
GULF OF THE FARALLONES NATIONAL MARINE SANCTUARY



DRAFT MANAGEMENT PLAN

UPDATED IN RESPONSE TO THE PROPOSED SANCTUARY EXPANSION

UPDATED APRIL 2014

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE
OFFICE OF NATIONAL MARINE SANCTUARIES





**GULF OF THE FARALLONES
NATIONAL MARINE SANCTUARY
DRAFT MANAGEMENT PLAN**

Updated April 2014



The Gulf of the Farallones National Marine Sanctuary (GFNMS) Management Plan has been updated in response to the proposed sanctuary expansion. A sanctuary management review is conducted at a sanctuary periodically, in accordance with the National Marine Sanctuaries Act (NMSA; 16 U.S.C. 1431 et seq.). The draft updated plan applies to the entire area encompassed by the existing sanctuary and the proposed expansion area. The issue areas and programs addressed in this document were built with guidance from the general public, sanctuary staff, agency representatives, experts in the field and the sanctuary advisory council.

For readers that would like to learn more about the management plan, GFNMS policies and community-based management processes, we encourage you to visit our website at www.farallones.noaa.gov. Readers who do not have Internet access may call the Sanctuary office at (415) 561-6622 to request relevant documents or further information.

The National Oceanic and Atmospheric Administration's (NOAA) Office of National Marine Sanctuaries (ONMS) seeks to increase public awareness of America's ocean and Great Lakes treasures by conducting scientific research, monitoring, exploration and educational programs. Today, the program manages thirteen national marine sanctuaries and one marine national monument that together encompass more than 170,000 square miles of America's ocean and Great Lakes natural and cultural resources.

The NOAA Ocean Service is the umbrella organization for ONMS and is dedicated to exploring, understanding, conserving and restoring the nation's coasts and oceans and works to balance environmental protection with economic prosperity in its mission promoting safe navigation, supporting coastal communities, sustaining coastal habitats and mitigating coastal hazards.

NOAA, an agency of the U.S. Department of Commerce, is dedicated to enhancing economic security and national safety through the prediction and research of weather and climate-related events and providing environmental stewardship of our nation's coastal and marine resources.

For more information, contact:

Maria Brown, Sanctuary Superintendent
Gulf of the Farallones National Marine Sanctuary
991 Marine Drive, The Presidio
San Francisco, CA 94129
(415) 561-6622

Cover Photo Credits:

Tufted Puffin (*Fratercula cirrhata*) –Jeff Foott
Blue Whale (*Balaenoptera musculus*) –Thomas M. Johnson
White Shark (*Carcharodon carcharias*) – Scot Anderson

**PROPOSED NEW BOUNDARY FOR
GULF OF THE FARALLONES NATIONAL MARINE SANCTUARY**

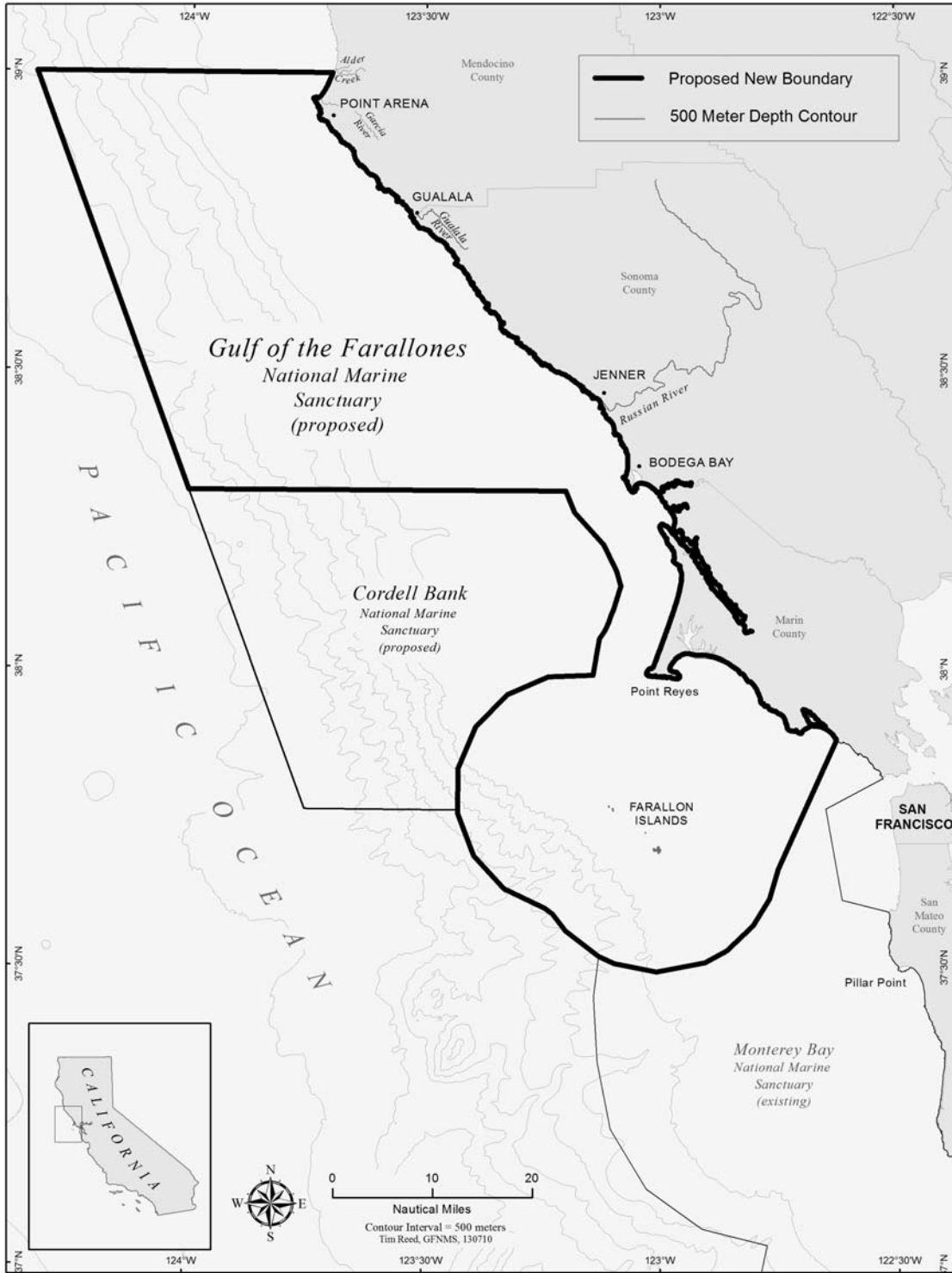


TABLE OF CONTENTS

<i>Gulf of the Farallones National Marine Sanctuary Map</i>	v
<i>Executive Summary</i>	1
<i>Introduction</i>	5
<i>Sanctuary Setting</i>	13
<i>Structure of the Action Plans</i>	33
<i>Issue-Based Action Plans</i>	39
Water Quality	41
Performance Measures.....	57
Wildlife Disturbance	59
Wildlife Protection & MPWC Zone Maps	75
Performance Measures.....	77
Introduced Species	79
Performance Measures.....	90
Ecosystem Protection: Impacts from Fishing Activities	93
Performance Measures.....	102
Impacts from Vessel Spills	105
Vessel Traffic Lanes Map.....	117
Performance Measures.....	118
<i>Program Area Action Plans</i>	121
Education and Outreach	123
Performance Measures.....	132
Conservation Science	135
Performance Measures.....	145
Resource Protection	149
Performance Measures.....	165
Administration	167
Staffing Plan.....	177
<i>Cross-Cutting Action Plans</i>	179
Administration and Operations	183
Community Outreach	189

Table of Contents
GFNMS Draft Management Plan

Ecosystem Monitoring.....	195
Maritime Heritage	203
<i>Appendices</i>.....	213
Appendix A: Jurisdictional Authorities	215
Appendix B: Glossary of Terms	219
Appendix C: Acronyms	223
Appendix D: Citations	229
Appendix E: Vertebrates.....	235
Appendix F: Invertebrates and Algae	247
Appendix G: Introduced Species	261

EXECUTIVE SUMMARY



THE SOUTH FARALLON ISLANDS SERVE AS A CRITICAL BREEDING AND FEEDING GROUND FOR MANY SEABIRD AND MARINE MAMMAL POPULATIONS OF THE SANCTUARY. PHOTO: NOAA

Current Status

This document is the draft update to the Management Plan for Gulf of the Farallones National Marine Sanctuary (GFNMS). The National Oceanic and Atmospheric Administration (NOAA) prepared the plan in cooperation with the public, state and federal agencies, stakeholders, and the Gulf of the Farallones Sanctuary Advisory Council. The last version of the management plan was published in 2008, and has been updated in response to the proposed sanctuary expansion. The plan applies to the entire area encompassed by the existing sanctuary and the proposed expansion area. The entire management plan has not been rewritten; the plan will be reviewed five years after the expansion is effective (if approved).

GFNMS Designation

GFNMS has been vested with the authority, in accordance with the National Marine Sanctuaries Act (NMSA), to provide comprehensive and coordinated conservation and management of the sanctuary. In general, the Sanctuary includes the waters surrounding the Farallon Islands and the coastal waters extending north-to-south from the 39th Parallel at Alder Creek in Mendocino County to Rocky Point in Marin County. From east-to-west the Sanctuary extends from the Mean High Water Line, with notable exceptions, to the continental margin at or about the 10,000 foot depth contour. The Sanctuary is adjacent to Cordell Bank National Marine Sanctuary (CBNMS) on the north and east sides of CBNMS, and adjacent to the Monterey Bay National Marine Sanctuary (MBNMS) along the northern boundary of MBNMS. Shoreward, the sanctuary includes the Estero Americano, Estero de San Antonio, Tomales Bay and Bolinas

Executive Summary
GFNMS Draft Management Plan

Lagoon but does not include the Garcia River Estuary, Point Arena Harbor, Gualala River Estuary, Russian River Estuary, Salmon Creek Estuary or Bodega Harbor.

This area of special national significance was designated a national marine sanctuary because these waters provide important marine and nearshore habitats for a diverse array of marine mammals and marine birds, as well as fishery, plant, algae, and benthic resources. The marine mammals and seabirds present in abundant numbers on the Farallon Islands and the mainland coast depend as much on the integrity and productivity of these adjacent ocean and estuarine waters as on the preservation of the shore areas they use for breeding, feeding, and hauling out.

GFNMS Original Management Plan

Originally designated in 1981 as the Point Reyes-Farallon Islands Marine Sanctuary, sanctuary management responsibilities were delegated to the California Department of Fish and Wildlife (CDFW). Historically, the site focused largely on education and public awareness of biologically, culturally, or historically significant underwater resources.

The original management plan, developed at the time of designation of the sanctuary in 1981, provided guidelines to ensure that all management actions undertaken in the first five years of designation were directed to resolving important issues as a means of meeting sanctuary objectives. Management objectives were considered in three areas: resource protection, interpretation, and research. The management plan also called for promulgation of regulations or prohibitions.

The specific requirements of GFNMS' original management plan were compatible with the overall sanctuary management concepts embodied within the NMSA of 1972 and its implementing regulations (15 CFR Part 922), which require that a management plan be prepared and implemented for each national marine sanctuary.

Management Plan Review

The 1992 amendments to the NMSA required that each of the national marine sanctuaries engage in a management plan review process periodically to reevaluate site-specific goals and objectives, management techniques, and strategies in achieving those goals and objectives. The Office of National Marine Sanctuaries (ONMS) initiated a review of the management plans of Gulf of the Farallones, Cordell Bank, and Monterey Bay national marine sanctuaries jointly. Since these sanctuaries are located adjacent to one another, and share many of the same resources and issues, the staff from each office work closely together on programs. In addition, all three sites share overlapping interest and user groups. It was more cost effective for the ONMS to review the three sites jointly, rather than conduct three independent reviews.

The management plan review process provided GFNMS with the opportunity to: take a closer look at how the marine environment has changed since its designation; understand the cause and effect relationship of human activity and natural perturbations on the marine resources; and engage the public in the management decision-making process. As a result of this process,

which ended in 2008, GFNMS reshaped its management structure, restructured program areas, and evaluated regulations.

With this update, the GFNMS management plan will guide the operation of the expanded sanctuary, if applicable, for the next five to ten years, helping the sanctuary set budget and project priorities each year in preparation of its annual operating plan. Nine action plans are contained in this management plan:

1. Water Quality
2. Wildlife Disturbance
3. Introduced Species
4. Ecosystem Protection: Impacts from Fishing Activities
5. Vessel Spills
6. Education and Outreach
7. Conservation Science
8. Resource Protection
9. Administration

Updates to this Management Plan include: revisions to the description and map of GFNMS; updated maps in the Wildlife Disturbance and Vessel Spills action plans; technical corrections, including removal of obsolete text and completed actions and additions relevant to the expanded sanctuary area; additional activities regarding climate change, white shark stewardship, ship strikes and monitoring of whales, and wildlife protections in the expansion area; key partners summarized at the action plan and cross-cut action plan level rather than at the strategy level; deletion of specific products; revision of former timelines and budgets into a summary implementation table, and updates to the species list appendix. Activities were also added to the Cross-cut Action Plans related to management of the expansion area, which apply to all three sanctuaries.

INTRODUCTION

OVERVIEW

Background

Gulf of the Farallones National Marine Sanctuary (GFNMS) has been vested with the authority, in accordance with the National Marine Sanctuaries Act (NMSA) (1972), to provide comprehensive and coordinated conservation and management of the nearshore and offshore waters within its boundaries. A complete spectrum of marine habitats ranging from unique estuarine, to intertidal, pelagic, and deep oceanic environments is found within the sanctuary. The sanctuary was established to protect the largest assemblage of breeding seabirds in the contiguous United States as well as large concentrations of marine mammals that use these productive waters.

Expansion of sanctuary boundaries northward protects the source waters of a globally ecologically significant coastal upwelling center originating off Point Arena and flowing south into the Gulf of the Farallones. Upwelling currents carry nutrients from the deep to the surface at Point Arena and winds drive the surface currents south transporting nutrient-filled water along the southern Mendocino, Sonoma, Marin, and San Francisco coast to the waters over Cordell Bank and around the Farallon Islands and down through San Mateo County. These nutrients are the foundation for the food-rich environment of the north-central coast and offshore environment and promote the growth of organisms at all levels of the marine food web. The nutrients flowing from this upwelling center form the basis of support for a range of species, from plankton to predators. When upwelling winds relax, surface currents flow to the north and provide nutrients and food from the south to kelp bed inhabitants.

Including this area within GFNMS helps conserve and protect the wildlife and habitats within an interconnected upwelling cell by reducing impacts to habitats and species such as disturbance to the seabed, disturbance to wildlife, and discharges into the ocean. The sanctuary also increases education, outreach, and opportunities for community engagement in the management and protection of the coastal and ocean environment.



Bodega Head and Bay. Photo: NOAA

Description of GFNMS

Located in the waters west of San Francisco, and extending northward to Manchester Beach in Mendocino County, the GFNMS provides many examples of the marine life and habitats characteristic of cold temperate waters of the eastern Pacific marine region that extends from

Introduction
GFNMS Draft Management Plan

Point Conception to British Columbia. A large portion of the sanctuary lies in the Gulf of the Farallones between the western edge of the continental shelf and the coast of Marin and Sonoma counties. Some of the largest and most diverse eastern Pacific populations of seabirds and pinnipeds (seals and sea lions) south of Alaska occur in the Gulf. Large flocks of Cassin's Auklets, Common Murres, Western Gulls, and the endangered Brown Pelican feed on the small fish and crustaceans that are abundant in the surface waters of the sanctuary. This food source also supports California's largest breeding population of harbor seals, as well as the growing population of northern elephant seals. Large numbers of whales and dolphins, including the California gray whale, the Pacific humpback whale and the blue whale are found in the area. Around the Farallon Islands is one of the world's largest seasonal congregations of white sharks. There are also many significant nearshore habitats represented within the sanctuary, such as the inland reaching Estero de San Antonio and Estero Americano; Tomales Bay and Bolinas Lagoon; and the large intertidal and subtidal reef at Duxbury Reef.

The coastal and offshore habitats of northern California from Bodega Head, in Sonoma County, to Manchester State Beach, in Mendocino County include unique geological and biological features such as the influence of currents, seasonal upwelling, and weather patterns.

This unique combination of oceanographic conditions and undersea topography create conditions in the expansion area that support a rich and diverse assemblage of marine species. This includes a wide array of temperate cold-water species with occasional influxes of warm-water species. The species diversity is directly related to the diversity of habitats and oceanic conditions, and its location within a broad biogeographic transition zone (Point Arena to Año Nuevo). This transition zone provides a complex gradient of changing environments in which the relative proportions of species changes from north to south.

The Point Arena region serves as a source of upwelled, nutrient-rich ocean waters, which are transported by wind driven currents to the Gulf of the Farallones region over a period of five to seven days. Upwelling may be widespread at times, or localized at upwelling centers or "cells" (e.g., Point Arena). Upwelling offshore of Point Arena delivers deep, nutrient-rich cold water to the surface and supports high productivity off of Point Reyes and the Gulf of the Farallones region. San Francisco Bay is another important source of nutrients and organic matter in the Gulf of Farallones region. The nutrient rich waters support high concentrations of phytoplankton in the Gulf of the Farallones region and in turn support zooplankton and higher trophic prey species such as whales, fish and birds. During periods of calm winds, in the fall, surface currents relax and high concentrations of phytoplankton move northward from the Gulf of the Farallones and Cordell Bank region into the expansion area. Seasonal streams and rivers such as Salmon Creek, Russian River, Gualala River, and Garcia River are also important sources of nutrients and organic matter that support high productivity in the region.

The sanctuary also illustrates how important the ocean and its wildlife and habitats are for the economic and social well-being of the region. The sanctuary contains some of the West Coast's busiest shipping lanes. The area supports large commercial fisheries, including a large percentage of the San Francisco fleet. Sport fishing also generates revenue for the party boat fleets operating out of San Francisco Bay, Half Moon Bay, and Bodega Bay. Data from 2000 to

2011 show that about 200 commercial fishing vessels made landings in the ports adjacent to the expansion area on an average annual basis. These are unique vessels, spanning all gear types. Whale watching, diving, and offshore excursions are other uses that occur in the sanctuary waters.

History of GFNMS

In April 1978, NOAA initiated a proposal to designate the sanctuary. Based on public response and a recommendation by the CA Coastal Commission (CCC) to develop an environmental impact statement, NOAA prepared a draft environmental impact statement (DEIS) which described the proposed alternative of sanctuary designation and included draft regulations. The DEIS including a draft management plan was distributed for review in March through May 1980 with public hearings. As a result, the Point Reyes – Farallon Island Marine Sanctuary was designated on January 26, 1981. The proposal to expand GFNMS approximately 1,520 square miles offshore and north from Bodega Bay to Alder Creek was initiated with a notice in the *Federal Register* on December 21, 2012. Three scoping meetings were held from Bodega Bay to Point Arena during January and February 2013 to receive public comment on the proposed expansion. This draft management plan and the accompanying DEIS reflect the public input received.

Management Plan Reviews

The original management plan, developed in 1981 at the time of designation of the sanctuary, provided guidelines to ensure that all management actions undertaken in the first five years of designation were directed to resolving important issues as a means of meeting sanctuary objectives. Management objectives were considered in three areas: resource protection, interpretation, and research. The management plan also called for promulgation of regulations or prohibitions.

The 1992 congressional legislation that reauthorized the NMSA required that each of the thirteen national marine sanctuaries engage in a management plan review process periodically to reevaluate site-specific goals and objectives, management techniques, and strategies. In 2001 GFNMS embarked on its first management plan review since designation.

The Office of National Marine Sanctuaries (ONMS) reviewed the management plans of Gulf of the Farallones, Cordell Bank, and Monterey Bay national marine sanctuaries jointly, and published final management plans for each sanctuary in 2008. These sanctuaries are located adjacent to one another, managed by the same program, and share many of the same natural resources and issues. In addition, all three sites share overlapping interest and user groups. It was cost effective for ONMS to review the three sites jointly rather than to conduct three independent reviews.

The management plan review process provided GFNMS with the opportunity to: take a closer look at how the environment had changed over the past twenty years; understand the cause and effect relationship of human activity and natural perturbations on the marine ecosystem; and

Introduction

GFNMS Draft Management Plan

engage the public in the management decision making process. As a result, GFNMS reshaped its management structure and program areas, and revised its regulations.

During public scoping for the 2008 management plan the GFNMS received public comments and petitions to expand the sanctuary. As a result, analyzing boundary alternatives was included in the management plan. In December 2012, ONMS initiated a public process to expand GFNMS. After receiving public comment on the proposed expansion, ONMS produced this draft management plan and companion DEIS. This management plan evaluates management and operational strategies, regulations, and programs as it apply to the existing sanctuary as well as the proposed expansion area. Public and agency comments will be taken on the draft management plan and DEIS. The comments will be considered by ONMS, and, if warranted, a Final Management Plan (FMP) and Final EIS will be released to the public and submitted to Congress and the governor for review. Following a 45-day review period and completion of any necessary changes, the FMP and accompanying regulations will become effective.

Biogeographic Assessment

In support of the 2001 management plan review process, NOAA's Biogeography Program developed an assessment to identify important biological zones, time periods and ecological linkages within the three national marine sanctuaries and their encompassing biogeographic region. This geographic information systems (GIS) analysis extended from Point Arena in the north to Point Sal in the south, and identified key biological areas (e.g., areas of species richness and reproductive areas), time periods, and communities within the area of interest; focused on the continental shelf and slope. The results of the biogeographic assessment for seabirds and marine mammals have been integrated into this Draft Management Plan.

BUILDING A NEW MANAGEMENT PLAN

Vision Statement

The vision, goals and objectives that follow are based on the National Marine Sanctuary Act.

GFNMS' highest priority is ecosystem protection. The sanctuary with its partners protects habitats, biological communities, and ecosystem dynamics. Through the watersheds and out to the sea, GFNMS addresses current management issues and anticipates future challenges in order to maintain and protect a healthy marine environment now and for future generations.

GFNMS Goals and Objectives

GFNMS has clearly defined goals and objectives on which to develop program areas and regulations. These goals and objectives are broad and intended to be for the site as a whole. Specific goals and objectives were also developed for each issue or program area in the management plan. Consistent with the guiding legislation established in the NMSA, the mandate for the thirteen national marine sanctuaries, GFNMS has chosen the following priority goals:

- Improve the conservation, understanding, and wise and sustainable use of marine resources;
- Enhance public awareness, understanding, and stewardship of the marine environment;
- Maintain for future generations the habitat and ecological services of the natural assemblage of living resources that inhabit these areas;
- Maintain the natural biological communities to protect, and where appropriate, restore and enhance natural habitats, populations, and ecological processes;
- Provide authority for comprehensive and coordinated conservation and management of these marine areas, and activities affecting them, in a manner which complements existing regulatory authorities;
- Create models of and incentives for ways to conserve and manage these areas, including the application of innovative management techniques; and
- Cooperate with global programs encouraging conservation of marine resources.

The strategies of the GFNMS management plan are directed to meet these goals and objectives. It should be noted that although the sanctuary goals and objectives are listed discretely, they are overlapping. Collectively, the strategies developed in the management plan address the full range of goals and objectives set forth in the previous paragraph.

Regulations and Program Areas

The GFNMS management plan is made up of two complementary parts: regulatory and non-regulatory. The regulatory component includes site-specific regulations or prohibitions and general regulations that apply to all thirteen national marine sanctuaries (see 15 CFR Part 922 at <http://www.ecfr.gov>). Regulations are used to control or restrict human behavior that is not compatible with protection of sanctuary resources or qualities. The non-regulatory component of the management plan includes GFNMS' three program areas: Conservation Science; Education and Outreach; and Resource Protection. These three program areas are supported by an administrative framework which ensures that all ecosystem management activities are coordinated, and provides an appropriate infrastructure needed to help meet the goals and objectives set forth by this management plan. Collectively, the above-mentioned parts make up the whole of the management plan and are important tools for effective ecosystem management.

The regulatory and non-regulatory components of the management framework are structured to address the priority ecosystem management issues identified during the last management plan review in 2008, which include the following site-specific issues and programs: Water Quality; Wildlife Disturbance; Introduced Species; Ecosystem Protection; Impacts from Fishing Activities; Vessel Spills; Education and Outreach; Conservation Science; Resource Protection; and Administration. The priority cross-cutting action plans include: Maritime Heritage; Ecosystem Monitoring; Community Outreach; and Administration

Introduction

GFNMS Draft Management Plan

Addressing Goals and Objectives within an Ecosystem Context

The priority goals and objectives listed above lead GFNMS management to take an ecosystem-based approach to managing a fluid marine environment with great temporal and spatial complexity and diversity. The scientific community, natural resources agencies, and the public have recognized the importance of an integrated ecosystem-based approach to protect marine biodiversity and habitats. The emphasis on marine ecosystem management is consistent with other state and federal agencies' programs and initiatives.

Tools for Effective Management Planning

GFNMS' management plan was designed not only to protect the marine resources and biodiversity, but also to consider maintenance of economic equity, cultural integrity and human social structures. GFNMS management is looking at a wide range of activities that take place in the sanctuary and evaluates them in terms of whether they are compatible with ecosystem protection and protect the structure, function, and diversity of the marine environment. In order to better evaluate human-use activities and their impacts on the ecosystem, GFNMS used three strategic tools in the development of the management plan: science, socioeconomics and local knowledge.

Science

Protection of living and nonliving marine resources is the primary objective of the ONMS, and science serves an important tool for understanding, measuring, and predicting change in the status and health of the marine ecosystem. Scientific inventories, habitat characterization, research, and monitoring provide an important information base for natural resource managers to understand and evaluate effectiveness of management regimes. NOAA collected data from site programs, individual researchers and institutions throughout the region and, where possible, integrated it into GIS to spatially identify significant living and nonliving marine resources, habitats, and physical and geological features. These data were used to describe and define the ecosystem, identify areas of special significance, and locate important ecosystem support systems.



Sanctuary researchers monitor the rocky intertidal of the Farallon Islands. Photo: NOAA

Socioeconomics

In California, the total gross domestic product from the ocean economy accounted for approximately \$42 billion dollars in 2000. Coastal recreation and tourism alone brings in approximately \$12 billion to California annually. California's 3,427 miles of shoreline and 27.2 million people (76% of the population as of 2007) live in coastal regions. Economic activity is intense in these areas, accounting for 80.7% (11.8 million) of



Commercial fishing has long been an important industry in GFNMS. Photo: NOAA

all jobs and 85.8% of the state's Gross Domestic Product in 2007 (Pendleton 2007). These numbers paint an important picture about the need to properly manage the marine resources. A sustainable community recognizes both ecosystem sustainability and economic sustainability as mutually beneficial. The ONMS not only considers the potential economic cost of management restrictions on income generating activities, but also public benefits derived from long-term protection of nationally significant resources. A cost/benefit analysis may be found in the DEIS to determine socioeconomic impacts and benefits to user groups from any proposed actions in this management plan.

Local Knowledge

Local knowledge represents the voice of direct experience and interaction with the marine environment over time. Many of the community partners involved in the management plan have been linked to its waters prior to them becoming a marine sanctuary. Their knowledge is more extensive and long range than much of the scientific research available for the study area. GFNMS not only honors and incorporates historical knowledge, but also acknowledges that stakeholder groups have a strong connection and knowledge about their environment. These local voices also represent local interests, issues and concerns to be balanced against those from outside interests. The sanctuary advisory council members, local mariners, interest groups, and the public provided valuable input to the sanctuary.

Looking at the Next Five Years and Beyond

Since its establishment in 1972, the ONMS has been building models for better marine ecosystem-based management. But even today, with better knowledge of the natural world and more experience managing human behavior, the program continues to build new models to enhance ecosystem protection. This is why the GFNMS management plan is referred to as a "living document," serving as a dynamic and responsive framework to guide ecosystem-based management.

GFNMS' "living document" also serves as a proactive tool for planning a sustainable future. To ensure a sustainable future, GFNMS' "living document" will provide a framework for not only addressing ecosystem management issues of the present, but also anticipating those emerging issues of the future.

The emergence of new issues and other unforeseeable factors may affect specific aspects of sanctuary management as described in this plan. However, the overall goals, management objectives, and general guidelines will continue to be relevant. Throughout the next five to ten years of this plan, the aim is to carefully adjust the plan to changing circumstances in light of the experience gained through actual management. Additionally, modifications to the scope and scale of the action plans may have to be made due to unforeseeable changes in levels of funding. However, the goals and objectives of the management plan will remain unchanged.

SANCTUARY SETTING

PHYSICAL SETTING

Location

Gulf of the Farallones National Marine Sanctuary (GFNMS) lies off the California coast extending west off Mendocino, Sonoma, Marin, San Francisco and San Mateo Counties. Included are nearshore waters up to the mean high tide line from Manchester Beach in Mendocino County to Rocky Point in Marin County, and offshore waters extending out to and around the Farallon Islands and down offshore Half Moon Bay in San Mateo County.

Geology

The portion of GFNMS that is offshore of San Francisco is characterized by the widest continental shelf on the West Coast of the contiguous United States. In the Gulf of the Farallones region, the shelf reaches a width of 32 nautical miles (59 km) and narrows to a width of 15 nautical miles (28 km) in the Point Arena region. Shoreward of the shelf break and Farallon Islands, the continental shelf is sandy and contains large underwater sand dunes. The shelf slopes gently to the west and north from the mainland shoreline and provides an especially large and relatively shallow (120 meters) foraging and habitat area for coastal and oceanic seabirds, marine mammals, and fish.



Southeast Farallon Island provides a range of habitats for sanctuary inhabitants, including cliffs for seabird nesting, rocky shores for marine mammal haulouts and subtidal areas for fish and invertebrate shelter. Photo: NOAA

The Farallon Islands are seven islands and large rocks, which lie along the outer edge of the continental shelf, between 13 and 19 nautical miles (24 and 35 km) southwest of Point Reyes and roughly 26 nautical miles (48 km) due west of San Francisco. The islands are located on part of a larger submarine ridge that extends for approximately 30 nautical miles between the Farallon Islands and Cordell Bank near the shelf break. The Farallon Islands provide secluded habitat that is essential for seabirds and marine mammals. Submarine rock outcrops surrounding the islands and extending to Cochrane Bank, Rittenburg Bank, Cordell Bank, and “The Football” provide rich habitat for a diverse rocky reef community.

The GFNMS coast includes sandy beaches, rocky cliffs, open bays (Bodega Bay, Drakes Bay, and Bolinas Bay) and enclosed bays or estuaries (Bolinas Lagoon, Tomales Bay, Estero Americano, and Estero de San Antonio). High-energy waves typical of the winter storm season distribute sediment washed into the sanctuary by rivers and from shoreline erosion and move sand down-coast from beach to beach. The two Esteros are typically closed during summer and fall by seasonally formed sand bars, isolating the estuaries from the ocean. Other rivers not found

Sanctuary Setting ***GFNMS Draft Management Plan***

within the boundary of the sanctuary but influence conditions within the sanctuary, and are seasonally closed in some years include: Alder Creek, Garcia Creek, Gualala River, Russian River, and Salmon Creek. Tomales Bay and Bolinas Lagoon, however, remain open to the ocean year-round. Water and water-borne materials in these rivers, streams, bays and lagoon are exchanged with the open ocean through tidal currents, although inner bay and lagoon waters may take a long time to exchange. The open bays are sheltered from prevailing southerly currents by headlands and points projecting westward and are important nutrient and plankton retention areas. Tomales Bay, Bolinas Lagoon and Bodega Bay lie directly on the San Andreas Fault.



The Eesteros provide important nursery habitat for sanctuary fish species and forage habitat for local and migratory birds. Photo: NOAA

Climate and Oceanography

The Gulf of the Farallones National Marine Sanctuary is located in the California Current, one of the world's four major wind-driven upwelling systems, the other three systems being located along the west coasts of South America, southern and northwest Africa. Northerly winds drive a shallow surface layer that moves offshore due to the Coriolis effect. This offshore (Ekman) transport of surface waters results in the upwelling of cold, nutrient-rich waters from depth into sunlit surface waters to support a food-rich environment and promote the growth of organisms at all levels of the marine web. The Point Arena region serves as an area that originates upwelled, nutrient-rich waters that are transported to the Gulf of the Farallones region over a period of five to seven days (Halle and Largier 2011). Upwelling may be widespread at times, or localized at upwelling centers (e.g., Point Arena). Upwelling offshore of Point Arena delivers nutrients to the light filled surface waters that are important in supporting high productivity off Point Reyes and into the Gulf of the Farallones region.

San Francisco Bay is another important source of nutrients and organic matter in the Gulf of Farallones region. The result is that high concentrations of phytoplankton are observed in the Cordell Bank and Gulf of the Farallones regions near the water surface, making them available to zooplankton and higher trophic prey species such as whales, fish and birds. During periods of calm winds, specifically during the fall high concentrations of phytoplankton move from the Gulf of the Farallones and Cordell Bank regions northward into the water off of Marin, Sonoma and Mendocino Counties. Seasonal streams and rivers such as Salmon Creek, Russian River, Gualala River, and the Garcia River are also sources of nutrients and organic matter, delivered to the system and support high productivity.

During the spring-summer upwelling season (typically March 15-August 14), strong northwest winds drive surface waters offshore and cold deep waters are upwelled to the surface over the continental shelf. The California Undercurrent (also called the Davidson Current) carries cold high-salinity waters north at depth along the shelf-edge and is a source for upwelled waters. These waters are rich in nutrients and feed very high levels of primary production near-surface.

The resultant phytoplankton blooms are the foundation of the rich GFNMS food webs, involving zooplankton, benthic and pelagic invertebrates, fish, birds, and mammals.

Spring-summer currents over the middle and outer shelf strongly move southeastward during upwelling, but nearshore flow patterns are mixed. San Francisco Bay and other nearshore outflows are carried both north and south by prevailing coastal currents and eddies. During brief periods of weak winds (relaxation periods), much of the inner and mid-shelf Gulf of the Farallones waters reverse direction and flow north. Phytoplankton levels peak during these relaxation periods.

In the fall, upwelling winds weaken and water temperatures increase. Sometimes known as the oceanic season, this period (typically August 15-November 15) is characterized by onshore flow of oceanic surface waters (warmer and lower salinity). Periods of upwelling winds and phytoplankton blooms do still occur during the fall.

Winter in the GFNMS is characterized by the passage of rain-bearing cold fronts, accompanied by westerly and southerly winds which drive surface currents northward and downwelling over the shelf. After the fall transition period and the cessation of the upwelling winds, the Davidson Current comes to the surface with a weak northeastward flow. While storm fronts characterize the months of December through March, upwelling winds are equally common and many upwelling events are also observed at this time of year (although lower levels of light in winter produce only weak phytoplankton blooms). During the downwelling events, warm oceanic surface waters move onshore and land runoff is held nearshore. Large plumes of terrestrial runoff from the mainland are also subject to the Coriolis effect, hence San Francisco Bay and Russian River outflow typically remains close to shore. Water originating from San Francisco Bay flows north around Point Reyes after major rain and runoff events. On occasion the influences of the San Francisco Bay outflow extend west to the Farallon Islands. Lowest surface seawater salinities are observed in the GFNMS during the winter runoff season.

Eddies are found both offshore, in the core of the California Current, and in the waters over the shelf. In the coastal waters of the GFNMS, fast flow past headlands like Point Reyes and Bodega Head may create eddies that move through the region. Eddies and open embayments partly retain nutrient-rich, upwelled waters and help explain the high levels of plankton, fish, mammals and birds observed in this region year-round. The sanctuary contains bottom features of higher rugosity (slope variability), and counter-clockwise eddies north and south of Bodega Head, Point Reyes, Pillar Point, and Pigeon Point. As a result, the sanctuary is one of the most productive areas along the California Coast, and in the world.

BIOLOGICAL SETTING

Sanctuary Ecosystems

The coast of the Gulf of the Farallones is a complex array of habitats from exposed rocky headlands to protected sandy beaches; from open bays to calm estuaries; from rocky intertidal

habitats to productive mudflats; from offshore islands to submerged seamounts; and from the continental slope dissected by numerous submarine canyons to the deep sea.

Rocky Shores

The intertidal habitat between the low and high tides is biologically rich, supporting diverse assemblages of algae, plants and animals. It is characterized by extreme conditions caused by wind, waves, and the fluctuation of tides. Organisms living in the intertidal face many challenges that are unique to living at the edge of the ocean, including threat of desiccation, physical wave action, and limited space. Rocky shores are found throughout the Gulf of the Farallones sanctuary but particularly at Duxbury Reef, Bodega Head, Sea Ranch, Salt Point, and Point Arena.

Four zones of rocky intertidal organisms are traditionally associated with different tidal heights. Species distributions are restricted according to physiological tolerance along the thermal and moisture gradient in the intertidal zone. The splash zone is almost always exposed to air, and has relatively few species. The high intertidal zone is exposed to air for long periods twice a day. The mid-intertidal zone is exposed to air briefly once or twice a day. The low intertidal zone is exposed only during the lowest tides (See Appendix III-H for the rocky intertidal species list).

Splash Zone

The periwinkle, *Littorina keenae*, and the barnacle, *Balanus glandula*, can be used as an indicator of the splash zone. Microscopic algae are common in the splash zone in winter months when large waves produce consistent spray on the upper portions of the rocky shore. Black Oystercatchers and Black Turnstones are the common birds along the rocky shoreline off central and northern California. These birds are most abundant during fall and winter, and during this period, are accompanied by small numbers of Ruddy Turnstones, Surfbirds, and Wandering Tattlers. Black Oystercatchers nest along rocky coasts including the Farallon Islands (Sowls et al. 1980). A variety of species commonly considered land birds also feed along rocky shores, including Black Phoebe, American Crow, Brewer's Blackbird and European Starlings.

High and Middle Intertidal Zones

Perennial macrophytes exhibit conspicuous zonation in the rocky intertidal community. Descending into the intertidal are several zones dominated by (1) furoid and ceramial algae in the high intertidal; (2) a dense turf of erect coralline and gigartinal algae in the mid-intertidal; and (3) beds of *Postelsia palmaeformis* (sea palm), rhodymenials, and laminarials in the low intertidal zone. Intertidal invertebrates also exhibit conspicuous zonation. In northern California, the barnacle, *Balanus glandula*, and red algae, *Endocladia muricata* and *Mastocarpus papillatus*, are used as indicators of the high intertidal zone, but these species are also found in other areas of the rocky shore. At wave-exposed sites, the mussel, *M. californianus*, can dominate the available attachment substratum in the mid-intertidal zone. Intertidal predators generally include whelks, sea stars, sea urchins, octopus, fishes, and shore crabs.

Low Intertidal Zone

The low intertidal zone is subjected to nearly constant wave action and exposed only for short periods of time during the lowest tides. The presence of the seagrass, *Phyllospadix* spp., is a good indicator of the mean low water level.

Sandy Beaches

North-central California beaches exhibit classic structure: cliffs or dunes demarcate the upper boundary of the beach; the mean high tide line is generally indicated by a berm; and beach flats, troughs, or sand bars form the seaward side of the beach. Exposed sand beaches are harsh environments subjected to high wave action, wide temperature range, and periodic tidal exposure. Quiet-water beaches of estuaries and bays are protected environments subjected to less wave action.

Species distributions within the sandy beach habitat are strongly influenced by physical factors on exposed sand beaches, whereas biological factors, e.g., competition and predation, influence species distributions on protected beaches of estuaries and bays. Exposed beaches of northern California show distinct patterns of biological zonation defined by the amount of tidal inundation to each region. The biological zones of the sandy beach habitat are: upper intertidal beach zone, mid-littoral beach zone, swash zone, low intertidal beach zone, and the surf zone.

Upper Intertidal Beach

The upper intertidal beach is submerged for a short time and exposed to the widest range of temperatures. It is often sparsely inhabited, because the food supply on sandy beaches is unpredictable. The major sources of food on the sandy beach include plankton, macroalgae, and occasional corpses of fishes, birds, and marine mammals that are washed ashore by waves. As a result, the upper intertidal is primarily dominated by scavengers on beach wrack, such as talitrid amphipods, flies, isopods, and Coleopteran beetles (Berzins 1985). When beach wrack washes ashore, it is colonized first by the highly mobile talitrid amphipods and flies (Diptera).

Eventually, the beach wrack is colonized by terrestrial isopods and Coleopteran beetles. The pill bug, *Alloniscus perconvexus*, burrows into the sand just beneath the surface and emerges at night to feed on beach wrack. During the day, beach hoppers (genus *Megalorchestia*) are usually in shallow burrows or under piles of macroalgae. At night, the hoppers emerge to forage on algae and other detritus.

Mid-Littoral Beach

The mid-littoral beach zone is characterized by a moderate inundation time, but is subject to many of the same rigors as the upper zone (e.g., temperature extremes and fresh water). The mid-littoral beach fauna is dominated by species with high mobility such as the cirolanid isopod, *Excirrolana*, which are preyed upon by various shorebirds. The mid-littoral zone fauna must be highly mobile because this zone is subjected to rapid sediment removal during storms.

Swash Zone

The swash zone, where waves break on the beach, is characterized by the highest water movement and is submerged approximately twelve hours per day (Oakenen and Nybakken 1977). Thus, the swash zone is not subjected to extreme temperatures and salinity characteristic of the high- and mid-littoral zones. The dominant species in the swash zone is the sand (mole) crab, *Emerita analoga*, an herbivorous species that forms the basis for much of the sandy intertidal food web.

Low Intertidal Zone

The low intertidal zone is subjected to nearly constant wave action and exposed only for short periods of time during the lowest tides. Most of the inhabitants of the low intertidal are either rapid burrowers or protected against injury. Numerous invertebrate species burrow into superficial sediments and flourish in wave-disturbed sand bottoms (Slattery 1980).

Surf Zone

The surf zone is submerged continuously and experiences constant motion of waves breaking against the sea floor. Many studies suggest that sandy beach surf zones are low diversity environments, dominated by small planktivores and benthic feeding fishes and their predators (Gunter 1958, McFarland 1963, Edwards 1973a, Modde and Ross 1981, Lasiak 1983, McDermott 1983). The trophic structure of surf zone fish communities appears to be controlled primarily by three factors: (1) primary production input to the surf zone; (2) water movement; and (3) geomorphology of the sandy beaches.

Over 180 bird species were observed on beaches between Bodega Head and the northern Santa Cruz County border from October 1993 to September 1999 (Roletto et al. 2000). Sanderlings, Western Gulls, and Brown Pelicans were observed most frequently. Most of the bird species that occur in coastal wetlands (especially Sanderlings, Willets and Marbled Godwits) also occur on outer sand beaches (Davis and Baldrige 1980). Snowy Plovers, which have decreased significantly during the past two decades, nest in coastal dunes.

Breeding populations of pinnipeds are found on sand beaches off northern California. The species most commonly found along Northern California beaches, rocks and mudflats include California sea lions (*Zalophus californianus*) and harbor seals (*Phoca vitulina*).

Estuaries Including Bays, Mudflats, and Marshes

Bays and estuaries are among the most productive natural systems. Their physical, chemical, and biological characteristics are critically important to sustaining living resources (Mann 1982, Weinstein 1979). Bays and estuaries are important nursery areas that provide food, refuge from predation and a variety of habitats. The four main estuaries within the sanctuary are Tomales Bay, Estero Americano, Estero de San Antonio, and Bolinas Lagoon.

Tomales Bay is located between the shores of West Marin and the Point Reyes National Seashore (PRNS). Tomales Bay is an example of a fault-controlled valley along the San Andreas Fault. Lagunitas Creek, which drains into Tomales Bay, supports a run of approximately 10 percent of California's current Coho salmon population. Dense seagrass meadows are found throughout Tomales Bay. Pacific herring use the seagrass beds for spawning. Tomales Bay also supports seasonal populations of salmon, steelhead, sardines, and lingcod. The shallow bay's sandy bottom attracts a variety of bottom-dwelling fish including sole, halibut, skates and rays. Leopard sharks are common in Tomales Bay and occasionally blue sharks are sighted. White sharks, although not found in enclosed bays or estuaries, do hunt for seals and sea lions that frequent the bays to haul out on the sandy beaches and rocks near the mouth of Tomales Bay. Over 20,000 shorebirds and seabirds, including loons, grebes, geese, cormorants, and ducks, spend the winter in Tomales Bay.

The Esteros Americano and de San Antonio are coastal estuaries located on Bodega Bay. Estero Americano drains into Bodega Bay at the Sonoma-Marín County line. South of Estero Americano, Stemple Creek becomes the Estero de San Antonio, also draining into Bodega Bay. Many different habitat types are found in the esteros including mudflats, marshes, rocky shore, coastal scrub, and grasslands. With the variety of habitats, the esteros support many species of plants, invertebrates, fishes, birds, and mammals. They provide essential feeding and resting areas for shore and sea birds. Some common fish species found in the esteros include Pacific herring, staghorn sculpins and starry flounder. The endangered tidewater goby breeds in the shallow waters of Estero de San Antonio.

Seagrass beds occur on the extensive mudflats in Tomales Bay, Bolinas Lagoon and within the esteros. Seagrass supports a unique and diverse assemblage of invertebrates and fishes, including snails, shrimp, nudibranchs and sea hares. The structure of seagrass beds provides protection from predation, especially for juvenile invertebrates and fishes. Pacific herring, invertebrates, and birds depend on seagrass beds in Tomales Bay to spawn and feed.

The soft bottom habitats associated with estuarine environments support large concentrations of burrowing organisms, such as clams, snails, worms, and crabs. Benthic invertebrates in estuaries have a large effect on community structure.

Willetts and Marbled Godwits are among the most abundant large shorebirds in northern California estuaries whereas Sanderlings, Western Sandpipers, Least Sandpipers, Dowitchers, and Dunlins are the most abundant small shorebirds in wetlands and the outer coast beaches from Point Reyes to Manchester State Beach. There are some differences within estuaries in the abundances of shorebirds. Horned and Eared Grebes, American Coots, and numerous ducks (including Buffleheads, Goldeneyes, Pintail, Mallard, and Cinnamon Teal dominate the coastal bird assemblage in shallow, tidal waters of local sloughs and estuaries while egrets and herons use brackish and salt marshes as roosting and feeding habitats during high tides [Davis and Baldrige 1980]). The time of migration and the routes of travel between breeding and wintering grounds seasonally affect the patterns in abundance of shorebird species in northern California (Ramer et al. 1991). Most species of wintering shorebirds move into California from August

through March and leave wintering grounds for northern breeding grounds between late March and early May.

Fish assemblages in estuaries of the Gulf of the Farallones and Point Arena regions exhibit similar trophic structure and taxonomic structure. The most abundant estuarine fish are juvenile planktivores or low-level carnivores on infaunal invertebrates (Yoklavich et al. 1991). Fish assemblages exhibit higher abundance and species richness during the summer with the invasion of young-of-the-year marine species (Allen and Horn 1975, Hoff and Ibara 1977, Allen 1982, Onuf and Quammen 1983, Yoklavich et al. 1991). Species richness (diversity of species) and the change in species composition decline with distance from the ocean (Loneragen et al. 1986, Blaber et al. 1989, Yoklavich et al. 1991). The mouths of bays and estuaries are strongly influenced by marine hydrographic processes (Broenkow 1977), and are therefore more accessible to coastal marine species.

Kelp Forests

The rocky nearshore environment of northern California is characterized by dense forests of kelp growing at depths from 2 meters to more than 30 meters (Foster and Schiel 1985). The bull kelp, *Nereocystis luetkeana*, is the dominant canopy-forming kelp north of Santa Cruz to the Aleutian Islands (Foster 1982). The shallow areas inshore of kelp forests are often characterized by canopies of the feather boa kelp, *Egregia menziesii*, and other Laminariales (Foster and Schiel 1985). Extensive kelp forests occur along the Sonoma and Mendocino County coasts.

Kelp forests are spatially complex communities. They alter turbulent flow patterns in the nearshore region through drag generated by their large size and frequently high densities (Duggins 1988). The biological ramifications of this type of hydrodynamic influence are potentially very important to a wide range of nearshore organisms. Disruption of flow by kelp forests is likely to have significant effects on feeding and growth (particularly in suspension and deposit feeders), dispersal and recruitment (Duggins 1988). Food and dispersal stages of many kelp forest organisms are passively dispersed, and their transport and settling characteristics will be determined largely by the movement of water in which they are suspended. Kelp beds may retain larvae released within the bed, and the strong deceleration of flow at the margins of the bed could facilitate settlement of larvae imported from outside the bed (Duggins 1988). The concentration of zooplankton at the upcurrent edge of a kelp bed, and the corresponding higher densities and feeding rates of fish in that area, are probably results of alterations of current flow by kelp (Bray 1981). Predation risk may increase the association between certain species and kelp forests because predation (by fish, birds, and marine mammals) is lower in spatially complex environments such as kelp beds (Gooding and Magnuson 1967, Wickham and Russell 1974).

Kelp forests harbor a large potential source of invertebrate and fish prey for birds (Foster and Schiel 1985). Gulls, terns, Snowy Egrets, Great Blue Herons and cormorants are associated commonly with kelp forests (Foster and Schiel 1985). Other species (e.g., phalaropes) feed on the plankton and fish larvae associated with kelp.

Harbor seals (*Phoca vitulina*) and California sea lions (*Zalophus californianus*) are common in and around kelp forests off northern and central California. Harbor seals feed on fishes in the kelp forest whereas California sea lions probably limit their use of the kelp forests to transitory feeding (Foster and Schiel 1985).

Gray whales (*Eschrichtius robustus*) have been observed entering kelp forests to feed on invertebrates such as mid-water crustacean swarms and to escape predation from killer whales (*Orcinus orca*).

Open Ocean

The habitat covering the largest area within the GFNMS is the open continental shelf and the pelagic (open ocean) habitat. This habitat is strongly influenced by the oceanographic patterns of the northern California coast (for more detail, see Climate and Oceanography section above). The strong upwelling events stimulate the productivity of organisms at all levels of the marine food web. Cool, nutrient-rich, upwelled waters support high primary productivity.

All the food that drives the biology of the deep ocean originates in the very thin, near surface layer, the euphotic zone, which is defined as the zone where sunlight can penetrate.. Therefore, the feeding conditions of the ocean floor are linked with that primary production occurring in the euphotic zone. Deep-sea communities depend on the distribution and quantity of primary production, the rate of movement of organic material to the bottom, and the conditions of deposition and transformation of the organic matter in the sediment.

Distribution and abundance of zooplankton are related to the physical dynamics of the California Current system (Reid et al. 1958, Parrish et al. 1981, Huntley et al. 1995). Zooplankton are usually most abundant in neritic and inshore regions (Colebrook 1977), as compared with waters of the offshore California Current. Large populations of zooplankton are associated with subarctic water and intense upwelling along the northern/central coast of California extending to Point Conception (Reid et al. 1958, Loeb et al. 1983a).

Crustacean larvae, euphausiids (or krill), and copepods are dominant groups in the epipelagic zone (Colebrook 1977). Euphausiid swarms often concentrate near Cordell Bank, the Farallon Islands (Rice 1977, Kieckhefer 1995) and in Monterey Bay, due to high local productivity and oceanographic characteristics of the regions (e.g., upwelling, fronts, canyons, and vertical walls). Distributions of the euphausiids, *Euphausia pacifica* and *Thysanoessa spinifera*, vary seasonally in response to both temperature and light availability. Changes in euphausiid behavior can reduce the availability of prey in surface waters to predators such as seabirds (Ainley et al. 1996, Veit et al. 1997) and rorqual whales (Schoenherr 1991, Croll et al. 1998).

California blue whales respond to the seasonal patterns in productivity in foraging areas along the west coast of North America. Blue whales exhibit strong seasonal migration feeding primarily on euphausiids in the Gulf of the Farallones and migrating to the lower latitudes where they feed on “upwelling-modified” waters (Fielder et al. 1998, Croll et al. 1998), mate and give birth (Lockyer 1981). California humpback whales follow similar migration patterns as the blue whales and primarily feed on small schooling fish and euphausiid prey in the Gulf of the

Farallones and migrate to Mexican and Central American waters to mate and give birth (Kieckhefer 1992).

The composition of fish species in the pelagic zone varies throughout the year with migration and spawning and from year to year with environmental fluctuations. A small number of migratory pelagic species dominate the fisheries of central and northern California, including northern anchovy (*Engraulis mordax*), Pacific sardine (*Sardinops sagax*), Pacific hake (*Merluccius productus*), and jack mackerel (*Trachurus symmetricus*). These pelagic species spawn in the Southern California Bight and migrate into waters off central and northern California. However, the composition of larval fish species off central and northern California varies with oceanographic conditions.

The deep-sea pelagic invertebrate fauna is dominated by the following Phyla: cnidarians (or coelenterates), ribbon worms (Nemertean), ctenophores, chaetognaths, mollusks, annelids (including Polychaetes), and crustaceans. The cnidarians include hydroids, sea anemones, corals, jellyfishes, and their relatives. The mollusks include marine snails (Prosobranchia), sea slugs (Opisthobranchia and Pulmonata), clams (Bivalves), chitons (Polyplacophora), squids and octopuses (Cephalopods including the Decapods, Octopods, and Siphonophora). The crustaceans include barnacles (Cirripedia), isopods, amphipods, copepods, shrimps (Caridea), ghost shrimps (Macrura), hermit crabs (Anomura), and true crabs (Brachyura).

Continental Shelf and Slope Communities (0-200 meters)

The continental shelf off central and northern California is generally quite gradual, and the bottom substrate is a combination of varying amounts of sand, silt, and clay. Much of the mud and sand on the continental shelf was deposited by rivers that formed during the melting of the glaciers approximately 18,000 years ago (Eittrheim et al. 2000). At water depths between about 40 to 90 meters, the continental shelf off central California is covered by a nearly continuous blanket of mud as much as 30 meters thick. In areas of high wave energy, mud and sand may be resuspended and transported away from the shore. A zone of outcropping bedrock and sands is located seaward of the mud accumulation zone, on the far outer shelf where water depth exceeds 90 meters.

Sandy Continental Shelf Communities

Although sandy sediments may appear less productive than rocky reefs and kelp forests, numerous organisms are adapted to the shifting environments on the sandy shelf. Some animals find shelter by living in tubes and burrows. Clams lie permanently buried with their siphons extended to the surface of the sediment. Some crustaceans and mollusks live beneath the sand, emerging at night to forage. Flatfishes are camouflaged on the sandy surface of the sea floor. Ocean shrimp (*Pandalus jordani*) are found in California from depths of 240 to 750 feet. Spot prawns are found in depths of 150 to 1,600 feet and concentrate in the regions around the Farallon Islands and offshore banks. Many species of fish prey on ocean shrimp, including Pacific hake, arrowtooth flounder, petrale sole, sablefish, and several rockfishes.

Many species of flatfishes (Pleuronectidae and Bothidae) use the soft-bottom habitats along the continental shelf. English sole (*Paraphrys vetulus*) are distributed from northwest Alaska to San Cristobal Bay, Baja California, in waters as deep as 1,800 feet. Spawning of English sole generally occurs over sand and mud-sand bottoms at depths of 200 to 360 feet from September to April (Pearson et al. 2001).

Dungeness crabs (*Cancer magister*) are commonly found in a variety of habitats, but populations are concentrated on sandy to sandy-mud bottoms from the intertidal to a depth of 300 feet. Dungeness crabs are opportunistic feeders, consuming clams, fish, isopods, and amphipods.

Rocky Continental Shelf Communities

Along the northern California coast, rocky reefs support extensive macroalgal growth and associated abalones, sea urchins, and rockfishes.

Juvenile red abalone settle as postlarvae on coralline algae in crevices between rocks (Haaker et al. 2001). Sea urchins are abundant subtidal herbivores that play an important ecological role in the structure of kelp forest communities. Red sea urchins (*Strongylocentrotus franciscanus*) are found on rocky shores of open coasts from the low-tide water line to 300 feet deep. Purple sea urchins (*S. purpuratus*) are found on rocky shores with moderately strong surf from the low-tide line to 525 feet deep.

Fish commonly found in the rocky habitats of the continental shelf at Cochrane Bank, Rittenburg Bank and “The Football” includes surfperches, rockfish (black and shortbelly), cabezon, and bocaccio. The surfperches (Embiotocidae) are small abundant fishes found predominantly in temperate eastern North Pacific waters. Schools of black rockfish (*Sebastes melanops*) frequently occur 10 to 20 feet above shallow rocky reefs. Shortbelly rockfish (*Sebastes jordani*) are found in greatest abundances between the Farallon Islands. The peak abundance of adults is over the bottom at depths of 400 to 700 feet. Adults commonly form very large schools often near or on the bottom during the day. At night, aggregations of shortbelly rockfish may loosen as the fish move up in the water column. Cabezon (*Scorpaenichthys marmoratus*) are found on hard bottoms in shallow water from intertidal pools to depths of 250 feet. Cabezon are common in subtidal habitats in and around rocky reefs and kelp beds. Bocaccio (*Sebastes paucispinis*) ranges from Kodiak Island, Alaska, to central Baja California. These rocky habitats also include a wide variety of invertebrates such as deep-sea corals (*Antipathes dendrochristos*, *Chromoplexaura marki*, *Stylaster* spp., *Swiftia* spp., and *Paragorgia* spp.) and sponges (*Iophon piceus* var. *pacifica*, *Halichondria panacea*, *Heterochone calyx*, *Staurocalyptus fasciculatus*, *Xestospongia diprosopea*, and *Acanthascus fasciculatus*).

Continental Slope Communities (200-2000 meters)

At a depth of about 200 meters, the continental slope drops steeply to the sea floor. The deep waters of the continental slope are characterized by extremely low light conditions, nearly freezing temperatures, and very high pressures (Laidig 2002). Continental slope species eat less frequently, are slower at digesting their food, and move more slowly than species in warmer

Sanctuary Setting
GFNMS Draft Management Plan

waters. In order to achieve sexual maturity and successful reproduction under conditions of reduced growth, continental slope species may live longer than species in warmer waters.

The invertebrate infaunal and epifaunal communities along the continental slope include many species such as polychaete worms, pelecypod and scaphopod mollusks, shrimp, and brittle stars.

Productive commercial fisheries for deep-sea fish operate on the continental slope. The species targeted include deep-sea rockfishes such as Cowcod (*Sebastes levis*) and Blackgill rockfish (*Sebastes melanostomus*), thornyheads (genus *Sebastolobus*), sablefish (*Anoplopoma fimbria*), and Dover sole (*Microstomus pacificus*). Many of these species occupy similar habitats and generally are caught together.

Submarine Banks, Canyons, and Seamounts

Submarine banks and shoals are found near the shelf break along a submarine ridge that extends for approximately 30 nautical miles between the Farallon Islands and Cordell Bank. The vertical structure of Fanny Shoal, Rittenburg Bank, Cochrane Bank, “The Football”, and the submerged rocky outcrops surrounding the Farallon Islands provide rich habitat for a diverse rocky reef community.

To the west of the Farallon Islands and the continental shelf, the seafloor drops precipitously to depths over 6,000 feet. Submarine canyons and gullies indent the steep continental slope of the Farallones Escarpment.

Pioneer and Guide Seamounts are found west of the sanctuary. These underwater islands of volcanic origin are home to colorful, long-lived invertebrates and other marine life adapted to living in dark, deep waters. Due to the difficulty in studying these remote habitats, it is possible that these seamounts harbor marine life that is yet unknown to science.

Living marine resources

Marine and Coastal Birds

One of the most spectacular components of the sanctuary’s abundant and diverse marine life is its nesting and migratory seabirds (see Appendix III-G for a complete species list). The Gulf of the Farallones supports the largest concentration of breeding seabirds in the contiguous U.S. These birds forage in the Gulf of the Farallones and are highly dependent on the productive waters of the sanctuary. Eleven of the sixteen species of seabirds known to breed along the U.S. Pacific coast have breeding colonies on the Farallon Islands and feed in the sanctuary. Breeding colonies include Ashy and Leach’s Storm-Petrels; Brandt’s, Pelagic, and Double-crested Cormorants; Western Gulls; Common Murres; Pigeon Guillemots; Tufted Puffins; and Cassin’s and Rhinoceros Auklets. The Black Oystercatcher, a moderate-sized shorebird, also nests on the Farallon Islands.



Common Murres breed on the Farallon Islands and other craggy promontories within the sanctuary. They are particularly vulnerable to impacts from oil spills.
Photo: NOAA

The sanctuary also protects foraging habitat for aquatic birds such as waterfowl, shorebirds, pelicans, loons, and grebes. These habitats are pristine compared to most coastal wetlands in California and provide habitat for thousands of migrating and wintering birds. More than 170 species of birds use the sanctuary for shelter, food, or as a migration corridor. Of these, over 50 species of birds are known to use the sanctuary during their breeding season.



GFNMS was originally designated to protect the seabirds of the Gulf of the Farallones. Here are a few examples. Northern Fulmar (left) forage within the open waters of the sanctuary, Snowy Egrets (center) inhabit the shallow estuarine waters, and Western Gulls and other birds fill the skies above the sanctuary. Photos: NOAA

Four marine and aquatic bird species that are federally listed as threatened or endangered can be found in the sanctuary (May 2013). These include the Marbled Murrelet, Western Snowy Plover, Short-tailed Albatross, and Dark-rumped Petrel.

Marine Mammals

Thirty-six species of marine mammals have been observed in the GFNMS. This includes six species of pinnipeds (seals and sea lions), twenty-eight species of cetaceans (whales, dolphins, and porpoises), and two species of otter (southern sea otter and river otter). Pinnipeds and cetaceans occur in large concentrations and are dependent on the productive and secluded habitats for breeding, pupping, hauling out, feeding, and/or resting during migration. The Farallon Islands provide habitat for breeding populations of five species of pinnipeds, and support the largest concentrations of California sea lions and northern elephant seals within the sanctuary.



Common marine mammals of the GFNMS include California and Steller sea lions (left), gray whales (center), and longbeaked common dolphins (right). Photo: NOAA

Fish Resources

Fish resources are abundant over a wide portion of the Gulf of the Farallones. Because of the comparatively wide continental shelf and the configuration of the coastline, the sanctuary is vital to the health and existence of salmon (Chinook and Coho), northern anchovy, rockfish, and flatfish stocks. The extension of Point Reyes and the resulting current patterns tend to retain larval and juvenile forms of these and other species within the sanctuary, thereby easing recruitment pressures and ensuring continuance of the stocks. Sanctuary waters offshore of the Farallon Islands act as a location for shallow and intertidal fishes which further enhance finfish stocks.



The rockfish group of fish (Sebastes spp.) are among the most diverse fish species in the sanctuary nearshore and deep habitats. Photo: NOAA



White sharks migrate to the Gulf of the Farallones in the fall to prey upon the marine mammal populations. Photo: NOAA

The sanctuary includes many diverse habitats, thereby contributing to the region's high productivity. Bays and estuaries are especially important as feeding, spawning, and nursery areas for a wide variety of finfish. Common fish species of the major bays and estuaries include the Pacific herring, smelts, starry flounder, surfperch, sharks and rays, and Coho salmon. The rocky intertidal zone supports a specialized group of fish adapted for life in tide pools, including monkey face eels, rock eels, dwarf surfperch, juvenile cabezon, sculpins, and blennies. Many of these stocks are important as forage for shorebirds and seabirds. Subtidal habitats support large populations of juvenile finfish (e.g., flatfish, rockfish, etc.). Nearshore pelagic environs are habitat to large predatory finfish such as sharks, tunas, and mackerel. Northern anchovies, Pacific mackerel, and Market squid are abundant and can be commercially valuable. Pelagic fish resources in the study area generally parallel species living in the nearshore subtidal zone. At the mid-depth or meso-pelagic range over sand and mud bottoms, Bocaccio, Chilipepper, Widow rockfish, and Pacific hake are abundant. Kelp beds substantially increase the useable habitat for pelagic and demersal species and offer protection to juvenile finfish.

Marine Flora

Significant algal and plant communities within the sanctuary include kelp beds, salt marshes, and seagrass beds. The importance of these plants, algae, and microscopic phytoplankton for habitat and food cannot be overstated.

Kelp forests include the giant kelp species bull kelp. The highest concentration of kelp beds in the sanctuary occurs along the mainland coast between Fort Ross and Point



Kelp forests in GFNMS are dominated by bull kelp (Nereocystis luetkeana). Photo: NOAA



The intertidal algae the sea palm is a State-species of special concern and is found in pockets along the GFNMS rocky shores

Arena. As noted above, these kelp beds provide important habitat and food for many invertebrate and finfish species.

Salt marshes offer food and protected habitat for many coastal species during vulnerable lifecycle stages. For example, some flounders breed near salt marshes to allow juveniles to develop in the marsh system. Herons, sandpipers, duck, rails, and geese are also dependent upon the marsh for feeding and breeding.

Seagrass beds are situated on subtidal estuarine flats, in bays, and coastal inlets. Seagrass beds provide important breeding and nursery habitat for organisms such as herring, which attach their eggs to eelgrass. Although some marine organisms feed directly on seagrass, the principal food chain supported by seagrass is based on detritus.

Benthic Fauna

Benthic fauna communities refer to invertebrates living directly on or in the seafloor. Benthic fauna communities differ according to habitat type and exist in all habitats of the sanctuary (bays and estuaries, intertidal zones, nearshore, and offshore). Generally, each habitat area supports differing benthic assemblages of most classes, e.g., worms, clams, or crabs. The most conspicuous species include abalone, crabs, and sea urchins. Hundreds of other species (including sea stars, clams, amphipods, and shrimp) are critical links in the food chains of fish, birds, and mammals.



Sea urchins are important grazers in the intertidal ecosystem. Photo: NOAA

HUMAN SETTING

A wide range of human-use activities occur in and around the waters of the GFNMS. The San Francisco Bay metropolitan area exerts considerable user influence on the scale and intensity of uses (often competitive) occurring in the area. The major near and offshore activities include commercial fishing and mariculture, commercial shipping, recreation, and research. Additional details on the extent of human-use activities in the sanctuary can be found in the introduction of each action plan.



Fishing vessels can be seen plying sanctuary waters for fish throughout the seasons. Photo: NOAA

Commercial Fishing and Mariculture

The most important commercial harvests include Pacific herring, salmon, flatfish, albacore, tuna, red urchin, groundfish and Dungeness crab. Most of the commercial catches harvested in the sanctuary are landed in the four port complexes of Fort Bragg, Bodega Bay, San Francisco, and

Sanctuary Setting

GFNMS Draft Management Plan

Princeton/Half Moon Bay area ports. Data from 2000 to 2011 show that about 200 commercial fishing vessels make landings in the ports adjacent to the sanctuary on an average annual basis. These are unique vessels, spanning all gear types (California Fishery Information System Database 2013). A number of mariculture operations in Tomales Bay and Drakes Estero raise oysters, mussels, and other shellfish.

Commercial Shipping



Large cargo ships daily transit the sanctuary enroute to and from the Port of San Francisco. Photo: NOAA

Three major shipping lanes converge just west of the Golden Gate Bridge at the approach to San Francisco Bay. The northern and western lanes pass through GFNMS. The volume of traffic in and out of San Francisco Bay is large, totaling approximately 8,000 transits of vessels greater than 300 gross registered tons in calendar year 2010. Roughly one-half (~4000 per year) of these transits are in the western shipping lane, which passes south of SE Farallon Island, while one-quarter (~2000 transits per year) are in the northern and southern lanes, respectively (USCG 2010). Almost 60% of the commercial vessel traffic in and out of San Francisco Bay is from high speed (18-26 knots) container, car carrier and cruise ships, while 30% is from slower (13-16 knots) bulkers and tankers. The remaining 10% is from tug and barge operations (SFMX 2012).

Recreation

The sanctuary is a popular recreation area because of its many outstanding natural features and its proximity to the San Francisco Bay metropolitan area. More than 68 coastal access points in Mendocino, Sonoma, Marin, San Francisco, and San Mateo Counties provide direct access and views of the sanctuary. Most of these access points are located in federal, state, county, and local parks.



Kayaking is a popular way to experience the sanctuary. Photo: NOAA

Sport fishing is one of the more popular activities in the sanctuary. King salmon and rockfish are the major species taken. Whale watching, Farallon Islands wildlife viewing, sailing, and oceanic birding excursions account for several thousands of visitors venturing offshore. The major recreational uses include beach-related activities, bird watching, coastal hiking, wildlife viewing, tide pooling, surfing, kayaking, canoeing, boardsailing, clamming, diving, and surf fishing. On some weekend days, more than 1,000 clam diggers harvest geoduck, gaper, Washington, and littleneck clams

Research and Monitoring

The diversity of physical and biological habitats throughout the sanctuary offers an outstanding

opportunity for scientific research on marine and estuarine ecosystems. Several academic institutions, government agencies and nongovernmental organizations have ongoing monitoring and research programs in the area. Research on the Farallon Islands (Farallon National Wildlife Refuge) is coordinated by the U.S. Fish and Wildlife Service (USFWS), through a Cooperative Agreement with Point Blue Conservation Science. The sanctuary collaborates with these and other institutions on conducting monitoring and research to help characterize the wildlife and habitats of the sanctuary and to help understand natural and human factors responsible for causing changes in the marine environment.

Ongoing research and monitoring are performed not only by the sanctuary but other federal, state and regional agencies such as USFWS, National Park Service, California Coastal National Monument, National Marine Fisheries Service, Environmental Protection Agency, State Department of Fish and Wildlife, State Water Quality Control Board, and Sonoma County Water Agency. Non-government groups performing research and monitoring in the sanctuary include: Farallones Marine Sanctuary Association, Point Blue Conservation Science, Ecotrust, The Marine Mammal Center, California Academy of Sciences, Reef Check, State Parks Stewards of the Redwoods, Sea Ranch Association and Task Force, Madd River Consulting, City of Point Arena, Mendocino Coast Audubon Society, and Point Arena Lighthouse Keepers. Academic institutions includes: California State University at Monterey Bay, Partnership for Interdisciplinary Studies of Coastal Oceans, Stanford University, San Jose State University, San Francisco State University, and the University of California at Davis, Bodega Marine Laboratory.



Sanctuary scientists collect data on the rocky shores of the Farallon Islands to answer important resource management questions. Photo: NOAA

JURISDICTIONAL SETTING

Federal

United States Coast Guard (USCG)

The USCG holds broad responsibility for enforcing all federal laws throughout the sanctuary and assists NOAA in the enforcement of sanctuary regulations. USCG provides on-scene coordination with regional response center facilities under the National Contingency Plan for removal of oil and hazardous substances in the event of a spill that threatens sanctuary resource.

National Marine Fisheries Service (NMFS)

The NMFS has responsibility under the Magnuson-Stevens Fishery Conservation Act (MSFCMA), for approving, implementing and enforcing fishery management plans (FMPs) prepared by regional fishery management councils to ensure protection of fishery resources in the Exclusive Economic Zone. NMFS also shares responsibility with the United States Fish and

Sanctuary Setting
GFNMS Draft Management Plan

Wildlife Service (USFWS) for the implementation of the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA) to prevent taking of any endangered, threatened or otherwise depleted species.

Environmental Protection Agency (EPA)

The EPA has regulatory responsibilities with regard to sewage outfalls (under the U. S. Clean Water Act [CWA]) via National Pollutant Discharge Elimination System (NPDES) Permits, and ocean dumping (under Title I of the Marine Protection, Research, and Sanctuaries Act) to protect water quality.

Farallon National Wildlife Refuge (USFWS)

The USFWS has responsibility for managing the Farallon National Wildlife Refuge. The refuge includes: North, Middle, and Southeast Farallon Islands; Maintop Island; and Noonday Rock. The refuge is operated primarily as a migratory bird refuge to protect murre, auklets, guillemots, puffins, and other birds, and secondarily, to protect seal, sea lion, and other marine mammal assemblages.

Golden Gate National Recreation Area (GGNRA)

The National Park Service (NPS) is responsible for the management of the GGNRA. The GGNRA manages approximately 80,000 acres within the GGNRA boundary, which includes lands in San Francisco, Marin, and San Mateo counties. Non-federal lands within the GGNRA boundary are managed by other public agencies such as the City and County of San Francisco, California Department of Parks and Recreation, and San Mateo County.

Point Reyes National Seashore (PRNS)

The NPS is responsible for the management of the PRNS. PRNS includes the entire Point Reyes peninsula, with the exception of Inverness, Bolinas and Tomales Bay State Park. In addition, certain tide and submerged lands have been legislatively conveyed by the state to PRNS.

State

California Coastal Commission

The California Coastal Commission (CCC) was established under the California Coastal Act, which gives authority to the commission to establish policy for activities in state waters. In addition, seaward of state jurisdiction, federal development and activities directly affecting the coastal zone must be conducted in a manner consistent with these policies to the maximum extent practicable.

California State Lands Commission (SLC)

The California State Lands Commission (SLC) administers land including the beds of all waterways of the state below ordinary high water mark as well as tidelands (located between the mean high and low tide lines) and submerged lands (located below the mean low tide line and extending 3 nautical miles seaward). These sovereign state lands are held by the state “in trust” for the benefit of the public.

California Department of Fish and Wildlife (CDFW)

The CDFW regulates commercial fishing, including the taking of tidal invertebrates for commercial purposes, under a licensing system. CDFW also regulates sport fishing through license and bag limit systems. A sport fishing license is required for the taking and possession of fish for any non-commercial purpose. CDFW also leases state water bottoms for the purpose of mariculture.

California Department of Parks and Recreation

California Department of Parks and Recreation manages 280 park units, including over 280 miles of coastline. Responsible for almost one-third of California's scenic coastline, California State Parks manages the state's finest coastal wetlands, estuaries, beaches, and dune systems.

STRUCTURE OF THE ACTION PLANS

This management plan is constructed around a set of action plans that outline how Gulf of the Farallones National Marine Sanctuary (GFNMS) will be managed. Each action plan outlines how different strategies will be conducted and proposes performance indicators as a measure of management effectiveness.

DEVELOPMENT OF ACTION PLANS

The following issues and program areas are addressed in this management plan:

- A. Water Quality
- B. Wildlife Disturbance
- C. Introduced Species
- D. Ecosystem Protection: Impacts from Fishing Activities
- E. Impacts from Vessel Spills
- F. Education and Outreach (Program)
- G. Conservation Science (Program)
- H. Resource Protection (Program)
- I. Administration (Program)
- J. Administration and Operations (Crosscut)
- K. Communication and Outreach (Crosscut)
- L. Ecosystem Monitoring (Crosscut)
- M. Maritime Heritage (Crosscut)

There are three types of action plans. Issue plans focus on a particular issue and require the involvement of more than one GFNMS program. Program plans represent the priority activities for the sanctuary's science, education, resource protection, and administration programs. Crosscut plans involve the three contiguous sanctuaries in central California, Monterey Bay, Cordell Bank, and Gulf of the Farallones.

OUTLINE OF ACTION PLANS

Each action plan is structured so that sanctuary staff and constituents may quickly and easily reference this document. Each action plan is divided into sections that are described in detail below.

Issue Statement/ Program Statement

The issue (or program) statement clearly and concisely provides an introduction about "why" this is an issue to be addressed by the sanctuary in the management plan. It may include a brief description of the current situation or problem, and areas that need attention.

Structure of Action Plans
GFNMS Draft Management Plan

Issue Description/ Program Description

The issue (or program) description provides a general background on what sanctuary management currently knows or understands about an issue. Program descriptions explicitly describe the types of actions already undertaken by sanctuary management and the general direction it would like to move in the future. It includes the status of natural resources, related human-use activities occurring in the sanctuary, and jurisdictional authorities pertinent to the specific issue.

Goals

The goal describes the desired future state of the sanctuary ecosystem and management relevant to the specific resource management issue or program area. The goal is a broad statement about a long-term desired outcome that may or may not be completely attainable.

Objectives

The objectives are measurable outcomes for evaluating progress and success in moving toward the future desired condition. Objectives will be achieved in a specific time frame to help accomplish the desired goal.

Strategies

This section is a description of how the objectives will be accomplished for the particular issue or program area. Each strategy addresses one or more objectives and is divided into specific activities for the sanctuary staff to carry out. Activities are developed and implemented to achieve the goals and objectives of the issue or program area.

Potential Partners

The potential partners are organizations that have been identified as possible partners and that have shown interest in contributing to the effort. This list does not limit the partners involved, but merely serves as a guide when implementing the action plan. Sanctuary management may partner with other organizations as work on the particular activity progresses.

Performance Measures

Each action plan includes a chart presenting the outcomes expected and the performance indicators that will be used to measure progress toward the outcome. This effort is being undertaken to measure the sanctuary's management effectiveness (e.g., the achievement of a planned effort or activity). The methodology to be used to assess the effectiveness of each strategy in achieving the desired goal is detailed below. The definitions for the performance measure terminology follow.

Strategy The management action to address a particular issue.

<i>Performance Goal</i>	The over-arching, very broad target for the action plan.
<i>Desired Outcome (Objective)</i>	The more specific outcomes achieved within the scope of the performance goal.
<i>Outcome Measure</i>	A specific indicator that shows progress towards a desired outcome.
<i>How Measured</i>	Describes exactly how the outcome measure will be measured.
<i>Who Measures</i>	Identifies the staff or outside partner who will measure the outcome measure.
<i>Output Measure</i>	A specific product or tool that results from the activities. Its production demonstrates a completed objective.

IMPLEMENTATION OF THE MANAGEMENT PLAN

This plan is designed to guide management of activities in the sanctuary. Implementation of this new management plan will require cooperation and coordination among many federal, state, and local government agencies, as well as private organizations and individuals. Information exchange, sharing facilities and staff, and the coordination of policies and procedures within an ecosystem context are features of this management plan and each of its program areas. As this plan is being implemented, GFNMS management will work to facilitate all public and private uses of those resources that are compatible with the primary objective of resource protection.

Limitations

Although this management plan for GFNMS details the action plans for the four program areas, how these strategies are implemented may be affected by multiple factors. These include: (1) funding – the primary source of funding comes from congressional appropriations that may fluctuate from year to year; (2) the ability to forge new partnerships in which staff, facilities and financial resources may be shared; (3) the need to be responsive to the ever changing impacts on the sanctuary’s marine resources from both natural perturbations and human activities; (4) an increased understanding of the complexity of the ecosystem, habitats and living marine resources; and (5) learning better ways to manage the resources through experience, experimentation, and the sharing of knowledge. GFNMS staff, the sanctuary advisory council, the public, and GFNMS’ partners will, as appropriate, provide oversight and guidance for redirecting any management plan strategies.

Incremental Implementation Scenarios

Table 1 provides an outline of how the various strategies in the management plan will be implemented. The implementation of the strategies depends on various factors including:

Structure of Action Plans
GFNMS Draft Management Plan

1. Status of strategy implementation
2. Priority of strategy implementation
3. Coordination level necessary with partners for implementation, and
4. 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 priority of a strategy or action plan is indicated by the level of implementation based upon the funding or resources currently available. Full implementation of the management plan exceeds the resources available to the GFNMS therefore requiring some prioritization of the action plan or strategies. As resources become available, a greater level of implementation is possible. Table 1 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 non-government organizations (NGOs). Table 1 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 Office of Marine Sanctuaries (ONMS) funds as well as funding from external sources such as grants, the Farallones Marine Sanctuary Association (FMSA), or in-kind work from partner agencies. Table 1 highlights the probable source of funding as primarily internal or external or a mix of funding sources.

Table 1. GFNMS Management Plan Implementation Table

Table Legend			
Strategy Status:	Implementation Ranking:	Necessary Partnership Coordination:	Primary Funding Sources:
● – Existing w/o significant modification	H – High	● – Not possible w/o partners	● – External (e.g., grants)
◐ – Existing w/significant modification	M – Medium	◐ – Significant reliance on partners	◐ – Internal/External
○ – New or future (not yet implemented).	L – Low	○ – Little reliance on partners	● – Internal (increased budget) ○ – Internal (base budget)

Action Plans	Activity Status	Level Funding Scenario 1	Moderate Increase Scenario 2	Substantial Increase Scenario 3	Partnership Coordination	Primary Funding Sources
Issue Area Action Plans						
Water Quality						
WQ-1: Water Quality Monitoring Coordination	○	L	L	M	●	◐
WQ-2: Harbor and Marina Water Quality	○	M	H	H	●	◐
WQ-3: Land-based Discharges	○	L	L	M	●	◐
WQ-4: ASBS Water Quality	○	M	M	H	●	◐
WQ-5: Mussel Watch Monitoring Program	○	M	M	H	●	●
WQ-6: Water Quality Working Group	○	L	L	M	●	○
WQ-7: Water Quality Staff Support	○	M	M	H	○	○
WQ-8: Water Quality Bibliography	○	L	M	H	◐	○
WQ-9: Nonpoint Education for Municipal Officials (NEMO)	○	L	M	H	●	◐
Wildlife Disturbance						
WD-1: Web-Based Database	○	L	M	H	◐	○
WD-2: Volunteer Monitoring Programs	○	L	M	H	◐	○
WD-3: Agency Monitoring Programs	○	L	M	H	●	◐
WD-4: Interpretive Enforcement	○	H	H	H	●	◐
WD-5: Wildlife Viewing Guidelines	◐	H	H	H	●	◐
WD-6: Outreach and Media	◐	H	H	H	◐	◐
WD-7: Coordinate SPN	●	H	H	H	◐	◐
Introduced Species						
IS-1: Introduced Species Database	○	H	H	H	●	●

Structure of Action Plans
GFNMS Draft Management Plan

Action Plans		Activity Status	Level Funding Scenario 1	Moderate Increase Scenario 2	Substantial Increase Scenario 3	Partnership Coordination	Primary Funding Sources
	IS-2: Estuarine Detection and Monitoring	○	M	M	H	▶	▶
	IS-3: Intertidal Detection and Monitoring	○	M	M	H	▶	○
	IS-4: Pelagic Detection and Monitoring	○	H	H	H	●	●
	IS-5: Early Detection Outreach Program	○	L	M	M	▶	▶
	IS-6: Technical Advisory Council	○	L	M	M	●	▶
	IS-7: Rapid Response Plan	○	M	M	M	●	▶
	IS-8: Regulatory Actions	○	H	H	H	○	○
	IS-9: Outreach to Prevent Introductions	○	M	M	H	▶	▶
	Ecosystem Protection: Impacts from Fishing Activities						
	FA-1: Resource Characterization	▶	M	H	H	▶	▶
	FA-2: Socioeconomic Profile of Fishing Activities	○	M	M	H	●	▶
	FA-3: Develop Compatibility Index	○	L	M	H	▶	○
	FA-4: Address Impacts from Fishing Activities	○	M	H	H	▶	▶
	FA-5: Develop Maritime Heritage Model	○	M	M	H	●	○
	FA-6: Sanctuary Representation At Fisheries Management Meetings	○	H	H	H	●	○
	FA-7: Krill Harvesting Ban	○	H	H	H	●	▶
	EP-1: Evaluate Marine Zoning	○	H	H	H	●	○
	EP-2: Living Resource and Habitat Protection Working Group	○	H	H	H	●	○
	EP-3: Estero Marine Reserves	○	M	H	H	●	○
	Impacts from Vessel Spills						
	VS-1: Expand Drift Analysis Model	●	L	L	L	●	●
	VS-2: Refine Spill and Drift Model	▶	L	L	L	●	●
	VS-3: Profile Vessel Activity	▶	L	L	M	▶	○
	VS-4: Evaluate Vessel Routing Changes	▶	M	H	H	▶	●
	VS-5: Refine Resources At Risk Model	▶	H	H	H	●	▶
	VS-6: Participate in Regional Response Team	▶	H	H	H	●	▶
	VS-7: Revise Internal Emergency Response Plan	●	H	H	H	○	○
	VS-8: Integrate Beach Watch Data Into Area's Contingency Plan	●	M	H	H	▶	▶
	VS-9: Mariner Outreach	▶	M	H	H	▶	▶
	VS-10: Maritime Trade Advisory Council Seat	○	M	M	M	▶	○
	VS-11: Sanctuary Representation At Vessel Traffic Forums	○	H	H	H	●	●



ISSUE-BASED ACTION PLANS

GFNMS DRAFT MANAGEMENT PLAN

- I. Water Quality**
- II. Wildlife Disturbance**
- III. Introduced Species**
- IV. Ecosystem Protection: Impacts from Fishing Activities**
- V. Impacts from Vessel Spills**



WATER QUALITY ACTION PLAN

ISSUE STATEMENT

Water quality within Gulf of the Farallones National Marine Sanctuary (GFNMS) is generally good due to the rural nature of the coastline and strong currents of the open ocean. Nevertheless, depending on coastal currents, the 8 million people living in the Bay Area and the discharge of the San Francisco Bay Estuary (including agricultural wastes from the Central Valley and residual sediments and metals from historic mining) periodically impact the sanctuary. The coastal waters of the sanctuary, particularly the estuarine habitats of Bolinas Lagoon, Tomales Bay, Estero Americano, and Estero de San Antonio, are vulnerable to land-based nonpoint source pollution. Sources of concern include nonpoint source runoff, agriculture, marinas and boating activities, mining, and aging and undersized septic systems. Other potential threats to water quality include activities such as diversion of fresh water, spills, dumping, land use changes, and pollutants such as floating debris (e.g., plastics), pathogens, emerging pollutants (e.g., endocrine disrupters), and residual materials such as radioactive waste and chemical contaminants including bioaccumulative legacy pollutants (e.g., DDT, PCBs).

ISSUE DESCRIPTION

Impacts on Estuarine Environments

As with much of California and the nation, the sanctuary is threatened by nonpoint source pollution. Given the rural nature of the sanctuary's coastline, the greatest current threat is not from urban development, but from livestock grazing, agricultural activities, mining activities, and aging and undersized septic systems. Of special concern are the estuarine habitats of Bolinas Lagoon, Tomales Bay, Estero Americano, and Estero de San Antonio where circulation is more restricted than on the open coast and where organisms that rely on estuarine conditions are exposed to the relatively undiluted effects of polluted runoff. Due to restricted circulation, the estuarine environment is especially threatened by accidental spills from ships, land-based tanks or other sources, as well as by poorly regulated small-scale discharges such as oily bilge water, detergents from deck wash, runoff from shipyards, or sewage from boats, septic systems, or leaking sewers. Residual pollutants from past practices such as mining operations and diversion of freshwater have the greatest potential impact in restricted waterways such as estuaries and creeks. Several of these sources of impact have occurred in Tomales Bay, which has been identified by the State Water Resources Control Board as not in compliance with state water quality standards for mercury (from an abandoned mine), pathogens, sediment, and nutrients.

Impacts on Open Coastal Environments

The open coastal environments of the sanctuary are also threatened by nonpoint source pollution, but the threat is generally considered to be less (than for estuaries) due to the greater distance from most sources (mines, residential runoff, storm water runoff, septic systems, high density grazing) and greater water circulation. Nevertheless, the areas near the mouths of creeks, rivers such as the Russian River or estuaries can be subject to impacts from nonpoint source pollution.

Impacts on Offshore Environments

The greatest protection for the offshore waters of the sanctuary is the designation of the sanctuary itself. The size of the sanctuary and the restrictions placed on its use and protections for water quality provide additional oversight and protections to offshore waters. The offshore areas of the sanctuary are somewhat unaffected by land-based threats to water quality by their distance from the sources of land-based pollutants and runoff, as well as the continuous circulation of the offshore waters at many scales. Nevertheless, water quality in the offshore regions could be threatened or impacted by large or continuous discharges from the shore, spills by vessels, illegal dumping activities, or residual contaminants from past dumping activities. Discharges from sunken vessels and illegal discharges from oil tankers and cargo vessels have been a periodic source of negative impacts to marine organisms within the sanctuary. The threat of an offshore spill is a constant presence in areas near well-used shipping lanes. In the event of an oil spill, the impact to the open coast would mainly be determined by the wind and sea conditions, which could easily overcome protection efforts.

Persistent organic pollutants such as DDT and PCBs were widely used nationwide before the mid-1970s, and residuals of these chemicals still remain in sediments and organisms within the sanctuary. Elevated levels of pollutants have been reported for fish, seabirds, and marine mammals found within the sanctuary. The sanctuary should evaluate these reports to determine if they warrant recommendations for additional water quality protection efforts. Additionally, there are emerging pollutants whose effects should also be considered. Threats and strategies related to oil pollution are addressed under the issue-based action plan for Impacts from Vessel Spills and the program-based action plan for Conservation Science.

Impacts from the San Francisco Bay Area

To the east of the sanctuary there are treated wastewater discharges from the City of San Francisco that can have sewage overflows during large storm events, and outflow from the San Francisco Bay, potentially transporting pollution from the 8 million people living in the Bay Area. These include sewage outfalls, agricultural waste products from the Central Valley, and residual sediments and metals from historical mining. The bay has been identified by the State Water Resources Control Board as not in compliance with state water quality standards for several pesticides, metals, PCBs, and exotic species. The potential for the outflow from the bay to degrade sanctuary water quality needs to be evaluated.

Impacts from Floating Debris (e.g., Plastics)

Marine debris that threatens sanctuary resources may come from the San Francisco Bay outflow and local watersheds that drain into the sanctuary or from across the Pacific Ocean. The impact of plastic debris is a world-wide problem due to the many potential sources of debris, longevity of plastic in the marine environment, and impacts caused by plastics even as they degrade to smaller and smaller particles. Plastic particles may be ingested by marine organisms that select food by sight, filter feeders, or animals that live in the open water who mistake plastic for food. Plastic debris has also been shown to entangle marine wildlife. Sanctuary management should evaluate the potential local efforts that could be taken to reduce the impacts of marine debris on sanctuary wildlife.

JURISDICTIONAL SETTING

California's waters extend three miles seaward from the coastline (including the coasts of its islands). These are considered nearshore waters. Ocean water quality beyond three miles is regulated directly by the EPA, in consultation with the state and regional water boards. Beyond three miles from the mainland or the islands, EPA's water quality standards (for the receiving waters) and effluent limitations are applicable.

The following is an overview of the relevant federal and state laws and regulations that may apply to water quality. This is not a comprehensive review of all water quality related laws and regulations, and additional regulations could apply. The laws and regulations presented in this section are subject to change.

Federal Law

Rivers and Harbors Appropriations Act of 1899, 33 U.S.C §§ 401, 403

USACE acts in accordance with the provisions of the Rivers and Harbors Act, which regulates placement of structures or other work in addition to fill in "navigable waters," and the CWA (Section 404), which governs fill in "waters of the United States," including wetlands. A USACE permit is required if a project would place structures within navigable waters or if it would result in altering waters of the US below the ordinary high water mark in nontidal waters. The USACE does not issue these types of permits in cases where the USACE itself is the lead agency; instead it evaluates the project to determine compliance and acceptability. Typical activities requiring Section 10 permits are construction of buoys, piers, wharves, bulkheads, marinas, ramps, floats, intake structures, cable or pipeline crossings, and dredging and excavation.

Federal Water Pollution Control Act, commonly known as the Clean Water Act, 33 U.S.C § 1251 et seq.

The CWA requires California to submit statewide and basin plans to the EPA for approval.

The CWA differentiates between point source and nonpoint source pollution. Point sources of pollution are those that have a fixed discharge point. For example, sewage treatment plants (also called publicly owned treatment works) or industrial facilities (such as power plants or oil refineries) are considered point sources. The EPA definition is as follows:

Water Quality Action Plan
GFNMS Draft Management Plan

POINT SOURCE POLLUTION is any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, or concentrated animal feeding operation from which pollutants are or may be discharged. This term does not include agricultural storm water discharges and return flows from irrigated agriculture.

NONPOINT SOURCE POLLUTION is simply any source of water pollution that is not point source pollution. Nonpoint source pollution results from, but is not limited to, land runoff, precipitation, atmospheric deposition, drainage, seepage, or hydrologic modification. Nonpoint sources of pollution are those that do not have a distinct pipe or other conveyance through which pollutants are discharged. Instead, the pollutants enter water over a large and diffuse area. Examples of nonpoint source pollution include, but are not limited to, air pollution fallout, timber harvesting, agriculture, grazing and small scale animal husbandry, boating and marinas, urban runoff, and hydro modification of streams and wetlands.

One commonly misunderstood category is urban stormwater runoff. Urban runoff has many of the same origins and problems as nonpoint source pollution. Together, nonpoint source pollution and urban runoff are the leading sources of pollution into California's waters. Originally, all urban runoff was considered a form of nonpoint source pollution. However, since 1987 the EPA and the State Water Resources Control Board have considered urban runoff collected in stormwater systems to be point sources of pollution. Urban stormwater systems, while collecting runoff over large and diffuse areas, do eventually drain through pipes or other distinct conveyances into natural water bodies. Hence, urban runoff is regulated as point source pollution.

Point source discharges are illegal under the Clean Water Act unless authorized by an NPDES permit. Under CWA Section 402 (33 U.S.C. § 1342), any discharge of a pollutant from a point source (e.g., a municipal or industrial facility) to the navigable waters of the United States or beyond must obtain an NPDES permit, which requires compliance with technology- and water quality-based treatment standards.

CWA Section 312 (33 U.S.C. § 1322) contains regulations protecting human health and the aquatic environment from disease-causing microorganisms that may be present in sewage from boats. Pursuant to Section 312 of the CWA, all recreational boats with installed toilet facilities must have an operable MSD on board. All installed MSDs must be Coast Guard-certified. Coast Guard-certified devices are so labeled except for some holding tanks, which are certified by definition under Section 312 of the CWA (33 U.S.C. § 1322). In 2012, under the authority of the CA Section 312, the USEPA established national No Discharge Zones (NDZs) within which sewage discharges are prohibited from all large passenger vessels (of 300 gross tons or greater) and from large oceangoing vessels (of 300 gross tons or greater) with available holding tank capacity or containing sewage generated while the vessel was outside of the marine waters of the State of California. In California, NDZs have been created for ten bays and harbors along the outer coast and for all state marine waters (i.e. within three nautical miles of the shore).

Water Quality Impairments

Section 303(d) of the CWA requires the states to submit to the EPA a list of water bodies that do not meet water quality standards for specific pollutants (i.e., are “impaired”). On November 12, 2010, USEPA approved the inclusion of all waters to California's 2010 303(d) list of impaired waters requiring TMDLs and disapproved the omission of several water bodies and associated pollutants that meet federal listing requirements. On October 11, 2011, USEPA issued its final decision regarding the water bodies and pollutants USEPA added to California's 2010 303(d) List. In the vicinity of the GFNMS, the following areas were identified in the 2010 303(d) List:

- Garcia, Gualala, and Russian Rivers are designated as impaired primarily due to sedimentation/siltation and water temperature. The Lower Russian River and Clam Beach (just north of Fort Ross State Historic Park) are listed for pathogens. Summary of sources listed: pasture and range grazing (upland and riparian), intensive animal feeding operations, manure lagoons, dairies, hydro-modification, removal of riparian vegetation, stream bank modification, erosion/siltation, and other nonpoint source.
- Bodega Harbor is designated as impaired primarily due to invasive speices. The sources are unknown.
- Estero Americano and Estero de San Antonio are designated as impaired primarily due to for nutrients and sediment (Stemple Creek is a listed tributary). Summary of sources listed: agriculture and related storm runoff, irrigated crops, land development, pasture and range grazing (upland and riparian), intensive animal feeding operations, confined animal feeding operations (point source), manure lagoons, dairies, hydro modification, channelization, wetland drainage/fill removal of riparian vegetation, stream bank modification, erosion/siltation, natural sources, and other nonpoint source.
- Tomales Bay is designated as impaired primarily due to pathogens, nutrients, mercury, and sediment (Walker and Lagunitas Creeks are listed tributaries). Summary of sources listed: agriculture, surface mining and mine tailings, intensive animal feeding operations, waste storage and disposal, upstream impoundment, and urban runoff/storm sewers.
- Central San Francisco Bay is designated as impaired primarily due to chlordane, DDT, diazinon, dieldrin, dioxin, furan compounds, mercury, PCBs, selenium, and exotic species. Summary of sources listed: industrial and municipal point sources, atmospheric deposition, resource extraction, agriculture, other nonpoint sources, natural sources, and ballast water. Other portions of San Francisco Bay and many tributaries to the bay are also listed, but were not described here for brevity.

Total Maximum Daily Loads

Under the CWA, total maximum daily loads (TMDLs) are required to be developed for 303(d) listed water bodies. The purpose of a TMDL is to bring a water body back into compliance with the water quality objective for which it was listed. The development of a TMDL involves the identification of the various sources contributing to the water quality standard exceedance, including both point and nonpoint sources. The TMDL must also take into account the natural

Water Quality Action Plan
GFNMS Draft Management Plan

background level and a margin of safety. Once a TMDL is developed, it must be approved and included in the Basin Plan. Implementation of the TMDLs will, by necessity, include public involvement and education, since many of our pollution problems are related to nonpoint sources and urban stormwater runoff, which are not regulated activities.

Title I of the Marine Protection, Research, and Sanctuaries Act, also known as the Ocean Dumping Act, 33 U.S.C. §§ 1401-1445

The Marine Protection, Research, and Sanctuaries Act (MPRSA) regulates the dumping of wastes into marine waters. It is the primary federal environmental statute governing transportation of dredged material for the purpose of disposal into ocean waters, while CWA Section 404 governs the discharge of dredged or fill material into all waters of the U.S. In 1983, a global ban on the dumping of radioactive wastes was implemented. The MPRSA and the CWA regulate materials that are disposed of into the marine environment, and only sediments determined to be nontoxic by USEPA standards may be disposed of into the marine environment. The USEPA and the USACE share responsibility for managing the disposal of dredged materials.

Oil Pollution Control Act, 33 U.S.C. § 2701 et seq.

The Oil Pollution Control Act of 1990 requires extensive planning for oil spills from tank vessels and onshore and offshore facilities and places strict liability on parties responsible for oil spills. See Impacts from Vessel Spills Action Plan for more information.

Act to Prevent Pollution from Ships, 33 U.S.C. § 1901 et seq.

The discharge of solid wastes is regulated under the APPS. The APPS regulates the disposal of plastics and garbage for the United States Annex V of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL73/78). Under these regulations the disposal of plastics is prohibited in all waters, and other garbage, including paper, glass, rags, metal, and similar materials, is prohibited within 22 km (twelve nm; 14 miles) from shore (unless macerated).

Coastal Zone Management Act, 16 U.S.C. §§ 1451-1466

The Coastal Zone Management Act (CZMA) provides incentives for coastal states to develop and implement coastal area management programs. It is significant with regards to water pollution abatement, particularly concerning nonpoint source pollution.

Under CZMA, the National Oceanic and Atmospheric Administration (NOAA) provides federal funding for the development and implementation of state coastal zone management programs. The CCC has been charged with developing and implementing a state coastal plan in accordance with CZMA. The commission also has the authority to review federal activities in the coastal zone to ensure consistency with California's coastal zone management program.

Through the Coastal Zone Authorization Amendments of 1990 (CZARA), the Coastal Nonpoint Pollution Control Program was established to address the control of nonpoint source pollution.

The State Water Resources Control Board (SWRCB) and the CCC have submitted to the EPA and NOAA a Nonpoint Source Pollution Control Program Plan in accordance with CZARA Section 6217 requirements. The plan provides an outline for nonpoint source pollution management measures to be implemented over the next 15 years.²

The CCC addresses water quality issues through additional programs including:

- 1) Water Quality Unit, which provides technical assistance to district offices and statewide nonpoint source pollution coordination
- 2) Local Coastal Programs
- 3) Interagency Coordination Committee
- 4) Critical Coastal Areas
- 5) Model Urban Runoff Program
- 6) Contaminated Sediments Task Force
- 7) Snapshot Day
- 8) First Flush

Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§ 9601-9675

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) addresses cleanup of hazardous substances and mandates liability for environmental cleanup on those whose actions cause release into the environment. In conjunction with the CWA, it requires preparation of a National Contingency Plan for responding to oil or hazardous substances release.

Resource Conservation and Recovery Act, 42 U.S.C §§ 6901-6992K

The RCRA addresses hazardous waste management, establishing duties and responsibilities for hazardous waste generators, transporters, handlers, and disposers.

State Law

Porter-Cologne Water Quality Control Act, California Water Code §§ 13000-14958

The Porter-Cologne Water Quality Control Act contains provisions for enforcing water quality standards through issuance of Waste Discharge Requirements. Pursuant to the act, the SWRCB has the primary responsibility to protect California's coastal and ocean water quality. SWRCB has been given the authority by the USEPA to administer the NPDES program for California. The Regional Water Quality Control Boards, in coordination with the SWRCB, issue both state

Water Quality Action Plan
GFNMS Draft Management Plan

waste discharge requirements and NPDES permits to individual dischargers. Dischargers are required to establish self-monitoring programs for their discharges and to submit compliance reports to Regional Water Quality Control Boards. The SWRCB has established regulations to implement these measures through water quality control plans, including the California Ocean Plan (Ocean Plan), the Regional Water Quality Control Plans (Basin Plans), and the Thermal Water Quality Control Plan (California Ocean Resources Management Program 1995). The Ocean Plan is applicable to nearshore ocean waters, but does not cover enclosed bays and estuaries. The Thermal Plan covers waste heat (e.g., from power plants) into all of the state's coastal waters. The Regional Board Basin Plans are applicable to freshwater bodies (e.g., streams and rivers) as well as enclosed bays and estuaries.

In addition, the state has a Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (State Implementation Policy). The State Implementation Policy includes the measures by which California implements the U.S. Environmental Protection Agency's (EPA) California Toxics Rule. The California Toxics Rule establishes water quality criteria for priority toxic pollutants.

The State Water Resources Control Board adopts the statewide water quality control plans and policies, such as the Ocean Plan, the Thermal Plan, and the State Implementation Policy. The regional boards adopt and submit basin plans to the state board for approval

Permits

Parties identified with point sources of water pollution into surface waters (ocean, bays, streams, and lakes) are required to obtain a National Pollutant Discharge Elimination System (NPDES) permit. In California, the NPDES permits issued by the state and regional boards also double as Waste Discharge Requirements (WDRs). WDRs are required under Porter-Cologne for any discharges into surface or ground waters. Only activities that discharge in groundwater are issued WDRs, since the federal CWA (and therefore NPDES permits) only applies to surface waters. Under federal regulations, nonpoint source discharge into surface waters are also not issued NPDES permits. In California, regional boards may issue WDRs to nonpoint source dischargers. Alternatively, regional boards may allow certain nonpoint source dischargers to operate under conditional waivers.

Metropolitan areas in California having populations in excess of 100,000 people have been issued Phase I stormwater NPDES permits. San Francisco, the largest point source discharger near the GFNMS, is an unusual situation compared to other large California cities in that it has a combined storm sewer system, which handles both stormwater and sewage waste streams.

A draft Phase II general stormwater NPDES permit has been proposed to cover certain designated smaller municipalities in California serving populations of fewer than 100,000 people. Discharge to sensitive water bodies (e.g., Areas of Special Biological Significance) is one of the factors to consider when evaluating a municipality's designation status. There are other stormwater permits in the state as well. The California Department of Transportation (CalTrans) currently operates under a statewide permit covering both municipal and construction

related storm water discharges. Statewide general permits also are currently in effect for industrial and construction related storm water discharges.

State Water Resources Control Board and Areas of Special Biological Significance

On March 21, 1974, the State Water Resources Control Board decided that, “The list of Areas of Special Biological Significance (ASBS) will be used to identify for planning purposes, those areas where the regional water quality control boards will prohibit waste discharges...” There are currently a total of 34 ASBSs in California, nine of which are within the GFNMS waters including the boundaries in the proposed expansion area. These are at Saunders Reef, Del Mar Landing, Gerstle Cove, Bodega, Bird Rock, Point Reyes Headland, Duxbury Reef, Double Point, and the Farallon Islands.

An ASBS is a marine or estuarine area that is designed to protect marine species or biological communities from an undesirable alteration in natural water quality. The State Water Resources Control Board is responsible for designating these areas. In an ASBS, point source waste and thermal discharges are prohibited or limited by special conditions. Nonpoint source pollution is controlled to the extent practicable. No other use is restricted by the State in these areas.

The Ocean Plan prohibits the discharge of wastes to an ASBS. Discharges must be located a sufficient distance from an ASBS to ensure maintenance of natural water quality. Limited-term maintenance, repair and replacement activities (e.g., on boat facilities, sea walls, storm water pipes, and bridges) resulting in waste discharges in an ASBS may be approved by a Regional Water Quality Control Board. Such discharges are allowable only if they result in temporary and short-term changes in existing water quality, and do not permanently degrade water quality. All practical means must be implemented in order to minimize water quality degradation. The Ocean Plan does not regulate the discharge of vessel wastes, dredging, or the disposal of dredge spoil materials.

The Thermal Plan requires existing discharges of elevated temperature wastes to comply with limitations necessary to ensure protection of ASBSs. New discharges of elevated temperature wastes must be discharged a sufficient distance from an ASBS to ensure the maintenance of natural temperature in these areas. Additional limitations may be imposed in individual cases if necessary for the protection of ASBSs.

California Health and Safety Code §115880 et seq.

California has established minimum standards for the sanitation of public beaches, including: 1) requiring the testing of the waters adjacent to all public beaches for microbiological contaminants; 2) establishing protective minimum standards for total coliform, fecal coliform, and enterococci bacteria, or for other microbiological indicators; and (3) requiring that the waters adjacent to public beaches are tested for total coliform, fecal coliform, and enterococci bacteria, or for other microbiological indicators if appropriate. Since 2012, testing on beaches that are visited by more than 50,000 people annually and are located on an area adjacent to a storm drain that flows in the summer is required on a weekly basis from April 1 to October 31, inclusive, of each year.

California Coastal Act, Cal. Pub. Res. Code §30000 et seq.

The California Coastal Act (CCA) defines the “coastal zone” as the area of the state that extends three miles seaward and generally about 1,000 yards (910 meters) inland. The CCA of 1976 mandates protections for terrestrial and marine habitat through its policies on visual resources, land development, agriculture, commercial fisheries, industrial uses, water quality, offshore oil and gas development, transportation, power plants, ports, and public works. The Coastal Commission administers various programs, including Local Coastal Programs and the Water Quality Program, which facilitates the interagency Nonpoint Source Pollution Control Program. Almost all development within the coastal zone, which contains many wetlands, requires a coastal development permit from either the Coastal Commission or a local government with a certified Local Coastal Program.

California Marine Invasive Species Act, Cal. Pub., Res. Code § 71200 et seq.

See Introduced Species Action Plan.

California Ballast Water Regulations, CCR, Title 2, Division 3, Chapter 1, Article 4.6 et seq.

The master, operator, or person in charge of vessels arriving at a California port or place carrying ballast water from another port or place within the Pacific Coast must employ at least one of the following ballast water management practices: 1) exchange the vessel's ballast water in near-coastal waters (more than 50 nm from land and at least 657 feet deep), before entering the waters of the state, if that ballast water has been taken on in a port or place within the Pacific Coast region; 2) retain all ballast water on board the vessel; 3) use an alternative, environmentally sound method of ballast water management that, before the vessel begins the voyage, has been approved by the CSLC or the United States Coast Guard as being at least as effective as exchange, using mid-ocean waters, in removing or killing nonindigenous species; 4) discharge the ballast water to a reception facility approved by the commission; or 5) under extraordinary circumstances where compliance with the four options above is not practicable, perform a ballast water exchange within an area agreed to by the CSLC in consultation with the United States Coast Guard. “Pacific Coast Region” is defined in Article 4.6 as all estuarine and ocean waters within 200 nm of land or less than 2,000 meters (6,560 feet, 1,093 fathoms) deep, and rivers, lakes or other water bodies navigably connected to the ocean on the Pacific Coast of North America east of 154 degrees west longitude and north of 25 degrees north latitude, exclusive of the Gulf of California.

California Clean Coast Act, Cal. Pub. Res. Code §72400 et seq.

The California Clean Coast Act, which became effective on January 1, 2006, prohibits the release from large passenger vessels (cruise ships) and other oceangoing ships (300 gross tons or more) of hazardous waste, oily bilge water, other waste, and sewage sludge into the marine waters of the state and marine sanctuaries and sets up notification protocols for release of these substances into state waters or waters of a national marine sanctuary. The Clean Coast Act also prohibits the release of graywater from cruise ships and oceangoing ships with sufficient holding

capacity into the marine waters of the state. Furthermore, the Clean Coast Act requires the State Water Resources Control Board to request the appropriate federal agencies to prohibit the release of wastes from cruise ships and oceangoing ships into state marine waters and the four National Marine Sanctuaries in California. The Act is more stringent than federal regulation of cruise ships and also provides the strongest state protections from cruise ship pollution in the United States.

Sanctuary Regulations

The proposed sanctuary site-specific regulations affecting water quality are available for review in the proposed rule published concurrently with this document.

WATER QUALITY GOAL

1. Protect and enhance water quality in the estuarine, nearshore, and offshore environments of the sanctuary by engaging in corrective and proactive measures.

WATER QUALITY OBJECTIVES

1. Develop a regionally based, cooperative water quality protection plan to address past, present and future point and non-point source water quality impacts.
2. Emphasize a watershed/ecosystem approach and address the range of water quality threats from chronic land-based runoff to catastrophic offshore events.

WATER QUALITY ACTION PLANS

IMPACTS ON ESTUARINE AND NEARSHORE ENVIRONMENTS

STRATEGY WQ-1: *Develop an umbrella program to coordinate partnerships in implementing a comprehensive and integrated water quality monitoring program in order to track impacts on the estuarine and nearshore environment.*

Activity 1.1 Throughout the Marin, Sonoma, and Mendocino county watersheds adjacent to the sanctuary, and in the estuarine and nearshore environments within the sanctuary, are a multitude of volunteer and expert-based water quality monitoring programs. Through better coordination, both efficiency and effectiveness could be improved, and monitoring needs and data gaps identified and filled. Steps to be taken include:

- A. Inventory and evaluate existing volunteer and expert-based monitoring programs, including data collected, sampling duration and frequency, analyses performed, and ability to detect change over time.
- B. Identify sanctuary water quality monitoring data needs; evaluate against inventoried monitoring programs; and identify data gaps specific to sanctuary management needs.

Water Quality Action Plan
GFNMS Draft Management Plan

- C. Develop strategy to fill data gaps, including partners and funding sources.
- D. Coordinate with agencies and water quality monitoring entities to: identify funding opportunities and potential collaborative partnerships; reduce sampling and analysis duplication; ensure quality assurance/quality control; and provide platform for data sharing.
- E. Use data to make informed management decisions specific to sanctuary issues and concerns.
- F. Extend Tomales Bay water quality monitoring program to other estuarine areas not fully monitored.
- G. Establish a forum for bringing together representatives of volunteer water quality monitoring programs in and adjacent to sanctuary watersheds, estuarine, and nearshore environments, to promote continued coordination and maximize program potential.

STRATEGY WQ-2: Address sources of anthropogenic pathogens and pollutants on estuarine and nearshore environments from recreational and commercial boating activities and marinas.

Activity 2.1 Impacts from discharges such as oily bilge water, detergents from deck wash, runoff from shipyards and marinas, and sewage affect Tomales Bay and Bodega Bay. The state is currently evaluating the need for sewage pumpout stations; the sanctuary will:

- A. Track the state's effort to survey and evaluate the need for a sewage waste and oily bilge pumpout station on Tomales and Bodega Bays.
- B. Become a cooperating partner with the state and make recommendations, as appropriate, on: where to locate pumpout stations; education and outreach efforts; tracking compliance; and maintenance of facilities.

Activity 2.2 Develop a combined outreach program on best management practices (BMPs) and interpretive enforcement for recreational and commercial user groups in and around Arena Cove, Gualala River, Russian River, Tomales and Bodega Bays (e.g., campers, kayakers) by taking the following steps:

- A. Inventory and evaluate existing BMPs and interpretive enforcement programs such as Dock Walkers.
- B. Develop partnerships with state agencies that participate in clean boating programs, such as Boating and Waterways, to develop and implement a BMP/interpretive enforcement outreach program.

STRATEGY WQ-3: *Coordinate with other agencies to address land-based discharges into the estuarine and nearshore areas of the sanctuary including Areas of Special Biological Significance (ASBS) and Critical Coastal Areas.*

Activity 3.1 Land-based discharges from stormwater, aging and undersized septic systems, agricultural runoff, livestock grazing, mining and freshwater diversion are impacting the sanctuary's estuarine and nearshore environments. The sanctuary will take the following steps to understand and address impacts from pathogens, sediments, nutrients, residual pollutants, and other contaminants such as pharmaceutical waste, micropollutants and pesticides:

- A. Participate in the Interagency Coordinating Committee (IACC), chaired by the SWRCB, and implement management measures on state's nonpoint source pollution plan.
- B. Identify, cooperate, and exchange information with agencies and authorities that pertain to land-based discharges and impacts on water quality.
- C. Assess levels of land-based discharges and impacts on sanctuary resources.
- D. Identify water quality enforcement issues that are not being addressed adequately or appropriately and communicate to appropriate agencies.

Activity 3.2 There are known industries and specific areas that have been identified as having detrimental impacts on sanctuary water quality. Problematic areas should be addressed and industries that discharge into the watersheds in and adjacent to GFNMS (e.g., dairies, agriculture, marinas, mining facilities), should be encouraged through letters and awards of recognition to employ best management practices [BMPs]). Steps to be taken:

- A. Inventory and become familiar with existing BMPs including: SWRCB Non-Point Source Plan, RWQCB's specific BMPs for selected areas, and UC Davis BMPs for dairies.
- B. Profile all activities, users, and areas that may be impacting water quality in estuarine and nearshore environments and establish criteria for compatibility with the sanctuary's primary purpose of ecosystem protection. Use criteria to evaluate those to be awarded and those areas where additional effort is needed.
- C. Coordinate with agencies and entities that have developed BMPs on the implementation and evaluation of effective management practices. Collaborate with agencies and entities on evaluating and rewarding for successful integration of BMPs in industries potentially impacting sanctuary waters.

Activity 3.3 There are specific developed and developing areas, such as Bolinas Lagoon and Dillon Beach, where land-use activity is increasing. These activities are creating additional pressure in the watersheds adjacent to the sanctuary, potentially impacting the estuarine and nearshore environments within the sanctuary. Steps to be taken to address impacts from land

Water Quality Action Plan
GFNMS Draft Management Plan

development and encourage the use of BMPs during the planning, development and alteration of upland areas include:

- A. Identify and map specific upland areas adjacent to the sanctuary where development activities are taking place.
- B. Coordinate with agencies and entities that have developed BMPs on the implementation of effective management practices for land-use development. Collaborate with agencies and entities on evaluating and rewarding for successful integration of BMPs in land development adjacent to the sanctuary.
- C. Continue to track and evaluate development activities in watersheds adjacent to the sanctuary.

STRATEGY WQ-4: Evaluate California-designated Areas of Special Biological Significance (ASBS) and make a determination whether to implement a vessel discharge prohibition, without exception, within these areas of concern.

Activity 4.1 Develop a process to make a determination on the need for a prohibition on vessel discharge in California ASBSs within the sanctuary to protect sanctuary wildlife and habitat. Within California-designated ASBSs, point source waste and thermal discharges are prohibited or limited by special conditions and nonpoint source pollution is controlled to the extent practicable. Discharges of vessel wastes are not currently restricted. Additional GFNMS protections could augment the current state ASBS restrictions.

- A. GFNMS, in conjunction with the state and Regional Water Quality Control Boards, will initiate a process to evaluate the impacts to ASBSs from vessel discharges and determine whether a prohibition is needed.

IMPACTS ON OPEN OCEAN COASTAL ENVIRONMENT

STRATEGY WQ-5: Ensure the continuation of the long-term data collection efforts under the Mussel Watch program.

Activity 5.1 The Mussel Watch program represents one of the longest term national efforts to track the impacts from nonpoint source pollution on bioaccumulation in the marine environment. Originally spearheaded by NOAA, the state adopted the program and has been a major source of support, although the program has been eroded in recent years by funding cutbacks. Mussel Watch has supplied critical data on the health of coastal, bay, and estuarine waters of the state. The sanctuary should seek to continue this program by taking the following step:

- A. A water quality working group of the sanctuary advisory council should work together with the state to investigate reliable, long-term funding mechanisms to help perpetuate the state's Mussel Watch sampling stations within GFNMS.

ADDITIONAL AREAS TO BE ADDRESSED

STRATEGY WQ-6: *Support a potential water quality working group established by the sanctuary advisory council.*

Activity 6.1 Support a working group of experts representing other agencies and institutions that can advise the sanctuary advisory council on the development and implementation of a comprehensive and cooperative water quality protection plan. The working group will also provide advice on current, new, and emerging water quality issues. Objectives for the working group include:

- A. Develop specific water quality action plans for issues including: agriculture, urban areas, boating and marinas, marine debris, offshore impacts (radioactive materials, shipping, etc.), mining facilities and mariculture.
- B. Provide advice to the sanctuary advisory council for the sanctuary water quality program on current research, management techniques, and issues.
- C. Work with the state and counties on such issues as aging septic systems, discharge from live-aboards, urban runoff, moored vessels, total maximum daily loads (TMDLs), Critical Coastal Areas, agricultural runoff, and freshwater diversion.

STRATEGY WQ-7: *Develop administrative capacity to support a comprehensive and coordinated water quality protection plan.*

Activity 7.1 Hire a full-time water quality specialist/coordinator.

Activity 7.2 Create a water quality seat or ensure representation from water quality interests through agency or other seats on the GFNMS Sanctuary Advisory Council.

STRATEGY WQ-8: *Develop an annotated bibliography of water quality research and monitoring programs in and adjacent to the sanctuary to evaluate data and determine the overall water quality of the sanctuary's ecosystem.*

Activity 8.1 Inventory all short- and long-term water quality research and monitoring programs throughout the sanctuary including estuarine, nearshore, coastal, and open ocean environments to determine status, data gaps, and sanctuary needs. Monitoring is used to determine where water quality is threatened, and also to determine compliance with state and federal law from the CWA to the Porter-Cologne Water Quality Control Act.

- A. Evaluate GFNMS' current monitoring programs that have a water quality component and recommend appropriate changes in order to better address water quality data needs.
- B. Integrate the inventory of water quality research and monitoring programs into a Web-based database or SIMoN.
- C. Assess data needs and make recommendations to other agencies and institutions on data collection gaps.

STRATEGY WQ-9: *Educate local decision makers on land-based water quality impacts in the sanctuary.*

Activity 9.1 GFNMS will partner with the CCC and other agencies and institutions on Nonpoint Education for Municipal Officials (NEMO) to inform decision makers on the link between development/growth and water quality.

- A. Educate elected officials about the link between land use planning and the health of watersheds and coastal waters. Provide up-to-date and accurate information about specific issues and facts that pertain to water quality in the sanctuary.
- B. In areas where development is being planned, facilitate watershed planning and review of local regulations to promote better water quality and watershed protection.

Potential Partners:

Federal: National Park Service (NPS), Army Corps of Engineers, National Marine Fisheries Service (NMFS), United States Coast Guard (USCG), Environmental Protection Agency (EPA), Cordell Bank National Marine Sanctuary (CBNMS), Monterey Bay National Marine Sanctuary (MBNMS), National Oceanographic Data Center (NODC), Office of National Marine Sanctuaries (ONMS), NOAA Coastal Services Center (CSC),

State & County: CA Department of Fish and Wildlife (CDFW), CA Office of Oil Spill Prevention and Response (OSPR), CA State Parks (CSP), Regional Parks, CA Coastal Commission (CCC), California Department of Boating and Waterways (CDBW), State Water Resources Control Board (SWRCB), Regional Water Quality Control Boards (RWQCB), State Health Dept. Harmful Algal Bloom (HAB) Program, UC Sea Grant, UC Cooperative Extension (UCCE), City and County of San Francisco, San Mateo County, Marin County, Sonoma County, Mendocino County, Sonoma County Agriculture Commissioner, Sonoma County Water Agency, Marin Resource Conservation District, SF Bay Conservation and Development Commission, Marin Rural Development Council, Marin Used Oil Program, Sonoma County Water Agency, Marin County Storm Water Pollution Prevention Program

Other: Bodega Harbor District, Bodega Marine Lab, Tomales Bay Watershed Council, Bolinas Bay Watershed Council, Bolinas Lagoon Technical Advisory Committee, Dock Walkers, Farallones Marine Sanctuary Association, Surfrider, Beach Watch, Snapshot Day, First Flush, kayak vendors, Students and Teachers Restoring a Watershed (STRAW)

GFNMS WATER QUALITY

Performance Measures

Strategy Title(s)	Performance Goal	Desired Outcome (Objective)	Outcome Measure	How Measured	Who Measures	Output Measure
STRATEGY WQ-1: Coordinate partnerships in implementing an integrated water quality monitoring program in estuarine and nearshore environments.	Engage in corrective and proactive measures to protect and enhance water quality in the estuarine, nearshore and other environments of the sanctuary.	Develop a regionally-based, cooperative water quality protection plan to address point and nonpoint source water quality impacts.	Collect sufficient data to make informed management decisions specific to protecting sanctuary resources.	1) Complete inventory of existing monitoring programs; identify data gaps; and identify sanctuary needs. 2) Establish collaborative partnership with agencies to create consistency, eliminate duplication, and leverage opportunities.	Ecosystem Protection Coordinator	Inventory (database) of water quality monitoring programs
STRATEGY WQ-2: Address sources of anthropogenic pathogens and pollutants from recreational and commercial boating activities and marinas.	Engage in corrective and proactive measures to protect and enhance water quality in the estuarine, nearshore and other environments of the sanctuary.	Emphasize a watershed/ecosystem approach and address the range of water quality threats from chronic land-based runoff to catastrophic offshore events.	Decrease, and over time, eliminate the discharge of pathogens and pollutants from recreational and commercial boating activities.	1) Become cooperating agency with state addressing the discharge of pathogens and pollutants. 2) Locate sewage waste and oily bilge pumpout stations in strategic locations. 3) Develop education and outreach effort targeting boaters. 4) Track compliance.	Ecosystem Protection Coordinator, Sanctuary Superintendent	1) Kiosk 2) Outreach materials 3) Sewage and bilge pumpout stations

Water Quality Action Plan
GFNMS Draft Management Plan

Strategy Title(s)	Performance Goal	Desired Outcome (Objective)	Outcome Measure	How Measured	Who Measures	Output Measure
STRATEGY WQ-3: Coordinate with other agencies to address land-based discharges into the estuarine and nearshore environments of the sanctuary.	Engage in corrective and proactive measures to protect and enhance water quality in the estuarine, nearshore and other environments of the sanctuary.	Emphasize a watershed/ecosystem approach and address the range of water quality threats from chronic land-based runoff to catastrophic offshore events.	Decrease discharge of land-based pathogens, sediments, nutrients and residual pollutants on estuarine and nearshore environments in the sanctuary.	1) Establish formal relationship with water quality agencies and authorities to implement the state's nonpoint source plan. 2) Take corrective action on enforcement issues related to land-based discharges into the sanctuary. 3) Coordinate with agencies and entities that have developed BMPs on the implementation and evaluation of effective management practices.	Sanctuary Superintendent, Ecosystem Protection Coordinator	1) Outreach and recognition materials related to BMPs 2) Successful prosecution of sanctuary discharge violations 3) Decrease in number of violations
STRATEGY WQ-8: Develop an annotated bibliography of water quality research and monitoring programs in and adjacent to the sanctuary to evaluate if the data are complete enough to determine the overall health of the sanctuary's ecosystem.	Engage in corrective and proactive measures to protect and enhance water quality in the estuarine, nearshore and other environments of the sanctuary.	Develop a regionally-based, cooperative water quality protection plan to address point and nonpoint source water quality impacts.	Ensure data is sufficient to determine where water quality is both threatened, and where there is compliance with state and federal standards.	Inventory all short- and long-term water quality research and monitoring programs to determine status, data gaps and sanctuary needs.	Research Coordinator, Ecosystem Protection Coordinator	Comprehensive annotated bibliography



WILDLIFE DISTURBANCE ACTION PLAN

ISSUE STATEMENT

The pressure on marine wildlife continues to grow as the human population increases around coastal areas and access to nearshore and offshore environments becomes easier. Of specific concern to Gulf of the Farallones National Marine Sanctuary (GFNMS) are wildlife disturbances associated with: harvesting and collecting in tide pools and mudflats; trampling of the intertidal zone; impacts from hikers and beach users, dogs, boaters, and kayakers on birds and marine mammals; entanglements; vessel strikes, acoustic impacts; overflights; activities associated with increasing ecotourism; and the use of attractants or chumming.

ISSUE DESCRIPTION

Wildlife disturbance is caused by direct and indirect factors. Wildlife disturbance may be a result of natural events such as storms, fluctuations in water temperature, or physical/chemical changes to water. Wildlife disturbance may also stem from anthropogenic causes. Of these causes, human interaction with wildlife is the most manageable. Ways in which humans can impact wildlife include observing and feeding wild animals; encroachment on breeding areas and rookeries; collecting tide pool inhabitants; and trampling intertidal habitats.

In 2011, nearly 72 million U.S. residents – 23% of the population 16 years old and older – engaged in wildlife-watching activities such as observing or photographing wildlife. Over 6.5 million Californians watch wildlife, and hundreds of thousands of visitors watch wildlife as part of their travels to the state. California continues to attract more wildlife viewers and associated expenditures than any other state in the nation, and exceeded \$3.7 million in expenditures in 2011. Nature tourism activities in the sanctuary include: wildlife viewing from shore or boat, photography (wildlife and scenery), wildlife viewing from aircraft, beach visitation, kayaking and paddling. California and Florida are the top two states for nature tourism and wildlife viewing.

Attractants have been used for several decades around the Farallon Islands to attract white sharks (which seasonally migrate to the islands every fall primarily to feed on elephant seals) closer to vessels for both ecotourism and research purposes. The definition of “attract or attracting” under sections 922.81 and 922.131 of the NMSA, means conducting or attempting to conduct any activity that lures or may lure any animal in the sanctuary by using food, bait, chum, dyes, decoys (e.g., surfboards or body boards used as decoys), acoustics, or any other means, except the mere presence of human beings (e.g., swimmers, divers, boaters, kayakers, surfers). A

Wildlife Disturbance Action Plan
GFNMS Draft Management Plan

number of studies suggest that the presence of chum may be linked to modification of white sharks' normal swimming and/or hunting behaviors. Thus, minimizing potential disturbances to white sharks during this critical feeding time by limiting the permitted use of attractants is a priority issue for the Sanctuary.

Three major shipping lanes converge in the sanctuary just west of the Golden Gate Bridge at the entrance to San Francisco Bay. The volume of traffic in and out of San Francisco Bay has averaged about 7,000-8,000 vessels arriving and departing from San Francisco Bay over the past decade (See Vessel Spills Action Plan for more information). In recent years, the sanctuary is seeing an increase in cruise ship traffic. Cruise ship visitation to San Francisco Bay more than doubled in two years from 44 in 2002 to 91 in 2004. Since 2004, there has been a slight increase. Between 2008 and 2010, a yearly average of over 100 cruise ships transited in and out of San Francisco Bay, many headed north to destinations in the Pacific Northwest, Canada and Alaska. Although partly constrained by the lack of local docking facilities, cruise ship visits to the area are likely to continue to grow as the fleet shifts from international to more domestic cruises, and due to a new cruise ship docking facility opening in 2014 in San Francisco Bay.

Commercial vessel traffic along the west coast of the continental United States may negatively impact large whales, both through chronic exposure to engine and propeller noise and the increased risk of injuring or killing marine mammals through collisions (ship strikes). Vessels can also potentially alter the behavior of marine mammals and seabirds, changing the distribution of the animals or the amount of time that they spend feeding and/or resting. Several large whale species in the North Pacific are listed as endangered under the Endangered Species Act and depleted under the Marine Mammal Protection Act. Between 2001 and 2010, 44 whale strandings or deaths were reported in Central California, with 10 (about 23%) of these deaths from suspected or verified vessel strike. Protecting these species is a priority issue for the National Oceanic and Atmospheric Administration (NOAA).

SIGNIFICANT RESOURCES

This area of North-central California was selected and designated as the GFNMS because of significant concentrations of the following marine fauna and flora: seabirds and aquatic birds; marine mammals (pinnipeds and cetaceans); fish; marine flora (algae); benthic fauna; and estuarine environments.

The sanctuary has diverse biological communities in close proximity to one another. Habitats within the sanctuary include estuarine, pelagic (open ocean), benthic (sea floor), island, rocky intertidal, and sandy beach. The variety and size of habitats support a high diversity and abundance of species. The sanctuary's habitats are home to a number of species that are federally listed as endangered or threatened. The list includes highly recognized species such as blue and humpback whales, Marbled Murrelets, and Coho and Chinook salmon, as well as lesser-known species such as the tidewater goby and Short-tailed Albatross. Of particular concern to sanctuary management are wildlife disturbance impacts on seabirds, marine mammals, white sharks, and intertidal organisms.

Seabirds

The nesting seabird population is a significant wildlife resource of the sanctuary. The Farallon Islands support the largest concentrations of breeding seabirds in the contiguous United States. These birds forage in the Gulf of the Farallones, and are highly dependent on the productive waters of the sanctuary. Of the 164 species of birds known to occur in the sanctuary, 12 species of seabirds have breeding colonies on the Farallon Islands and feed in the sanctuary. These include Ashy and Leach's Storm Petrels; Brandt's, Pelagic, and Double-crested Cormorants; Western and California Gulls; Common Murres; Pigeon Guillemots; Cassin's Auklets; Rhinoceros Auklets; and Tufted Puffins. Other birds breeding on the Farallon Islands, include Black Oystercatchers, a shorebird, Rock Wren, Common Ravens, and Peregrin Falcons..

Coastal Birds

The sanctuary protects four estuaries, a lagoon, and one large coastal bay that provide foraging habitat for aquatic birds such as waterfowl, shorebirds, pelicans, loons, and grebes. These habitats are pristine compared to most coastal wetlands in California and provide important habitat for thousands of migrating and wintering birds. More than 160 species of birds use the sanctuary for shelter, food, or as a migration corridor. Of these, 54 species are known to use the sanctuary during their breeding season.

Marine Mammals

Thirty-six species of marine mammals have been observed in the sanctuary; six species of pinnipeds (seals and sea lions), twenty-eight species of cetaceans (whales, dolphins, and porpoises), and two species of otter (sea otter and river otter). Many of these animals occur in large concentrations and are dependent on the productive and secluded habitats for breeding, pupping, hauling-out, feeding, and resting during migration. The Farallon Islands provide habitat for breeding populations of five species of pinnipeds, and support the largest concentrations of California sea lions and northern elephant seals within the sanctuary.

Harbor seals breed on the Farallon Islands and on mainland rookeries. The Gulf of the Farallones region contains one-fifth of the California population of harbor seals, which was estimated at 30,000 in 2012. Prior to 1996, northern fur seals had not been known to breed on the Farallon Islands for over 170 years. Since then, the fur seal colony has grown to over 500 individuals, with over 200 pups born on the Farallon Islands every summer. From November to June, thousands of female and immature fur seals migrate through the western edge of the sanctuary along the continental shelf. Of all the marine mammals in the sanctuary, northern fur seals are the most sensitive to oil spills, because they depend largely on their fur for insulation.

Recently delisted from the status of threatened, Steller sea lions occur year-round in the sanctuary. This population has decreased dramatically in the southern part of its range, which includes the Farallon Islands. The decline has amounted to 20 percent of the total population over the past thirty years. The California sea lion is the most conspicuous and widely distributed pinniped in the sanctuary. It is found year-round in the sanctuary with the population increasing

Wildlife Disturbance Action Plan
GFNMS Draft Management Plan

at about 8 to 12 percent each year. The northern elephant seal is the largest pinniped species found in the sanctuary, with a total breeding population in the sanctuary of about 1,700.

Twelve cetacean species are seen regularly in the sanctuary, and, of these, the minke whale, harbor porpoise, Dall's porpoise, and Pacific white-sided dolphin are considered year-round residents. The harbor porpoise is the most abundant small cetacean in the Gulf of the Farallones, with approximately 9,000 porpoises in the central California region.

Gray whales migrate from Alaska southward through the sanctuary from December through February. The northward migration begins at the end of February and peaks in March. A few gray whales remain in the sanctuary during the summer. The sanctuary waters represent critical feeding habitat for endangered species such as blue and humpback whales, which forage here from April through November.

White Sharks

The Gulf of the Farallones region, and in particular the Farallon Islands, is considered to be an important aggregation area for adult and sub-adult white sharks. The waters around Guadalupe Island, which is offshore Baja, Mexico, are the only other location in the northeastern Pacific where adult white sharks are currently known to regularly congregate.

White sharks tend to arrive to the GFNMS management area during the summer months (although white sharks have been sighted year-round throughout the sanctuary) to the nearshore aggregation areas in the vicinity of large pinniped haul-out and breeding colonies between Año Nuevo in San Mateo County, the Farallon Islands, Tomales Point at the north end of the Point Reyes peninsula, and Bodega Headlands in Sonoma County (ONMS, 2010). Around the Farallones and Año Nuevo Island, white sharks primarily feed on pinnipeds (Ainley et al., 1981, Ainley et al., 1985). Near Point Reyes, they appear to be feeding mostly on harbor seals and California sea lions (Anderson et al., 2008).

Generally, white sharks leave the GFNMS management area, migrate into the open ocean during winter months, and tend to remain far offshore into the summer (Boustany et al., 2002; Weng et al., 2007; Jorgensen et al., 2010). It has been found that the sharks from both the north-central California region and from Guadalupe Island tend to regularly migrate to an open ocean region, located between Hawaii and North America and referred to as the "white shark café" or "shared offshore foraging area (SOFA)" (Domeier and Nasby-Lucas, 2008).

Little is known about the white shark's life cycle, particularly when and where they mate, where different populations give birth, and the duration of gestation.

JURISDICTIONAL SETTING

Wildlife disturbance or "harassment" within the sanctuary is governed by a multitude of federal and state laws including the National Marine Sanctuaries Act (NMSA), the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), Migratory Bird Treaty Act, Airborne

Hunting Act and the California Endangered Species Act. Site specific regulations for GFNMS address wildlife disturbance through prohibitions such as: disturbing seabirds or marine mammals by flying motorized aircraft at less than 1,000 feet (location specific); discharging or depositing (with exceptions); and altering the seabed (with exceptions); taking any marine mammal, marine reptile, or seabird; and attracting or approaching white sharks. There are also other state site-specific regulations such as California Special Closures that prohibit vessels from close approaches to specific seabird and marine mammal colonies.

The following is an overview of the relevant federal and state laws and regulations that may apply to wildlife disturbance. This is not a comprehensive review of all wildlife disturbance laws and regulations, and additional regulations could apply. The laws and regulations presented in this section are subject to change.

Federal Law

Endangered Species Act, 16 U.S.C. §§ 1531-1544

The ESA protects plant, fish and wildlife species (and their habitats) that are listed as endangered and threatened. Species are listed as endangered if found to be in danger of extinction throughout all or a significant portion of their ranges; species are listed as threatened if they are likely to become endangered within the foreseeable future. The ESA also protects designated critical habitat for listed species, which are areas of physical or biological features essential to the conservation of the species and which may require special management considerations. The ESA requires federal agencies to consult with USFWS and/or NMFS, as applicable, before initiating any action that may affect a listed species.

Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. § 1801 et seq.

Under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the U.S. claimed sovereign rights and exclusive fishery management authority over all fish, and all Continental Shelf fishery resources, within the Exclusive Economic Zone (EEZ) (within 200 nm [230 miles; 370 km] of the shoreline). The MSA established a procedure for authorizing foreign fishing, and prohibited unauthorized foreign fishing within the EEZ.

The MSA also established national standards for fishery conservation and management within the EEZ, and created eight Regional Fishery Management Councils composed of state officials with fishery management responsibility, the regional administrators of NMFS, and individuals appointed by the Secretary of Commerce who are knowledgeable regarding the conservation and management, or the commercial or recreational harvest, of the fishery resources of the geographical area concerned. The Councils are responsible for preparing and amending fishery management plans for each fishery under their authority that requires conservation and management.

Fishery management plans (FMPs) describe the fisheries and contain necessary and appropriate conservation and management measures, applicable to foreign vessels in U.S. waters and fishing by U.S. vessels. The plans are submitted to the Secretary of Commerce, who has delegated to

Wildlife Disturbance Action Plan
GFNMS Draft Management Plan

NOAA approval of the plans. If approved, NMFS promulgates implementing regulations. NMFS may prepare Secretarial FMPs if the appropriate Council fails to develop such a plan.

(For more information on MSA, see Ecosystem Protection: Impacts from Fishing Activities Action Plan.)

Fish and Wildlife Coordination Act and Implementing Regulations, 16 U.S.C. §§ 661-666c

Any federal agency that proposes to control or modify any body of water must first consult with the USFWS or NMFS, as appropriate, and with the head of the appropriate state agency exercising administration over the wildlife resources of the affected state. The USACE has a memorandum of understanding with the USFWS to provide assistance in planning efforts.

Migratory Bird Treaty Act, 16 U.S.C. § 703 et. seq.

The MBTA is a federal statute that implements US treaties with several countries concerning the conservation and protection of migratory birds. The number of bird species covered by the MBTA is extensive and is listed at 50 CFR 10.13. Further, the regulatory definition of a migratory bird is broad and includes any mutation or hybrid of a listed species, as well as any part, egg, or nest of such bird (50 CFR 10.12). Migratory birds are not necessarily federally listed endangered or threatened under the ESA. The MBTA, which is enforced by the USFWS, makes it unlawful “by any means or manner, to pursue, hunt, take, capture [or] kill” any migratory bird except as permitted by regulation. The applicable regulations prohibit the take, possession, import, export, transport, sale purchase, barter, or the offering of these activities, except as permitted by the implementing regulations.

Marine Mammal Protection Act, 16 U.S.C. §§ 1361-1421h

The MMPA protects and conserves marine mammal species by placing a moratorium on harassing, hunting, capturing, or killing any marine mammal or attempting any of these. If a project proponent determines that an action could incidentally harass (“take”) marine mammals, the proponent must consult with either the USFWS or NMFS to determine if a permit to take a marine mammal is required. A recent redefinition of “take” of an MMPA-protected species occurred under the FY 2004 Defense Authorization Act (House Bill 1588), where an animal is “taken” if it is harassed, and where harassment is defined as “(i) any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild or (ii) any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered” (section 315(f) P.L. 107–314; 16 U.S.C. § 703 note).

Coastal Zone Management Act, 16 U.S.C. §§ 1451-1466

The CZMA encourages states to preserve, protect, develop, and, where possible, restore or enhance valuable natural coastal resources, such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as the fish and wildlife using those habitats. To encourage states

to participate, the CZMA makes federal financial assistance available to any coastal state or territory that is willing to develop and implement a comprehensive coastal management program. Federal agencies are required to carry out activities that affect any land or water use or natural resource of a state's coastal zone in a manner consistent with the enforceable policies of an approved state management plan.

State Laws and Regulations

California Endangered Species Act, California Fish and Game Code §§ 2050-2111.5

The CESA places the responsibility for maintaining a list of threatened and endangered species on the CDFW. The CDFW also maintains a list of candidate species that are under review for addition to either the list of endangered species or the list of threatened species. Pursuant to the requirements of CESA, an agency reviewing a proposed project within its jurisdiction must determine whether any California-listed endangered or threatened species may be present in the project area and determine whether the proposed project will have a potentially significant impact on such species. In addition, the CDFW encourages informal consultation on any proposed project that may affect a candidate species.

Fish and Wildlife Protection and Conservation, California Fish and Game Code §§ 1600-1616

The state's authority in regulating activities in wetlands resides primarily with the CDFW and the SWRCB. The State of California regulates wetlands through the CDFW, which provides comment on USACE permit actions under the Fish and Wildlife Coordination Act. The CDFW may develop mitigation measures and require the preparation of a streambed alteration agreement if a proposed project would obstruct the flow or alter the bed, channel, or bank of a river or stream in which there are fish or wildlife resources, including intermittent and ephemeral streams.

The California legislature gave the Fish and Game Commission the authority to establish State Marine Reserves, State Marine Conservation Areas State Marine Parks, State Marine Recreational Management Areas, and Special Closures as a result of the California Marine Life Protection Act of 1999. The California Fish and Game Commission also has the authority to prohibit or restrict activities that may harm resources, including fishing, collecting, swimming, boating, and public entry. The CDFW also conducts oil spill response, damage assessment, and restoration through its Office of Spill Prevention and Response.

California Code of Regulations, Title 14 Division 1

The Fish and Game Commission has broad authority under Title 14 to establish regulations that afford protection to marine organisms and habitats. Of particular relevance to this DEIS is the eleven Existing Marine Protected Areas (MPAs) in the study area (Title 14, Section 632). MPAs in the study area have been in effect since May 1, 2010.

Wildlife Disturbance Action Plan
GFNMS Draft Management Plan

There are a total of nine State Marine Reserves in GFNMS region: Point Arena, Del Mar Landing, Stewarts Point, Gerstle Cove, Bodega Head, Point Reyes, Estero de Limantour, North Farallon Islands and Southeast Farallon Island. In a state marine reserve, it is unlawful to injure, damage, take, or possess any living, geological, or cultural marine resource, except under a scientific collecting permit or specific authorization from the California Fish and Game Commission for research, restoration, or monitoring purposes.

There are eleven state marine conservation areas in GFNMS: Point Arena, Sea Lion Cove, Saunders Reef, Stewarts Point, Salt Point, Russian River, Bodega Head, Drakes Estero, Point Reyes, Duxbury Reef and Southeast Farallon Island. In a state marine conservation area, it is unlawful to injure, damage, take, or possess any living, geological, or cultural marine resource for commercial or recreational purposes, or a combination of commercial and recreational purposes except as specified. The California Fish and Wildlife Commission may issue scientific collecting permits or specifically authorize research, education, and recreational activities, and certain commercial and recreational harvest of marine resources, provided that these uses do not compromise protection of the species of interest, natural community, habitat, or geological features.

There are three State Marine Recreational Management Areas: the Russian River, Estero Americano and Estero de San Antonio. In a state marine recreational management area, it is unlawful to perform any activity that would compromise the recreational values for which the area may be designated. Recreational opportunities may be protected, enhanced, or restricted, while preserving basic resource values of the area. No other use is restricted unless specified.

California Marine Invasive Species Act, Cal. Pub. Res. Code § 71200 et seq.

(See Introduced Species Action Plan)

California Code of Regulations, Title 2, Division 3, Chapter 1, Article 4.6

Article 4.6 was designed to move the state toward elimination of the discharge of nonindigenous species into the waters of the state or into waters that may impact the waters of the state, based on the best available technology economically achievable. The provisions of Article 4.6 apply to all vessels arriving at a California port or place from another port or place within the Pacific Coast Region. All such vessels shall (1) exchange ballast water in near-coastal waters (more than 50 nm from land and in water at least 200 meters [656 feet, 109 fathoms] deep) before entering the waters of the State if that ballast water was taken on in a port or place within the Pacific Coast Region, (2) retain all ballast water on board, (3) discharge the ballast water to a reception facility approved by the California State Lands Commission (CSLC) or (4) use an alternative, environmentally sound method of ballast water management that has been approved by the CSLC or the USCG.

California Species of Special Concern (CSC): It is the goal and responsibility of the CDFW to maintain viable populations of all native species. The department has designated certain vertebrate species as “species of special concern” because declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction. The goal of

designating species as CSC is to halt or reverse their decline by calling attention to these threats and addressing the issues of concern early enough to secure the species' long-term viability.

California Fully Protected Species: Fully protected species may not be taken or possessed without a permit from the California Department of Fish and Wildlife and/or the CDFW.

WILDLIFE DISTURBANCE GOAL

1. Reduce or eliminate impacts on sanctuary marine wildlife and their habitats by encouraging responsible human behavior.

WILDLIFE DISTURBANCE OBJECTIVES

1. Continually evaluate levels and sources of impacts on wildlife and habitats.
2. Address human behavior that is impacting wildlife and habitats.

WILDLIFE DISTURBANCE ACTION PLAN

STRATEGY WD-1: *Create easily accessible centralized Web-based spatial database to house information pertaining to wildlife disturbance.*

STRATEGY WD-2: *Through the use of volunteer monitoring programs, observe and record impacts from human activities on marine wildlife and key habitats of the sanctuary.*

Activity 2.1 Develop volunteer-based intertidal monitoring program to evaluate human impacts on the intertidal habitat of the sanctuary and measure recovery rates of closed areas. This program will fall under a coordinated and complementary set of volunteer outreach and monitoring programs.

Activity 2.2 Develop volunteer-based coastal and offshore monitoring program to report location and numbers of whales in risk of possible ship strikes. This program will fall under a coordinated and complementary set of volunteer outreach and monitoring programs.

- A. The volunteer-based coastal and offshore whale monitoring program will be implemented through the development of a mobile device application technology to allow stakeholders and the general public to report whale observations to NOAA in near real-time. These observations may be incorporated with a suite of data sets on whale sightings, abundance and distribution, to assist management when establishing potential whale advisory zones or dynamic management areas to better protect whales from ship strike by commercial vessels.

STRATEGY WD-3: *Coordinate with other agencies, institutions and programs to better understand and address anthropogenic noise, light, visual and physical impacts on wildlife from vessels and low flying aircraft.*

Activity 3.1 In coordination with partners, identify types and frequency of impacts on wildlife from motorized and non-motorized aircraft and vessels both inside and outside restriction zones. Close approaches by vessels and low flying aircraft are known to create behavioral changes in wildlife including flushing, stampeding, and abandonment. Information from monitoring programs will help to identify key geographical areas with high disturbance frequency to be targeted for needed outreach and enforcement. Of particular concern are seabird colonies at Point Reyes Headlands, Bolinas Lagoon, Farallon Islands, Bird Rock, and Bodega Rock, Russian River Colony Complex, Fish Rocks, and Gualala Point Island and white sharks around Southeast Farallon Island.

Activity 3.2 In coordination with partners, create a regional monitoring program to better protect whales from commercial vessels in and around the shipping lanes at the entrance to San Francisco Bay. Endangered blue, fin and humpback whales feed within sanctuary waters. Large commercial vessels utilize an internationally approved traffic separation scheme (TSS) when they transit through sanctuaries, heading to and from ports in San Francisco Bay and other major ports in the Pacific Rim. The co-occurrence of these two global populations (whales and ships) in space and time creates an elevated risk of vessel strike, and thus mortality, to whales. High densities of vessel traffic also expose marine mammals to chronic underwater engine and propeller noise. Exposure to this underwater noise can impact the ability of whales to communicate with each other, navigate and forage.

- A. Increase and strengthen partnerships with regional research institutions and management agencies whose programs focus on gathering accurate whale observations, and expedite interpretation of data findings which can be used to support management decisions (i.e. the creation of whale advisory zones, dynamic or seasonal management areas) to reduce the risk to whales in sanctuary waters.
- B. Augment current shoreline and offshore sanctuary monitoring programs that gather data on baleen whale sightings, behavior, age abundance and distribution, so that findings can be rapidly interpreted to support management decisions to reduce the risk of ship strikes to whales in the sanctuary.
- C. Develop data management, interpretation and dissemination protocols to gather, review interpret data from various levels of expertise, e.g. data gathered by the general public, trained naturalists, and marine mammal scientists. Management of data gathered and interpreted from various data sets, e.g. data collected through the mobile application, data gathered from scientists on the Farallon Islands, through sanctuary monitoring programs, and data collected from CDFW and NMFS aerial surveys.
- D. Convene workshop of West Coast marine mammal scientists and managers to recommend criteria for whale advisories and implementation of management measures.

- E. Assess compliance of advisories or regulations to reduce vessel speed and use of dynamic management areas and determine the need for regulatory actions.
- F. The sanctuary and its partners will seek to secure funding to support these programs. Potential funding sources include the Pacific Merchant Shipping Association (PMSA), Chamber of Shipping of America (CSA), private foundations, and others.

Activity 3.3 GFNMS will take an active role in reviewing project proposals that have the potential to introduce harmful levels of sound into the sanctuary environment and will work with project proponents to mitigate impacts and protect sanctuary resources. Impacts on marine resources from noise are of increasing concern with over 6,000 container ships and bulk product carriers passing through the sanctuary on an annual basis; the use of seismic surveys for oil and gas exploration; identification of earthquake faults and activities; and the use of side scan sonar for research. Sound travels approximately five times faster in water than in air, with low frequency sounds traveling the farthest. Low frequency sounds (below 1,000 Hz) are generated by many human activities. Communication by many marine mammals and fish also falls within this range of frequency. Individually and cumulatively, the sound produced by these activities may have significant impacts on the living marine resources of the sanctuary. GFNMS would like to have a better understanding of the long-term and cumulative impacts on marine mammals, fishes and invertebrates.

Activity 3.4 Through the use of permit conditions, reporting requirements, workshops, and/or tracking systems, the sanctuary will identify wildlife disturbance-related research and monitoring programs taking place in the sanctuary and collaborate with these researchers to collect data on wildlife disturbance in the sanctuary.

- A. Coordinate with research partners at CBNMS, Point Blue Conservation Science and PRNS to document, while in the field, wildlife disturbance from vessels and low flying aircraft.
- B. Through SIMoN, identify institutions, principal investigators and actual location of data collection efforts taking place in the sanctuary.
- C. Inform researchers about responsible wildlife interactions, seasonal restrictions, and GFNMS' and other agency regulations.
- D. Use SIMoN to identify potential partnerships and opportunities to collect data on wildlife disturbance.
- E. Develop standardized data reporting system, including standardized protocols, for researchers to record wildlife disturbance observations and combine with data from monitoring programs (see also Activity WD-3.1C).

***Wildlife Disturbance Action Plan
GFNMS Draft Management Plan***

- F. As appropriate, request data sets from researchers to include in SIMoN for use by natural resource managers in addressing wildlife disturbance issues, to be submitted through an on-line reporting system.

Activity 3.5 Evaluate emerging scientific studies delineating the impacts of anthropogenic noise, light and visual and physical disturbance including vessel traffic, seismic surveys for hydrocarbon exploration and other industrial and governmental activities impacting sanctuary resources.

- A. Conduct a literature search, including grey literature, and develop an annotated bibliography.
- B. Coordinate with research partners to document anthropogenic noise, light and visual and physical disturbance in the Sanctuary.

STRATEGY WD-4: *Through interpretive enforcement and law enforcement efforts, address human behavior that may adversely impact wildlife.*

Activity 4.1 Using existing volunteer outreach and monitoring programs, develop a coordinated and complementary set of interpretive enforcement efforts to address human behavior and its impacts on sanctuary wildlife. Interpretive enforcement is intended to be a proactive and a preventative method to avert potential negative impacts from human behavior before they occur.

- A. Create a new interpretive enforcement program to address impacts from human trampling and harvesting on rocky intertidal habitats. Based on Fitzgerald Marine Reserve's (FMR) Roving Intertidal Docent Program, a similar volunteer-based program will be expanded to address trampling and harvesting on sensitive and high traffic areas such as Salt Point, Sea Ranch, Duxbury Reef and Pillar Point beach in MBNMS.
- B. Develop and distribute wildlife viewing guidelines (posters, informational cards, brochures) to target audiences including: kayakers; whale watching boats (based on Watchable Wildlife and Hawaiian Islands Humpback Whale National Marine Sanctuary [HIHWNMS] guidelines); and private boaters (including recreational and commercial boats).
- C. Develop interpretive enforcement/outreach program targeting pilot organizations, flight schools, flight clubs, aviation publications and airports.

Activity 4.2 Develop a coordinated and cooperative Protected Resource Enforcement Plan to ensure sufficient patrol presence in the sanctuary.

- A. Through the development of partnerships and interagency cooperation, assess the potential to create a cross-deputization program with the CDFW, U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration (NOAA) Fisheries, and the National Park Service (NPS).

- B. Train enforcement officers in interpretive enforcement and sanctuary regulations.
- C. Maintain an active enforcement relationship with the United States Coast Guard (USCG), the United States Coast Guard Air Patrol Auxiliary and the Civil Air Patrol (CAP).
- D. Hire a dedicated sanctuary enforcement officer.
- E. Investigate the potential for training volunteer uniformed interpretive enforcement officers.

STRATEGY WD-5: *Develop wildlife viewing guidelines to reduce disturbance to wildlife from human interactions.*

Activity 5.1 Conduct an assessment of target audiences to determine appropriate messaging, products and avenues for communicating to wildlife viewers about responsible interactions with wildlife. Wildlife viewing guidelines will be developed in concert with NOAA’s *Responsibly Watching California Marine Life* handbook and the National Ocean Etiquette program. The Ocean Etiquette program is a partnership between NOAA, other federal and state agencies, and non-profit organizations. This program is directed at the public and commercial operators to educate them about safe and responsible wildlife viewing, pertaining specifically to marine species and habitats. Other wildlife viewing models to be considered include: Paddler’s Etiquette, The Marine Mammal Center’s Stranded Mammal Etiquette and Marine Mammal Viewing Guidelines, and Audubon’s Standards for Bird Viewing.

- A. Develop viewing guidelines and outreach materials for boaters based on species-specific behavioral responses and vessel approach and speed guidelines (to be consistent with whale watching guidelines and the National Ocean Etiquette Program).
 - 1. Develop volunteer program based on *Dockwalkers* model to reach boaters at harbors and marinas.
 - 2. Develop kiosk at key harbors to display wildlife viewing guidelines and animal identification cards.
 - 3. Reach boaters through vessel registration with Department of Motor Vehicles and through harbors and marinas.
- B. Develop wildlife watching guidelines based on the National Etiquette program and Hawaiian Islands Humpback Whale National Marine Sanctuary’s guidelines for commercial operators.
 - 1. Hold workshops for wildlife watching operators.
 - 2. Develop responsible wildlife viewing certification program for wildlife watching boats.
- C. Continue and expand distribution of Paddler’s Etiquette and develop complementary outreach tools such as signage and animal identification cards.
 - 1. Hold workshops for kayak vendors.

***Wildlife Disturbance Action Plan
GFNMS Draft Management Plan***

- D. In coordination with the Ocean Etiquette program, develop wildlife viewing and interaction guidelines for shoreline observers addressing shorebirds, marine mammal strandings, and trampling and harvesting in the rocky intertidal zone.
- E. Develop guidelines for wildlife interactions for researchers conducting research in the sanctuary.
 - 1. Include outreach materials in research permit package.
 - 2. Distribute outreach materials to other agencies and institutions conducting research in the sanctuary that does not require a permit.
 - 3. Review permit conditions for consistency with wildlife viewing guidelines.

STRATEGY WD-6: Maximize media venues to augment directed outreach efforts and increase public awareness of wildlife disturbance issues.

Activity 6.1 In conjunction with partners, develop a media communications plan to address wildlife disturbance issues.

- A. Identify target audiences.
- B. Work with partners on joint media messaging.
- C. Develop boilerplate messaging format for planned media communications and to be prepared for unplanned/emergency events (reactive) media coverage.
- D. Develop wildlife disturbance media kit.
- E. Identify opportunities for cooperative marketing efforts with other agencies and organizations.

STRATEGY WD-7: Coordinate the Seabird Protection Network aimed at improving the survival and recruitment of seabird colonies by reducing and eliminating human disturbances at seabird breeding and roosting sites throughout California.

Activity 7.1 In coordination with partners, provide appropriate education and outreach to government agencies and ocean and coastal users on the macro level by targeting organized events, association meetings, conferences, air and boat shows and ecotourism vendors; and on the micro level with individuals including pilots, researchers, rangers, sea kayakers, coastal recreational users, commercial and recreational fishermen, whale watchers and students. Breeding and roosting seabird populations are significant wildlife resources of the California coast and the protection of seabird populations and habitats were a critical consideration in the sanctuary's designation.

- A. Use colony monitoring and surveillance data to identify key audiences and venues.
- B. When necessary, establish working groups to advise the Seabird Protection Network on any one of its primary project components (Education, Coordinated Management and Enforcement, and Monitoring).

STRATEGY WD-8: Coordinate the White Shark Stewardship Program to protect and conserve the white shark population that utilizes the sanctuary.

Activity 8.1 Through the use of permit conditions, reporting requirements, naturalist trainings and workshops, various monitoring programs, and community outreach the sanctuary will identify potential disturbances to white sharks and work with partner agencies, researchers, and the community to minimize these disturbances, including:

- A. Review current statutes, authorities, regulations and agency jurisdictions pertaining to managing and protecting white sharks, determine what regulations need better enforcement and what geographic areas are subject to regulations, and whether or not additional or amended regulations are required.
- B. Require naturalist trainings for white shark tour operators and conduct public and boater outreach efforts to foster stewardship of the local population of white sharks and enhance compliance with sanctuary regulations.
- C. Evaluate emerging scientific information on potential impacts of anthropogenic activities on white sharks (such as using attractants) by conducting literature reviews and coordinating with other resource management agencies and the scientific community in order to better evaluate management decisions within the sanctuary.
- D. Maintain long-term monitoring to document disturbance and/or effectiveness of regulatory action and enforcement program.
- E. Work with enforcement agencies on the federal, state and local level to encourage active enforcement of laws and regulations that protect white sharks, and to promote a coordinated law enforcement effort.
- F. Develop national and international partnerships and agreements with other regions that have significant white shark populations to better understand potential disturbances and management concerns.

Potential Partners:

Federal: NOAA Coastal Services Center, Office of National Marine Sanctuaries (ONMS), Golden Gate National Recreation Area (GGNRA), Point Reyes National Seashore (PRNS), United States Fish and Wildlife Service (USFWS), US Coast Guard, Monterey Bay National Marine Sanctuary (MBNMS), Cordell Bank National Marine Sanctuary (CBNMS), National

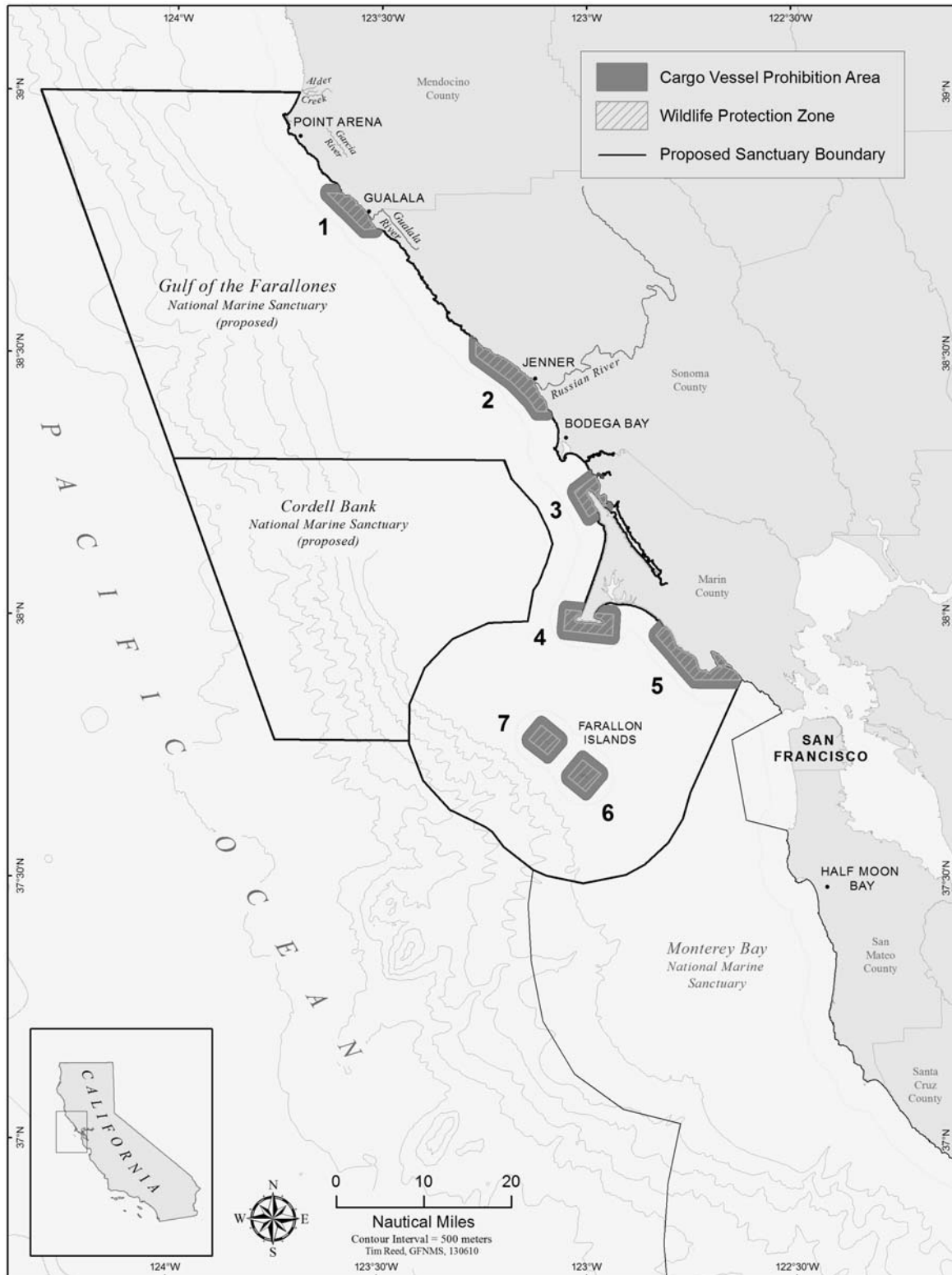
Wildlife Disturbance Action Plan
GFNMS Draft Management Plan

Marine Fisheries Service, NOAA Office of Law Enforcement, Federal Aviation Administration, Bureau of Land Management,

State & County: CA Dept. of Fish and Wildlife, Fitzgerald Marine Reserve (FMR), Bodega Marine Laboratory (BML), CA State Parks, California Department of Boating and Waterways (CDBW),

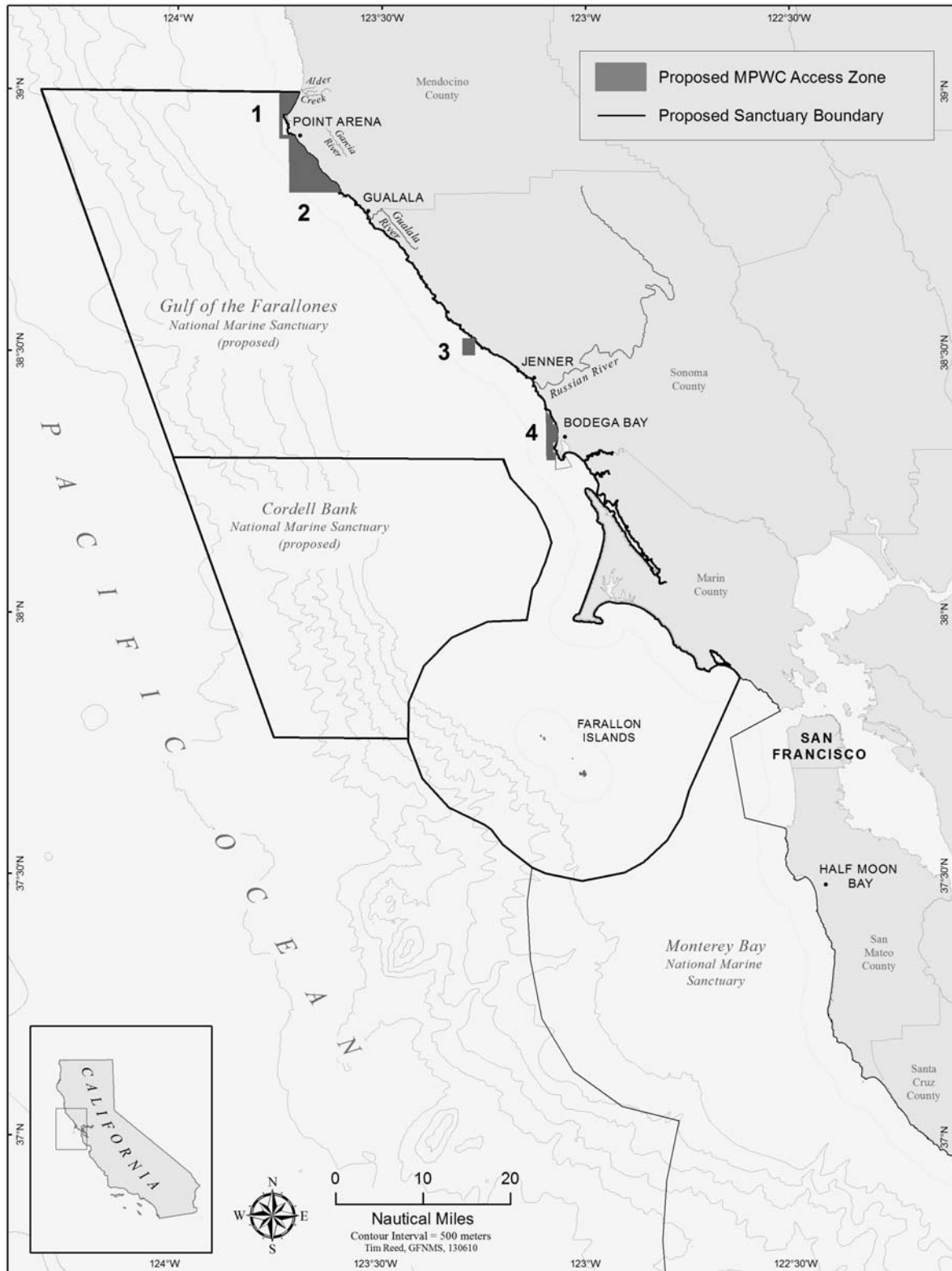
Other: Farallones Marine Sanctuary Association (FMSA), Earth NC/Conserve IO, Pacific Merchant Shipping Association (PMSA), Chamber of Shipping of America (CSA), Point Blue Conservation Science, The Marine Mammal Center (TMMC), Harbor Patrol, Coast Guard Auxiliary, San Francisco (SF) Ad Council, Coast Guard Auxiliary, Stewards of the Coast and Redwoods, Sea Ranch Task Force, and the Reserva de la Biosfera Isla Guadalupe.

Proposed Wildlife Protection Zone Map



Proposed Motorized Personal Watercraft Access Zone Map
GFNMS Draft Management Plan

Proposed Motorized Personal Watercraft (MPWC) Access Zone Map



GFNMS WILDLIFE DISTURBANCE

Performance Measures

Strategy Title(s)	Performance Goal	Desired Outcome (Objective)	Outcome Measure	How Measured	Who Measures	Output Measure
STRATEGY WD-2: Through the use of volunteer monitoring programs, observe and record impacts from human activities on marine resources and key habitats such as the rocky intertidal.	Lessen or eliminate, and remedy impacts on the living marine resources of the sanctuary and their habitats by encouraging responsible human behavior.	Continually evaluate levels and sources of impacts on wildlife and habitats.	1) Increase sanctuary management and the public's understanding of the effects of human disturbance on key habitats and recovery rates. 2) Increase recovery of trampled intertidal habitat.	1) Complete design and implementation of volunteer monitoring program to evaluate impacts and recovery rates. 2) Use results of monitoring program to manage human impacts on rocky intertidal habitats in the sanctuary.	Research Coordinator, Education Coordinator, Ecosystem Protection Coordinator	Report on intertidal monitoring program findings
STRATEGY WD-4: Through the use of interpretive and law enforcement efforts, address human behavior that may be adversely impacting wildlife. STRATEGY WD-5: Develop wildlife viewing guidelines to reduce disturbance to wildlife from human interactions. STRATEGY WD-6: Maximize venues to augment directed outreach efforts and increase public awareness of wildlife disturbance issues.	Lessen or eliminate, and remedy impacts on the living marine resources of the sanctuary and their habitats by encouraging responsible human behavior.	Address human behavior that is impacting wildlife and habitats.	1) Increase awareness and change behavior of humans to lessen impacts while interacting with wildlife. 2) Reduce the number of disturbances to wildlife.	Monitor human interactions with wildlife to determine effectiveness of outreach and enforcement in affecting behavior.	Ecosystem Protection Coordinator, Education Coordinator	1) Technical data summaries 2) Fine-scaled seasonal distribution maps 3) Annual report of observed wildlife disturbances and sources of disturbance



INTRODUCED SPECIES ACTION PLAN

ISSUE STATEMENT

Introduced species have been identified in and around Gulf of the Farallones National Marine Sanctuary (GFNMS) waters and have the potential to cause ecological and economic degradation to the affected coastal areas. If detection, prevention, and eradication efforts are not taken, further introduction and spread of introduced species will continue in and adjacent to the sanctuary and potentially impact sanctuary wildlife and habitats. Current levels, in terms of abundance and diversity of introduced species are not well documented; nor are the impacts, existing or potential, well understood.

ISSUE DESCRIPTION

In the context of GFNMS, introduced species in the marine/estuarine environment are defined as (1) a species (including any of its biological material capable of propagation) that is non-native to the ecosystem(s) protected by the sanctuary; or (2) any organisms into which genetic matter from another species has been transferred in order that the host organism acquires the genetic traits of the transferred genes. GFNMS is close to San Francisco Bay, which is considered the most invaded aquatic ecosystem in the world, with over 255 introduced species. Indications are that introduced species are the greatest threats to rare, threatened, or endangered species in this country, thought to be second only to habitat destruction. In general, introduced species in the marine/estuarine environment alter species composition; threaten the abundance and/or diversity of native marine species; interfere with the ecosystem's function; and disrupt commercial and recreational activities. Although several introduced species have been identified in the bays and estuaries throughout the range of GFNMS, a complete inventory is currently underway and has not been completed.

Nearshore discharge of ballast water is a common source of introduced species. Many organisms carried in ballast water are in the larval or diapause stage of their life cycle. Once discharged, estuaries and harbors provide optimal environments for the growth of these organisms. Viruses, bacteria, and other pathogens have also been identified in ballast water. With over 45,000 commercial cargo ships (4,000 vessels entering or exiting San Francisco Bay per year) transporting 10 billion tons of ballast water around the globe every year, the rate of introduced species will be certain to grow if efforts to prevent introductions do not occur.

Introduced species may also be transported on commercial and recreational vessel hulls, rudders, propellers, intake screens, ballast pumps, and sea chests. Other vectors for the spreading of

introduced species include recreational and research equipment, debris, dredging and drilling equipment, dry docks, and buoys. Organisms transported or used for research, restoration, educational activities, aquarium activities, live bait, aquaculture, biological control, live seafood, and rehabilitated and released organisms also have the potential for accidental or intentional release into the marine/estuarine environment. Of additional concern are genetically modified species that either escape or are released into nearshore or open ocean environments.

JURISDICTIONAL SETTING

The following is an overview of the relevant federal and state laws and regulations that may apply to introduced species. This is not a comprehensive review of all laws and regulations related to introduced species, and additional regulations could apply. The laws and regulations presented in this section are subject to change.

International Law

Guidelines for the Control and Management of Ships' Ballast Water to Minimize the Transfer of Harmful Aquatic Organisms and Pathogens Resolution A.868(20)–Nov. 20, 1997

These guidelines were developed by the International Maritime Organization (IMO), and outline the techniques for minimizing introductions from cargo ship ballast discharge.

International Council for Exploration of the Sea (ICES) Code of Practice Concerning Introductions and Transfers of Marine Species

A regulatory framework for member states to use in managing the introduction of non-native species. This Code of Practice is continually modified to incorporate new scientific knowledge.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

CITES was developed by the United Nations and signed by the U.S. in 1975. It is designed to restrict trade in listed species to protect depletion in the habitat of origin.

International Plant Protection Convention (IPPC)

IPPC was developed by the United Nations and signed by the U.S. in 1972 with 94 other countries. It is designed to prevent the introduction and spread of agricultural pests.

Federal Law

Executive Order 13112, February 1999

This Executive order directs federal agencies to prevent the introduction of invasive species and provide for their control; establishes the Invasive Species Council and directs them to write an invasive species management plan within eighteen months.

National Invasive Species Act, P. Law 104-332

NISA requires open water exchange (OWE) of ballast water and mandatory ballast management plans and reporting. It also required the development of voluntary ballast management guidelines for all ships entering US waters. The law also requires all vessels that enter US territorial waters (with certain exemptions) to manage ballast water according to prescribed measures. NISA also required the US Coast Guard (USCG) to evaluate the effectiveness of the voluntary ballast management program three years after implementation. In 2004, voluntary guidelines were determined to be ineffective, and thus USCG initiated mandatory ballast management for all ships entering U.S. waters from outside the Exclusive Economic Zone (EEZ) of the United States.

At the federal level, both the USCG and the EPA regulate ballast water discharges. Both agencies currently require ballast water exchange for the majority of vessels operating in U.S. waters. However, the USCG issued a final rule in 2012 establishing performance standards for ballast water discharges that will be implemented during the remainder of this decade. These performance standards are currently aligned with the IMO standards contained within the BWM Convention and include a standard that operators must avoid exchanging ballast water within a National Marine Sanctuary. The EPA regulates ballast water under the Vessel General Permit for Discharges Incidental to the Normal Operation of Vessels (VGP), through authority contained within the Clean Water Act.

At the U.S. state level, several states have used their authority under the Clean Water Act to add additional requirements into the VGP when vessels operate in their state waters, however California has been granted the authority by their state legislature to regulate ballast water independent of the Clean Water Act. The California regulations provide additional protections against the introduction of introduced species through the release of ballast water throughout GFNMS waters.

Title 50, U.S. Code of Federal Regulations; 58976-58981, 1993

This law is enforced by U.S. Fish and Wildlife Service, Dept. of Interior, prohibiting importation of specific disease agents of salmonid fish.

Federal Noxious Weed Act of 1974 (amended 1990), Federal Plant Pest Act (1957) and Plant Quarantine Act (1912)

These Acts give the U.S. Dept. of Agriculture the authority to regulate the movement of plants, plant products, plant pests, and their vectors. Also regulates the introduction of genetically engineered organisms.

State Law

California Marine Invasive Species Act, Cal. Pub., Res. Code § 71200 et seq.

The California Marine Invasive Species Act of 2003 applies to all vessels, United States and foreign, carrying, or capable of carrying, ballast water into the coastal waters of the state after operating outside of the coastal waters of the state, except vessel of the armed forces or a foreign vessel merely traversing the territorial sea of the United States and not entering or departing a United States port, or not navigating the internal waters of the United States, and that does not discharge ballast water into the waters of the state, or into waters that may impact waters of the state. It requires mid-ocean exchange or retention of ballast water for vessels coming from outside the EEZ and requires vessels coming from other west coast ports to minimize ballast water discharge. Record-keeping and other compliance measures apply to all vessels entering California waters.

California Code of Regulations, Title 2, Division 3, Chapter 1, Article 4.6

Article 4.6 was designed to move the state toward elimination of the discharge of nonindigenous species into the waters of the state or into waters that may impact the waters of the state, based on the best available technology economically achievable. The provisions of Article 4.6 apply to all vessels arriving at a California port or place from another port or place within the Pacific Coast Region. All such vessels shall (1) exchange ballast water in near-coastal waters (more than 50 nm from land and in water at least 200 meters [656 feet, 109 fathoms] deep) before entering the waters of the State if that ballast water was taken on in a port or place within the Pacific Coast Region, (2) retain all ballast water on board, (3) discharge the ballast water to a reception facility approved by the California State Lands Commission (CSLC) or (4) use an alternative, environmentally sound method of ballast water management that has been approved by the CSLC or the USCG.

Hundreds of federal programs, state organizations, international organizations and non-profit organizations have established databases, community outreach, monitoring, eradication, research and education programs. Additionally, industry is working on a number of physical, biological and chemical means of treating or controlling organisms in ballast water.

INTRODUCED SPECIES GOALS

Maintain an abundance and diversity of native marine/estuarine species:

1. Prevent future introductions of introduced species in the sanctuary.
2. Detect, manage, and where feasible, eradicate new and established introduced species in the sanctuary.

INTRODUCED SPECIES OBJECTIVES

1. Understand the current extent of introduced species in GFNMS.
2. Create a new program and/or coordinate with existing programs to detect and monitor new introductions.
3. Develop management actions to eradicate and/or control existing and new introductions.
4. Identify and control current and potential pathways to prevent new introductions.

INTRODUCED SPECIES ACTION PLAN

STRATEGY IS-1: *Develop a native and introduced species inventory and database specifically for GFNMS and areas adjacent to the sanctuary.*

Activity 1.1 Although efforts are being made by California Department of Fish and Wildlife (CDFW), Smithsonian, and others to create a centralized database, there has been no effort to profile and maintain a database specifically on the extent of introduced species in and adjacent to GFNMS. In order to understand the current extent of introduced species in the sanctuary, the following steps will be taken:

- A. As a component of STRATEGY FA-1, update current species list and integrate introduced species into this list. Perform a species abundance and distribution assessment, and an all-taxa inventory (species inventory) through a meta-analysis (identifying existing literature, specimens, and data).
- B. Perform an introduced species inventory literature search (mostly grey literature) and develop an annotated bibliography. Where possible, collect documents and catalog in library.
- C. Identify data gaps for native and introduced species (areas surveyed) inventories, particularly focusing on the outer coast. Address data gaps by working with researchers and partner organizations.

Activity 1.2 Develop an easily accessible and queryable database to be used by sanctuary superintendent, staff, researchers and other agencies and institutions.

- A. Create a centralized Web-based spatial database on SIMoN or as a PDF portfolio for mapping species abundance and distribution and spatial extent of introduced species, focusing on areas of concern such as Estero Americano and Estero de San Antonio. Database will identify potential areas of highest likelihood of invasion.
- B. Ensure compatible database protocols by investigating existing database structures.

STRATEGY IS-2: *In coordination with existing monitoring programs, develop a program to detect introduced species in estuarine environments of the sanctuary.*

Activity 2.1 Currently, there are no formal introduced species monitoring programs for estuaries in the sanctuary (Bolinás Lagoon, Tomales Bay, Estero de San Antonio, and Estero Americano). Monitoring efforts are taking place in estuarine environments in and around the sanctuary, such as PRNS's all-taxa inventory of Tomales Bay, although not specifically focused on introduced species. GFNMS will work with other agencies and institutions to incorporate introduced species identification and monitoring into existing monitoring programs. Ensuring continuous monitoring in coordination with other agencies will include the following steps:

- A. Formalize partnerships with agencies/institutions currently conducting monitoring programs in Tomales Bay and Bolinas Lagoon.
- B. Develop an introduced species monitoring program for Estero Americano and Estero de San Antonio (in conjunction with other sanctuary monitoring programs, such as water quality, to be developed).
- C. Adopt standardized protocols from Smithsonian Environmental Research Center (SERC).
- D. Consult with the sanctuary Introduced Species Technical Advisory Council (see STRATEGY IS-6) for advice on frequency of monitoring. Also, conduct random characterization on rotational basis.
- E. Feed data into sanctuary's centralized database (STRATEGY WD-1), as well as other regional and national databases.

Activity 2.2 Develop guidelines for new estuarine monitoring programs for introduced species, such as:

- A. Target known invasives, new invasives, and those with likelihood of being established.
- B. Conduct an annual survey of representative areas, high profile areas (high visibility), and conservation areas.
- C. Track other areas in the region to identify potential future introduced species.
- D. Understand the life history and tolerances of already introduced species in the region.

STRATEGY IS-3: *Develop a monitoring program to detect and monitor introduced species in the rocky intertidal areas of the sanctuary.*

Activity 3.1 Ongoing since 1992 (with the exception of two years), the GFNMS' rocky intertidal monitoring program's goals are to: (1) monitor trends in population dynamics of selected indicator organisms; (2) determine normal levels of variation; (3) discover abnormal conditions; and (4) measure the effects of management actions. Data indicate changes from natural events

such as El Nino on the study species, the varied distribution of species, and the influences that habitat has on the abundance of species. The study includes island and mainland sites. GFNMS' rocky intertidal monitoring program can be modified to identify and track introduced species as follows:

- A. Identify additional representative coastal sites to be monitored for introduced species.
- B. Adopt standardized protocols from SERC and Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) for monitoring introduced species.
- C. Consult with sanctuary Introduced Species Technical Advisory Council for advice on frequency of monitoring. Also, conduct random characterization on rotational basis.
- D. Feed data into the sanctuary's centralized database (see Strategy WD-1),, as well as other regional and national databases.

Activity 3.2 In adding onto GFNMS' existing intertidal monitoring program to look for introduced species, and in coordinating with other agencies' rocky intertidal monitoring programs, the following steps will be taken:

- A. Target known invasives, new invasives, and those with the likelihood of being established.
- B. Conduct an annual survey of representative areas, high profile areas, and conservation areas.
- C. Track other areas in the region to see what is being introduced, and what to start watching for possible new introductions into the sanctuary.
- D. Understand the life history and tolerances of already introduced species in the region.
- E. Identify the top ten introduced species the sanctuary would like other intertidal monitoring programs to target.
- F. Coordinate with other agencies on protocols.

STRATEGY IS-4: *Develop a monitoring program to detect and monitor introduced species in the pelagic environment of the sanctuary.*

Activity 4.1 Introduced plankton species entering San Francisco Bay (and potentially adjacent areas) may already be present in the open ocean (presumably, primarily from ballast water). Although this does not necessarily mean that plankton present in the open water will establish itself in the bay (as some species are benthic while others pelagic), it may provide an indication of the presence of an introduced species. One component of the GFNMS' Sanctuary Ecosystem Assessment Surveys (SEA Surveys) is to assess biological productivity (chlorophyll-a;

***Introduced Species Action Plan
GFNMS Draft Management Plan***

phytoplankton species inventory; euphausiid abundance and distribution; distribution/ abundance of jellyfish; assessment of drift algae). Without any additional effort by the sanctuary, SEA's plankton tows and Harmful Algal Bloom assessments will be used to sample for introduced species.

- A. Since plankton samples are already being collected, detection of introduced species would not require modifications to the sampling protocol, but would require additional analysis to identify introduced species within the sample. GFNMS will coordinate with San Francisco State University's (SFSU) Romberg Tiburon lab to analyze plankton samples and identify introduced species.

STRATEGY IS-5: Develop an outreach and monitoring program to improve early detection of introduced species.

Activity 5.1 Since most introduced species are accidental finds, GFNMS will develop an early detection program to widely disseminate information about introduced species to local citizens and visitors who frequent areas of the sanctuary where invaders could become established. Using Elkhorn Slough National Estuarine Research Reserve's (ESNERR) *Least Wanted Aquatic Invaders Programs* model, the sanctuary will partner with other agencies to develop a similar program. Steps to develop this program include:

- A. Identify other agencies with which to develop a cooperative partnership.
- B. Identify two dozen "least wanted" invaders. These are species that are not yet present in GFNMS, but have successfully invaded other coastal regions; are colonizing and increasing in abundance; and are spreading rapidly. Species will be chosen based on significance of size and obvious characteristics that provide the ability for them to be easily identified by non-experts.
- C. Develop outreach materials with clear messaging and photos or illustrations for easy identification of the top twelve potential invaders.
- D. Develop agency staff training program so outreach and field personnel may effectively engage the public in early detection of introduced species.

STRATEGY IS-6: Develop partnerships with other agencies and organizations that are involved in issues related to introduced species to advise the sanctuary.

Activity 6.1 Develop a Technical Advisory Committee of agency experts to advise the sanctuary on coordinated introduced species management issues. This group would meet on an as needed basis and may coordinate with SAC working groups as needed.

Activity 6.2 Work with the West Coast Region to identify a regional representative of the California sanctuaries (GFNMS, CBNMS, MBNMS, CINMS) to sit on CalFed's Non-native Invasive Species Advisory Committee (NISAC). The regional representative's role is to communicate the sanctuaries' interests, needs, and efforts in addressing introduced species

issues. The representative will also be in attendance to listen and learn from experts in the field of introduced species and identify potential partners.

STRATEGY IS-7: *Develop a rapid response plan and streamlined permit process in order to respond in a timely manner to necessary eradication or control efforts in the sanctuary.*

Activity 7.1 Take the lead in coordinating with other agencies in the development of a rapid response plan to eradicate or control existing or new introductions in, or in areas adjacent to, the sanctuary.

- A. Examine existing models such as the Western Regional Plan or Southern California Caulerpa Action Team (SCCAT) to use as a template for developing a rapid response plan.
- B. Establish a rapid response team consisting of agency representatives actually responsible for responding in an emergency situation.
- C. Develop and execute mock training exercises.
- D. Develop a manual that outlines a rapid response fire alarm approach.
 - 1. Identify twelve new likely invaders (habitats, pathways, probable sites)
 - 2. Develop a separate response plan for each species
 - 3. Test the notification scheme (phone tree)
 - 4. Clarify and have approval on the “authority to act” agency ownership
 - 5. Identify stakeholder team, how will they be engaged, and who will notify them
 - 6. Identify the pool of experts (needs to be large), who, where, what kind of availability and expertise (eradication, management, biology, habitats, etc.)
 - 7. Formalize each part of the plan as a document and identify lead agency
 - 8. Form intervention team to carry out eradication or control effort in the field
- E. Review relevant laws, regulations, and policies to determine necessary permits that might be required in order to perform.
- F. Test all components of the rapid response plan.

STRATEGY IS-8: *Take action to control new introductions of introduced species.*

Activity 8.1 Work with the State Water Resource Quality Board to include in the definition for “impaired waters” those areas where introduced species have been identified. Section 303(d) of

***Introduced Species Action Plan
GFNMS Draft Management Plan***

the Clean Water Act requires the states submit to EPA a list of water bodies that do not meet water quality standards for specific pollutants (i.e., are “impaired”).

Activity 8.2 Request the reporting of all research activities in the sanctuary to determine: (1) the types of activities taking place that might accidentally introduce invasive species; and (2) understand who may be doing research or monitoring of introduced species.

STRATEGY IS-9: *Through outreach efforts, inform targeted audiences and industry about pathways through which introduced species may enter the sanctuary and educate those targeted audiences on prevention methods.*

Activity 9.1 Develop a targeted prevention program (other than the shipping industry, as ballast water is already being targeted).

- A. Identify and categorize potential vectors associated with introductions within and adjacent to the sanctuary.
- B. Identify audiences including: recreational and commercial boat users and fishermen; landscapers; adjacent residential homeowners; restaurants; aquarium stores; aquaculture industry; and bait shops.
- C. Identify and incorporate applicable features of existing outreach programs (e.g., Great Lakes Sea Grant) into the development of a program for the sanctuary.
- D. Develop messaging and method of delivery and integrate into other sanctuary outreach materials and education programs.

Potential Partners:

Federal: Point Reyes National Seashore (PRNS), Golden Gate National Recreation Area (GGNRA), NSF Integrative Graduate Education and Research Traineeship Program (IGERT) Intern Program, The National Centers for Coastal Ocean Science (NCCOS), National Marine Fisheries Service (NMFS), United States Fish and Wildlife Service (USFWS), San Francisco Bay National Estuarine Research Reserve (SFBNERR), Farallon National Wildlife Refuge, U. S. Environmental Protection Agency (EPA), United States Coast Guard (USCG), Office of National Marine Sanctuaries (ONMS), MBNMS Sanctuary Integrated Monitoring Network (SIMoN), BOEM (MARINe)

State & County: CA Department of Fish & Wildlife, SWRCB, Regional Water Quality Control Board (RWQCB), Marin Open Space, California Coastal Conservancy, University of California Davis (UCD), California State Lands Commission (CSLC), Sonoma County Water Agency, Sonoma State University, Sonoma County Water Agency, Sonoma Coast State Parks, CalFed, Bodega Marine Laboratory (BML), PISCO, SFSU, Marin Open Space, SFSU Romberg Tiburon Center, State Department of Public Health

Other: Audubon, Smithsonian, Point Reyes National Seashore Association (PRNSA), Point Blue Conservation Science, California Academy of Sciences, Berkeley Herbarium, Monterey Bay Aquarium Research Institute (MBARI)

***Introduced Species Action Plan
GFNMS Draft Management Plan***

GFNMS INTRODUCED SPECIES

Performance Measures

Strategy Title(s)	Performance Goal	Desired Outcome (Objective)	Outcome Measure	How Measured	Who Measures	Output Measure
STRATEGY IS-1: Develop a native and introduced species inventory.	Maintain an abundance and diversity of native marine/estuarine species: Detect, manage, and where feasible, eradicate new and established introduced species in the sanctuary.	Understand the current extent of introduced species in GFNMS.	To develop a spatial distribution of native species and introduced marine and estuarine species.	1) Complete native and introduced species inventory. 2) Maintain a database on the extent of introduced species in and adjacent to GFNMS. 3) Effectively use inventory as management decision-making tool to control further introductions.	Research Coordinator, Sanctuary Superintendent, Ecosystem Protection Coordinator	1) Native species inventory and introduced species inventory 2) Spatial Web-based database and GIS map of invasives
STRATEGY IS-2: Develop a program to detect introduced species in estuarine environments of the sanctuary. STRATEGY IS-3: Develop a monitoring program to detect introduced species in the rocky intertidal areas of the sanctuary. STRATEGY IS-4: Develop a monitoring program to detect introduced species in the pelagic environment of the sanctuary.	Maintain an abundance and diversity of native marine/estuarine species: Detect, manage, and where feasible, eradicate new and established introduced species in the sanctuary.	Create a new program and/or coordinate with existing programs to detect and monitor new introductions.	To detect, and thus improve ability to prevent, colonization or spatial expansion of introduced species.	Incorporate identification and monitoring of introduced species into existing monitoring programs, particularly in representative or high profile areas and targeting: known invasives, new species, and those with a likelihood of being established.	Research Coordinator, Education Coordinator, Ecosystem Protection Coordinator	1) Triennial summary reports of monitoring programs 2) GIS map of invasives

***Introduced Species Action Plan
GFNMS Draft Management Plan***

Strategy Title(s)	Performance Goal	Desired Outcome (Objective)	Outcome Measure	How Measured	Who Measures	Output Measure
STRATEGY IS-7: Develop a rapid response plan and streamlined permit process to respond to eradication or control of introduced species.	Maintain an abundance and diversity of native marine/estuarine species: To detect, manage, and where feasible, eradicate new and established introduced species in the sanctuary.	Develop management actions to eradicate and/or control existing and new introductions.	1) Improve ability to rapidly respond to, and eradicate or control existing or new introductions in the sanctuary or areas adjacent to the sanctuary. 2) Effective rapid response should prevent the establishment or spread of introduced species.	1) Establish a rapid response plan with partner agencies and institutions, including preparedness training. 2) In coordination with other agencies, participate in a streamlined permit process.	Ecosystem Protection Coordinator, partners	1) Rapid response plan manual 2) Permits for pre-approved plans
STRATEGY IS-9: Outreach to targeted audiences on prevention methods.	Maintain an abundance and diversity of native marine/estuarine species: To prevent future introductions of introduced species in the sanctuary.	Identify and control current and potential pathways to prevent new introductions.	1) Decrease the number of pathways for, and sources of introduced species. 2) Control spreading of already established introduced species.	1) Develop a targeted prevention program directed at user groups and industry in and around sanctuary waters. 2) Through monitoring programs track numbers of new introduced species to determine effectiveness of outreach efforts. See Performance Measures for IS-1-4.	Ecosystem Protection Coordinator, Education Coordinator	1) Outreach materials 2) Best management practices identified in GFNMS special permit conditions



ECOSYSTEM PROTECTION: IMPACTS FROM FISHING ACTIVITIES ACTION PLAN

ISSUE STATEMENT

Although fishing activities may have impacts on living marine resources, habitats, and ecosystem dynamics, specific impacts to Gulf of the Farallones National Marine Sanctuary (GFNMS) from fishing activities in and around sanctuary waters are not well understood.

Some of the issues related to fishing or harvesting activities to be explored include: (1) impacts from trampling and harvesting of invertebrates in the intertidal; (2) gear impacts on habitats and living resources; (3) impacts on trophic levels from localized depletion of bait fish; and (4) region-wide declines in fish populations.

ISSUE DESCRIPTION

The diversity and abundance of fish and invertebrate species within the sanctuary are largely due to the variety of habitats, including intertidal mudflats, estuaries, rocky shorelines and deeper subtidal areas. The intertidal mudflats support large concentrations of burrowing organisms such as clams, snails, and crabs. Eelgrass beds occur on the more extensive flats of Tomales Bay, Bolinas Lagoon, and within the Esteros. Pacific herring and invertebrates depend on eelgrass beds in Tomales Bay to spawn and feed. The shallow, protected waters of the bays and estuaries are critical habitat for salmon and several species of perch and flatfish. In their journey from the ocean through Tomales Bay and into Lagunitas Creek, the federally listed, threatened Coho salmon depend on clear water, riparian vegetative cover, and a certain size gravel to complete their reproductive process. Accurate characterizations of the deeper subtidal habitats of the sanctuary are limited. Rocky banks in deep water are inhabited by large populations of rockfish, more than fifty species of which occur in the sanctuary. Sablefish and flatfish such as sole, sandab, and halibut are found on offshore soft-bottom habitats. Concentrations of sardines, northern anchovies, krill, and Pacific herring are also found in the sanctuary.

King salmon and rockfish have been the primary target species for sport fishing in GFNMS. On some weekend days, more than 1,000 clam diggers harvest gaper, geoduck, Washington and littleneck clams. The most important commercial harvests have included Pacific herring, salmon, rockfish, and Dungeness crab. Prawn and shrimp harvesting also take place in the area. Most of the commercial catches harvested in GFNMS are landed in San Francisco, Bodega Bay, Oakland, Half Moon Bay, and Sausalito. The tidal community includes a wide variety of invertebrates such as barnacles, limpets, black turban snails, mussels, sea anemones, abalone,

and urchins, which may be harvested as well. Gear types used in the GFNMS include hook and line, long lines, gill nets, seines, traps, bottom trawlers, and mid-water trawlers.

Management of commercial and recreational fisheries in California is the responsibility of the California Department of Fish and Wildlife (CDFW) in state waters (0-3 nautical miles), and National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) in federal waters (3 to 200 miles), although fisheries management plans may cover both state and federal waters. In contrast, GFNMS does not manage fisheries, but it does have a mandate to protect the entire sanctuary ecosystem and has authority to manage human uses that may impact sanctuary wildlife and habitats.

JURISDICTIONAL SETTING

The following is an overview of the relevant federal and state laws and regulations that may apply to fishing activities. This is not a comprehensive review of all laws and regulations related to fishing activities. Additional fishing regulations apply. The laws and regulations presented in this section are subject to change. For the most recent and applicable information refer to the Commercial Fish Laws and Licensing Requirements, the California Ocean Sport Fishing Regulation Book, the CA Code of Regulations, Title 14 § 632, and Code of Federal Regulations Title 50 § 660.

Federal Law

Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. §§ 1801-1882

General Provisions

The Magnuson-Stevens Fishery Conservation and Management Act, commonly referred to as the Magnuson-Stevens Act (MSA), is the primary federal law governing marine fisheries management in the United States. The MSA was enacted in 1976 and has been amended many times over the years with a notable revision in 1996 including provisions to minimize bycatch (the incidental harvest of non-target species), and promote protection of essential fish habitat and catch and release in recreational fishing. The 1996 MSA revision is often referred to as the Sustainable Fisheries Act or SFA. Revisions in 2006 required an end to overfishing and to prevent overfishing through annual catch limits and accountability measures. The 2006 MSA revision is commonly referred to as the Magnuson-Stevens Reauthorization Act or MSRA.

The PFMC is one of eight regional fishery management councils established by the MSA. Over the last 30+ years, the PFMC has developed four fishery management plans (FMPs) and has addressed a wide range of fisheries issues through amendments to those plans. The four FMPs are focused on groundfish, salmon, coastal pelagics and highly migratory species. The Groundfish FMP covers 90 species of rockfish, flatfish, roundfish, sharks, skates, and others. Chinook and coho are the primary salmon species addressed in the Salmon FMP, while northern anchovy, market squid, Pacific sardine, Pacific mackerel, and jack mackerel are specified in the Coastal Pelagic Species FMP. Finally, the Highly Migratory Species FMP authorizes the PFMC to actively manage tunas (north Pacific albacore, yellowfin, bigeye, skipjack, and northern

Bluefin), sharks (common thresher, pelagic thresher, bigeye thresher shortfin mako and blue) billfish/swordfish (striped marlin, Pacific swordfish) and other highly migratory fishes (dorado). The PFMC also participates in international fishery management organizations such as the International Pacific Halibut Commission, and international commissions tasked with managing migratory tunas (albacore, yellowfin and other highly migratory species).

Coastal Pelagic Species Management

In 2006, the PFMC adopted Amendment 12 to the Coastal Pelagic Species Management Plan, which resulted in a complete ban on commercial fishing for all species of krill in West Coast federal waters. Amendment 12 also specified essential fish habitat for krill, an action that makes it easier to work with other federal agencies to protect krill. State laws prohibit krill landings by state-licensed fishing vessels in California, Oregon, and Washington. This broader prohibition applies to all vessels in PFMC managed waters.

Groundfish Management

The Groundfish FMP contains the rules for managing the groundfish fishery. It outlines the areas, species, regulations, and methods that PFMC and NMFS must follow to make changes to the fishery. A biennial management process was implemented in 2003 through an amendment 17 to the FMP. The biennial cycle implements management measures for a two-year period, rather than just for one year. Separate harvest specifications (allowable biological catch and optimum yield) are identified for each year in the two-year period. This cycle provides more time for PFMC and NMFS to work on other critical groundfish issues, and more time for public comment (NOAA 2006).

Groundfish are managed through numerous management measures including harvest guidelines, quotas, trip and landing limits, area restrictions, seasonal closures, and gear restrictions (such as minimum mesh size for nets and small trawl footrope requirements for certain areas. The trawl sector of the groundfish fishery recently shifted to an individual fishing quota (IFQ) system and harvest co-operative program that was implemented in 2011. This program is expected to reduce harvest capacity in the fishery, to make the fishery more efficient, and to lower bycatch in the fishery. All sectors of the groundfish fishery are currently constrained by the need to rebuild groundfish species that have been declared overfished (widow rockfish, canary rockfish, yelloweye rockfish, darkblotched rockfish, bocaccio, Pacific ocean perch, and cowcod). Rebuilding plans have been developed to help these species recover. Because of the low available harvest of species managed under rebuilding plans, the overall groundfish harvest has been significantly reduced.

Since 2003, several groundfish conservation areas have been implemented through regulation by NMFS to reduce overfishing on various groundfish species (NOAA 2006). A groundfish conservation area is defined by NMFS as “any closed area intended to protect a particular groundfish species or species group or species complex.” The Rockfish Conservation Areas (RCA) are the only groundfish conservation areas in the study area. The RCAs are large area closures intended to protect overfished shelf rockfish species (e.g. canary and yelloweye rockfish). The RCAs have boundaries defined by specific latitude and longitude coordinates that

Ecosystem Protection: Impacts from Fishing Activities Action Plan ***GFNMS Draft Management Plan***

approximate depth contours over the shelf and differ between gear types, for example trawl, non-trawl and recreational RCA, which vary throughout the year with cumulative limit periods. A core area has protected a region over the shelf for more than a decade.

Based on recommendations within amendment 19 of the Pacific Coast Groundfish fishery management plan, in 2006 NMFS implemented essential fish habitat (EFH) for groundfish. To minimize impacts on ecologically important habitats of groundfish EFH, NMFS implemented areas closed to bottom trawl gear or all bottom contact gear (trawl and other bottom tending gear). There are currently 50 such closed areas on the west coast and four bottom trawl closed areas within GFNMS: Point Arena North, Point Arena South and Fanny Shoal/Farallon Island Closed Areas, and portions of the Bottom Trawl Footprint Closure. The latter covers all areas westward of the 1280 m (700 fathom) contour out to the 3500 m (1914 fathom) contour, within the EEZ. The Bottom Trawl Footprint Closure was designed to minimize adverse fishing effects on EFH, by freezing the footprint of where trawling occurred in 2004. The PFMC is currently in the process of reviewing current groundfish EFH. designations.

State Law

Marine Life Management Act

California's Marine Life Management Act (MLMA) regulates the harvest of California's marine living resources, including commercial fisheries. The fishery management system established by the MLMA applies to four groups of fisheries.

1. The nearshore finfish fishery and the white seabass fishery;
2. Emerging fisheries – new and growing fisheries that are not currently subject to specific regulation;
3. Those fisheries for which the Fish and Game Commission held some management authority before January 1, 1999. Future regulations affecting these fisheries will need to conform to the MLMA; and
4. Those commercial fisheries for which there is no statutory delegation of authority to the Fish and Game Commission and Department (CDFG 2004a).

The California Aquaculture Development Act

The California Aquaculture Development Act of 1979 established the California Department of Fish and Wildlife (CDFW) as the lead agency for aquaculture in the state. In 1982, legislation was passed that provided guidelines and authority for aquaculture regulations developed by the Fish and Game Commission. These guidelines and authority for aquaculture regulations are in California Code of Regulations, Title 14, Natural Resources: Division 1. Fish and Game Commission – Department of Fish and Wildlife. These regulations are referred to as Title 14. CDFW is responsible for issuing leases and permits for specific aquaculture activities and coordinating with two committees, the Aquaculture Development Committee and the

Aquaculture Disease Committee, which exist for the purpose of interaction among sectors of the aquaculture industry and government regulatory agencies.

There are several other state agencies that have regulatory authority over certain aspects of aquaculture. They include the California Departments of Health Service and Food and Agriculture (disease and health), the State Lands Commission (leased lands), the Coastal Commission (coastal uses and public recreation and access), and the State Water Resources Control Board (water quality).

In federal waters NOAA, US Army Corps of Engineers, EPA, DOI, USDA and the US Department of Health and Human Services all have various jurisdictional oversight over aquaculture facilities and operations. There is also pending legislation relating to aquaculture in offshore waters.

California Code of Regulations, Title 14 Division 1

The Fish and Game Commission has broad authority under Title 14 to establish regulations that restrict both sport and commercial fishing and otherwise afford protection to marine organisms and habitats. This includes the establishment of a network of marine protected areas (MPAs) in California waters to protect habitats and preserve ecosystem integrity. California MPAs within GFNMS have been in effect since May 1, 2010 and include three types of MPA designations: 1) state marine reserves, in which it is unlawful to injure, damage, take, or possess any living, geological, or cultural marine resource, except under a scientific collecting permit or specific authorization from the California Fish and Wildlife Commission for research, restoration, or monitoring purposes; 2) state marine conservation areas, in which it is unlawful to injure, damage, take, or possess any living, geological, or cultural marine resource for commercial or recreational purposes, or a combination of commercial and recreational purposes except as specified; and 3) state marine recreational management areas, in which it is unlawful to perform any activity that would compromise the recreational values for which the area may be designated. Recreational opportunities may be protected, enhanced, or restricted, while preserving basic resource values of the area. No other use is restricted unless specified.

Restricted Access Fisheries

Restricted access programs in fisheries limit the quantity of persons, vessels, or fishing gear that may be engaged in the take of a given species of fish or shell fish. Restricted access may also limit the catch allocated to each fishery participant through harvest rights such as individual or community quotas. A primary purpose of restricted access programs is to balance the level of effort in a fishery with the health of the fishery resources. In most situations, except harvest rights, this involves setting an appropriate fishery capacity goal.

California's Fisheries Management Programs

In 1977, California focused its first limited access program on the abalone fishery, followed in 1979 with legislation requiring salmon limited entry permits. In the 1990s, industry began to demand more restricted access programs, so the California Department of Fish and Wildlife

Ecosystem Protection: Impacts from Fishing Activities Action Plan
GFNMS Draft Management Plan

(CDFW) began to address restricted access in a comprehensive manner. In 1996, a limited entry review committee was formed to develop a standard restricted access policy for the Fish and Game Commission. The commission approved the restricted access policy in June 1999.³

Since the passage of the Marine Life Management Act (MLMA) of 1998, which became law on January 1, 1999 and the commission's subsequent adoption of the restricted access policy in 1999, more restricted access program responsibility has shifted from the legislature to the commission and CDFW, including the management of nearshore finfish and Market Squid. The CDFW works closely with constituent advisory committees and task forces to carefully design and evaluate restricted access plans for submission to the commission. The commission then conducts hearings for further public input. The plan is then returned to the CDFW and advisory groups for any necessary revisions before going to the commission for final approval. The legislature is involved and informed with fisheries that require legislation to implement restricted areas, such as the Dungeness crab fishery.

ECOSYSTEM PROTECTION: FISHING ACTIVITIES GOALS

Maintain an abundance and diversity of native marine/estuarine/intertidal species:

1. Better understand the impacts from fishing activities on sanctuary ecosystems.
2. Support fishing that is compatible with sanctuary goals and ecosystem protection.

ECOSYSTEM PROTECTION: FISHING ACTIVITIES OBJECTIVES

1. Based on the best available scientific and socioeconomic information, the sanctuary will facilitate the evaluation of the status and trends in marine populations (and their causes) in sanctuary waters; and identify and evaluate impacts on sanctuary ecosystems from fishing activities.
2. GFNMS will facilitate the protection of cultural resources and wildlife and habitats in its boundaries; and strive to maintain native biodiversity and the health and balance of the sanctuary ecosystem.

ECOSYSTEM PROTECTION: FISHING ACTIVITIES ACTION PLAN

STRATEGY FA-1: *Develop an ecosystem characterization of the sanctuary to better understand types and distributions of habitats, species, and processes.*

Activity 1.1 Modify the Applied California Current Ecosystem Assessment Studies (ACCESS) and develop additional research components as necessary to build a baseline characterization and regional monitoring of the sanctuary including habitat, physical, and biological characteristics.

- A. ACCESS will systematically survey and assess the distribution and abundance of marine birds, sea turtles and marine mammals. The study will simultaneously assess ocean habitat, and biological productivity. Additional components will include:

Habitat characterization including mapping substrate type/bathymetry (static)

Biological characterization including species abundance and distribution, spatial and temporal

Physical characterization including oceanographic features (spatial and temporal) and pelagic (dynamic)

B. Use GIS as a tool to characterize sanctuary habitats, species, and processes.

Activity 1.2 Conduct workshops to develop a coordinated plan for regional monitoring and ocean observing system activities to supplement the NMFS five-year surveys (per recommendations developed during the marine mammal/seabird workshop in December 2002). These workshops will develop a plan to expand appropriate methodologies for monthly and annual ocean observing and trophic structure surveys across all five West Coast sanctuaries.

Activity 1.3 Based upon available ship time, facilitate expansion of California Cooperative Oceanic Fisheries Investigations (CalCOFI) transect lines through the five West Coast sanctuaries.

STRATEGY FA-2: *Evaluate impacts from fishing activities on sanctuary resources.*

Activity 2.1 Evaluate types and levels of impacts from fishing activities. Consider the following factors when conducting an evaluation:

1. Habitat impacts (physical)
2. Habitat impacts (biological)
3. Levels of by-catch (shellfish and crabs, finfish, sharks, marine mammals, seabirds and sea turtles, juvenile life stages)
4. Impacts associated with species' life history (such as aggregated behavior during spawning)

STRATEGY FA-3: *Develop policy recommendations or management action(s) to address impacts from fishing activities on sanctuary resources.*

Activity 3.1 If there is an indication of potential significant negative impacts on sanctuary resources from fishing activities, then evaluate and make recommendations on actions the sanctuary should take to address impacts from specific activities. A stakeholder-based, working group could be convened by the sanctuary advisory council, which could include: resource management agencies, interest groups, user groups, fishermen representing different gear types, and the scientific community. The working group could make recommendations to the SAC based on best available scientific and socioeconomic data.

STRATEGY FA-4: *Develop public awareness about the value and importance of the historical and cultural significance of maritime communities and their relationship and reliance on healthy sanctuary waters.*

Activity 4.1 Develop a maritime heritage and fishing community model.

- A. Identify an appropriate marina or harbor to profile as a living maritime community.
- B. Work together with the fishing community, businesses, chambers of commerce and local government to develop a marketing and outreach plan to profile the fishing community, the associated working harbor, and their relationship to the sanctuary and its healthy marine resources. The plan may include workshops, signage, kiosks, events, attractions, and activities. The plan will also articulate clear and consistent messages.
- C. Educate the community about sustainable fishing practices and the role of consumers. Work with the fishing community to promote compatible fishing practices in the sanctuary.

STRATEGY FA-5: *Maintain consistent and coordinated region-wide sanctuary representation at the Pacific Fishery Management Council and Fish and Game Commission meetings.*

Activity 5.1 Maintain a regional sanctuary representative to attend Pacific Fishery Management Council (PFMC) and Fish and Game Commission (FGC) meetings and participate as appropriate.

- A. Inform and update the PFMC and FGC on current activities and emerging fishing issues in GFNMS as appropriate.
- B. Listen and track issues PFMC and FGC are addressing.
- C. Create briefing packets, as appropriate, for the PFMC and FGC on sanctuary activities.

Potential Partners:

Federal: National Park Service (NPS), National Marine Fisheries Service (NMFS), Bureau of Ocean Energy Management (BOEM), United States Geological Survey (USGS), National Oceanographic Data Center (NODC), Southwest Environmental Response Management Application (ERMA)(SHIELDS), Office of Law Enforcement (OLE), The National Centers for Coastal Ocean Science (NCCOS), sanctuary advisory council (SAC), Sea Grant, NOAA MPA Center, Naval Postgraduate School (NPS)

*Ecosystem Protection: Impacts from Fishing Activities Action Plan
GFNMS Draft Management Plan*

State & County: CA Department of Fish and Wildlife, California Department of Boating and Waterways (CDBW), Central California Ocean Observing Systems (CeNCOOS), Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO), Moss Landing Marine Laboratories (MLML), California Species of Special Concern (CSC)

Other: Pacific Fisheries management Council (PFMC), fishing community, visitors bureaus, tourism industry and business community, Farallones Marine Sanctuary Association (FMSA), Ford Consulting Inc., H. T. Harvey Consulting, Point Blue Conservation Science, Center for Integrated Marine Technology (CIMT), various marine laboratories and research institutions, commercial and recreational fishing interests, conservation community, agricultural landowners, the STRAW Project, Friends of the Esteros, Environmental Action Committee of West Marin, Sonoma Land Trust, MALT

***Ecosystem Protection: Impacts from Fishing Activities Action Plan
GFNMS Draft Management Plan***

GFNMS ECOSYSTEM PROTECTION: IMPACTS FROM FISHING ACTIVITIES

Performance Measures

Strategy Title(s)	Performance Goal	Desired Outcome (Objective)	Outcome Measure	How Measured	Who Measures	Output Measure
STRATEGY FA-1: Develop an ecosystem characterization of the sanctuary to better understand types and distributions of habitats, species and processes.	Maintain an abundance and diversity of native marine/estuarine/intertidal species: 1) Better understand the impacts from fishing activities on sanctuary resources.	Based on the best available scientific and socio-economic information, the sanctuary will: 1) facilitate the evaluation of the status and trends in marine populations (and their causes) in sanctuary waters; and 2) identify and evaluate impacts on sanctuary resources from fishing.	Increase understanding of the habitats and communities of the sanctuary.	Complete site characterization including: detailed oceanographic climatology; clear delineation of habitat types and distribution; and relative abundance and distribution of species.	Sanctuary Superintendent, Research Coordinator, Ecosystem Protection Coordinator	1. Oceanographic climatology report with effective maps and graphics; 2. fine scale bathymetric and habitat maps; 3. technical data summary on species distribution and abundance
STRATEGY FA-3: Evaluate impacts from fishing activities on sanctuary resources. STRATEGY FA-4: Develop policy recommendations or management action(s) to address impacts.	Maintain an abundance and diversity of native marine/estuarine/intertidal species: 1) Better understand the impacts from fishing activities on sanctuary resources. 2) Allow for fishing that is compatible with sanctuary goals and ecosystem protection.	Based on the best available scientific and socioeconomic information, the sanctuary will: 1) facilitate the evaluation of the status and trends in marine populations (and their causes) in sanctuary waters; 2) identify and evaluate impacts on sanctuary resources from fishing, and 3) identify and develop appropriate actions to address any negative impacts from fishing activities on sanctuary resources.	Improved ability to carry out a consistent and systematic evaluation of impacts from fishing activities occurring in the sanctuary.	Develop series of management or policy response categories	Sanctuary Superintendent, Ecosystem Protection Working Group, sanctuary advisory council	Compatibility index matrix

*Ecosystem Protection: Impacts from Fishing Activities Action Plan
GFNMS Draft Management Plan*

Strategy Title(s)	Performance Goal	Desired Outcome (Objective)	Outcome Measure	How Measured	Who Measures	Output Measure
STRATEGY FA-5: Bring public awareness to the value and importance of maritime communities.	Maintain an abundance and diversity of native marine/estuarine/intertidal species: 1) Allow for fishing that is compatible with sanctuary goals and ecosystem protection.	The sanctuary will seek to facilitate the management of fisheries resources within its boundaries in order to protect cultural resources, to protect important natural resources, and to maintain biodiversity and the health and balance of the sanctuary.	Increase understanding of fishing communities in and around the sanctuary.	Complete maritime heritage and fishing community model plan.	Sanctuary Superintendent, Education Coordinator, sanctuary advisory council	Signs, kiosks, workshops, attractions, events and activities



IMPACTS FROM VESSEL SPILLS ACTION PLAN

ISSUE STATEMENT

There is a continuing risk of vessel spills that could impact marine mammals, seabirds and other natural resources in and around Gulf of the Farallones National Marine Sanctuary (GFNMS). Recognizing that spills can occur from any transiting vessel as they all carry crude oil, bunker fuel, and/or other hazardous material or cargo, GFNMS will take every opportunity to enhance prevention and improve response efforts to offset impacts from potential cumulative and catastrophic events.

ISSUE DESCRIPTION

The volume of large vessel traffic in and out of San Francisco Bay is significant. According to USCG unpublished data from the USCG Automatic Identification System (AIS) Vessel Traffic Service, in 2012 a total of 7,450 vessels transited in and out of San Francisco Bay. AIS vessel traffic patterns in and out of San Francisco Bay capture information on all vessels over 300 gross tons, which includes tugs, tanker ships, cruise ships, container vessels, military craft and research vessels.

In the past decade, the sanctuary has seen an increase in cruise ship traffic (see Wildlife Disturbance Action Plan for more information). In 2012 California ports handled an estimated 700 cruise ship port calls. The Port of San Francisco experienced steady gains in cruise ship traffic, from 44 calls and 56,968 passengers in 1994 to 65 calls and 195,000 passengers in 2012 (SFPORT 2013). Itineraries from San Francisco include round trip cruises to Alaska and Mexico.

Historically, the total number of spills from large transiting vessels is small, but the potential impacts are enormous, given the number and volume of vessels and the hazardous cargo lane's proximity to the Farallon Islands and major seabird and marine mammal populations. Large commercial vessels (LCVs) are of particular concern for spills because in addition to their cargo, they can carry up to 1 million gallons of bunker fuel, a heavy, viscous fluid similar to crude oil, which they use for fuel. According to the *2012 Preliminary Report of California Oil and Gas Production Statistics*, published by the California Department of Conservation Division of Oil, Gas, and Geothermal Resources, California produced approximately 197.5 million barrels oil in 2012 (California Department of Conservation, 2013). In addition to this significant amount of oil production, California refines an even larger amount of oil annually, thus, there is considerable risk of vessel spills from oil tankers transiting through California waters.

Large cruise ships can also be a source of vessel discharge. Cruise ships are regulated by state and federal laws and regulations aimed at reducing air pollution, graywater, sewage, sewage sludge, and hazardous waste. However, a cruise ship spill could result in discharge of large volumes of untreated sewage and untreated graywater into the Sanctuary.

Smaller vessels, including recreational vessels or commercial fishing vessels smaller than 300 gross tons also pose a threat. In many cases the harm is localized to a particular location or set of isolated locations. However, when small spills happen in the vicinity of a particularly sensitive environment such as a rocky reef, estuary or shallow bay including areas like Duxbury Reef, Bolinas Lagoon or Tomales Bay, the impacts can be substantial. Data from 2000 to 2011 show that about 200 commercial fishing vessels make landings in the ports adjacent to the sanctuary on an average annual basis. There are thousands of recreational vessels in marinas, harbors, and moorings within and adjacent to the sanctuary that can also transit sanctuary waters.

SIGNIFICANT RESOURCES AND IMPACTS FROM VESSEL SPILLS

GFNMS was designated in 1981 to protect significant concentrations of seabirds and aquatic birds; marine mammals (pinnipeds and cetaceans); fish; marine flora (algae); benthic fauna; and estuarine environments.

The sanctuary has diverse biological communities in close proximity to one another. Habitats within the sanctuary include rocky intertidal, sandy beach, estuarine, pelagic (open ocean), benthic (sea floor), and islands. The variety and size of habitats support a high diversity and abundance of species. The intertidal mudflats support large concentrations of burrowing organisms such as clams, snails, and crabs. Seagrass beds occur on the more extensive flats of Tomales Bay, Bolinas Lagoon and also within the Esteros. Pacific herring and invertebrates depend on seagrass beds in the Bay to spawn and feed. The shallow, protected waters of the bays and estuaries are critical habitat for salmon and several species of perch and flatfish. In their journey from the ocean to the Russian River, Tomales Bay and into Lagunitas Creek, the federally-listed, threatened Coho salmon depend on clear water, riparian vegetative cover, and a certain size gravel to complete their reproductive process.

The tidal community includes a wide variety of invertebrates and marine plants and algae, such as barnacles, limpets, black turban snails, mussels, sea anemones, abalone, and urchins, which may be harvested. The intertidal zone is an important breeding ground, spawning and feeding area for many marine organisms. Impacts from oil and other spills including cargo vessel containers in the intertidal zone may include smothering of benthic biota, and fouling or poisoning of organisms.

Accurate characterizations of the various habitats of the sanctuary are limited. Rocky banks in deep water are inhabited for the most part by large populations of rockfish, more than fifty species of which occur in the sanctuary. Sablefish and flatfish such as sole, sandab, and halibut are found on offshore soft-bottom habitats. Concentrations of sardines, Northern anchovies and Pacific herring are also found in the sanctuary. A spill resulting in a surface slick could affect upper water biota such as squid, Northern anchovy, Jack Mackerel, and the pelagic portion of the

planktonic food chain. Heavier oils and chemicals that sink could affect shellfish such as crabs or lobster and finfish such as flounders and sole.

Sensitive Species of the Sanctuary

The sanctuary's habitats are home to a number of species that are federally-listed as endangered or threatened. The list includes highly recognized species such as blue and humpback whales, Marbled Murrelets, and Coho and Chinook salmon, as well as lesser-known species such as the Tidewater Goby and Short-tailed Albatross. Of particular concern to the GFNMS are impacts on seabirds and marine mammals from potential vessel spills.

Seabirds

The nesting seabird population is a significant natural resource of the sanctuary. The Farallon Islands support the largest concentration of breeding seabirds in the contiguous United States. These birds forage in the Gulf of the Farallones, and are highly dependent on the productive waters of the sanctuary. Of the 164 species of birds known to occur in the sanctuary, 12 species of seabirds have breeding colonies on the Farallon Islands and feed in the sanctuary. These include Ashy and Leach's Storm-Petrels; Brandt's, Pelagic, and Double-crested Cormorants; Western and California Gulls; Common Murres; Pigeon Guillemots; Cassin's Auklets; Rhinoceros Auklets; and Tufted Puffins. Other birds breeding on the Farallon Islands include Black Oystercatchers (a shorebird), Rock Wren, Common Ravens, and Peregrin Falcons.

Floating oil affects seabirds through ingestion, inhalation, irritation of eyes and membranes, and fouling of feathers. Feather contamination is the primary cause of immediate mortality because of the resulting inability to fly, avoid predators, and forage underwater. It also lowers body temperature due to loss of insulation. Birds may also ingest oil while preening or grooming contaminated feathers. Vulnerability of different species of birds to surface oil is based on several factors, including their likeliness to dive in the water and flock on the surface. To some extent, all marine birds that breed in large colonies are vulnerable to contact with floating oil during the nesting season due to their large congregations. Indirect effects to birds may include accumulation of toxic components from their food, exposure to secondary chemicals (dispersants), and destruction of habitat or prey resources.

Marine Mammals: Pinnipeds

Thirty-six species of marine mammals have been observed in GFNMS, including six species of pinnipeds (seals and sea lions). Many of these animals occur in large concentrations and are dependent on the productive and secluded habitats for breeding, pupping, feeding, hauling-out, and resting during migration. The Farallon Islands provide habitat for breeding populations of five species of pinnipeds, and support one of the largest concentrations of California sea lions and northern elephant seals within the sanctuary.

Harbor seals breed on the Farallon Islands and in mainland rookeries. The Gulf of the Farallones region contains one-fifth of the California population of harbor seals, which was estimated at 30,000 in 2012.

Impacts from Vessel Spills Action Plan
GfNMS Draft Management Plan

For more than 170 years prior to 1996, northern fur seals (*Callorhinus ursinus*) had not been known to breed on the Farallon Islands, but in recent years, a colony has resumed breeding on the South Farallon Islands during the summer. As of August 2012, this colony was estimated to contain 521 individuals, 201 of which were pups. From November to June, thousands of female and immature fur seals migrate through the western edge of the sanctuary along the continental shelf. Of all the marine mammals in the sanctuary, fur seals are the most sensitive to oil spills because they depend largely on their fur for insulation.

Recently delisted from the threatened status, Steller sea lions occur year-round in the sanctuary. This population has decreased dramatically in the southern part of its range, which includes the Farallon Islands. The decline throughout the Gulf of the Farallones and California has amounted to 80 percent over the past thirty years. The California sea lion is the most conspicuous and widely distributed pinniped in the sanctuary. It is found year-round in the Gulf with the population increasing at about 8-12 percent each year. The northern elephant seal is the largest pinniped species in the sanctuary, with a total breeding population in the sanctuary of about 1,700 individuals¹.

Impacts to pinnipeds from floating oil include inhalation, fouling of fur, ingestion, and irritation of eyes and membranes. Particularly detrimental to pinnipeds is the contamination of fur that may cause loss of buoyancy and impairment of normal thermal regulation.

Marine Mammals: Cetaceans

Twelve cetacean species are seen regularly in the sanctuary, and of these, the minke whale, harbor porpoise, Dall's porpoise, and Pacific white-sided dolphin are considered year-round residents. The harbor porpoise is the most abundant small cetacean in the Gulf of the Farallones, with approximately 9,000 porpoises in the central California region.

Gray whales and other large baleen and toothed whales migrate from Alaska southward through the sanctuary. The northward migration of gray whales begins at the end of February and peaks in March. A few gray whales remain in the sanctuary during the summer. An increasing number of other species have been seen feeding in the sanctuary between April and November, including humpback and blue whales, representing one of the largest congregations of whales in the Northern Hemisphere.

Although the effects of oil on cetaceans are not well understood, it is believed the oil could cause both short- and long-term impacts. For example, because baleen whales are filter feeders, they are susceptible to direct ingestion of oil, oil-covered substances, and oil spill remediation chemicals such as dispersants and bioremediation agents. It is also thought that oil may irritate

¹ Berger, R. W. 2013. Population Size and Reproductive Performance of northern elephant seals on the South Farallon Islands, 2012-2013. Unpublished report to the US Fish and Wildlife Service. PRBO Conservation Science, Petaluma, California. PRBO Contribution Number 1932.
National Park Service, 2013, unpublished data

the eyes of whales and possibly interfere with breathing. Some whales, such as grey whales, have been seen avoiding slicks, while others have been found with oiled baleen.

Socioeconomic, Cultural, and Historical Resources Impacts

A large oil spill could pose a potentially serious threat to commercial and recreational industries such as fishing, especially in or near valuable fishing areas; and wildlife viewing/tourism, including whale watching, shark tourism, and diving. The type and extent of impacts depend on timing with respect to spawning season, migration patterns, oil type (solubility or toxicity), and prevailing weather conditions. A large spill can also impact historical resources including submerged archaeological sites, such as underwater shipwrecks.

Dispersants

During an oil spill, responding agencies may choose to use chemical dispersants after an evaluation of environmental tradeoffs for all potentially impacted resources in the spill zone. Chemical dispersants are used to accelerate the natural dispersion of oil into the water column in order to reduce environmental impacts associated with surface slicks (e.g., impacts to marine mammals, seabirds, marshes), to enhance removal of oil from the environment through biodegradation, and to rapidly reduce toxicity through dilution. The potential impact from the use of chemical dispersants on wildlife is a complex issue and more research needs to be done. Generally, the use of chemical dispersants introduces higher total concentrations of petroleum hydrocarbons into the water column than naturally dispersed oil (e.g. from wind and wave action). This higher concentration may have a larger footprint and potentially impact a wider range of species that would not likely have been exposed or affected by the surface oil slick. Dispersed oil can expose fish in the water column to potential toxic effects. Nearly all chemicals are toxic at some concentration. Assessing the toxicity of oil at the surface or chemically dispersed oil in the water column depends upon environmentally-relevant concentrations. It is likely that a dispersed oil plume generated by an offshore dispersant operation will rapidly be diluted to concentrations not expected to be problematic to most species within the water column or bottom habitats. The negative impacts on certain species may be localized; however, given their wide larval distribution there may not be long-term/regional impacts or population-level effects from local dispersant use.

Different organisms and life stages have varying sensitivities. Both embryo-larval stages and early juvenile life stages of wildlife are generally more sensitive to chemicals than are adults of the same species. Many California endemic species have been used in toxicity studies involving oil and dispersants (including red abalone, giant kelp, mysid shrimp, Chinook Salmon, and Top Smelt). Species of concern found in the Gulf of the Farallones that have not had toxicity test data include black abalone and Dungeness crab. Most zooplankton populations are not likely to be permanently affected by oil spills and are expected to recover due to their high population numbers and wide distribution.

Water containing dispersed oil droplets and oil that reaches the gills of fish can also potentially cause effects through ingestion and respiration. Juvenile out-migrating salmon are potentially

Impacts from Vessel Spills Action Plan
GFNMS Draft Management Plan

more vulnerable to oil and dispersed oil due to increased residency time in the Gulf of the Farallones and generally slower swim speeds. Rockfish are found wherever suitable habitat is located in the sanctuaries. Rockfish do not move widely and are considered more vulnerable to oil spills locally, but are generally found at depths that provide significant dilution for dispersed oil.

There is much information on the potential effects of oiling on birds but little information on the effects of dispersants or chemically dispersed oil on feathers or ingestion at environmentally-realistic concentrations. Indirect effects to birds may include accumulation of toxic components from their food, exposure to secondary chemicals (dispersants), and destruction of habitat or prey resources.

JURISDICTIONAL SETTING

The following is an overview of the relevant federal and state laws and regulations that may apply to vessel spills. This is not a comprehensive review of all laws and regulations related to vessel spills, and additional regulations could apply. The laws and regulations presented in this section are subject to change.

Federal Law

Oil Pollution Control Act, 33 U.S.C. § 2701 et seq.

The Oil Spill Prevention Act (OPA) regulates discharges of oil or oily mixtures from vessels. Except for discharges from machinery space bilges, tankers subject to the OPA may not discharge oil or oily mixtures unless they are 50 nautical miles from the nearest land and the total quantity of oil discharged cannot exceed 1/15,000 of the total cargo capacity. In addition, an oil discharge by any vessel regulated by the OPA must be made while the vessel is en route. The instantaneous discharge rate must not exceed 60 liters per mile.

The USCG is the federal government's primary maritime law enforcement agency. The USCG's missions include maritime law enforcement, national security, maritime safety, and marine environmental protection. For ocean and coastal activities, the USCG manages maritime transportation activities in order to minimize loss of life and injury to the environment. The USCG has historically held the primary responsibility for ensuring cleanup of any oil spill or other pollutants in the marine environment. The USCG requires vessels to have approved response plans detailing owner and operator response to an oil spill and ensuring proper response activities. Vessels are also required to have salvage and firefighting plans in place, these are necessary to prevent incidents from becoming spills. To avert oil spills and promote safety, the USCG inspects vessels carrying oil and other hazardous materials. Pursuant to OPA, which defines ground rules for dealing with oil pollution events and recommends pollution prevention measures, the USCG has responsibility for preparing most of the regulations necessary to implement OPA. Additionally, the USCG must be consulted in the development of oil spill contingency plans for marine oil and gas facilities and terminals. OPA allows for natural resource damage assessment recoveries and subsequent restoration by federal, state and tribal and state resource trustees.

Ports and Waterways Safety Act 33 U.S.C. §§ 1221 et seq.

The Ports and Waterways Safety Act (PWSA) is designed to promote navigation and vessel safety and the protection of the marine environment. The PWSA authorizes the USCG to establish vessel traffic services and systems for ports, harbors, and other waters subject to congested vessel traffic. The San Francisco Vessel Traffic Separation Schemes (VTSS) are designed to prevent vessel collisions by separating vessels going in opposite directions. Outside the traffic lanes, vessels may proceed in any direction consistent with good seamanship.

State Law

Lempert-Keene-Seastrand Oil Spill Prevention and Response Act

The Office of Spill Prevention and Response (OSPR) was created within the California Department of Fish and Wildlife (CDFW) as the lead state agency charged with oil spill prevention and response. The OSPR Administrator has substantial authority to direct spill response, cleanup, and natural resource assessment activities in state waters. Although OSPR is the lead state agency for oil spill prevention and response, this responsibility is shared with twenty-two agencies represented on the State Interagency Oil Committee. OSPR is involved in a variety of programs to prevent spills in the marine environment. One of the most important prevention programs is the harbor safety committee process established to reduce risk of marine vessel accidents within or on approach to the major harbor facilities. In conjunction with navigation safety, OSPR is also working with the USCG regarding evaluation of vessel traffic routing and other safety measures to reduce pollution incidents off the coast of California.

LARGE VESSEL OIL SPILLS IN THE GULF OF THE FARALLONES

- | | |
|--------|---|
| 1971 | Two vessels collide under Golden Gate Bridge (840,000 gallons of Bunker C oil) |
| 1984 | T/V <i>PUERTO RICAN</i> (1.4 million gallons of oil, stern sunk with 8,500 barrels of bunker fuel, estimated 2,873 birds killed, including 1,856 Common Murres) |
| 1986 | T/V <i>APEX HOUSTON</i> (oil barge, 25,500 gallons of oil between San Francisco and Long Beach, 9,000 birds including 6,000 Common Murres killed) |
| 1990 | Two mystery spills from San Francisco to Monterey County, source and amounts undetermined |
| 1996 | S/S <i>CAPE MOHICAN</i> (estimated 39,890 gallons of oil, 7,000 birds killed) |
| 1997-8 | S/S <i>JACOB LUCKENBACH</i> / Point Reyes Tarball Incident (oil washes onto beaches from Salmon Creek to Pillar Point), later determined to be part from the S/S <i>JACOB LUCKENBACH</i> which sunk in 1952 |

***Impacts from Vessel Spills Action Plan
GFNMS Draft Management Plan***

- 1998 T/V *COMMAND* (3,000 gallons heavy crude or bunker oil, estimated 11,193 birds killed, 75 percent of which were Common Murres)
- 1990-2002 S/S *JACOB LUCKENBACH* (clean up and removal of approximately 100,000 gallons, (2,380 bbl), occurred summer of 2002, however, it is estimated that more than 300,000 gallons of bunker fuel oil chronically leaked into the sanctuary from the sunken vessel between 1953 and 200.) 2) An estimated 29,000 gallons remains on board in inaccessible areas.
- 2007 M/V *COSCO BUSAN* (53,000 gallon bunker oil spill in San Francisco Bay that spread into the sanctuary.)

VESSEL SPILLS GOAL

1. Reduce the risk to sanctuary natural resources from spills.

VESSEL SPILLS OBJECTIVES

1. Assess level of risk from vessel traffic and determine whether improvements can be made to reduce risk.
2. Develop long-term monitoring programs within the sanctuary to identify trends and take proactive measures to reduce risk from vessel spills.
3. Review current response programs and identify areas of improvement, focusing on sanctuary resources at risk.
4. Develop outreach program for maritime industry, fishing, and recreational boating communities based on risk assessment and long-term monitoring results.
5. Provide for continuous evaluation and leverage opportunities for improvement in coordination with partners.

VESSEL SPILLS ACTION PLAN

STRATEGY VS-1: *Expand Monterey Bay National Marine Sanctuary (MBNMS) drift analysis model to include Point Arena and Mendocino.*

Activity 1.1 Expand MBNMS drift analysis model north to Point Arena/Mendocino using existing data. The current model of vessel drift rates and tug response times only extends as far north as San Francisco Bay. Seasonal variability and coverage north to Mendocino is necessary to protect GFNMS.

- A. Work with the Naval Postgraduate School (NPS) in Monterey (producers of the current model) and investigate feasibility of extending the model north and including seasonal

variability and consult with NOAA Office of Response and Restoration (ORR) to ensure compatibility with NOAA's GNOME and TAP spill trajectory models.

STRATEGY VS-2: *Refine oceanographic data used in existing spill and drift model to increase accuracy of risk assessments.*

Activity 2.1 Revise existing oceanographic circulation model to reflect the unique fine-scale features of the Gulf of the Farallones and consult with NOAA ORR to ensure compatibility with NOAA's GNOME and TAP spill trajectory models.

- A. Work with NOAA ORR, MBNMS, USCG, and other relevant partner agencies to develop recommendations for installing current meters at the appropriate sites.

STRATEGY VS-3: *Evaluate recent vessel routing changes.*

Activity 3.1 Evaluate how the vessel routing adjustments have affected GFNMS, what lessons have been learned, and what improvements could be made.

- A. Examine current Vessel Traffic System (VTS) data from USCG, collect information from Automated Identification System (AIS), determine if revised lanes are being used correctly and, if not, then determine if a correction needs to occur (e.g., education, send information to Port Access Route Studies [PARS]).
- B. Make recommendations to USCG based on findings of the evaluation.

STRATEGY VS-4: *Track distribution and numbers of species of concern and habitats in relation to probable spill trajectories.*

Activity 4.1 Refine resources-at-risk analysis for Gulf of the Farallones. The resources-at-risk assessments define the seasonal distribution and numbers of sensitive species and habitats in relation to probable spill trajectories.

Activity 4.2 Modify ACCESS and develop additional research components as necessary to build a baseline characterization and to monitor sanctuary habitats and physical and biological characteristics. This information will also be used for natural resource damage assessment and restoration of pelagic species, including trophic levels, spill response and the use (applicability) of dispersants and in-situ burning.

- A. ACCESS will: (1) systematically survey and assess the distribution and abundance of marine birds, mammals, and krill; (2) simultaneously assess ocean habitat; and (3) simultaneously assess biological productivity. Additional components to include:
 - 1. Habitat characterization including mapping substrate type/bathymetry (static)
 - 2. Biological characterization including species abundance and distribution, spatial and temporal

***Impacts from Vessel Spills Action Plan
GFNMS Draft Management Plan***

3. Physical characterization including oceanographic (spatial and temporal), and pelagic (dynamic) features
4. Monitoring to detect changes in spatial and temporal oceanographic features and biological sentinel species for historic comparison with injury assessment

STRATEGY VS-5: *Participate in Area Contingency Planning and engage in NMSA consultation during the revision of the ACPs in the region to address risks to sanctuary resources.*

Activity 5.1 Review Regional Response Plan (RRP) and Area Contingency Plan (ACP), including location of Oil Spill Response Organization (OSRO) pre-positioned response equipment.

- A. Participate in SF Bay Area Contingency Meeting and Wildlife Operations meetings.

Activity 5.2 Review and compile all available information from reports, management/response plans, and literature on the potential effects of various Applied Response Technologies (ARTs) (such as dispersants) on sanctuary resources.

- A. Develop GFNMS policies and recommendations (e.g. potential monitoring protocols) regarding the use of ARTs in the event of an oil spill. Solicit input from the Vessel Spills Working Group, Sanctuary Advisory Council, emergency response agencies, and other applicable local, state, and federal trustee agencies.

STRATEGY VS-6: *Periodically review and revise, as necessary, GFNMS in-house emergency response plan.*

Activity 6.1 Revise tasks and responsibilities for GFNMS in the event of a vessel spill, both small and large, in the sanctuary (also see Administration recommendations).

- A. Participate in ACP drills and test in-house communication and response equipment including database connections and GIS mapping capabilities.
- B. Hold annual GFNMS meeting to provide refresher training on in-house emergency response plan and to ensure staff understands their individual roles in the event of a spill.

STRATEGY VS-7: *Continue to improve integration of GFNMS Beach Watch and ACCESS data into Area Contingency Plan.*

Activity 7.1 Enhance Integration of Beach Watch and ACCESS data into the ACP and Web-based GIS in the Southwest Environmental Response Management Application (ERMA). Regularly integrate updated GFNMS data to strengthen the ACP and ERMA and allow for more accurate decision making by incident command.

- A. GFNMS will participate in ACP meetings including meetings of the Wildlife Operations and Planning sub-committees.
- B. Provide Beach Watch and ACCESS data to incident command on a real-time basis, as needed, to inform decision making during a spill and to help assist any associated NRDA operations and ensure that data are also incorporated into ERMA.

STRATEGY VS-8: *Conduct outreach to mariners to increase stewardship of the sanctuary, including voluntary compliance with Vessel Traffic System (VTS) and sanctuary regulations.*

Activity 8.1 Develop outreach plan based on results of vessel activities profile, risk assessment, and resources-at-risk assessment to increase voluntary compliance with VTS and sanctuary regulations (container ships, bulk carriers, chemical carriers, military vessels, research vessels, cruise ships, and tugs).

- A. Ensure GFNMS regulations are listed accurately in the *Coast Pilot*. Update as needed.
- B. Review vessel activities profile, risk assessment, and resources-at-risk assessment and identify high-risk vessels and circumstances (target audiences).
- C. Identify pathways for reaching target audiences.
- D. Develop and distribute appropriate materials and programs.

STRATEGY VS-9: *Increase regular communication between GFNMS and maritime trade industry.*

Activity 9.1 Recruit maritime trade industry member for GFNMS Advisory Council. The maritime trade council member would represent the industry's interest at the sanctuary advisory council meetings and report sanctuary activities to the industry.

STRATEGY VS-10: *Participate in regional forums for addressing vessel traffic issues.*

Activity 10.1 A sanctuary representative will attend regional meetings, including the area committee meetings, harbor safety meetings, and ad hoc panels. Sanctuary participation will include, but not be limited to:

- A. Provide information for the geographic response plans.
- B. Participate in discussion on use of dispersants.
- C. Develop a strategy diagram for all sensitive areas as a part of ERMA and regional monitoring programs such as ACCESS.

Impacts from Vessel Spills Action Plan
GFNMS Draft Management Plan

- D. Conduct outreach to appropriate local, state, and federal agencies and political representatives to discuss boater insurance and liability issues.

STRATEGY VS-11: *Continue to implement recommendations of the vessel spills working group and seek regular input from the sanctuary advisory council.*

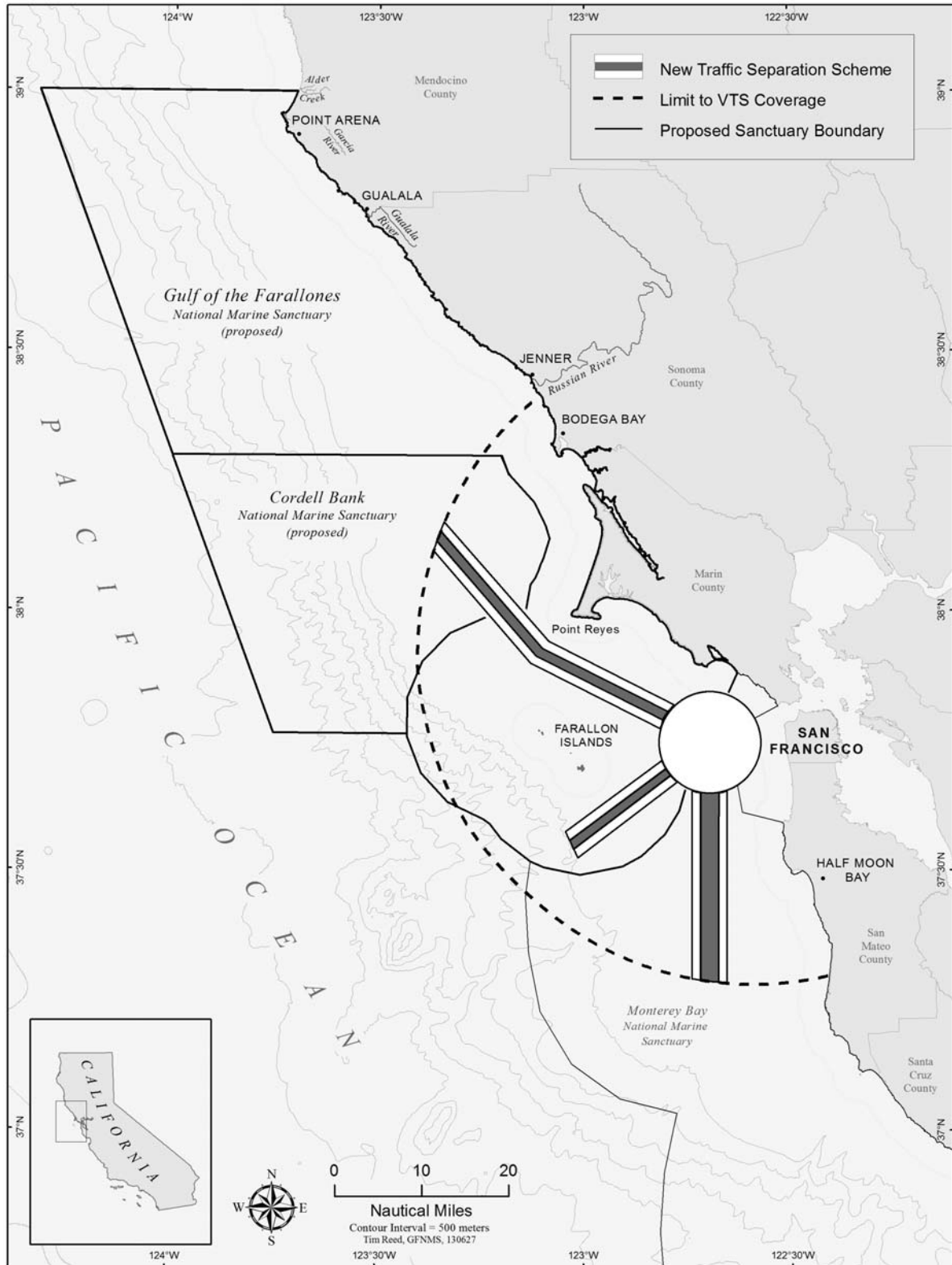
Potential Partners:

Federal: National Park Service (NPS), US Coast Guard (USCG), National Oceanic and Atmospheric Administration (NOAA) modelers/Office of Response and Restoration (ORR), Emergency Response Division (ERD), National Ocean Service (NOS) charting, NOAA Scientific Support Coordinator, United States Geological Survey (USGS), NOAA Coastal Services Center, Office of National Marine Sanctuaries (ONMS), NOAA Coast Survey, NOAA Scientific Support Coordinator, US Fish and Wildlife Service (USFWS), NOAA Office of Response and Restoration (ORR), National Centers for Coastal Ocean Science (NCCOS), Bureau of Ocean Energy Management (BOEM), National Marine Fisheries Service (NMFS), National Oceanographic Data Center (NODC), MBNMS/Sanctuary Integrated Monitoring Network (SIMoN)

State & County: California Department of Boating and Waterways (CDBW), CA Office of Spill Response (OSPR), California Coastal Conservancy, CA Department of Fish & Wildlife (CDFW), California Department of Boating and Waterways (CDBW) (licensing info), California Coastal Commission (CCC), Central California Ocean Observing Systems (CeNCOOS), SF Harbor Safety Committee, Moss Landing Marine Laboratories (MLML), Bodega Marine Laboratory (BML), San Francisco State University (SFSU)

Other: Farallones Marine Sanctuary Association (FMSA), Fleet Numerical, Maritime trade industry, fishing industry, Monterey Bay Aquarium Research Institute (MBARI), Scripps Institute of Oceanography, Point Blue Conservation Science, The Marine Mammal Center (TMMC), Glen Ford Consulting, Marine Exchange, Port of Oakland, Port of San Francisco, Marine Mammal Commission, Coast Guard Auxiliary, California Academy of Sciences (CAS), Oiled Wildlife Care Network, (OWCN), Center for Integrated Marine Technology (CIMT), Regional Response Team, Area Committee, Harbor Safety Committee

Vessel Traffic Lanes Map



**Impacts from Vessel Spills Action Plan
GFNMS Draft Management Plan**

GFNMS IMPACTS FROM VESSEL SPILLS

Performance Measures

Strategy Title(s)	Performance Goal	Desired Outcome (Objective)	Outcome Measure	How Measured	Who Measures	Output Measure
STRATEGY VS-1: Expand MBNMS drift analysis model north to Point Arena/Mendocino using existing data. STRATEGY VS-2: Refine spill and drift model to increase accuracy of risk assessments. STRATEGY VS-3: Evaluate recent vessel routing changes .	Minimize the risk to GFNMS' natural resources from spills, while allowing for the continuation of safe, efficient and environmentally sound transportation.	Assess level of risk and determine whether improvements can be made to reduce risk.	Increase understanding of worst case scenario in the event of a vessel collision or grounding, based on understanding oceanographic processes and response time.	1) Complete evaluation of potential risks to GFNMS from transiting vessels by understanding: a) Vessel activity profile b) Causal events c) Spill and drift model 2) Use risk analysis as a management decision making tool to take action to minimize risk and potential impacts on sanctuary resources.	Sanctuary Superintendent, Ecosystem Protection Coordinator, Research Coordinator	1) Updated and expanded drift analysis model 2) Vessel activities profile 3) Risk assessment report
STRATEGY VS-4: Track distribution and numbers of species of concern and habitat in relation to probable spill trajectories.	Minimize the risk to GFNMS' natural resources from spills, while allowing for the continuation of safe, efficient and environmentally sound transportation.	Develop long-term monitoring programs within GFNMS to identify trends and take proactive measures to reduce risk from vessel spills.	Increase understanding of sensitive habitats and species to receive priority protective measures during a vessel spill event. Assess impacts from low level chronic oil pollution.	Continually update Resources at Risk Model for GFNMS and integrate information into Area Contingency Plan (as revised every five years).	Sanctuary Superintendent, Research Coordinator, Ecosystem Protection Coordinator	1) Update model, and Report C 2) Regular maps depicting distribution and abundance of sentinel species and vessel type and activity

*Impacts from Vessel Spills Action Plan
GFNMS Draft Management Plan*

Strategy Title(s)	Performance Goal	Desired Outcome (Objective)	Outcome Measure	How Measured	Who Measures	Output Measure
<p>STRATEGY VS-5: Participate in Area Contingency Planning and engage in NMSA consultation during the revision of the ACPs in the region to address risks to sanctuary resources.</p> <p>STRATEGY VS-6: Revise GFNMS in-house emergency response plan.</p> <p>STRATEGY VS-7: Continue to improve integration of Beach Watch and SEA Surveys data into Area Contingency Plan and Southwest ERMA.</p>	<p>Minimize the risk to GFNMS' natural resources from spills, while allowing for the continuation of safe, efficient and environmentally sound transportation.</p>	<p>Review current response programs and identify areas of improvement, focusing on GFNMS resources at risk.</p>	<p>Increase effectiveness in responding to an emergency spill in order to reduce impacts on sanctuary resources.</p>	<p>1) Build into the Area Contingency Plan specific strategies to increase probability of protection of sanctuary resources during a catastrophic event. On an annual basis review, and as appropriate, revise GFNMS in-house plan.</p> <p>2) Provide on-going training and practice drills for staff.</p> <p>3) Provide regular updates of GFNMS data and information to Southwest ERMA and as needed to ICP.</p>	<p>Sanctuary Superintendent, Research Coordinator, Ecosystem Protection Coordinator</p>	<p>1) Technical data summary 2) Peer reviewed articles 3) ACP post-drill report</p>



PROGRAM AREA ACTION PLANS

GFNMS DRAFT MANAGEMENT PLAN

- I. Education and Outreach**
- II. Conservation Science**
- III. Resource Protection**
- IV. Administration**



EDUCATION AND OUTREACH ACTION PLAN

PROGRAM STATEMENT

Gulf of the Farallones National Marine Sanctuary (GFNMS) requires a long-term strategy to fulfill the over-arching education goal of the sanctuary, which is: “to educate and engage residents and visitors in the Gulf of the Farallones National Marine Sanctuary watersheds about their connection to the sanctuary and to develop a sense of personal responsibility to protect the marine environment.”

PROGRAM DESCRIPTION

Education programs are designed to enhance public awareness, understanding and appreciation of the sanctuary and its resources, and build stewards to take on the responsibility of protecting these special places. Our education programs are in direct alignment with the ONMS education vision and mission.

ONMS Education Vision: An ocean-literate public making informed environmental decisions.

ONMS Education Mission: To inspire ocean and climate literacy and conservation through National Marine Sanctuaries.

The development of effective and coordinated education programs is a priority for all national marine sanctuaries. GFNMS has developed a long-term education strategy to raise the public’s awareness of the local and regional marine environment and how they can become involved in the sanctuaries. These education programs complement the sanctuary’s broad-based community outreach efforts by focusing on targeted audiences such as students, teachers, families, adults and youth. GFNMS and Cordell Bank National Marine Sanctuary (CBNMS) will collaborate to service common audiences.

The Farallones Marine Sanctuary Association (FMSA) works collaboratively with GFNMS to implement education, interpretation, and volunteer programs. GFNMS, in cooperation with FMSA, sponsors student classroom and field programs, teacher trainings, summer camps, public lectures and excursions, family workshops and other education programs. FMSA and GFNMS are developing and implementing a comprehensive K-12 program that includes field-work, trips and classroom activities as well as multicultural programs with the San Francisco Recreation and Parks Department. GFNMS will expand its partnerships and develop additional working relationships with other government agencies, institutions, and organizations.

GFNMS uses education as a resource management tool to address specific priority ecosystem protection issues identified during the management plan review process. Education is essential to achieving many of the sanctuary's management objectives. In addition, education is used to both complement and promote other sanctuary programs such as research, monitoring, and enforcement by communicating information about these programs.

EDUCATION AND OUTREACH GOALS

1. Use education as a management tool to help protect the sanctuary's habitats, wildlife and cultural resources.
2. Ensure that education complements and promotes other sanctuary programs such as research, monitoring, enforcement and resource protection.
3. Continually reach broader audiences to create an ocean literate, informed and connected public.

EDUCATION AND OUTREACH OBJECTIVES

1. Address critical human impact issues to habitats, wildlife and cultural resources by developing education and outreach programs that involve sanctuary research, resource protection and education programs, to communicate to key users how to lessen their impacts.
2. Develop all education programs with input from sanctuary research, resource protection and monitoring programs to promote ocean literacy.
3. Expand and increase strategic partnerships to continually reach and engage diverse and new audiences.

EDUCATION AND OUTREACH ACTION PLAN

SCHOOL PROGRAMS - To connect the next generation of scientists, managers, educators and leaders with the ocean's influence on them and their influence on the ocean

STRATEGY ED-1: *Educate K-8 students about the sanctuary through visitor center, classroom, and field activities.*

Activity 1.1 Update K-8 Crissy Field visitor center programs to align with state and national science standards. Expand to include national ocean and climate literacy principles. Develop activities that incorporate emerging marine issues and correlate to school curricula.

- A. Develop theme-based field trip programs for specific grade levels that correlate to ocean and climate literacy principles and science standards.

- B. Develop outreach programs targeting a diverse cross section of elementary schools. These programs will incorporate hands-on activities, emerging sanctuary issues and teachers' needs.

STRATEGY ED-2: *Educate high school students and teachers about the sanctuary through classroom and field activities.*

Activity 2.1 Expand LiMPETS (Long-term Monitoring Program & Experiential Training for Students) Program to a four-tiered program including curriculum, student monitoring, stewardship projects, and teacher professional development.

- A. Continue high school sandy beach and rocky intertidal monitoring program by incorporating newly developed techniques based on new science standards.
- B. Expand high school program to include a stewardship component in which students volunteer for the sanctuary as a part of Education STRATEGY ED-5.
- C. Develop a water quality, introduced species, and climate change component of the LiMPETS programming, including curricula and monitoring, in collaboration with other West Coast sanctuaries.
- D. Increase enrollment by working to reach a broader, more diverse audience by targeting multiple school districts in San Francisco, San Mateo and Marin Counties.

STRATEGY ED-3: *Educate culturally diverse inner city children about the sanctuary through summer camp experiences that are highly experiential and field based.*

Activity 3.1 Expand Sanctuary Explorers Camp to reach a broader audience.

- A. Increase capacity and duration of the camp program by incrementally expanding the camp to six weeks with simultaneous sessions to reach a broader audience.
- B. Adapt curriculum to increase stewardship ethic by providing examples for how students may become more involved in sanctuary activities.
- C. Include high school LiMPETS Program students as camp counselors to ensure a continuum of sanctuary experiential learning opportunities.

***Education and Outreach Action Plan
GFNMS Draft Management Plan***

- D Incorporate Crissy Field visitor center and other Bay Area summer programs into the Visitor Center Field Trip Program.

STRATEGY ED-4: Educate teachers about the resources and programs of the sanctuary by providing professional development programs.

Activity 4.1 As a component of the education program, develop a set of professional development programs for teachers.

- A. Invite teachers to biannual research symposium to learn about sanctuary research activities.
- B. Participate in local, regional and national teacher development venues. As part of this attendance, develop a series of K-12 teacher workshops that provide participants with classroom activities and introduce them to sanctuary programs. Possible venues include: The Presidio Teachers Night; County Math and Science Council conferences; CSTA (California Science Teachers Association); NSTA (National Science Teachers Association); NMEA (National Marine Educators Association); NAEE (National Association of Environmental Education); NAI (National Association of Interpretation).
- C. Utilize volunteer corps to maintain GFNMS resource center to make it accessible to sanctuary constituents such as teachers, other volunteers, students, staff, and partners. Resource center contents include classroom lending kits, marine-related books, PowerPoint shows, videos, and research library. Develop a marketing plan and check-out system for center use.

STEWARDSHIP – To involve the community in understanding their relationship to the ocean and in caring for its future

STRATEGY ED-5: Provide stewardship opportunities for high school students.

Activity 5.1 Develop GFNMS high school volunteer internship program.

- A. Recruit students in grades 10-12 from local and regional high school education programs to volunteer for summer camp, the visitor center, field research, volunteer program, and other opportunities.

STRATEGY ED-6: Create stewards of the sanctuary by engaging middle and high school students in a large-scale, long-term monitoring project.

Activity 6.1 Participate in LiMPETS, a collaborative program of the West Coast sanctuaries to work with teachers and students to learn how to collect long-term monitoring data while increasing awareness of the sanctuaries.

- A. Implement teacher workshops to increase the number of teachers who teach LiMPETS monitoring protocols to their middle and high school students. These workshops can be

hosted in conjunction with Cordell Bank, Monterey Bay, and Channel Islands National Marine Sanctuaries.

- B. Maintain network of teachers and students to support their monitoring efforts.
- C. Maintain online databases as part of the overall LiMPETS network protocol.
- D. Expand monitoring program to include other key species and/or habitats.

VOLUNTEER PROGRAMS – To offer experiences to inspire an ocean conservation ethic

STRATEGY ED-7: *Expand the reach of GFNMS education and outreach programs by enhancing volunteer program training to foster volunteers to educate about the sanctuary at various events and locations.*

Activity 7.1 Recruit, train, and manage a diverse team of volunteers to engage and educate visitors about the sanctuary at the GFNMS visitor center, summer camps, schools, and outreach events (lectures, fairs) as well as in the field at high use areas.

- A. Maintain and grow program for training volunteer naturalists to lead sanctuary programs at the visitor center and schools.
- B. Maintain and grow the Rocky Intertidal Stewardship program at Duxbury Reef to be a collaboration with the California Academy of Sciences and LiMPETS and be replicated at strategic rocky reefs in the sanctuaries, such as Pillar Point Reef.
- C. Develop a speakers' bureau to provide sanctuary trained speakers for schools and community groups on sanctuary related topics.
- D. Maintain and grow program for training volunteers to represent the sanctuary at outreach fairs and events.
- E. Train staff and docents to work successfully with diverse and multicultural audiences by providing cultural sensitivity training and multilingual materials appropriate for each audience.

Activity 7.2 Develop GFNMS naturalist certification program to train volunteers and professional naturalists to present basic sanctuary information to multiple audiences.

***Education and Outreach Action Plan
GFNMS Draft Management Plan***

- A. Train professional naturalists on sanctuary-specific information and certify them as sanctuary Certified Naturalists.
- B. Train and certify volunteers and staff of other marine interpretation organizations as sanctuary Certified Naturalists.

PUBLIC PROGRAMS – To instill greater public understanding of our dependence upon a healthy ocean ecosystem and how the sanctuary is an integral part of that system.

STRATEGY ED-8: *Increase awareness and knowledge of the sanctuary through a lecture series.*

Activity 8.1- Raise the profile of the GFNMS lecture series by working to increase attendance by expanding to target new potential audiences.

- A. Increase collaboration with partners by developing a list of targeted potential locations based on attendance. Then work with the targeted partner to host the invited speakers for an overall larger reach.
- B. Increase effective use of media and press by tracking which venues program participants use to find their information on sanctuary events.
- C. Hold lectures in new and diverse communities not already reached (e.g., East Bay, Bodega Bay).
- D. Investigate potential sponsorship possibilities..

STRATEGY ED-9: *Increase awareness and build knowledge of the sanctuary through educational programs and exhibits at the Sanctuary and partner visitor centers.*

Activity 9.1 Maintain engaging educational exhibits and activities at the GFNMS Crissy Field visitor center and partner exhibits.

- A. Improve and expand visitor center exhibits. This will include renovating existing exhibits and creating new exhibits and activities based on sanctuary cultural resources, habitats and wildlife, and ecosystem protection.
- B. Continue scheduled drop-in programs such as “Creature Feature” to attract new and return visitors. These programs will be scheduled during high visitation periods (summer, holidays, weekends).
- C. Increase attendance at the Crissy Field visitor center by marketing its programs and services in conjunction with the Crissy Field Environmental Center. As part of this marketing plan, ensure that the drop in visitor activity schedule is coordinated at both sites.

STRATEGY ED-10: *Increase sanctuary awareness and reach to larger audiences through the production and distribution of videos on the sanctuary and its resources.*

Activity 10.1 Complete production of a general video and distribute to appropriate audiences.

- A. Finalize script(s) and explore possibility of generating two cuts—one targeted to a general audience (7th grade and above), and one for children (7th grade and below).
- B. Develop distribution and marketing plan to reach desired audiences across the region and state such as environmental education centers and county offices of education.

STRATEGY ED-11: *Increase awareness of GFNMS by using effective media and marketing techniques.*

Activity 11.1 Implement awareness campaign to raise the profile and recognition of the GFNMS.

- A. Internally develop new image, messages, and determine targeted diverse audiences. Designate a media/public affairs point of contact to maintain campaign outcomes.
- B. Utilize marketing in television, radio, print and online media based on audience needs.
- C. Establish relationships with key local reporters (collaboratively with MBNMS and CBNMS, where media markets overlap) and develop talking points for press releases.
- D. Identify key publications for sanctuary articles.
- E. Develop media plan and release schedule.
- F. Develop best practices (including logo and web site) for all publications, online and printed materials.
- G. Develop shared outreach materials/products/programs with CBNMS and MBNMS based on established priorities that inspire stewardship.

Activity 11.2 Increase reach and success of all sanctuary programs by increasing distribution of GFNMS education and outreach messages through other environmental education groups.

- A. Increase GFNMS brochure and flyer distribution list to include online listservs, newsletters and blogs. Target specific groups including: Students and Teachers Restoring a Watershed (STRAW), Marine Activities, Resources, and Education (MARE), Point Reyes National Seashore Association (PRNSA), California State Parks, County Parks, The Marine Mammal Center (TMMC), Crissy Field Environmental Center, Nature Bridge and GGNRA.

***Education and Outreach Action Plan
GFNMS Draft Management Plan***

- B. Work individually with partners (including those listed above) to incorporate sanctuary messages into their materials/programs and vice versa. Prioritize organizations and aim for two collaborations per year.

Activity 11.3 Increase reach and success of all sanctuary programs by effectively marketing, distributing, and evaluating all sanctuary programs and products.

- A. Develop strategy for marketing, distributing, and evaluating existing and new programs and products.

STRATEGY ED-12: *Increase audience by building a larger visitor center with increased exhibits, programs, and opportunities to learn about and support GFNMS.*

Activity 12.1 Create a new visitor center that showcases the Office of National Marine Sanctuary (ONMS) with exhibits, lecture hall, and classroom/lab facilities, providing a gateway to the GFNMS and beyond. The center will be a destination for greater ocean literacy and community stewardship in the 21st century. See AD-1 for list of potential sites.

STRATEGY ED-13: *Increase awareness of the sanctuary through interpretive signage and exhibits at strategic locations.*

Activity 13.1 Develop a coordinated network of signs and exhibits throughout the sanctuary.

- A. Install and maintain interpretive signs at strategic locations along the coast including sites of high traffic and high educational value.
- B. Incorporate sanctuary exhibits into visitor centers and museums along the coast.
- C. Develop a sanctuary multi-use and/or vehicular trail along the coast linking signs, wayside exhibits, museum exhibits, and interactive kiosks.
- D. Coordinate and collaborate with CBNMS and MBNMS on sanctuary-sponsored signage and visitor center displays along the coast.

STRATEGY ED-14: *Outreach to residents and visitors in inland areas of the GFNMS watersheds and educate them about their connection with the sanctuary.*

Activity 14.1 Develop a traveling exhibit on sanctuary watersheds to bring the sanctuary to inland communities.

- A. Develop storyboard and exhibit plan featuring the connection between inhabitants of watersheds and the GFNMS. Contact potential venues for guidance on sizes and content (including curriculum needs). Potential venues include schools, libraries, and community locations in the Bay Area and Central Valley.

- B. Develop curriculum and/or activities related to exhibit.
- C. Build and circulate exhibit and curriculum around the Bay Area. Particular focus may be placed on the exhibit during Oceans week.

Potential Partners:

Federal: National Park Service (NPS), Point Reyes National Seashore (PRNS), Golden Gate National Recreation Area (GGNRA), Cordell Bank National Marine Sanctuary (CBNMS), Olympic Coast National Marine Sanctuary (OCNMS), Monterey Bay National Marine Sanctuary (MBNMS), Channel Islands National Marine Sanctuary (CINMS), Sanctuary Advisory Council, The Presidio Trust, United States Fish and Wildlife Service (USFWS), Bureau of Land Management

State & County: California Department of Fish and Wildlife (CDFW), California State Parks, SF Bay Conservation and Development Commission, county Parks, CA Coastal Conservancy, San Francisco Recreation and Parks Department, University of California Santa Cruz (UCSC), Bodega Marine Laboratory (BML)

Other: Farallones Marine Sanctuary Association (FMSA), Crissy Field Environmental Center, Fitzgerald Marine Reserve, Audubon Canyon Ranch (ACR), Stewards of the Coast and Redwoods, California Academy of Sciences (CAS), Randall Museum, Aquarium of the Bay, Oceanic Society, Ocean Conservancy, Point Blue Conservation Science, California Coastal Trail, Green Belt Alliance, Oakland Museum, Maritime Museum, Aquarium of the Bay, The Bay Model, Exploratorium, PRNSA, Marine Activities, Resources, and Education (MARE), Bay Area Science Alliance (BASA), Southwest Marine and Aquatic Educator's Association (SWMEA), Environmental Education Council of Marin (EECOM), city visitor centers, chambers of commerce, Convention Bureau, TV, radio, print and online media, Libraries, community centers, other Bay Area marine science education organizations, teachers, local research institutions, Bay Area schools, other marine interpretation organizations

Education and Outreach Action Plan
GFNMS Draft Management Plan

GFNMS EDUCATION AND OUTREACH

Performance Measures

Strategy Title(s)	Performance Goal	Desired Outcome (Objective)	Outcome Measure	How Measured	Who Measures	Output Measure
<p>STRATEGY ED-1: Educate K-8 students about the sanctuary.</p> <p>STRATEGY ED-2: Educate high school students about the sanctuary.</p> <p>STRATEGY ED-3: Educate diverse inner city children about the sanctuary.</p> <p>STRATEGY ED-4: Educate teachers about the sanctuary.</p>	Use education as a tool to help protect the sanctuary's resources.	<p>1) Structure programs to educate along an environmental literacy continuum including developing awareness, building a knowledge base, changing behavior, and building stewardship.</p> <p>2) To target diverse audiences including various multicultural, socio-economic, age, and gender groups.</p>	Increase number and diversity of students and teachers exposed to messages about the sanctuary in an effort to increase awareness about sanctuary resources and issues.	<p>1) Track numbers of children reached in K-8 programs.</p> <p>2) Track number of youth reached in high school programs.</p> <p>3) Track number of children reached through summer camp program. 4) Evaluate increase in students' knowledge about the sanctuary.</p>	Sanctuary Superintendent, Education Coordinator, FMSA	<p>1) K-8 program and resources, elementary school outreach plan</p> <p>2) High school curriculum, website, database, workshops, outreach materials, slide shows, teacher lending kits</p> <p>3) Summer camp curriculum</p> <p>4) Assessment and evaluation</p>
<p>STRATEGY ED-5: Provide stewardship opportunities for high school students.</p> <p>STRATEGY ED-6: Create stewards by engaging middle and high school students in monitoring.</p>	Use education as a tool to help protect the sanctuary's resources.	Structure programs to educate along an environmental literacy continuum including developing awareness, building a knowledge base, changing behavior, and building stewardship.	Increase in effectiveness of high school education programs whereby the literacy continuum is fully realized from awareness building to stewardship building.	<p>1) Track increase in number of high school students participating in internship program.</p> <p>2) Track increase in number of high school students participating in high school monitoring programs.</p> <p>3) Track student-directed stewardship projects implemented.</p>	Sanctuary Superintendent, Education Coordinator, FMSA	<p>1) Formal framework for internship program including training materials, and evaluation standards 2) Case studies of student-directed stewardship projects</p>

Education and Outreach Action Plan
GFNMS Draft Management Plan

Strategy Title(s)	Performance Goal	Desired Outcome (Objective)	Outcome Measure	How Measured	Who Measures	Output Measure
STRATEGY ED-7: Expand the reach of GFNMS education and outreach expanding volunteer program	Continually reach broader audiences to create an informed and connected public.	Target diverse audiences including various multicultural, socioeconomic, age and gender groups.	Expand outreach programs throughout region, through diverse venues, to increase the general public's awareness about the sanctuary, and increase sanctuary stewardship.	1) Increase in number and diversity of volunteers trained through the Sanctuary Naturalist Corps and actively participating in outreach, monitoring, and restoration efforts (in hours). 2) Measurable increase in types and locations of venues used for delivering sanctuary messages.	Sanctuary Superintendent, Education Coordinator, FMSA	1) Training manual and program for volunteers 2) Outreach materials to be disseminated to public
STRATEGY ED-8: Increase awareness through a lecture series. STRATEGY ED-9: Increase awareness through educational programs and exhibits at the visitor center STRATEGY ED-10: Increase awareness through video. STRATEGY ED-11: Increase awareness through effective media and marketing. STRATEGY ED-12: Increase audience by building larger visitor center. STRATEGY ED-13: Increase awareness through interpretive signage and exhibits.	a) Continually reach broader audiences to create an informed and connected public. b) Ensure education complements and promotes other sanctuary programs such as research, monitoring and resource protection.	a) Target diverse audiences including various multicultural, socioeconomic, age and gender groups. b) To develop programs to target content builders, user/impact groups, influencers, and decision makers.	Target new audiences and increase participation in sanctuary programs in order to raise the profile and recognition of GFNMS within the broader region.	Increase the reach and success of all sanctuary programs by developing an overall marketing strategy, distribution plan, and evaluation of all sanctuary products and programs. Marketing plan directed at: 1) increasing number of tools used to reach different audiences and interest groups. 2) increasing attendance in sanctuary programs 3) increasing press coverage of the sanctuary.	Sanctuary Superintendent, Education Coordinator, FMSA	1) Outreach materials 2) Exhibits, touch tank 3) Video, marketing materials 4) Public service announcements, press releases, ad campaign, outreach materials



CONSERVATION SCIENCE ACTION PLAN

PROGRAM STATEMENT

Characterization, monitoring, and research assist in the protection of sanctuary wildlife and habitats by increasing the understanding of ecosystem structure and function; detecting environmental problems; tracking ecosystem health and trends of the various habitats and natural resources in the sanctuary; and contributing to solutions to management issues throughout the Gulf of the Farallones National Marine Sanctuary (GFNMS). An updated long-term conservation science plan has been developed to coordinate current and future habitat characterization, ecosystem monitoring, and research efforts. The following three specific areas are the focus of the conservation science plan: (1) baseline and characterization studies for populations and habitats whose presence were critical in the sanctuary's designation, yet whose distributions and other basic characteristics remain poorly understood; (2) directed monitoring studies focusing on indicator species and representative habitats and undertaken jointly with other sanctuaries, research institutions and agencies; and (3) analytical studies aimed at determining the cause of a condition or impacts and predictive studies to understand trends and variability (e.g., in a specific population).

PROGRAM DESCRIPTION

GFNMS manages a complex region with high biological diversity; nationally significant wildlife breeding and feeding areas; significant commercial and recreational fishing; estuarine habitats; numerous federally, state, and locally protected marine and estuarine waters; and watershed influences and impacts from the eight million San Francisco Bay Area residents. Conservation science will help address specific management problems, enhance resource protection efforts, and assist in bringing scientific information to the general public. The conservation science program will ensure that science activities address management issues and are effectively integrated into the administration, management, education, outreach and resource protection programs of the sanctuary.

CONSERVATION SCIENCE GOALS

1. Increase our knowledge and understanding of the estuarine, nearshore, and offshore ecosystems in the sanctuary.
2. Develop monitoring programs to understand long-term status and trends, detect emerging issues, and guide management decisions.

3. Develop research programs to identify and address specific management issues and assess effectiveness of management solutions.

CONSERVATION SCIENCE OBJECTIVES

1. Assess the sanctuary's information base to identify gaps in knowledge that can affect our ability to manage the area.
2. Conduct studies of species or marine communities to identify wildlife and habitats most at risk or in need of management attention.
3. Promote the sanctuary as a site for ecosystem-based management research by providing financial and logistical support for scientific investigations that address critical marine ecosystem protection issues.
4. Design research and monitoring projects that are responsive to management concerns and contribute to improved management of the sanctuary.
5. Make effective use of research and monitoring results by incorporating them into education and resource protection programs.
6. Encourage information exchange and cooperation among all organizations and agencies undertaking ecosystem-based research in the sanctuaries to promote more timely and informed management.

CURRENT CONSERVATION SCIENCE PROGRAM

The sanctuary's conservation science program consists of several ecosystem monitoring projects, issue specific research projects, and habitat characterization projects. The monitoring programs, Sanctuary Ecosystem Assessment Surveys (SEAS), are a compilation of GFNMS programs that provide biological observations and habitat characterization for the Gulf of the Farallones region. SEAS include several long-term monitoring programs such as Beach Watch, Applied California Current Ecosystem Surveys (ACCESS), and Rocky Intertidal Monitoring. SEAS will also include future monitoring and exploration programs such as invasive species detection, restoration, and monitoring; estuarine monitoring; water quality monitoring through assessment of indicator species for ecosystem health; and the status and trends of species populations and ranges in the Gulf of the Farallones as indicators of impacts from global climate change.

SEAS—Beach Watch volunteers have been monitoring coastal marine life (alive and dead) and human activities along the sanctuary shoreline continuously since 1993. Beach Watch collects baseline data on sanctuary wildlife and maintains a long-term database used by the sanctuary and other natural resource management agencies to answer management questions.

SEAS—Rocky Intertidal Program monitors species abundance and distribution within several locations throughout the sanctuary, and spatial-temporal changes within the rocky intertidal habitat.

Dedicated research projects in the past have included efforts to assess wildlife disturbance levels from permitted overflights and advise management on the effectiveness of special conditions required in sanctuary permits. Another example of a past dedicated research project is the assessment of human activities upon three harbor seal haul-outs. This six-year project, called Sanctuary Education, Awareness and Long-term Stewardship (SEALS), categorized and quantified human activities near the seal haul-outs and provided recommendations for approach distances. This information was later incorporated into various outreach products and docent programs, aided National Marine Fisheries Service investigating violations to the Marine Mammal Protection Act, and informed U.S. Fish and Wildlife Service during development of new refuge boundaries and regulations. Past habitat characterization efforts included the production of the Biogeographic Atlas, a compilation of maps and analyses to identify areas of highest ecological importance in sanctuary offshore areas, side-scan sonar and multibeam mapping and video-documentation of benthic resources around the South Farallon Islands, Fanny Shoal, Rittenburg Bank, Cochrane Bank, Farallon Escarpment, and Drakes Bay, and characterization of oceanographic features through the use of thermistor arrays and ACCESS underway data collection.

Since 1997, Gulf of the Farallones has conducted at-sea monitoring for birds, mammals, turtles, and vessel activities, through various projects similar to ACCESS. ACCESS is a long-term study that focuses on krill, a critical building block in the food chain for this area. Through the use of acoustics and sampling, krill and juvenile and schooling fish are located and identified. The parameters influencing their distribution in the water column are investigated. These data are analyzed along with oceanographic parameters, chlorophyll, seabird, and marine mammal sightings to better understand the causes and dynamics of marine life concentrations in particular areas of the sanctuary.

Information and products from current and future science programs contribute to the understanding of sanctuary wildlife and habitats and how they are influenced by anthropogenic stressors such as oil pollution, climate change, noise, marine debris, and extraction. Science products also help to predict or model changes from natural phenomenon and human-induced stressors. Information from the Conservation Science program also contributes to outreach and educational materials used in handouts, classroom assignments and web-based products.

CONSERVATION SCIENCE STRATEGIES

STRATEGY CS-1: *Maintain the Beach Watch program to monitor marine life and human activities on sanctuary beaches, and provide baseline information, and identify ecosystem changes to assist sanctuary management decisions.*

Activity 1.1 Maintain Beach Watch volunteer monitoring program to gather baseline information about the resources of the sanctuary.

- A. Beach Watch is a long-term shoreline monitoring program. The Beach Watch program primarily assesses coastal birds, marine mammals, human activities, and oil pollution. The program goals are to: 1) educate the public about the coastal environment; 2) educate the public that they can make a difference in protecting their beaches; 3) assist GFNMS in the early detection of natural and human-caused environmental perturbations such as warm or cold water events and oil spills; 4) provide a baseline of information on the average presence of live and beachcast marine organisms; and 5) develop a network of local experts who can document and discuss the natural changes a specific beach will undergo over a period of several years. Beach Watch and similar west coast sanctuary monitoring programs will be integrated to produce data sets for tracking the health and status of west coast seabird and marine mammal populations.
- B. Revise and reprint beached bird book to support the efforts of Beach Watch, BeachCOMBERS in MBNMS and COASST volunteers in OCNMS by making available the most current information on identification and demographic information of beached birds and mammals.
- C. Integrate Beach Watch data with other biological and physical monitoring data sets such as ACCESS data sets, SEAS rocky intertidal monitoring, the state's North-Central Coast Marine Protected Areas monitoring through the Monitoring Enterprise, and future monitoring programs (introduced species and water quality). Make data applicable to and posted on the Southwest Environmental Response Management Application. Data should be available for access by staff during emergency response.
- D. Integrate Beach Watch data with regional and national Integrated Ocean Observation Efforts (IOOS) and Central and Northern California Ocean Observation System as well as West Coast Regional Monitoring Program and United States Fish and Wildlife Service (USFWS) seabird populations assessment, and harmful algal bloom events.
- E. Upgrade Beach Watch data management and availability by posting data sets on local and regional web sites such as Center for Integrated Marine Technologies (CIMT), (CICORE), the national data base for the Marine Mammal Stranding Network, and the Sanctuary Integrated Monitoring Network (SIMoN).
- F. Improve efficiency of data collection through the use of smart phones, digital imagery, and other electronic information gathering tools. Tools and programs shall be compatible

with those used by other shoreline monitoring programs, emergency response and injury assessment, National Marine Fisheries Service and US Fish and Wildlife Service.

STRATEGY CS-2: Conduct research as needed, to guide permit conditions.

Activity 2.1 Conduct research to guide permit conditions for white shark viewing and assess effectiveness of regulations.

- A. Develop and implement a white shark behavioral study to assess the impacts of motorized vessels in the vicinity of feeding and milling sharks. Study will assess shark behavior in relation to numbers of vessels and approach distances during various shark predator-prey interactions. Study analysis shall be targeted to recommend acceptable number of vessels, vessel size(s), and approach distances. Study will be conducted August through January during the seasonal migration of sharks to the Farallon Islands.
- B. Periodically review effectiveness of special permit conditions and revise as appropriate.

STRATEGY CS-3: Host a biennial research workshop to facilitate information exchange in the GFNMS.

Activity 3.1 Every other year, the sanctuary will continue to host a conservation science workshop with local researchers and educators to highlight science in and around the sanctuary.

- A. Host workshop every other year. Workshop proceedings will include oral presentations, poster sessions, and publication of proceedings and abstracts.
- B. Compile a comprehensive list of research being conducted in and around the sanctuary. Produce map of sampling locations and study areas.
- C. Educate research community how to post monitoring program descriptions and findings on to GFNMS SIMoN, OceanObs, SEAMAP, CICORE and other appropriate web sites.

STRATEGY CS-4: Develop and implement sanctuary ecosystem assessment and monitoring programs, and integrate with regional ocean observation programs along the west coast and the sanctuary program's System Wide Monitoring guidelines.

Activity 4.1 Expand ACCESS.

- A. Conduct long-term monitoring of the macrovertebrates of the sanctuary, seabirds, marine mammals, and sea turtles and their prey species. Monitor the abundance and distribution of species impacted by chronic and acute oil pollution, such as seabirds, marine mammals, and sea turtles, and their trophic relationship and the population dynamics of euphausiid shrimp or krill.

Conservation Science Action Plan
GFNMS Draft Management Plan

- B. Investigate the relationship between hydrographic conditions, physical features and the distribution and abundance of marine organisms in the vicinity of the Gulf of the Farallones region and the coastal and pelagic region west of Sonoma County.
- C. Link local abundance and distribution data sets with associated habitats, oceanographic features, and occurrence and distribution of human activities, such as vessel activities.
- D. Monitor phytoplankton for detection of harmful algal blooms.
- E. Identify and map specific and trend information for identification of areas of ecological significance and changes of ranges as potential indicators of global warming.

Activity 4.2 Expand sanctuary's Rocky Intertidal Monitoring Program. The rocky intertidal habitat of the sanctuary is limited to outer coast and island shorelines. This habitat is subjected to extraction, trampling impacts from humans and wildlife, smothering and scouring from natural and human-induced erosion factors, permanent destruction from vessel groundings, loss of acreage from non-native species, and impacts from pollutants such as urban run-off and vessel spills. Restoration of the rocky intertidal habitat is difficult and time-consuming, with projects often taking from seven to ten years.

- A. Continue monitoring of the rocky intertidal areas of the Farallon Islands and re-establish long-term monitoring of six mainland monitoring sites: Bodega Head, Pinnacle Rock, Estero Americano, Duxbury Reef, Slide Ranch, Bean Hollow and Pigeon Point and along the Sonoma and southern Mendocino coasts. The objectives are to: 1) establish non-destructive, permanent sampling transects, quadrats and density plots within the intertidal areas of the GFNMS; 2) determine native and introduced species inventory in the intertidal communities; 3) determine primary and secondary cover in established quadrats; 4) determine percent cover of sessile organisms; 5) determine density of macroinvertebrates susceptible to oil spill injury; 6) photo-document, collect and archive voucher specimens from the intertidal areas for future reference. Through regular assessment (monitoring) of the condition and health of this sensitive habitat, sanctuary staff can detect acute changes and long-term trends. Monitoring information can also indicate if a management action is effective and having positive results.
- B. Integrate monitoring protocols and data sets with CeNCOOS, West Coast Observations – Sanctuary Ecosystem Assessment Stations, , Multi-agency Rocky Intertidal Network (MARINE), Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO), and the National Park Service. Provide data sets and integrated analyses to the State's Marine Life Protection Act Initiative, marine protected areas.
- C. Provide species inventory updates and integrate with introduced species detection programs.

Activity 4.3 Long-term monitoring of sanctuary physical/oceanographic processes

- A. Reestablish West Coast Obs-Sanctuary Ecosystem Assessment Stations (SEA Stations). SEA Stations are nearshore and near-island buoy-instrumentation, customized for particular locations. SEA Stations measure environmental events that affect marine life. The stations measure physical processes that affect distribution, settlement, growth and reproduction of marine life. Arrays have been placed at areas of water mass convergence, areas of strong upwelling influence and high productivity, and also near rocky intertidal monitoring sites. Interannual and shorter-term upwelling and relaxation events have been shown to drive recruitment and movement of certain fish species. It is also likely that these events affect other wildlife, including keystone species. The GFNMS will reestablish three arrays to continuously measure water column temperature, providing information necessary to understand and track water mass movements that affect recruitment of key species to coastal habitats. The stations shall be located at: located at: Bodega Head, Southeast Farallon Island, and Pigeon Point. A fourth and fifth array shall be newly established at Double Point and Point Arena.
- B. Establish Cooperative Agreement with Bodega Bay Marine Lab for long-term maintenance and periodic replacement and upgrades to array hardware; data down loading and web posting; data interpretation and integration with biological assemblage data and ecological areas of significance.

Activity 4.4 Conduct research and monitoring to assess eelgrass beds

- A. Develop and implement an eelgrass status study to assess size, density, health, and species richness of eelgrass beds in Tomales Bay.
- B. Periodically review effectiveness of regulation. Assess size and location of management zones.

STRATEGY CS-5: *Complete characterization of sanctuary biological and physical features.*

Activity 5.1 Map sanctuary habitat types and bottom substrate. A habitat map will provide important baseline information for management including relative proportions of sanctuary habitats; the current state of sanctuary wildlife and habitats as a basis against which to measure future change; unique habitats; identify areas of ecological significance; and extent of injuries from anthropogenic stressors.

Activity 5.2 Identify and map seasonal and year round circulatory patterns for surface and subsurface currents. Relate circulatory patterns to abundance and distribution of flora and fauna. Characterizing and mapping local and regional circulatory patterns and influences is important because the sanctuary is located in one of the world's four major upwelling systems. The upwelling of nutrient-rich, deep ocean water supports a food-rich environment and promotes the growth of organisms at all levels of the marine food web. The interaction of major currents, wind, topography, and other factors create coastal upwelling in the spring and summer that

influences the biological productivity of the sanctuary. This process drives the productivity of the area by bringing cool, nutrient-rich waters from deep offshore to the sunlit inshore surface. Upwelling increases the productivity of surface waters by supporting large plankton blooms, the basis for the abundance of marine life in the sanctuary.

Activity 5.3 Characterize the soft and hard bottom epifaunal communities. Survey the surface biota and sediment characteristics, quantify estimates of abundance and distribution of epifauna, assess disturbance effects and marine debris, develop species list of invertebrates and epifaunal fish, and characterize cultural resources.

Activity 5.4 Integrate characterization, mapping and monitoring programs with regional ocean observation programs along the west coast and incorporate the sanctuary program's System Wide Monitoring guidelines.

Strategy CS-6: *Work with partners to integrate data integration and infrastructure for SEA-S programs.*

Activity 6.1 SEAS program needs to be fully integrated with other science programs on a regional basis and need to use new technologies to link data sets from local and regional ecosystem monitoring and characterization programs within the West Coast sanctuaries. As part of an effort to develop a west coast regional observation system to support system-wide monitoring in the five West Coast sanctuaries, the ONMS will partner with researchers and the National Oceanographic Data Center (NODC) National Coastal Data Development Center (NCDDC) and will use new technologies for data and information management.

- A. Partner with local and regional researchers to develop complementary data collection methods and consistent data base structures to improve data exchange and data integration.
- B. Partner with the National Oceanographic Data Center (NODC) National Coastal Data Development Center (NCDDC) for data and information management support. Work with NCDDC to support ONMS efforts to build on SIMoN's existing structure to enhance data input and review, data management, analyses, reporting, archiving and dissemination functions in order to facilitate the use of the SIMoN framework by other sanctuaries. NCDDC will address requirements and needs for data rescue, metadata, federal compliance issues, and data accessibility and delivery. In addition, NCDDC will work with the ONMS to expand the use of the Sanctuary Integrated Monitoring Network (SIMoN) planned for the GFNMS in 2015.
- C. Develop the administrative infrastructure to identify and act on cross-boundary opportunities, collaborate with large-scale initiatives, and interpret the results for natural resource managers and public audiences across the region.

- D. Establish a regional monitoring coordination team. The regional monitoring team shall consist of the site's research coordinator and possibly additional science staff. The team will develop a regional science communication plan to improve coordination, evaluate effectiveness of monitoring programs, develop "state of the sanctuary" reports to help assess the health of the sanctuaries, and develop a regional ecosystem-based science operating plan in collaboration with each other to meet site, regional and national monitoring needs.

- E. Increase the use of new technologies to enhance data collection, expedite data management, and improve data availability for outreach and ecosystem protection. The sanctuary will automate data collection for near-real time retrieval of uncorrected data by developing on-line data entry and data downloading, and building a multi-sanctuary "real-time" database. The data will be available through CICORE, SEAMAP, SIMoN and IMaST portals and should result in expedited project analyses and findings, the ability to post new findings on the web site, and integrate new findings into exhibits and classroom activities.

Potential Partners:

Federal: National Park Service, Point Reyes National Seashore, US Fish and Wildlife Service (USFWS), NOAAs Deep-sea Coral Research and Technology Program, NOAA Damage Assessment, Research and Restoration Programs (DARRP), National Marine Fisheries Service (NMFS), NMFS SW Science Centers, NMFS Marine Mammal Stranding Network, NOAA Marine Debris Program, NOAA National Oceanographic Data Center (NODC), NOAA National Coastal Data Development Center (NCDDC), Southwest Environmental Response Application (ERMA), Monterey Bay National Marine Sanctuary (MBNMS), MBNMS Beach COMBERS, MBNMS-Sanctuary Integrated Monitoring Network (SIMoN), Olympic Coast National Marine Sanctuary (OCNMS), OCNMS Central Observation and Seabird Survey Team (COASST), Cordell Bank National Marine Sanctuary (CBNMS), San Francisco Bay National Estuarine Research Reserve, CeNCOOS, NSF IGERT Internship

State & County: California Department of Fish and Wildlife (CDFW), CA State Parks, CA Office of Spill Prevention and Response (OSPR), CA Department of Public Health HAB monitoring, CA-MLPA program, PISCO, BOME MARINE, State Coastal Conservancy, Sonoma State University, UC Davis Bodega Marine Lab, Duke University, San Francisco State University (SFSU), Hawaii Pacific University, University of Washington, Duke University SEAMAP, CICORE, Sonoma Coast State Parks, Fitzgerald Marine Reserve (FMR), Moss Landing Marine Laboratories

Other: Farallones Marine Sanctuary Association (FMSA), Point Blue Conservation Science, Tomales Bay Watershed Council, Stewards of the Coast and Redwoods, Sea Ranch Task Force, The Marine Mammal Center, California Academy of Sciences

GFNMS CONSERVATION SCIENCE

Performance Measures

Strategy Title(s)	Performance Goal	Desired Outcome (Objective)	Outcome Measure	How Measured	Who Measures	Output Measure
STRATEGY CS-1: Maintain Beach Watch program to monitor marine life and human activities on sanctuary beaches.	Develop monitoring programs to establish baselines, understand long-term status and trends, detect emerging issues, and guide management decisions.	Design research and monitoring projects that are responsive to management concerns and contribute to improved management of the sanctuary.	Increase understanding of human-use activities and their impacts on sanctuary resources.	1) Complete baseline data set about the resources of the sanctuary. 2) Expand long-term data set. 3) Integrate data into ERMA online ArcView database to be used during emergency response.	Ecosystem Protection Coordinator and Research Coordinator	1) Beach Watch Annual Report 2) Collaborative research papers 3) NRDA data 4) Web-based database
STRATEGY CS-2: Conduct research, as needed, to guide permit conditions	Develop monitoring programs to understand long-term status and trends, detect emerging issues, and guide management decisions.	Design research and monitoring projects that are responsive to management concerns and contribute to improved management of the sanctuary.	To determine appropriate permit conditions and effectiveness of new regulations.	1) Complete assessment of white shark behavior in relation to numbers of vessels, at approach distances, during various predator-prey interactions (short term). 2) Sufficient data to make recommendations.	Research Coordinator and Ecosystem Protection Coordinator	Report with recommendations

Conservation Science Action Plan
GFNMS Draft Management Plan

Strategy Title(s)	Performance Goal	Desired Outcome (Objective)	Outcome Measure	How Measured	Who Measures	Output Measure
STRATEGY CS-3: Host a biennial research workshop to facilitate information exchange in the GFNMS.	1) Increase our knowledge and understanding of the estuarine, nearshore and offshore ecosystems in GFNMS. 2) Develop monitoring programs to understand long-term status and trends, detect emerging issues, and guide management decisions. 3) Develop research programs to identify and address specific resource management issues and assess effectiveness of management solutions.	Encourage information exchange and cooperation among all organizations and agencies undertaking management related research in the sanctuaries to promote more timely and informed management.	1) To track data collected on sanctuary wildlife and habitats and qualities as a source of information for managing sanctuary resources. 2) Identify data gaps as they pertain to management needs.	Track increases in number and quality of monitoring and research projects in and around the sanctuary, and their relevance to sanctuary resources management issues.	Sanctuary Superintendent, Research Coordinator, Ecosystem Protection Coordinator	1) Workshop proceedings 2) Website 3) SIMoN listing
STRATEGY CS-4: Develop and implement integrated sanctuary ecosystem assessment and monitoring programs	Develop monitoring programs to establish baselines, understand long-term status and trends, detect emerging issues, and guide management decisions.	Design research and monitoring projects that are responsive to management concerns and contribute to improved management of the sanctuary.	Increase understanding of human-use activities and their impacts on sanctuary wildlife and habitats.	1) Complete baseline data set about the habitats and wildlife of the sanctuary. 2) Expand long-term data set. 3) Integrate data into ERMA online ArcView database to be used during emergency response.	Research Coordinator Resource Protection	1) SEAS Biennial Report 2) Rocky intertidal biennial report, 3) Collaborative research papers 4) NRDA data 5) Web-based database

Strategy Title(s)	Performance Goal	Desired Outcome (Objective)	Outcome Measure	How Measured	Who Measures	Output Measure
STRATEGY CS-5 Complete characterizations of sanctuary biological and physical features.	Adequately characterize sanctuary resources to establish baselines, understand long-term status and trends, detect emerging issues, and guide management decisions.	Complete site characterization of all sanctuary habitats, key indicator species and oceanographic processes, and physical features of the sanctuary.	Increase understanding of sanctuary wildlife and habitats and physical processes and how the sanctuary effect population health	1) Complete baseline benthic surveys and maps 2) Update species inventory 3) Quantify species distribution 4) Quantify introduced species distribution	Research Coordinator Resource Protection	1) Benthic maps of areas of ecological significance, and species 2) inventory of native species, 3) inventory of introduced species
STRATEGY CS-6 Work with partners functional integration and infrastructure for SEA Station and Survey programs	Effective operations and increased public awareness and information exchange	Automate data collection procedures to expedite data exchange; data summaries and data interpretation on web sites	Increased access and distribution of data	Data are analyzed within one year of collection and summary is posted	Research Coordinator	1) Use of data logging and digital imagery; 2) Methods are used by multiple management and marine researchers; 3) DRAFT data sets are available for emergency response and injury assessment activities within three days of collection



RESOURCE PROTECTION ACTION PLAN

PROGRAM STATEMENT

Consistent with the purposes and policies of the National Marine Sanctuaries Act (NMSA), NOAA uses an ecosystem approach to managing the marine areas of the sanctuaries. Gulf of the Farallones National Marine Sanctuary's (GFNMS) ecosystems include habitat structure, species assemblages, and ecological processes, as well as the many interactions with humans and their activities. GFNMS developed a resource protection program to expressly maintain an ecosystem perspective while providing oversight in addressing the multitude of resource protection issues the sanctuary is currently facing, as well as anticipating and planning for new and emerging issues on the horizon.

PROGRAM DESCRIPTION

Pursuant to the NMSA, GFNMS' role is protection of the area's natural resource and ecosystem values by protecting the biodiversity, productivity and aesthetic qualities of the marine environment of the Gulf of the Farallones through ecosystem-based management. The GFNMS incorporates the following principles into management:

1. Ecosystem-based management;
2. Precautionary approach;
3. Adaptive management; and
4. Managing for sustainability.

RESOURCE PROTECTION GOAL

Maintain and, where necessary, restore the natural biological and ecological processes in the sanctuary by evaluating and addressing adverse impacts from human activities on sanctuary ecosystems.

RESOURCE PROTECTION OBJECTIVES

1. Ensure protection for the habitats, wildlife, and qualities of GFNMS.

2. Continue to build on partnerships, collaborative efforts, and coordination with other agencies, institutions, and organizations, in taking a comprehensive and effective ecosystem protection approach.

RESOURCE PROTECTION ACTION PLAN

NEW AND EMERGING ISSUES

Although a wide range of issues have been included in the management plan action plans, many other issues are not addressed. These include: (1) issues which are currently considered to have relatively small impacts, but which may grow to have large impacts in the future; (2) activities which may be occurring in similar environments, but not actually in the sanctuary; and/or (3) activities that are based on new technology, and their potential impacts are not well understood. Emerging issues may include activities that are currently unforeseen, but may emerge in the future due to technological advances, changes in operations, changes in market demand, and increased pressures on the coast.

STRATEGY RP-1: *Develop a coordinated communication system among all national marine sanctuaries and other natural resource management agencies to stay informed about new and emerging issues, share information, and provide a forum for exchange and policy discussion.*

Activity 1.1 The National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), and ONMS are addressing new and emerging issues in some capacity every day. Each of these divisions and offices comment on environmental documents from other agencies, provide comment on policy development from within NOAA, and consult on new and emerging issues either on the ONMS site level or from congressional inquiries. GFNMS will track, review, and comment on environmental assessments and environmental impact statements (EIS) that have the potential to affect the resources of GFNMS.

Activity 1.2 GFNMS will formalize a communication system and leverage opportunities with other natural resource management agencies to exchange ideas on new and emerging issues. Forums for information exchange include:

- A. California Coastal Zone Managers quarterly meetings.
- B. Annual Coastal Zone Managers meeting in Washington, D.C.
- C. Conferences and professional meetings.

STRATEGY RP-2: *Develop a resource protection plan (policy) and potential regulations to minimize user conflicts and provide special areas of protection for sensitive habitats, living resources, and other unique sanctuary features, such as Special Wildlife Protection Zones.*

Activity 2.1 Determine the need to take a proactive approach and address specific ecosystem management issues. This plan will be built in consideration of other management strategies, both temporary and permanent.

- A. Characterize and map the wildlife and habitats of the sanctuary to identify and link species distribution with critical areas/phases of their life history.
- B. Overlay socioeconomic profile of human activities taking place in the sanctuary.
- C. Use stakeholder-based group processes either by receiving advice from the sanctuary advisory council or participating in other agency working groups, and scientific expertise to review data to determine possible indicators of “special areas of concern” and/or “species of concern.”

STRATEGY RP-3: *Develop strategy to protect habitats that are known to be “special areas of concern.”*

Activity 3.1 Through a community-based process, make a determination on special status for particular areas to protect and restore habitat for marine life.

REGULATORY DEVELOPMENT

One of the NMSA’s purposes is to facilitate compatible use that is consistent with its primary purpose of ecosystem protection. To this end, each of the national marine sanctuaries has a discreet set of site-specific regulations or prohibitions (15 CFR § 922), and general policy under the NMSA (16 USC § 1431 et seq.).

STRATEGY RP-4: *GFNMS will develop a program to consistently and continuously review and evaluate sanctuary regulations, including its boundaries.*

Activity 4.1 Evaluate the appropriateness and effectiveness of current sanctuary regulatory language (prohibitions) in addressing the priority ecosystem protection issues identified through the management plan review process.

- A. Interpret, refine, amend, and develop site-specific regulations as needed following the appropriate public process.
- B. Ensure coordination and consistency with other natural resource management agencies regulations and permits.

PERMITTING

Generally, permit requests are for research or education purposes. The sanctuary evaluates these requests on a case-by-case basis in detail to determine if the activity is necessary to be conducted in the sanctuary and the extent of the activity’s impacts on sanctuary resources or qualities.

STRATEGY RP-5: *Continue to implement a formalized permit program as a mechanism to review requests to conduct prohibited activities within the sanctuary, and where possible permit these activities to be conducted in such a way to have negligible effects.*

Activity 5.1 In order to understand, monitor, and control prohibited activities within the sanctuary, and to minimize cumulative impacts from these activities, the permit program will continue to review projects by:

- A. Evaluating permit requests on a case-by-case basis.
- B. Developing permit requirements for applicants on procedures and operations to avoid or reduce impacts to sanctuary wildlife, habitats, or qualities.
- C. Tracking permitted activities to ensure compliance with permit conditions.
- D. Requiring applicants to provide the sanctuary with the data and findings gained through research conducted with research permits and submit findings on SIMoN.
- E. Ensure permits are issued in compliance with national policies, National Environmental Policy Act (NEPA), NMSA, Marine Mammal Protection Act (MMPA), and other environmental protection legislation.
- F. Review all proposed projects with respect to environmental consequences and the level of impact, individually or cumulatively, and make a determination if the activity is excluded from the requirement to prepare an environmental assessment or environmental impact statement.

Activity 5.2 The Permit Coordinator will coordinate with other regulatory agencies issuing permits to ensure consistency with applicable laws.

- A. Coordinate with other regulatory agencies to ensure that other agency permits are consistent with the sanctuary's regulations. Inconsistencies may be rectified by incorporating or referencing the sanctuary's regulations.
- B. Consult with other agencies, as needed, to ensure that Sanctuary permits are consistent with other agencies' laws and regulations and develop appropriate permit conditions.

Activity 5.3 Conduct outreach about the sanctuary's permit process to help inform potential applicants and bring them into compliance with the sanctuary's permit process.

- A. Provide sufficient outreach to education and research institutions and individuals wishing to conduct prohibited activities within the sanctuary about the permit application process.
- B. Use the SAC as a link to educate the larger community on the sanctuary's permitting process.

PROTECTED RESOURCES ENFORCEMENT PLAN

The objective of this program is to achieve ecosystem protection through compliance with sanctuary regulations and other applicable state and federal statutes. The mission of sanctuary enforcement is to ensure compliance with the NMSA (16 USC § 1431 et seq.) and applicable regulations of the sanctuary (15 CFR § 922). The approach is two-fold in nature: (1) conducting public outreach as a tool to inform and encourage voluntary compliance; and (2) the use of patrols and other traditional law enforcement methods to enforce regulations and investigate incidents or suspected prohibited activities. Together, these two programs should result in a regular and ongoing deterrent presence in sanctuary waters and improve compliance with sanctuary regulations.

STRATEGY RP-6: *Strive to increase ecosystem protection through compliance with sanctuary regulations and other applicable local state and federal statutes that protect sanctuary natural resources.*

Activity 6.1 Ensure sufficient patrol presence in the sanctuary through the development of partnerships and interagency coordination.

- A. Develop enforcement priorities and articulate them on an annual basis in NOAA Joint Enforcement Agreement (JEA) between NOAA Office of Law Enforcement and California Department of Fish and Wildlife.
- B. Develop compliance priorities for permitted activities.
- C. Develop recommended patrol schedules.
- D. Develop partnerships with other federal, state and local enforcement agencies in order to provide a strong multi-jurisdictional enforcement presence throughout the sanctuary.
- E. Facilitate communication among enforcement assets to ensure coordination. This can be done through the establishment of a Law Enforcement Technical Advisory Committee.
- F. Promote training and, as appropriate, offer to other law enforcement agencies.
- G. Involve the USCG Auxillary, Lighthawk and the Civil Aeronautical Patrol (CAP) in presence and patrol in sanctuary waters.

Activity 6.2 Use outreach tools to inform and encourage voluntary compliance with sanctuary regulations. These tools such as presentations, signage, electronic communications, newsletters, and displays may be used to affect behavior and change values as it is generally believed, that once informed, most individuals will choose to comply. Efforts will include:

Resource Protection Action Plan
GFNMS Draft Management Plan

- A. Integrate basic information regarding sanctaury regulations, as needed, into coast-side signage throughout geographic range of sanctuary.
- B. Work with California Dept. of Motor Vehicles to include informational inserts in boat license renewal packets (to be coordinated with all California national marine sanctuaries).
- C. Give presentations to yacht clubs, the Coast Guard Auxiliary, and other appropriate groups.

Activity 6.3 Develop a volunteer-based program that will use education and outreach to affect behavior and values to achieve voluntary compliance with sanctuary regulations.

- A. Identify major user groups for targeted education and outreach efforts about sanctuary regulations.
- B. Conduct community outreach program to encourage compliance with sanctuary regulations and citizen involvement in reporting violations.
- C. Hold meetings and workshops to inform user groups and promote voluntary compliance and stewardship.
- D. Train volunteers as a component of the Sanctuary Naturalist Corps (see Education Action Plan).

Activity 6.4 Develop enforcement tools to ensure effectiveness of the enforcement program.

- A. Provide assistance to Office of the General Counsel Enforcement Section (GCES) on developing hierarchy of options for addressing minor violations including: warnings, fix-it tickets, and summary settlements/on the scene citations when applicable.
- B. Evaluate the effectiveness of technology for surveillance including satellite imagery, unmanned aerial surveys, wireless cameras, and tracking systems.
- C. Provide technical assistance to NOAA Office of Law Enforcement and GCES on violation assessment, including conducting impact analyses.
- D. Comment on national penalty schedule.

EMERGENCY RESPONSE

Incidents within the sanctuary requiring an emergency response may have the potential to significantly impact sanctuary wildlife, habitat and cultural resources. Incident response may be to a recently occurring catastrophic event (e.g., plane crash or vessel grounding), or the delayed

or persistent impacts from incidents that occurred years previously (e.g., dumpsites or historic shipwrecks).

STRATEGY RP-7: *Review and revise the sanctuary’s spill response plan and emergency response portfolio (ERP) in order to be prepared to respond to an incident.*

Activity 7.1 GFNMS will review and revise its in-house, spill response plan and ERP, based on the Incident/ Unified Command System (ICS) and the USCG’s Area Contingency Plan (ACP), to respond to oil spills, hazardous material spills, grounded vessel or natural disasters. The response plan will also be reviewed, evaluated and updated on an annual basis. The ERP will be reviewed, evaluated and updated on an as-needed basis throughout the year. GFNMS’ spill response plan and ERP:

- A. Lays out emergency response notification (including all relevant agencies, user groups, and media) and preparation procedures.
- B. Identifies specific duties for sanctuary staff.
- C. Outlines training standards and instructs all sanctuary staff to be trained on an ongoing basis with regular updates and refresher courses, and ready to respond in the case of an emergency.
- D. Provides appropriate contact lists for other ONMS sites, responder agencies, local, state, and federal park and land managers, and life safety agencies.

Activity 7.2 Develop tools to ensure a coordinated and timely response to incidents.

- A. Establish a relationship and coordinate with ORR, Emergency Response Division (ERD), NOAA’s Science Support Coordinator and NOAA Regional Response Team representative, and the ONMS (including other sanctuary site emergency response staff, the West Coast Regional Office, and Headquarters).
- B. Identify resources at risk, potential high probability threats, available response and information assets, notification contacts, maps, coastal observation systems, and jurisdictional information. This information can be used in area contingency plans, the GFNMS in-house emergency response plan, and the Southwest Environmental Response Management Application (ERMA).
- C. Provide GFNMS data and information to help populate the Southwest ERMA, a web-based interface system that is by responder agencies (e.g. USCG, CDFW OSPR, NOAA ORR) used on- and off-line to assist in incident response, facilitating the abilities of sanctuary staff to provide information to a unified command during an incident. Enhance ERMA to accept and provide near-real time data collected during response efforts.

Resource Protection Action Plan
GFNMS Draft Management Plan

- D. Participate in the Resources and Undersea Threats (RUST) database that catalogs submerged resources, threats, and hazards data.
- E. Develop contingency response fund for prompt removal or recovery of abandoned vessels.
- F. Identify potential injury to resources at risk from the proposed use of alternative response technologies during an oil pollution response event by performing a regional specific Net Environmental Benefits Analysis. Develop a GFNMS policy and recommended guidelines for the use of dispersants in advance of a spill in order to ensure this information can be more readily provided to the ICP.
- G. Maintain and enhance data collection, interpretation, and mapping from Beach Watch and ACCESS monitoring for determining resources at risk, effectiveness of response measures, clean-up end points, and baseline conditions.

Activity 7.3 Assess levels of potential risk from activities in and adjacent to the sanctuary.

- A. Track distribution and numbers of sensitive species and habitats.
- B. Develop resources-at-risk model analysis for the sanctuary.
- C. Participate in regional response team to address risks to sanctuary resources.
- D. Based on risk assessment, develop outreach program targeting user groups.

DAMAGE ASSESSMENT AND RESTORATION

Section 312 of the NMSA authorizes NOAA to pursue civil actions to recover response costs and damages for incidents that injure, destroy, or cause the loss of sanctuary resources. Funds collected by NOAA under Section 312 are deposited in the Damage Assessment and Restoration Revolving Fund (DARRF). The scope of Section 312 covers how the response costs and damages recovered shall be retained and used, as follows:

- (1) **RESPONSE COSTS.**—Amounts recovered by the United States for costs of response actions and damage assessments under this section shall be used, as the Secretary considers appropriate—
 - (A) to reimburse the Secretary or any other Federal or State agency that conducted those activities; and
 - (B) after reimbursement of such costs, to restore, replace, or acquire the equivalent of any sanctuary resource.
- (2) **OTHER AMOUNTS.**—All other amounts recovered shall be used, in order of priority—
 - (A) to restore, replace, or acquire the equivalent of the sanctuary resources that were the subject of the action, including for costs of monitoring and the costs of curation and conservation of archeological, historical, and

- (B) cultural sanctuary resources;
to restore degraded sanctuary resources of the national marine sanctuary that was the subject of the action, giving priority to sanctuary resources and habitats that are comparable to the sanctuary resources that were the subject of the action; and
- (C) to restore degraded sanctuary resources of other national marine sanctuaries.

STRATEGY RP-8: *Formalize plans that address incidents that injure sanctuary ecosystems.*

Activity 8.1 Coordinate with NOAA’s Office of Response ONMS HQ, ORR Assessment and Restoration Division (ARD), the National Marine Fisheries Service Restoration Center (RC) and Trustee Councils to restore sanctuary wildlife and habitats.

- A. Work with other NOAA offices and agencies to assess natural resource damages and implement ecosystem restoration projects.
- B. Coordinate with ONMS Resource Protection Coordinator and Office of Response and Restoration (ORR) Assessment and Restoration Division (ARD) on natural resource damage assessments. Provide cost estimate and cost documentation for response and National Resource Damage Assessment costs. Provide ONMS HQ, General Counsel for Natural Resources, ORR and RC and other state, tribal and federal trustees litigation support as appropriate.
- C. Work with ONMS Resource Protection Coordinator and trustee councils (oil spill cases) to implement restoration programs.
- D. Work with state, tribal and federal trustee scientists on developing monitoring programs to assess restoration effectiveness if sufficient funds are provided in settlements.

COLLABORATIVE PLANNING AND MANAGEMENT

Sanctuary program development and planning efforts provide an opportunity for public input in identifying and resolving ecosystem protection issues. These partnerships and public involvement are essential ingredients to successful resolutions and implementation of strategies.

STRATEGY RP-9: *Continue to build partnerships and leverage opportunities for protecting sanctuary wildlife, habitats, qualities and cultural resources.*

Activity 9.1 Coordinate development of collaborative processes.

- A. Identify appropriate partners for implementing the management plan.

Resource Protection Action Plan
GFNMS Draft Management Plan

- B. Coordinate with sanctuary advisory council on multi-stakeholder options for addressing ecosystem protection issues.
- C. Provide coordination, oversight and facilitation, as appropriate, to issue-specific committees addressing targeting issues.

Activity 9.2 Coordinate with other agency management and restoration plans to enhance and protect the sanctuary.

- A. Coordinate with Marin County Open Space and the National Park Service on Bolinas Lagoon restoration plans.
- B. Coordinate with the Farallon National Wildlife Refuge on the Coordinated Conservation Plan update.
- C. Coordinate with U.S. Coast Guard on commercial vessel traffic patterns and whale observations.
- D. Coordinate with NMFS, Sonoma County Water Agency, and U.S. Army Corps of Engineers on the management of the Russian River mouth.
- E. Take an active role in reviewing project proposals, environmental impact statements and environmental impact reports as needed to protect and restore sanctuary biological and ecological processes.

RADIOACTIVE WASTE DUMP

The area referred to as the "Farallon Islands Radioactive Waste Dump" (FIRWD) is where approximately 47,800 barrels of low-level radioactive waste were dumped between 1946 and 1970. Although the containers were to be dumped at three designated sites, they are actually strewn over an area of 540 square miles in depths ranging from 300 to more than 6,000 feet within GFNMS. Research results to date are inconclusive on the impacts on the marine ecosystem from radioactive leakage. Significant public fear and uncertainty about the contamination from leaking barrels continue, particularly since major commercial fishing, sport fishing and other recreational activities take place in the area in and above the dump site.

STRATEGY RP-10: *Evaluate condition of, and actual impacts on sanctuary resources and qualities from the Farallon Islands radioactive waste dump.*

Activity 10.1 Convene a group of agency scientists to evaluate status of radioactive waste dump and make recommendations on roles and responsibilities for addressing some of the issues associated with FIRWD.

- A. Identify appropriate agency partners.

- B. Inventory current research on the FIRWD and identify data gaps.
- C. Determine under whose mandate the issues/impacts will be addressed.

Activity 10.2 Develop an outreach campaign to inform the public on the status and potential threats of the FIRWD.

- A. Develop a communications plan to systematically educate the public and target audiences on a routine basis about the status of FIRWD.
- B. Develop a list of audiences, both targeted and general public, on which to focus outreach efforts.
- C. Update nautical charts to show known area with radioactive waste containers.
- D. Identify partners, such as other agencies or institutions, to help develop outreach materials and participate in outreach efforts.

ECOSYSTEM RESTORATION

In order to restore the natural biological and ecological processes of the sanctuary, it is critical to evaluate and address adverse impacts from human activities on sanctuary wildlife, habitats and qualities. Tomales Bay and Bolinas Lagoon are two places in the sanctuary that have been identified as a priority for ecosystem restoration projects. Tomales Bay and Bolinas Lagoon have long been recognized as special places deserving a high level of protection by citizens and local, state and federal agencies. Both areas are significant biological communities that support a diversity of habitats, including eelgrass beds, intertidal sand and mud flats and salt and freshwater marshes. Thousands of species of birds, invertebrates and plants and numerous threatened and endangered species inhabit both of these estuarine ecosystems.

STRATEGY RP-11: *In cooperation and coordination with other local, state and federal agencies, develop and implement a comprehensive plan to ensure the protection of water quality, wildlife, habitats and safety in Tomales Bay.*

In 2013 GFNMS, in collaboration with the California State Lands Commission, adopted the Tomales Bay Vessel Management Plan, which was developed as the result of a long-term multi-agency effort to streamline and coordinate vessel management activities for the benefit of the public. It represents extensive input from the boating community and other local stakeholders, and the intended outcome is a collaborative plan that provides guidance to the agencies and the public for managing boater-related uses of Tomales Bay. The primary goals of the Plan are to protect habitat, decrease threats to and disturbance of wildlife, and ensure safe and enjoyable water-related recreation by removing and preventing illegally and improperly placed moorings and mooring materials. The Plan addresses numerous issues including vessel sewage discharge, impacts from moorings, derelict or deserted vessels, introduction of invasive species, disturbance of wildlife, and discharges of oil, fuel, and vessel maintenance products.

Resource Protection Action Plan
GFNMS Draft Management Plan

GFNMS has taken a lead in proposing both programmatic and management actions to address priority ecosystem protection issues that complement other agencies' actions, and is one of the lead agencies supporting the development of a comprehensive plan for Tomales Bay. The adoption of the Vessel Management Plan was the first step in this endeavor and the following activities are based on the results of the adoption of the Vessel Management Plan.

Activity 11.1 Implement vessel management guidelines in coordination with ten local, state and federal agencies to address vessel use that may be impacting sensitive habitats.

- A. Control the number of moored vessels and/or moorings in Tomales Bay.
- B. Take actions to promote boater compliance with all discharge regulations.
- C. Identify sensitive areas that may warrant additional protection.
- D. Coordinate between agencies on developing an education program about impacts from moorings and vessel activities in Tomales Bay.

Activity 11.2 Develop sewage, oil and bilge water waste disposal and facility guidelines for public and private boating facilities.

- A. Coordinate with existing public and private boating facility operators to develop sewage waste or oil and bilge waste facilities. Agency coordination will include streamlining of permits and assisting with seeking funding for construction of sewage waste facilities.
- B. Encourage new facilities, or facilities with expansion plans, to provide sewage waste management facilities.
- C. Take regulatory action or develop voluntary guidelines to ensure that vessels that are occupied and moored within the Sanctuary have the capacity to manage on-board sewage waste during the extent of their day. Any regulatory action would be developed in accordance with mandates requiring public process.
- D. Coordinate with other agencies on developing a targeted outreach program to educate boaters on proper management of sewage waste.
- E. Work with the San Francisco Bay Regional Water Quality Control Board on developing regional standards for sewage disposal facilities for Tomales Bay.

Activity 11.3 Develop an enforcement plan to address derelict and abandoned vessels and moorings in Tomales Bay.

- A. Develop a plan for removal of derelict and abandoned vessels.
- B. Develop a plan for removal of moorings that are in violation of regulations and/or pose a threat to water quality, marine wildlife and natural benthic habitat, and/or safety of Tomales Bay.
- C. Take action to prevent placement of unapproved moorings.

Activity 11.4 Address impacts to sensitive habitats from construction, modifications and additions to docks and piers in Tomales Bay.

- A. Protect sensitive nearshore and estuarine habitats by ensuring docks and piers in Tomales Bay stay within their existing footprint. Any regulatory action would be developed in accordance with mandates requiring public process.

Activity 11.5 **Through a community-based, multi-stakeholder process develop a comprehensive plan addressing aquaculture and native oyster bed restoration in Tomales Bay.**

STRATEGY RP-12: *Work in collaboration with federal, state and local agencies, and the local community, to restore the natural ecological processes of Bolinas Lagoon.*

Activity 12.1 Collaborate in the development and implementation of a comprehensive plan to examine actions that would reduce, and possibly reverse, sediment accumulation and habitat shifts caused by human impacts.

- A. Participate as a member of the Bolinas Lagoon Advisory Council.
- B. Work with partners to design and implement restoration projects.
- C. Conduct regular outreach through meetings, workshops (e.g. the State of the Lagoon), and correspondence with the community to keep them apprised about on-going research and restoration efforts.

STRATEGY RP-13: *In cooperation and coordination with local, state and federal agencies, develop and implement a comprehensive plan to ensure the protection of water quality and habitat in Arena Cove.*

Activity 13.1 Develop mooring guidelines in coordination with other agencies to address vessel moorings.

- A. Control the number of moored vessels and/or moorings in Arena Cove.

***Resource Protection Action Plan
GFNMS Draft Management Plan***

- B. Through a permitting process in coordination with California State Lands Commission, ensure that vessels that are moored within Arena Cove have the capacity to manage on-board sewage waste. Take actions to promote moored boater compliance with all sanctuary discharge regulations.

Activity 13.2 Develop vessel sewage waste disposal and facility guidelines for Arena Cove.

- A. Coordinate with the City of Point Arena to develop vessel sewage waste management facilities. Agency coordination will include streamlining of permits and assisting with seeking funding for construction of sewage waste facilities.
- B. Coordinate with other agencies on developing a targeted outreach program to educate boaters on proper management of vessel sewage waste.

CLIMATE SMART CONSERVATION

The sanctuary's Climate Smart Conservation Project is an effort to integrate climate change mitigation, monitoring, education, and adaptation into sanctuary management through the development of four planning documents: 1) Green Operations Plan; 2) Ocean Climate Indicators Monitoring Inventory and Plan; 3) Ocean Climate Education Plan, and 4) Climate Smart Adaptation and Implementation Plan. These products combined will form the sanctuary's Climate-Smart Conservation Plan, a first of its kind along the California coast and within the National Marine Sanctuary System, and a guiding document for sanctuary management and partners to ensure long-term viability of the habitats and resources protected by the sanctuary.

STRATEGY RP-14: *Integrate climate change mitigation, monitoring, education, and adaptation into sanctuary management through the development of the Gulf of the Farallones National Marine Sanctuary Climate Smart Conservation Plan.*

Activity 14.1: Publish to the ONMS Conservation Science Series the report, "Ocean Climate Indicators: A Monitoring Inventory and Plan for Tracking Climate Change in the North-central California Coast and Ocean Region", that identifies 12 indicators and identifies a consistent way to measure and manage the impacts of climate change in the region, and provides a foundation of scientific consensus for the Climate Smart Conservation Plan. This report was drafted through a working group of the Gulf of the Farallones National Marine Sanctuaries Advisory Council .

Activity 14.2 Reduce Site Emissions

- A. Complete an annual emissions inventory for the facilities and operations of GFNMS (ongoing since 2008).
- B. Maintain staff Green Team to prioritize and implement Green Operations Plan.

Activity 14.3 Develop the Ocean Climate Education Plan.

- A. Sanctuary climate and education staff develop the Ocean Climate Education Plan through identifying existing and new education strategies that address the effects of climate change on local marine ecosystems, appropriate audiences for each impact, and funding requirements in the education and outreach focus areas of 1) Public Programs, 2) School Programs, 3) Exhibits and Interpretive Signage, 4) Media.
- B. Review and incorporate specific education and outreach guiding principles into the plan, such as the NOAA Climate and Ocean Literacy Principles, Office of National Marine Sanctuaries Education Strategic Plan, and West Coast Sanctuaries Interpretive Plan.
- C. Incorporate the key climate change issues affecting the local marine environment identified in the Climate Change Impacts Report.
- D. Provide staff and partner education opportunities on climate change.

Activity 14.4 Develop the Climate Smart Adaptation and Implementation Plan.

- A. Identify scope of adaptation project and internal planning team.
- B. Internal planning team develop draft list of focal resources based on internal and external research and management documents.
- C. Conduct Focal Resources Stakeholder Workshop to finalize list of focal resources through expert input.
- D. Conduct Vulnerability Assessment Stakeholder Workshop to assess vulnerability of focal resources to climate change impacts through expert input.
- E. Conduct Scenario Planning Stakeholder Workshop to evaluate vulnerability assessments in the context of different scenarios for the interaction of climate and non-climate stressors, and define and name distinct scenarios for the study region, based on the top 2 or 3 most uncertain/important drivers.
- F. Request a working group of the Sanctuary Advisory Council to develop the Climate Smart Adaptation Plan.
- G. Sanctuary Advisory Council review of the recommended plan and forward to the sanctuary superintendent.
- H. Sanctuary staff develops the Adaptation Implementation Plan, with immediate emphasis on identified pilot adaptation responses.

Resource Protection Action Plan
GFNMS Draft Management Plan

- I. Implement pilot green-resilient shoreline projects from Adaptation Implementation Plan.

Activity 14.5 Assemble the GFNMS Climate Smart Conservation Plan and request ONMS Climate Smart Sanctuary Certification.

- A. Compile and format each separate plan into a comprehensive Climate Smart Conservation Plan.
- B. Prepare the necessary documentation to request ONMS Climate Smart Sanctuary Certification.

Potential Partners:

Federal: US Coast Guard (USCG), United States Department of the Interior (DOI), United States Geological Survey (USGS), United States Army Corps of Engineers, Environmental Protection Agency (EPA), U.S. Navy, Point Reyes National Seashore (PRNS), Golden Gate National Recreational Area (GGNRA), NOAA General Council Ocean Service (GCOS), National Marine Fisheries Service (NMFS), NOAA Office of Law Enforcement (OLE), NOAA Office of National Marine Sanctuaries (ONMS), Cordell Bank National Marine Sanctuary (CBNMS), Monterey Bay National Marine Sanctuary (MBNMS), Channel Islands National Marine Sanctuary (CINMS), Olympic Coast National Marine Sanctuary (OCNMS), sanctuary advisory council (SAC), NOAA National Centers for Coastal Ocean Science (NCCOS), NOAA Office of Response and Restoration (ORR) HAZMAT, National Park Service Pacific West Region

State & County: California Department of Fish and Wildlife (CDFW), California Department of Transportation (CalTrans), California Department of Health, CA Oil Spill Prevention and Response (OSPR), California State Lands Commission (CSLC), California Coastal Commission (CCC), California State Parks (SP), San Francisco Bay Regional Water Quality Control Board (SFRWQCB), California Department of Boating and Waterways (CDBW), California Department of Public Health (CDPH), California Ocean Science Trust, County of Marin, Marin Open Space District, County of Sonoma, Sonoma County Water Agency, City of Gualala, County of Mendocino, City of Point Arena.

Other: Marine Conservation Biology Institute (MCBI), Bolinas Lagoon Technical Advisory Committee, Bodega Marine Lab (BML), Point Blue Conservation Science

GFNMS RESOURCE PROTECTION

Performance Measures

Strategy Title(s)	Performance Goal	Desired Outcome (Objective)	Outcome Measure	How Measured	Who Measures	Output Measure
STRATEGY RP-1: Develop a coordinated communication system among all national marine sanctuaries and other natural resource management agencies to stay informed about new and emerging issues, share information, and provide a forum for exchange and policy discussion.	Maintain the natural biological and ecological processes in the GFNMS by evaluating and addressing adverse impacts from human activities on sanctuary resources and qualities.	Continue to build on partnerships; collaborative efforts; and coordination with other agencies, institutions and organizations to take a comprehensive and effective ecosystem protection approach.	Increase ability to take a proactive, rather than reactive approach to addressing issues, thus averting significant impacts on sanctuary resources.	1) Develop system to track and flag the most relevant new and emerging issues. 2) Take measures to evaluate, and address as appropriate, new and emerging issues that were identified through the JMPR process. 3) Establish communications system with other agencies and NMSs.	Sanctuary Superintendent, Ecosystem Protection Coordinator	Electronic Web-based tracking system
STRATEGY RP-7: Review and revise the sanctuary's emergency response plan, and be prepared to respond to an incident.	Maintain the natural biological and ecological processes in the GFNMS by evaluating and addressing adverse impacts from human activities on sanctuary resources and qualities.	Continue to build on partnerships; collaborative efforts; and coordination with other agencies, institutions and organizations to take a comprehensive and effective ecosystem protection approach.	Increase the sanctuary's ability to respond in a coordinated and timely manner to catastrophic events, and respond to delayed or persistent impacts to sanctuary resources from previous events.	Conduct regular emergency response drills to evaluate: 1) Emergency response notification system 2) Staff preparedness 3) Effectiveness of ERMA and RUST system tools 4) Effectiveness of Area Contingency Plan	Sanctuary Superintendent, Ecosystem Protection Coordinator, staff	1) Emergency response plan 2) ERMA 3) RUST

Resource Protection Action Plan
GFNMS Draft Management Plan

Strategy Title(s)	Performance Goal	Desired Outcome (Objective)	Outcome Measure	How Measured	Who Measures	Output Measure
STRATEGY RP-8: Formalize plans that address incidents that injure sanctuary ecosystems.	Maintain the natural biological and ecological processes in the GFNMS by evaluating and addressing adverse impacts from human activities on sanctuary resources and qualities.	Build a comprehensive and coordinated Resource Protection plan to ensure protection for the resources and qualities of GFNMS.	Increase ability to assess natural resource injury and restore affected habitats and/or living resources.	Implement ecosystem restoration projects and monitor to assess restoration effort effectiveness.	Ecosystem Protection Coordinator, Research Coordinator	



ADMINISTRATION ACTION PLAN

PROGRAM STATEMENT

In order for Gulf of the Farallones National Marine Sanctuary (GFNMS) to implement a management plan that is effective in addressing the priority site-specific and cross-cutting resource management issues, as identified through the management plan review process, GFNMS will need to strengthen its infrastructure by increasing staff and financial resources. In addition to basic infrastructure needs, some administrative areas that will be addressed include: building partnerships; improving interagency coordination; and addressing regulatory and enforcement issues.

PROGRAM DESCRIPTION

Since 1990, GFNMS has grown from a staff of three with a budget of under \$300,000, to a staff of twenty-six and budget of \$1.4 million in 2013. The GFNMS' office manages the GFNMS, and the northern portion of Monterey Bay National Marine Sanctuary (MBNMS).

The Office of National Marine Sanctuaries (ONMS) provides oversight and coordination among the thirteen national marine sanctuaries by developing a framework for resource management, and directing national program and policy development. The sanctuary superintendent oversees site-specific management functions including implementation of the management plan. The management plan makes use of two complementary and strategic tools for ecosystem management: (1) programs, or action plans, carried out through Conservation Science, Education, and Marine Resource Protection programs, and (2) regulations, for controlling or restricting human behavior that is not compatible with cultural resources and ecosystem protection. The sanctuary superintendent establishes who is responsible for implementing specific programs, provides an administrative framework to ensure that all cultural resources and ecosystem protection activities are coordinated, and provides and manages an appropriate infrastructure to meet the goals and objectives of the management plan. The sanctuary superintendent reports directly to the West Coast Region (WCR) of the ONMS. In this capacity, the sanctuary superintendent represents the ONMS and is the primary spokesperson for GFNMS.

The ONMS and GFNMS are committed to coordinating with other federal, state, and local agencies in a continuous ecosystem management process. This process is designed to ensure the long-term protection of the unique cultural resources, habitats and wildlife of this region, while considering the demands of multi-use interests. Because of the complexity of managing the activities and protecting cultural resources, habitats and wildlife in the sanctuary, cooperative

efforts are necessary to effectively meet sanctuary goals. Overlapping jurisdictions, different agency mandates and limited resources necessitate the development of a management plan that brings together multiple institutions for the common purpose of ecosystem protection. Achieving the long- and short-term goals for this region requires the development of close and continuing partnerships.

ADMINISTRATIVE STRUCTURE

All thirteen national marine sanctuaries are managed by the ONMS. On an annual basis, the ONMS reviews and adjusts funding priorities and requirements to reflect ecosystem protection needs at each of the national marine sanctuaries. The ONMS and the site superintendent coordinate efforts to protect and manage sanctuary cultural resources, habitats, and wildlife with other federal, state, regional and local agencies according to the priorities laid out in the management plan, which itself is consistent with the purposes and policies of the National Marine Sanctuaries Act..

Sanctuary Superintendent

The GFNMS superintendent recommends to the ONMS priorities for annual allocation of funds for site-specific resource and ecosystem protection needs. The superintendent reports to the WCR on surveillance and enforcement activities, violations and emergencies, and program activities. The superintendent coordinates with the ONMS on evaluating, processing and issuing of permits; monitors and evaluates Conservation Science, Education, and Resource Protection programs; oversees staffing needs and requirements; coordinates on-site efforts of all parties involved in sanctuary activities including state, federal, regional and local agencies. Finally, the superintendent evaluates overall progress toward the resource and ecosystem protection objectives of the ONMS and prepares regular reports highlighting progress made in realizing these goals.

Sanctuary Staff

Under the direction of the superintendent, the sanctuary staff is directly responsible for implementation of the management plan. Although each staff member is assigned to one of the program areas, collectively the staff is responsible for coordinating their efforts in addressing resource and ecosystem protection issues.

Sanctuary Advisory Council

The sanctuary advisory council (SAC) has been structured in accordance with the ONMS guidelines and procedures consistent with the National Marine Sanctuaries Act.. The sanctuary advisory council, with its expertise and broad based representation, offers advice to the sanctuary superintendent on resource and ecosystem protection management issues and decisions. Gulf of the Farallones National Marine Sanctuary Advisory Council representation includes sixteen agency and stakeholder representatives and their respective alternates. The council is representative of a broad based constituency to ensure that the superintendent has a diverse information base upon which to make management decisions.

IMPLEMENTATION OF THE MANAGEMENT PLAN

Each of GFNMS' program areas (Education and Outreach, Conservation Science, and Resource Protection) has outlined action plans for implementing management plan strategies. These action plans are designed to directly address resource and ecosystem protection issues and guide management of GFNMS.

Action plans are purposely designed with general implementation guidelines as their parameters may change in the future. The action plans presented in the management plan address current resource and ecosystem protection issues identified as priorities by the sanctuary during the management plan review process. The implementation of these action plans is highly dependent on available staffing and financial resource allocation.

Implementation of the new management plan will require: coordination within and between action plans; sharing of staff and financial resources between program areas; and cooperation and coordination among many federal, state and local government agencies, as well as private organizations and individuals.

GFNMS' administration provides an organized structure and support system for implementing management strategies while providing the flexibility and guidance necessary to address changing, new, and emerging resource management issues.

Implementation Costs

Operating funds for sanctuary management come from federal appropriations to the ONMS. These funds cover expenses such as personnel salaries, vessel use and maintenance, utilities, property rental, equipment, and supplies.

Unpredictable and variable funding for staff and program development may affect specific aspects of the sanctuary management plan. The scale and scope of certain programs may be modified due to any unforeseeable changes in the level of funding. However, the goals and objectives of the plan will remain unchanged.

OTHER MANAGEMENT TOOLS

With limited staff and financial resources, partnerships are an integral part of successful resource and ecosystem protection of the sanctuary. The Gulf of the Farallones sanctuary superintendent may draw from a selection of standard management tools to formalize relationships with other federal, state and local agencies or the private sector. Examples of these agreements are a Memorandum of Understanding or Agreement, a Letter of Understanding or Agreement, an Interagency Agreement, a Cooperative Agreement, a grant, or a contract.

JURISDICTIONAL SETTING

ADMINISTRATION GOAL

1. Provide support for the site in achieving the goals of the management plan, and increase protection for the resources, ecosystem and qualities of the sanctuary.

ADMINISTRATION OBJECTIVES

1. Evaluate, maintain, and expand, as necessary, programmatic and administrative operations.
2. Identify appropriate staffing, budget levels, and facility needs to support implementation of the management plan.
3. Continue to build on partnerships, collaborative efforts, and coordination with other agencies, institutions and organizations.

ADMINISTRATION ACTION PLAN

OPERATIONS

The GFNMS headquarters office and visitor center is located at Crissy Field in the Presidio of San Francisco, California. In the future, satellite facilities and visitor centers are planned throughout the region.

STRATEGY AD-1: *New sanctuary facilities will be developed through various partnerships with both the public and private sector.*

Activity 1.1 Build a world class icon for marine stewardship in San Francisco.

- A. Implement the long-range Facilities Master Plan to guide development of an iconic site for marine stewardship.
- B. Adopt the recommendations of the Golden Gate National Recreation Area's Fort Point Station Cultural Landscape Report.
- C. Rehabilitate the current main office space to accommodate additional staffing needs and allow for future growth.
- D. Sustainably design the facilities to follow LEED standards.
- E. Showcase sanctuary marine life and cultural heritage.
- F. Serve as a destination for greater ocean literacy.

Activity 1.2 Continue to maintain the Crissy Field visitor center.

Activity 1.3 Increase the sanctuary staff's ability to access the marine waters of the sanctuary by expanding vessel capabilities and contracting more vessel time to support research and monitoring efforts. Currently, the sanctuary's research vessel a regional asset called the *FULMAR*, serves as a day-use platform supporting the three Central and Northern California sanctuary programs and partners. Investigate adding an additional boat to the West Coast Region to support the expanded GFNMS and CBNMS.

Activity 1.4 Implement a facilities plan for visitor centers and outreach venues. GFNMS has identified a number of outreach opportunities that cover the sanctuary's interpretive needs from both geographical and thematic points of view. The existing plan covers a geographic area from San Mateo to Sonoma County, and includes shared signage with MBNMS and CBNMS. Incorporate the expansion area into long-range interpretive planning. Outreach and interpretive exhibit venues being considered include:

- A. Bear Valley Visitors Center at Point Reyes National Seashore (PRNS) headquarters has an exhibit on GFNMS and CBNMS. The visitor center has 450,000 visitors per year from school children to local and recreational users.
- B. The PRNS lighthouse visitor center has space for a display about the national marine sanctuaries. GFNMS will partner with CBNMS to design an exhibit highlighting the natural history of the two sanctuaries.
- C. Bodega Marine Laboratory (BML) is the marine research arm of UC Davis (UCD), and the center of marine research on the north coast. GFNMS, in partnership with CBNMS, is proposing to update and expand its partnership with BML, including enhancing interpretive panels at the lab.
- D. Fort Ross State Park celebrates the Russian presence in northern California in the 19th century during the heyday of the Russian-American Company. It also tells the story of local Native American tribes who fished and hunted in the area. GFNMS is proposing to develop wayside signage themed on wildlife watching, including tide pool etiquette and marine mammal viewing.
- E. Bodega Head State Park is the best vantage for getting a perspective on GFNMS and CBNMS. This is a popular whale and sunset watching location. GFNMS and CBNMS propose to build a permanent whale watching station designed after one under construction at Beach 6, along the Olympic coastline.
- F. Update the three-paneled kiosk at Duxbury Reef that provides an interpretation of the intertidal habitats, intertidal etiquette and a description of the GFNMS.

Administration Action Plan
GFNMS Draft Management Plan

- G. GFNMS will partner work with the California Academy of Sciences to update of the Northern California Coast exhibit
- H. GFNMS will build a premier ocean learning and experiential visitor center at its headquarters location. The visitor center will feature hands-on, interactive exhibits on the marine environment, maritime history features, and exhibits for the ONMS. It will also have a theater for films, lectures, telepresence and seminars, as well as classrooms, , office space, and improved storage.
- I. GFNMS will update the maritime exhibit at the Aquarium of the Bay. This exhibit - an interactive kiosk - highlights maritime information in San Francisco Bay and beyond.
- J. GFNMS and MBNMS will update interpretive displays at the Pigeon Point Lighthouse. These displays highlight the maritime heritage of the area, including shipwrecks and lighthouse keepers. There will also be a panel on watchable wildlife.
- K. GFNMS will support the CBNMS exhibit at the Oakland Museum. The exhibit features CBNMS but includes information about GFNMS.
- L. GFNMS will continue to develop interpretive signs at coastal locations throughout central and northern California. Much of the signage will be developed in coordination with Cordell Bank and/or Monterey Bay national marine sanctuaries.
- M. GFNMS will open a visitor center in Half Moon Bay and investigate potential additional visitor centers in Sonoma and southern Mendocino County.

Activity 1.5 Improve, upgrade, maintain, and evolve the information technology infrastructure of the facilities. Continue to innovate technology through dedicated base funds, stable support staff, and strategic partnerships with Silicon Valley and other Bay area information technology leaders. The San Francisco Bay area is recognized as one of the most technologically advanced regions in the world. The GFNMS should tap into these local resources and creative thinking to evolve more efficient, creative, and engaging methods of protecting our marine resources.

Activity 1.6 Partner with local research and academic institutions to develop facilities and infrastructure to support research and monitoring in the GFNMS.

- A. Partner with Bodega Marine Laboratory to provide office and laboratory space to support sanctuary conservation science programs.
- B. Support the Surface Current Mapping (CODAR) technology in the sanctuary.

STAFFING

Under the direction of the sanctuary superintendent, the sanctuary staff is directly responsible for implementation of the management plan. Although each staff member is assigned to one of the

four program areas or administration, collectively the staff is responsible for coordinating their efforts in addressing the priority resource and ecosystem protection issues identified in the management plan.

STRATEGY AD-2: *The primary focus of GFNMS is ecosystem protection. Basic staffing requirements must provide support for administration and the program areas of conservation science, education/outreach, and resource management.*

Activity 2.1 Sanctuary staff skills should collectively represent expertise in policy, marine resource management, education, outreach, volunteer development, research, monitoring, geographic information systems (GIS), communications technology, and administration. The actual number and expertise of staff will depend on budget allocations and the operating priorities of GFNMS. In order to meet the objectives of this management plan, target staffing requirements have been laid out (see staffing chart). Administration will support the following:

- A. Building leadership in the field.
- B. Increasing professional exposure of the staff.

Activity 2.2 Each staff member must exhibit general knowledge about all GFNMS program areas and the ability to effectively communicate with constituents, other professionals, and the community-at-large. In an effort to attract and maintain a consistent and high caliber staff base, the GFNMS Superintendent will encourage staff participation in professional development such as:

- A. Continuous training
- B. Advancement opportunities
- C. Professional development and attendance at professional meetings and workshops
- D. Staff exchanges with other sanctuaries

Activity 2.3 Collectively, the staff will function as a team supporting each program area, working towards the common goals and objectives of the management plan and increasing protection of sanctuary ecosystems and qualities. Through administration, the following support will be provided:

- A. Team building through on-site activities and off-site retreats.
- B. Define relationship and nature of interactions between staff and management.
- C. Clarify job and program area responsibilities.
- D. Support internal coordination between program areas.

Administration Action Plan
GFNMS Draft Management Plan

- E. Implement a structured staff performance review process.
- F. Facilitate communication and coordination with other sanctuaries.
- G. Clarify relationship between partners and GFNMS.
- H. Provide oversight on achieving goals and objectives.

Activity 2.4 Through the administrative framework, the sanctuary will work to create a positive working environment that encourages transparency, trust and accountability.

- A. Continue staff retreats (see above).
- B. Maintain clear channels of communication among all staff members, and within program teams.
- C. Hold regular, well-planned staff meetings.
- D. Continue regular meetings between program coordinators to ensure cross-program integration and support.

Activity 2.5 Maintain a strong and favorable public identity.

- A. Develop site communications and media plan.
- B. Offer formal media training for site staff.
- C. Submit articles on a quarterly basis for NOAA publications (NOAA Report, Sanctuary Watch).
- D. Develop PowerPoint presentation for GFNMS and specific programs.
- E. Revamp and refine image library.
- F. Develop series of boilerplate press releases.
- G. Encourage headquarters to highlight GFNMS in press releases and publications. Participate in targeted conferences and outreach events.
- H. Improve GFNMS Web presence.

PARTNERSHIPS

With limited staff and financial resources, GFNMS relies on partnerships, outside funding sources and volunteers to assist in the implementation of the management plan. An integrated

approach to ecosystem protection requires direct and broad-based participation in resource management by all parties who have a stake in the long-term health of the region.

STRATEGY AD-3: *With limited staff and financial resources, GFNMS will develop partnerships and identify outside funding sources and in-kind services to assist in the implementation of the management plan.*

Activity 3.1 Continue to maintain and build on existing partnerships.

- A. Continue the Cooperative Agreement with the Farallones Marine Sanctuary Association (FMSA) to support GFNMS education and outreach programs and maintain visitor centers.
- B. Continue the Memorandum of Agreement and long-term occupancy agreement with GGNRA for office space and services.
- C. Revise the Memorandum of Agreement with PRNS for enforcement of sanctuary regulations.
- D. Develop a Memorandum of Agreement with Bodega Marine Laboratory to coordinate on research and monitoring activities and education and outreach opportunities. Explore shared workspace at BML.

Activity 3.2 Expand informal working relationship with NMFS and United States Geological Survey (USGS). Partnership activities include coordination on research projects, data analysis and cruise operations.

STRATEGY AD-4: *The sanctuary advisory council plays an active role in ecosystem protection and provides advice to the sanctuary superintendent.*

Activity 4.1 Strengthen the structure of the sanctuary advisory council by: evaluating and amending as necessary the sanctuary advisory council charter; evaluating and developing organizational strategies to enhance the sanctuary advisory council's level of participation and effectiveness; evaluating and adjusting as necessary the representation of sanctuary advisory council membership; and providing support to help the advisory council continue to evolve their respected voice in the community.

Activity 4.2 Support the role of the sanctuary advisory council in addressing ecosystem protection issues by using their assistance to recommend GFNMS policies and procedures.

Activity 4.3 Provide support, resources, and guidance to help the sanctuary advisory council engage and educate the public about current, new, and emerging ecosystem protection issues in the sanctuary. Develop a strategy to increase public awareness of the advisory council as a way to increase public involvement.

Activity 4.4 Sanctuary advisory council members may choose to serve on various advisory council working groups. Working groups would be convened by the sanctuary advisory council to focus on specific issues and to allow for participation by additional stakeholders and community experts.

Activity 4.5 Add seats to the sanctuary advisory council and support the sanctuary advisory council in creating working groups as needed.

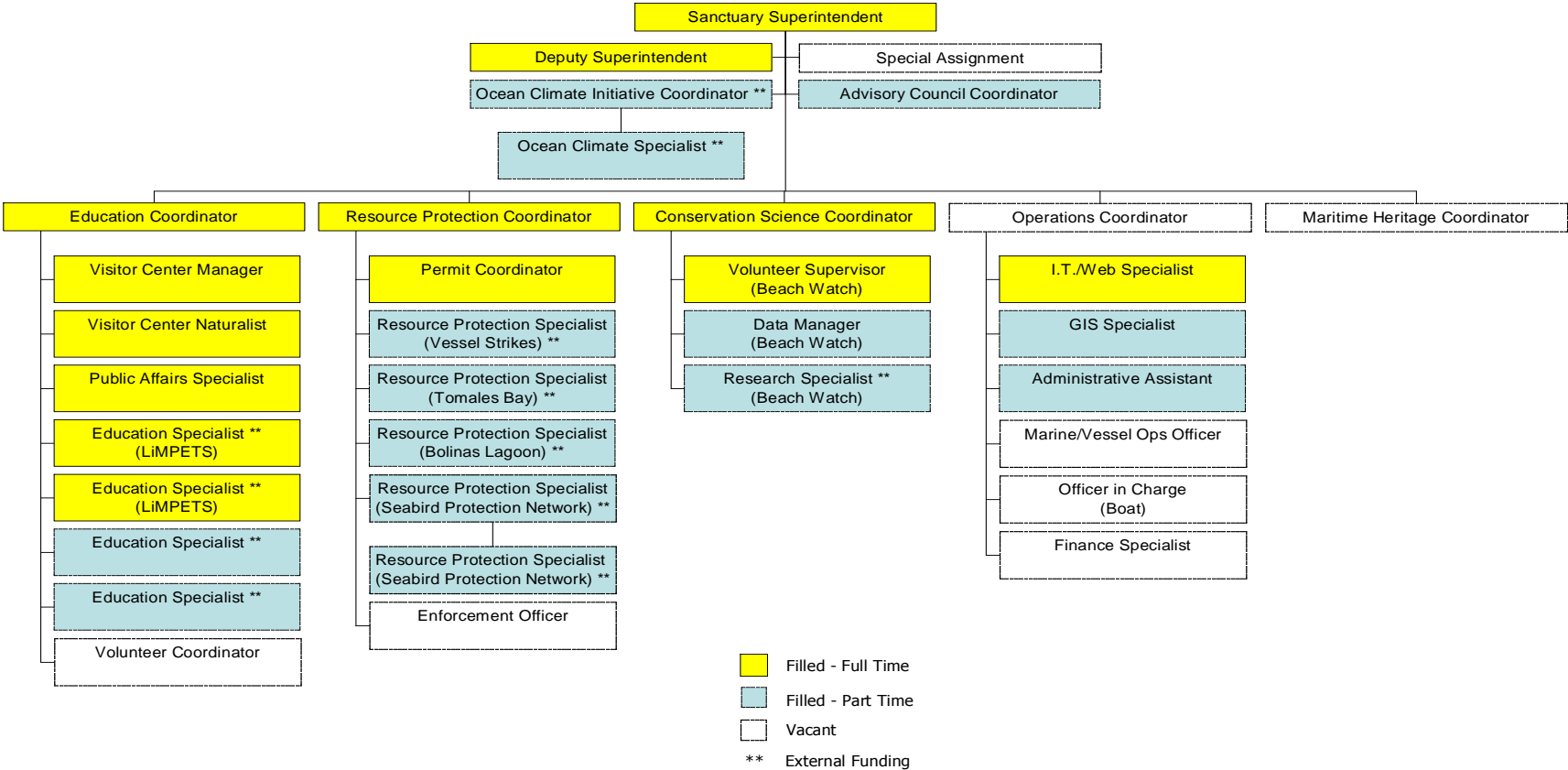
INTERAGENCY COORDINATION

The ONMS and GFNMS are committed to coordinating with other federal, state and local agencies in a continuous ecosystem management process. This process is designed to ensure the long-term protection of the unique ecosystems of this region, while considering the demands of multi-use interests. This requires the cooperation of many institutions that historically have not focused on the same goals. Because of the complexity of managing the activities and cultural resources in the sanctuary, no single agency or institution can effectively meet all sanctuary goals. Overlapping jurisdictions, different agency mandates, and limited resources necessitate the development of a management plan that brings together multiple institutions for the common purpose of ecosystem protection. Achieving the long- and short-term goals for this region requires the development of a close and continuing partnership among all the agencies.

STRATEGY AD-5: *NOAA and GFNMS recognize all other authorities in and around sanctuary waters as important components of effective ecosystem protection. Therefore, GFNMS' regulations complement or supplement, but do not replace, existing authorities. To ensure coordination and cooperation with federal, state, and local jurisdictions within or adjacent to the sanctuary, GFNMS seeks to formalize intra- and interagency efforts.*

Activity 5.1 GFNMS will engage other agencies in reviewing each other's actions, responding to environmental impact statements (EIS), and participating on sanctuary panels and working groups. Building agency relationships allows for: coordinating the development of policies at the federal, state and local level; the sharing of research and education resources; and the opportunity to work together to identify resource management issues.

Staffing Plan: GFN





CROSS-CUTTING ACTION PLANS

GFNMS DRAFT MANAGEMENT PLAN

- I. Cross-Cutting Introduction**
- II. Administration and Operations**
- III. Community Outreach**
- IV. Ecosystem Monitoring**
- V. Maritime Heritage**

CROSS-CUTTING INTRODUCTION

Cordell Bank (CBNMS), Gulf of the Farallones (GFNMS), and Monterey Bay (MBNMS) National Marine Sanctuaries are located adjacent to one another along a 350-mile stretch of the north-central California coast. All three sanctuaries are managed by the Office of National Marine Sanctuaries (ONMS), share many of the same resources and issues, and have some overlapping interest and user groups. There are many opportunities for these sites to work cooperatively, share assets, and address resource management issues in a coordinated manner.

The three sanctuaries coordinate on many important resource management issues, such as oil spills and monitoring. However, each site is, for the most part, managed independently of the others. The three sanctuaries have separate advisory councils and independent education, research and resource protection programs.

In February 2004 ONMS established the Northern Management Area (NMA) of Monterey Bay National Marine Sanctuary extending from the San Mateo/Santa Cruz line northward to the existing boundary between Monterey Bay and Gulf of the Farallones sanctuaries. The Gulf of the Farallones assumed full administrative and management responsibilities of the NMA in March 2004. Existing Monterey Bay sanctuary regulations and congressional prohibitions apply in the Northern Management Area. MBNMS continues to manage its Water Quality Protection Program in San Mateo County. During the Joint Management Plan Review a Northern Management Area Transition Action Plan was developed and published in the 2008 management plans for the respective sanctuaries under the Cross-Cutting Action Plan. Many of the strategies have been implemented since the publication of the plan. Ongoing Strategies have been incorporated into this publication of the Cross-Cutting Action Plan.

GOALS

The goal of the cross-cutting action plans is to build upon existing coordination efforts and identify some activities that should be jointly implemented so that these three sites can operate as integrated and complementary sites to better protect the sanctuaries' resources. This will ensure scarce program resources are used more efficiently and result in a more consistent and coordinated delivery of programs, products and services to the public. Cross-cutting actions plans were developed to address: Administration and Operations; the Northern Management Area; Community Outreach; Maritime Heritage; and Ecosystem Monitoring. Though the implementation of other activities contained in the site-specific plans may also be effectively coordinated, the cross-cutting action plans would be jointly developed and implemented across the three sites.

IMPLEMENTATION WITHIN THE CONTEXT OF A REGIONAL STRUCTURE

ONMS efforts to address certain priority issues in a cross-cutting framework was a first step in a larger effort to begin looking at sanctuary resource management issues in a regional or ecosystem-based context. Since the cross-cutting plans were developed, the ONMS adopted a regional management structure, comprised of four regions, including a West Coast region, which is led by a regional director. The purpose of this structure is to maximize program integration among the ONMS sites, regions, and national program and to other state and federal programs and partners – across all levels. The regional structure dedicates program leadership and regional staff resources directly towards integrating programs and forging partnerships that supports NOAA’s evolving ecosystem-based management approach.

The regional director and staff are based in the region and dedicate their efforts towards addressing priority regional issues and capitalizing on regional opportunities and partnerships. Some of their expertise and responsibilities includes working closely with individual sanctuary staff to coordinate the implementation of certain cross-cutting action plans or projects, such as regional ecosystem monitoring, community outreach, or maritime heritage. Individual sanctuaries may also either take or share the lead for implementing the cross-cutting action plans.



ADMINISTRATION AND OPERATIONS CROSS-CUTTING ACTION PLAN

GOALS

The goals of the cross-cutting Administration and Operations Action Plan are to (1) improve and sustain coordination and cooperation across the three sanctuaries to better and more efficiently manage and protect sanctuary resources, and (2) for the individual sites to continue working and functioning as an integrated team. Fulfilling these goals for the three sanctuaries requires enhanced communication and collaboration among and between superintendents and program staff.

ISSUE DESCRIPTION

During scoping meetings for the JMPR, the ONMS received many comments relating to the need to coordinate various administration and operations across the sites. The three advisory councils and sanctuary staff identified several of these issues as priority items to address in the management plan review. These include:

- Improving resource management consistency and efficiency
- Expanding coordination and communication between sites and to the public
- Evaluating emergency response capabilities in the region, and clarify and coordinate the sanctuary's role in relation to other agencies
- Developing a mechanism to address current and emerging issues between the sites
- Coordinating research/monitoring, education/outreach, and enforcement activities

ADDRESSING THE ISSUE

Each of the three sanctuaries developed site-specific administration and operations action plans to address the staffing and infrastructure needed in order to implement their new management plans. In contrast, this cross-cutting administration and operations plan targets some activities that will be implemented by all three sites in order to improve communication and maximize their ability to collaborate and cooperate on many important resource management and program areas.

STRATEGY XAO-1: *Improve internal communications among the three sanctuaries.*

Successful collaboration and coordination among sanctuaries is related to the amount and intensity of communication. This strategy focuses on improving communications between the

***Administration and Operations Cross-Cutting Action Plan
GFNMS Draft Management Plan***

sites to ensure there are regular opportunities for the superintendents, staff and the advisory councils to learn what is happening at each of the three sites and jointly plan regional programs and activities.

Activity 1.1 Maintain regular communications between the sanctuary superintendents.

Superintendents will engage in informal (impromptu phone calls) and formal (regularly scheduled calls or meetings) communications. GFNMS and MBNMS superintendents will meet monthly by phone to discuss common issues.

Activity 1.2 The west coast superintendents will meet monthly by phone with the West Coast Region staff to discuss regional issues and will meet annually in person to develop annual regional priorities.

Activity 1.3 Maintain a new employee orientation program that includes information from the three sanctuaries and the ONMS.

If funding allows, the orientation program will include travel to the other sites to meet staff and learn about their program and activities. These efforts should be coordinated with similar efforts at headquarters.

Activity 1.4 The program coordinators will meet at least once per year to share information and plan joint activities prior to the development of the annual operating plans.

In cooperation with the regional office, the regional lead for each program will facilitate bringing this group together, either via conference call or in person if budgets allow.

Activity 1.5 Schedule annual joint advisory council chair and sanctuary superintendent meeting.

The MBNMS and GFNMS advisory councils currently meet biannually to discuss issues and program activities in the MBNMS NMA. GFNMS and CBNMS advisory councils will meet jointly on an annual basis to discuss the expansion area.

Activity 1.6 Encourage and provide opportunities for site staff to give presentations at each other's advisory council meetings.

Superintendents, council chairs and coordinators should encourage program staff presentations at each other's meetings.

STRATEGY XAO-2: Improve the efficiency and cost-effectiveness of program operations and administration.

Each of the three sanctuaries has been designated for over twenty years and during this time has accumulated an inventory of equipment, vessels and resources to support their own research/monitoring, education/outreach, and resource protection programs. This strategy recognizes there are instances in which it is more cost-effective to share resources among the

sites and some instances when it may be more appropriate for each site to have their own. Currently each sanctuary office is responsible for managing most of its own administration and information technology functions, including contracts, procurements, time and attendance, travel orders and vouchers, websites, databases, and geographic information systems. Each site employs a varying number of staff or contractors to perform some of the administrative tasks. The goal of this strategy is to evaluate the staffing plans at the sites and maximize opportunities to share personnel and implement methods to make routine administrative functions more efficient. The strategy also highlights the importance of building upon existing efforts to share information technology resources.

Activity 2.1 Contact and inform the other sites early in the planning stages of field operations to provide opportunities to plan joint missions and to share information and data.

Individual sites may have program personnel, technology or information that would benefit the field operations of another site.

Activity 2.2 As opportunities arise, create short-term opportunities for staff exchanges, rotations, details and informal staff loans for specific projects or to fulfill on-going needs across the West Coast Region.

In addition to sharing valuable technical expertise, staff exchanges provide opportunities for professional development of program staff.

Activity 2.3 Participate in each other's interview panels to review candidates for new and vacant positions, where possible.

This is particularly important when hiring for positions that work with other sites on a regular basis.

Activity 2.4 Cordell Bank and Gulf of the Farallones superintendents and other planning staff will discuss administrative and operational needs and expectations related to the expansion area.

Staff will meet to determine needs and best opportunities for efficiency in addressing the management of the new expansion area. This relates to all programs, shared staffing, and budget allocation across the two sites.

Activity 2.5 Evaluate alternative management strategies for offshore portions of northern expansion areas.

GFNMS and CBNMS superintendents and WCRO will conduct a series of discussions regarding the most efficacious means to manage the offshore portions of the expanded areas of GFNMS and CBNMS, ensuring effective marine science, outreach and resource protection.

STRATEGY XAO-3: *Improve the coordination of sanctuary resource protection activities and programs.*

Administration and Operations Cross-Cutting Action Plan
GFNMS Draft Management Plan

Each of the three site-specific management plans proposes various strategies to address their own resource protection programs (e.g., regulations/permitting, emerging issues, enforcement, emergency response). This strategy is aimed at improving the communication and coordination of resource protection activities across the three sites. The strategy addresses the need to improve staff understanding and awareness of all of the three sites' regulatory and permit processes and activities. Secondly, it establishes a process to identify and, when appropriate, jointly address emerging issues in a regional capacity. This includes coordination with local, state and other federal entities. Third, it recommends the development of a regional sanctuary emergency response plan so that the ONMS is better prepared to address emergencies on a regional scale. Finally, it identifies the need to comprehensively evaluate enforcement needs in relation to the new management plans and develop and implement a regional enforcement plan.

Activity 3.1 Improve staff awareness and understanding of each site's regulations.

Establish a basic and consistent understanding of each site's regulations. Ensure all staff have and are familiar with the portion of the WCRO web page which consolidates the management documents for the West Coast Region: regional regulations, terms of designation and management plans. Produce a table listing all regulations of West Coast sanctuaries.

Activity 3.2 The West Coast sanctuaries will continue to work closely on any future proposed regulatory changes that could affect other sites. The GFNMS and MBNMS Resource Protection Teams will closely coordinate on any future proposed regulatory changes that could impact the NMA.

Activity 3.3 GFNMS will facilitate a public process in the next five years to consider whether the San Francisco Exemption Area should be incorporated into the MBNMS.

Such an action would require changing the MBNMS regulations and designation document and require coordination with MBNMS staff, and approval from the MBNMS Superintendent. Public scoping for this process was initiated in 2012.

Activity 3.4 The West Coast sanctuaries will share responsibilities for preparing regional permits. GFNMS will be responsible for permit activities in the NMA.

West Coast sanctuaries will inform each other of any new permit applications or other activities that could affect any of the sanctuaries. GFNMS will process permits within the NMA, except for water quality permits, which will continue to be overseen by MBNMS.

Activity 3.5 MBNMS staff will continue to implement Water Quality Protection Program activities including conducting site water quality needs assessment, review water quality permits and authorizations.

MBNMS Water Quality staff will participate on Technical Advisory Committees that implement strategies within the WQPP Action Plans, implement volunteer water quality monitoring events including First Flush and Snapshot Day, review and comment on NPDES permits, respond to

discharges entering the MBNMS NMA, coordinate and collaborate with partners participating in the Agriculture Water Quality Alliance, and oversee monitoring of Areas of Special Biological Significance in a sub-contract to the San Mateo Resource Conservation District.

Activity 3.6 Coordinate emerging issues among the West Coast sanctuaries and develop coordinated strategies to address emerging issues

As an individual site staff identifies emerging issues, staff members will determine the significance and potential to impact another site, and communicate this to the potentially affected site(s). They will jointly determine if a new or emerging issue needs action and identify a strategy and activities to address the issue, depending on whether it is an immediate or long-term threat, what is (or is not) known about it, and if there are adequate resources to address it properly.

Activity 3.7 Implement West Coast Region emergency response plan.

The West Coast Region emergency response plan addresses broad emergency response issues that affect the region, identifies ONMS staffing responsibilities and expertise, and outlines how the ONMS will coordinate with existing federal, state and local emergency response agencies in California. GFNMS staff will lead efforts to coordinate and implement site-specific activities to respond to emergencies in the NMA.

Activity 3.8 Coordinate with the ONMS Damage Assessment Team on populating and making the Southwest Environmental Response Application (ERMA) functional and operative for the three sanctuaries and integrating it with the existing SIMoN database.

Activity 3.9 Continue to work closely on enforcement activities in the region.

Regional enforcement staff will coordinate and cooperate on enforcement activities as they relate to other sites. GFNMS staff will provide assistance as appropriate in the planning and implementation of enforcement activities in the NMA and will coordinate with MBNMS to ensure consistency across sites.

TABLE XAO-1: MEASURING PERFORMANCE OF THE CROSS-CUTTING ADMINISTRATION & OPERATIONS ACTION PLAN

Desired Outcome(s) For This Action Plan:	
Improved communication and coordination among Sanctuary staff resulting in more integrated and coordinated resource protection for Sanctuary resources.	
Performance Measures	Explanation
Increase the number of cross-cutting Annual Operating Plan (AOP) activities that each site includes in their site-specific AOP each year.	One of the primary purposes of this action plan is to increase the amount of communication and interaction among the three sites. This action plan identifies specific opportunities for staff to interact, resulting in more coordinated planning and implementation of joint activities that address priority issues. The tangible results of these interactions will be formulated within each site's AOP.

KEY PARTNERS

CBNMS, GFNMS, and MBNMS (superintendents, program coordinators, and site staff); Advisory Councils Chairs for CBNMS, GFNMS, and MBNMS; General Council Ocean Service (GCOS); NOAA OLE; NOAA General Counsel Enforcement Section (GCES); NOAA Hazardous Materials (HAZMAT); United State Coast Guard (USCG); National Park Service (NPS); California State Parks; California Department of Fish & Wildlife; California State Lands Commission (CSLC); and County Sheriff Departments.



COMMUNITY OUTREACH CROSS-CUTTING ACTION PLAN

GOAL

A coordinated, collaborative regional community outreach strategy will build awareness throughout north-central California and beyond about (1) the existence and purpose of the three sanctuaries, the West Coast region, and the ONMS; (2) the diverse natural resources and ecosystems of each sanctuary and why they need protection; (3) the relevance of these ecosystems to people; (4) the economic and intrinsic value of the three sanctuaries to coastal and inland communities beyond such direct industries as fishing and ecotourism; (5) how these three sanctuaries are working with constituent groups; and (6) how individuals and groups can be engaged in helping the sanctuaries accomplish their resource protection, research, and education goals.

ISSUE DESCRIPTION

Under the ONMS, each sanctuary in the system conducts education and outreach activities to build broad public awareness about the existence and purpose of our nation's marine sanctuaries. The ONMS recognizes a well-informed local, regional, and national constituency greatly enhances the ability of the sanctuaries to protect their natural and cultural resources. Therefore, outreach activities should provide local and state governments, businesses, non-governmental organizations, constituent groups, and the general public with the information necessary to be effective partners in the stewardship of sanctuary resources.

This cross-cutting action plan identifies appropriate regional audiences and topics, regional outreach strategies, and marketing and media exposure efforts that effectively highlight specific program activities across all three sites, the region and the national system. It is also designed to complement each site-specific program and to be flexible enough to incorporate new strategies and topics over time.

Effective community outreach is accomplished through a continuous cycle of ocean and coastal outreach, education, and stewardship. Community outreach expands awareness, knowledge and ultimately changes attitudes and behaviors. By finding information on ocean and coastal resources, and stewardship opportunities in which to get involved in the sanctuary, people begin to have a personal relationship with the sanctuary and may be more likely to become ambassadors helping to protect sanctuary resources. Community outreach involves three strategies tailored to the specific needs and interests of a given audience and may be delivered by members of that audience.

Community Outreach Cross-Cutting Action Plan
GFNMS Draft Management Plan

- Outreach provides audiences with sanctuary-related information and materials promoting ocean and coastal stewardship.
- Education provides fundamental scientific understanding, knowledge, training, or professional development on topics relevant to the world's atmosphere, climate, oceans and coastal ecosystems, and resource protection.
- Stewardship is a personal sense of responsibility to take informed action and make caring choices, at home or work, which promote and protect the health of our coasts and oceans.

STRATEGY XCO-1: *Build upon and expand existing ocean and coastal outreach*

This strategy is aimed at raising general awareness of marine ecosystems, individual national marine sanctuaries and the national marine sanctuary system, and inspiring stewardship of ocean and coastal resources. Outreach provides audiences with sanctuary-related information and materials based on NOAA science, products, and services that promote ocean and coastal stewardship. These audiences may be: north-central California coastal residents; people who live and work in inland California communities that regularly visit the ocean, such as divers, kayakers, tidepoolers, etc.; those who make their living within the ocean environment, like fishermen, maritime shipping companies, etc.; or people who live outside California that care about the ocean even though they may never visit. These, and others, are important voices in the protection and stewardship of the oceans. Key target audiences and messages should also be closely coordinated with outreach needs identified in the issue-related action plans.

Activity 1.1 Develop or strengthen coordinated regional outreach programs and opportunities.

Outreach staff should coordinate on public service announcements, issue-specific workshops and brochures (e.g., tide pool etiquette), docent programs, signage, learning centers, exhibits and displays at community events that encompass or represent the region.

Activity 1.2 Plan and conduct regional sanctuary outreach events.

Outreach staff should promote the importance of national marine sanctuaries, conservation science and resource protection programs, working together to improve understanding of marine conservation and management.

Activity 1.3 Develop and implement joint media communications plan, e.g., print, radio, TV, Internet.

Media personnel at respective sites should coordinate with the WCRO media liaison to develop a plan.

Activity 1.4 Identify and partner with external programs and partners to incorporate sanctuary-related messages, identify best practices and achieve common goals.

Regional outreach personnel should work together to target partners and programs that can effectively communicate ONMS messages on a regional level, and assign appropriate leads to initiate contact and follow-up.

STRATEGY XCO-2: *Enhance and coordinate ocean and coastal education*

This strategy focuses on building community knowledge and fostering caring actions and attitudes targeting priority issues identified in the management plans. The ONMS's joint ocean and coastal education efforts provide a fundamental understanding grounded in science, knowledge, training, and/or professional development to a particular audience on topics identified as important to protect sanctuary resources. There are many possible audiences such as students, teachers, state and local agencies, community leaders, and the general public. Sanctuary-related educational activities are based on NOAA science, systematic in design with clear goals, objectives and measurable outcomes; aligned, where appropriate, with state or national education standards; and designed to facilitate evaluation by a third party.

Activity 2.1 Collaborate on existing site-specific education programs and products as a means to enhance and expand educational offerings.

Each year, the education staff will jointly meet to identify collaborative projects for inclusion in their respective AOPs.

Activity 2.2 Take a multicultural/multilingual approach to all outreach efforts.

Assess demographics of geographic areas with programming and ensure multicultural relevance to diverse audiences. Develop multicultural educational curricula and materials in response to demographic assessment.

Activity 2.3 Identify and implement new education programs that can be developed jointly with other sites.

Education leads should identify and implement new programs as needs arise and as budgets allow.

STRATEGY XCO-3: *Enhance ocean and coastal stewardship*

Marine sanctuary stewardship is a personal sense of responsibility to take informed action and make caring choices, at home or work, which promote and protect the health of our coasts and oceans. A steward develops attitudes, motivations, and commitments that are reflected in informed decisions and responsible actions. Stewards can be individuals, members of groups, or entities that influence others' opinions and actions about the oceans. Stewardship can be demonstrated through a variety of means, including:

- Volunteering for an organized stewardship program,
- Taking personal action to protect our ocean sanctuaries,
- Providing informed public input into decisions regarding the sanctuaries, and

Community Outreach Cross-Cutting Action Plan
GFNMS Draft Management Plan

- Informing others regarding marine ecosystems and the sanctuary program.

Similar to the audiences for outreach, ocean and coastal stewards may be north-central California coastal residents, people who live and work in inland California communities that regularly visit the ocean, those who make their living within the ocean environment, or people who care about the ocean even though they may never visit.

Activity 3.1 Create, maintain and promote sanctuary and partner volunteer programs.

Cultivate volunteers to provide opportunities for stewardship as well as expand resource protection, education, and outreach capabilities of the three sanctuaries.

Activity 3.2 Create new ways to inspire coastal and ocean stewardship in local communities.

The three sites will conduct needs assessments with targeted constituents and audiences to identify innovative and creative methods of engaging specific groups of people in sanctuary activities. Some examples include working with tourism industry, faith-based or cultural organizations, retired citizens or local art groups.

Activity 3.3 Identify partners to incorporate stewardship messages.

Regional outreach personnel should work together to target partners that can effectively communicate ONMS stewardship messages, and assign appropriate leads to initiate contact and follow-up.

Table XCO-1: Measuring Performance of the Cross-Cutting Community Outreach Action Plan

Desired Outcome(s) For This Action Plan:	
Expand joint education and outreach efforts in a manner enhancing protection for Sanctuary resources and the delivery of programs and services to local communities.	
Performance Measures	Explanation
Increase the number of joint education and outreach efforts directed at communities	One of the main purposes of this action plan is to expand general awareness of the three sanctuaries, develop joint education products addressing priority issues, and increase involvement of individuals in the stewardship of the resources in the three sanctuaries. Some of the programs directed at local communities include schools and teachers, volunteers, fairs and festivals, visitor centers, public lecture series, etc.

KEY PARTNERS

CBNMS, GFNMS, MBNMS, CINMS, OCNMS, West Coast Region Office, NMFS, NOAA OLE, USCG, NPS, USEPA, California Coastal Monument, other federal agencies, California State Parks, Elkhorn Slough National Estuarine Research Reserve, other state agencies, Association of Monterey Bay Area Governments, Association of (SF) Bay Area Governments, Sonoma County Regional Parks, cities, local parks/recreation departments, Advisory council members from all three sanctuaries/working groups, FMSA, Monterey Bay and Channel Islands Sanctuary Foundation, Stewards of Coast and Redwoods, Fort Ross Conservancy, local NGOs/non-profits, Save Our Shores, The JASON Project, SIMoN, Community Outreach Working Group, Snapshot Day Water Quality Monitoring Event, Long-term Monitoring Program and Experiential Training for Students (LiMPETS), Beach Watch, Beach Coastal Ocean Mammal/Bird Educational and Research Survey (Beach COMBERS), MBNMS Team Ocean Conservation Education Action Network (OCEAN), Global Learning and Observation to Benefit the Environment (GLOBE), Bay Net, traditional and electronic media (both coastal and inland, local and national, including local weekly papers, community access TV stations, social media), California Ocean Communicators Alliance (Thank You Ocean), pollution prevention programs, chambers of commerce, shipping trade associations, tourism trade associations, dive clubs/shops, kayak clubs/shops, spot abalone divers, other recreational groups, natural history museums, institutions with community service requirements/marine sciences (high schools, colleges), state/local volunteer programs, high school/college classes doing coastal monitoring, multicultural community leaders, and bilingual school programs.



ECOSYSTEM MONITORING CROSS-CUTTING ACTION PLAN

GOALS

The cross-cutting goal of coordinated ecosystem monitoring across CBNMS, GFNMS and MBNMS is to better (1) determine the current and anticipate the future status of sanctuary resources; (2) understand the limits of variation in resources; (3) detect temporal and spatial changes in resources; (4) identify potential agents of change; and (5) provide scientific information that can guide management decisions on priority issues.

INTRODUCTION

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

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

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

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

ADDRESSING THE ISSUE

Most of the monitoring data that informs sanctuary management are not financed, collected, or analyzed by the sanctuaries. Instead, sanctuaries support and promote these activities indirectly by providing vessel time, staff support, and equipment, and coordinating the interests and information of outside agencies and partners. They also assist in securing outside funding that can be directed toward projects that address sanctuary information needs such as SIMoN.

Indirect support is appropriate to enhance capacities of the sanctuary programs to meet the mandate of resource protection. Such expertise to collect and analyze the variety of information required for management needs is accessible through partnerships with various research institutions. However, effective resource management requires a holistic view, which sanctuaries are uniquely positioned to achieve. To meet their resource management mandate, sanctuaries must synthesize and integrate information from disparate research and monitoring projects. They have the further responsibility of interpreting and applying available scientific knowledge for resource managers and the public. Thus, coordination of ecosystem monitoring efforts requires strategic action on various sanctuary-specific programmatic levels.

Recommended strategies focus on coordinating existing activities, identifying opportunities for additional coordination, and establishing the administrative infrastructure, advisory panels, and oversight mechanisms required to support, direct, and evaluate coordinated monitoring across the three sanctuaries. Because many of the monitoring requirements common to CBNMS, GFNMS, and MBNMS overlap with the interests of CINMS and OCNMS, the strategies recommended in this proposed action plan should serve as a model for expanded coordination of appropriate monitoring activities across all five of the West Coast sanctuaries. The strategies are also consistent with efforts of the System Wide Monitoring Program (SWiM) to improve collection, evaluation, and interpretation of monitoring information throughout the sanctuaries. Thus, these activities promote system and regional integration across the program as well as improving ecosystem conservation and management in the combined area of the three sanctuaries.

STRATEGY XEM-1: *Coordinate existing targeted monitoring activities to promote greater efficiency and effectiveness.*

Priority activities for initiation of joint ecosystem monitoring within the region should be focused on the coordination of existing sanctuary-specific monitoring programs that assess similar ecosystems in at least two of the three sanctuaries. This includes coordinating targeted programs that monitor conditions in the coastal interface and the pelagic/offshore systems.

These priorities are based on the need to establish common ecological monitoring efforts throughout the region and the priority issue areas identified in the management plan that could best be addressed through a coordinated approach among the sanctuaries. Some of the priority habitats that have been identified for joint monitoring include: rocky intertidal shores, deep sea benthos and pelagic/open ocean. The coordination channels and activities established to support these targeted efforts could serve as a model for additional monitoring coordination in the future. Other existing or newly emerging monitoring activities, not identified in this action plan, represent potential opportunities for additional coordination. Assessment of such opportunities is addressed in Strategies XEM-2 and XEM-3.

Activity 1.1 Regional science staff should coordinate regarding intertidal monitoring programs.

Coordinate individual sanctuary rocky intertidal monitoring programs and continue to collaborate with other large-scale rocky intertidal monitoring efforts, such as PISCO and MARINE.

Activity 1.2 Beach Watch and Beach COMBERS will continue to collaborate on sharing information on the health of seabirds and trends in beachcast wildlife.

GFNMS Beach Watch staff should evaluate the feasibility of expanding existing citizen science monitoring in the expansion area.

Activity 1.3 Maintain and expand ACCESS integrated sanctuary marine mammal, seabird and sea turtle surveys.

CBNMS and GFNMS science staff should evaluate the feasibility of expanding existing at-sea monitoring to the expansion area.

Activity 1.4 Regional science staff should coordinate regarding benthic habitat surveys.

Jointly develop research cruise plans and standards for sampling and reporting results for benthic habitat survey work. Augment the benthic habitat survey work with new technologies such as ROV and AUV surveys.

STRATEGY XEM-2: *Implement existing regional ecosystem monitoring activities.*

Over the last decade, many federal and state agencies have actively participated in collaborative efforts to develop and implement integrated coastal and ocean observing and data management systems. To further these efforts, the ONMS, and many individual sanctuaries, have been working closely with their partners to build upon and integrate existing site monitoring programs into regional ecosystem monitoring programs. The following activities have been identified as pilot programs within the ONMS to test the concept of integrating observation data and making it available to resource managers and the public.

Activity 2.1 Continue the West Coast Observation Project at CBNMS, GFNMS and MBNMS.

Ecosystem Monitoring Cross-Cutting Action Plan
GFNMS Draft Management Plan

The West Coast Observation Project integrates ocean observation data collected at OCNMS, CBNMS, GFNMS and CINMS. The project focuses on data streams collected at numerous new instrument moorings installed at specific locations within each of the four sanctuaries. The project intends to make the monitoring data accessible via the Internet in an IOOS compatible format. The data from this project would be best shared through the Central and Northern California Ocean Observing System (CeNCOOS).

Activity 2.2 Develop and implement an integrated Sanctuary System-Wide Monitoring (SWiM) program for CBNMS, GFNMS and MBNMS by publishing Condition Reports and collaborating with CeNCOOS.

The primary purpose of the SWiM program is to monitor specific ecological parameters of the sanctuary and ensure the timely flow of data and information to those responsible for managing and protecting resources in the ocean and coastal zone, and to those that use, depend on, and study the ecosystems encompassed by the sanctuaries. It also provides a reporting strategy, through Condition Reports, to enable the evaluation of status and trends in protected resources and activities that affect them. These efforts will be integrated with SIMoN, which implements the monitoring, coordinates with partners, and provides GIS, Web and other products that allow for local and regional information sharing, as well as through CeNCOOS.

Activity 2.3 Continue expanding the Sanctuary Integrated Monitoring Network (SIMoN).

SIMoN is the primary mechanism to coordinate data and information among the sites. CB, GF and MBNMS have their monitoring projects summarized with available data and images on the SIMoN website. This information is linked to the National Program monitoring summary. Joint interactive maps, images and “what’s new” items are also available. Project information and new cross site tools will continue to be developed as needed.

Activity 2.4 Look for partnerships to support ecosystem monitoring.

Collaborate with NMFS on the California Current Integrated Ecosystem Assessment and integrate this into SIMoN ecosystem assessments.

Activity 2.5 Look for innovative ways to support ecosystem monitoring.

Evaluate and identify ongoing funding opportunities to support regional and larger scale ongoing monitoring activities.

STRATEGY XEM-3: *Establish a joint internal monitoring coordination team.*

Coordination of monitoring activities among the sanctuaries requires an administrative infrastructure to identify and act on cross-boundary opportunities, collaborate with large-scale initiatives, and interpret the results for resource managers and public audiences across the region.

Activity 3.1 Continue to coordinate research and monitoring across CBNMS, GFNMS and MBNMS.

CBNMS, GFNMS, and MBNMS coordinate on the use of the research vessel FULMAR. In addition, GFNMS and CBNMS coordinate and partner on offshore monitoring which includes the NMA. Finally, monitoring information from all sites is shared through the SIMoN web page and interactive maps.

Activity 3.2 The CBNMS, GFNMS, and MBNMS science staff will continue to work jointly with the site and West Coast Region media staff to develop a research and communications plan

Activity 3.3 Develop annual ecosystem-based research and monitoring operating plans in collaboration with each other to meet site, regional, and national monitoring needs. CBNMS, GFNMS and MBNMS science staff should share research and monitoring information between sites as annual operating plans are developed.

TABLE XEM-1: MEASURING PERFORMANCE OF THE CROSS-CUTTING ECOSYSTEM MONITORING ACTION PLAN

Desired Outcome(s) For This Action Plan:	
Increased collaboration among, capacity of, and productivity of the three sanctuary monitoring programs in order to enhance our understanding of the ecosystem(s) in this region and those natural and human factors affecting them.	
Performance Measures	Explanation
<p>1. Increase the number of cooperative research and monitoring activities.</p> <p>2. Continue to include Cordell Bank and Gulf of the Farallones in SIMoN and expand its infrastructure so that it can be integrated with other coastal and ocean observation systems along the West Coast.</p> <p>3. Design and implement coordinated monitoring programs consistent with the ONMS System Wide Monitoring Framework (SWiM) at each site.</p>	<p>1. Research staff from the three sanctuaries currently engage in limited joint research and monitoring activities. However, to improve our knowledge and understanding about the broader ecosystem in this region, the three sites need to coordinate and systematically plan and implement joint research and monitoring activities with each other and other partners. These new joint research and monitoring activities will be reflected in each sites' AOP.</p> <p>2. SIMoN is rapidly evolving into a system-wide tool for organizing and displaying research and monitoring related information for MBNMS, GFNMS, and CBNMS. In addition, SIMoN has evolved so other regional coastal and ocean observation systems could be integrated within SIMoN.</p> <p>3. The ONMS has been working for several years to develop a System Wide Monitoring (SWiM) Program Framework. The program is underway and ready to be implemented at MBNMS, GFNMS, and CBNMS, particularly through Condition Reports..</p>

KEY PARTNERS

CBNMS, GFNMS, MBNMS, CINMS, OCNMS, WCR), NCCOS, NMFS, NESDIS, National Coastal Data Development Center (NCDDC), National Oceanographic Data Center (NODC), National Data Buoy Center (NDBC), NOAA National Estuarine Research Reserve System (NERRS), advisory councils, NPS, USEPA, USFWS, BOEM, USGS, BML, University of California-Santa Cruz (UCSC), State of California, Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO), Multi-Agency Rocky Intertidal Network (MARINe), Southern California Coastal Water Research Project Authority (SCCWRP), Tenera Inc., Kinetic Labs, Inc., SIMoN, Coastal Observation and Seabird Survey Team (COASST), California Cooperative Oceanic Fisheries Investigations (CalCOFI), Monterey Bay Aquarium Research Institute (MBARI), Alliance for California Current Ecosystem Observation (ACCEO), NCDFW, Ocean-US, SWiM, Southeast Area Monitoring and Assessment Program (SEAMAP), Integrated Ocean

Ecosystem Monitoring Cross-Cutting Action Plan
GFNMS Draft Management Plan

Observing System (IOOS), CeNCOOS, MBNMS RAP, CBNMS RAP, FMSA, Monterey Bay and Channel Islands Sanctuary Foundation, and PRCS.



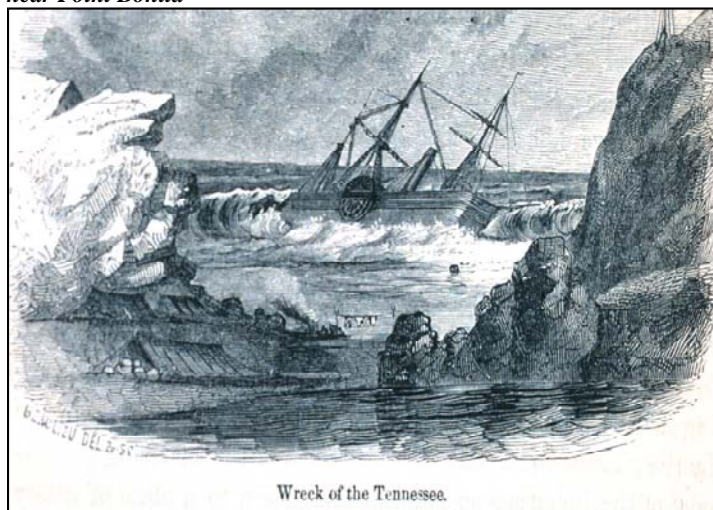
MARITIME HERITAGE CROSS-CUTTING ACTION PLAN

GOALS

The ONMS has developed the Maritime Heritage Program (MHP), to identify, protect and raise awareness of the cultural and historical resources in sanctuaries. The MHP's efforts include conducting paleo-ecological and archaeological studies; inventorying, locating, and monitoring both historic shipwrecks and those that pose an environmental threat to sanctuary marine resources; and characterizing and protecting maritime heritage resources.

This cross-cutting plan provides the framework for a maritime heritage resources program that addresses historic and cultural underwater sites, as well as traditional heritage resources such as Native American and fishing communities, commercial marine transport of passengers and cargo, and recreational activities like diving, surfing, and boating. This maritime cultural landscape of the region involves understanding the broader context of specific places that encompasses human activities. This includes indigenous people of our nation's pre-historic and historic past as well as today's modern cultures and their sacred places; geography; paleontology; archaeology; traditional knowledge and sociocultural studies; oral traditions; commercial and recreational fisheries; recreation activities, maritime heritage resources such as lighthouses, piers, wharves, lifesaving stations, abandoned dog-hole ports and landings and working waterfronts, revealing the many human communities that overlap with marine environments in our national marine sanctuaries and contiguous waters. Although the ONMS only has authority to protect sanctuary cultural and historic resources, the program recognizes that traditional user and ocean-dependent groups are interconnected with the sanctuaries and are an integral part of their history.

Figure MH-1: The passenger-cargo steamer Tennessee runs aground near Point Bonita



ISSUE DESCRIPTION

The NMSA and site regulations mandate the management and protection of sanctuary cultural and historical resources. Cultural resources are defined as any historical or cultural feature, including archaeological sites, historic structures, shipwrecks, and artifacts. *Historical resources* are defined as any resources possessing historical, cultural, archaeological or paleontological significance, including sites, contextual information, structures, districts, and objects significantly associated with or representative of earlier people, cultures, maritime heritage, and human activities and events. Historical resources include “submerged cultural resources,” and also include “historical properties,” as defined in the National Historic Preservation Act (NHPA), as amended, and its implementing regulations, as amended.

The area encompassed by CBNMS, GFNMS, and MBNMS has a long and interesting maritime history. The sea floor preserves remnants of the sites where people lived and of the vessels in which they conducted trade and fought wars. Ships, boats, wharves, lighthouses, lifesaving stations, fort, dog-hole ports, whaling stations, prehistoric sites, and a myriad of other heritage treasures lie covered by water, sand, and time in GFNMS and MBNMS. To date, no submerged cultural or historic resources have been discovered in CBNMS.

The history of California’s north-central coast is predominantly a maritime one. From the days of the early Ohlone, Coast Miwok, and *Kashia* Pomo inhabitants to the exploration and settlement of California to the present, coastal waterways remain a main route of travel, subsistence, and supply. The heritage of the first peoples has been and is today represented not only in the sites of former settlements but also by the traditions and heritage of those people, who have persisted as important members of the coastal community. Their place names, their memories and their traditions remain on these shores and waters whether written on a map or not.

Ocean-based commerce and industries (e.g., fisheries, shipping, military, recreation, tourism, extractive industries, exploration, research, and aesthetics) are important to the maritime history, the modern economy, and the social character of this region. These constantly changing human uses define the maritime cultural landscape of these sanctuaries and help interpret our evolving relationship with the sanctuary resources. Ports such as San Francisco and Monterey, and smaller coastal harbor towns, developed through fishing, shipping, and economic exchange. Today these have become major urban areas, bringing millions of people in proximity to national marine sanctuaries. Many of these people are connected to the sanctuaries through commercial and recreational activities such as surfing, boating, and diving.

Records indicate that 787 vessel and aircraft losses were documented between 1595 and 2013 along California’s north-central coast from Cambria north to Manchester, including the Farallon Islands. To date, 392 in GFNMS, 395 in MBNMS, and none in CBNMS have been documented. Some sites have been located and inventoried by NOAA and the NPS. Although some vessels were later salvaged or refloated, some artifacts associated with wrecking events may still exist. GFNMS and MBNMS have also collaborated with state and federal agencies, and the private sector to gather resource documentation and to create opportunities to locate and

record submerged archaeological resources. GFNMS and MBNMS maintains shipwreck inventories, created from established shipwreck databases, ongoing historical research and field surveys. GFNMS and MBNMS are also faced with the challenge of identifying and monitoring historic and non-historic shipwrecks posing environmental threats to sanctuary marine resources. Lurking in the deep are the hazardous cargoes, abandoned fuel, and unexploded ordnance inside sunken vessels that are slowly deteriorating in a corrosive marine environment.

Submerged Site Inventory and Assessment Initiative

ONMS regulations mandate that archaeological resources are managed consistently with the Federal Archaeological Program. The ONMS's MHP was established to emphasize the need for research, education, outreach, and protection of maritime heritage resources. Issues to be addressed regarding inventorying, assessing, and protecting submerged archaeological are below.

Shipwrecks as Environmental Threats

GFNMS and MBNMS both coordinate with the Damage Assessment Restoration Fund and other relevant agencies. GFNMS and MBNMS will work with CINMS to expand their efforts to identify shipwrecks that may pose environmental threats and will provide pertinent information to NOAA's Hazardous Materials (HAZMAT) division and the NMSP for development of the Southwest Environmental Response Application (ERMA) and the Resources and Under Sea Threats (RUST) Geographic Information Systems (GIS) database systems.

Site Protection

As submerged shipwreck sites are inventoried in the sanctuaries and become more visible to the public, they are also more at risk from divers wishing to remove artifacts. GFNMS, and MBNMS will consider enhancing visitor usage while mitigating damage to heritage resources by providing the sport and commercial diving communities and visitors to shoreline sites with interpretive information about archaeological sites and their protection. Sanctuary and California state regulations prohibit the un-permitted disturbance of submerged archaeological and historical resources. The ONMS and California State Lands Commission (CSLC) have an archaeological resource recovery permit system in place. Protection and monitoring of these sites will become a more pronounced responsibility in the sanctuaries' heritage resources management program. Partnerships will be established with local law enforcement agencies for site monitoring and compliance of public access to submerged sites.

Traditional User and Ocean-Dependent Groups

There is the potential to cultivate partnerships with local, state, and federal programs (e.g., American Folk Life Center, universities, Department of the Interior) and the identified communities. These partnerships could aid in the design and implementation of studies of living maritime heritage and folk life to help educate the public about traditional cultures and practices including Native Americans, other ethnic residents, fishermen and economic activities reflecting historic human interaction with the ocean.

Maritime Heritage Cross-Cutting Action Plan
GFNMS Draft Management Plan

Education and Outreach

GFNMS, and MBNMS have partnered with CINMS and OCNMS in the development of the West Coast Shipwreck Database online curriculum. The database serves to inform the public about the historical significance of shipwrecks, including those posing environmental threats to sanctuary marine resources, e.g., the *Jacob Luckenbach* story. The database is being expanded to include living journals assisting families searching for information about shipwrecked vessels their relatives may once have served on as crewmembers or passengers. Family members are encouraged to share with the public their living journals associated with the shipwreck histories for dissemination. CBNMS, GFNMS, and MBNMS will identify partners to explore exhibit development at maritime or regional museums and learning centers that focus on the areas' maritime heritage history; shipwrecks, exploration, fishing, and fisheries; vessel trades, routes and nationalities; and shoreline structures such as lighthouses, lifesaving stations, canneries, dog-hole ports, whaling facilities, surfing, and boating.

STRATEGY XMHR-1: *Continue to build the Maritime Heritage Program.*

The ONMS is placing increasing emphasis on the development of maritime heritage resources programs to identify and protect submerged archaeological sites, and to increase public awareness about the maritime history associated with individual sanctuaries. A well-coordinated program will be required to identify and assess documented shipwrecks, some of which may pose significant environmental hazards; to protect sites from unauthorized disturbance; and to develop heritage partnerships and education programs.

Activity 1.1 Continue to identify potential maritime heritage partners and sources of funding.

Regional MHP staff should look for partners and funding opportunities to expand program into the expansion area.

STRATEGY XMHR-2: *Inventory and assess submerged sites.*

CBNMS, GFNMS, and MBNMS, in conjunction with the West Coast Regional Maritime Heritage Coordinator, will collaborate with state and federal agencies and the private sector to gather resource documentation and to create opportunities to locate and record submerged archaeological resources.

Activity 2.1 Inventory shipwrecks across the region.

Continue to establish external partnerships to inventory potential shipwreck sites with other federal, state, and local agencies as well as avocational archaeologists, commercial divers and fishermen, and recreational divers.

Activity 2.2 Conduct systematic research and surveys of archaeological sites, including the remains of prehistoric, as well as historic sites, representing ship and aircraft losses.

This effort would be focused on geographic regions with a high probability of cultural and historic remains established by conducting remote sensing surveys and/or diver investigations of target sites as part of larger research expeditions across the three sanctuaries. Such surveys would include the development of a research plan, education materials and curriculum, a project website, a site assessment report that include a comparison with previous surveys.

Activity 2.3 Establish a shipwreck reconnaissance and site monitoring program.

Use a model similar to that used at CINMS to record and monitor submerged sites and to document new artifact discoveries and evaluation of human site disturbance. Record site positions in NOAA's National Marine Sanctuary Archeological Site (ARCH) GIS database.

Activity 2.4 Assess and nominate appropriate submerged archaeological sites for inclusion in the National Register of Historic Places.

Regional MHP staff should look to contribute appropriate sites across the sanctuaries.

STRATEGY XMHR-3: *Assess shipwrecks and submerged structures for hazards.*

GFNMS and MBNMS, and possibly CBNMS, are faced with the challenge of identifying and monitoring historic and non-historic shipwrecks that may pose environmental threats to sanctuary marine resources. Information pertaining to shipwrecks as environmental threats is provided to NOAA's Emergency Response Division and the ONMS for the development of the ERMA and Remediation of Underwater Legacy Environmental Threats (RULET) database systems. The sanctuaries will develop a plan to address this issue since there are many shipwrecks that pose threats in the near future.

Activity 3.1 As needed, add to the inventory of shipwrecks, inside and outside of sanctuary boundaries, posing environmental threats to sanctuary marine resources.

This inventory is based upon primary and secondary source documentation from established shipwreck databases, interviews with commercial divers and fishermen, and recreational divers who frequently visit submerged shipwrecks. The sanctuaries will also collaborate with other organizations doing similar research. As the sanctuaries compile information regarding sites that may pose environmental threats, this information will be coordinated with NOAA's Emergency Response Division and the ONMS for the development of the ERMA and RULET database systems.

Activity 3.2 Monitor shipwreck sites.

Direct efforts to monitor sites that have been located and are considered a threat to sanctuary marine resources. Use protocols for site evaluation based on the monitoring work at such sites as the *Jacob Luckenbach* and the *Montebello*.

Activity 3.3 Coordinate with partners to reduce threats from shipwrecks.

Maritime Heritage Cross-Cutting Action Plan
GFNMS Draft Management Plan

GFNMS and MBNMS will continue to work with ONMS to identify shipwrecks that may pose environmental threats and will provide pertinent information to NOAA's Emergency Response Division and the ONMS for the inclusion in the ERMA and RULET GIS database systems. ONMS will work with other trustee agencies to develop a plan to monitor and prevent, reduce, and respond to environmental threats from any such vessels.

Activity 3.4 For historic shipwrecks, ensure compliance under Section 106 of the NHPA and the NMSA.

STRATEGY XMHR-4: *Protect and manage submerged archaeological resources.*

As part of the NEPA compliance process CBNMS, GFNMS and MBNMS are required to submit a review under Section 106 of the National Historic Preservation Act (NHPA) identifying historic and pre-historic archaeological properties and to take into account activities that may have an adverse or no adverse effect to these properties. Issues to be addressed by GFNMS, MBNMS, and possibly CBNMS, regarding the protection of submerged archaeological resources include:

- Permitting
- Site protection through enforcement and education
- Shipwrecks as environmental threats

Activity 4.1 Coordinate stewardship of submerged resources.

Jointly develop a uniform protocol to manage, monitor, and protect submerged sites within the three sanctuaries in partnership with appropriate local law enforcement agencies.

Activity 4.2 Provide training to sanctuary staff and facilitate training for partners.

The training will focus on the importance of submerged archaeological resources and the need and tools to manage and protect them and Section 106 requirements.

Activity 4.3 Identify archaeological and historic resources currently outside sanctuary boundaries that may be of significant historic interest or may pose a threat to sanctuary resources.

STRATEGY XMHR-5: *Conduct public outreach with traditional user and ocean-dependent groups and communities.*

A key aspect of the CBNMS, GFNMS, and MBNMS maritime heritage program will be to educate the public about traditional maritime cultures and practices including Native Americans; exploration; settlement; ethnic groups; whalers; dog-hole ports, historic and present-day fishermen; recreational uses; and traditional shipping, shipbuilding, canneries, and other economic activities reflecting historic human interaction with the ocean. Although sanctuary's maritime heritage protection status is given only to cultural and historical resources, the program recognizes that traditional user and ocean-dependent groups are interconnected with the

sanctuaries and are an integral part of their history and cultural maritime landscape of the region. Therefore, this program will also acknowledge those traditional maritime heritage activities and practices consistent with the NMSA's primary goal of resource protection.

Activity 5.1 Identify traditional user and ocean-dependent groups.

Solicit and document the range of traditional user and ocean-dependent groups' ideas, values, etc. Conduct a literature search to gather resource documentation on traditional users and ocean-dependent groups and communities. Use this information to prioritize appropriate aspects of their maritime heritage.

Activity 5.2 Develop collaborative programs and initiatives.

GFNMS will initiate a partnership with the fishing community at Pillar Point Harbor to enhance relationships and jointly develop ways to educate the public on the interconnections with the three sanctuaries.

Activity 5.3 Create an inventory of historic and present maritime heritage communities.

Focus on traditionally associated people to support mapping, traditional place names, and interpretive programs. Assess and nominate appropriate sites for the National Register of Historic Places.

Activity 5.4 Map and document traditional communities and sites.

These communities and sites may include fishing and whaling sites; place names; shipping/commercial marine transport of passengers and cargo; lighthouses and life-saving stations; dog-hole ports; fort, tribes (coastal); and recreational uses such as surfing and diving.

STRATEGY XMHR-6: *Continue to provide maritime heritage-focused education and outreach programs.*

CBNMS, GFNMS and MBNMS's maritime cultural landscape of provides a unifying theme to educate and inform people along the California coast and throughout the country about the human interaction with the ocean. This involves understanding the broader context of specific places that encompasses human activities that includes indigenous people of our nation's pre-historic and historic past as well as today's modern cultures and their sacred places; geography; paleontology; archaeology; traditional knowledge and sociocultural studies; oral traditions; commercial and recreational fisheries; recreation activities, maritime heritage resources such as lighthouses, piers, wharves, lifesaving stations, abandoned dog-hole ports and landings and working waterfronts, revealing the many human communities that overlap with marine environments in our national marine sanctuaries and contiguous waters. Through websites, museum exhibits, and other tools, the sanctuaries will continue to provide information on:

- Programs by and about traditional cultures and practices including Native Americans, ethnic groups, fishermen, and economic activities

Maritime Heritage Cross-Cutting Action Plan
GFNMS Draft Management Plan

- Shipwrecks, exploration, fishing and fisheries; trade vessels, routes and nationalities
- Shoreline structures such as lighthouses, life-saving stations, fort, canneries, dog-hole ports, and whaling facilities
- Traditional recreational activities such as diving, surfing, and boating
- Stewardship of our cultural and historic maritime resources

Activity 6.1 Improve information sharing and dialogue.

Hold an annual maritime heritage event to highlight specific cultural and historic resources that the sites are mandated to protect, such as archeological sites, shipwrecks, etc., and link to adjacent communities and human uses.

Activity 6.2 Create, expand and populate individual sanctuary websites and/or the West Coast Shipwreck Database.

The websites should include specific information about maritime heritage resources, such as living journals of traditional users and ocean-dependent groups as well as shipwreck survivors, archaeological project updates, potential environmental threats, and maps.

Activity 6.3 Develop and implement education and outreach programs and materials for the MHP.

Incorporate traditional users/ocean-dependent groups and submerged archaeological resources into existing and new education/outreach programs.

Activity 6.4 Collaborate on maritime heritage resource exhibits and signage.

The three sites will incorporate maritime heritage themes and messages as part of the California Statewide Signage, Exhibits, and Facilities plan.

TABLE XMHR-1: MEASURING PERFORMANCE OF THE CROSS-CUTTING MARITIME HERITAGE RESOURCES ACTION PLAN

Desired Outcome(s) For This Action Plan:	
Establish a well-coordinated joint maritime heritage program that identifies and assesses documented shipwrecks and associated environmental hazards; protects sites from unauthorized disturbance; and develops heritage partnerships and education programs.	
Performance Measures	Explanation
By Year 5, the Maritime Heritage program will identify and characterize all historical and cultural resources in these three sanctuaries in a Web database and, when appropriate, develop plans to protect these resources from threats. In the case of ships that pose a threat from oil spills, plans will be developed to mitigate harmful effects on natural resources.	The specific maritime heritage activities identified in this plan build upon existing site efforts and collectively establish a new joint maritime heritage program for this region. The program will allow these sites to be responsive to the NMSA mandate to identify and protect cultural and historic resources. Implementation of these strategies will better streamline and coordinate overall NMSP efforts to protect maritime heritage resources and expand awareness of the importance of these resources to the public.

KEY PARTNERS

CBNMS, GFNMS, MBNMS, CINMS, MAC, NOAA Emergency Response Division , NOAA Office of Response and Restoration, NOAA OLE, NPS, SHPO, California Sea Grant, CSLC, San Mateo County Harbor District – Pillar Point, and Half Moon Bay Fishermen’s Association, FMSA.



APPENDICES

GFNMS DRAFT MANAGEMENT PLAN

- A. Jurisdictional Authorities**
- B. Glossary of Terms**
- C. Acronyms**
- D. Citations**
- E. Vertebrates**
- F. Invertebrates and Algae**
- G. Introduced Species**

Appendix A: Jurisdictional Authorities

The sanctuary overlaps and borders the jurisdictions of several other agencies. Coordination and cooperation among the responsible agencies are critical to the success of the sanctuary. These agencies and their roles in assisting management of the sanctuary are described below.

FEDERAL AUTHORITIES

National Marine Sanctuaries

Two other national marine sanctuaries share boundaries with Gulf of the Farallones National Marine Sanctuary (GFNMS). To the north and west is Cordell Bank National Marine Sanctuary (CBNMS); to the south and east is Monterey Bay National Marine Sanctuary (MBNMS). GFNMS works closely with both CBNMS and MBNMS to protect shared populations and habitats.

The GFNMS is responsible for managing programs and regulations of the Northern Management Area of MBNMS, which includes all MBNMS waters and submerged lands north of Point Año Nuevo and the San Mateo/ Santa Cruz county line.

National Park Service

The sanctuary manages waters adjacent to two agencies of the National Park Service (NPS), the Golden Gate National Recreation Area (GGNRA) and Point Reyes National Seashore (PRNS). They work closely with the sanctuary on the protection and management of natural and cultural marine resources. GGNRA includes an extensive network of recreational and historic sites. The sanctuary coordinates and cooperates with PRNS and GGNRA in the areas of interpretation, administrative support, wildlife protection, oil spill preparedness, and natural resource damage assessment and restoration. PRNS represents the largest stretch of shoreline adjacent to the sanctuary. It includes certain state tide and submerged lands that have been conveyed to the national seashore. The seashore's management plan defines Natural Zones that are to remain unaltered by human activity.

United States Fish and Wildlife Service (FWS)

Within the waters of GFNMS, the FWS is responsible for protecting all marine mammal species, including sea otters; other than cetaceans and pinnipeds under the Marine Mammal Protection Act (MMPA); and Brown Pelican, Short-Tailed Albatross and other bird species listed as threatened or endangered under the Endangered Species Act (ESA). The National Marine Fisheries Services (NMFS) is responsible for protecting cetaceans and pinnipeds under the MMPA, and sea turtles and fish that are listed as threatened or endangered under the ESA.

The FWS also has responsibility for managing the Farallon National Wildlife Refuge. The refuge includes North, Middle, and Southeast Farallon Islands; Maintop Island; and Noonday Rock. The refuge is operated primarily as a migratory bird refuge to protect murrelets, auklets,

Appendix A: Jurisdictional Authorities
GFNMS Draft Management Plan

guillemots, puffins, and other birds, and secondarily, to protect seal, sea lion, and other marine mammal assemblages.

National Marine Fisheries Service (NMFS)

The NMFS is responsible for enforcing the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), the MMPA, and the ESA. Pursuant to the MSFCMA NMFS approves, implements and enforces fishery management plans (FMP) prepared by regional fishery management councils. NMFS works closely with the California Department of Fish and Wildlife (CDFW) and United States Coast Guard (USCG) for enforcement operations both within and outside the three-mile territorial sea. Gulf of the Farallones fish populations affected by FMP regulations include lingcod, rockfish, and salmon.

The NMFS shares responsibility with the FWS for implementation of the MMPA and the ESA (see FWS entry above).

United States Coast Guard (USCG)

The USCG is the federal government's primary maritime law enforcement agency. The USCG's missions include maritime law enforcement, national security, maritime safety, and marine environmental protection. For ocean and coastal activities, the USCG manages maritime transportation activities in order to minimize loss of life and damage to the environment. The USCG has historically held the primary responsibility for ensuring cleanup of any oil spill or other pollutants in the marine environment. To avert oil spills and promote safety, the USCG inspects vessels carrying oil and other hazardous materials. The USCG requires vessels to have approved response plans detailing owner and operator response to an oil spill and ensuring proper response activities. Pursuant to the Oil Spill Prevention Act of 1990 (OPA), which defines ground rules for dealing with oil pollution events and recommends pollution prevention measures, the USCG has responsibility for preparing most of the regulations necessary to implement OPA. Additionally, the USCG must be consulted in the development of oil spill contingency plans for marine oil and gas facilities and terminals. The OPA also allows for natural resource damage recovery by federal and state resource trustees.

Bureau of Ocean Energy Management (BOEM)The Bureau of Ocean Energy Management (BOEM) is responsible for managing development of the nation's offshore resources in an environmentally and economically responsible way. Functions include: Leasing, Plan Administration, Environmental Studies, National Environmental Policy Act (NEPA) Analysis, Resource Evaluation, Economic Analysis and the Renewable Energy Program.

Bureau of Safety and Environmental Enforcement (BSEE)

BSEE was created to enforce safety and environmental regulations. Functions include: All field operations including Permitting and Research, Inspections, Offshore Regulatory Programs, Oil Spill Response, and newly formed Training and Environmental Compliance functions.

Environmental Protection Agency (EPA)

The Environmental Protection Agency (EPA) has regulatory responsibilities with regard to ocean water quality. Under the U. S. Clean Water Act (CWA), EPA establishes and enforces water quality standards for waters outside of the three-mile state waters. Title 1 of the Marine Protection, Research, and Sanctuaries Act (Ocean Dumping Act), prohibits the unpermitted dumping of “any material transported from a location outside the United States” into the territorial sea of the United States, or into the zone contiguous to the territorial sea, to the extent discharge into the contiguous zone would affect the territorial sea or the territory of the United States. The act is administered by the EPA and supersedes any CWA requirements.

STATE AUTHORITIES

California Department of Fish and Wildlife (CDFW)

The CDFW, under the Fish and Game Code (and Chapter 14 of the Administrative Code), regulates and manages a wide variety of activities affecting the living marine resources found in the territorial sea and in the 200-mile-wide exclusive economic zone (EEZ). In cooperation with NMFS, the CDFW enforces federal regulations established under the MSFCMA. It also enforces and implements the Marine Life Management Act and the Marine Life Protection Act (MLPA). The CDFW has established ecological reserves, marine reserves, game refuges, and marine life refuges in the ocean waters and submerged lands surrounding the Farallon Islands and Point Reyes. The agency has the authority to prohibit or restrict activities that may harm resources, including fishing, collecting, swimming, boating, and public entry. The CDFW works closely with the sanctuary in oil spill response, damage assessment, and restoration through its Office of Spill Prevention and Response (OSPR).

Several fisheries conducted within the GFNMS are managed by the state of California. The CDFW is responsible for preparing FMPs under the authority of the California Fish and Game Commission and the California State Legislature. Gulf of the Farallones fish populations affected by California regulations include Pacific herring, nearshore finfish, Market squid, and Dungeness crab.

State Water Resources Control Board (SWRCB)

The SWRCB is responsible for water quality within state waters. The SWRCB adopts statewide water quality control plans and policies, such as the Ocean Plan, the Thermal Plan, and the State Implementation Policy. The Regional Water Control Boards adopt and submit basin plans to the state board for approval. Title III, Section 303 of the CWA requires California to submit statewide and basin plans to the EPA for approval.

The SWRCB has established a system of thirty-four Areas of Special Biological Significance (ASBS), now known as State Water Quality Protection Areas (SWQPA). These are areas designated for special protection from undesirable alteration in natural water quality. Five ASBSs (SWQPAs) are located in GFNMS. These are at Duxbury Reef, Point Reyes Headland, Double Point, Bird Rock, and the Farallon Islands.

California Coastal Commission (CCC)

Appendix A: Jurisdictional Authorities
GFNMS Draft Management Plan

The CCC was established under the California Coastal Zone Management Act (CZMA) of 1972, which gives authority to the commission to establish policy for activities in state waters. The CZMA established the authority for a federal-state partnership to manage development and use of the coastal zone. The CCC also has the authority to review federal activities in the coastal zone to ensure consistency with California's Coastal Zone Management Program.

California State Lands Commission (SLC)

SLC has jurisdiction over all of California's tide and submerged lands and over the beds of naturally navigable rivers and lakes, each of which are sovereign lands, swamp, and overflow lands, and school lands (proprietary lands). Management responsibilities of the SLC extend to activities within submerged land and those within three nautical miles of shore.

California Department of Boating and Waterways (DBW)

The DBW programs are designed to fulfill the needs of California's boating community including funding for local waterway law enforcement programs, assisting in beach erosion control projects, licensing yacht and ship brokers, and funding the development of public access boating facility projects. The DBW also provides grants to cities, counties, and districts for developing small craft harbors/marinas; and loans to private recreational marinas.

Appendix B: Glossary of Terms

Action plan: A major section of a management plan containing related strategies and activities designed to address a specific issue or function (NOAA, *National Marine Sanctuary Management Plan Handbook*, 3rd edition, 2002).

Activity: Specific actions that will be taken to carry out a strategy (NOAA, *National Marine Sanctuary Management Plan Handbook*, 3rd edition, 2002).

Aquaculture: The cultivation of marine life for harvest and utilization by humans.

Bathymetry: Water depth measurement information used to produce depth-contoured charts.

Benthic: The region of the ocean consisting of the sea bed and the organisms that live on or in it.

Benthic communities: Bottom-dwelling plants and animals.

Biodiversity: The variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

Chum: Bait usually consisting of oily fish ground up and scattered on the water.

Continental shelf: A generally shallow, flat submerged portion of a continent, extending to the point of step descent to the ocean floor.

Critical habitat: The specific areas within the geographical area occupied by a threatened or endangered species on which are found those physical or biological features essential to the conservation of the species, and which may require special management considerations or protection.

Demersal: Fishes and other aquatic organisms that live near the bottom of the water column.

Depleted: A species is termed depleted when it falls below its optimum sustainable population.

Designation document: A portion of the regulations for a given sanctuary that spells out the terms of its designation, including boundaries, regulations, and those activities potentially subject to future regulation.

Desired outcome: A succinct and concise statement that articulates a desired future for a sanctuary relative to a specific problem statement (NOAA, *National Marine Sanctuary Management Plan Handbook*, 3rd edition, 2002).

Ecology: The science of the relationships between organisms and their environments.

Appendix B: Glossary of Terms
GFNMS Draft Management Plan

Ecosystem: The sum total of all living and nonliving components of a particular area that interact and exchange materials with each other; sometimes defined as the ecological community of organisms plus the environment with which they interact. Energy flow and nutrient cycling are regulated within a particular ecosystem and are studied as indicators of its overall health.

Effluent: An outflow of waste, as from a sewer.

Endangered species: Any species that is in danger of extinction throughout all or a significant portion of its range.

Epifauna: Animals that live on the ocean bottom, either attached or moving freely over it.

Food chain: A succession of organisms in a community that constitutes a feeding chain in which food energy is transferred from one organism to another as each consumes a lower member and in turn is preyed upon by a higher member.

Indigenous: Living or occurring naturally in a specific area or environment.

Infaunal: Organisms that live buried in sediments, including a variety of polychaetes, burrowing crustaceans, and mollusks.

Infrastructure: Basic installations and facilities, such as roads, power plants, transportation, and communication systems.

Invertebrate: An animal lacking a backbone or spinal column.

Isobath: An imaginary line or one drawn on a map connecting all points of equal depth below the surface of a body of water.

Marine protected area: Any area of the marine environment that has been reserved by federal, state, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein. (Executive Order 13158 on Marine Protected Areas). Under this broad definition, a wide variety of sites including fishery management zones, national parks, national marine sanctuaries, national estuarine research reserves, state conservation areas, critical habitats, and state reserves could be considered as marine protected areas.

Marine reserve: A kind of marine protected area generally agreed to have strict regulations regarding the extraction of resources.

Marine sanitation device: Any equipment for installation on board a vessel which is designed to receive, retain, treat, or discharge sewage, and any process to treat such sewage.

Mollusks: Any of various members of the phylum Mollusca, largely marine invertebrates, including the edible shellfish and some 100,000 other species.

Multibeam: A type of sonar that has multiple beams to record water depth.

Nonpoint source pollutant discharges: Those pollutant discharges not associated with a specific location (e.g., urban and agricultural pesticide runoff).

Organism: Plant or animal.

Overfished: An overfished stock or stock complex is one whose size is sufficiently depleted that a change in management practices is required in order to achieve an appropriate level and rate of rebuilding. A rebuilding plan is required for stocks that are overfished.

Pathogens: Any agent, most commonly a micro-organism, capable of causing a disease.

Pelagic: Of, relating to, or living in open seas or oceans rather than waters adjacent to land or inland waters.

Planktonic: Organisms dependent on water movement and currents as their means of transportation, including phytoplankton, zooplankton, and ichthyoplankton.

Point source pollutant discharges: The discharge of pollutants from a distinct and identifiable source, such as a sewer or industrial outfall pipe.

Program/Issue Statements: A one or two sentence articulation of the specific components of an issue (NOAA, *National Marine Sanctuary Management Plan Handbook*, 3rd edition, 2002).

Salinity: The relative concentration of salts, usually sodium chloride, in a given water sample. It is usually expressed in terms of the number of parts per thousand (ppt) or parts per million (ppm) of chlorine (Cl). As a reference, the salinity of seawater is approximately 35 ppt.

Side-scan sonar: A type of sonar that gathers sound reflections at oblique angles to the sensor.

Socioeconomic: Being both social and economic.

Strategy: The means by which a particular desired outcome can be achieved (NOAA, *National Marine Sanctuary Management Plan Handbook*, 3rd edition, 2002).

Substrate: A surface on which a plant or animal grows or is attached.

Threatened species: Plant or animal species believed likely to move into the endangered category in the foreseeable future.

Trawling: To fish using a trawl, a large tapered and flattened or conical net towed along the sea bottom.

Trolling: To fish by running a baited line behind a slowly moving boat.

Trophic: A description related to feeding; it often refers to a feeding level in a food chain.

Appendix B: Glossary of Terms
GFNMS Draft Management Plan

Trophic level: One of a succession of steps in the movement of energy and matter through a food chain in an ecosystem.

Turbidity: The extent to which there are suspended or stirred up particles or sediments, as in the water column.

Zone: An area or region considered as separate and distinct from others because of its designated use, plant or animal life, etc.

Zoning: The act of partitioning areas of land or water into sections dedicated to specific purposes and activities.

Appendix C: Acronyms

ACP	Area Contingency Plan (USCG)
ACR	Audubon Canyon Ranch
ACS	American Cetacean Society
AIS	Automated Identification System
AOP	Annual Operating Plan
APPS	U.S. Act to Prevent Pollution from Ships
ASBS	Area of Special Biological Significance
ATOC	Acoustic Thermometry of Ocean Climate
BASA	Bay Area Science Alliance
BLM	Bureau of Land Management
BML	Bodega Marine Laboratory
BMP	best management practices
BOEM	Bureau of Ocean Energy Management
Cal EPA	California Environmental Protection Agency
CalCOFI	California Cooperative Oceanic Fisheries Investigations
CalTrans	California Department of Transportation
CAP	Civil Aeronautical Patrol
CAS	California Academy of Sciences
CBNMS	Cordell Bank National Marine Sanctuary
CBSOA	California Boating Safety Officers Association
CCA	California Critical Coastal Areas
CCC	California Coastal Commission
CCR	California Code of Regulations
CCRWQBC	Central Coast Regional Water Quality Control Board
CDBW	California Department of Boating and Waterways
CDF	California Department of Forestry
CDFW	California Department of Fish and Wildlife
CDPR	California Department of Parks and Recreation
CenCOOS	Central California Ocean Observing Systems
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CHP	California Highway Patrol
CIMT	Center for Integrated Marine Technology
CINMS	Channel Islands National Marine Sanctuary
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMAR	Coastal Maritime Archaeology Resources
COASST	Coastal Observation and Seabird Survey Team
CODAR	Coastal Ocean Dynamics Applications Radar
COE	U.S. Army Corps of Engineers
CSC	California Species of Special Concern
CSC	Coastal Services Center
CSLC	California State Lands Commission
CSUMB	California State University Monterey Bay
CWA	U.S. Clean Water Act
CZARA	Coastal Zone Authorization Amendments
CZMA	Coastal Zone Management Act

Appendix C: Acronyms
GFNMS Draft Management Plan

DARRF	Damage Assessment and Restoration Evolving Fund
DBW	California Department of Boating and Waterways
DDT	dichlorodiphenyltrichloroethane
DEIS	Draft Environmental Impact Statement
DMP	Draft Management Plan
DOC	United States Department of Commerce
DOI	United States Department of the Interior
DPR	California Department of Parks and Recreation
EDS	Ecosystem Dynamics Study
EECOM	Environmental Education Council of Marin
EEZ	U.S. Exclusive Economic Zone
EFH	essential fish habitat
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ERMA	Southwest Environmental Response Management Application
ESA	Endangered Species Act
ESNERR	Elkhorn Slough National Estuarine Research Reserve
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEIS/MP	Final Environmental Impact Statement / Management Plan
FES	Friends of the Elephant Seal
FGC	Fish and Game Commission
FGDC	Federal Geospatial Data Center
FIRWD	Farallon Islands Radioactive Waste Dumpsite
FKNMS	Florida Keys National Marine Sanctuary
FMP	Fishery Management Plan
FMR	Fitzgerald Marine Reserve
FMSA	Farallones Marine Sanctuary Association
FSO	Friends of the Sea Otter
FWPCA	Federal Water Pollution Control Act
GCEL	General Council Enforcement Litigation
GCOS	General Council Ocean Service
GFNMS	Gulf of the Farallones National Marine Sanctuary
GGNRA	Golden Gate National Recreation Area
GIS	geographic information systems
GPS	global positioning system
GRNMS	Grey's Reef National Marine Sanctuary
GSA	General Services Administration
HAB	harmful algal bloom
HAZMAT	Hazardous Materials Response Division
HDD	horizontal directional drilling
HIHWNMS	Hawaiian Islands Humpback Whale National Marine Sanctuary
IACC	Interagency Coordinating Committee
ICES	International Council for Exploration of the Sea
ICS	Incident Command System
IFQ	individual fishing quota
IGERT	Integrative Graduate Education and Research Traineeship Program
IMO	International Maritime Organization

Appendix C: Acronyms
GFNMS Draft Management Plan

IPPC	International Plant Protection Convention
ITQ	individual transferable quota
IUCN	International Union for Conservation of Nature and Natural Resources
JMPR	Joint Management Plan Review
LCP	Local Coastal Program
LCV	Large Commercial Vessels
LiMPETS	Long-term Monitoring Program and Experiential Training for Students
MAC	Maritime Archaeology Center (NOAA)
MALT	Marin Agricultural Land Trust
MARE	Marine Activities, Resources, and Education
MARPOL	International Convention for the Prevention of Pollution from Ships
MATE	Marine Advanced Technology Education (Center)
MBA	Monterey Bay Aquarium
MBARI	Monterey Bay Aquarium Research Institute
MBNMS	Monterey Bay National Marine Sanctuary
MBTA	Migratory Bird Treaty Act
MCBI	Marine Conservation Biology Institute
MCSTOPPP	Marin County Stormwater Pollution Prevention Program
MERITO	Multicultural Education for Resource Issues Threatening Oceans
MGD	million gallons per day
MHW	mean high water
MHWL	mean high water line
MLMA	Marine Life Management Act
MLML	Moss Landing Marine Laboratories
MLPA	Marine Life Protection Act
MMPA	Marine Mammal Protection Act
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MPA	marine protected area
MRDC	Marin Rural Development Council
MSD	marine sanitation device
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
NANPCA	Nonindigenous Aquatic Nuisance Prevention and Control Act
NAS	Nautical Archaeology Society
NASA	National Aeronautics and Space Administration
NCCOS	National Centers for Coastal Ocean Science
NEBA	Net Environmental Benefits Analysis
NEMO	Nonpoint Education for Municipal Officials
NEPA	National Environmental Policy Act
NGO	non-governmental organization
NHPA	National Historic Preservation Act
NISA	National Invasive Species Act of 1996
NISAC	Non-native Invasive Species Advisory Committee
NM	nautical mile
NMFS	National Marine Fisheries Service
NMSA	National Marine Sanctuaries Act
NMSF	National Marine Sanctuaries Foundation
NMSS	National Marine Sanctuary System

Appendix C: Acronyms
GFNMS Draft Management Plan

NOAA OLE	NOAA Office of Law Enforcement
NOAA	National Oceanic and Atmospheric Administration
NODC	National Oceanographic Data Center
NOS	National Ocean Service
NPDES	National Pollutant Discharge Elimination System
NPR	National Public Radio
NPS	National Park Service
NPS	Naval Postgraduate School
NPS	non-point source pollution
NRDA	National Resource Damage Assessment and Restoration
NURP	National Undersea Research Program (NOAA)
OCNMS	Olympic Coast National Marine Sanctuary
OCRM	Office of Coastal Resource Management (NOAA)
OCS	outer continental shelf
OE	Office of Enforcement
OES	Office of Emergency Services
ONMS	Office of National Marine Sanctuaries
OPA	Oil Spill Prevention Act of 1990
ORR	Office of Response and Restoration
OSPR	(Office of) Oil Spill Prevention and Response (CDFW)
OSRO	Oil Spill Response Organization
OWE	Open Water Exchange
PARS	Port Access Route Studies
PCB	polychlorinated biphenyl
PCFFA	Pacific Coast Federation of Fishermen's Associations
PCLC	Pacific Coast Learning Center
PFMC	Pacific Fishery Management Council
PISCO	Partnership for Interdisciplinary Studies of Coastal Oceans
PRBO	Point Blue Conservation Science, (formerly PRBO Conservation Science and Point Reyes Bird Observatory)
PRNS	Point Reyes National Seashore
PRNSA	Point Reyes National Seashore Association
PSA	public service announcement
PSMFC	Pacific States Marine Fisheries Commission
PWSA	Ports and Waterways Safety Act
RBOC	Recreational Boaters of California
RCRA	U.S. Resource Conservation and Recovery Act
ROV	remotely operated vehicle
RRP	Regional Response Plan
RUST	Resources and Under Sea Threats (ONMS database system)
RWQCB	Regional Water Quality Control Board
SAC	Sanctuary Advisory Council
SBNMS	Stellwagen Bank National Marine Sanctuary
SCCAT	Southern California Caulerpa Action Team
SCRP	Submerged Cultural Resources Program (ONMS)
SEALS	Sanctuary Education Awareness and Long-term Stewardship
SeaWif	Sea-viewing Wide Field of Vision
SERC	Smithsonian Environmental Research Center
SFBNERR	San Francisco Bay National Estuarine Research Reserve

SFSU	San Francisco State University
SFU	San Francisco State University
SHPO	California State Historic Preservation Office
SIMoN	Sanctuary Integrated Monitoring Network (MBNMS)
SLC	California State Lands Commission
SMCNHA	San Mateo Coast Natural History Association
SPO	Special Projects Office
SST	sea surface temperature
STRAW	Students and Teachers Restoring a Watershed
SWiM	System Wide Monitoring Program (ONMS)
SWMEA	Southwest Marine and Aquatic Educator's Association
SWQB	State Water Quality Board
SWQPA	State Water Quality Protection Area
SWRCB	State Water Resources Control Board
TBNMS	Thunder Bay National Marine Sanctuary
TMDL	total maximum daily loads
TMMC	The Marine Mammal Center
UCCE	University of California Cooperative Extension
UCD	University of California Davis
UCSC	University of California Santa Cruz
UNESCO	United Nations Educational Scientific and Cultural Organization
USACE	U.S. Army Corps of Engineers
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VTSS	Vessel Traffic System
VTSS	Vessel Traffic Separation Schemes
WDR	Waste Discharge Requirement
WRP	Western Regional Panel on Aquatic Nuisance Species

Appendix D: Citations

Allen, L. G., and M. H. Horn. 1975. Abundance, diversity, and seasonality of fishes in Colorado Lagoon, Alamitos Bay, California. *Estuarine and Coastal Marine Science* 3: 371-380.

Allen, L. G. 1982. Seasonal abundance, composition, and productivity of the littoral fish assemblage in upper Newport Bay, California. *Fishery Bulletin* 80: 769-790.

Ainley, D. G., L. B. Spear, and S. G. Allen. 1996. Variation in the diet of Cassin's auklet reveals spatial, seasonal, and decadal occurrence patterns of euphausiids off California, U. S. A. *Marine Ecology Progress Series* 137: 1-10.

Berger, R. W. 2013. Population Size and Reproductive Performance of northern elephant seals on the South Farallon Islands, 2012-2013. Unpublished report to the US Fish and Wildlife Service. PRBO Conservation Science, Petaluma, California. PRBO Contribution Number 1932. National Park Service, 2013, unpublished data

Berzins, I. K. 1985. *The Dynamics of Beach Wrack Invertebrate Communities: An Evaluation of Habitat Use Patterns*. University of California, Berkeley.

Blaber, S. J. M., D. T. Brewer, and J. P. Salini. 1989. Species composition and biomasses of fishes in different habitats of a tropical northern Australian estuary: their occurrence in the adjoining sea and estuarine dependence. *Estuarine, Coastal and Shelf Science* 29: 509-531.

Bray, R. N. 1981. Influences of water currents and zooplankton densities on daily foraging movements of blacksmith, *Chromis punctipinnis*, a planktivorous reef fish. *Fisheries Bulletin* 78: 829-841.

Bray, R. N., and A.W. Ebeling. 1975. Food, activity and habitat of three "picker-type" microcarnivorous fishes in the kelp forests off Santa Barbara, California. *Fisheries Bulletin* 73: 815-829.

Broenkow, W. 1977. Water chemistry of the Elkhorn Slough and Moss Landing Harbor. In Nybakken, J. G. Cailliet, and W. Broenkow (eds). *Ecologic and Hydrographic Studies of Elkhorn Slough Moss Landing Harbor and Nearshore Coastal Waters*. Moss Landing Marine Laboratories Technical Publication. Moss Landing, California.

California Department of Conservation. Division of Oil, Gas, and Geothermal Resources. "2012 Preliminary Report of California Oil and Gas Production Statistics". April 2013. Retrieved 3 January 2014.

California Fishery Information System Database. 2013. Accessed May 10, 2013.

Appendix D: Citations
GFNMS Draft Management Plan

- Carr, M. H. 1983. Spatial and temporal patterns of recruitment of young-of-the-year rockfishes (genus *Sebastes*) into a central California kelp forest. Thesis, San Francisco State University. San Francisco.
- Colebrook, J. M. 1977. Annual fluctuations in the biomass of taxonomic groups of zooplankton in the California Current, 1955-1959. *Fishery Bulletin* 75: 357-368.
- Croll, D. A., B. R. Tershy, R. Hewitt, D. Demer, S. Hayes, P. Fiedler, J. Popp, and V. L. Lopez. 1998. An integrated approach to the foraging ecology of marine birds and mammals. *Deep-Sea Research II* 45: 1353-1371.
- Davis, J., and A. Baldrige. 1980. *The Bird Year: A Book for Birders with Special Reference to the Monterey Bay Area*. Boxwood Press. Pacific Grove, California.
- Duggins, D. O. 1988. The effects of kelp forests on nearshore environments: biomass, detritus, and altered flow. In VanBlaricom, G.R., and J.A. Estes (eds). *The Community Ecology of Sea Otters*. Springer-Verlag, Germany. Pp. 192-201.
- Ebeling, A. W., and D. R. Laur. 1985. The influence of plant cover on surfperch abundance at an offshore temperate reef. *Environmental Biology of Fishes* 12: 169-179.
- Ebeling, A. W., D. R. Laur, and R. J. Rowley. 1985. Severe storm disturbances and reversal of community structure in a southern California kelp forest. *Marine Biology* 84: 287-294.
- Edwards, R. R. C. 1973a. Production ecology of two Caribbean marine ecosystems. I. Physical environment and fauna. *Estuarine Coastal and Marine Science* 1: 303-318.
- Eittem, S. L., M. E. Field, and M. Noble. 2000. Where Does the Mud Go? Ecosystem Observations for the Monterey Bay National Marine Sanctuary.
- Fiedler, P. C., S. B. Reilly, R. P. Hewitt, D. Demer, V. Philbrick, S. Smith, W. Armstrong, D. A. Croll, B. R. Tershy, and B. R. Mate. 1998. Blue whale habitat and prey in the California Channel Islands. *Deep-Sea Research II* 45: 1781-1801.
- Foster, M. S. 1982. The regulation of macroalgal associates in kelp forests. In Srivastava, L. (ed). *Synthetic and Degradative Processes in Marine Macrophyte*. Walter de Gruyter and Co. Berlin, Germany. Pp. 185-205.
- Foster, M. S., and D. R. Schiel. 1985. The ecology of giant kelp forests in California: a community profile. U.S. Fish and Wildlife Service Biological Report 85(7.2): 152 pp.
- Gooding, R. M., and J. J. Magnuson. 1967. Ecological significance of a drifting object to pelagic fishes. *Pacific Science* 21: 486-497.
- Gunter, G. 1958. Population studies of the shallow water fishes of an outer beach in south Texas. *Publications of the Institute of Marine Science, University of Texas* 5: 186-193.

Haaker, P. L., K. Karpov, L. Rogers-Bennett, I. Taniguchi, C. S. Friedman, and M. J. Tegner. 2001. Abalone. In Leet, W. S., C. M. Dewees, R. Klingbeil, and E. J. Larson [Eds]. *California's Living Marine Resources: A Status Report*. California Department of Fish and Game Resources Agency. Pp. 89-97.

Halle, C.M. and J.L. Largier. 2011. Surface circulation downstream of the Point Arena upwelling center. *Continental Shelf Research* 31(12): 1260-1272.

Hoff, J. G., and R. M. Ibara. 1977. Factors affecting the seasonal abundance, composition, and diversity of fishes in a southeastern New England estuary. *Estuarine and Coastal Marine Science* 5: 665-678.

Huntley, M. E., M. Zhou, and W. Nordhausen. 1995. Mesoscale distribution of zooplankton in the California Current in late spring, observed by Optical Plankton Counter. *Journal of Marine Research* 53: 647-674.

Kieckhefer 1995 Check in Kieckhefer, T. R. 1992. Feeding ecology of humpback whales in continental shelf waters near Cordell Bank. Moss Landing Marine Laboratories. Moss Landing.

Laidig, T. 2002. Continental slope communities. In Karl, H. A., J. L. Chin, E. Ueber, P. H. Stauffer, and J. W. Hendley II [Eds.]. *Beyond the Golden Gate: Oceanography, Geology, Biology, and Environmental Issues in the Gulf of the Farallones*. U. S. Department of the Interior and U. S. Geological Survey. Circular 1198.

Lasiak, T. A. 1983. The impact of surf-zone fish communities on faunal assemblages associated with sandy beaches. In McLachlan, A., and T. Erasmus (eds). *Sandy Beaches as Ecosystems*. Dr. W. Junk Publishers. The Hague. Pp. 501-506.

Lockyer, C. 1981. Growth and energy budgets of large baleen whales from the Southern hemisphere. *Food and Agricultural Organization Fisheries Series* 5: 379-487.

Loeb, V. J., P. E. Smith, and H. G. Moser. 1983a. Ichthyoplankton and zooplankton abundance patterns in the California Current area, 1975. *California Cooperative Oceanic Fisheries Investigations Reports* 24: 109-131.

Loneragen, N. R., I. C. Potter, R. C. J. Lenanton, and N. Caputi. 1986. Spatial and seasonal differences in the fish fauna in the shallows of a large Australian estuary. *Marine Biology* 103: 461-479.

Mann, K. H. 1982. *Ecology of Coastal Waters*. University of California Press. Los Angeles, California. 322 pages.

McDermott, J. J. 1983. Food web in the surf-zone on an exposed sandy beach along the mid-Atlantic coast of the United States. In McLachlan, A. and T. Erasmus. *Sandy Beaches as Ecosystems*. Dr. W. Junk Publishers. The Hague. Pp. 529-538.

Appendix D: Citations
GFNMS Draft Management Plan

- Modde, T. and S. T. Ross. 1981. Seasonality of fishes occupying a surf zone habitat in the northern Gulf of Mexico. *Fishery Bulletin* 78: 911-922.
- Onuf, C. P., and M. L. Quammen. 1983. Fishes in a California coastal lagoon: Effects of major storms on distribution and abundance. *Marine Ecology Progress Series* 12: 1-14.
- Parrish, R. H., C. S. Nelson, and A. Bakun. 1981. Transport mechanisms and reproductive success of fishes in the California Current. *Biological Oceanography* 1: 175-203.
- Pearson, D. E., S. L. Owen, and D. Thomas. 2001. English Sole. In Leet, W. S., C. M. Dewees, R. Klingbeil, and E. J. Larson [Eds]. *California's Living Marine Resources: A Status Report*. California Department of Fish and Game Resources Agency. Pp. 384-385.
- Pendleton, L., editor. 2007. The economic and market value of coasts and estuaries: what's at stake? *Restoring America's Estuaries*, Washington, D.C
- Ramer, B. A., G. W. Page, and M. M. Yoklavich. 1991. Seasonal abundance, habitat use, and diet of shorebirds in Elkhorn Slough, California. *Western Birds* 22: 157-174.
- Reid, J. L., G. L. Roden, and J. G. Wyllie. 1958. Studies in the California Current system. *California Cooperative Oceanic Fisheries Investigations Reports* 6: 27-57.
- Roletto, J., P. Etnoyer, G. Cochrane, E. Salgado, K. Graiff, G. Williams, K. Reyna, and J. Hyland. 2013. Characterization of deep-sea coral and sponge communities in Gulf of the Farallones National Marine Sanctuary: Rittenburg Bank, Cochrane Bank and Farallon Escarpment. A report to the NOAA Deep-sea Coral Research and Technology Program and Gulf of the Farallones National Marine Sanctuary, San Francisco, CA (unpublished report)
- Roletto, J., J. Mortenson, L. Grella, and D. Osorio. 2000. Beach Watch Annual Report: 1999. Unpublished report to the National Oceanic and Atmospheric Administration. Gulf of the Farallones National Marine Sanctuary, San Francisco, California.
- SFMX (San Francisco Marine Exchange) "Shipping reports." <http://www.sfm.org>. Accessed March 2012.
- Schoenherr, J. R. 1991. Blue whales feeding on high concentrations of euphausiids around Monterey Submarine Canyon. *Canadian Journal of Zoology* 69: 583-594.
- Slattery, P. N. 1980. Ecology and life histories of dominant infaunal crustaceans inhabiting the subtidal high energy beach at Moss Landing, California. M. A. Thesis, San Jose State University, California.
- Sowls, A. L., A. R. DeGange, J. W. Nelson and G. S. Lester. 1980. Catalog of California Seabird Colonies. U.S. Dept Interior, Fish and Wildl. Serv., Biol. Serv. Prog. FWS/OBS 37/80.371 p.

Rice 1977 Check in Rice, D. W. 1978. Blue Whale. In Haley, D. (ed). *Marine Mammals of Eastern Pacific and Arctic Waters*. Pacific Search Press. Seattle, Washington. Pp. 30-55.

U.S. Coast Guard. Unpublished data. Automatic Identification System, Vessel Tracking Service. Yerba Buena Island, California; U.S. Coast Guard Research and Development Lab, Groton, Connecticut.

Weinstein, M. P. 1979. Shallow, marsh habitats as primary nurseries for fishes and shellfish. Cape Fear River, North Carolina. *Fisheries Bulletin* 77: 339-357.

ABA Consultants. 1989. Elkhorn Slough Wetlands Management Plan: Hearing Draft Report. Prepared for Monterey County and California Coastal Commission. ABA Consultants. Capitola, California.

Wickham, D. A., and G. R. Russell. 1974. Evaluation of midwater artificial structures for attracting coastal pelagic fishes. *Fisheries Bulletin* 72: 181-191.

Yoklavich, M. M., G. M. Caillet, J. P. Barry, D. A. Ambrose, B. S. Antrim. 1991. Temporal and spatial patterns in abundance and diversity of fish assemblages in Elkhorn Slough, California. *Estuaries* 14(4): 465-480.

Veit, R. R., J. A. McGowan, D. G. Ainley, and T. R. Wahls. 1997. Apex marine predator declines ninety percent in association with changing ocean climate. *Global Change Biology* 3: 23-28.

Appendix E: Vertebrates

GULF OF THE FARALLONES NATIONAL MARINE SANCTUARY

VERTEBRATES

Compiled by:

Peter Pyle
Institute for Bird Populations
ppyle@birdpop.org

Douglas Long
Oakland Museum of California
dlong@museumca.org

Robert N. Lea
California Department of Fish and Wildlife (retired)
RNLea2@aol.com

Jan Roletto
Gulf of the Farallones National Marine Sanctuary
Jan.Roletto@noaa.gov

Kaitlin Graiff
Cordell Bank National Marine Sanctuary
Kaitlin.Graiff@noaa.gov

The following lists of vertebrate species are known to occur in the Gulf of the Farallones National Marine Sanctuary (GFNMS). These lists include 36 mammals, 174 birds, 4 reptile, and 390 fish species that have been recorded alive or dead or, for some species of fish, are suspected of occurring within the boundary of the GFNMS, including the waters of Tomales Bay, Drakes and Limantour Esteros, and Bolinas Lagoon. In addition to common and scientific names of each specific taxon, the lists include information or data on Federal listed status and the importance of the sanctuary to the species, as listed under "Habitat Importance." This designation is based on 1) the abundance of the species within the sanctuary, 2) the proportion of the overall range or population that occurs in the sanctuary, and 3) the importance of the sanctuary to breeding individuals. Also noted by asterisk for bird and mammal species, is if the sanctuary is used by that species for foraging, roosting, nesting, and/or rearing of young during its breeding season.

Taxonomic classification, phylogenetic order, and all other information are according to references used for each class of vertebrates, listed below. Each class has slightly differing

Appendix E: Vertebrates
GFNMS Draft Management Plan

criteria for acceptance to the list. For mammals the list includes all marine species, including vagrants, which have been recorded within sanctuary waters, either observed alive or dead. Only one fresh-water/estuarine species, river otter, is included based on occurrence in coastal bodies of water and because the GFNMS boundary includes estuarine habitats where these otters have been documented. For birds the list includes all marine species, including vagrants, that have been recorded in sanctuary waters and those species that are regularly found in the coastal esteros and lagoons. For a full list of over 400 bird species, including vagrant estuarine species and landbirds recorded on Southeast Farallon Island, see Pyle 2000. For reptiles and fish the lists include those species recorded in the sanctuary plus others suspected of occurring based on records both north and south of the sanctuary, but for which no definite records are currently known.

The headings of the vertebrate lists include the following categories:

COMMON NAME - The common (English) name of the species.

SCIENTIFIC NAME - The scientific (Latin) name of the species.

FEDERAL STATUS - The federal listed status as of May 2013 (as found at URL: <http://ecos.fws.gov/ecos/indexPublic.do>). These designations are given if any population or subspecies occurring in the sanctuary is so listed.

E - Endangered

T - Threatened

D – Delisted since designation of the sanctuary

HABITAT IMPORTANCE - The "Habitat Importance" of the sanctuary to the species. Codes are as follows:

E - Extremely Important

V - Very Important

S - Somewhat Important

No designation indicates the sanctuary is of little importance or importance is unknown.

References

Birds

Ainley, D. G., and R. J. Boekelheide. 1990. Seabirds of the Farallon Islands. Ecology, dynamics, and structure of an upwelling-system community. Stanford University Press, Stanford, CA

Ainley, D. G., W. J. Sydeman, S. A. Hatch, and U. L. Wilson. 1994. Seabird population trends along the west coast of North America: causes and the extent of regional concordance. *Studies in Avian Biology* 15:119-133

American Ornithologists' Union. 1998. Check-list of North American birds. 7th Edition. American Ornithologists' Union, Washington D.C.

Briggs, K. T., W. B. Tyler, D. B. Lewis, and D. R. Carlson. 1987. Bird communities at sea off California: 1975-1983. *Studies in Avian Biology* 11:1-74

California Academy of Sciences. 2013. Ornithology and Mammalogy Research and the Marine Mammal Stranding Network, URL: research.calacademy.org/om/mmsn

Carter, H. R., G.J. McChesney, D.L. Jaques, C. S. Strong, M.W. Parker, J.E. Takekawa, D.L. Jory, and D. L. Whitworth. 1992. Breeding populations of seabirds on the Northern and Central California coasts in 1989-1991. U.S.

Department of Interior, Mineral Management Services, Los Angeles, CA

Farallones Marine Sanctuary Association (FMSA). 2013. On line data query for Beach Watch data, URL: www.farallones.org/BeachData/BeachWatchData.php

Kelly, J.P. and S.L. Tappan. Distribution, abundance, and implications for conservation of winter waterbirds on Tomales Bay, California. *Western Birds* 29:103-120

Klimkiewicz, M.K., and A.G. Futcher. 1989. Longevity records of North American birds. *Journal of Field Ornithology* 60:469-494. [And updates through May 2000 by M.K. Klimkiewicz at www.pwrc.fws.gov/bbl/homepage/longvrec.htm]

Morrison, R.I.G., R.E. Gill, Jr., B.A. Harrington, S. Skagen, G.W. Page, C.L. Gratto-Trevor, and S.M. Haig. 2000. Population estimates of Nearctic shorebirds. *Waterbirds* 23:337-552

National Centers for Coastal Ocean Science (NCCOS) 2007. A Biogeographic Assessment off North/Central California: In Support of the National Marine Sanctuaries of Cordell Bank, Gulf of the Farallones and Monterey Bay. Phase II - Environmental Setting and Update to Marine Birds and Mammals. Prepared by NCCOS's Biogeography Branch, R.G. Ford Consulting Co. and Oikonos Ecosystem Knowledge, in cooperation with the National Marine Sanctuary Program. Silver Spring, MD. NOAA Technical Memorandum NOS NCCOS 40. 145 pps

Page, G.W., L.E. Stenzel, and C.M. Wolfe. 1979. Aspects of the occurrence of shorebirds on a Central California estuary. *Studies in Avian Biology* 2:15-32

Poole, A., and F. Gill, Eds. 1992-2001. *Birds of North America*. Academy of Natural Sciences, Philadelphia, and American Ornithologists' Union, Washington D.C.

PRBO Conservation Science (PRBO). 2013. On line mapping tool for the California Avian Data Center, URL: data.prbo.org/cadc2/

Pyle, P. 2000. The birds of the Gulf of the Farallones: A distributional checklist. Gulf of the Farallones National Marine Sanctuary, San Francisco, CA

Appendix E: Vertebrates
GFNMS Draft Management Plan

Pyle, P., and D. F. DeSante. 1994. Trends in waterbirds and raptors at Southeast Farallon Island, California, 1974-1993. *Bird Populations* 2:33-43

Pyle, P., and R. P. Henderson. 1991. The birds of Southeast Farallon Island: occurrence and seasonal distribution of migratory species. *Western Birds* 22:41-84

Rose, P.M., and D.A. Scott. 1994. Waterfowl population estimates. International Waterfowl and Wetlands Research Bureau, Slimbridge, U.K.

Shuford, W.D., G.W. Page, J.G. Evens, and L.E. Stenzel. 1989. Seasonal abundance of waterbirds at Point Reyes: A coastal California perspective. *Western Birds* 20:137-265

Stallcup, R. 1990. Ocean birds of the nearshore Pacific. Point Reyes Bird Observatory, Stinson Beach, CA.

USFWS Threatened and Endangered Species List URL <http://ecos.fws.gov/ecos/indexPublic.do>

Mammals

Barlow, J. 1994. Recent information on the status of large whales in California waters. Report NOAA-TM-NMFS-SWFSC-203, Southwest Fisheries Center, La Jolla, CA

Barlow, J., A.E. Henry, J.V. Redfern, T.M. Tack, A.R. Jackson, C. Hall, F.I. Archer, and L.T. Balance. 2008. Oregon, California and Washington line-transect and ecosystem (ORCAWALE) 2008 cruise report. NOAA technical memorandum NMFS, NOAA-TM-NMFS-SWFSC, La Jolla, CA. 33 pps.

California Academy of Sciences. 2013. Ornithology and Mammalogy Research and the Marine Mammal Stranding Network, URL: research.calacademy.org/om/mmsn

Farallones Marine Sanctuary Association (FMSA). 2013. On line data query for Beach Watch data, URL: www.farallones.org/BeachData/BeachWatchData.php

Forney, K.A. 1994. Recent information on the status of odontocetes in California waters. Report NOAA-TM-NMFS-SWFSC-202, Southwest Fisheries Center, La Jolla, CA

Leatherwood, S., and R.R. Reeves. 1983. The Sierra Club handbook of whales and dolphins. Sierra Club Books, San Francisco, CA

National Centers for Coastal Ocean Science (NCCOS) 2007. A Biogeographic Assessment off North/Central California: In Support of the National Marine Sanctuaries of Cordell Bank, Gulf of the Farallones and Monterey Bay. Phase II - Environmental Setting and Update to Marine Birds and Mammals. Prepared by NCCOS's Biogeography Branch, R.G. Ford Consulting Co. and

Oikonos Ecosystem Knowledge, in cooperation with the National Marine Sanctuary Program. Silver Spring, MD. NOAA Technical Memorandum NOS NCCOS 40. 145 pps

PRBO Conservation Science (PRBO). 2013. On line mapping tool for the California Avian Data Center, URL: data.prbo.org/cadc2/

Pyle, P., and L. Gilbert. 1996. Occurrence patterns and trends of cetaceans recorded from Southeast Farallon Island, California, 1973 to 1994. *Northwestern Naturalist* 77:1-8

Stone, G., J. Goebel, and S. Webster. Eds. Pinniped populations, Eastern North Pacific: Status, trends and issues. New England Aquarium, Boston, MA, and Monterey Bay Aquarium, Monterey, CA

Stallcup, R. 1990. Ocean birds of the nearshore Pacific. Point Reyes Bird Observatory, Stinson Beach, CA

Sydeman, W.J., and S.G. Allen. 1999. Pinniped population dynamics in central California: Correlations with sea surface temperature and upwelling indices. *Marine Mammal Science* 15:446-461.

USFWS Threatened and Endangered Species List URL <http://ecos.fws.gov/ecos/indexPublic.do>

Fish

Eschmeyer, W. N. and E. S. Herald. 1983. A field guide to Pacific Coast fishes of North America. Houghton Mifflin Co., Boston. 336 pps.

Long, D.J. Personal Communications. California Academy of Sciences, San Francisco, CA

Hubbs, C. L., W. I. Follett, and L. J. Dempster. 1979. List of the fishes of California. Occasional Papers of the California Academy of Sciences, No. 133. 51 pps.

Miller, D. J. and R. N. Lea. 1976. Guide to the coastal marine fishes of California. Revised edition. State of California, Dept. of Fish and Game, Fish Bull. 157. 149 pps.

Nelson, J. S., E. J. Crossman, H. Espinosa-Pérez, L. T. Findley, C. R. Gilbert, R. N. Lea, and J. D. Williams. 2004. Common and Scientific Names of Fishes from the United States, Canada, and Mexico. Sixth Ed. American Fisheries Society, Spec. Publ. 29. 386 pps.

Stallcup, R. 1990. Ocean birds of the nearshore Pacific. Point Reyes Bird Observatory, Stinson Beach, CA

USFWS Threatened and Endangered Species List URL <http://ecos.fws.gov/ecos/indexPublic.do>

Appendix E: Vertebrates
GFNMS Draft Management Plan

Reptiles

California Academy of Sciences. 2013. Ornithology and Mammalogy Research and the Marine Mammal Stranding Network, URL: research.calacademy.org/om/mmsn

Farallones Marine Sanctuary Association (FMSA). 2013. On line data query for Beach Watch data, URL: www.farallones.org/BeachData/BeachWatchData.php

Stallcup, R. 1990. Ocean birds of the nearshore Pacific. Point Reyes Bird Observatory, Stinson Beach, CA

Stebbins, R.C. 1966. A field guide to western reptiles and amphibians. Houghton Mifflin Co., Boston.

USFWS Threatened and Endangered Species List URL <http://ecos.fws.gov/ecos/indexPublic.do>

VERTEBRATES

Birds

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS	HABITAT IMPORTANCE
Red-throated Loon	<i>Gavia stellata</i>		V
Pacific Loon	<i>Gavia pacifica</i>		E
Common Loon	<i>Gavia immer</i>		V
Yellow-billed Loon	<i>Gavia adamsii</i>		S
Pied-billed Grebe*	<i>Podilymbus podiceps</i>		V
Horned Grebe	<i>Podiceps auritus</i>		V
Red-necked Grebe	<i>Podiceps grisegena</i>		V
Eared Grebe	<i>Podiceps nigricollis</i>		E
Western Grebe	<i>Aechmophorus occidentalis</i>		E
Clark's Grebe	<i>Aechmophorus clarkii</i>		E
Laysan Albatross*	<i>Phoebastria immutabilis</i>		S
Black-footed Albatross*	<i>Phoebastria nigripes</i>		E
Short-tailed Albatross*	<i>Phoebastria albatrus</i>	E	S
Light-mantled Albatross	<i>Phoebetria palpebrata</i>		
Shy Albatross	<i>Thalassarche cauta</i>		
Northern Fulmar	<i>Fulmarus glacialis</i>		E
Pink-footed Shearwater	<i>Puffinus creatopus</i>		E
Flesh-footed Shearwater	<i>Puffinus carneipes</i>		V

Appendix E: Vertebrates
GFNMS Draft Management Plan

Buller's Shearwater	<i>Puffinus bulleri</i>		E
Sooty Shearwater	<i>Puffinus griseus</i>		E
Short-tailed Shearwater	<i>Puffinus tenuirostris</i>		E
Greater Shearwater	<i>Puffinus gravis</i>		
Black-vented Shearwater	<i>Puffinus opisthomelas</i>		V
Manx Shearwater	<i>Puffinus puffinus</i>		
Cook's Petrel	<i>Pterodroma cookii</i>		
Mottled Petrel	<i>Pterodroma inexpectata</i>		S
Dark-rumped Petrel	<i>Pterodroma phaeopygia</i>	T	
Murphy's Petrel	<i>Pterodroma ultima</i>		S
Fork-tailed Storm-Petrel*	<i>Oceanodroma furcata</i>		V
Leach's Storm-Petrel*	<i>Oceanodroma leucorhoa</i>		V
Ashy Storm-Petrel*	<i>Oceanodroma homochroa</i>		E
Wilson's Storm-Petrel	<i>Oceanites oceanicus</i>		
Black Storm-Petrel	<i>Oceanodroma melania</i>		
Least Storm-Petrel	<i>Oceanodroma microsoma</i>		
Brown Pelican	<i>Pelecanus occidentalis</i>	D	E
American White Pelican	<i>Pelecanus erythrorhynchos</i>		S
Magnificent Frigatebird	<i>Fregata magnificens</i>		
Great Frigatebird	<i>Fregata minor</i>		
Masked Booby	<i>Sula dactylatra</i>		
Brown Booby	<i>Sula leucogaster</i>		S
Red-footed Booby	<i>Sula sula</i>		
Red-billed Tropicbird	<i>Phaethon aethereus</i>		
Red-tailed Tropicbird	<i>Phaethon rubricauda</i>		
Brandt's Cormorant*	<i>Phalacrocorax penicillatus</i>		E
Double-crested Cormorant*	<i>Phalacrocorax auritus</i>		V
Pelagic Cormorant*	<i>Phalacrocorax pelagicus</i>		E
American Bittern	<i>Botaurus lentiginosus</i>	SC	S
Great Blue Heron*	<i>Ardea herodias</i>		E
Great Egret*	<i>Ardea alba</i>		E
Snowy Egret*	<i>Egretta thula</i>		V
Green Heron*	<i>Butorides virescens</i>		V
Black-crowned Night-Heron*	<i>Nycticorax nycticorax</i>		E
Turkey Vulture*	<i>Cathartes aura</i>		S
Canada Goose*	<i>Branta canadensis</i>	D (B.c. leucopareia)	S
Brant	<i>Branta bernicla</i>		E

Appendix E: Vertebrates
GFNMS Draft Management Plan

Gadwall*	<i>Anas strepera</i>		V
Eurasian Wigeon	<i>Anas penelope</i>		S
American Wigeon	<i>Anas americana</i>		E
Mallard*	<i>Anas platyrhynchos</i>		E
Blue-winged Teal	<i>Anas discors</i>		S
Cinnamon Teal*	<i>Anas cyanoptera</i>		V
Northern Shoveler	<i>Anas clypeata</i>		E
Northern Pintail	<i>Anas acuta</i>		E
Green-winged Teal	<i>Anas crecca</i>		V
Greater Scaup	<i>Aythya marila</i>		E
Lesser Scaup	<i>Aythya affinis</i>		S
Harlequin Duck	<i>Histrionicus histrionicus</i>		S
Surf Scoter	<i>Melanitta perspicillata</i>		E
White-winged Scoter	<i>Melanitta fusca</i>		E
Black Scoter	<i>Melanitta nigra</i>		E
Long-tailed Duck (Oldsquaw)	<i>Clangula hyemalis</i>		S
Bufflehead	<i>Bucephala albeola</i>		E
Common Goldeneye	<i>Bucephala clangula</i>		E
Red-breasted Merganser	<i>Mergus serrator</i>		V
Ruddy Duck*	<i>Oxyura jamaicensis</i>		E
Osprey*	<i>Pandion haliaetus</i>		E
Bald Eagle*	<i>Haliaeetus leucocephalus</i>	D	S
Northern Harrier	<i>Circus cyaneus</i>		S
Merlin	<i>Falco columbarius</i>		V
Peregrine Falcon*	<i>Falco peregrinus</i>	D	E
Prairie Falcon*	<i>Falco mexicanus</i>		S
Black Rail	<i>Laterallus jamaicensis</i>		E
Virginia Rail	<i>Rallus limicola</i>		V
Yellow Rail	<i>Coturnicops noveboracensis</i>		S
Sora	<i>Porzana carolina</i>		V
American Coot*	<i>Fulica americana</i>		V
Black-bellied Plover	<i>Pluvialis squatarola</i>		E
Snowy Plover*	<i>Charadrius alexandrinus</i>	T	E
Semipalmated Plover	<i>Charadrius semipalmatus</i>		V
Killdeer*	<i>Charadrius vociferus</i>		V
Black Oystercatcher*	<i>Haematopus bachmani</i>		E
American Avocet	<i>Recurvirostra americana</i>		V

Appendix E: Vertebrates
GFNMS Draft Management Plan

Greater Yellowlegs	<i>Tringa melanoleuca</i>		V
Willet	<i>Catoptrophorus semipalmatus</i>		E
Wandering Tattler	<i>Heteroscelus incanus</i>		V
Spotted Sandpiper	<i>Actitis macularia</i>		V
Whimbrel	<i>Numenius phaeopus</i>		V
Long-billed Curlew	<i>Numenius americanus</i>		E
Marbled Godwit	<i>Limosa fedoa</i>		E
Ruddy Turnstone	<i>Arenaria interpres</i>		S
Black Turnstone	<i>Arenaria melanocephala</i>		E
Surfbird	<i>Aphriza virgata</i>		V
Red Knot	<i>Calidris canutus</i>		S
Sanderling	<i>Calidris alba</i>		E
Western Sandpiper	<i>Calidris mauri</i>		E
Least Sandpiper	<i>Calidris minutilla</i>		E
Rock Sandpiper	<i>Calidris ptilocnemis</i>		S
Dunlin	<i>Calidris alpina</i>		E
Short-billed Dowitcher	<i>Limnodromus griseus</i>		V
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>		V
Common Snipe	<i>Gallinago gallinago</i>		V
Wilson's Snipe	<i>Gallinago delicata</i>		V
Red-necked Phalarope	<i>Phalaropus lobatus</i>		E
Red Phalarope	<i>Phalaropus fulicaria</i>		E
Wilson's Phalarope	<i>Phalaropus tricolor</i>		
South Polar Skua	<i>Catharacta maccormicki</i>		V
Pomarine Jaeger	<i>Stercorarius pomarinus</i>		E
Parasitic Jaeger	<i>Stercorarius parasiticus</i>		E
Long-tailed Jaeger	<i>Stercorarius longicaudus</i>		V
Bonaparte's Gull	<i>Larus philadelphia</i>		V
Heermann's Gull	<i>Larus heermanni</i>		E
Mew Gull	<i>Larus canus</i>		E
Ring-billed Gull*	<i>Larus delawarensis</i>		V
California Gull*	<i>Larus californicus</i>		E
Herring Gull	<i>Larus argentatus</i>		V
Thayer's Gull	<i>Larus thayeri</i>		V
Western Gull*	<i>Larus occidentalis</i>		E
Glaucous-winged Gull	<i>Larus glaucescens</i>		E
Glaucous Gull	<i>Larus hyperboreus</i>		S

Appendix E: Vertebrates
GFNMS Draft Management Plan

Sabine's Gull	<i>Xema sabini</i>		V
Swallow-tailed Gull	<i>Creagrus furcatus</i>		
Black-legged Kittiwake	<i>Rissa tridactyla</i>		V
Caspian Tern*	<i>Sterna caspia</i>		E
Elegant Tern*	<i>Sterna elegans</i>		E
Common Tern	<i>Sterna hirundo</i>		V
Arctic Tern	<i>Sterna paradisaea</i>		V
Forster's Tern*	<i>Sterna forsteri</i>		E
Sooty Tern	<i>Sterna fuscata</i>		
Common Murre*	<i>Uria aalge</i>		E
Thick-billed Murre	<i>Uria lomvia</i>		
Pigeon Guillemot*	<i>Cepphus columba</i>		E
Marbled Murrelet*	<i>Brachyramphus marmoratus</i>	T	E
Long-billed Murrelet	<i>Brachyramphus perdix</i>		
Scripps's Murrelet	<i>Synthliboramphus scrippsi</i>		S
Craveri's Murrelet	<i>Synthliboramphus craveri</i>		S
Ancient Murrelet	<i>Synthliboramphus antiquus</i>		V
Cassin's Auklet*	<i>Ptychoramphus aleuticus</i>		E
Parakeet Auklet	<i>Aethia psittacula</i>		
Least Auklet	<i>Aethia pusilla</i>		
Crested Auklet	<i>Aethia cristatella</i>		
Rhinoceros Auklet*	<i>Cerorhinca monocerata</i>		E
Horned Puffin	<i>Fratercula corniculata</i>		S
Tufted Puffin*	<i>Fratercula cirrhata</i>		E
Short-eared Owl	<i>Asio flammeus</i>		S
Belted Kingfisher*	<i>Ceryle alcyon</i>		V
Black Phoebe*	<i>Sayornis nigricans</i>		S
Say's Phoebe	<i>Sayornis saya</i>		S
Common Raven*	<i>Corvus corax</i>		V
Horned Lark*	<i>Eremophila alpestris</i>		V
Tree Swallow*	<i>Tachycineta bicolor</i>		S
Northern Rough-winged Swallow*	<i>Stelgidopteryx serripennis</i>		V
Cliff Swallow*	<i>Petrochelidon pyrrhonota</i>		S
Barn Swallow*	<i>Hirundo rustica</i>		S
Rock Wren*	<i>Salpinctes obsoletus</i>		V
Marsh Wren	<i>Cistothorus palustris</i>		V
American Pipit	<i>Anthus rubescens</i>		S

Appendix E: Vertebrates
GFNMS Draft Management Plan

Yellow-rumped Warbler	<i>Dendroica coronata</i>		S
Savannah Sparrow*	<i>Passerculus sandwichensis</i>		V
Song Sparrow*	<i>Melospiza melodia</i>		V
Swamp Sparrow	<i>Melospiza georgiana</i>		S
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>		
Red-winged Blackbird*	<i>Agelaius phoeniceus</i>		V
Tricolored Blackbird*	<i>Agelaius tricolor</i>		
Western Meadowlark*	<i>Sturnella neglecta</i>		S

Appendix F: Invertebrates and Algae

GULF OF THE FARALLONES NATIONAL MARINE SANCTUARY

INVERTEBRATES AND ALGAE

Compiled by Natalie Cosentino-Manning
National Marine Fisheries Service
Santa Rosa, CA
Natalie.Cosentino-Manning@noaa.gov

Jan Roletto
Gulf of the Farallones National Marine Sanctuary
Jan.Roletto@noaa.gov

Scott Kimura
Tenera Environmental, Inc.
skimura@tenera.com

Peter Etnoyer
National Centers for Coastal Ocean Science
Peter.Etnoyer@noaa.gov

Gary Williams
California Academy of Sciences
GWilliams@calacademy.org

Enrique Salgado
National Centers for Coastal Ocean Science
Enrique.Salgado@noaa.gov

The following are lists of known algae and invertebrate species known to occur within and adjacent to the GFNMS. There are over 500 species of invertebrates and algae found in the intertidal regions of California alone, therefore these lists should be considered as a minimum inventory. Also included are invertebrates known from benthic surveys within the sanctuary. Species listed are represented at most intertidal sites within GFNMS as well as some offshore organisms. Species lists includes species found at the outer coast intertidal habitats on the Farallon Islands and along the Sonoma and Mendocino Counties, estuarine habitats at Tomales Bay, Bolinas Lagoon, Estero Americano, Estero de San Antonio, and deep-sea habitats at Rittenburg Bank, Cochrane Bank, the Farallon Escarpment, and The Football found 33 km west of the Russian River. As of 2013, documented species include: 238 invertebrate taxon, 138 red algal taxon, 29 brown algal taxon, 22 green algal taxon and 6 vascular plant species.

Appendix F: Invertebrates and Algae
GFNMS Draft Management Plan

References:

Multi-Agency Rocky Intertidal Network (MARINe). 2013. URL: www.marine.gov

Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO). 2013. URL: www.pisco.org

Roletto, J., S. Kimura, N. Cosentino-Manning, R. Berger, and R. Bradley. 2013. Long-term trends of the rocky intertidal community on the Farallon Islands. *Western North America Naturalist (in press)*.

Roletto, J., P. Etnoyer, G. Cochrane, E. Salgado, K. Graiff, G. Williams, K. Reyna, and J. Hyland. 2013. Characterization of deep-sea coral and sponge communities in Gulf of the Farallones National Marine Sanctuary: Rittenburg Bank, Cochrane Bank and Farallon Escarpment. A report to the NOAA Deep-sea Coral Research and Technology Program and Gulf of the Farallones National Marine Sanctuary, San Francisco, CA (*in prep*)

Invertebrates

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	POPEST (Sanctuary)	POPEST (N.E. Pacific)	RANGE
Annelida				
	<i>Arabella iricolor</i>			
	<i>Cheilonereis cyclurus</i>			
	<i>Errantia spp.</i>			
Polycheate	<i>Nereis guberi</i>			
	<i>Phragmatopoma californica</i>			
	<i>Phyllochaetopterus prolifica</i>			
	<i>Platynereis bicanaliculata</i>			
Tube worm	<i>Serpula vermicularis</i>			
	<i>Spirorbis borealis</i>			
	<i>Stylantheca prophyra</i>			
	<i>Terribellidae</i>			
	<i>Thelepus crispus</i>			
	<i>Typosyllis aciculata</i>			
Arthropoda				
	<i>Acanthomysis sp.</i>			
	<i>Achelia chelata</i>			

Invertebrates

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	POPEST (Sanctuary)	POPEST (N.E. Pacific)	RANGE
	<i>Achelia nudiscula</i>			
	<i>Achelia spinoseta</i>			
	<i>Allorchestes anceps</i>			
	<i>Alpheus dentipes</i>			
	<i>Ammonothea hilgendorfi</i>			
	<i>Amphiodia occidentalis</i>			
	<i>Amphissa columbiana</i>			
	<i>Anatanais normani</i>			
	<i>Balanus amphitrite</i>			
Barnacle	<i>Balanus cariosus</i>			
Barnacle	<i>Balanus glandula</i>			
Barnacle	<i>Balanus nubilus</i>			
	<i>Cancer antennarius</i>			
	<i>Cancer magister</i>			
	<i>Cancer productus</i>			
	<i>Caprella californica</i>			
	<i>Chthamalus dalli</i>			
	<i>Cirolana harfordi</i>			
	<i>Elasmopus serricatus</i>			
	<i>Emerita analoga</i>			
	<i>Euphausia pacifica</i>			
	<i>Exosphaeroma inornata</i>			
	<i>Exosphaeroma rhomburum</i>			
	<i>Fabia subquadrata</i>			
	<i>Hemigrapsus nudus</i>			
	<i>Hildenbrandia prototypus</i>			
	<i>Hyale frequens</i>			
	<i>Hyale grandicornis</i>			
	<i>Ianiropsis kincaidi</i>			
	<i>Idotea fewkesi</i>			
	<i>Idotea resecata</i>			
	<i>Idotea schmitti</i>			
	<i>Idotea sp.</i>			

Appendix F: Invertebrates and Algae
GFNMS Draft Management Plan

Invertebrates

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	POPEST (Sanctuary)	POPEST (N.E. Pacific)	RANGE
	<i>Idotea stenops</i>			
	<i>Idotea urotoma</i>			
	<i>Idotea wosnesenskii</i>			
	<i>Lecythorhynchus hilgendorfi</i>			
	<i>Ligia occidentalis</i>			
	<i>Ligia pallasii</i>			
	<i>Limnoria algarum</i>			
	<i>Littorophiloscia richardsonae</i>			
	<i>Lophopanopeus leucomanus</i>			
Crab	<i>Loxorhynchus crispatus</i>			
	<i>Melita californica</i>			
	<i>Metacaprella anomala</i>			
	<i>Metacaprella kennerlyi</i>			
	<i>Nymphopsis spinosissima</i>			
	<i>Oedignathus inermis</i>			
	<i>Oligochinus lighti</i>			
	<i>Pachycheles rudis</i>			
Crab	<i>Pachygrapsus crassipes</i>			
	<i>Pachygrapsus nudus</i>			
	<i>Pagurus granosimanus</i>			
Hermit crab	<i>Pagurus hirsutiusculus</i>			
	<i>Pagurus samuelensis</i>			
	<i>Pagurus sp.</i>			
	<i>Paracerceis cordata</i>			
	<i>Paradynoides benedicti</i>			
	<i>Parallorchestes ochotensis</i>			
	<i>Paranthura elegans</i>			
	<i>Paraxanthia taylorii</i>			
	<i>Petrolisthes cinctipes</i>			
	<i>Pinnixa franciscana</i>			
	<i>Pollicipes polymerus</i>			

*Appendix F: Invertebrates and Algae
GFNMS Draft Management Plan*

Invertebrates

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	POPEST (Sanctuary)	POPEST (N.E. Pacific)	RANGE
	<i>Polycheria osborni</i>			
	<i>Porcellio americanus</i>			
Crab	<i>Pugetia fragilissima</i>			
Crab	<i>Pugettia gracilis</i>			
Crab	<i>Pugettia producta</i>			
Sea spider	<i>Pycnogonum rickettsi</i>			
Sea spider	<i>Pycnogonum stearnsi</i>			
Crab	<i>Scyra acutifrons</i>			
Barnacle	<i>Semibalanus cariosus</i>			
	<i>Semibalanus sp.</i>			
Barnacle	<i>Tetraclita rubescens</i>			
	<i>Thysanoessa spinifera</i>			
Chordata				
	<i>Aplidium arenatum</i>			
Tunicate	<i>Aplidium californicum</i>	Co	Co	BC - Baja
Tunicate	<i>Cystodytes lobatus</i>	Co	Co	BC - Baja
Tunicate	<i>Didemnum carnulentum</i>	Co	Co	OR - c.AM
	<i>Polyclinum planum</i>			
Tunicate	<i>Pycnoclayella stanleyi</i>	Co	Co	BC - Baja
Tunicate	<i>Ritterella aequalisphonis</i>	Ab	Co	WA - s. CA+
Cnidaria				
Fern hydroid	<i>Abietinaria sp.</i>	Co	Co	AK - s.CA
	<i>Aglaophenia inconspicua</i>			
Ostrich-plume hydroid	<i>Aglaophenia latirostris</i>	Ab	Co	AK - s. CA
	<i>Aglaophenia sp</i>			
Aggregating anemone	<i>Anthopleura elegantissima</i>	Ab	Ab	AK - Baja
Giant green anemone	<i>Anthopleura xanthogrammica</i>	Co	Co	AK - C. Am
	<i>Aurelia aurita</i>			
Orange cup coral	<i>Balanophyllia elegans</i>	Co	Co	OR - s. CA
	<i>Corynactis californica</i>			

Appendix F: Invertebrates and Algae
GFNMS Draft Management Plan

Invertebrates

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	POPEST (Sanctuary)	POPEST (N.E. Pacific)	RANGE
Poliferating anemone	<i>Epiactis prolifera</i>	Co	Co	AK - s.CA
	<i>Eudendrium californicum</i>			
	<i>Garveia annulata</i>	Ab	Co	AK - s. CA
White-plumed anemone	<i>Metridium senile</i>	Co	Co	AK - s. CA
	<i>Obelia sp.</i>			n.CA+
	<i>Sertularella turgida</i>			
	<i>Sertularia sp.</i>			
Sea pen	<i>Stylatula elongata</i>	Co	Co	n. CA - s. CA
	<i>Tealia crassicornis</i>	Co	Co	AK - c.CA+
	<i>Tealia lofotensis</i>	Co	Co	WA - s. CA
	<i>Tubularia crocea</i>			
	<i>Urticina crassicornia</i>			
	<i>Urticina lofotensis</i>			
Echinodermata				
	<i>Amphipholis squamata</i>			
	<i>Asterina miniata</i>			
Sea cucumber	<i>Cucumaria curata</i>	rare	rare	c.CA
Sea cucumber	<i>Cucumaria pseudocurata</i>	Co	Co	BC -c. CA
Leather star	<i>Dermasterias imbricata</i>	Co	Co	AK - s.CA
Blood star	<i>Henricia leviuscula</i>	Co	Co	AK - Baja
	<i>Leptasterias aequalis</i>			
6-rayed star	<i>Leptasterias hexactis</i>	Co	Co	WA - s.CA
	<i>Leptasterias puscilla</i>			
	<i>Ophiopholis aculeata</i>			
	<i>Ophioplocus papillosa</i>			
Brittle star	<i>Ophiothrix spiculata</i>	Co	Co	c.CA - s.Am
Sea cucumber	<i>Parastichopus</i>	UnCo	Co	c.CA -

Appendix F: Invertebrates and Algae
GFNMS Draft Management Plan

Invertebrates

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	POPEST (Sanctuary)	POPEST (N.E. Pacific)	RANGE
	<i>parvimensis</i>			Baja
Bat star	<i>Patiria miniata</i>	Co	Co	AK - Baja
	<i>Pisaster giganteus</i>			
Ochre star	<i>Pisaster ochraceus</i>	Ab	Co	Ak - c.CA
Sunflower star	<i>Pycnopodia helianthoides</i>	Co	Co	AK - s.CA
	<i>Strongylocentrotus droebachiensis</i>			
Red sea urchin	<i>Strongylocentrotus franciscanus</i>	Co	Unco	AK - Baja+
Purple sea urchin	<i>Strongylocentrotus purpuratus</i>	Ab	Co	BC - Baja
Ectoprocta				
	<i>Barentsia benedeni</i>			
Bryozoan	<i>Bugula californica</i>	Ab	Co	BC - s. Am
	<i>Crisia maxima</i>			
Bryozoan	<i>Dendrobeania laxa</i>	Ab	Ab	BC - s.CA
	<i>Dendrobeania lichenoides</i>			
	<i>Eurystomella bilabiata</i>			
Bryozoan	<i>Flustrellidra corniculata</i>	Co	Co	AK - c.CA
	<i>Tricellaria occidentalis</i>			
	<i>Tricellaria sp</i>			
	<i>Tricellaria ternata</i>			
Mollusca				
Angular unicorn	<i>Acanthina spirata</i>	Co	Co	n. CA - Baja
	<i>Acanthina spp.</i>			
	<i>Acanthodoris nanaimoensis</i>			
	<i>Aclis shepardiana</i>			
White capped limpet	<i>Acmaea mitra</i>	Co	Co	AK - Baja
Shag-rug nudibranch	<i>Aeolidia papillosa</i>	Co	Co	n.CA - s.CA+
	<i>Alia carinata</i>			

Appendix F: Invertebrates and Algae
GFNMS Draft Management Plan

Invertebrates

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	POPEST (Sanctuary)	POPEST (N.E. Pacific)	RANGE
Variegated amphissa	<i>Amphissa versicolor</i>	Co	Co	n. CA - Baja
Sea lemon	<i>Anisodoris noblis</i>	Co	Co	BC - Baja
	<i>Antiopella barbarensis</i>			
Monterey dorid	<i>Archidoris montereyensis</i>	Co	Co	AK - s.CA
	<i>Balcis thersites</i>			
	<i>Baptodoris mimetica</i>			
Snail	<i>Barleeia haliotiphila</i>			
Snail	<i>Barleeia subtenuis</i>			
Horn snail	<i>Batillaria attramentaria</i>	Co	Co	BC - c. CA
Threaded bittium	<i>Bittium eschrichtii</i>	Unco	Co	AK - Baja
	<i>Bittium purpureum</i>			
	<i>Bittium schrichtii</i>			
	<i>Cadlina luteomarginata</i>			
Yellow-edged cadlina	<i>Cadlina modesta</i>	Co	Co	BC - Baja
Channeled top snail	<i>Calliostoma canaliculatum</i>	Co	Co	AK - Baja
Blue top snail	<i>Callistoma ligatum</i>	Co	Co	AK - s.CA
	<i>Ceratostoma foliatum</i>			
	<i>Cerithiopsis carpenteri</i>			
	<i>Chama arcana</i>			
	<i>Collisella scabra</i>			
	<i>Corolla spectabilis (Pteropod)</i>			
Pacific oyster	<i>Crassostrea gigas</i>	Co	Co	BC - s.CA
Hooked slipper snail	<i>Crepidula adunca</i>	Co	Co	BC - Baja
	<i>Crepidula nummaria</i>			
	<i>Crepidula perforans</i>			
	<i>Crepipatella lingulata</i>			
Gumboot chiton	<i>Cryptochiton stelleri</i>	Rare	Co-Rare	AK - s.CA+
	<i>Cryptomya californica</i>			

Appendix F: Invertebrates and Algae
GFNMS Draft Management Plan

Invertebrates

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	POPEST (Sanctuary)	POPEST (N.E. Pacific)	RANGE
	<i>Cymakra aspera</i>			
	<i>Daphana californica</i>			
	<i>Diaphana californica</i>			
Ring spotted dorid	<i>Diaulula sandiegensis</i>	Co	Co	AK - Baja
	<i>Diplodonta orbella</i>			
	<i>Discurria scutum</i>			
	<i>Dirona picta</i>			
	<i>Doto columbiana</i>	Unco	Unco	BC - n.CA
	<i>Entodesma saxicola</i>			
Snail	<i>Epitonium tinctum</i>			
	<i>Fissurella volcano</i>			
	<i>Fusinus luteopictus</i>			
	<i>Granula margaritula</i>			
Black Abalone	<i>Haliotis cracherodii</i>	UnCo	Co	c. CA - Baja
	<i>Haliotis racherodii</i>			
Red Abalone	<i>Haliotis rufescens</i>	Co	Unco	OR - Baja
Hermisenda	<i>Hermisenda crassicornis</i>	Co	Co	AK - Baja
	<i>Hiatella arctica</i>			
	<i>Hinnites giganteus</i>			
Hoof snail	<i>Hipponix craniodes</i>	Co	Co	BC - Baja+
Hopkin's Rose	<i>Hopkinsia rosacea</i>	Co	Co	OR -Baja
	<i>Irus lamellifer</i>			
Chiton	<i>Ischnochiton regularis</i>			
Chiton	<i>Katharina tunicata</i>			
	<i>Kellia laperousii</i>			
	<i>Lacuna cistula</i>			
Chink snail	<i>Lacuna marmorata</i>	Co	Co	AK - s.CA
	<i>Lacuna porrecta</i>			
	<i>Lacuna unifasciata</i>			
	<i>Lasaea cistula</i>			
Clam	<i>Lasaea subviridis</i>	Ab	Co	AK - Baja
Chiton	<i>Lepidochitona dentiens</i>			

**Appendix F: Invertebrates and Algae
GFNMS Draft Management Plan**

Invertebrates

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	POPEST (Sanctuary)	POPEST (N.E. Pacific)	RANGE
	<i>Lepidozona sinudentata</i>			
	<i>Littorina keanae</i>			
Eroded periwinkle	<i>Littorina planaxis</i>	Ab	Ab	WA - Baja
Checkered periwinkle	<i>Littorina scutulata</i>	Ab	Ab	AK - Baja
	<i>Littorina sitkana</i>			
	<i>Littorina sp.</i>			
	<i>Lottia asmi</i>			
Ribbed limpet	<i>Lottia digitalis</i>	Ab	Co	AK - Baja
Owl limpet	<i>Lottia gigantea</i>	Ab	Co	WA - Baja
Unstable seaweed limpet	<i>Lottia instabilis</i>	Ab	Co	AK - s.CA
File limpet	<i>Lottia limantula</i>	Co	Ab	OR - s.Baja
Shield limpet	<i>Lottia pelta</i>	Co	Co	AK - Baja
	<i>Lottia strigatella</i>			
Triangular limpet	<i>Lottia triangularis</i>	Co	Co	AK - Baja
Rough limpet	<i>Macclintockia scabra</i>	Ab	Co	OR - Baja
	<i>Milneria minima</i>			
	<i>Mitrella carinata</i>			
	<i>Mitrella tuberosa</i>			
Fat horse mussel	<i>Modiolus capax</i>	Co	Co	c.CA - S.AM
	<i>Modiolus carpenti</i>			
Hairy chiton	<i>Mopalia ciliata</i>	Co	Co	AK - Baja
Mossy chiton	<i>Mopalia muscosa</i>	Co	Co	BC - Baja
Pygmy mussel	<i>Musculus pygmaeus</i>	Ab	Co	c.CA
	<i>Mytilimeria nuttallii</i>			
California mussel	<i>Mytilus californianus</i>	Ab	Ab	AK - Baja
Bay mussel	<i>Mytilus edulis</i>	Co	Co	AK - Baja+
	<i>Nassarius mendicus</i>			
Limpet	<i>Notoacmea insessa</i>			
Limpet	<i>Notoacmea persona</i>			

*Appendix F: Invertebrates and Algae
GFNMS Draft Management Plan*

Invertebrates

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	POPEST (Sanctuary)	POPEST (N.E. Pacific)	RANGE
Channeled dogwinkle	<i>Nucella canaliculata</i>	Ab	Co	Ak - c.CA
Emarginate dogwinkle	<i>Nucella emarginata</i>	Ab	Co	Ak - n. Baja
Chiton	<i>Nuttallina californica</i>	Co	Co	WA - s. CA
	<i>Ocenebra atropurpurea</i>			
	<i>Ocenebra interfossa</i>			
	<i>Ocenebra lurida</i>			
	<i>Octopus dofleini</i>			
	<i>Octopus rubescens</i>			
	<i>Octopus sp.</i>			
	<i>Odostomia sp.</i>			
	<i>Onchidella borealis</i>			
	<i>Opalia wroblewskyi</i>			
Olympic oyster	<i>Ostrea lurida</i>	Rare	Rare-Co	AK - Baja
	<i>Palciphorella velatta</i>			
	<i>Penitella conradi</i>			
	<i>Penitella turnerae</i>			
	<i>Petalconchus montereyensis</i>			
	<i>Petricola carditoides</i>			
	<i>Philobrya setosa</i>			
Abalone jingle	<i>Pododesmus cepio</i>	Co	Co	AK - Baja
	<i>Protothaca staminea</i>			
Red sponge nudibranch	<i>Rostanga pulchra</i>	Ab	Ab	BC - Baja
Dire welk	<i>Searlesia dira</i>	Co	Co	AK - c.CA
	<i>Stenoplax heathiana</i>			
Streaked stiliger	<i>Stiliger fuscovittatus</i>	Ab	Ab	WA - Baja
	<i>Tectura insessa</i>			
	<i>Tectura persona</i>			
	<i>Tectura scutum</i>			
Brown turban snail	<i>Tegula brunnea</i>	Ab	Ab	OR - s. CA
Black turban	<i>Tegula funebris</i>	Ab	Co-Ab	BC - Baja

Appendix F: Invertebrates and Algae
GFNMS Draft Management Plan

Invertebrates

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	POPEST (Sanctuary)	POPEST (N.E. Pacific)	RANGE
snail				
Lined chiton	<i>Tonicella lineata</i>	Ab	Co	AK - s.CA+
	<i>Transennella tantilla</i>			
Reticulate button snail	<i>Trimusculus reticulatus</i>	Co	Co	OR - MEX
Sea-clown nudibranch	<i>Triopha catalinae</i>	Co	Co	AK - Baja
	<i>Triopha maculata</i>			
	<i>Trivia californica</i>			
	<i>Velutina velutina</i>			
Nemertea				
	<i>Emplectonema gracile</i>			
	<i>Tubulanus sexlineatus</i>			
Porifera				
Sponge	<i>Acarus erithacus</i>			
	<i>Allopora porphyra</i>			
Sponge	<i>Anaata spongigartina</i>			
	<i>Antho lithophoenix</i>			
Keratose sponge	<i>Aplysilla glacialis</i>	Ab	Ab	
	<i>Aplysilla polyraphis</i>			
Sponge	<i>Axocelita originalis</i>			
	<i>Clathria sp.</i>			
	<i>Cliona celata</i>			
Sponge	<i>Geodia mesotriaence</i>	Co	Co	AK - Mex
Crumb-of-bread sponge	<i>Halichondria panicea</i>	Ab	Ab	n.CA
	<i>Halichondria sp.</i>			
	<i>Haliclona permollis</i>			
Sponge	<i>Haliclona sp.</i>	Ab	Ab	n. CA +
	<i>Higginsia sp.</i>			
	<i>Hinksia sandriana</i>			
	<i>Hymedsmia sp.</i>			
	<i>Hymenamphiastra</i>			

Invertebrates

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	POPEST (Sanctuary)	POPEST (N.E. Pacific)	RANGE
	<i>cyanocrypta</i>			
Sponge	<i>Leucandra heathi</i>			
Sponge	<i>Leucilla nuttingi</i>			
Sponge	<i>Leucosolenia eleanor</i>			
Sponge	<i>Lissodendoryx firma</i>			
Sponge	<i>Lissodendoryx topsenti</i>			
Sponge	<i>Mycale psila</i>			
	<i>Myxilla incrustans</i>			
Sponge	<i>Ophlitaspongia pennata</i>	Ab	Co	BC - Mex
	<i>Scypha sp.</i>			
	<i>Spongia idia</i>			
Sponge	<i>Stelletta clarella</i>			
Sponge	<i>Suberites sp.</i>			
Sponge	<i>Tedania gurjanovae</i>			
Sponge	<i>Tethya aurantia</i>	Co	Co	BC - Mex+
Sponge	<i>Toxidocia sp.</i>			
Sponge	<i>Xestospongia vanilla</i>			
Sponge	<i>Zygherpe hyaloderma</i>			
Sipuncula				
	<i>Phascolosoma agassizii</i>			
Urochordata				
	<i>Archidistoma ritteri</i>			
	<i>Styela montereyensis</i>	Co	Co	BC - Baja
	<i>Styela truncata</i>	Co	Co	AK - s.CA

Appendix G: Introduced Species

GULF OF THE FARALLONES NATIONAL MARINE SANCTUARY

INTRODUCED SPECIES INVERTEBRATES AND ALGAE

Compiled by Jarrett Byrnes
Center for Population Biology
University of California, Davis, California
jebyrnes@ucdavis.edu

The Introduced Species list is for species in and around the Gulf of the Farallones National Marine Sanctuary (GFNMS), the Northern Management Area, and the Cordell Bank National Marine Sanctuary (CBNMS). The list was obtained by comparing lists of species within and around sanctuary waters to lists of known invaders within California, Bodega Harbor, Tomales Bay, and Elkhorn Slough. The list should therefore be regarded as conservative, including some species that may not yet be within Sanctuary waters per se, but given their geographic proximity, have a high probability of invading in the near future. Some of these species (e.g. *Ficopomatus enigmaticus*), may therefore qualify for the so-called “dirty-dozen” status based on impacts in other habitats despite not being found within Sanctuary waters. The sources used and their abbreviations are noted in column “Listing Sources(s).”

cb	Current species list for CBNMS as provided by Dan Howard (2002)
nma	Current species list for the Northern Management Area (2002)
bird	Species list from the Bird Rock Area of Special Biological Significance (ASBS) Report
nas	The USGS Nonindigenous Aquatic Species listing for California, found at http://nas.er.usgs.gov
bth	List of species identified during the all taxa biological inventory by Leslie Harris
gf	Current species list for GFNMS as provided by Jan Roletto (2002)
bod	Listing of introduced species in Bodega Harbor by Jim Carlton
neers	Listing of introduced species within the Elkhorn Slough National Estuarine Research Reserve System (NERRS) site
CDFW	California Department of Fish and Wildlife’s (CDFW) Nonindigenous Aquatic Species list
amer	Species list from the Estero Americano and Estero de San Antonion ASBS report (1977)
fitz	Species list from the Fitzgerald Reserve ASBS report (1979)
elk	Updated list of invasive species in and around the Elkhorn Slough NERRS site provided by Kirsten Wasson
bth	CDFW’s amended list of introduced species in Bodega Bay and Tomales Bay

Appendix G: Introduced Species
GFNMS Draft Management Plan

* Entries marked with a * indicate that while the species may not have been included in a given list, there was an entry for the genus listed as a “sp.”. Entries who only have starred listing sources should be viewed with caution.

INTRODUCED SPECIES

Algae

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	Synonyms	Listing Source(s)	Invasive Status Source(s)
	<i>Aglaothamnion cordatum</i>		btc	btc
Dead Man's Fingers	<i>Codium fragile tomentosoides</i>	btc	btc, CDFW	
	<i>Gelidium vagum</i>	<i>Gelidium sp.</i>	btc, nma*	btc, CDFW
Red Siphonweed	<i>Polysiphonia denudata</i>	<i>Polysiphonia sp.</i>	nma*	CDFW
British Wireweed	<i>Sargassum muticum</i>		nma, elk	elk, CDFW
Wakame	<i>Undaria pinnatifida</i>		elk	elk, CDFW

Marsh Plants

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	Synonyms	Listing Source(s)	Invasive Status Source(s)
Brassbuttons	<i>Cotula coronopifolia</i>		bod	bod
European Sea Rocket	<i>Cakile maritima</i>		bod	bod
Russian Thistle	<i>Salsola soda</i>		bod	CDFW, bod

Sponges

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	Synonyms	Listing Source(s)	Invasive Status Source(s)
	<i>Cliona celata</i>	<i>Cliona sp.</i>	neers, nma, elk, bird*	neers, elk, neers*
	<i>Cliona lobata</i>	<i>Cliona sp.</i>	neers	neers
	<i>Halichondria bowerbanki</i>	<i>Halichondria panicea</i> , <i>Halichondria coalita</i> , <i>Halichondria sp.</i>	btc, bird, neers, elk, cb*, nma*	btc, CDFW, neers, elk
	<i>Haliclona loosanoffi</i>	<i>Haliclona sp.</i>	neers, elk, bod, bird*, gf*, nma*	CDFW, neers, elk, bod, nas*
	<i>Hymeniacidon sinapium</i>	<i>Hymeniacidon sp.</i>	neers, elk, bird*	neers, elk, CDFW*
	<i>Prosuberites sp.</i>		bird	CDFW

Cnidarians

**Appendix G: Introduced Species
GFNMS Draft Management Plan**

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	Synonyms	Listing Source(s)	Invasive Status Source(s)
	<i>Amphinema sp.</i>		bod	bod
Moon Jelly	<i>Aurelia aurita</i>	<i>Aurelia dubia</i> , <i>Aurelia flavidula</i>	gf, nma	CDFW
	<i>Cordylophora caspia</i>		neers, elk	CDFW, neers, elk
San Francisco Anemone	<i>Diadumene franciscana</i>		btc, neers, elk	btc, CDFW, neers, elk
White Anemone	<i>Diadumene leucolena</i>	<i>Cylista leucolena</i>	neers, elk	CDFW, neers, elk
	<i>Haliplanella lineata</i>	<i>Diadumene lineata</i>	bod, neers, elk	CDFW, bod, neers, elk
Doubletoothed Hydroid	<i>Obelia bidentata</i>	<i>Obelia sp.</i>	bird*, gf*, nma*	CDFW, nas
Sea Thread Hydroid	<i>Obelia dichotoma</i>	<i>Obelia sp.</i>	bod, bird*, gf*, nma*	nas, CDFW, bod
Clapper Hydromedusa	<i>Sarsia tubulosa</i>	<i>Oceania tubulosa</i>	neers	CDFW, neers
	<i>Tubularia crocea</i>	<i>Ectopleura crocea</i>	amer, gf, nma, neers, elk	CDFW, neers, elk

Platyhelminthes

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	Synonyms	Listing Source(s)	Invasive Status Source(s)
	<i>Cercaria batillariae</i>		neers, elk	CDFW, neers, elk
Annelids				
	<i>Apoprionospio pygmaea</i>		btc	btc
Bristleworm	<i>Capitella capitata</i> Complex	<i>Capitella sp.</i>	btc, tmh*	btc,
	<i>Ctenodrilus serratus</i>	<i>Parthenope serratus</i>	btc	btc
	<i>Dipolydora socialis</i>		btc, tmh	btc
	<i>Euchone limnicola</i>		btc, tmh	btc
	<i>Exogone lourei</i>		btc, tmh	btc
Tube Worm	<i>Ficopomatus enigmaticus</i>	<i>Mercierella enigmatica</i>	neers, elk	CDFW, neers, elk
polychate	<i>Glycera americana</i>		btc	btc
polychate	<i>Harmothoe imbricata</i>	<i>Aphrodita imbricata</i>	btc, bird	btc
polychate	<i>Heteromastus filiformis</i>		neers, elk	CDFW, neers, elk
polychate	<i>Mediomastus ambiseta</i>		btc	btc
polychate	<i>Neanthes succinea</i>	<i>Nereis succinea</i> , <i>Nereis limbata</i>	btc	btc, CDFW
polychate	<i>Notomastus hemipodus</i>		btc	btc

**Appendix G: Introduced Species
GFNMS Draft Management Plan**

polychate	<i>Platynereis bicanaliculata</i>		btc, bird, nma	btc
spionid	<i>Polydora amarincola</i>	<i>Polydora sp.</i>	bird*, amer*	CDFW
Mud Worm	<i>Polydora cornuta</i>	<i>Polydora sp.</i>	bod, bird*, amer*	nas, CDFW, bod
Mud Worm	<i>Polydora ligni</i>	<i>Polydora sp.</i>	neers, elk, bird*, amer*	CDFW, neers, elk
spionid	<i>Pseudopolydora kempfi</i>		btc, bod, tmh	btc, CDFW, bod,
spionid	<i>Pseudopolydora paucibranchiata</i>	btc, neers, elk, bod	btc, CDFW, neers, elk, bod	
spionid	<i>Streblospio benedicti</i>		btc, amer, neers, elk, bod, tmh	btc, CDFW, neers, elk, bod,

Crustaceans

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	Synonyms	Listing Source(s)	Invasive Status Source(s)
	<i>Ampelisca abdita</i>		btc	btc, CDFW
	<i>Ampelisca agassizi</i>	<i>Ampelisca compressa</i> , <i>Ampelisca vera</i>	btc	btc
	<i>Ampithoe lacertosa</i>	<i>Ampithoe sp.</i>	btc, bird*	btc
	<i>Ampithoe valida</i>	<i>Ampithoe sp.</i>	neers, elk, bod, tmh, bird*	CDFW, neers, elk, bod, nas
	<i>Caprella acanthogaster</i>		btc	btc, CDFW
	<i>Caprella californica</i>		btc, gf, nma	btc
Skeleton Shrimp	<i>Caprella mutica</i>		btc, neers	btc, CDFW, neers
	<i>Corophium acherusicum</i>		elk, bod	CDFW, elk, bod
	<i>Corophium alienense</i>		btc, bod	btc, CDFW, bod
	<i>Corophium insidiosum</i>		btc, elk, bod	btc, CDFW, elk, bod
	<i>Corophium uenoi</i>		elk	CDFW, elk
	<i>Erichthonius brasiliensis</i>		btc	btc, CDFW
	<i>Grandidierella japonica</i>		btc, neers, elk	btc, CDFW, neers, elk
	<i>Jassa carltoni</i>		btc	btc
	<i>Jassa marmorata</i>		btc, neers, elk, bod	btc, CDFW, neers, elk, bod
	<i>Jassa slatteryi</i>		btc	btc
	<i>Leucothoe alata</i>		btc	btc, CDFW
	<i>Melita nitida</i>		neers, elk	CDFW, neers, elk
	<i>Monocorophium acherusicum</i>	btc, neers	btc, CDFW, neers	
	<i>Monocorophium insidiosum</i>		neers	neers
	<i>Monocorophium uenoi</i>		neers	neers
	<i>Parapleustes derzhavini</i>		btc, neers, elk	btc, CDFW,

**Appendix G: Introduced Species
GFNMS Draft Management Plan**

				neers, elk
	<i>Sinocorophium alienense</i>		btc	btc, CDFW
	<i>Sinocorophium heteroceratum</i>	btc	btc, CDFW	
	<i>Iais californica</i>		neers, elk, bod, tmh	CDFW, neers, elk, bod,
	<i>Ianiropsis tridens</i>		btc	btc, CDFW
	<i>Laticorophium baconi</i>		btc, tmh	btc
	<i>Limnoria quadripunctata</i>		neers	CDFW, neers
	<i>Limnoria tripunctata</i>		bod	CDFW, bod
	<i>Paranthura elegans</i>		btc, nma, tmh	btc, CDFW
Sphaeromatid Isopod	<i>Sphaeroma quoyanum</i>		btc, neers, elk	btc, CDFW, neers, elk
mysid	<i>Acanthomysis aspera</i>	<i>Acanthomysis sp.</i>	gf*, nma*	CDFW, nas
mysid	<i>Acanthomysis bowmani</i>	<i>Acanthomysis sp.</i>	gf*, nma*	CDFW, nas
barnacle	<i>Balanus amphitrite</i>	<i>Balanus sp.</i>	nma, nma*	CDFW, CDFW
barnacle	<i>Balanus improvisus</i>	<i>Balanus sp.</i>	neers, elk, nma*	CDFW, neers, elk, nas
Green Crab	<i>Carcinus maenas</i>	<i>Carcinides maenas</i>	btc, neers, bod	btc, CDFW, neers, bod
cumacean	<i>Cumella vulgaris</i>		btc	btc
tanaid	<i>Leptochelia dubia</i>	<i>Leptochelia affinis,</i> <i>Leptochelia algalicola,</i> <i>Leptochelia corsica,</i> <i>Leptochelia durbanensis,</i> <i>Leptochelia edwardsii,</i> <i>Leptochelia incerta ,</i> <i>Leptochelia lifuensis ,</i> <i>Leptochelia neapolitana ,</i> <i>Leptochelia savignyi ,</i> <i>Paratanais algalicola ,</i> <i>Paratanais edwardsii ,</i> <i>Paratanais kroyerii ,</i> <i>Paratanais savignyi ,</i> <i>Tanaiomera columbina ,</i> <i>Tanais dubius ,</i> <i>Tanais durbanensis ,</i> <i>Tanais</i>	btc	btc

**Appendix G: Introduced Species
GFNMS Draft Management Plan**

		<i>edwardsi</i> , <i>Tanais filum</i>		
Red Worm (copepod)	<i>Mytilicola orientalis</i>		neers, elk	CDFW, neers, elk
Asian cumacean	<i>Nippoleucon hinumensis</i>		btc	btc, CDFW
Korean Shrimp	<i>Palaemon macrodactylus</i>		neers	CDFW, neers
copepod	<i>Pseudodiaptomus marinus</i>		btc	btc, CDFW
tanaid	<i>Sinelobus sp.</i>		neers, elk	CDFW, neers, elk

Molluscs

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	Synonyms	Listing Source(s)	Invasive Status Source(s)
Pacific Giant Oyster	<i>Crassostrea gigas</i>		gf, nma	CDFW
Amethyst Gemclam	<i>Gemma gemma</i>		btc, neers, bod	btc, CDFW, neers, bod
Blacktip Shipworm	<i>Lyrodus pedicellatus</i>		neers, elk	CDFW, neers, elk
Baltic Macoma	<i>Macoma balthica</i>		bod	CDFW, bod
Northern Quahog	<i>Mercenaria mercenaria</i>	<i>Venus mercenaria</i>	btc	btc, CDFW
Green Mussel	<i>Musculista senhousia</i>		btc, neers, bod	btc, CDFW, neers, bod
Softshell Clam	<i>Mya arenaria</i>		btc, amer, neers, bod	btc, CDFW, neers, bod
Mediterranean mussel	<i>Mytilus galloprovincialis</i>		neers, elk, bod	CDFW, neers, elk, bod
Mahogany Clam	<i>Nutallia nutallia</i>		elk	elk
Purple-Mahogany Clam	<i>Nuttallia obscurata</i>		neers	neers
Edible oyster	<i>Ostrea edulis</i>		btc	btc, CDFW
Olympia Oyster	<i>Ostrea lurida</i>		gf, nma	CDFW
Wing Oyster	<i>Pteria sterna</i>		btc	btc, CDFW
Asian semele	<i>Theora lubrica</i>		btc	btc, CDFW
Japanese Littleneck Clam	<i>Venerupis philippinarum</i>		btc, neers, bod	btc, CDFW, neers, bod
Japanese False Cerith	<i>Batillaria attramentaria</i>		btc, gf, neers, nma, elk	btc, CDFW, neers, elk
Japanese oyster drill	<i>Ceratostoma inornatum</i>		btc	btc, CDFW
European Melampus	<i>Myosotella myosotis</i>		neers, elk, bod	CDFW, neers, elk, bod
Easterm Mud Snail	<i>Nassarius obsoletus</i>	<i>Ilyanassa obsoleta</i> , <i>Nassa obsoleta</i>	btc	btc, CDFW
Flat Okenia	<i>Okenia plana</i>		neers, elk	CDFW, neers, elk
nudibranch	<i>Philine auriformis</i>		btc, neers, bod	btc, CDFW, neers, bod
nudibranch	<i>Philine orientalis</i>		bod	bod

**Appendix G: Introduced Species
GFNMS Draft Management Plan**

Miniature Aeolis	<i>Tenellia adspersa</i>	<i>Embletonia pallida</i>	neers, elk	CDFW, neers, elk
Atlantic Oyster Drill	<i>Urosalpinx cinerea</i>		btc, neers	btc, CDFW, neers

Bryozoans

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	Synonyms	Listing Source(s)	Invasive Status Source(s)
	<i>Alcyonidium gelatinosum</i>		btc	btc, CDFW
	<i>Alcyonidium parasiticum</i>		btc	btc
	<i>Alcyonidium polyoum</i>		btc	btc, CDFW
	<i>Amathia vidovici</i>		neers, elk	CDFW, neers, elk
	<i>Barentsia benedeni</i>		gf, neers, nma, elk	CDFW, neers, elk
	<i>Bowerbankia gracilis</i>		btc, neers, elk, bod	btc, CDFW, neers, elk, bod
	<i>Bugula neritina</i>		btc, bird, neers, elk, bod	btc, CDFW, neers, elk, bod
	<i>Bugula stolonifera</i>		neers, elk	CDFW, neers, elk
	<i>Conopeum tenuissimum</i>		neers, elk	CDFW, neers, elk
	<i>Cryptosula pallasiana</i>		btc, neers, elk, bod	btc, CDFW, neers, elk, bod
Single Horn Bryozoan	<i>Schizoporella unicornis</i>	<i>Lepralia unicornis</i>	btc, neers, elk, bod	btc, CDFW, neers, elk, bod
	<i>Victorella pavida</i>		btc	btc, CDFW
	<i>Watersipora subtorquata</i>		btc, neers, elk, bod	btc, CDFW, neers, elk, bod

Chordates

CLASSIFICATION & COMMON NAME	SCIENTTIFIC NAME	Synonyms	Listing Source(s)	Invasive Status Source(s)
tunicate	<i>Ascidia zara</i>		btc	btc, nas, CDFW
tunicate	<i>Botrylloides perspicuum</i>		btc	btc, nas, CDFW
tunicate	<i>Botrylloides violaceus</i>		btc, neers, elk, bod	btc, nas, neers, elk, bod
tunicate	<i>Botryllus schlosseri</i>		btc, gf, bod	btc, CDFW, bod
tunicate	<i>Ciona intestinalis</i>	<i>Ascidia intestinalis</i>	btc, gf	btc, CDFW
tunicate	<i>Ciona savignyi</i>		btc	btc, nas, CDFW
tunicate	<i>Didemnum lahillei</i>	<i>Didemnum vexillum</i>	--	nas
tunicate	<i>Diplosoma listerianum</i>		btc	btc, CDFW

**Appendix G: Introduced Species
GFNMS Draft Management Plan**

tunicate	<i>Molgula manhattensis</i>	<i>Ascidia manhattensis</i> , <i>Gymnocystis manhattensis</i>	btc, neers, elk	btc, CDFW, neers, elk
tunicate	<i>Polyandrocarpa zorritensis</i>		btc	btc, CDFW
tunicate	<i>Styela clava</i>		btc, neers, elk	btc, CDFW, neers, elk
Yellowfin goby	<i>Acanthogobius flavimanus</i>		gf, nma, elk	CDFW, elk
Atlantic Shad	<i>Alosa sapidissima</i>		gf, nma, elk	CDFW, elk
European Carp	<i>Cyprinus carpio</i>		amer	CDFW
Mosquitofish	<i>Gambusia affinis</i>	<i>Gambusia patruelis</i>	elk, amer	CDFW, elk
Rainwater Killifish	<i>Lucania parva</i>		amer	CDFW
Striped Bass	<i>Morone saxatilis</i>	<i>Roccus saxatilis</i>	gf, nma, elk	CDFW, elk
North American Bullfrog	<i>Rana catesbeiana</i>		amer	CDFW

Chordates

CLASSIFICATION & COMMON NAME	SCIENTIFIC NAME	Synonyms	Listing Source(s)	Invasive Status Source(s)
ciliate	<i>Prionospio pygmaea</i>	<i>Ancistrocoma pelseneeri</i>	btc	btc, CDFW
foraminifera	<i>Trochammina hadai</i>		bod	CDFW, bod

