ISSUE-BASED ACTION PLANS

GFNMS MANAGEMENT PLAN

I. Water Quality

II. Wildlife Disturbance

III. Introduced Species

IV. Ecosystem Protection: Impacts from Fishing Activities

V. Impacts from Vessel Spills

SITE-SPECIFIC ISSUE
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 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 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 was the designation of the sanctuary itself. The size of the sanctuary and the restrictions placed on its use provide additional oversight and protections to offshore waters. The offshore areas of the sanctuary are somewhat unaffected by threats to water quality by their distance from the sources of pollutants and land-based 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 and outflow from the San Francisco Bay, potentially transporting pollution from the 8 million people living in the Bay Area. These include sewage outfalls, sewage overflows, 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. The sanctuary should evaluate the potential local efforts that could be taken to reduce the impacts of marine debris on sanctuary wildlife.

JURISDICTIONAL SETTING

Water Quality Standards

The federal Water Pollution Control Act (U.S. Clean Water Act) and California's Porter-Cologne Water Quality Control Act require the adoption of water quality control plans for the state's waters. Water quality control plans contain, among other things, the water quality standards for a particular water body. Standards are composed of two parts: beneficial uses and water quality objectives.

Four water quality control plans are primarily applicable to GFNMS. These are: (1) the California Ocean Plan; (2) the Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California (California Thermal Plan); (3) the Basin Plan for the North Coast Regional Water Quality Control Board (Region 1); and (4) the Basin Plan for the San Francisco Bay Regional Water Quality Control Board (Region 2). 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. Title III, Section 303 of the U.S. Clean Water Act (CWA) requires California to submit statewide and basin plans to the EPA for approval.

California's waters extend three miles seaward from the coastline (including the coasts of its islands). These are considered nearshore waters. Ocean waters beyond three miles are regulated directly by the EPA, in consultation with the state and regional boards. Beyond three

miles from the mainland or the islands, EPA's water quality standards (for the receiving waters) and effluent limitations are applicable.

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..." Thirty-one ASBSs were designated at that time. Two more ASBSs were designated later, one in 1974 and another in 1975. There are currently a total of 34 ASBSs, five of which are within the GFNMS. These are at Duxbury Reef, Point Reyes Headland, Double Point, Bird Rock, and the Farallon Islands.

Under the Marine Managed Areas Improvement Act's new classification system, codified in the Public Resources Code, 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.

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.

The state board is currently contracting with the Southern California Coastal Water Research Project and Moss Landing Marine Labs (MLML) to perform a survey of discharges into all of the ASBSs. The final results, in Geographic Information Systems (GIS) (ArcView) format, were released during the fall of 2003.

Pollution Sources

Generally, sources of water pollution are divided into two different categories: point source and nonpoint source. 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:

> 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.

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., ASBSs) 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.

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"). The 1998 list was approved by both the state board and the EPA. On February 4, 2003, the state board approved the most recent 303(d) list with some modifications. In the vicinity of the GFNMS, the following areas were identified:

- Estero Americano for nutrients and sediment (Americano Creek is a listed tributary). 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.
- Estero de San Antonio 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 for 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, septage disposal, upstream impoundment, and urban runoff/storm sewers.
- Central San Francisco Bay for 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 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. 1

The Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) of 1972 established the authority for a federal-state partnership to manage development and use of the coastal zone. 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

Ocean Dumping Act

Title I 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

1 Gregorio, D.E., State Water Resources Board. February 5, 2003; *A Water Quality Primer for Gulf of the Farallones National Marine Sanctuary Water Quality Working Group* (unpublished)

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 is on top of any CWA requirements.

Sanctuary Regulations

The sanctuary site-specific regulations affecting water quality in the GFNMS were under revision as a part of the management plan review. The draft regulations were available for review as a part of the draft management plan/environmental impact statement . The final regulations are included in the final management plan and final environmental impact statement (FMP/FEIS).

WATER QUALITY GOAL

1. Engage in corrective and proactive measures to protect and enhance water quality in the estuarine, nearshore, and offshore environments of the sanctuary.

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 and Sonoma 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, 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.

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, including Bolinas Lagoon, Estero Americano and Estero de San Antonio.

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.

Potential Partners: Tomales Bay Watershed Council, National Park Service (NPS), Beach Watch, State Health Dept. Harmful Algal Bloom (HAB) Program, Snapshot Day, First Flush

Products: Inventory (database) of existing monitoring programs; GIS-based database

Complementary Strategies: GFNMS FMP, Water Quality, STRATEGY WQ-2, STRATEGY WQ-3, STRATEGY WQ-4, STRATEGY WQ-5, STRATEGY WQ-6, STRATEGY WQ-7, STRATEGY WQ-8, STRATEGY WQ-9; Introduced Species, STRATEGY IS-2;

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 from boats are impacting 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, Bodega and San Francisco 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.

Potential Partners: Marin Used Oil Program, Bodega Harbor District, California Department of Boating and Waterways (CDBW), State Water Resources Control Board (SWRCB), Dock Walkers, Integrated Waste Management Program, Point Reyes National Seashore (PRNS), California State

Parks (CSP), California Costal Commission (CCC), Farallones Marine Sanctuary Association

Complementary Strategies: GFNMS FMP, Water Quality, STRATEGY WQ-3, Resource Protection, STRATEGY RP-12; Conservation Science, STRATEGY CS-1, CS-4, CS-5, CS-6; Ecosystem Monitoring, XEM-1, XEM-2, XEM-3; Northern Management Area Transition Action Plan, XNRM-1, XNRM-2, XNRM-4, XNRM-5

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 Tomales and Bodega Bays (e.g., campers, kayakers, moored vessels and live-aboards) 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.

Potential Partners: SWRCB, Regional Water Quality Control Boards (RWQCB) 1 and 2, harbor masters, Boating and Waterways, California Coastal Commission, Integrated Waste Management Board, kayak vendors

Products: Kiosk, printed outreach materials, workshops

Complementary Strategies: GFNMS FMP, Water Quality, STRATEGY WQ-1, STRATEGY WQ-3; Vessel Spills, STRATEGY VS-3; Education, STRATEGY ED-7; Monterey Bay National Marine Sanctuary (MBNMS) Water Quality, STRATEGY WQPP-1, STRATEGY WQPP-2; MBNMS FMP, Water Quality, STRATEGY WQPP-13, STRATEGY WQPP-15, STRATEGY WQPP-16, STRATEGY WQPP-17

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.

Potential Partners: Regional Water Quality Boards 1 and 2, Marin County Storm Water Pollution Prevention Program, Sonoma County, Environmental Health Dept., UC Cooperative Extension, Bolinas Lagoon Technical Advisory Committee, Bolinas Bay Watershed Council, Tomales Bay Watershed Council, CCC, SWRCB, County Agriculture Commissioner

Products: Memorandums of Agreement

Complementary Strategies: GFNMS FMP, Water Quality, STRATEGY WQ-4, STRATEGY WQ-6, STRATEGY WQ-7

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.

Potential Partners: Sonoma County, Marin County, RWQCB, SWRCB, Tomales Bay Watershed Council, Students and Teachers Restoring a Watershed (STRAW), Aroin County Stormwater Pollution Prevention Program (MCSTOPP), UC Cooperative Extension (UCCE)

Products: BMPs, criteria for evaluating BMPs, awards, letters of recognition, fliers, press releases, website on BMPs and recognition of award recipients

Complementary Strategies: GFNMS FMP, Water Quality, STRATEGY WQ-7; Education, STRATEGY ED-7, STRATEGY ED-11; MBNMS FMP, Water

Quality, STRATEGY WQPP-1, STRATEGY WQPP-18, STRATEGY WQPP-19, STRATEGY WQPP-20

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 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.

Potential Partners: Sonoma County, Marin County, RWQCB, SWRCB, PRNS, Tomales Bay Watershed Council, STRAW, MCSTOPP, UCCE, Army Corps of Engineers, Bolinas Lagoon Technical Advisory Committee

Products: BMPs, criteria for evaluating BMPs, awards, letters of recognition, fliers, press releases, website on BMPs and recognition of award recipients

Complementary Strategies: GFNMS FMP, Water Quality, STRATEGY WQ-7; Education, STRATEGY ED-11; MBNMS FMP, Water Quality, STRATEGY WQPP-1, STRATEGY WQPP-18, STRATEGY WQPP-19, STRATEGY WQPP-20

STRATEGY WQ-4: ***Evaluate Areas of Special Biological Significance (ASBS) and make a determination whether to implement a vessel discharge prohibition 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 ASBSs within the sanctuary to protect sanctuary wildlife and habitat. ASBSs are areas designated by the SWRCB to protect marine species or biological communities from an undesirable alteration in natural water quality. The five ASBSs in GFNMS are located adjacent to Duxbury Reef, Point Reyes Headlands, Double Point, Bird Rock, and the Farallon Islands. Within 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.

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.

Potential Partners: RWQCB, SWRCB
Complementary Strategies: GFNMS FMP, Water Quality, STRATEGY WQ-3

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. The standing 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.

Potential Partners: California Department of Fish and Game **(**CDFG), RWQCB, SWRCB
Complementary Strategies: GFNMS FMP, Water Quality, STRATEGY WQ-1, STRATEGY WQ-6

ADDITIONAL AREAS TO BE ADDRESSED

STRATEGY WQ-6: ***Develop a standing water quality working group of the sanctuary advisory council, supported by sanctuary staff.***

Activity 6.1 Create a working group of experts representing other agencies and institutions that can advise the 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 ongoing advice to the sanctuary advisory council for the sanctuary water quality program on current research, management techniques, and issues.

C. Provide water quality expertise to the GFNMS research working group.

D. 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.

Potential Partners: National Marine Fisheries Service **(**NMFS), SWRCB, RWQCB (1 and 2), City and County of San Francisco, Marin County, Sonoma County, San Mateo County, PRNS, United States Coast Guard (USCG), Tomales Bay Watershed Council, non-government organizations (NGOs), EPA, CCC, Office of Oil Spill Prevention and Response (OSPR), National Park Service (NPS), state Parks, county parks, Cordell Bank National Marine Sanctuary (CBNMS), MBNMS

Complementary Strategies: GFNMS FMP, Water Quality, STRATEGY WQ-1, STRATEGY WQ-3, STRATEGY WQ-4, STRATEGY WQ-7, STRATEGY WQ-9; Ecosystem Monitoring, STRATEGY XEM-4; Northern Management Area Transition Action Plan XNRM-2

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 on the GFNMS Sanctuary Advisory Council.

Complementary Strategies: All Water Quality Strategies

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 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.

Potential Partners: Tomales Bay Watershed Council, PRNS, RWQCB, SWRCB, UCCE, California Department of Fish and Game (CDFG), Marin Rural Development Council (MRDC), Surfrider, National Oceanographic Data Center (NODC), National Marine Sanctuary Program (NMSP), Coastal Services Center (CSC)

Products: Comprehensive annotated bibliography

Complementary Strategies: GFNMS FMP, Water Quality, STRATEGY WQ-1, STRATEGY WQ-5; Conservation Science STRATEGY CS-6; Northern Management Area Transition Action Plan STRATEGY XNRM-1, XNRM-2

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.

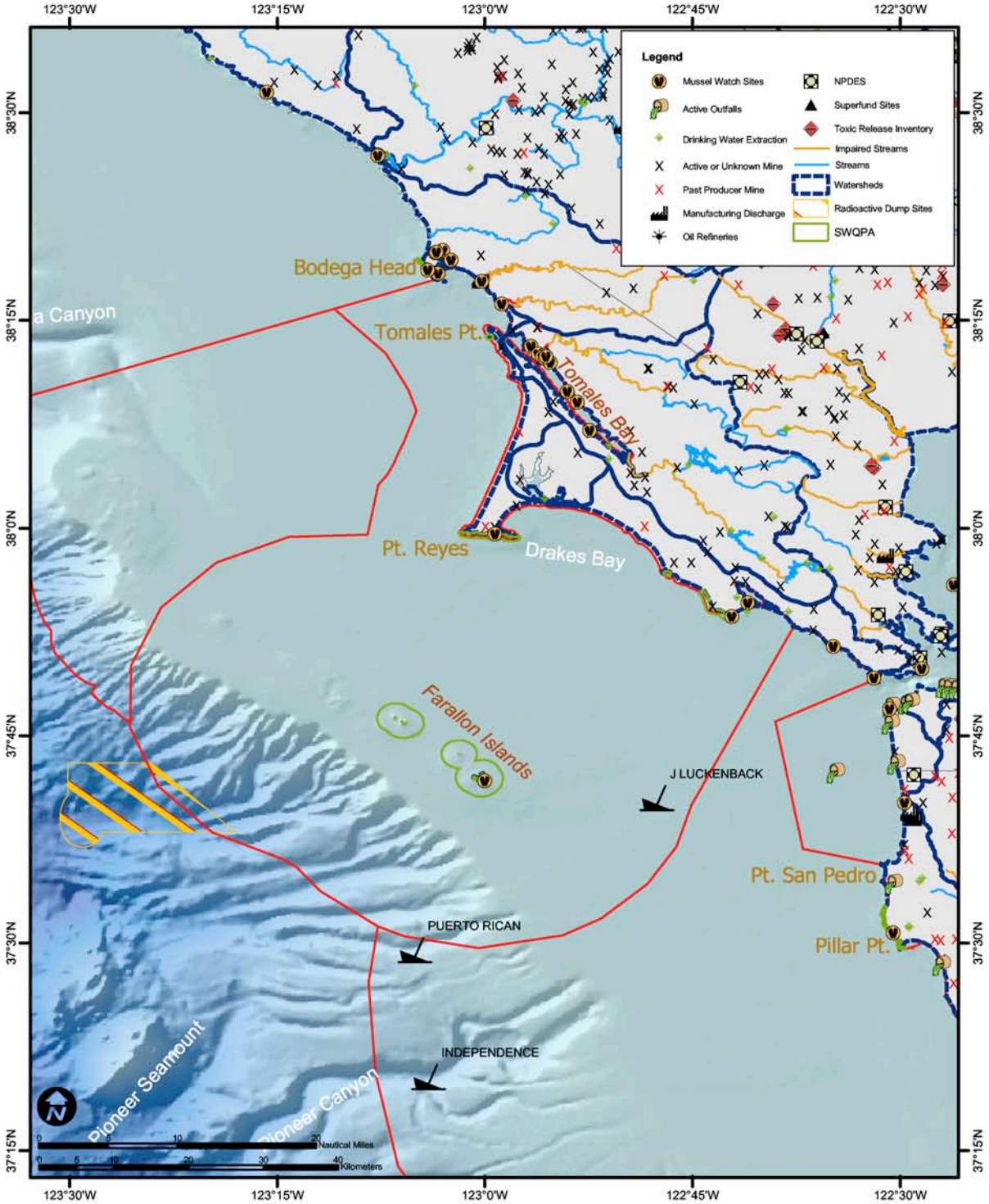
A. Educate elected officials about the link between land use planning and the health of watersheds and coastal waters. Provide up-to-date and accurate information about specific issues and facts that pertain to water quality in the sanctuary.

B. In areas where development is being planned, facilitate watershed planning and review of local regulations to promote better water quality and watershed protection.

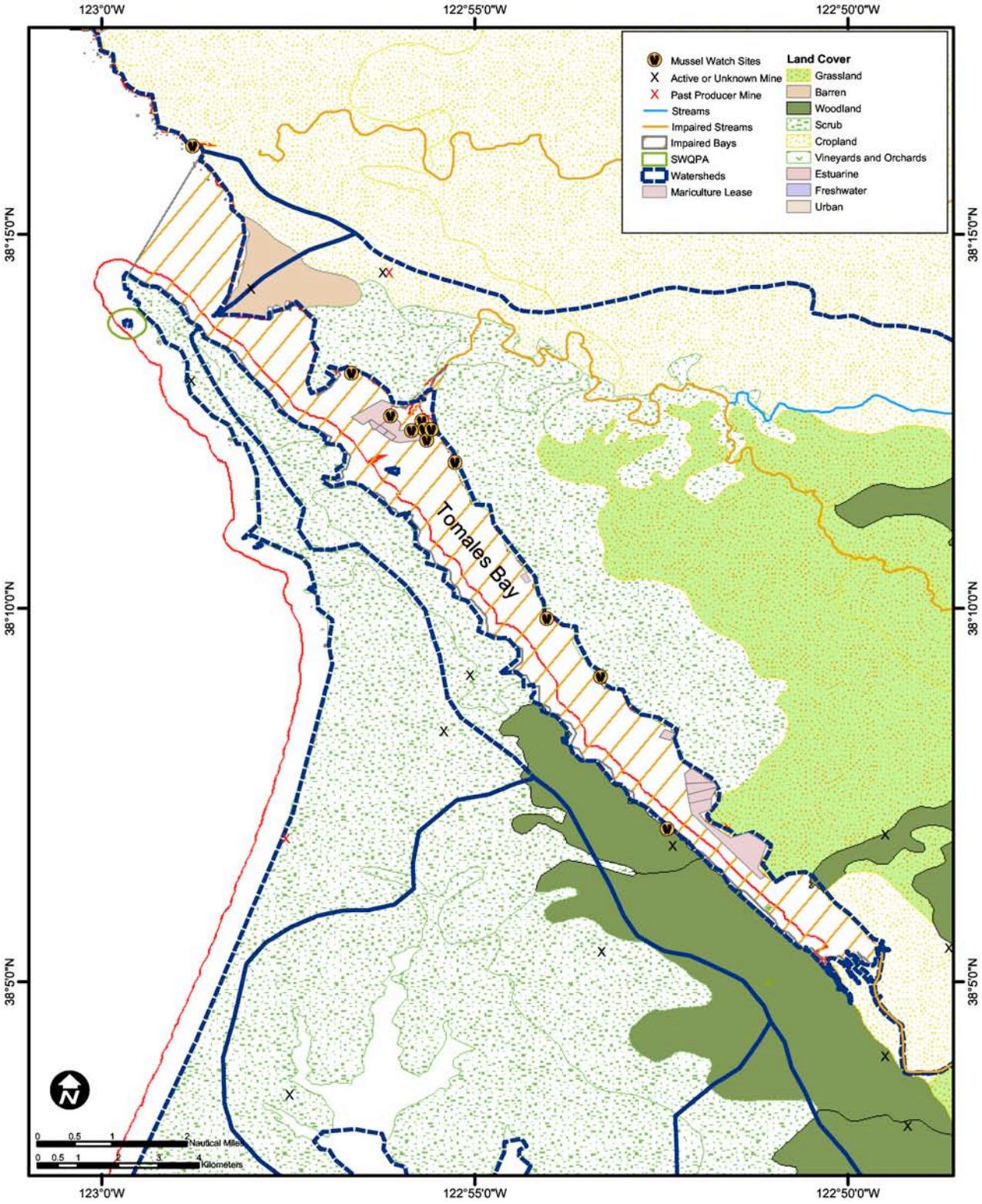
Potential Partners: CCC, UC Sea Grant, Marin Resource Conservation District, PRNS, SF Bay Conservation and Development Commission

Complementary Strategies: GFNMS FMP, Water Quality, STRATEGY WQ-3, STRATEGY WQ-6

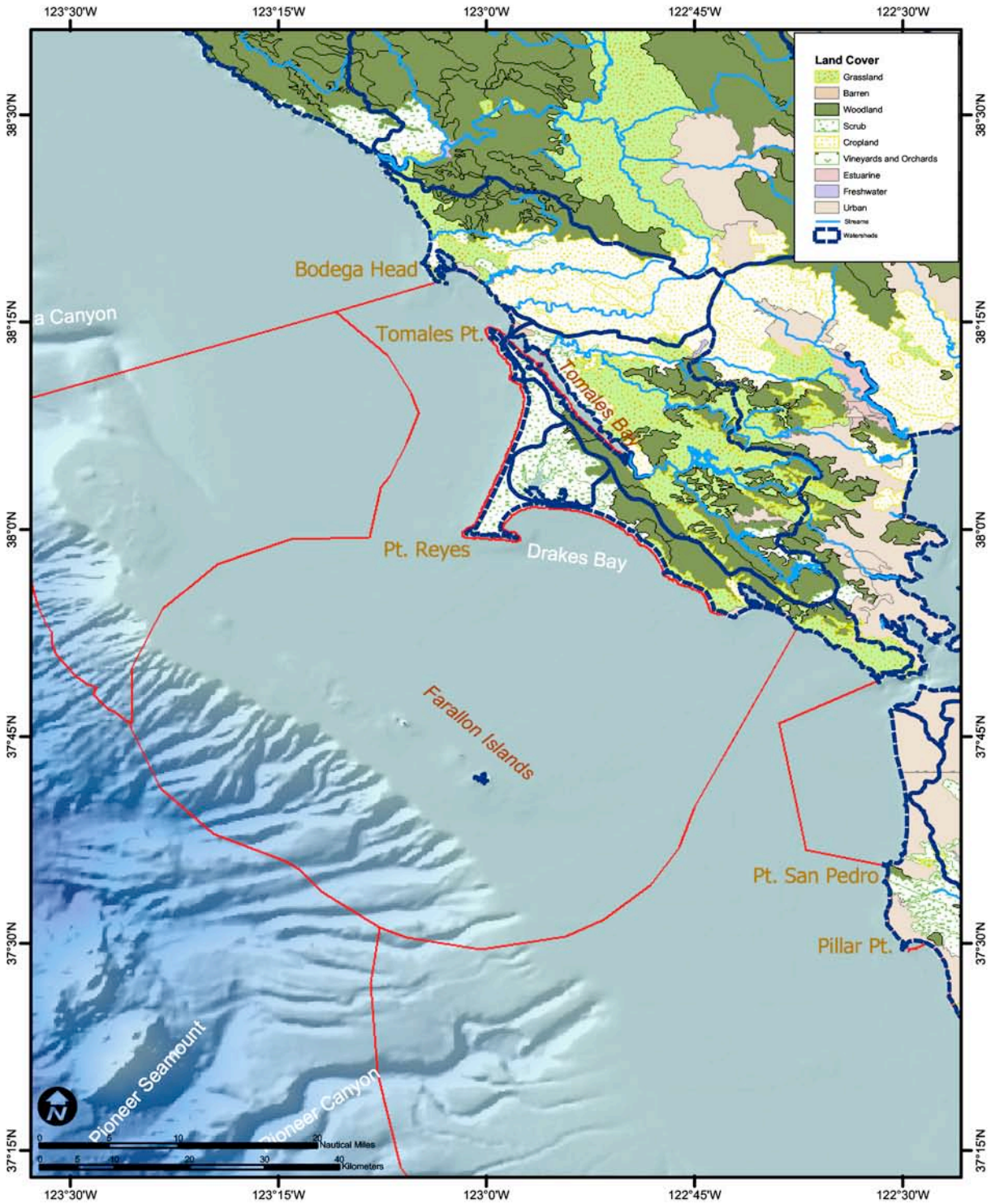
Water Quality Map



Tomales Bay Water Quality and Mariculture Map



Land Cover Map



GFNMS WATER QUALITY

Timeline

Water Quality Strategy	Year 1	Year 2	Year 3	Year 4	Year 5
STRATEGY WQ-1: Coordinate partnerships in implementing a comprehensive and integrated water quality monitoring program.	.....	.....	.....	.....	→
STRATEGY WQ-2: Address sources of anthropogenic pathogens and pollutants from recreational and commercial boating activities and marinas.	.....	.....	.....	→	→
STRATEGY WQ-3: Coordinate with other agencies to address land-based discharges into the estuarine and nearshore areas of the sanctuary.	→	→	→	→	→
STRATEGY WQ-4: Evaluate need for no vessel discharge in ASBSs.			→	◆	
STRATEGY WQ-5: Ensure the continuation of the state's Mussel Watch program.			→	→	◆
STRATEGY WQ-6: Develop a standing water quality working group.			→	→	→
STRATEGY WQ-7: Develop administrative capacity to support water quality protection plan.		→	→	→	→
STRATEGY WQ-8: Develop an annotated bibliography of water quality research and monitoring programs.		→	◆		
STRATEGY WQ-9: Educate local decision makers on water quality issues in the sanctuary.	→	→	→	→	→

Legend:

→ **Ongoing Activity**

..... → **Planning Stage**

—◆ **Completed**

GFNMS WATER QUALITY

Budget

Strategy	Estimated Annual Cost (1000's)*					Total Est. 5-Year Cost (1000's)
	YR 1	YR 2	YR 3	YR 4	YR 5	
STRATEGY WQ-1: Coordinate partnerships in implementing water quality monitoring program	$0	$23	$18	$18	$18	$77
STRATEGY WQ-2: Address sources of anthropogenic pathogens and pollutants from recreational and commercial boating activities and marinas	$0	$28	$24	$24	$25	$101
STRATEGY WQ-3: Coordinate with other agencies to address land-based discharges into the estuarine and nearshore areas of the sanctuary	$0	$18	$22.2	$24.4	$26.8	$91.4
STRATEGY WQ-4: Evaluate the need for no vessel discharge in SWQPAs	$0	$0	$13	$14	$0	$27
STRATEGY WQ-5: Ensure the continuation of the state's Mussel Watch program	$0	$0	$4	$0	$0	$4
STRATEGY WQ-6: Develop a standing Water Quality Working Group	$0	$0	$14	$10	$10	$34
STRATEGY WQ-7: Develop administrative capacity to support water quality protection plan	$0	$100	$105	$110	$115	$430
STRATEGY WQ-8: Develop an annotated bibliography of water quality research and monitoring programs	$0	$50.5	$0	$0	$0	$50.5
STRATEGY WQ-9: Educate local decision makers on water quality issues in the sanctuary	$10.5	$10.5	$10.5	$10.5	$10.5	$52.5
Total Estimated Annual Cost	$10.5	$230	$210.7	$210.9	$205.3	$867.4
The sanctuary's base budget is available each year from appropriated funds.						
There is both availability of and opportunity to receive additional funding from appropriated funds.						

The estimates do not take into account increasing personnel costs each year or inflation.
The estimates do not take into account unexpected events or emergencies or unforeseen projects.

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

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

SITE-SPECIFIC ISSUE
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; 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, 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 1996, more than 62 million Americans participated in some form of wildlife viewing or nature tourism—nearly one-third of all U.S. adults. Wildlife viewing has grown exponentially in the past decade, as state and local economies reported a 40 percent increase in spending by wildlife viewers between 1991 and 1996. New information indicates that the number of wildlife viewers is increasing. Nature tourism activities in the sanctuary include: wildlife viewing from shore or boat, photographing wildlife and scenery, wildlife viewing from aircraft, beach visitation, and paddling. California and Florida are the top two states for nature tourism and wildlife viewing.

SIGNIFICANT RESOURCES

This area of northern 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 the sanctuary are wildlife disturbance impacts on seabirds and marine mammals.

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. Thirteen 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. These include Ashy and Leach's Storm Petrels; Brandt's, Pelagic, and Double-crested Cormorants; Western Gulls; Common Murres; Pigeon Guillemots; Cassin's Auklets; and Rhinocerous Auklets. Black Oystercatchers, a shorebird, also breed on the Farallon Islands.

Aquatic 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. 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 28,000 in 2003. A small colony > 90 northern fur seals has recently resumed breeding on the south Farallon Islands during the summer. Prior to 1996, northern fur seals had not been known to breed on the Farallon Islands for over 170 years. 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.

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 30 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 at about 8 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 1,500.

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 4,000 to 5,000 residents.

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.

An important breeding-age population of white sharks also feed at the Farallon Islands each fall.

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). Additionally, GFNMS is proposing new regulatory actions to address wildlife disturbance issues including taking any marine mammal, marine reptile, or seabird and attracting or approaching white sharks.

Federal Law

Endangered Species Act (ESA): This act provides for conservation of ecosystems upon which endangered species and threatened species depend, provides a program for conservation of those endangered species and threatened species, and provides for enforcement of special treaties and conventions for the protection of species of fish or wildlife and plants facing extinction.

Marine Mammal Protection Act (MMPA): This act directs the Secretary of Commerce to allow, upon request, the incidental, but not intentional, taking of marine mammals by United States citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and regulations are issued. Permission may be granted for periods of five years or less if the National Marine Fisheries Service (NMFS) finds that a taking will have negligible impact on the species or stock(s); will not have any mitigatable adverse impact on the availability of the species or stock(s) for subsistence uses; and the permissible methods of taking and requirements pertaining to the monitoring and reporting of such taking are set forth.

Migratory Bird Treaty Act (MBTA): This act implements various treaties and conventions between the U.S. and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the act, taking, killing, or possessing migratory birds is unlawful.

Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA): This act provides for conservation and management of the fishery resources in the Exclusive Economic Zone of the United States; encourages the implementation and enforcement of international fishery agreements; provides for fishery management plans; and establishes regional fishery management councils.

State Law

California Endangered Species Act: The California Endangered Species Act definitions of endangered and threatened species parallel those of the federal ESA. Proposed species are candidate species for which the California Department of Fish and Game (CDFG) has sufficient information on biological vulnerability and threats to support proposals to list them as endangered or threatened.

California Species of Special Concern (CSC): It is the goal and responsibility of the CDFG 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 Fish and Game Commission (FGC) and/or the CDFG.

State Lands Commission: The California State Lands Commission (SLC) has jurisdiction over all of California's tide and submerged lands, and the beds of naturally navigable rivers and lakes all 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 from shore.

WILDLIFE DISTURBANCE GOAL

1. Lessen or eliminate future impacts, and remedy existing 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.***

Activity 1.1 Coordinate with National Marine Sanctuary Program (NMSP) headquarters and the Coastal Services Center (CSC) to develop and maintain a well-designed information management and dissemination system. The system will support the ability to carry out any type of data processing and analysis, including statistical analysis, while providing information for management decisions. The data management system will serve as a tool to help facilitate better ecosystem protection by incorporating data from all sanctuary ecosystem protection issues and programs into one easily accessible database.

A. Using outside software expertise, the sanctuary will develop a database system in which to integrate a large volume of data for separate programs, process all incoming data, synthesize, and analyze the data.

B. Develop a Web-based spatial system widely accessible to GFNMS staff, scientists, decision makers and volunteers (available for individual offsite data entry and querying of all available data sets).

C. Follow Federal Geospatial Data Center (FGDC) compliance standards for metadata base to accompany all data in system.

D. Contract new personnel for data analysis and data system maintenance.

Potential Partners: Farallones Marine Sanctuary Association (FMSA), CSC, National Marine Sanctuary Program (NMSP)

Products: Web-based spatial database

Complementary Strategies: GFNMS Final management Plan (FMP), Introduced Species, STRATEGY IS-1; Conservation Science, STRATEGY CS-1, CS-4, CS-6; Water Quality, STRATEGY WQ-2, STRATEGY WQ-8; Introduced Species, STRATEGY IS-1, STRATEGY IS-2, STRATEGY IS-3; Fishing Activities, STRATEGY FA-1; Vessel Spills, STRATEGY VS-6, STRATEGY VS-12; Education, STRATEGY ED-2; Administration, STRATEGY AD-2

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, such as the rocky intertidal.***

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 the Sanctuary Naturalist Corps umbrella, a coordinated and complementary set of volunteer outreach and monitoring programs.

A. The volunteer-based intertidal monitoring program will be based on the Fitzgerald Marine Reserve (FMR) Intertidal Human Impact Study model, and used to

evaluate the effects of trampling and harvesting on sensitive and high traffic areas such as Duxbury Reef. This program will be adopted by a San Francisco Bay Area high school using materials developed by Long-term Monitoring Program and Experiential Training for Students (LiMPETS), which includes information on monitoring key species, sampling protocols, data sheets and data analysis methods. Initial steps in developing this program include identifying problem areas, areas for restoration, and areas to be zoned.

Potential Partners: FMR, Bodega Marine Laboratory (BML), Golden Gate National Recreation Area (GGNRA)

Complementary Strategies: GFNMS FMP, Education, STRATEGY ED-7; Introduced Species, STRATEGY IS-3; Conservation Science, STRATEGY CS-4, CS-5, CS-6; Ecosystem Monitoring XEM-2; Northern Management Area Transition XNRM-2, XNRM-4

Monterey Bay National Marine Sanctuary (MBNMS) FMP, Tidepool Protection, STRATEGY TP-1, STRATEGY TP-2

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

Activity 3.1 In coordination with partners, modify existing monitoring programs to identify types and frequency of impacts on wildlife from motorized and non-motorized aircraft and vessels both inside and outside restriction zones. Close vessel passes 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.

A. Programs will focus on identifying disturbance to seabirds and increasing enforcement efforts. Observations will make distinctions between impacts associated with motorized (e.g., fixed wing, helicopters, motor boats) and non-motorized (e.g., paragliders, hang gliders, kayaks) aircraft and vessels, and provide valuable information on compliance with and effectiveness of the sanctuary's overflight and vessel restriction regulations.

B. Create a standardized reporting system for monitoring programs and other wildlife disturbance data collection efforts.

C. The sanctuary and its partners will seek to secure funding to support these programs. Potential funding sources include the Resource Trustee Council funds.

Potential Partners: PRBO Conservation Science (Point Reyes Bird Observatory) (PRBO), Point Reyes National Seashore (PRNS), FMSA, United States Fish and Wildlife Service (USFWS).

Products: Data collection and reporting system

Complementary Strategies: GFNMS FMP, Wildlife Disturbance, STRATEGY WD-7; Vessel Spills, STRATEGY VS-3; Conservation Science STRATEGY CS-1, CS-4, CS-5, CS-6; Ecosystem Monitoring XEM-2; Northern Management Area Transition Plan XNRM-2, XNRM- 4; Administration, STRATEGY AD-3; MBNMS FMP, Marine Mammal Seabird and Turtle Disturbance, STRATEGY MMST-2

Activity 3.2 Through the use of permit conditions, reporting requirements, 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 PRBO 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).

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.

Potential Partners: Research community, permitting agencies, USFWS

Products: Biennial symposium, tracking and reporting system

Complementary Strategies: GFNMS FMP, Wildlife Disturbance, STRATEGY WD-7; Conservation Science, STRATEGY CS-1 and CS-2; MBNMS FMP, Marine Mammal Seabird and Turtle Disturbance, STRATEGY MMST-2

Activity 3.3 Evaluate emerging scientific studies delineating the impacts of anthropogenic noise, light and visual 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 disturbance in the Sanctuary.

Potential Partners: USFWS, FMSA, PRNS, GGNRA, PRBO, USFWS
Complementary Strategies: GFNMS FMP, Conservation Science, STRATEGY CS-1 and CS-2, Resource Protection STRATEGY RP-2, STRATEGY RP-3, MBNMS FMP, Marine Mammal Seabird and Turtle Disturbance, STRATEGY MMST-2

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

Activity 4.1 Under the Sanctuary Naturalist Corps umbrella, 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 preventative method to avert potential negative impacts from human behavior before they occur. Sanctuary Naturalist Corps programs are volunteer-based peer education programs that use interpretation to change behavior and values to achieve voluntary compliance with sanctuary regulations.

A. Continue interpretive enforcement through the Sanctuary Education Awareness and Long-term Stewardship (SEALS) Program. The SEALS program works to minimize disturbance to sanctuary seal colonies and educate the community about protection of habitat. The presence of visitors at seal observation sites provides an excellent opportunity for on-site education. SEALS volunteers answer questions on harbor seal behavior and natural history; explain the purpose of the SEALS program; inform the public on how to recognize and minimize disturbance to the seal colonies; and provide information about the marine sanctuaries and how human activity affects their health.

B. 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 Duxbury Reef.

C. Develop and distribute wildlife viewing guidelines (posters, informational cards, brochures) to target audiences including: kayakers (Paddler's Etiquette); 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).

D. Develop interpretive enforcement/outreach program targeting pilot organizations, flight schools, flight clubs, aviation publications and airports.

Potential Partners: FMSA, state parks, The Marine Mammal Center (TMMC), PRNS, FMR, CDFG, MBNMS, Cordell Bank National Marine Sanctuary (CBNMS)
Products: Annual reports, interpretive enforcement materials

Complementary Strategies: GFNMS FMP, Wildlife Disturbance, STRATEGY WD-1, STRATEGY WD-3; Education, STRATEGY ED-7; Conservation Science STRATEGY CS-1, STRATEGY CS-4

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, asses the potential to create a cross-deputization program with the CDFG, 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) and the Civil Air Patrol (CAP).

D. Hire a dedicated sanctuary enforcement officer.

E. Investigate the potential for training volunteer uniformed interpretive enforcement officers.

Potential Partners: NOAA Enforcement, CDFG, NPS, Harbor Patrol, USCG, CAP, USFWS

Products: Interpretive enforcement materials

Complementary Strategies: GFNMS FMP, Wildlife Disturbance, STRATEGY WD-7, Resource Protection, STRATEGY RP-6; MBNMS FMP, Marine Mammal Seabird and Turtle Disturbance, STRATEGY MMST-8

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.

D. In coordination with the Ocean Etiquette program, develop wildlife viewing and interaction guidelines for shoreline observers addressing marine mammals' 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.

Potential Partners: FMSA, NMFS, USFWS, CDFG, NPS, TMMC, state parks, PRBO, harbors and marinas

Products: Handbook, signage, brochures, website, kiosk

Complementary Strategies: GFNMS FMP, Wildlife Disturbance, STRATEGY WD-7, Education, STRATEGY ED-7, Conservation Science, STRATEGY CS-2.

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.

Potential Partners: FMSA, San Francisco (SF) Ad Council, TMMC, state parks, USCG, NMFS, PRBO, GGNRA, MBNMS, CBNMS

Products: Wildlife disturbance media kit

Complementary Strategies: GFNMS FMP, Education, STRATEGY ED-11

STRATEGY WD-7: Coordinate the Seabird Colony Protection Program aimed at improving the survival and recruitment of seabird colonies by reducing and eliminating human disturbances at seabird breeding and roosting sites from Point Reyes to Point Sur.

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. Breading and roosting seabird populations are significant wildlife resources of the Central 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. Establish the Seabird Colony Education and Outreach Working Group

Potential Partners: USFWS, FMSA, PRBO, NPS, MBNMS, USCG, California Department of Boating and Waterways (CDBW), Coast Guard Auxiliary

Products: Outreach materials – booth displays for pilots and boaters, fact sheets for ocean users, posters, branding materials (stickers, tide books, pens, pocket maps), brochures, colony, roosting and overflight maps, news articles, Op-eds, power point presentations, and PSAs. Outreach events/venues- association meetings, conferences, air and boat shows and ecotourism vendors, airports, and pilot mailings.

Complementary Strategies: GFNMS FMP, Education, STRATEGY ED-11, STRATEGY ED-13, Wildlife Disturbance, STRATEGY WD-3

Activity 7.2:.Based on research and monitoring findings, take appropriate actions to address impacts on seabirds from vessels and low-flying aircraft including:

A. Review current statutes, authorities, regulations and agency jurisdictions pertaining to managing and protecting seabirds and seabird colonies, conduct a gap analysis by determining what regulations need better enforcement and what geographic areas are subject to regulations, and whether or not additional or amended regulations are required. If justifiable, propose appropriate regulatory action or propose adjustments to current GFNMS' overflight and vessel restrictions to address impacts from low flying aircraft and vessels.

B. Establish the Seabird Colony Coordinated Management and Enforcement Working Group.

C. Work with enforcement agencies on the federal, state and local level to encourage active enforcement of laws and regulations that protect seabirds, and to promote a coordinated law enforcement effort.

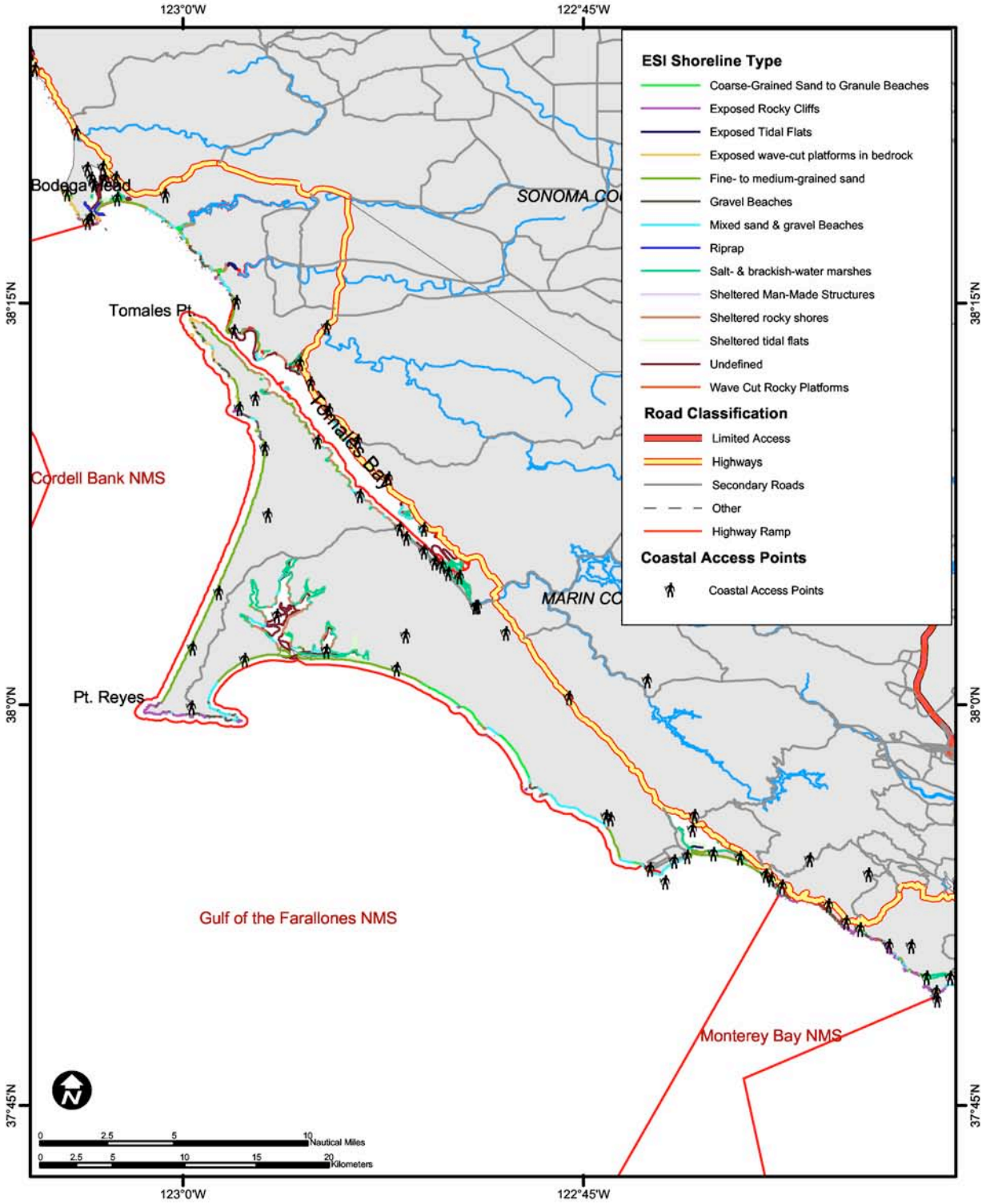
D. Maintain long-term monitoring to document disturbance and/or effectiveness of regulatory action and enforcement program.

Potential Partners: Federal Aviation Administration, NMFS, PRNS, GGNRA, PRBO, USFWS, CDFG, CDBW, Coast Guard Auxiliary, MBNMS

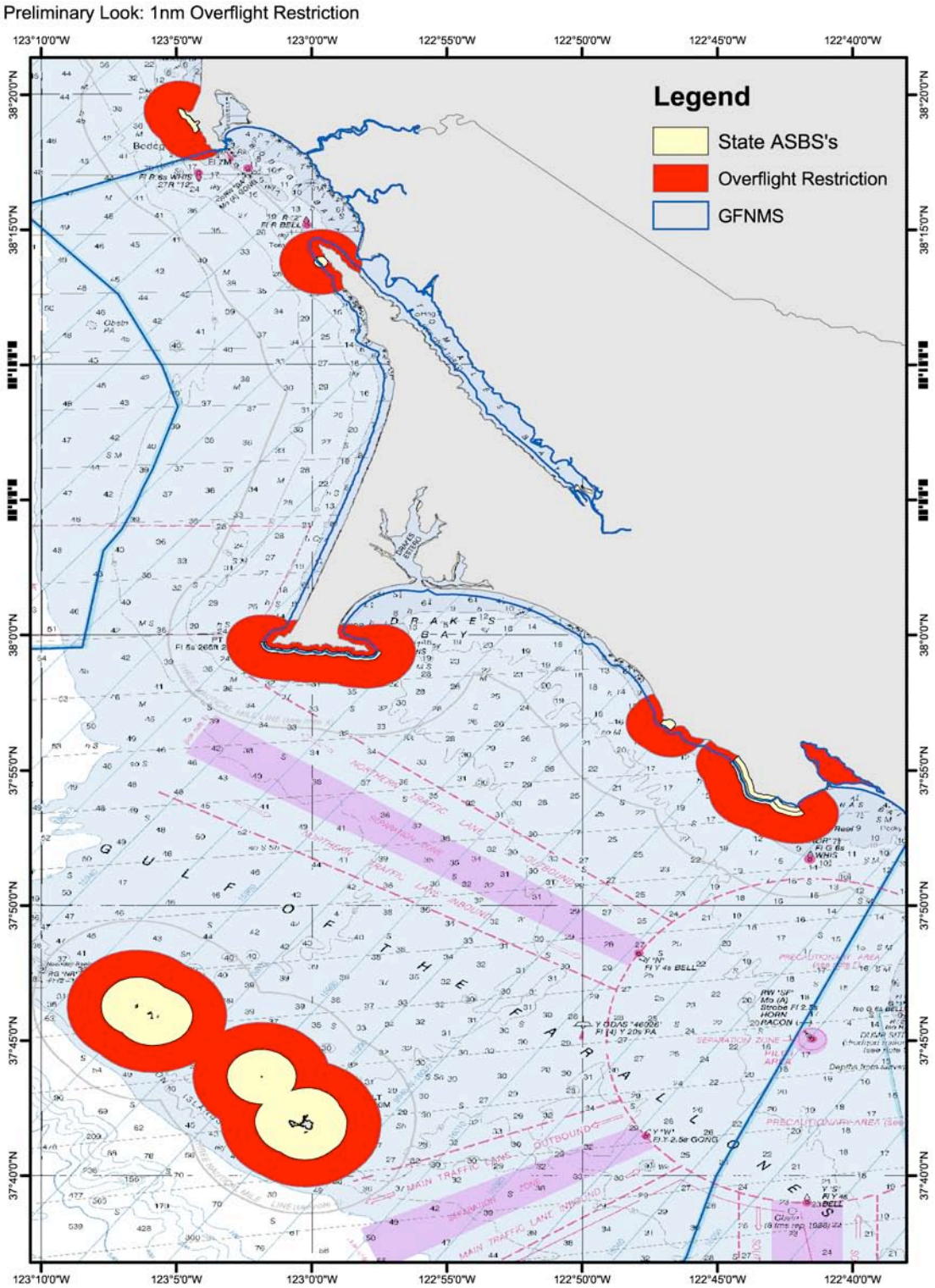
Products: Regulation(s) if necessary; Management products – buoy demarcation, standardized incident reporting form, incident reporting classes for researchers, rangers and fishermen; Enforcement products – MOU for seabird enforcement with partner agencies;

Complementary Strategies: GFNMS FMP, Wildlife Disturbance, STRATEGY WD-3, STRATEGY WD-4, STRATEGY WD-5; Ecosystem Protection, STRATEGY EP-1, Resource Protection, STRATEGY RP-6, STRATEGY RP-10; Education, STRATEGY ED-7; MBNMS FMP, Marine Mammal Seabird and Turtle Disturbance, STRATEGY MMST-2

Coastal Access Points and Shoreline Types Map



Overflight Restriction Map



GFNMS regulations prohibit airplane flights below 1000 feet within 1 nautical mile of Areas of Special Biological Significance.

GFNMS WILDLIFE DISTURBANCE

Timeline

Wildlife Disturbance Strategy	Year 1	Year 2	Year 3	Year 4	Year 5
STRATEGY WD-1: Create easily accessible centralized Web-based spatial database to house information pertaining to wildlife disturbance.		.....	.....	→	
STRATEGY WD-2: Using volunteer monitoring programs, observe and record impacts from human activity on rocky intertidal.			.....	→	
STRATEGY WD-3: Coordinate with other agencies, institutions and programs to better understand and address anthropogenic noise, light and visual impacts on wildlife from vessels and low flying aircraft.		.....	→	→	
STRATEGY WD-4: Using interpretive enforcement 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 media venues to augment direct outreach efforts and increase public awareness of wildlife disturbance issues.	.....	→	→	→	
STRATEGY WD-7: Coordinate the Seabird Colony Protection Program to reduce and eliminate human disturbances at seabird breeding and roosting sites.	→	→	→	→	

Legend:

→ **Ongoing Activity**

..... **Planning Stage**

—◆ **Completed Activity**

GFNMS WILDLIFE DISTURBANCE

Budget

Strategy	Estimated Annual Cost (1000's)*					Total Est. 5-Year Cost (1000's)
	YR 1	YR 2	YR 3	YR 4	YR 5	
STRATEGY WD-1: Create easily accessible centralized Web-based spatial database to house information pertaining to wildlife disturbance	$0	$25	$23	$23	$23	$94
STRATEGY WD-2: Using volunteer monitoring programs, observe and record impacts from human activities on marine resources and key habitats of the sanctuary, such as the rocky intertidal	$0	$0	$60	$60	$120	$240
STRATEGY WD-3: Better understand and address anthropogenic noise, light and visual impacts on wildlife from vessels and low flying aircraft.	$28	$30	$28	$32	$32	$150
STRATEGY WD-4: Through interpretive enforcement and law enforcement efforts, address human behavior that may adversely impact wildlife	$13	$35	$13	$13	$13	$87
STRATEGY WD-5: Develop wildlife viewing guidelines to reduce disturbance to wildlife from human interactions	$15	$15	$16	$16	$16	$78
STRATEGY WD-6: Maximize media venues to augment directed outreach efforts and increase public awareness of wildlife disturbance issues	$5	$5	$5	$5	$5	$25
STRATEGY WD-7: Coordinate the Seabird Colony Protection Program to reduce and eliminate human disturbances at seabird breeding and roosting sites.	$70.7	$170.5	$197	$293	$0	$731.2
Total Estimated Annual Cost	$131.7	$280.5	$342	$442	$209	$1,405.2
The sanctuary's base budget is available each year from appropriated funds.						

There is both availability of and opportunity to receive additional funding from appropriated funds.
The estimates do not take into account increasing personnel costs each year or inflation.
The estimates do not take into account unexpected events or emergencies or unforeseen projects.

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) 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

SITE-SPECIFIC ISSUE
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 (6,000 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

International

"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: Developed by the International Maritime Organization (IMO). These guidelines, which outline the techniques for minimizing introductions from cargo ship ballast discharge, are expected to become part of the International Convention for the Prevention of Pollution from Ships (MARPOL). This would require the U.S. Congress to enact legislation detailed in the guidelines.

"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): 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): 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: 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, 1996: The federal National Invasive Species Act (NISA) strengthened the 1990 Nonindigenous Aquatic Nuisance Prevention and Control Act requiring open water exchange (OWE) of ballast water and mandatory ballast management plans and reporting.

Title 50, U.S. Code of Federal Regulations; 58976-58981, 1993: Enforced by U.S. Fish and Wildlife Service, Dept. of Interior, prohibiting importation of specific disease agents of salmonid fish.

Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990: Established the

Aquatic Nuisance Species Task Force program to prevent introduction and dispersal of aquatic nuisance species; to monitor, control and study such species; and to disseminate related information. It also encouraged governors of each state to submit state aquatic nuisance species management plans.

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

SB 497, signed into California state law in 2006: requires the state to adopt regulations that require an owner or operator to implement performance standards for the discharge of ballast water.

AB 433, The Marine Invasive Species Act, signed into California state law in 2003: revised state law pertaining to control of nonindigenous species and ballast water management, including revising and adding definitions. It deleted exemptions for specified vessels from compliance with the act and imposed additional requirements upon vessel owners and operators to prevent the introduction of nonindigenous species. It also required the State Lands Commission to take samples from at least 25% of arriving vessels subject to nonindigenous species control requirements.

AB 703, signed into California state law in 1999: requires mid-ocean ballast water exchange in waters more than 200 nautical miles from land and in water at least 2,000 meters deep or retention of all ballast water on board the vessel for all U.S. and foreign vessels that enter California waters after operating outside the U.S. Exclusive Economic Zone (EEZ). "Good housekeeping" practices must be observed, which include the avoidance of discharge or uptake near marine sanctuaries, reserves, parks, coral reefs, and other areas.

Sanctuary prohibition on introducing or releasing an exotic species provides a greater impetus for vessels to comply with AB 703, as the sanctuary may enforce civil penalties up to $130,000 per violation per day. The sanctuary prohibition is applicable to federal as well as state waters.

Other state regulations governing introduced species include:

Fish and Game Code: Section 2116-2126 (illegal transportation of certain species)

Fish and Game Code: Section 6300-6306 (infected, diseased or parasitic fish, amphibia or aquatic plants)

Fish and Game Code: Section 6430-6433 (Ballast Water Management)

Fish and Game Code: Section 6440-6460 (control of aquatic nuisance plants)

Fish and Game Code: Section 8596-8598 (marine aquaria pet trade)

Public Resources Code: Section 71210-71213 (ballast water)

Public Resources Code: Section 71215 (Exotic Species Control Fund)

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 Game (CDFG), 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.

Potential Partners: Point Reyes National Seashore (PRNS), Integrative Graduate Education and Research Traineeship Program (IGERT) Intern Program, The National Centers for Coastal Ocean Science (NCCOS), Audubon, CDFG, Smithsonian, National Marine Fisheries Service (NMFS), United States Fish and Wildlife Service (USFWS), CalFed, Bodega Marine Laboratory (BML)

Products: Species inventory, introduced species inventory

Complementary Strategies: GFNMS Final Management Plan (FMP), Ecosystem Protection, STRATEGY FA-1; Conservation Science STRATEGY CS-1, CS-4, CS-5, CS-6; Northern Management Area Transition STRATEGY XNRM-1

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

A. Create a centralized Web-based spatial database on SIMoN 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.

Potential Partners: PRNS, IGERT Intern Program, NCCOS, Audubon, CDFG, Smithsonian, NMFS, USFWS, CalFed, National Marine Sanctuary Program (NMSP)

Products: Spatial Web-based database

Complementary Strategies: GFNMS FMP, Wildlife Disturbance, STRATEGY WD-1; Monterey Bay National Marine Sanctuary (MBNMS) FMP, Introduced Species, STRATEGY IS-2

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 (Bolinas 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.

Potential Partners: PRNS, Point Reyes National Seashore Association (PRNSA), SERC, BML

Complementary Strategies: GFNMS FMP, Wildlife Disturbance, STRATEGY WD-1; Introduced Species, STRATEGY IS-1, STRATEGY IS-6; Fishing Activities, STRATEGY FA-1; MBNMS FMP, Introduced Species, STRATEGY IS-4; Conservation Science STRATEGY CS-2, CS-5, CS-6; Northern Management Area Transition STRATEGY XNRM-1

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.

Potential Partners: PRNS, IGERT Intern Program, NCCOS, Audubon, CDFG, Smithsonian, NMFS, SERC, USFWS, CalFed, GGNRA, Marin Open Space, BML

Complementary Strategies: GFNMS FMP, Water Quality, STRATEGY WQ-2, STRATEGY WQ-6; Education, STRATEGY ED-4

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, 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 as 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.

Potential Partners: GGNRA (Slide Ranch), PISCO (looking at key indicators), PRNS, BML, California Academy of Sciences, Berkeley Herbarium, MBNMS Sanctuary Integrated Monitoring Network (SIMoN), MMS (MARINE)

Complementary Strategies: GFNMS FMP, Education, STRATEGY ED-4; MBNMS FMP, Introduced Species, STRATEGY IS-4; Conservation Science, STRATEGY CS-4, CS-5; Northern Management Area Transition STRATEGY XNRM-1

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; 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.

Potential Partners: NMFS, SFSU Romberg Tiburon Center, State Department of Health Services, Monterey Bay Aquarium Research Institute (MBARI), PRNS, Farallon National Wildlife Refuge, BML, SERC, Cordell Bank National Marine Sanctuary (CBNMS), NMSP Regional Monitoring (Channel Islands National Marine Sanctuary [CINMS]), Olympic Coast National Marine Sanctuary [OCNMS], MBNMS)

Complementary Strategies: GFNMS FMP, Ecosystem Protection, STRATEGY FA-1; MBNMS FMP, Introduced Species, STRATEGY IS-4; Conservation Science STRATEGY CS-4, CS-5; Northern Management Area Transition STRATEGY XNRM-1

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.

Potential Partners: NMFS, CDFG, Sea Grant, GGNRA, PRNS, ESNERR, San Francisco Bay National Estuarine Research Reserve (SFBNERR), SERC, NCCOS, UCCE

Complementary Strategies: GFNMS FMP, Education, STRATEGY ED-7; Introduced Species, STRATEGY IS-1, STRATEGY IS-2, STRATEGY IS-3; MBNMS FMP, Introduced Species, STRATEGY IS-4; Conservation Science, STRATEGY CS-5, Northern Management Area Transition STRATEGY XNRM-1

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 Council of experts on introduced species issues. This group would meet on an as needed basis and may coordinate with the research working group on many issues.

Potential Partners: NMFS, CDFG, Sea Grant, USFWS, ESNERR, SWRCB, Regional Water Quality Control Board (RWQCB), Marin Open Space, National Park Service (NPS), California Coastal Conservancy, University of California Davis (UCD), California State Lands Commission (CSLC)

Complementary Strategies: GFNMS FMP, Introduced Species, STRATEGY IS-1, STRATEGY IS-2, STRATEGY IS-3, STRATEGY IS-4, STRATEGY IS-5, STRATEGY IS-7, STRATEGY IS-8

Activity 6.2 A regional representative of the California sanctuaries (GFNMS, CBNMS, MBNMS, CINMS) should 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.

Potential Partners: CalFed, CBNMS, MBNMS, CINMS

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.

Potential Partners: NMFS, CDFG, Sea Grant, USFWS, ESNERR, SWRCB, RWQCB, SERC, Marin Open Spaces, NPS, California Coastal Conservancy, UCD (BML), SFSU, U. S. Environmental Protection Agency (EPA), United States Coast Guard (USCG), experts in the field

Complementary Strategies: GFNMS FMP, Introduced Species, STRATEGY IS-6; MBNMS FMP, Introduced Species, STRATEGY IS-4

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 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 Require 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: NMS, CDFG, Sea Grant, USFWS, UCCE

Complementary Strategies: GFNMS FMP, Education, STRATEGY ED-6, STRATEGY ED-7, STRATEGY ED-8, STRATEGY ED-9

GFNMS INTRODUCED SPECIES

Timeline

Introduced Species Strategy	Year 1	Year 2	Year 3	Year 4	Year 5
Strategy IS-1: Develop a native and introduced species inventory and database for GFNMS.	◆				
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 and monitor introduced species in the rocky intertidal areas of the sanctuary.		.....	→	→	→
Strategy IS-4: Develop a monitoring program to detect and monitor introduced species in the pelagic environment of the sanctuary.	→	→	→	→	→
Strategy IS-5: Develop an outreach and monitoring program to improve early detection of introduced species.			.....	→	→
Strategy IS-6: Develop partnerships with other agencies and organizations involved in introduced species management.			.....	→	→
Strategy IS-7: Develop a rapid response plan and streamlined permit process.				→	◆
Strategy IS-9: Outreach to targeted audiences and industries about how to prevent new introductions.			.....	→	→

Legend:

→ **Ongoing Activity**

..... → **Planning Stage**

→ ◆ **Completed Activity**

GFNMS INTRODUCED SPECIES

Budget

Strategy	Estimated Annual Cost (1000's)*					Total Est. 5-Year Cost (1000's)
	YR 1	YR 2	YR 3	YR 4	YR 5	
STRATEGY IS-1: Develop a native and introduced species inventory and database for the sanctuary	$9.5	$14.5	$7	$14.5	$7	$49.5
STRATEGY IS-2: Develop a program to detect introduced species in estuarine environments of the sanctuary	$0	$0	$18	$14	$17	$49
STRATEGY IS-3: Develop a monitoring program to detect and monitor introduced species in the rocky intertidal areas of the sanctuary	$0	$70.5	$55	$57	$66	$248.5
STRATEGY IS-4: Develop a monitoring program to detect and monitor introduced species in the pelagic environment of the sanctuary	$0	$0	$0	$0	$0	$.0
STRATEGY IS-5: Develop an outreach and monitoring program to improve early detection of introduced species	$0	$0	$22.5	$46	$48	$116.5
STRATEGY IS-6: Develop partnerships with other agencies and organizations that are involved in introduced species management	$0	$0	$16	$16	$16	$48
STRATEGY IS-7: Develop a rapid response plan and streamlined permit process	$0	$0	$0	$32	$29	$61
STRATEGY IS-8: Take regulatory action to control new introductions	$2	$2	$2	$2	$2	$10
STRATEGY IS-9: Outreach to targeted audiences and industry about pathways to prevent methods	$0	$0	$31	$27	$31	$89
Total Estimated Annual Cost	$12	$87	$151.5	$208.5	$216	$675
The sanctuary's base budget is available each year from appropriated funds.						
There is both availability of and opportunity to receive additional funding from appropriated						

funds.
The estimates do not take into account increasing personnel costs each year or inflation.
The estimates do not take into account unexpected events or emergencies or unforeseen projects.

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

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

SITE-SPECIFIC ISSUE
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 on trophic interactions from krill harvesting; (2) impacts from trampling and harvesting of invertebrates in the intertidal; (3) gear impacts on habitats and living resources; (4) impacts on trophic levels from localized depletion of bait fish; and (5) 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 Game (CDFG) in state waters (0-3 nautical miles), and National Oceanic and Atmospheric Administration (NOAA) Fisheries in federal waters (3 to 200 miles), although fisheries management plans may cover both state and federal waters. In contrast, the National Marine Sanctuary Program (NMSP) 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

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.[2]

California's Restricted Access Program

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 Game (CDFG) 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 Protection Act (MLPA) of 1998 and the commission's adoption of the restricted access policy in 1999, more restricted access program responsibility has shifted from the legislature to the commission and CDFG. The CDFG 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 CDFG 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.[3]

Marine Life Management Act

The Marine Life Management Act (MLMA) requires the CDFG and Fish and Game Commission to evaluate existing restricted access programs every five years. These evaluations and increase in restricted access programs will require the CDFG to expand capabilities to collect and analyze

2 California Department of Fish and Game. December 2001; *California's Living Marine Resources: A Status Report*, Sacramento, California

economic and social data related to fisheries. Socioeconomic data and biological data about fisheries resources are key components in developing and evaluating restricted access policy alternatives.

Marine Life Protection Act (MLPA)

State legislation requires that the CDFG develop a plan for establishing networks of marine protected areas in California waters to protect habitats and preserve ecosystem integrity. The master plan requires that recommendations be made for a preferred alternative network of MPAs with "an improved marine life reserve component." The MLPA further states that "it is necessary to modify the existing collection of marine protected areas (MPAs) to ensure that they are designed and managed according to clear, conservation-based guidelines that take full advantage of the multiple benefits that can be derived from the establishment of marine life reserves."

Magnuson-Stevens Fishery Conservation and Management Act

The implementation of the Magnuson-Stevens Fishery Conservation and Management Act virtually eliminated all foreign fishing vessels by extending the United States jurisdiction and control over all marine fisheries resources within 200 miles of the U.S. coast. The act required the establishment of eight regional fishery management councils composed of federal and state fishery management officials and industry representatives. The councils have responsibility to develop, monitor, and revise fishery management plans for each fishery within the Exclusive Economic Zone (EEZ) that requires management. Every fishery management plan must be approved by the Secretary of Commerce before it can be implemented by NOAA Fisheries.

The Pacific Fishery Management Council (PFMC) is one of eight regional councils establishedpursuant to the MSFCMA, and manages the fisheries in federal waters off California, Oregon, and Washington. The Pacific Council manages four major West Coast fisheries: (1) coastal pelagic species fishery (e.g., sardines); (2) marine salmon fishery; (3) Pacific coast groundfish fishery (including more than eighty species); and (4) West coast highly migratory species fishery (e.g., tunas and sharks).

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. Allow for 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. The sanctuary will seek to facilitate the management of fisheries resources within its boundaries in order to protect cultural resources; to protect sanctuary wildlife and habitat; and to maintain native biodiversity and the health and balance of the sanctuary ecosystem.

3. The sanctuary will identify and develop appropriate actions to address any negative impacts from fishing activities on sanctuary ecosystems.

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 Sanctuary Ecosystem Assessment Survey-Pelagic Habitat (SEA Surveys, formerly known as Ecosystem Dynamic Study) 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. The SEA Surveys will systematically survey and assess the distribution and abundance of marine birds, sea turtles and marine mammals. The primary region of interest is within GFNMS, north to the Russian River and west to the Farallon Escarpment. The study will simultaneously assess ocean habitat, and biological productivity. Additional components will include:

   1. Habitat characterization including mapping substrate type/bathymetry (static)
   2. Biological characterization including species abundance and distribution, spatial and temporal
   3. Physical characterization including oceanographic features (spatial and temporal) and pelagic (dynamic)

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

Potential Partners: National Marine Fisheries Service (NMFS), Minerals Management Service (MMS), United States Geological Survey (USGS), CDFG, Central California Ocean Observing Systems (CeNCOOS), Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO), Moss Landing Marine Laboratories (MLML), National Oceanographic Data Center (NODC), Sanctuaries Hazardous Incident Emergency Logistics Database System (SHIELDS), Office of Enforcement (OE), Ford Consulting Inc., H. T. Harvey Consulting

Complementary Strategies: GFNMS Final Management Plan (FMP), Introduced Species, STRATEGY IS-2; Ecosystem Protection, STRATEGY FA-3, STRATEGY FA-4, STRATEGY EP-1, STRATEGY EP-3; Vessel Spills, STRATEGY VS-8; Conservation Science, STRATEGY CS-3, CS-5

Activity 1.2 Conduct monitoring needs assessment workshops for West Coast national marine sanctuaries.

Activity 1.3 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 1.4 Based upon available ship time, facilitate expansion of California Cooperative Oceanic Fisheries Investigations (CalCOFI) transect lines through the five West Coast sanctuaries.

> **Potential Partners:** NMFS, MMS, United States Geological Survey (USGS), CDFG, CeNCOOS, PISCO, MLML, NODC, SHIELDS, OE, Ford Consulting Inc., H. T. Harvey Consulting
>
> **Complementary Strategies:** GFNMS FMP, Introduced Species, STRATEGY IS-2; Ecosystem Protection, STRATEGY FA-3, STRATEGY FA-4, STRATEGY EP-1, STRATEGY EP-3; Vessel Spills, STRATEGY VS-8

STRATEGY FA-2: ***Develop a socioeconomic profile of fishing activities and communities in and adjacent to the sanctuary.***

Activity 2.1 Hire a contractor to profile the history and evolution of fishing activities occurring in and adjacent to the sanctuary. Profile should include information on actual numbers of boats actively engaged in each fishery; areas where the fishery is taking place; gear types; catch levels; a socioeconomic profile of the harbors and marinas accessing the sanctuary; and an understanding of markets, changing gear types, and changing fisheries management regulations that influence this profile and the community. Information exchange with mariners will provide important input to the profile.

> **Potential Partners**: Fishing community, NMFS, NOAA, The National Centers for Coastal Ocean Science (NCOS), CDFG, California Species of Special Concern (CSC)
>
> **Products**: Publication, database
>
> **Complementary Strategies**: GFNMS FMP, Ecosystem Protection, STRATEGY FA-1, STRATEGY FA-5

STRATEGY FA-3: ***Evaluate impacts from fishing activities on sanctuary resources.***

Activity 3.1 Develop a definition for "compatible use." The "compatible use" definition will establish a threshold for maximum allowable impacts on sanctuary resources from fishing and other activities. The "compatible use" definition will set a standard for the compatibility index (see Activity 3.2 below).

Activity 3.2 Develop a "compatibility index" to rank and evaluate types and levels of impacts from fishing activities. The compatibility index will be based on a model similar to the *Severity*

Ranking of Collateral Impacts[1] model for fishing gear types and will include consideration and rankings for different types and levels of impacts such as:

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)

Potential Partners: NMFS, sanctuary advisory council (SAC), stakeholder representatives, agency representatives, interest groups

Product: Compatibility index

Complementary Strategies: GFNMS FMP, Ecosystem Protection, STRATEGY FA-1, STRATEGY FA-4, STRATEGY EP-1; Monterey Bay National Marine Sanctuary (MBNMS) FMP, Benthic Habitats, STRATEGY BH-2, Fishing Education and Research, STRATEGY FER-3

STRATEGY FA-4: ***Develop policy recommendations or management action(s) to address impacts from fishing activities on sanctuary resources.***

Activity 4.1 If the compatibility index indicates significant negative impacts on sanctuary resources from fishing activities, as appropriate, a stakeholder-based, issue-specific working group of the sanctuary advisory council will be developed to evaluate and make recommendations on actions the sanctuary should take to address impacts from specific activities.

A. A stakeholder-based working group (issue-specific) may include: resource management agencies, interest groups, user groups, fishermen representing different gear types, and the scientific community.

B. The working group will make recommendations to the SAC based on best available scientific and socioeconomic data.

Potential Partners: NMFS, SAC, stakeholder representatives, agency representatives, interest groups, PFMC, CDFG

Complementary Strategies: GFNMS FMP, Ecosystem Protection, STRATEGY FA-3, STRATEGY EP-1; MBNMS FMP, Benthic Habitats, STRATEGY BH-2, Fishing Education and Research, STRATEGY FER-3

[1] Morgan L. and R. Chuenpagdee. 2003; *Shifting Gears: Addressing the collateral impacts of fishing methods used in U.S. waters*. Island Press, Washington DC (42 pp.)

Activity 4.2 Develop a series of management categories (policy responses) based on relative level of impact from a fishing activity, as determined by the compatibility index.

A. Management responses or recommendations to other appropriate management agencies may include a range of recommendations such as:

1. Using less ecologically damaging types of gear
2. Changing fishing practices using appropriate incentives
3. Promoting innovations in fishing gear and technology
4. Establishing area-based restrictions
5. Supporting future studies, including assessment of social and economic effects of policy actions on fishing activities
6. Using tools such as adaptive management to reintroduce closed fisheries

B. Develop a timeline and mechanism(s) for implementation of recommendations, establishing protocols and procedures for working with other agencies.

Potential Partners: Fishing community, PFMC, NMFS, CDFG, MBNMS, Channel Islands National Marine Sanctuary (CINMS), Cordell Bank National Marine Sanctuary (CBNMS), Sea Grant

Products: Response categories and mechanisms for implementation

Complementary Strategies: GFNMS FMP, Ecosystem Protection, STRATEGY FA-3

STRATEGY FA-5: ***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 5.1 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.

Potential Partners: Fishing community, visitors bureau, tourism industry and business community, Farallones Marine Sanctuary Association (FMSA)

Complementary Strategies: GFNMS FMP, Ecosystem Protection, STRATEGY FA-2; MBNMS FMP, Benthic Habitats, STRATEGY BH-1; Fishing Related Education and Outreach, STRATEGY FER-4

STRATEGY FA-6: ***Establish consistent and coordinated region-wide sanctuary representation at the Pacific Fishery Management Council and Fish and Game Commission meetings.***

Activity 6.1 Select regional sanctuary representative to attend Pacific Fishery Management Council (PFMC) and Fish and Game Commission (FGC) meetings and participate as appropriate.

A. The West Coast sanctuaries (Olympic Coast, Cordell Bank, Gulf of the Farallones, Monterey Bay, and Channel Islands) need a single point of contact that will consistently represent all five sanctuaries to inform and update the council and commission on current activities and emerging fishing issues in the sanctuaries. The sanctuaries also need to listen and track issues PFMC and FGC are addressing.

B. Create semi-annual, or as appropriate, briefing packets for the council and commission on sanctuary activities.

Potential Partners: NMSP, Olympic Coast National Marine Sanctuary (OCNMS), CBNMS, MBNMS, CINMS
Complementary Strategies: CBNMS FMP, Ecosystem Protection, STRATEGY FA-1; MBNMS FMP, Fishing Education and Research, STRATEGY FER-1

STRATEGY FA-7: ***Work with Cordell Bank and Monterey Bay national marine sanctuaries and the PFMC to address impacts on marine ecosystems in and around sanctuary waters from krill harvesting.***

Activity 7.1 Krill are a critical component of the marine ecosystem. These species are preyed upon by almost all commercially important fish species and by whales and seabirds. Krill are currently not harvested within the sanctuary, however, the potential exists for this fishery to develop in the future due to an increasing need for aquaculture feed. A krill fishery could not only severely impact the integrity of the marine ecosystem, but could adversely affect commercial and recreational fisheries of all kinds as most targeted species are directly or indirectly dependent on this resource.

To address this issue, the fishing activities working group recommended that the sanctuary superintendent work with the PFMC and NMFS to take action on a total, permanent ban on krill harvesting in West Coast sanctuaries off of Washington, Oregon and California.

A. GFNMS will work with CBNMS, MBNMS, the PFMC, and NMFS to monitor the implementation of the Coastal Pelagic Species Fishery Management Plan, which includes a preferred alternative for a permanent ban on krill harvesting.

Potential Partners: CBNMS, MBNMS, PFMC, NMFS, CDFG, FGC

Complementary Strategies: CBNMS FMP, Ecosystem Protection, STRATEGY FA-5

ECOSYSTEM PROTECTION ACTION PLAN

STRATEGY EP-1: ***Develop a resource protection plan (policy) to minimize user conflicts and provide special areas of protection for sensitive habitats, living resources, and other unique sanctuary features.***

Activity 1.1 Determine the need for using tools such as zoning (e.g., marine reserves, research reserves, no motor zones) 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. This plan is not specifically directed at fishing activities, but rather ecosystem protection, and it may apply to many ecosystem management issues.

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 (see STRATEGY FA-1).

B. Overlay socioeconomic profile of human activities taking place in the sanctuary (see STRATEGY FA-2.1).

C. Use stakeholder-based group and scientific expertise to review data to determine possible indicators of "special areas of concern" and/or "species of concern."

D. Based on the above information, the working group will work with the sanctuary superintendent to identify if and where a zonal plans would be appropriate in the sanctuary.

Potential Partners: PFMC, CDFG, FGC, NMFS, California Department of Boating and Waterways (CDBW), PRBO Conservation Science (Point Reyes Bird Observatory) (PRBO), MPA Center, Center for Integrated Marine Technology (CIMT), CBNMS, Naval Postgraduate School (NPS), National Park Service (NPS), various marine laboratories and research institutions, commercial and recreational fishing interests, conservation community

Products: The product will consist of a potential network of zonal designations within sanctuary waters that will enable managers to minimize space-use conflicts, determine the appropriate level or type of human use in each area, and avoid adverse interactions between scientific research, public enjoyment of the sanctuary, and the maintenance of ecosystem integrity in compliance with the National Marine Sanctuaries Act (NMSA)

Complementary Strategies: GFNMS FMP, Wildlife Disturbance, STRATEGY WD-7, Ecosystem Protection, STRATEGY FA-3, STRATEGY FA-4, STRATEGY EP-2; MBNMS FMP, Marine Protected Areas, STRATEGY MPA-2

STRATEGY EP-2: ***Create a standing "Living Resource and Habitat Protection" working group to provide advice to the sanctuary on ecosystem protection issues.***

Activity 2.1 Develop a permanent standing working group of the sanctuary advisory council to address ecosystem protection issues in the sanctuary.

Potential Partners: Fishing community, stakeholders, interest groups and research community

Complementary Strategies: GFNMS FMP, Ecosystem Protection, STRATEGY EP-1, STRATEGY FA-3, STRATEGY FA-4, STRATEGY FA-6; MBNMS FMP, Benthic Habitats, STRATEGY BH-1

STRATEGY EP-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 Estero Americano and Estero de San Antonio to protect and restore habitat for marine life. Estero Americano and Estero de San Antonio lie within the boundaries of GFNMS and are also part of the United Nations Educational Scientific and Cultural Organization (UNESCO) Golden Gate Biosphere Reserve. Estero Americano and Estero de San Antonio are part of a unique habitat category, in that most of the significant estuaries along the California coast have been dredged, diked, or filled. These two estuaries serve as critical food sources and nursery areas for the marine life within GFNMS. Their estuarine environment provides habitat for the tidewater goby, a federally endangered species, and both estuaries represent historically important salmon and steelhead trout habitat that is in need of restoration. Threats to sanctuary resources within Estero Americano and Estero de San Antonio are multi-faceted and ongoing. The following steps will be taken to determine the appropriate level of protection for Estero Americano and Estero de San Antonio.

A. GFNMS, in conjunction with local landowners, the Students and Teachers Restoring a Watershed (STRAW) Project, the Sonoma Land Trust, the California Coastal Conservancy, the Regional Water Quality Control Board (RWQCB), and California's Critical Coastal Areas (CCA) Program, will initiate a consultative process (MLPA) to coordinate with the relevant MLPA stakeholder group of the CDFG, as appropriate, to achieve designation of the Estero Americano and Estero de San Antonio as state marine protected areas.

B. The sanctuary will serve as the "lead agency" by requesting a working group of the sanctuary advisory council to pursue a multi-stakeholder effort that will involve the fishing industry, agricultural landowners, the STRAW Project, Friends of the Esteros, Environmental Action Committee of West Marin, the Sonoma Land Trust, the Marin Agricultural Land Trust (MALT), the CDFG, the California Coastal Conservancy, the RWQCB, and the CCA Program.

C. Work with agriculture industry and other user groups to pursue the implementation of best management practices (BMPs) in the Esteros.

Potential Partners: Fishing industry, agricultural landowners, the STRAW Project, Friends of the Esteros, Environmental Action Committee of West Marin, the Sonoma Land Trust, MALT, the California Coastal Conservancy, the RWQCB, and the CCA Program, CDFG

Product/ Outcome: An enhanced level of protection, in the form of a state marine protected area, that will preclude any municipal effluent discharges to sanctuary waters, and will result in a cooperative effort to improve water quality in the Esteros by diminishing non-point polluted runoff into these waterways. Protection of the endangered tidewater goby and the potential restoration of salmon and steelhead runs are also priorities.

Complementary Strategies: GFNMS FMP, Ecosystem Protection, STRATEGY FA-1, STRATEGY FA-2, STRATEGY EP-2; Water Quality, STRATEGY WQ-1, STRATEGY WQ-2, STRATEGY WQ-5; Introduced Species, STRATEGY IS-1, STRATEGY IS-2

GFNMS IMPACTS FROM FISHING ACTIVITIES

Timeline

Impacts From Fishing Activities Strategy	Year 1	Year 2	Year 3	Year 4	Year 5
Strategy FA-1: Develop a resource characterization to understand types and distributions of habitats, species, and processes.	→	→	→	→	→
Strategy FA-2: Develop a socioeconomic profile of fishing activities and communities in and adjacent to the sanctuary.	◆				
Strategy FA-3: Evaluate impacts from fishing activities on sanctuary resources.	→	→	→	→	→
Strategy FA-4: Develop management action(s) to address impacts from fishing activities on sanctuary resources.	→	→	→	→	→
Strategy FA-5: Bring public awareness to the relationship between maritime communities and healthy sanctuary waters.	·····	→	→	→	→
Strategy FA-6: Establish sanctuary representation at the PFMC and FGC meetings		·····	→	→	→
Strategy FA-7: Work with CBNMS and MBNMS to address impacts in the sanctuary from krill harvesting.	→ ◆				
Ecosystem Protection Timeline					
Strategy EP-1: Develop a resource protection plan (policy) to protect sensitive habitats, living resources and other unique sanctuary features.	·····	·····	→	→	→
Strategy EP-2: Create a standing "Living Resource and Habitat Protection" working group.	→	→	→	→	→
Strategy EP-3: Protect habitats that are known to be "special areas of concern."	·····	·····	·····	→	→

Legend:

→ **Ongoing Activity**

····→ **Planning Stage**

—◆ **Completed Activity**

GFNMS IMPACTS FROM FISHING ACTIVITIES

Budget

Strategy	Estimated Annual Cost (1000's)*					Total Est. 5-Year Cost (1000's)
	YR 1	YR 2	YR 3	YR 4	YR 5	
Strategy FA-1: Develop a resource characterization to understand types and distributions of habitats, species and processes	$396	$209	$250	$226	$280	$1,361
Strategy FA-2: Develop a socioeconomic profile of fishing activities and communities in and adjacent to the sanctuary	$110	$0	$0	$0	$0	$110
Strategy FA-3: Evaluate impacts from fishing activities on sanctuary resources	$4	$4	$4	$4	$4	$20
Strategy FA-4: Develop management action(s) to address impacts from fishing activities on sanctuary resources	$85	$30	$0	$0	$0	$105
Strategy FA-5: Bring public awareness to the relationship between maritime communities and healthy sanctuary waters	$25	$25	$25	$25	$25	$125
Strategy FA-6: Establish sanctuary representation at the PFMC and FGC meetings	$15	$10	$4	$4	$10	$25
Strategy FA-7: Work with CBNMS and MBNMS to address impacts in the sanctuary from krill harvesting	$10	$0	$0	$0	$0	$10
ECOSYSTEM PROTECTION						
Strategy EP-1: Develop a resource protection plan (policy) to protect sensitive habitats, living resources and other unique sanctuary features	$30	$30	$30	$32	$30	$152
Strategy EP-2: Create a standing "Living Resource and Habitat Protection" working group	$4	$4	$4	$5	$5	$22

Strategy	Estimated Annual Cost (1000's)*					Total Est. 5-Year Cost (1000's)
	YR 1	YR 2	YR 3	YR 4	YR 5	
Strategy EP-3: Protect habitats that are known to be "special areas of concern"	$0	$42	$44	$25	$22	$133
Total Estimated Annual Cost	$679	$354	$361	$321	$375	$2,090
The sanctuary's base budget is available each year from appropriated funds.						
There is both availability of and opportunity to receive additional funding from appropriated funds.						
The estimates do not take into account increasing personnel costs each year or inflation.						
The estimates do not take into account unexpected events or emergencies or unforeseen projects.						

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 a resource 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-2: Develop a socioeconomic profile of fishing activities and communities in and adjacent to the sanctuary.	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 fishing activities and fishing communities in and around the sanctuary.	Complete socioeconomic profile of fishing communities.	Sanctuary Superintendent, Living Resource and Habitat Protection Working Group and sanctuary advisory council.	Report on socio-economic Profile of Fishing Activities in the sanctuary.

Strategy Title(s)	Performance Goal	Desired Outcome (Objective)	Outcome Measure	How Measured	Who Measures	Output Measure
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.	Complete "compatible use" definition or threshold; complete compatibility index framework; develop series of management or policy response categories	Sanctuary Superintendent, Ecosystem Protection Working Group, sanctuary advisory council	Compatibility index matrix
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

Strategy Title(s)	Performance Goal	Desired Outcome (Objective)	Outcome Measure	How Measured	Who Measures	Output Measure
STRATEGY FA-6: Develop strategy to protect special areas of concern and species of concern.	To 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 boundary in order to protect cultural resources, to protect important natural resources, and to maintain biodiversity and the health and balance of the sanctuary.	Increase protection for Estero Americano and Estero de San Antonio.	Complete community-based recommendation on protection measures for the Esteros.	Sanctuary Superintendent and Ecosystem Protection Coordinator	
STRATEGY EP-1: Develop a Resource Protection Plan to minimize user conflicts and provide special areas of protection.	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, and 2) identify and evaluate impacts on sanctuary resources from fishing.	Minimize user conflicts and increase protection for unique sanctuary resources.	Complete evaluation and recommendations, as appropriate, for zonal management plan.	Sanctuary Superintendent, Ecosystem Protection Coordinator, Living Resource and Habitat Protection Working Group, sanctuary advisory council	

SITE-SPECIFIC ISSUE
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, GFNMS will take every opportunity to enhance prevention and improve response efforts to offset impacts from potential cumulative and catastrophic events.

ISSUE DESCRIPTION

Over 6,000 commercial vessels (excluding domestic fishing craft) enter and exit the San Francisco Bay every year. Approximately half of these vessels transit south off the coast of California, while the other half transit north or west of San Francisco. Less than 25 percent of the vessels are tankers of intermediate size (draft <50 feet) and about 5 percent are large vessels (draft >50 feet). Other vessels that transit between San Francisco and Los Angeles include: container ships, bulk carriers, chemical carriers, military vessels, research vessels, cruise ships, and tugs.

Historically, the total number of spills from 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. During recent years, approximately 2,000 commercial vessels have been reported using the southern approach shipping lane.

Large commercial vessels (LCVs) are of particular concern for spills because 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 2006 CA Energy Commission Staff Report, California produces approximately 250 million barrels and refines 675 million barrels of oil annually. There is considerable risk of vessel spills from oil tankers carrying Alaskan, Californian, and International oil up and down the California coast.

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, despite these laws and regulations, cruise ships are currently still able to discharge large volumes of untreated sewage and untreated graywater into the Sanctuary.

SIGNIFICANT RESOURCES AND IMPACTS FROM VESSEL SPILLS

GFNMS was designated in 1981 to protect significant concentrations of the following marine resources: 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 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 sanctuary are impacts on seabirds and marine mammals from 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 dependant 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. These include Ashy and Leach's Storm-Petrels; Brandt's, Pelagic, and Double-crested Cormorants, Western Gulls; Common Murres; Pigeon Guillemots; Cassin's Auklets; and Rhinocerous Auklets. Black Oystercatchers, a shorebird, also breed on the Farallon Islands.

Floating oil from vessel spills affects seabirds through ingestion, inhalation, the fouling of feathers, and causing irritation of eyes and membranes. 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.

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 28,000 in 2003. A small colony of six to twenty northern fur seals has recently resumed breeding on the South Farallon Islands during the summer. Prior to 1997, fur seals had not been known to breed on the Farallon Islands for over 170 years. 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.

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 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 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 1,500 individuals.

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.

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 4,000 to 5,000 residents.

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 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 Impacts

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 reefs and deeper subtidal areas. 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 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 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. King salmon and rockfish are 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 include 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 and marine plants and algae, such as barnacles, limpets, black turban snails, mussels, sea anemones, abalone, and urchins, which may be harvested as well.

The intertidal zone is an important breeding ground, spawning and feeding area for many marine organisms. Impacts from oil in the intertidal zone may include smothering of benthic biota, and fouling or poisoning of organisms.

A large oil spill in or near valuable fishing areas could pose a potentially serious threat to commercial and recreational industries such as fishing and wildlife viewing/tourism. 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 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 that sink could affect shellfish such as crabs or lobster and finfish such as flounders and sole.

JURISDICTIONAL SETTING

Oil Pollution Act

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, a 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.

U.S. 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 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 also allows for natural resource damage recovery and restoration by federal and state resource trustees.

Ports and Waterways Safety Act

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) consist of two mile-wide inbound and outbound vessel traffic lanes with a separations zone located in between. The lanes 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.

Department of Boating and Waterways

The California Department of Boating and Waterways (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 provides grants to cities, counties, and districts for developing small craft harbors/marinas, as well as loans to private recreational marinas.

Office of Spill Prevention and Response (OSPR)

OSPR was created within the California Department of Fish and Game (CDFG) by the OPA to be 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. 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.

Sanctuary Regulations

The sanctuary site-specific regulations addressing vessel spills in the GFNMS were under revision as a part of the management plan review. The draft regulations were available for review as a part of the Draft Management Plan/Environmental Impact Statement. The final regulations are included in the Final Management Plan and Final Environmental Impact Statement (FMP/FEIS).

VESSEL SPILLS IN THE GULF OF THE FARALLONES

1971	2 vessels collide under Golden Gate Bridge (840,000 gallons of Bunker C oil)
1984	*T/V PUERTO RICAN* (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 APEX HOUSTON* (oil barge, 20,000 gallons of oil between San Francisco and Long Beach, 9,000 birds including 6,000 Common Murres killed)
1990	Spill from San Francisco to Monterey County
1996	R/V *TEMPEST* (65' yacht off Dillon Beach)
1996	*SS CAPE MOHICAN* (estimated 96,000 gallons of oil, 7,000 birds killed)
1997-8	*SS JACOB LUCKENBACH*/ Point Reyes Tarball Incident (oil washes onto beaches from Salmon Creek to Pillar Point; sunk in 1952), later determined to be part of the *S/S JACOB LUCKENBACH* oil spill
1998	*T/V COMMAND* (3,000 gallons heavy crude or bunker oil, estimated 11,193 birds killed, 75 percent of which were Common Murres)
1990-2005	*SS JACOB LUCKENBACH*, clean up and removal of approximately 20 million gallons, occurred summer of 2002
2007	*C/V COSCO BUSAN* (53,000 gallon bunker oil spill in San Francisco Bay that spread into the sanctuary.)

VESSEL SPILLS GOAL

1. Minimize the risk to GFNMS' natural resources from spills, while allowing for the continuation of safe, efficient, and environmentally sound transportation.

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 GFNMS 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 GFNMS 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.

Potential Partners: NPS, MBNMS, USCG, Fleet Numerical, National Oceanic and Atmospheric Administration (NOAA) modelers/Hazardous Materials Response Division (HAZMAT), National Ocean Service (NOS) charting

Products: Updated drift analysis model

Complementary Strategies: GFNMS Final management Plan (FMP), Vessel Spills, STRATEGY VS-2, STRATEGY VS-3, STRATEGY VS-4

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. There are currently three models of the GFNMS region, however, none of them capture the fine-scale oceanographic processes.

A. Increase the number of Coastal Ocean Dynamic Applications Radar (CODAR) receiving stations around the Gulf of the Farallones. CODAR allows for the real

time observation of the evolution of surface currents. Work with partners to determine sites and data management.

B. Analyze historical data including satellite images and circulatory patterns on a fine scale. Conduct gap analysis and mine data for fine-scale (seasonal, monthly, weekly, 3-5 period) oceanographic model. Data should include:

1. Surface currents adjacent to ports
2. Fine-scale bathymetry of the continental shelf and slope, and
3. Satellite imagery for biological productivity (upwelling index, sea surface temperature, chlorophyll a)

C. Analyze Sea-viewing Wide Field of Vision (SeaWiF) satellite acquired ocean-color data indicating sea surface temperature and associated phytoplankton pigment (biological productivity).

D. Integrate all data into a comprehensive Web-based database with geographic information systems (GIS) capability (Sanctuaries Hazardous Incident Emergency Logistics Database System [SHIELDS]).

E. Integrate new fine-scale oceanographic circulation model into spill and drift model and use as a decision-making tool for HAZMAT and the Area Contingency Plan (ACP).

Potential Partners: Research institutions such as Moss Landing Marine Laboratories (MLML), Bodega Marine Laboratory (BML), San Francisco State University (SFSU), United States Geological Survey (USGS), California Coastal Conservancy, Coastal Services Center, Cordell Bank National Marine Sanctuary (CBNMS), National Marine Sanctuary Program (NMSP), NOAA HAZMAT, Monterey Bay Aquarium Research Institute (MBARI), Scripps Institute of Oceanography, Central California Ocean Observing Systems (CeNCOOS), NOAA Scientific Support Coordinator, Ford Consulting Inc., The National Centers for Coastal Ocean Science (NCCOS)

Products: Improved Spill and Drift Analysis Model, Web-based GIS

Complementary Strategies: GFNMS FMP, Vessel Spills, STRATEGY VS-1, STRATEGY VS-3, STRATEGY VS-4; Conservation Science, STRATEGY CS-4, CS-5, CS-6

STRATEGY VS-3: ***Evaluate vessel activities in GFNMS as a first step to assessing the risk of spills in the sanctuary.***

Activity 3.1 Profile vessel activities within the Gulf of the Farallones.

A. Hire a contractor to collect and compile data on types of vessels, traffic patterns, and last/next port of call for vessels transiting through GFNMS. Investigate use of San Francisco VTS data.

B. Use data and report from vessel activities profile for risk assessment study.

Potential Partners: USCG, Marine Exchange, Port of Oakland, Port of San Francisco, California Department of Boating and Waterways (CDBW) (licensing info), MBNMS

Products: Report A (Vessel Activities Profile)

Complementary Strategies: GFNMS FMP, Vessel Spills, STRATEGY VS-1, STRATEGY VS-2, STRATEGY VS-3; Water Quality, STRATEGY WQ-4

Activity 3.2 Based on existing vessel traffic and risk assessment reports, determine potential risks to GFNMS and develop report.

A. Identify relevant studies, including:

1. Drift groundings
2. Power groundings
3. Collisions
4. Discharge (bilge or ballast) locations and frequency of use
5. Wildlife harassment

B. Look at causal chain of events and evaluate based on Gulf of the Farallones qualities.

C. Build upon Profile of Vessel Activities Report (Report A- see STRATEGY VS-3.1).

D. Use Volpe's risk analysis for Puget Sound as a model.

Potential Partners: SF Harbor Safety Committee, California Coastal Commission (CCC), OSPR, USCG, HAZMAT, MBNMS, Farallones Marine Sanctuary Association (FMSA), National Marine Fisheries Service (NMFS) Marine Mammal Commission

Products: Report B (Risk Assessment)

Complementary Strategies: GFNMS FMP, Vessel Spills, STRATEGY VS-1, STRATEGY VS-2, STRATEGY VS-3; Water Quality, STRATEGY WQ-4; Conservation Science STRATEGY CS-4

STRATEGY VS-4: ***Evaluate recent vessel routing changes related to MBNMS vessel traffic study.***

Activity 4.1 Evaluate how the vessel routing adjustments have affected GFNMS, what lessons have been learned, and what improvements could be made.

A. Collect historic data from MBNMS to use as baseline data.

B. Examine current Vessel Traffic System (VTS) data from USCG, collect information from Automated Identification System (AIS) if available, and partner with Olympic Coast National Marine Sanctuary (OCNMS) or Washington State Coast Guard to analyze. Determine if revised lanes are being used correctly and, if not, then determine if a correction needs to occur (i.e., education, send information to Port Access Route Studies [PARS]).

C. Using data, determine if there is increased risk to islands as a result of the VTS routing changes.

D. Make recommendations to USCG based on findings of the evaluation prior to port access route studies.

Potential Partners: MBNMS, USCG, Fleet Numerical
Product: Evaluation Report
Complementary Strategies: GFNMS FMP, Vessel Spills, STRATEGY VS-1

STRATEGY VS-5: ***Track distribution and numbers of species of concern and habitats in relation to probable spill trajectories.***

Activity 5.1 Refine resources-at-risk model analysis for Gulf of the Farallones. The resources-at-risk model tracks the distribution and numbers of sensitive species and habitats in relation to probable spill trajectories.

A. The (Office of) Oil Spill Prevention and Response (OSPR) and United States Fish and Wildlife Service's (USFWS) contractor will integrate products from spill and drift analysis (see STRATEGY VS-3) into an updated resources-at-risk model.

B. Use updated resources-at-risk model as a decision-making tool for improving response activities by integrating data into SHIELDS system.

Potential Partners: NOAA HAZMAT, OSPR, PRBO Conservation Science (Point Reyes Bird Observatory) (PRBO), The Marine Mammal Center (TMMC), CDFG, Glen Ford Consulting, NOAA Scientific Support Coordinator, USFWS, CBNMS, MBNMS, CeNCOOS, BML, SFSU, NOAA Office of Response and Restoration (ORR)
Products: Updated model, Report C
Complementary Strategies: GFNMS FMP, Vessel Spills, STRATEGY VS-2, STRATEGY VS-3, STRATEGY VS-7, STRATEGY VS-8

Activity 5.2 Modify the Sanctuary Ecosystem Assessment Surveys (SEA Surveys) 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. SEA Surveys will: (1) systematically survey and assess the distribution and abundance of marine birds, mammals, and krill. The primary region of interest is within GFNMS, north to the Russian River and west to the Farallon Escarpment; (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
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 damage assessment

Potential Partners: NMFS, Minerals Management Service (MMS), USGS, CDFG, Center for Integrated Marine Technology (CIMT), National Oceanographic Data Center (NODC), SHIELDS, OCNMS, CBNMS, Channel Islands National Marine Sanctuary (CINMS), PRBO, NMSP, CeNCOOS

Complementary Strategies: GFNMS FMP, Ecosystem Protection, STRATEGY FA-1, STRATEGY FA-3, STRATEGY FA-4; Introduced Species, STRATEGY IS-2; Vessel Spills, STRATEGY VS-2, STRATEGY VS-4, STRATEGY VS-6, STRATEGY VS-7, STRATEGY VS-8, Conservation Science, STRATEGY CS-1, CS-4

STRATEGY VS-6: ***Participate in Area Contingency Planning to address risks to sanctuary resources.***

Activity 6.1 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.

Potential Partners: CCC, OSPR, NOAA HAZMAT

Products: Improved RRP and ACP

Complementary Strategies: GFNMS FMP, Vessel Spills, STRATEGY VS-1, STRATEGY VS-2, STRATEGY VS-4, STRATEGY VS-5, STRATEGY VS-8; Conservation Science, STRATEGY CS-1, CS-4, CS-6

STRATEGY VS-7: ***Revise GFNMS in-house emergency response plan.***

Activity 7.1 Revise tasks and responsibilities for GFNMS in the event of a vessel spill in the sanctuary (also see Administration recommendations).

A. Participate in ACP drills and test in-house communication and response equipment including database connections and mapping GIS capabilities.

Potential Partners: CBNMS, MBNMS

Products: Updated in-house emergency response plan

Complementary Strategies: GFNMS FMP, Vessel Spills, STRATEGY VS-1, STRATEGY VS-2, STRATEGY VS-4, STRATEGY VS-5

STRATEGY VS-8: ***Continue to improve integration of GFNMS Beach Watch and SEA Survey data into Area Contingency Plan.***

Activity 8.1 Enhance Integration of Beach Watch and SEA Survey data into the ACP. The ACP is currently based on five- to ten- year-old data. Regularly integrate Beach Watch results to strengthen the ACP 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. Link Beach Watch and SEA Survey data to incident command on a real-time basis to inform decision making. Ideally, data would be available by Web-based GIS.

C. Link Beach Watch and SEA Surveys with SHIELDS to provide real-time data and mapping of sensitive resources to incident command and unified command.

Potential Partners: FMSA, OSPR, California Academy of Sciences (CAS), TMMC, USCG, MBNMS, Oiled Wildlife Care Network, NODC, MBNMS/Sanctuary Integrated Monitoring Network (SIMoN), SHIELDS, Ford Consulting Inc., NPS, CeNCOOS/CIMT, CBNMS

Products: Web-based GIS with online data entry

Complementary Strategies: GFNMS FMP, Vessel Spills, STRATEGY VS-6, STRATEGY VS-5, STRATEGY VS-7

STRATEGY VS-9: ***Conduct outreach to mariners to increase stewardship of the sanctuary, including voluntary compliance with Vessel Traffic System (VTS) and sanctuary regulations.***

Activity 9.1 Develop outreach plan based on results of vessel activities profile, risk assessment, and resources-at-risk assessment (see STRATEGIES VS-3, VS-4, and VS-6) 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.

Potential Partners: MBNMS, USCG, California Department of Boating and Waterways (CDBW), Coast Guard Auxiliary

Products: Sanctuary regulations in *Coast Pilot*, fliers, bulletins

Complementary Strategies: GFNMS FMP, Vessel Spills, STRATEGY VS-3, STRATEGY VS-4, STRATEGY VS-6, STRATEGY VS-11, STRATEGY VS-12; Water Quality, STRATEGY WQ-2

Activity 9.2 Provide information about the sanctuary to maritime industry, fishing and recreational boating communities. Mariners may not be familiar with the attributes of GFNMS and providing mariners with information on the sanctuary will allow them to be informed and make good decisions, increasing compliance with sanctuary regulations and ultimately reducing impacts to sanctuary resources.

A. Work with Coast Survey and NOAA Marine Protected Areas Center to publish information about the sanctuary in the *Coast Pilot*.

B. Develop Web-based, shore-side, real-time kiosk with information about the sanctuary as well as links to weather conditions and advisories.

C. Give presentations specifically targeted to mariner groups.

Potential Partners: Coast Survey (lead), NOS MPA Center

Products: Sanctuary regulations in *Coast Pilot*, fliers, bulletins

Complementary Strategies: GFNMS FMP, Introduced Species, STRATEGY IS-9, Vessel Spills, STRATEGY VS-10, STRATEGY VS-12; Water Quality, STRATEGY WQ-2

STRATEGY VS-10: Increase regular communication between GFNMS and maritime trade industry.

Activity 10.1 Recruit maritime trade industry member for GFNMS Sanctuary 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.

Potential Partners: Maritime trade industry

Complementary Strategies: GFNMS FMP, Vessel Spills, STRATEGY VS-9, STRATEGY VS-11

STRATEGY VS-11: ***Select a sanctuary representative to participate in regional forums for addressing vessel traffic issues.***

Activity 11.1 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 SHIELDS and regional monitoring programs such as SEA Surveys.

Potential Partners: Regional Response Team, Area Committee, Harbor Safety Committee

Complementary Strategies: GFNMS FMP, Vessel Spills, STRATEGY VS-10, STRATEGY VS-12

STRATEGY VS-12: ***Create a standing vessel spills working group to advise the sanctuary on implementation of proposed action plans.***

Activity 12.1 Create a vessel spills working group of the sanctuary advisory council.

A. Recommend to council that a vessel spills working group be created. If sanctuary advisory council supports this recommendation, the sanctuary will support creation of the group by providing staff time and support.

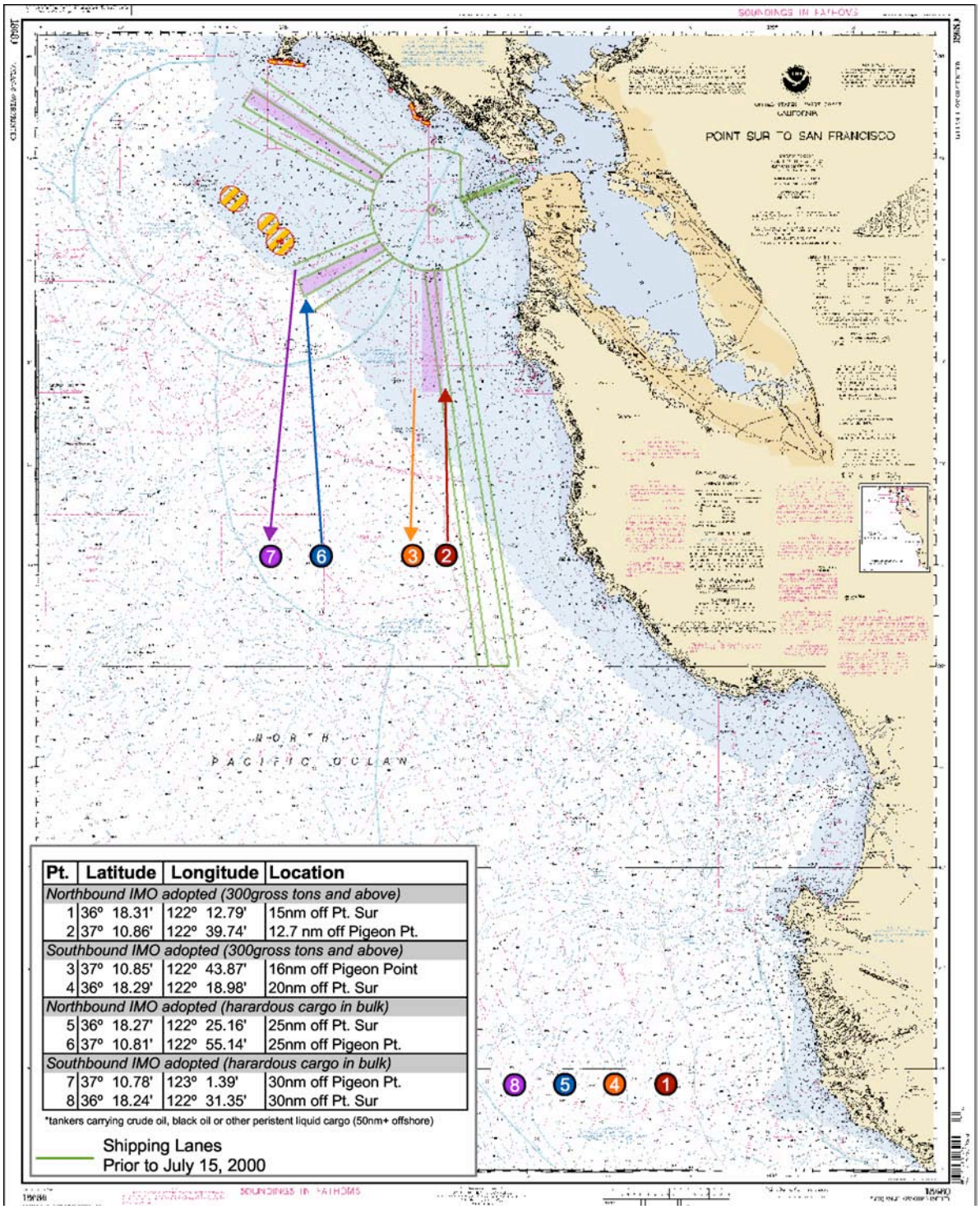
B. The vessel spills working group will make recommendations on implementation of proposed action plans, review effectiveness, advise on future direction, and report findings to the sanctuary advisory council.

Potential Partners: USCG, NOAA Scientific Support Coordinator, OSPR, NOS (NOAA Regional Representative), oceanographers, non-governmental organizations (NGOs), NPS, maritime Industry, fishing Industry

Products: Annual Report to sanctuary advisory council (SAC)

Complementary Strategies: GFNMS FMP, Vessel Spills, STRATEGY VS-9, STRATEGY VS-10, STRATEGY VS-11, Ecosystem Monitoring, STRATEGY XEM-4.

Vessel Traffic Recommended Lanes Map



Pt.	Latitude	Longitude	Location
Northbound IMO adopted (300gross tons and above)			
1	36° 18.31'	122° 12.79'	15nm off Pt. Sur
2	37° 10.86'	122° 39.74'	12.7 nm off Pigeon Pt.
Southbound IMO adopted (300gross tons and above)			
3	37° 10.85'	122° 43.87'	16nm off Pigeon Point
4	36° 18.29'	122° 18.98'	20nm off Pt. Sur
Northbound IMO adopted (harardous cargo in bulk)			
5	36° 18.27'	122° 25.16'	25nm off Pt. Sur
6	37° 10.81'	122° 55.14'	25nm off Pigeon Pt.
Southbound IMO adopted (harardous cargo in bulk)			
7	37° 10.78'	123° 1.39'	30nm off Pigeon Pt.
8	36° 18.24'	122° 31.35'	30nm off Pt. Sur

*tankers carrying crude oil, black oil or other peristent liquid cargo (50nm+ offshore)

Shipping Lanes
Prior to July 15, 2000

GFNMS IMPACTS FROM VESSEL SPILLS FIVE-YEAR

Timeline

Impacts From Vessel Spills Strategy	Year 1	Year 2	Year 3	Year 4	Year 5
STRATEGY VS-1: Expand MBNMS drift analysis model up to Point Arena and Mendocino.					
STRATEGY VS-2: Refine spill and drift model to increase accuracy of risk assessments.					
STRATEGY VS-3: Evaluate vessel activities in the GFNMS as a first step to assessing the risk of spills.					
STRATEGY VS-4: Evaluate recent vessel routing changes related to the MBNMS vessel traffic study.					
STRATEGY VS-5: Track distribution and numbers of species of concern and habitats in relation to probable spill trajectories.					
STRATEGY VS-6: Participate on regional response team to address risks to sanctuary resources.					
STRATEGY VS-7: Revise GFNMS in-house emergency response plan.					
STRATEGY VS-8: Continue to improve integration of GFNMS Beach Watch and Sanctuary Ecosystem Assessment Surveys (SEA Surveys) data into Area Contingency Plan.					
STRATEGY VS-9: Outreach to mariners to increase stewardship of the sanctuary, including voluntary compliance with Vessel Traffic System (VTS) and sanctuary regulations.					
STRATEGY VS-10: Provide better communication between GFNMS and maritime trade industry.					
STRATEGY VS-11: A sanctuary representative should participate in regional forums for addressing vessel traffic issues.					
STRATEGY VS-12: Create a standing vessel spills working group.					

Legend:

Ongoing Activity

Planning Stage

Completed Activity

GFNMS IMPACTS FROM VESSEL SPILLS

Budget

Strategy	Estimated Annual Cost (1000's)*					Total Est. 5-Year Cost (1000's)
	YR 1	YR 2	YR 3	YR 4	YR 5	
STRATEGY VS-1: Expand MBNMS drift analysis model	$0	$10	$0	$0	$0	$10
STRATEGY VS-2: Improve spill and drift model to increase accuracy of risk assessments	$0	$0	$0	$14	$14	$28
STRATEGY VS-3: Evaluate vessel activities in the GFNMS as a first step to assessing the risk of spills in the sanctuary	$0	$72	$76	$56	$56	$260
STRATEGY VS-4: Evaluate recent vessel routing changes related to the MBNMS vessel traffic study	$0	$10	$0	$0	$0	$10
STRATEGY VS-5: Track distribution and numbers of species of concern and habitats in relation to probable spill trajectories	$0	$0	$0	$0	$0	$0
STRATEGY VS-6: Participate on regional response team	$6.5	$6.5	$6.5	$6.5	$6.5	$32.5
STRATEGY VS-7: Revise GFNMS in-house emergency response plan	$10.5	$0.5	$0.5	$0.5	$0.5	$12.5
STRATEGY VS-8: Integration of Beach Watch and SEA Surveys data into Area Contingency Plan	$99	$88	$84	$118	$84	$473
STRATEGY VS-9: Outreach to mariners to increase stewardship of the sanctuary	$15	$15	$15	$15	$15	$75
STRATEGY VS-10: Better communication between GFNMS and maritime trade industry	$0	$5	$0	$0	$0	$5
STRATEGY VS-11: Participate in regional forums for addressing vessel traffic issues	$10	$7	$5	$5	$5	$32

Strategy	Estimated Annual Cost (1000's)*					Total Est. 5-Year Cost (1000's)
	YR 1	YR 2	YR 3	YR 4	YR 5	
STRATEGY VS-12: Vessel spills working group	$4	$4	$4	$4	$4	$20
Total Estimated Annual Cost	$145	$218	$191	$219	$185	$958
The sanctuary's base budget is available each year from appropriated funds.						
There is both availability of and opportunity to receive additional funding from appropriated funds.						
The estimates do not take into account increasing personnel costs each year or inflation.						
The estimates do not take into account unexpected events or emergencies or unforeseen projects.						

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-2: Refine spill and drift model to increase accuracy of risk assessments. STRATEGY VS-3: Evaluate vessel activities in the GFNMS as a first step to assessing the risk of spills.	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 worse 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 drift analysis model 2) Vessel activities profile 3) Risk assessment report
STRATEGY VS-5: 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) Monthly map depicting distribution and abundance of sentinel species and vessel type and activity

Strategy Title(s)	Performance Goal	Desired Outcome (Objective)	Outcome Measure	How Measured	Who Measures	Output Measure
STRATEGY VS-6: Participate on regional response team to address risks to sanctuary resources. STRATEGY VS-7: Revise GFNMS in-house emergency response plan. STRATEGY VS-8: Continue to improve integration of Beach Watch and SEA Surveys data into Area Contingency Plan.	Minimize the risk to GFNMS' natural resources from spills, while allowing for the continuation of safe, efficient and environmentally sound transportation.	Review current response programs and identify areas of improvement, focusing on GFNMS resources at risk.	Increase effectiveness in responding to an emergency spill in order to reduce impacts on sanctuary resources.	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 plan. 2) Provide on-going training and practice drills for staff.	Sanctuary Superintendent, Research Coordinator, Ecosystem Protection Coordinator	1) Technical data summary 2) Peer reviewed articles 3) ACP post-drill report