiction of NMFS that may occur off the coasts of California

Marine Mammals	Status	
Cetaceans		
Blue whale (<i>Balaenoptera musculus</i>)	Endangered	
Fin whale (<i>Balaenoptera physalus</i>)	Endangered	
Humpback whale (<i>Megaptera novaeangliae</i>)	Endangered	
Killer whale - southern resident DPS (<i>Orcinus orca</i>)	Endangered	
Northern Right Whale (<i>Eubalaena glacialis</i>)	Endangered	
Sei whale (<i>Balaenoptera borealis</i>)	Endangered	
Sperm whale (<i>Physeter macrocephalus</i>)	Endangered	
Pinnipeds		
Guadalupe fur seal (<i>Arctocephalus townsendi</i>)	Threatened	
Steller sea lion - eastern distinct population segment (DPS) (<i>Eumetopias jubatus</i>)**	Threatened	
Sea turtles		
Green turtle (<i>Chelonia mydas</i>)	Endangered/threatened*	
Leatherback turtle (<i>Dermochelys coriacea</i>)	Endangered	
Loggerhead turtle (<i>Caretta caretta</i>)	Threatened	
Olive ridley turtle (<i>Lepidochelys olivacea</i>)	Endangered/threatened*	
Marine fish		
Green Sturgeon, southern DPS (<i>Acipenser medirostris</i>)	Threatened	
Marine invertebrates		
White abalone (<i>Haliotis sorenseni</i>)	Endangered	
Salmonids		
Chinook (<i>Oncorhynchus tshawytscha</i>)	Sacramento River winter, evolutionarily significant unit (ESU)	Endangered
	Central Valley Spring ESU	Threatened
	California Coastal ESU	Threatened
Coho (<i>O. kistutch</i>)	Central California Coastal ESU	Endangered
	S. Oregon/N. CA Coastal ESU	Threatened
Steelhead (<i>O. mykiss</i>)	Southern California DPS	Endangered
	South-Central California DPS	Threatened
	Central California Coast DPS	Threatened
	California Central Valley DPS	Threatened
	Northern California DPS	Threatened

*In the Pacific Ocean, breeding colony populations on the Pacific coast of Mexico of both green turtles and olive ridley turtles are listed as endangered; all others are listed as threatened.

**Critical habitat for Steller sea lions includes the rookeries at Año Nuevo Island within the MBNMS and Southeast Farallon Island within the GFMNS (see 50 CFR 226.202(b) and Table 1 to part 226). No other ESA listed species under NMFS's jurisdiction have proposed or designated critical habitat within the MBNMS, CBNMS, or GFNMS waters.

Regulations and Prohibitions

All activities (e.g. fishing, boating, diving, research, and education) may be conducted in the MBNMS unless prohibited or otherwise regulated by the Monterey Bay National Marine Sanctuary (MBNMS). Also, all activities are subject to all prohibitions, regulations, restrictions, and conditions validly imposed by any government authority of competent jurisdiction and are also subject to liability for destruction, loss, or injury to Sanctuary resources under Section 312 of the NMSA, as amended.

Scope of Regulations

Each national marine sanctuary is designated with a broad “scope of regulations” within which regulations may be promulgated as necessary to ensure the protection and management of the conservation, ecological, recreational, research, educational, historical and aesthetic resources and qualities of the sanctuary. The designation document of the MBNMS includes the following activities within the “scope of regulations,” including prohibition, to the extent necessary and reasonable. The prohibitions of the MBNMS follow this section. For complete text of the revised Designation Document please see Appendix E.

Activities subject to regulation regarding the MBNMS include:

- a. Exploring for, developing, or producing oil, gas, or minerals (e.g., clay, stone, sand, metalliferous ores, gravel, non-metalliferous ores, or any other solid material or other matter of commercial value) within the Sanctuary;
- b. Discharging or depositing, from within or into the Sanctuary, any material or other matter, except specific types of vessel discharges and dredged material deposited at disposal sites authorized prior to the effective date of Sanctuary designation, provided that the activity is pursuant to, and complies with the terms and conditions of, a valid Federal permit or approval existing on the effective date of Sanctuary designation;
- c. Discharging or depositing, from beyond the boundary of the Sanctuary, any material or other matter, except dredged material deposited at the authorized disposal sites described in Appendix D to the site regulations, provided that the activity is pursuant to, and complies with the terms and conditions of, a valid Federal permit or approval;
- d. Taking, removing, moving, catching, collecting, harvesting, feeding, injuring, destroying, or causing the loss of, or attempting to take, remove, move, catch, collect, harvest, feed, injure, destroy, or cause the loss of, a marine mammal, sea turtle, seabird, historical resource, or other Sanctuary resource;
- e. Drilling into, dredging, or otherwise altering the submerged lands of the Sanctuary; or constructing, placing, or abandoning any structure, material, or other matter on or in the submerged lands of the Sanctuary;
- f. Possessing within the Sanctuary a Sanctuary resource or any other resource, regardless of where taken, removed, moved, caught, collected, or harvested, that, if it had been found within the Sanctuary, would be a Sanctuary resource;
- g. Possessing any Sanctuary historical resource;
- h. Flying a motorized aircraft above the Sanctuary;
- i. Operating a vessel (i.e., water craft of any description) within the Sanctuary;
- j. Aquaculture or kelp harvesting within the Sanctuary;

- k. Interfering with, obstructing, delaying, or preventing an investigation, search, seizure, or disposition of seized property in connection with enforcement of the Act or any regulation or permit issued under the Act;
- l. Introducing or otherwise releasing from within or into the Sanctuary an introduced species.

In the event of an emergency and where necessary to prevent or minimize the destruction of, loss of, or injury to a Sanctuary resource or quality, or minimize the imminent risk of such destruction, loss or injury, any and all activities, including those not listed above, may be subject to immediate regulation.

Prohibitions

Following is a summary of MBNMS prohibited and restricted activities. The exact language of these regulations can be found in Appendix F.

Oil, Gas and Mineral Development: The first activity prohibited is exploring for, developing or producing oil, gas or minerals within the Sanctuary except for jade in certain areas and subject to restriction.

Discharge and Disposal: The second activity prohibited is depositing or discharging from within or into the Sanctuary, other than from a cruise ship, any material or other matter except: (1) fish, fish parts, chumming materials or bait used in or resulting from lawful fishing operations in the Sanctuary; (2) for a vessel less than 300 gross registered tons (GRT) or a vessel greater than 300 GRT without sufficient holding tank capacity to hold sewage while within the Sanctuary, clean (meaning not containing detectable levels of harmful matter as defined) effluent generated incidental to vessel use by an operable Type I or Type II marine sanitation devices; (3) clean vessel deck wash down, vessel engine cooling water, vessel generator cooling water, anchor wash, or bilge water; (4) for a vessel less than 300 gross registered tons (GRT) or a vessel greater than 300 GRT without sufficient holding capacity to hold graywater while within the Sanctuary, clean graywater as defined by section 312 of the FWPCA; (5) vessel engine or generator exhaust; and (6) dredged material deposited at disposal sites authorized by the U.S. EPA (in consultation with U.S. Army Corps of Engineers) prior to the effective date of Sanctuary designation, provided that the activity is pursuant to, and complies with the terms and conditions of, a valid federal permit or approval existing on the effective date of Sanctuary designation.

This prohibition also prohibits all discharges from cruise ships (defined as having more than 250 passenger births for hire) except clean vessel engine cooling water, generator cooling water or anchor wash.

This prohibition also prohibits depositing or discharging, from beyond the boundary of the Sanctuary, material or other matter that subsequently enter the Sanctuary and injure a Sanctuary resource or quality, except for the discharges identified above.

Protection of Historical Resources: The third activity prohibited is possessing, moving, removing or injuring or attempting to move, remove or injure a Sanctuary historical resource.

Historical resources in the marine environment are fragile, finite and non-renewable. This prohibition is designed to protect these resources so that they may be researched and information about their contents and type made available for the benefit of the public. This prohibition does not apply to moving, removing or injury resulting incidentally from kelp harvesting, aquaculture or lawful fishing operations.

Alteration of the Submerged Lands within the Sanctuary: The fourth activity prohibited is drilling into, dredging or otherwise altering the submerged lands of the Sanctuary; or constructing, placing or abandoning any structure, material or other matter on the submerged lands of the Sanctuary, except as incidental and necessary to: (1) conduct lawful fishing operations (2) anchor a vessel; (3) conduct aquaculture or kelp harvesting; (4) install an authorized navigation aid; (5) conduct harbor maintenance in the areas necessarily associated with a Federal project in existence on January 1, 1993, including dredging of entrance channels and repair, replacement or rehabilitation of breakwaters and jetties; (6) construct, repair, replacement or rehabilitation of breakwaters and jetties; (7) construct, repair, replace, or rehabilitate a dock or pier; or (8) collect jade pursuant to paragraph (a)(1) of this section, provided that there is no constructing, placing, or abandoning any structure, material, or other matter on the submerged lands of the Sanctuary. Federal Projects are any water resources development projects conducted by COE or operating under a permit or other authorization issued by COE and authorized by federal law. The only exception to this regulation that applies in the Davidson Seamount Management Zone is that for lawful fishing. However, while this regulation does not prohibit fishing at the Davidson Seamount, NOAA fisheries regulations (50 CFR Part 660) prohibit fishing below 3000 at this location. The intent of the prohibition against altering the submerged lands within the Sanctuary is to protect the resources and qualities of the Sanctuary from the harmful effects of activities such as archaeological excavations, drilling into the seabed, strip mining, laying of pipelines and outfalls, and offshore commercial development, which may disrupt and/or destroy sensitive marine resources.

Protection of Marine Mammals, Sea Turtles, and Seabirds: The fifth activity prohibited is taking marine mammals, sea turtles or seabirds within or above the Sanctuary, except as authorized by the Marine Mammal Protection Act, as amended, (MMPA), 16 U.S.C. 1361 et seq., the Endangered Species Act, as amended, (ESA), 16 U.S.C. 1531 et seq., and the Migratory Bird Treaty Act, as amended, (MBTA), 16 U.S.C. 703 et seq. The term "taking" includes all forms of harassment. The MMPA, ESA and MBTA prohibit the taking of species protected under those acts. The prohibition overlaps with the MMPA, ESA and MBTA but also extends protection for Sanctuary resources on an environmentally holistic basis and provides a greater deterrent with civil penalties of up to \$130,000 per taking. The prohibition covers all marine mammals, sea turtles and seabirds within or above the Sanctuary.

Overflight of Motorized Aircraft: The sixth activity prohibited is flying motorized aircraft at less than 1,000 feet above the Sanctuary within four specified zones. This area-specific prohibition on overflights below 1,000 feet is designed to limit potential noise impacts, particularly those that might startle hauled-out seals and sea lions, sea otters or birds nesting along the shoreline margins of the Sanctuary. For more information, see the Marine Mammal, Seabird and Turtle Disturbance Action Plan in Section VII.

Motorized Personal Watercraft: The seventh activity prohibited is the operation of motorized personal watercraft within the Sanctuary except in five specified zones and access routes to and from these zones. This regulation is intended to provide enhanced resource protection by prohibiting operation of motorized personal water craft in areas of high marine mammal and seabird concentrations, kelp forest areas, river mouths, estuaries, lagoons and other similar areas where sensitive marine resources are concentrated and most vulnerable to disturbance and other injury from personal water craft. The regulation is also intended to allow the continuation of this form of recreation while minimizing conflicts with other recreational users, as well as reducing aesthetic disturbance. For more information, see the Motorized Personal Watercraft Action Plan in Section VII.

Possessing a marine mammal, seabird, or turtle: The eighth prohibition serves to facilitate enforcement actions for violations of Sanctuary regulations. It prohibits the possession within the Sanctuary of any marine mammal, sea turtle or seabird, regardless of where the resource was taken, except in compliance with the ESA, MMPA and MBTA.

Deserting a vessel aground, at anchor, or adrift in the Sanctuary: The ninth prohibited activity is deserting a vessel aground, at anchor, or adrift in the Sanctuary. This regulation is intended to reduce the number of derelict vessels coming aground on the beaches or going adrift within the Sanctuary prior to causing harm to the natural resources.

Leaving harmful matter aboard either a grounded or deserted vessel: The tenth prohibited activity is leaving harmful matter aboard either a grounded or deserted vessel. This prohibition requires removal of harmful substances (as defined) from these vessels to preempt any harm to the environment from their discharge.

Protection of the Davidson Seamount: The eleventh prohibited activity is in the Davidson Seamount Management Zone. The regulation prohibits:

(i) Moving, removing, taking, collecting, catching, harvesting, disturbing, breaking, cutting, or otherwise injuring, or attempting to move, remove, take, collect, catch, harvest, disturb, break, cut, or otherwise injure, any Sanctuary resource located more than 3,000 feet below the sea surface within the Davidson Seamount Management Zone (DSMZ). This prohibition does not apply to fishing below 3000 feet within the DSMZ, which is prohibited pursuant to 50 CFR part 660 (Fisheries off West Coast States and in the Western Pacific).

(ii) Possessing any Sanctuary resource the source of which is more than 3,000 feet below the sea surface within the Davidson Seamount Management Zone. This prohibition does not apply to possession of fish resulting from fishing below 3000 feet within the DSMZ, which is prohibited pursuant to 50 CFR part 660 (Fisheries off West Coast States and in the Western Pacific).

Introduced Species: The twelfth prohibited activity is the release or introduction of non-native species, except striped bass released during catch and release fishing activity, into the MBNMS. This regulation is intended to restrict activities displacing native species and causing biological or economic harm to the MBNMS or its users. For more information, see the Introduced Species Action Plan.

Attraction of White Sharks: The thirteenth activity prohibited is the attraction of white sharks by any means within the MBNMS. This regulation is intended to prohibit activities that might harm white sharks or change their behavior in a manner that may cause conflicts with other uses of the MBNMS (e.g. surfing, kayaking, swimming).

Interfering with Enforcement: The fourteenth prohibition prohibits interfering with, obstructing, delaying or preventing investigations, searches, seizures or disposition of seized property in connection with enforcement of the NMSA or any regulation or permit issued under the NMSA.

Marine Zones

Certain human activity within the MBNMS can have negative impacts on its sensitive physical and biological resources. As a result, agencies have attempted to protect resources by designating areas (e.g., Marine Protected Areas, Dredged Material Disposal sites) in which human activities are controlled through regulatory zoning and spatial restrictions. The MBNMS contains 73 of these marine zones, 60 of which encompass coastline areas and are managed by NOAA, Department of Defense, California Department of Fish and Game, California Department of Parks and Recreation, State and Regional Water Control Boards, and National Park Service. The remaining 13 areas encompass offshore marine habitats and are managed by NOAA, Army Corps of Engineers, U.S. Coast Guard, Department of Defense, and U.S. Environmental Protection Agency. In addition to restricting uses in certain areas, zoning is also used to allow uses or activities otherwise prohibited in the MBNMS.

The following identify and describe the primary regulatory zones of the MBNMS:

Jade Collection Zones: Areas in which traditional small-scale collection of loose jade is allowed in the MBNMS. Zone regulations allow small-scale collection to support the local artisans while protecting the mineral resources of the Sanctuary.

Dredged Material Disposal Zones: Areas designated as disposal sites for dredged material (sediment removed from the sea floor, by means of suction or scooping). For more information on dredged material disposal see Section II - Coastal Development: Harbors and Dredge Disposal Action Plan.

Restricted Overflight Zones: Intertidal and subtidal areas over which motorized aircraft are restricted from flying below 1000 feet (305 meters). These zones often encompass areas with high densities of marine mammals or seabirds. For more information see Section VII - Wildlife Disturbance: Marine Mammal, Seabird, and Turtle Disturbance Action Plan.

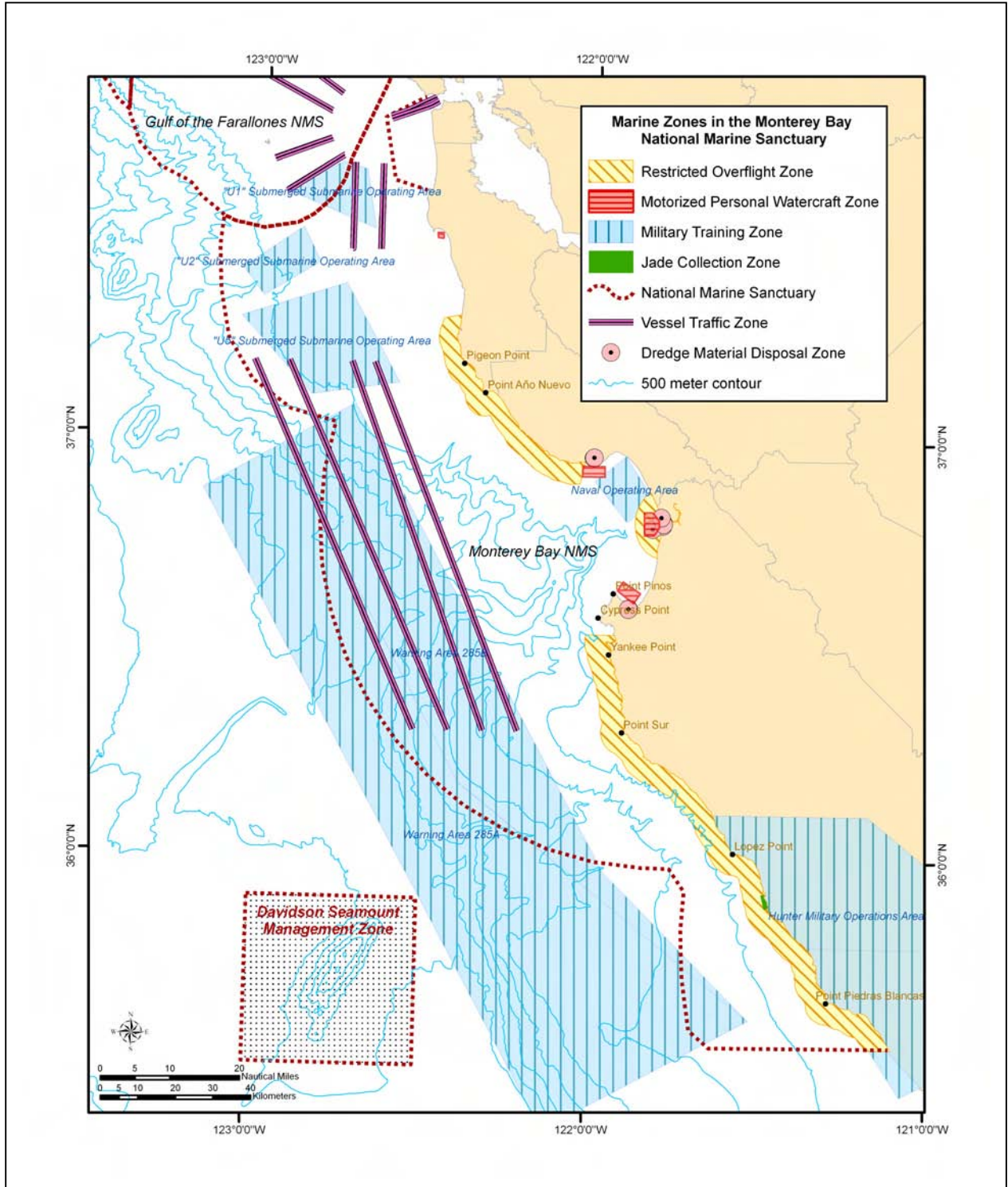
Motorized Personal Watercraft Zones (MPWC): Areas designated for the use of motorized personal watercraft (MPWC). MPWC zones allow this form of recreation while protecting nearshore marine life from disturbance or other injury and minimizing conflicts with other users, such as surfers and kayakers. For more information see Section VII Wildlife Disturbance: Motorized Personal Watercraft Action Plan.

Military Training Zones: Military training zones are mapped to provide awareness to the public areas of the Sanctuary in which military training operations are conducted by the Department of Defense and marine activities may be restricted during MBNMS training or operations. Information about military zones, including the location of the zone and advisories to civilian users, are included on nautical and aeronautical charts. Military zones allow military training while avoiding interference from and harm to civilian vessels and aircraft. Military activities that were specifically identified in the original 1992 MBNMS FEIS and Management Plan are exempt from Sanctuary regulations. New activities may be exempted by the Director of the National Marine Sanctuary Program after consultation between the Director and the Department of Defense.

Vessel Traffic Zones: Vessel traffic zones apply primarily to the following vessel types: tankers, ships containing hazardous materials, barges, and large commercial vessels. These zones are managed by the U.S. Coast Guard, U.S. Department of Transportation, NOAA, U.S. Department of Commerce, International Maritime Organization, and the United Nations. Adherence is voluntary but recommended and accomplished by agreements between large vessel operators and agencies. To fulfill a Congressional mandate, in 1997, the United States Coast Guard (USCG) and NOAA established a workgroup of key stakeholders in the issue of maritime traffic through the MBNMS (including representatives from federal, state and local governments, environmental groups and industry) to review existing practices and risks, and recommend a package of strategies which would maximize protection of Sanctuary resources while allowing for the continuation of safe, efficient and environmentally sound transportation. The group's recommendations included alteration of the Traffic Separation Scheme off San Francisco to move vessels away from the sensitive San Mateo County shoreline. Most importantly, container ships, bulk freighters, and vessels carrying hazardous materials were moved approximately 10 miles further offshore to reduce the risk of groundings, and organized into north-south lanes to reduce the risk of collision. These recommendations were approved by the International Maritime Organization and implemented in 2000.

Davidson Seamount Management Zone: The Davidson Seamount Management Zone (DSMZ) is a special zone in which the only exception to the prohibition on disturbance of the submerged lands of the Sanctuary is for lawful fishing below 3000 feet of seawater. However, in the DSMZ, NOAA fisheries regulations prohibit fishing below 3000 feet, and the sanctuary regulations prohibit take by any other means. The DSMZ was designated to protect the fragile and pristine seamount environment that includes rare corals and sponge communities that are not found in other MBNMS habitats. For more information, see Section III Ecosystem Protection – Davidson Seamount.

Figure IR-1: MBNMS Marine Zones



Exceptions to Prohibitions and Permitting

When an activity is prohibited in the Sanctuary, it may still be conducted under certain circumstances. Some activities may be permitted by the MBNMS or they may be excepted from regulation. Many of the prohibitions contain exceptions for activities conducted in the MBNMS that would otherwise conflict with the regulations. For example, it is prohibited to drill into, dredge or otherwise alter the submerged lands of the MBNMS. However this would prevent certain activities such as anchoring a vessel or installing navigational aids. The regulations therefore provide exceptions for certain activities conflicting with a broad prohibition. For a complete list of the exceptions to the prohibitions, see Appendix F for the exact language of the MBNMS regulations.

Permits

Some prohibited activities may be allowed by regulatory exceptions (briefly described above) or by a “sanctuary permit,” “special use permit,” or “authorization” issued by the MBNMS. Regardless of potential impacts, in no case may the MBNMS issue a sanctuary permit, special use permit, or authorization for: (1) the exploration for, development of or production of oil, gas or minerals in the Sanctuary; (2) the discharge of primary-treated sewage within the Sanctuary; or (3) the disposal of dredged material within the Sanctuary other than at sites authorized by the EPA prior to the effective date of designation. The MBNMS may issue a Sanctuary permit for an otherwise prohibited activity that will have only short term negligible effects on MBNMS resources and qualities. To be considered for such a permit, an activity must either be research related to MBNMS resources or qualities; further the educational, natural, or historical value of the MBNMS; or further salvage or recovery operations.

MBNMS receives approximately sixty requests per year to conduct prohibited activities. The number of requests has grown each year since MBNMS designation in 1992. Generally, these requests are for research or education purposes, but may be for an activity otherwise prohibited, but authorized by another agency permit, such as overflights or coastal construction. The MBNMS evaluates these requests on a case-by-case basis in detail to determine if the activity would have only negligible short-term adverse effects on MBNMS resources and qualities. If the proposed activity meets that criterion, then a permit may be granted to the applicant. Implementation of the MBNMS permit program is addressed further in the Operations and Administration Action Plan, Strategy OA-8 Permit Program.

Special Use Permits

Some prohibited activities, with adequate mitigation measures, may not adversely impact a Sanctuary resource. Several of these activities are of a nature that does not qualify for other NMS permits because the proposed activity is not for the purpose of resource management, research, education, or salvage. Special Use Permits are designated for instances where a commercial “use” of the MBNMS is proposed, and are used when a typical MBNMS permit would not be applicable. Special Use Permits may be issued for the narrow range of activities prohibited by the National Marine Sanctuary Program (NMSP) regulations and must result in no adverse effect to the Sanctuary resource or qualities. The MBNMS named various activities for which it could consider issuing a Special Use Permit in a Federal Register notice to identify program-wide uses for Special Use Permits. These activities include:

The disposal of cremated human remains by a commercial entity

Commercial and private overflights in restricted zones

The placement on and subsequent recovery from the seafloor of objects associated with public events or uses on non-living substrate

The deposit and immediate recovery of objects related to special effects of motion pictures

The continued presence of commercial submarine cables on or beneath the seafloor

The provisions for issuing Special Use Permits as outlined in the NMSA allow the NMSP to recover the administrative costs of issuing the permit and certain other amounts. The MBNMS determines suitable fees. Fees include:

- The costs incurred, or expected to be incurred, by the MBNMS in issuing the permit
- The costs incurred, or expected to be incurred, by the MBNMS as a direct result of the conduct of the activity for which the permit is issued, including the costs of monitoring the conduct of the activity
- An amount that represents the fair market value of the use of the MBNMS resource

Authorizations

When the MBNMS was designated in 1992, it was recognized that other agencies had regulatory authority that interfaced with MBNMS regulations. Activities prohibited in the MBNMS, but not proposed for resource management, research or education purposes, could be permitted by these agencies. Thus, MBNMS regulations included an ability to “authorize” other agency’s permits to allow otherwise prohibited activities. An authorization must be issued in conjunction with a valid lease, permit, license, approval or other authorization issued by any federal, state, or local authority of competent jurisdiction. MBNMS staff coordinates with the agency issuing the original permit to address concerns of the MBNMS. If the original agency does not impose conditions MBNMS staff believes are essential, then the MBNMS may impose specific conditions or terms in issuing its authorization.

The authorization process is intended to be a streamlining measure alleviating the need to get permits from multiple government agencies. The MBNMS examines requests from an ecosystem-based perspective, whereas other agencies usually have a narrower, more focused mandate. Authorizations allow for a more integrated process among agencies with overlapping jurisdictions. The September 18, 1992 Federal Register document announcing the designation of the MBNMS outlines the process for notification and review of applications for leases, licenses, permits, approvals or other authorizations to conduct a prohibited activity. The MBNMS has several procedural options when issuing authorizations.

Authorizations of projects that may affect water quality are generally conducted under a Memorandum of Agreement (MOA) between NOAA, the State of California, the Environmental Protection Agency, and the Association of Monterey Bay Area Governments (AMBAG) regarding the MBNMS regulations relating to water quality within state waters within the MBNMS. This MOA prohibits any permit from being renewed or otherwise issued allowing the discharge of primary-treated sewage within the MBNMS. With regard to permits, the MOA encompasses:

National Pollutant Discharge Elimination System (NPDES) permits issued by the State of California under section 13377 of the California Water Code

Waste Discharge Requirements issued by the State of California under section 13263 of the California Water Code

The MOA specifies how the MBNMS authorization process will be administered within state waters within the MBNMS in coordination with the state permit program.

Other Exceptions

There are two other exceptions to the prohibitions, but under no circumstances do they apply to oil, or mineral activities, the discharge of primary treated sewage, or the disposal of dredged material at new disposal sites. The MBNMS regulatory prohibitions do not apply if one of the following situations applies:

1. An activity is necessary to respond to an emergency threatening life, property or the environment; authorized by a NMS permit; or authorized by a Special Use Permit issued under Section 310 of the Act.
2. With regard to Department of Defense activities: an activity is an existing military activity, or the activity is a new activity and exempted by the Director of the Office of the National Marine Sanctuaries or designee after consultation between the Director or designee and the Department of Defense. The regulations require that the Department of Defense carry out its activities in a manner that avoids, to the maximum extent practicable, any adverse impact on Sanctuary resources and qualities and that it, in the event of threatened or actual destruction of, loss of, or injury to a Sanctuary resource or quality resulting from an untoward incident, including but not limited to spills and groundings, caused by it, promptly coordinate with the Director or designee for the purpose of taking appropriate actions to respond to and mitigate the harm and, if possible, restore or replace the Sanctuary resource or quality.

Implementing the Management Plan

Joint Management Plan Review

Management plan review, which is required by the NMSA (16 U.S.C. §1434(e)) for all national marine sanctuaries, is conducted to ensure that each site properly conserves and protects its living and cultural resources. Management plans are documents that describe regulations and boundaries, outline staffing and budget needs, present management actions and performance measures, and guide development of future budgets and management activities. The MBNMS had not reviewed its management plan since its designation in 1992. Through the process of reviewing the management plans it was clear that recent scientific discoveries, advancements in managing marine resources, and new resource management issues were not adequately addressed in the 1992 plan.

The management plan review process is based on three fundamental steps: (1) public scoping meetings; (2) the prioritization of issues and development of action plans; and (3) the preparation of draft and final management plans and the relevant National Environmental Policy Act (NEPA) documentation (such as an Environmental Impact Statement or Environmental Assessment). Public meetings and formal public hearings on the draft plan help staff revise the document into a final management plan outlining the MBNMS's priorities for at least the next five years.

The National Marine Sanctuary Program (NMSP) reviewed the management plans of the MBNMS together with the Cordell Bank and Gulf of the Farallones National Marine Sanctuaries as part of a process known as the Joint Management Plan Review (JMPR). These sanctuaries are located adjacent to one another, managed by the same program, and share many of the same resources and issues. In addition, all three sites share many overlapping interest and user groups. Using a community-based process that provides numerous opportunities for public input, the NMSP examined the current issues and threats to the resources and whether the management plan put in place at that time is adequately protecting MBNMS resources.

Identification and Prioritization of Issues

The NMSP selected the issues to be addressed in the JMPR following an extensive public process of scoping and issue prioritization. Twenty scoping meetings were held jointly with Cordell Bank and Gulf of the Farallones National Marine Sanctuaries between November 2001 and January 2002, and over 12,500 comments were received. A Summary Scoping Report (February 25, 2002) was used by the Sanctuary Advisory Councils to help them provide advice on the highest priority issues. The Sanctuary Advisory Councils are advisory bodies representing various stakeholder and user groups who meet bi-monthly to advise Sanctuary management on issues of concern. Through a series of workshops in April 2002, Sanctuary Advisory Council members provided feedback and recommendations on the resource issues to be addressed. The results from the workshops were published, in a "Report on MBNMS Advisory Council Prioritization Workshops" on May 13, 2002. Based on input from the Sanctuary Advisory Councils, a report, "Selection of Priority Issues to be addressed in the Joint Management Plan Review" was presented in July 2002. Following selection of the priority issues, NMSP staff developed a work plan ("Priority Issue Work Plan," December 4, 2002) that

characterized the issues to be addressed, identified potential working group members, outlined the timelines for completion, and described the potential products to be produced as part of the working group or internal team efforts. For many of the priority issues, working groups comprised of staff, Sanctuary Advisory Council members, stakeholders and subject experts were established to further characterize the issue and develop strategies to address them. For the MBNMS, 223 members of the public or representing public agencies met in sixty-eight meetings over a period of five months to develop sixteen action plans. Internal teams comprised of NMSP staff addressed other issues and developed proposed action plans that were forwarded to the Sanctuary Advisory Council for review. These documents are available for viewing on the Jmpr website <http://sanctuaries.noaa.gov/jointplan/>

The NMSP determined that certain issues should be addressed as site-specific issues that are to be addressed by the individual sanctuary. Other issues were determined to cut across two or three sanctuaries and were to be addressed as cross-cutting issues. These cross-cutting issues were issues that will be addressed by all three sanctuaries in a coordinated fashion.

Action Plan Development

This report is comprised of action plans developed by working groups and internal teams that were tasked with identifying recommended strategies and activities that address specific priority issues identified during the scoping and prioritization phases of the Jmpr. Meetings of the working groups were meant to be working meetings focused on collaboratively developing a recommendation to the Sanctuary Advisory Council (SAC) regarding their specific issue. The working groups met approximately once a month between January 2003 and May 2003 and focused on the development of the action plans and recommendations in this report.

The action plans were then brought to the SAC in July and August of 2003 for review. The SAC reviewed, modified and recommended a series of action plans to the MBNMS. Generally, the SAC recommended the strategies and activities as proposed by the working groups and internal teams. The original action plans as well as modifications and recommendations from the MBNMS Advisory Council can be reviewed at <http://sanctuaries.noaa.gov/jointplan/archive/welcome.html>

Action Plan Components

Strategies and Activities: *Generally, the action plans are the means by which the MBNMS identifies and organizes the various management issues and the tools with which to address a given issue. They articulate how programs and projects will be implemented, the various steps in the program or project, and who will be accomplishing the work. The action plans are generally divided into strategies. These strategies describe the necessary programs to address a priority resource management issue identified in the scoping and prioritization processes. Each strategy is made up of “activities” describing the actions necessary for successful implementation.*

Performance Measures: *Each action plan contains one or more identified measures by which the MBNMS will evaluate progress toward the desired outcome. These measures will be evaluated periodically and reported as explained in the Performance Evaluation Action Plan.*

Timelines: *The action plans also contain estimated timelines that reflect both when a strategy can expect to start and end and the level of implementation. While the timelines may indicate how long the strategy should take, this may vary depending on the resources and partners available for implementation.*

Budgets: *The budgets identify the resources necessary for implementation of each strategy and in summary, the action plan on an annual basis. These budgets were developed by estimating aggregate costs associated with staff time, facilities, outreach materials, boat, plane, and diving operations, website needs, and outside contracts for studies or monitoring efforts.*

Multidisciplinary Implementation

The action plans are grouped by common themes and issues: Coastal Development, Ecosystem Protection, Operations and Administration, Partnerships and Opportunities, Water Quality, Wildlife Disturbance, and Cross-Cutting Issues. Each action plan is intended to be a discrete plan that will address the issue or problem. However, all issues require common tools of research, monitoring, education, outreach, enforcement, agency coordination, and partnership development. The MBNMS will seek to maximize the synergy between plans by exploring mutual research and monitoring needs for the various issues and combining outreach needs to common audiences. The priority issues identified in this action plan require research, monitoring, education, outreach, enforcement and operational support to be implemented. The MBNMS will implement the new management plan by addressing the action plans in a multi-program team approach where members of the education, research and resource protection programs will each play a critical role in the success of addressing the goals of the action plans. Each of the action plans also requires support from the program operations team to ensure that the multi-disciplinary approach of the action plans and the MBNMS as a whole are a success.

Performance Evaluation

This success will be evaluated through performance measures identified in each of the action plans and summarized in the Performance Evaluation Action Plan. In addition to members from different teams working toward the implementation of each of the action plans, the MBNMS will work cooperatively with its partners, including federal, state, and local agencies, non-

governmental organizations, as well as the Sanctuary Advisory Council and working groups. Successful implementation of this management plan relies on the MBNMS’s traditional multi-stakeholder and partnership-based approach, which will continue as the MBNMS addresses the many marine management issues outlined in this plan.

Budget Development

MBNMS management staff developed the budgets in each action plan by evaluating the resources necessary to completely implement each action plan. MBNMS staff estimated the number of hours of personnel staff required to address each activity, the number of field operation (boat, air, dive) days required, as well as materials, supplies, and travel time. Some activities were assumed to be contracted out to other parties and in these cases, the total cost of the contract was included in the budget estimate. Some assumptions were also necessary to arrive at a cost for each strategy. Staffing was estimated at \$80,000 per year for a full time employee. Each day at sea or in the air was estimated to cost \$2,000 and diving days were estimated to cost \$400 per day in addition to the personnel time. Outreach materials, supplies, travel, and outside contracts were estimated at their dollar value. A summary of the cost for each action plan is included in Table I-1.

The budgets were also developed assuming work would begin in the first year. Naturally, given resource limitations as well as the necessary program and partner development to fully implement all of the action plans, the MBNMS will not be able to operate at the necessary capacity for some time. After assessment of the likely resource needs for full implementation, the MBNMS and Sanctuary Advisory Council could then prioritize the implementation of the action plans.

Table I-1: Estimated Annual Costs for Action Plans

Action Plan	Estimated Annual Cost (in thousands)*				
	YR 1	YR 2	YR 3	YR 4	YR 5
Coastal Development Action Plans					
Coastal Armoring	\$227	\$173.5	\$194.5	\$120.5	\$119.9
Desalination	\$99.5	\$404.9	\$74.3	\$198.4	\$17
Harbors and Dredge Disposal	\$71.8	\$156.9	\$53.1	\$49.1	\$45.1
Submerged Cables	\$83	\$128	\$112	\$8	\$8
Ecosystem Protection Action Plans					
Big Sur Coastal Ecosystem	\$391	\$307	\$291	\$283	\$259
Bottom Trawling Effects on Benthic Habitats	\$317	\$484	\$513	\$165	\$65
Davidson Seamount	\$375	\$138	\$104	\$98	\$108
Emerging Issues	\$45	\$27	\$22	\$27	\$27

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Action Plan	Estimated Annual Cost (in thousands)*				
	YR 1	YR 2	YR 3	YR 4	YR 5
Introduced Species	\$133.5	\$332	\$303	\$345	\$336
Sanctuary Integrated Monitoring Network (SIMoN)	\$320	\$300	\$280	\$280	\$280
Marine Protected Areas	\$407	\$683	\$270	\$890	\$0
Operations and Administration Action Plans					
Operations and Administration	\$1,526.5	\$1,624.5	\$1,757.5	\$1,793.5	\$1,798.5
Performance Evaluation	\$4	\$4	\$4	\$4	\$4
Partnerships and Opportunities Action Plans					
Fishing Related Education and Research	\$223	\$249.5	\$433.5	\$250.5	\$192.5
Interpretive Facilities	\$288	\$4,225	\$2,929	\$1,933	\$2,083
Ocean Literacy and Constituent Building	\$670.6	\$888.1	\$1,150.8	\$2,937.3	\$1,132.8
Water Quality Issues					
Beach Closures and Microbial Contamination	\$1,256	\$668.5	\$1,020	\$660	\$684
Cruise Ship Discharges	\$183.5	\$103	\$64.5	\$51.5	\$51.5
Water Quality Protection Program Implementation	\$1,769	\$1,551	\$1,577	\$1,509	\$1,532
Wildlife Disturbance Action Plans					
Marine Mammals, Seabirds, and Turtles	\$1,438.5	\$738.5	\$609.5	\$581.5	\$617.5
Motorized Personal Watercraft	\$330	\$215	\$159.5	\$159.5	\$152
Tidepool Protection	\$533	\$391	\$416	\$395	\$486.5
Cross Cutting Action Plans					
Administration and Operations	\$288	\$276	\$264	\$264	\$264
Community Outreach	\$144	\$180	\$180	\$180	\$216
Ecosystem and Monitoring	\$381	\$525	\$567	\$531	\$471
Maritime Heritage	\$237	\$237	\$246	\$270	\$270

Action Plan	Estimated Annual Cost (in thousands)*				
	YR 1	YR 2	YR 3	YR 4	YR 5
Northern Management Area	\$50	\$50	\$50	\$50	\$50
Total Estimated Annual Cost	\$11,791.9	\$15,060.4	\$13,645.2	\$14,033.8	\$11,270.3

* Cost estimates are for both “programmatic” and “base” (salaries and overhead) expenses.

Action Plan Prioritization

The action plans and strategies in this management plan comprise a body of work that if fully implemented would require resources well beyond what is currently available to the MBNMS and NMSP. MBNMS staff worked with the Sanctuary Advisory Council and NMSP leadership to examine prioritization of the issues in order to identify which action plans should be implemented in which order or with the most initial emphasis. Implementation of some action plans may also be dependent on a variety of funding scenarios such as grant applications, funding priorities of outside parties, or reliance on partner participation. The implementation of various action plans in the management plan may therefore occur at different stages based on urgency, benefit to Sanctuary resources, and resource availability.

Management Plan Implementation and Funding Scenarios

The following table (Table 1.0) provides an outline of the how the various strategies in the management plan will be implemented. The implementation of the strategies depends on various factors including:

- status of strategy implementation
- priority of strategy implementation based on resources available,
- coordination level necessary with partners for implementation, and
- funding source for strategy implementation

The status of the strategy indicates the amount of work completed or the level of implementation of a strategy at the time of the management plan review. Certain strategies and activities have been partially or wholly implemented prior to or during the management plan review. Other strategies are new as part of the updated management plan or may not be initiated until the future.

The level of implementation indicates the priority of a strategy or action plan and subsequent level of effort based on resources available. As stated previously, full implementation of the management plan exceeds the resources available to the MBNMS therefore requiring some prioritization of the action plan or strategies. As resources become available, a greater level of implementation is possible. This table outlines how much implementation could occur with the existing amount of resources and how increases in resources would affect the amount of implementation possible for each strategy or action plan.

Implementation of most of the strategies in this management plan will require some input or coordination from partners, particularly other government agencies, research institutions, and NGO’s. The table outlines the level of involvement expected from partners to achieve full implementation of each strategy. Many action plans and strategies are completely dependent on involvement from other agencies or dependent on research conducted by a research institution.

Funding for implementation of many of the strategies will require a mix of internal NMSP funds as well as funding from external sources such as grants, the Monterey Bay Sanctuary Foundation, or in-kind work from partner agencies. The table highlights the probably source of the funding; primarily internal or external or a mix of funding sources.

Table 1.0 – Legend			
Column A	Column B, C, D	Column E	Column F
<p>Strategy Status:</p> <ul style="list-style-type: none"> ● – Existing w/o significant modification ◐ – Existing w/ significant modification ○ – New (since ‘05) or future (Not yet implemented.) 	<p>Implementation* (w/ NMSP Funding):</p> <p>H – High M – Medium L – Low</p> <p>* Implementation ranking considers the priority of each strategy as well as the percentage of activities that could be initiated, maintained, and/or completed under differing funding scenarios.</p>	<p>Necessary Partnership Coordination:</p> <ul style="list-style-type: none"> ● – Not possible w/o partners ◐ – Significant reliance on partners ○ – Little reliance on partners 	<p>Primary Funding Sources:</p> <ul style="list-style-type: none"> ● – External (e.g. Grants) ◐ – Internal and External ○ – Internal

Table I-1.0 Action Plan Strategy Funding Scenarios

Action Plan Strategies		A	B	C	D	E	F
		Strategy Status:	Implementation Level Funding: Scenario 1	10% per year Increase: Scenario 2	20% per year Increase: Scenario 3	Partnership Coordination	Primary Funding Source
Coastal Development							
Coastal Armoring Action Plan							
CA-1	Conduct Issue Characterization and Needs Assessment	◐	M	M	H	◐	○
CA-2	Develop and Implement Regional Approach to Coastal Armoring	○	M	M	M	●	◐
CA-3	Improve Permit Program Improvements	◐	L	M	M	◐	○
CA-4	Implement Programs and Increase Training	○	L	L	L	●	◐
Desalination Action Plan							
DESAL-1	Develop and Implement Regional Desalination Program	○	L	L	M	●	◐
DESAL-2	Develop Facility Siting Guidelines	○	M	H	H	●	○
DESAL-3	Identify Environmental Standards for Desalination Facilities	○	M	M	H	●	○
DESAL-4	Develop Modeling and Monitoring Program	○	L	L	M	●	◐
DESAL-5	Conduct Outreach and Information Exchange	○	L	L	M	◐	◐
Harbors and Dredge Disposal Action Plan							
HDD-1	Improve Agency Coordination	◐	M	M	M	●	○
HDD-2	Review Offshore Dredge Disposal Activities	◐	M	M	M	●	○
HDD-3	Coordinate with Sediment Monitoring and Reduction Programs	◐	L	L	M	●	◐
HDD-4	Disposal of Fine-Grained Material	◐	L	L	M	◐	◐
HDD-5	Alternative Disposal Methods	○	L	L	M	●	◐
Submerged Cables Action Plan							
SC-1	Identify Routing and Zones for Submerged Cable Projects	◐	L	L	M	○	○
SC-2	Develop Submerged Cable Project Permit Guidelines	○	L	L	M	○	○
Ecosystem Protection							
Big Sur Coastal Ecosystem Action Plan							
BSP-1	Provide Integrated Data and Information to the Public	○	L	L	L	●	◐
BSP-2	Interagency Coordination Program	◐	L	L	L	●	◐
Bottom Trawling Effects on Benthic Habitats Action Plan							
BH-1	Develop Partnerships with Fishermen	◐	M	H	H	◐	◐
BH-2	Assess Trawl Activity	◐	M	M	M	◐	◐

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		A	B	C	D	E	F
Action Plan Strategies		Strategy Status:	Implementation Level Funding: Scenario 1	10% per year Increase: Scenario 2	20% per year Increase: Scenario 3	Partnership Coordination	Primary Funding Source
BH-3	Identify Habitats Vulnerable to Trawling	◐	M	M	M	●	○
BH-4	Develop a Management Tracking Program	◐	M	M	M	●	○
BH-5	Develop an Impact Identification and Research Program	○	L	L	M	◐	◐
BH-6	Identify and Implement Potential Ecosystem Protection Measures	○	L	L	L	●	○
BH-7	Develop Education and Outreach Program	○	L	L	M	◐	◐
Davidson Seamount Action Plan							
DS-1	Conduct Site Characterization	◐	L	L	M	◐	◐
DS-2	Conduct Ecological Processes Investigations	○	L	L	L	◐	◐
DS-3	Develop Resource Protection Program	○	L	L	L	◐	○
DS-4	Conduct Seamount Education and Outreach Initiatives	◐	L	L	M	◐	◐
Emerging Issues Action Plan							
EI-1	Identify and Track Emerging Issues	◐	L	L	L	○	○
EI-2	Develop Process to Address Emerging Issues	◐	L	L	L	○	○
EI-3	Develop Emerging Issues Staffing and Operations Structure	○	L	L	L	○	○
Introduced Species Action Plan							
IS-1	Address Known Pathways of Introduction	◐	L	M	M	◐	○
IS-2	Develop Prevention Program for Known Pathways of Introduction	○	L	M	M	◐	◐
IS-3	Develop Baseline Information, Research & Monitoring Program	◐	L	L	L	◐	◐
Sanctuary Integrated Monitoring Network (SIMoN) Action Plan							
SI-1	Implement Monitoring Programs Needed to Support Management Priorities	◐	H	H	H	●	◐
SI-2	New Monitoring Efforts for Basic MBNMS Characterization and Understanding of Changes in Natural Resources	◐	H	H	H	●	◐
SI-3	Integrate Regional Monitoring Efforts	◐	H	H	H	●	◐
SI-4	Integrate, Synthesize, and Analyze New and Existing Data	◐	H	H	H	●	◐
SI-5	Increase Outreach and Information Dissemination	◐	H	H	H	◐	◐
SI-6	Expand SIMoN as a Model for the National Marine Sanctuary System	○	H	H	H	●	◐
Marine Protected Areas Action Plan							
MPA-1	Develop Partnerships	●	M	H	H	●	○

		A	B	C	D	E	F
Action Plan Strategies		Strategy Status:	Implementation Level Funding: Scenario 1	10% per year Increase: Scenario 2	20% per year Increase: Scenario 3	Partnership Coordination	Primary Funding Source
MPA-2	Define Conservation Goals and Objectives and Habitats and Resources to be Protected	◐	M	H	H	●	◐
MPA-3	Develop General Design Criteria	◐	M	H	H	●	◐
MPA-4	Determine Types of Use	○	M	H	H	●	○
MPA-5	Develop Integrated Management System	○	M	H	H	●	○
MPA-6	Conduct Socioeconomic Impact Analysis and Identify Mitigation	◐	M	H	H	●	◐
MPA-7	Develop Enforcement and Compliance Program	○	M	H	H	●	◐
MPA-8	Develop Education and Outreach Program	○	M	H	H	◐	◐
MPA-9	Build Research and Monitoring Program	○	M	H	H	◐	◐
MPA-10	Develop Timing Strategies and Phasing/ Effectiveness Evaluations	○	M	H	H	◐	○
MPA-11	Develop Interagency Coordination and Implementation Mechanisms in Federal and State Waters	○	M	H	H	●	◐
Operations and Administration							
Operations and Administration Action Plan							
OA-1	Assess Staffing Needs	◐	H	H	H	○	○
OA-2	Develop Volunteer Program	◐	M	M	H	◐	◐
OA-3	Coordinate and Support Sanctuary Advisory Council	●	H	H	H	○	○
OA-4	Conduct Facilities Assessment	◐	H	H	H	○	○
OA-5	Conduct Administrative Initiatives	◐	H	H	H	○	○
OA-6	Coordinate and Conduct Boat Operations	◐	M	M	H	○	○
OA-7	Oversee and Conduct Dive Operations	◐	L	L	M	◐	○
OA-8	Oversee and Conduct Aircraft Operations	◐	L	L	M	◐	○
OA-9	Maintain and Enhance Permit Program	●	M	M	M	◐	○
OA-10	Increase Interagency Program Review	◐	M	M	M	◐	○
Performance Evaluation Action Plan							
PE-1	Measure Sanctuary Performance Over Time	○	M	M	M	◐	○
Partnerships and Opportunities							
Fishing Related Education and Research Action Plan							
FER-1	Educate About Fisheries Management	○	M	M	M	◐	◐
FER-2	Enhance Stakeholder and Public Communication	◐	M	M	M	◐	◐
FER-3	Facilitate Sustainable Fisheries Definition and Promotion	○	M	M	M	◐	●

		A	B	C	D	E	F
Action Plan Strategies		Strategy Status:	Implementation Level Funding: Scenario 1	10% per year Increase: Scenario 2	20% per year Increase: Scenario 3	Partnership Coordination	Primary Funding Source
FER-4	Involve Fishermen in Education and Outreach Programs	◐	M	M	M	●	◐
FER-5	Fisheries Related Data Collection and Distribution	◐	M	M	H	●	◐
FER-6	Collect and Distribute Socioeconomic, Cultural, and Historical Data	◐	L	M	M	●	◐
FER-7	Conduct Public Outreach on Links Between Healthy Ecosystems and Fish Populations	○	L	M	M	◐	◐
Interpretive Facilities Action Plan							
IF-1	Construct and Operate Visitor Center	◐	H	H	H	●	◐
IF-2	Develop Smaller Regional Interpretive Facilities	◐	M	M	H	●	◐
IF-3	Increase Sanctuary-Wide Interpretive Signage	◐	M	M	H	●	◐
IF-4	Virtual Experiences	◐	M	M	H	●	◐
Ocean Literacy and Constituent Building							
MERITO-1	Implement Regional Planning Approach to Address Multicultural Outreach	●	M	M	M	●	◐
MERITO-2	Community-Based Bilingual Outreach Program	●	M	M	M	●	◐
MERITO-3	Implement Site-Based Bilingual Outreach Program	●	M	M	M	●	◐
MERITO-4	Implement Teacher Training and Internship Program	●	M	M	M	●	◐
MERITO-5	Develop Comprehensive Communications Plan	◐	L	M	M	○	◐
MERITO-6	Integrate Multicultural Elements Into Existing MBNMS Programs and Materials	◐	M	M	M	○	◐
MERITO-7	Intra-Sanctuary Expansion of MERITO	◐	M	M	M	◐	◐
Water Quality							
Beach Closures and Microbial Contamination Action Plan							
BC-1	Research	○	M	M	M	●	●
BC-2	Monitoring	◐	M	M	H	●	◐
BC-3	Notification Program	○	M	M	H	●	◐
BC-4	Geographic Information System (GIS)	○	M	M	H	◐	◐
BC-5	Increase Source Control Program	◐	H	H	H	●	◐
BC-6	Increase Technical Training for Industry Professionals	◐	H	H	H	◐	◐
BC-7	Enhance Public Outreach of Contamination Sources and Solutions	◐	H	H	H	●	◐
BC-8	Increase and Coordinate Enforcement	○	M	M	H	●	◐

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Action Plan Strategies		Strategy Status:	Implementation Level Funding: Scenario 1	10% per year Increase: Scenario 2	20% per year Increase: Scenario 3	Partnership Coordination	Primary Funding Source
BC-9	Improve Emergency Response	○	M	M	H	◐	◐
Cruise Ship Discharges Action Plan							
CS-1	Increase Outreach and Coordination	◐	M	M	M	○	○
CS-2	Develop Enforcement and Monitoring Program	◐	M	M	M	◐	○
Water Quality Protection Program Implementation Action Plan							
WQPP-1	Increase Public Education and Outreach	●	M	H	H	◐	◐
WQPP-2	Increase Technical Training	●	M	H	H	◐	◐
WQPP-3	Collaborate with Regional Urban Runoff Management Efforts	◐	M	M	M	●	◐
WQPP-4	Promote Structural/ Non-structural Controls	◐	M	M	H	●	◐
WQPP-5	Promote Sedimentation/Erosion Controls	○	L	L	M	●	◐
WQPP-6	Increase Storm Drain Inspection	◐	M	H	H	●	●
WQPP-7	Produce and Promote CEQA Additions	◐	L	L	M	●	◐
WQPP-8	Increase Regional Monitoring	●	M	M	M	●	●
WQPP-9	Increase Access to Monitoring Data	●	M	M	M	●	◐
WQPP-10	Increase Interagency Coordination	●	M	M	M	●	◐
WQPP-11	Increase Public Education and Outreach	●	L	L	L	◐	◐
WQPP-12	Develop and Implement Technical Training Team	●	L	L	L	◐	◐
WQPP-13	Promote Bilge Waste Disposal and Waste Oil Recovery	●	L	L	M	●	●
WQPP-14	Promote Topside and Haul-out Vessel Maintenance	○	L	L	M	●	◐
WQPP-15	Increase Underwater Hull Maintenance	○	L	L	M	●	◐
WQPP-16	Establish Agricultural Industry Networks to Address Water Quality	●	H	H	H	●	●
WQPP-17	Strengthen Technical Information and Outreach to Agriculture	●	H	H	H	◐	◐
WQPP-18	Improve Education and Public Relations on Watersheds and Agricultural Conservation measures	●	H	H	H	◐	◐
WQPP-19	Coordinate and Streamline Regulations for Conservation Projects	●	M	M	M	◐	●
WQPP-20	Improve Funding Mechanisms and Incentives for Water Quality Improvements	●	M	M	M	◐	◐
WQPP-21	Improve Water Quality Management on Public Lands and Rural Roads	○	H	H	H	◐	◐
WQPP-22	Develop Wetlands and Riparian Corridor Action Plan	○	L	L	L	●	●
Wildlife Disturbance							

	A	B	C	D	E	F
Action Plan Strategies	Strategy Status:	Implementation Level Funding: Scenario 1	10% per year Increase: Scenario 2	20% per year Increase: Scenario 3	Partnership Coordination	Primary Funding Source
Marine Mammal, Seabird, and Turtle Disturbance Action Plan						
MMST-1 Mitigate Impacts From Marine Vessels	●	M	M	H	◐	◐
MMST-2 Mitigate Impacts From Low Flying Aircraft	◐	L	L	M	◐	○
MMST-3 Mitigate Impacts From Shore-Based Activities	◐	M	M	M	◐	◐
MMST-4 Mitigate Impacts From Marine Debris	○	L	L	L	◐	○
MMST-5 Evaluate Impacts From Commercial Harvest	○	L	L	M	●	○
MMST-6 Assess Impacts From Acoustics	◐	L	L	M	●	◐
MMST-7 Reduce Sea Turtle Disturbance	○	L	L	L	◐	○
MMST-8 Maintain and Enhance Enforcement	◐	M	M	H	◐	○
Motorized Personal Watercraft Action Plan						
MPWC-1 Maintain Motorized Personal Watercraft Zones	◐	M	M	M	○	○
MPWC-2 Consider Zone Restriction Exceptions	◐	L	L	M	◐	○
MPWC-3 Conduct Educational Outreach to MPWC Community	○	M	M	M	◐	○
MPWC-4 Enhance Enforcement Efforts	◐	M	M	M	◐	○
Tidepool Protection Action Plan						
TP-1 Assess the Problem	◐	M	M	M	◐	○
TP-2 Conduct Education and Outreach	◐	L	M	M	◐	◐
TP-3 Strengthen Enforcement	○	L	L	M	◐	◐
TP-4 Improve Tracking and Evaluation of Collection and Take	○	L	L	L	◐	○
TP-5 Consider Limitation on Use in Selected Locations	○	L	L	L	●	○
TP-6 Identify Implementation Opportunities	○	L	L	M	○	○
TP-7 Address Other Human Activities	○	L	L	L	◐	○
Cross-Cutting						
Administration and Operations Action Plan						
XAO-1 Improve Internal Communications Among the Three Sanctuaries	◐	H	H	H	○	○
XAO-2 Improve the Efficiency and Cost-Effectiveness of Program Operations	○	M	H	H	○	○
XAO-3 Improve the Efficiency and Cost-Effectiveness of Program Administration	◐	M	M	H	○	○
XAO-4 Improve the Coordination of Sanctuary Resource Protection Activities and Programs	◐	L	M	H	◐	○
Community Outreach Action Plan						

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Action Plan Strategies	Strategy Status:	Implementation Level Funding: Scenario 1	10% per year Increase: Scenario 2	20% per year Increase: Scenario 3	Partnership Coordination	Primary Funding Source
XCO-1 Build Upon and Expand Existing Ocean and Coastal Outreach	○	L	M	H	◐	◐
XCO-2 Enhance and Coordinate Ocean and Coastal Education	◐	L	M	H	◐	◐
XCO-3 Enhance Ocean and Coastal Stewardship	○	L	M	H	●	◐
Ecosystem Monitoring Action Plan						
XEM-1 Coordinate Existing Targeted Monitoring Activities to Promote Greater Efficiency and Effectiveness	◐	M	M	H	●	○
XEM-2 Coordinate and Implement Existing Regional Ecosystem Monitoring Activities	◐	L	L	M	●	●
XEM-3 Identify Shared Monitoring Needs With Respect to Management Concerns and Responsibilities at Each of the Sanctuaries	◐	M	M	H	◐	◐
XEM-4 Establish a Joint Internal Monitoring Coordination Team	○	H	H	H	◐	○
XEM-5 Consider Establishing Additional Site-Specific or a Joint Research Activities Panel to Enhance Research and Monitoring Collaborations	○	L	L	M	◐	○
Maritime Heritage						
XMHR-1 Establish Maritime Heritage Resources Program	◐	M	M	M	◐	○
XMHR-2 Inventory and Assess Submerged Sites	◐	L	L	M	●	◐
XMHR-3 Assess Shipwrecks and Submerged Structures for Hazards	○	L	M	M	●	◐
XMHR-4 Protect and Manage Submerged Archaeological Resources	○	L	L	M	●	◐
XMHR-5 Conduct Public Outreach with Traditional User and Ocean-Dependent Groups and Communities	○	L	L	M	●	◐
XMHR-6 Establish Maritime Heritage Focused Education and Outreach Programs	○	L	L	M	◐	○
Northern Management Area Plan						
NMA Administration and Operations						
XNAO-1 Create a Multi-Functional HMB Regional Office.	◐	L	M	H	◐	○
XNAO-2 Evaluate the Delivery and Success of NMSP Programs and Services in the NMA	○	M	H	H	○	○
NMA Resource Protection						
XNRP-1 GFNMS Will Be Responsible for Permit Activities in the NMA	◐	M	M	M	●	○

	A	B	C	D	E	F
Action Plan Strategies	Strategy Status:	Implementation Level Funding: Scenario 1	10% per year Increase: Scenario 2	20% per year Increase: Scenario 3	Partnership Coordination	Primary Funding Source
XNRP-2 GFNMS Will Be Responsible for Regulatory Activities in the NMA While Maintaining Maximum Consistency and Protection to Sanctuary Resources	◐	M	M	M	●	○
XNRP-3 GFNMS Staff Will Coordinate Existing and Emerging Resource Protection Issues in the NMA	◐	L	L	L	●	◐
XNRP-4 GFNMS Staff Will Coordinate Enforcement Activities in the NMA	◐	M	M	M	●	◐
XNRP-5 GFNMS Staff Will Coordinate NMA Emergency Response Activities in the NMA	◐	M	M	M	●	◐
XNRP-6 MBNMS Water Quality Protection Program Staff Will Continue to Coordinate Water Quality Activities in the NMA	◐	M	M	M	●	◐
NMA Research & Monitoring						
XNRM-1 Share Information	●	H	H	H	○	○
XNRM-2 Coordinate Research and Monitoring Information Dissemination	○	M	M	M	○	○
XNRM-3 Collaborate on Sanctuary Advisory Committees and Working Groups on Research and Monitoring Issues Related to the NMA	●	H	H	H	○	○
XNRM-4 Collaborate on Volunteer Monitoring Efforts Related to the NMA	●	H	H	H	●	◐
XNRM-5 Implement JMPR Site-Specific Research and Monitoring Activities in the NMA	○	L	M	H	◐	●
NMA Education & Outreach						
XNEO-1 Transfer, Establish and Implement School Programs for the NMA	◐	M	H	H	●	◐
XNEO-2 Develop and Implement Community Outreach and Stewardship Programs	◐	M	H	H	●	◐
XNEO-3 Develop and Disseminate Outreach Materials in the NMA	○	L	M	M	◐	○
XNEO-4 Implement JMPR Site-Specific Education and Outreach Activities in the NMA	○	L	M	H	◐	◐