# Chapter 4:
# Affected Environment

This chapter describes the environmental, human, and socioeconomic setting for the proposed action. The description of the affected environment focuses on the resources most likely to be affected by the specific field activities, management actions, and regulatory changes being considered in the alternatives. For more information about the history and current status of Monterey Bay National Marine Sanctuary (MBNMS) and the sanctuary resources, see:

- MBNMS 2015 Condition Report Partial Update: A New Assessment of the State of the Sanctuary Resources
- Final Environmental Impact Statement (EIS) for the 2008 Joint Management Plan Review (2008)

## *4.1 Physical Setting*

The physical setting of the sanctuary is the structural and dynamic foundation for its biological processes. Through the physical setting and the linkages between its geography, geology, and oceanography, regional and large-scale ecosystem processes connect with and directly impact local productivity and biodiversity patterns in the sanctuary.

### 4.1.1 Geography, Geology, and Oceanography

MBNMS extends from Rocky Point, California (7 miles north of the Golden Gate Bridge) in the north to Cambria in the south, covering a shoreline length of approximately 276 miles. Geologic features in MBNMS include rocky shores, sandy beaches, estuaries, bays, lagoons, islands, pinnacles, ridges, underwater canyons, an underwater mountain, the continental shelf, the slope, and the abyssal plain, which reaches depths of 12,743 feet. Bottom types on the continental shelf include the sand and mud sediments, rocky and mud outcrops, and rocky reefs. Some of the seafloor features of MBNMS include cold seeps, underwater canyons, an underwater seamount formed from an ancient volcano, earthquake faults, and fossils. Coastal topography varies greatly, encompassing steep bluffs with flat-topped terraces and pocket beaches to the north; large sandy beaches bordered by cliffs and large dunes in the central area; and predominantly steep, rocky cliffs to the south. Low- to high-relief mountain ranges and broad, flat-floored valleys are prevalent farther inland.

MBNMS resides within one of four eastern boundary current upwelling centers worldwide. Coastal upwelling occurs along the western edges of continents, where winds from the northwest drive oceanic surface waters away from shore due to the Coriolis effect. Shallow, relatively warm waters are replaced by deep, cold, and nutrient-rich water. The cold water increases primary productivity, allowing phytoplankton to bloom, which in turn supports zooplankton. This process provides a key prey resource for higher-order predators such as fishes, birds, and whales. Globally, these upwelling regions rival the productivity of tropical rain forests and account for nearly 95% of the annual global production of marine biomass, despite only representing 0.1% of the ocean's total surface area.

MBNMS contains one of the world's most geologically diverse and complex seafloors and continental margins. MBNMS is characterized by its deep underwater canyons, the largest of which is the Monterey Canyon. The deepest point of MBNMS lies within the Davidson Seamount Management Zone and is 12,743 feet deep. MBNMS lies along the San Andreas fault system, consisting of the Hayward-Calaveras and San Andreas fault zones on land, and the Palo Colorado-San Gregorio fault zones offshore. This is an active tectonic region with common occurrences of earthquakes, submarine landslides, turbidity currents, flood discharges, and coastal erosion. The Monterey Canyon cuts across the north-south trending faults in Monterey Bay, and is the result of tectonic activity occurring since subduction of the Pacific Plate ceased and transform motion began, about 21 million years ago. The canyon has also been shaped by landslides and turbidity currents created by mass wasting events. These events steepened the canyon's walls, exposed basement and bedrock, and eroded the canyon (NOAA ONMS, 2002).

Near the southwest corner of MBNMS is Davidson Seamount, an ancient volcano that last erupted 9.8 million years ago. This pristine undersea mountain habitat is located 80 miles to the southwest of Monterey and 75 miles west of San Simeon. Davidson Seamount is one of the largest known underwater mountains in U.S. coastal waters; it is 26 miles long, 8 miles wide, and rises 7,480 feet from the ocean floor, with its summit at 4,101 feet below the sea surface.

The oceanographic setting in MBNMS is shaped by the California Current and the Davidson Current, with seasonal upwelling in localized areas off Año Nuevo and Point Sur. When upwelling ceases at the end of summer (typically August or September), sea level along the coast and inside Monterey Bay rises and the California Current slows. Sea surface temperatures along the coast may rise markedly. Later in the year (typically November) when winter storms bring occasional strong southerly winds, transport is shoreward, and in places the surface current becomes northerly. Some authors refer to this northward-flowing current as the Davidson Current, and others recognize it as the surfacing of the California Undercurrent. This flow is a deep coastal boundary current with a core depth of about 820 feet during spring and summer, and has speeds that can be as strong as the surface California Current. Wind-driven upwelling does not normally occur within Monterey Bay due to the topographic break of the coastal mountains afforded by the Salinas Valley. However, some upwelled water may be transported into the bay from areas to the south of Año Nuevo (NOAA ONMS, 2002).

Longer-term oceanographic variations also occur in MBNMS, including sporadic El Niño Southern Oscillation events and Pacific Decadal Oscillation, both of which influence and interact with climate change, and marine heatwaves. These phenomena affect local physical and biological systems. In the central-north coast region of California, these events are marked by the warming of nearshore waters due to equatorial Pacific trade winds relaxing. The onshore and northward flow increases, and coastal upwelling of deep, nutrient-rich water diminishes. Pacific Decadal Oscillation events are known to occur every 20 to 30 years, with the most recent event occurring in 1998. These events occur when the surface waters of the central and northern Pacific Ocean shift several degrees from the mean water temperature. The waters off the California coast have warmed significantly over the last forty years, possibly as a result of global warming or interdecadal climate shift (NOAA NCCOS, 2003).

## 4.1.2 Water Quality

The area of interest for water quality extends beyond the sanctuary's boundaries due to the fluid nature of the marine environment and freshwater inputs from nearby rivers and tributaries. The area of interest includes oceanic waters within MBNMS, the marine areas adjacent to MBNMS, including the oceanic waters of Greater Farallones and Cordell Bank national marine sanctuaries, and the watersheds contributing to the chemical composition in MBNMS. This includes San Francisco Bay, Elkhorn Slough, and more than 100 coastal rivers and streams draining from approximately 7,000 square miles of watersheds in the region. The major freshwater sources are the Sacramento and San Joaquin rivers that enter MBNMS through the San Francisco Bay.

### *4.1.2.1 Land-Based Pollution*

The offshore waters of the sanctuary are considered to be of relatively good quality. This is primarily attributed to the lack of urbanization along much of the San Mateo and Big Sur coastlines. Meanwhile nearshore waters are in comparatively worse condition because they are affected by land-based nonpoint source pollution from anthropogenic sources. Livestock grazing, agriculture, and urban areas are primary sources of land-based nonpoint source pollution affecting MBNMS. The threat of these nonpoint source pollutants is relatively minor for most of the coastal marine area due to large distances from pollution sources and the strong circulation patterns of the Pacific Ocean. However, the discharge of the San Francisco Bay Estuary is a threat to the water quality of MBNMS. By far, the largest sources of nutrients and persistent organic pollutants to Monterey Bay come from large watersheds primarily comprised of agriculture operations and the five wastewater treatment plants discharging to MBNMS. Other sources of land-based pollution of nearshore waters in MBNMS include runoff from urban areas due to aging sewer infrastructure systems, flows from creeks and rivers, and other unknown or unidentified sources. Concentration of microbial contaminants in nearshore waters has resulted in numerous beach warnings in MBNMS.

The waters of Monterey Bay close to shore contain numerous legacy pesticides such as organochlorine pesticides, Dieldrin, polychlorinated biphenyls (PCBs), and dichlorodiphenyltrichloroethane (also known as DDT), as well as chemical products in current use such as organophosphate pesticides and polynuclear aromatic hydrocarbons (PAHs). The largest source of these contaminants is agricultural runoff into the San Lorenzo, Pajaro, and Salinas rivers. Seasonal data collected by the Central Coast Long-term Environmental Assessment Network (CCLEAN) between 2001 and 2017 indicate numerous instances where water quality criteria and human health alert levels have exceeded the California Ocean Plan due to the presence of contaminants in nearshore waters and sediment of Monterey Bay. Annual data collected from 2004 to 2017 indicate that waters of Monterey Bay exceeded the Ocean Plan's PCB water quality objective for most of the years between 2004 and 2017 with the highest concentrations observed since 2010 (CCLEAN, 2018).

Monterey County Water Resources Agency operates and maintains drainage facilities in 14 drainage maintenance zones and districts throughout Monterey County. The stormwater drainage system is composed of approximately 57 miles of drainage ways (e.g., streams, drainage ditches, and drainage channels); eight pump stations; nine miles of river levees; two

large earthen dams; and numerous culverts, tide gates, and concrete structures (MCWRA, 2019). In addition, each municipality maintains its own sanitary sewer and stormwater conveyance infrastructure and natural drainage courses for their jurisdictions.

The Salinas Valley is a major vegetable and berry growing area in the U.S., with vegetable crops topping $3.2 billion and fruit and nut crops topping $1.1 billion in revenues in Monterey County (MCAC, 2016). Despite the agricultural productivity of this region, little is known about the agricultural use and disposal of plastic, the prevalence of recycling, nor the environmental fate and ecological effects of macro and microplastics in Salinas Valley rivers or MBNMS. Irrigated agriculture applies plastics in the field for a variety of purposes including as a mulch for weed control, in drip irrigation systems, as a fumigation tarp, coverings over hoop houses, or as a liner in ditches to prevent erosion. The use of plastics in agriculture increases yields, reduces reliance on herbicides and pesticides, increases efficiency of water use, extends the growing season and decreases disease (Kyrikou and Briassoulis, 2007). However, most plastic does not degrade and waste can end up in landfills, be buried in the soil, or it can be recycled. These plastics can also eventually enter MBNMS and compromise water quality within the sanctuary.

#### *4.1.2.2 Vessel Discharges*

During the course of normal operations, seagoing and coastal transiting vessels produce a multitude of wastes, which, when discharged into the marine environment even when operating under typical conditions and meeting compliance standards, can influence the water quality of MBNMS. The marine vessels that operate in or transit through MBNMS include a wide array of boats and motorized personal watercraft that are used in both commercial, research, public safety, and recreational activities. Operating vessels requires the use of various hazardous materials and generates hazardous wastes. Pollutants that have the potential to be discharged in the water include: oil, hydrocarbons, hazardous wastes, volatile organic compounds (VOCs), and sewage. These substances can be toxic or carcinogenic to marine life.

The Resource Conservation and Recovery Act requires that vessels that generate or transport hazardous waste offload these wastes at treatment or disposal facilities (NOAA ONMS, 2003a, 2003b, 2003c). In addition, MBNMS regulations prohibit discharging or depositing from within or into the sanctuary any material or other matter from vessels that is not specifically excepted by sanctuary regulations. These prohibitions reduce the potential for discharges of sewage, gray water, bilge water, ballast water, hazardous wastes, and solid wastes from vessels operating in or transiting through the sanctuary.

The volume of discharges from large cruise ships transiting through MBNMS is of particular concern. Cruise ships regularly transit sanctuary waters and embark at ports within the San Francisco and Monterey bays. Up to 80 cruise ships visit San Francisco Cruise Terminal each year with the majority transiting through MBNMS either before or after the visit. Cruise ship visits to this area are likely to continue as the fleet shifts from international to more domestic cruises, and due to the new cruise ship docking facility in San Francisco Bay. Cruise ships transiting through the sanctuary have a potential for waste generation of up to 11 million gallons per ship per day.

NOAA conducted a detailed analysis of cruise ship activity in MBNMS and discharges during the 2008 sanctuary management plan review process. The 2008 final EIS associated with this

action contains a detailed discussion of these activities and associated impacts on sanctuary resources (NOAA ONMS, 2008). The MBNMS regulations define a cruise ship as "a vessel with 250 or more berths for hire." In 2008, NOAA amended the MBNMS regulations to prohibit the discharging or depositing from within or into the MBNMS any material or other matter from a cruise ship except engine cooling water, clean vessel generator cooling water, vessel engine or generator exhaust, clean bilge water, or anchor wash (15 CFR § 922.132(a)(2)(ii)). Cruise ships making port calls inside the sanctuary are periodically boarded by U.S. Coast Guard and NOAA staff to ensure compliance with this discharge regulation. Passenger vessels that contain privately-owned residential spaces are not currently subject to sanctuary regulations restricting discharges from cruise ships.

In addition, despite existing vessel discharge prohibitions, accidental spills from cruise ships and vessels occurring within or outside the sanctuary pose a persistent threat to water quality. Spills occurring far offshore, particularly near high-use shipping lanes, have the potential to severely impair water quality. In the event of an oil spill, the severity of the impact on the sanctuary would depend on the spill location and the wind and sea conditions (NOAA ONMS, 2003a, 2003b, 2003c).

#### *4.1.2.3 Historic Dumping, Dredge Disposal, and Beach Nourishment*

Hundreds of millions of tons of hazardous and nonhazardous waste have historically been dumped on the continental shelf and slope in MBNMS, particularly outside of the San Francisco Bay. These wastes include industrial wastes from oil refineries, steel production, and other sources; munitions and ships from World War II; unwanted and capsized vessels; and barrels of low-level radioactive waste. Many ships and aircraft are scattered on the seafloor of MBNMS, although most of these ships and aircraft are not sources of hazardous contamination (MBNMS 2009 Condition Report).

In addition, local harbors adjacent to MBNMS regularly dredge harbor bottoms and dispose of dredge sediments in multiple possible locations: in the ocean, on land at landfill sites, or at designated beach nourishment sites. Dredge materials can contain a variety of hazardous materials including mercury and other heavy metals, chlorinated pesticides, PCBs, and PAHs. Disposing dredged material in the ocean may impact the marine environment by temporarily increasing water column turbidity and depositing other persistent contaminants into the sediment, water column, and food chain.

Since at least 1959, dredging activities, mostly in Santa Cruz and Moss Landing harbors, have disposed of dredged sediments in the area now designated as MBNMS. When NOAA designated MBNMS in 1992, the sanctuary regulations prohibited the establishment of new dredge disposal sites within the sanctuary. However, sites in use and permitted before designation of MBNMS are still authorized. Santa Cruz, Monterey, and Moss Landing harbors conduct regular dredging of the bottom of their harbors and dispose of the bulk of their dredge sediments within MBNMS at four designated dredge disposal sites: SF-12 and SF-14 (offshore sites) and Twin Lakes State Beach and Monterey Harbor (onshore sites). The location and use of these four sites are summarized below.

Table 4. Dredge Disposal Activities at Designated Sites in Monterey Bay National Marine Sanctuary and Beneficial Use Activities in Areas Above Mean High Water Line (Outside MBNMS)

| Name of disposal site | Location of disposal site | Permittee and use of site | Volume of material disposed |
|---|---|---|---|
| **SF-12** | 50 yards off the beach near Moss Landing Harbor at the head of the Monterey Canyon | Moss Landing Harbor; material piped from harbor to the disposal site | Historically: up to 50,000 to 150,000 cubic yards per year |
| **SF-14** | A deepwater site 2.3 miles west of Moss Landing Harbor | Rarely used due to the need for a barge and the associated expense | In 2012, the U.S. Army Corps of Engineers dredged the federal entrance of Moss Landing Harbor and disposed of 12,600 cubic yards of shoaled material from the Federal Entrance Channel. |
| **Moss Landing Beach** | An area above mean high water up to 600 yards south from the south entrance jetty and north from the north entrance jetty to the limit of harbor district jurisdiction | Moss Landing Harbor | In 2019, multiple agency approvals permitted dredging of up to 550,000 cubic yards of sediment over a 10-year period, with a dredging cap of no more than 80,000 cubic yards in any given year. Sediments greater than or equal to 80% sand composition could be placed on harbor beaches. Sediments less than or equal to 80% sand composition had to be placed at SF-12 or SF-14. |
| **Twin Lakes State Beach** | Harbor-adjacent beaches and the surf zone in Santa Cruz Harbor | Santa Cruz Harbor | Up to 2,560,000 cubic yards of sandy entrance channel sediment over 10 years<br><br>Up to 20,000 cubic yards per year of sandy inner harbor sediment<br>OR<br>Up to 10,000 cubic yards per year of sandy inner harbor sediment **AND** 10,000 cubic yards per year of finer-grained inner harbor sediment (at a rate not to exceed 550 cubic yards of silts and clays per day<br><br>Up to 35,000 cubic yards of inner harbor sediment at an upland site or at a federally approved offshore disposal site over a 10-year period |
| **Monterey Harbor** | Within Monterey Harbor adjacent to Wharf 2; and an area above mean high water at Del Monte Beach | Monterey Harbor | Historically, up to 10,000 cubic yards of dredged sediment annually |

Due to human reshaping of coastal environments (e.g., the creation of artificial harbors, river/stream diversion, shoreline armoring, installation of piers and jetties), longshore sediment transport patterns can become altered or interrupted. This, in turn, can lead to accelerated accretion or erosion of beaches. Whenever a fixed and hardened object is placed at the shoreline, it often interrupts natural sediment transport patterns and can block a beach downcoast from receiving sand needed to offset sediment stripped from that beach by daily waves, tides, and currents. In such cases, the beach loses equilibrium and begins to erode, allowing ocean waters to encroach on formerly backshore areas, threatening coastal ecosystems and infrastructure (NOAA ONMS, 2016). Equilibrium can be restored to the beach by artificially supplying sediment equal to the volume and composition of sediment normally supplied by natural processes. This is known as "beach nourishment." It is essentially a corrective engineering measure to restore balance to the sediment budget for a given beach.

Some dredged sediment is used for beach nourishment along shorelines adjacent to MBNMS. Beach nourishment is the introduction of sand onto a beach in order to supplement a decreased supply of sand due to coastal erosion or seasonal beach elevation changes. Nourishment projects have been implemented and are proposed in a number of coastal towns, mainly for the purposes of beach restoration, enhancement, and/or maintenance. NOAA can currently accommodate requests for beneficial use of sediment for beach nourishment in locations where the bathymetry and topography allow space for sediment placement above the mean high water (MHW) line, which is outside of the sanctuary. Beach replenishment projects currently occur at Del Monte Beach in Monterey, Salinas River and Moss Landing State beaches at Moss Landing, and Twin Lakes State Beach in Santa Cruz. Summaries of these activities are found in **Table 4**. Past habitat restoration projects at Santa Cruz and Monterey have proven successful in maintaining the integrity of high public use beaches that would otherwise suffer from accelerated erosion due to urban interruptions of natural sediment transport patterns in the area. Placement of dredged material on these beaches has helped stabilize beach profiles at these sites.

At some sites in MBNMS, shoreline habitat, beach access, and resources are increasingly impacted by shoreline erosion associated with shoreline structures, coastal armoring, sea level rise, and documented, increased storm activity. One example of such a site is Surfer's Beach, which is immediately adjacent to Pillar Point Harbor. Due to the interruption of natural sand transport patterns by shoreline infrastructure, the beach has eroded to such a degree that ocean waters now extend to the toe of the riprap armoring that safeguards Highway 1 (between the base of the East Breakwater and the ocean terminus of Coronado Street).

### 4.1.3 Air Quality

In 1970, Congress passed the federal Clean Air Act in order to protect human health and welfare from air pollution. As part of implementing the Clean Air Act, the U.S. Environmental Protection Agency (EPA) established National Ambient Air Quality Standards (NAAQS) for six criteria air pollutants: particulate matter (PM10 and PM2.5); sulfur dioxide; nitrogen dioxide; ozone; carbon monoxide; and lead. NAAQS are defined as levels of pollutants above which detrimental effects on human health or welfare may result.

For the purpose of planning and maintaining ambient air quality under NAAQS, EPA developed air quality control regions. Air quality control regions are intrastate or interstate areas that share

a common airshed. MBNMS is located within the North Central Coast air basin and the South Central Coast air basin in San Luis Obispo County (NOAA ONMS, 2008). The North Central Coast air basin is designated as a maintenance area for the one-hour ozone standard, an attainment area for the eight-hour ozone standard, and is classified as attainment or unclassified for the rest of the pollutant standards. The South Central Coast air basin is designated as unclassified/attainment for the one-hour and eight-hour ozone standards, except for Ventura County (outside MBNMS) which is designated nonattainment. The South Central Coast air basin is designated unclassifiable for the PM10 standard and unclassifiable/attainment for the other criteria pollutant standards (NOAA ONMS, 2008).

Vessel traffic within MBNMS contributes to the degradation of air quality. The main sources of air pollution from within MBNMS are diesel exhaust from ship engines and incineration of garbage on vessels within the sanctuary. Diesel exhaust has a high sulfur content, producing sulfur dioxide, nitrogen dioxide, and particulate matter in addition to common products of combustion such as carbon monoxide, carbon dioxide, and hydrocarbons. Consistent with MARPOL Annex VI "Regulations for the Prevention of Air Pollution from Ships," vessels transiting through MBNMS along the California coast must use marine diesel oil or exhaust scrubbers to minimize the emissions of air pollutants.

The extent and severity of the air pollution problem in the North Central Coast air basin is a function of the area's weather and topography, as well as human-created influences such as development patterns and lifestyle. In general, the air pollution potential of the coastal areas is relatively low due to persistent winds. The North Central Coast air basin is, however, subject to temperature inversions that restrict vertical mixing of pollutants, and the warmer inland valleys of the basin have a high pollution potential. Factors such as wind, sunlight, temperature, humidity, rainfall, and topography all affect the accumulation and/or dispersion of pollutants throughout the area (City of Santa Cruz, 2004).

The southernmost section of MBNMS abuts San Luis Obispo County and the South Central Coast air basin, which encompasses San Luis Obispo, Santa Barbara, and Ventura counties. The northern portion of this air basin is separated by mountains from the more polluted southern areas, which are adjacent to the South Coast air basin. The air quality in the northern portion of the basin is more linked to conditions in San Francisco Bay and San Joaquin Valley than to the South Coast air basin.

### 4.1.4 Climate Change

The waters of MBNMS, as well as surrounding coastal areas and communities, are experiencing the effects of climate-related stressors (e.g., sea level rise, extreme storms, and ocean acidification) and these stressors are expected to worsen over the coming decades. Through regional collaboration and coordination, coastal communities are preparing for the effects of increasing greenhouse gas emissions, increased levels of ocean carbon dioxide, and ocean acidification. Climate change is a global problem requiring solutions at many levels.

Oceanic and coastal waters are expected to become more acidic as pH lowers in response to increased concentrations of atmospheric carbon dioxide settling in the ocean. Current knowledge is insufficient to be certain how pH will change in MBNMS, however research is

critical as this phenomenon is likely to decrease the availability of chemical building blocks for marine organisms using structural components made out of calcium carbonate (e.g., shells, spines, and bones). Ocean acidification leads to decreased shell growth in key species (sea urchins, mussels, oysters, abalone, and crabs) making the animal more susceptible to predation or mortality at early life stages. It also decreases skeleton production of deep-sea corals and hydrocorals. As deeper water tends to be more acidic naturally, deep-sea corals may be among the first to experience the deleterious effects of ocean acidification. The larval and juvenile stages of many marine organisms rely on calcium structures and will be more susceptible to the effects of ocean acidification due to their small size. In addition, there is concern for negative effects on shell-building plankton at the base of the food web.

MBNMS staff have worked on a number of climate change projects in recent years including coordinating a set of collaborative workshops for regional public works staff, developing a west coast action plan on ocean acidification, and contributing to a report clarifying the benefits, costs, and effectiveness of a range of erosion mitigation management measures for the entire California shoreline. MBNMS staff will continue to work with other west coast national marine sanctuaries and partners to integrate coastal resilience adaptation planning, climate change monitoring, education, and adaptation into sanctuary management.

### 4.1.5 Soundscape

Haver et al. define the soundscape as the "sources and acoustic characteristics of all biotic and abiotic ambient sounds present in a particular location and time" (Haver et al., 2019; Pijanowski et al., 2011). NOAA and other agency and scientific partners are working to better understand the underwater soundscape within national marine sanctuaries, including MBNMS (Haver et al., 2019). This research primarily relies on deployment of hydrophones to assess sounds produced by marine animals, physical processes, and human activities and to provide data on baseline acoustic conditions and sound levels in national marine sanctuaries. More information on noise in MBNMS and sound monitoring in sanctuaries is available.

Generally, the anthropogenic sources of noise present in MBNMS include commercial shipping traffic, including cruise ships at port, recreational and commercial boats, military training and testing, research activities, and aerial overflights. Shipping, boating, and operation of sonar systems can emit mechanical and electronic sounds 24 hours a day. In addition, low-altitude flight operations, coastal construction activity, marine fireworks displays, and large-scale public shoreline events can elevate atmospheric sound levels in MBNMS. At the same time, low-intensity sound is an effective tool for vessel navigation and conducting valuable marine research that aids protection of marine ecosystems and the sanctuary's resources.

## *4.2 Biological Setting*

MBNMS is one of the most diverse marine ecosystems in the world, with numerous types of habitats, and a multitude of wildlife species, including 36 species of marine mammals, more than 180 species of seabirds and shorebirds, at least 525 species of fishes, and an abundance of invertebrates, algae, and marine plants. For the purposes of the 2015 MBNMS Condition Report, the sanctuary was divided into four main areas, shown below in **Figure 6**.

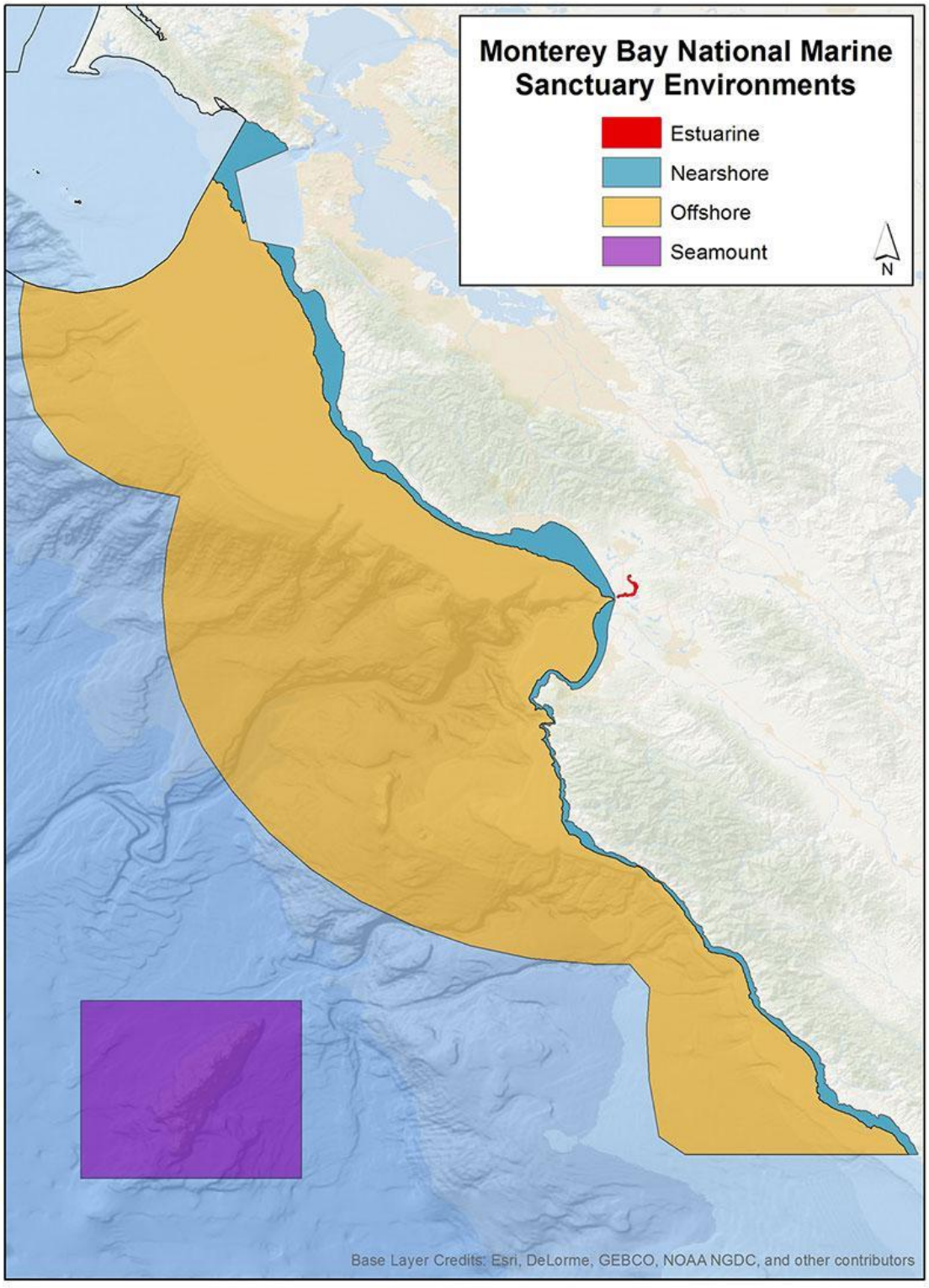


Figure 6. Monterey Bay National Marine Sanctuary was subdivided into estuarine, nearshore (shoreline to 30 meters depth), offshore (30 meters depth to seaward boundary), and seamount environments for the purpose of assessment in the 2015 MBNMS Condition Report.

### 4.2.1 Habitats

The sanctuary's kelp forests, rocky and soft bottom sub- or inter-tidal habitats, Monterey Canyon, underwater seamount, cold seeps, and open ocean (pelagic) habitats support a variety of organisms. Major habitat types found in MBNMS are described below.

**Rocky Shores**

Rocky shores are among the most accessible habitats within the sanctuary, and at low tide an incredible diversity of organisms can be observed. Approximately 39% of the MBNMS coast is rocky shore habitat. Particularly in central California, rocky shores are highly diverse, well-studied, and contribute significantly to our understanding of this habitat, both locally and globally.

MBNMS experiences mixed semidiurnal tides, with two high and two low tides each day (NOS, 2019). The rocky intertidal area can be categorized into four zones based on the relative exposure to air and the intertidal organisms found in each zone. The splash zone is exposed to air most of the time and has relatively few species present. The periwinkle snail (*Littorina keenae*) is indicative of the splash zone. Microscopic algae are common in winter, when large waves produce consistent spray on the upper portion of the rocky shore. The high intertidal zone is exposed to air for long periods twice per day. The acorn barnacle (*Balanus glandula)* and red algae (*Endocladia muricata* and *Mastocarpus papillatus*) are indicative of this zone. However, these species are also found in other areas of the rocky shore. The mid intertidal zone is exposed to air briefly once or twice per day and has many well-known organisms. At wave exposed sites, the California mussel (*Mytilus californianus*) can dominate this zone. The low intertidal zone is exposed only during the lowest tides and the presence of the seagrass *Phyllospadix* is a good indicator of the mean lower low water tide level. The low intertidal zone is also where sponges and tunicates are most common, typically on the underside of large boulders.

**Subtidal and Nearshore Waters**

Subtidal and nearshore waters refer to the area from the lowest low tide line to a depth of 100 feet (30 meters) where the seafloor drops and the deeper offshore waters begin. The substrate in this habitat can be sand, mud, or rock which provide habitat for a diversity of algae, invertebrates, and fishes. Upwelling transports cold nutrient-rich water to the surface, fueling a productive ecosystem in the nearshore environment.

**Estuarine**

An estuary is a water body that has regular exchange and interaction with ocean water, or a marine embayment with no more than a temporary separation from seawater (Airamé, Gaines, and Caldow, 2003). Estuaries represent the confluence of terrestrial, freshwater, and marine ecosystems, creating multiple, unique habitats supporting highly diverse communities and providing important ecosystem services (NOAA ONMS, 2015). There are a few large and many small estuaries along the central California coast; however, Elkhorn Slough is the only estuary located within the boundaries of MBNMS (NOAA ONMS, 2015). Estuaries adjacent to MBNMS include San Francisco Bay and Pescadero Marsh. Estuaries are among the most productive natural ecosystems. Their physical, chemical, and biological characteristics are critically

important to sustaining living resources. Estuaries serve as important habitats for many fishes, birds, and mammals (Caffrey et al., 2002). They provide suitable microhabitats for reproduction, feeding, resting, and cover. Phytoplankton is the primary vegetation in the open water portion of these habitats, while seagrasses dominate the channels and benthos.

Seagrass beds in MBNMS are highly productive habitats that support a unique assemblage of invertebrates and fishes. Seagrasses provide ecosystem services, including secondary production, habitat for many other species, shoreline protection, and carbon sequestration (Hughes et al., 2013). The structure of seagrass beds provides protection from predation for juvenile invertebrates and fishes. Many fishes, including Pacific herring (*Clupea pallasii*), spawn in seagrass beds. Large numbers of shorebirds and waterfowl are attracted to seagrass beds, where they feed on the seagrass, fishes, and invertebrate eggs and young.

### Continental Shelf and Slope

The continental shelf is the gradually sloping submerged margin of a continent that extends from shore to the shelf break. The shelf break is where the continental slope descends off into a steep slope. The sanctuary's continental shelf is relatively broad from the northern boundary to southern Monterey Bay and then narrows considerably south of Monterey Bay except around Point Sur and near the southern boundary in Cambria. The vast majority (~93%) of the shelf in MBNMS is composed of soft bottom habitats. The shelf edge is marked by the abrupt break in slope that occurs at a depth of approximately 325 to 410 feet (Greene et al., 2002). The continental slope usually begins at 430 feet depth and ends at approximately 9800 feet. The continental slope, together with the continental shelf, is called the continental margin.

The continental margin is generally an area of very productive habitat for many species. The central segment of the seafloor in MBNMS extends from the Point Año Nuevo area to south of Point Sur. This segment contains the most geologically diverse and physiographically varied seafloor within MBNMS. The Ascension-Monterey Canyon system, which has extensively dissected the continental shelf and slope in the Monterey Bay area, Carmel Canyon, and the many heads of Sur Canyon, which have cut the continental slope just south of Point Sur, provide valuable habitat for many species, as does Sur Ridge (Brown et al., 2013).

Davidson Seamount has been called "An Oasis in the Deep," hosting large coral forests, vast sponge fields, crabs, deep-sea fishes, shrimp, basket stars, and high numbers of benthic species that have yet to be named. The surface habitat hosts a variety of seabirds, marine mammals, and fishes, including albatross, shearwaters, jaegers, sperm whales, fin whales, albacore tuna, and ocean sunfish. Rarely seen organisms, such as swimming nudibranchs (an undescribed mollusk) and red jellyfish, have been observed above Davidson Seamount (Brown et al., 2013). **Figure 7** illustrates the depth zones and areas of hard substrate in the sanctuary.

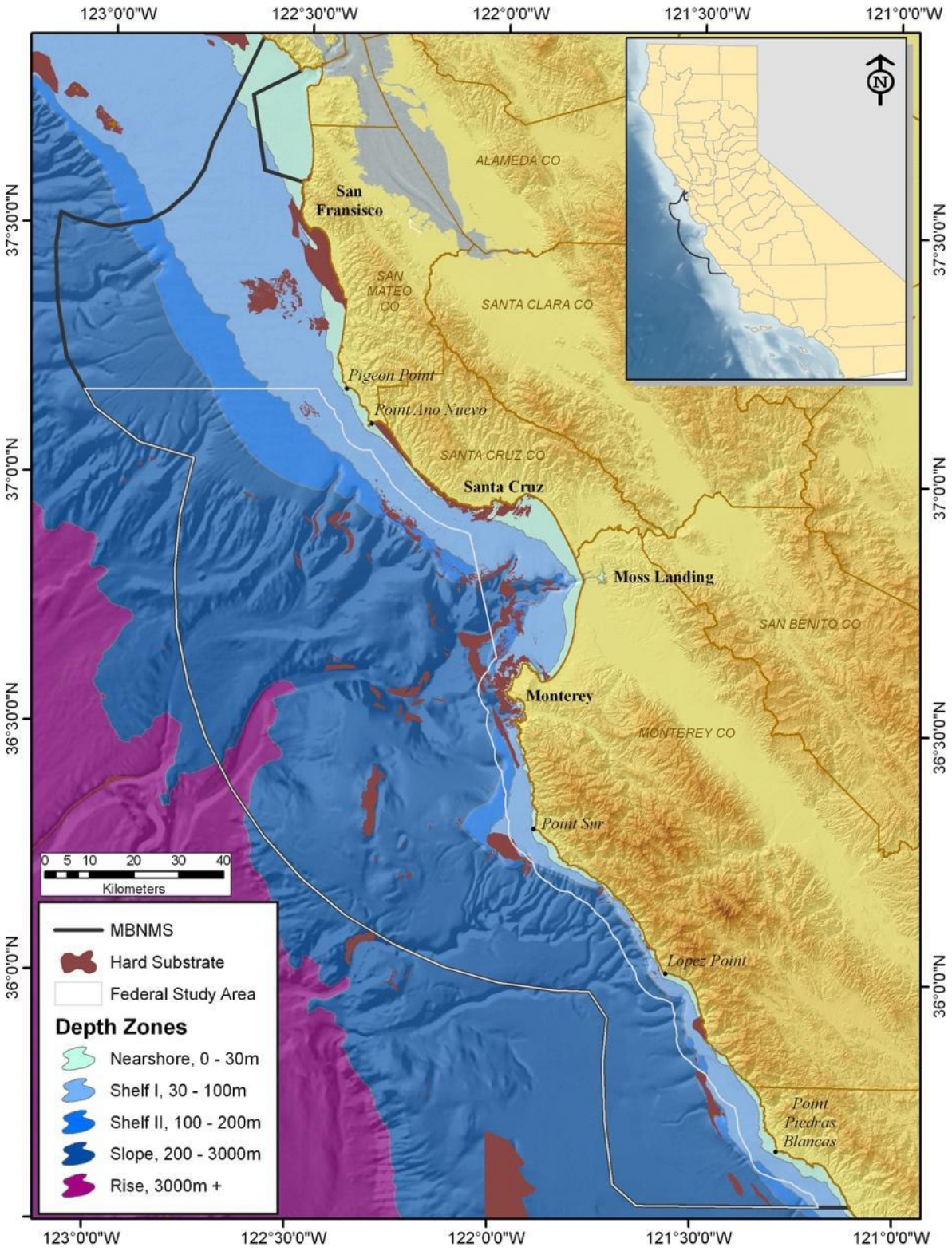


Figure 7. Depth Zones and Substrate Types in Monterey Bay National Marine Sanctuary (Brown et al., 2013)

### Offshore Waters

Offshore waters refer to open water areas that extend beyond 100 feet seaward from the continental margin (Shaffer, 2002). Offshore water habitat and deep-sea communities occur in MBNMS at Monterey Canyon and Davidson Seamount, as well as cold seeps. Monterey Bay is an example of an active transform margin between the Pacific and North American plates, that is, a translational margin in which there is widespread distribution of fluid expulsion features. Cold seeps are regions on the seafloor that release sulfide- and methane-rich fluids and are common along the translational margin off central California (Airamé, Gaines, and Caldow, 2003).

Seasonal upwelling occurring off Año Nuevo and Point Sur brings up cold nutrient-rich waters to the surface and also has an effect on animal movement. As such, coastal upwelling ecosystems are some of the most productive ecosystems in the world and support many of the world's most important fisheries. Movement of cold waters to the surface (i.e., upwelling) encourages seaweed growth and supports blooms of phytoplankton, the primary vegetation in offshore waters. Phytoplankton blooms serve as nutrients and both directly and indirectly support large predator populations, such as fishes, marine mammals, and seabirds. Upwelling also moves surface waters offshore, providing a mechanism to transport drifting larvae. Most marine fishes and invertebrates produce microscopic larvae as young, which drift in the water as they develop. Depending on the species, they may drift in ocean currents for weeks to months. Upwelling can infuse coastal waters with critical nutrients that fuel dramatic productivity and transport species incapable of swimming long distances.

### Kelp Forests

Kelp provides a unique and diverse habitat used by numerous species, including marine mammals, fishes, other algae, and vast numbers of invertebrates. Adjacent to the rocky coastline but beyond the shore break, several species of kelp cling to hard substrates and lend added vertical structure to the rocky reef habitat. Although some individual kelps can persist for up to three years, the overall structure of the kelp forest is very dynamic. Kelp canopy cover varies seasonally: thickest in late summer and thinnest in winter, when large swells and old age combine to remove weakened adults. During the following spring, the next generation grows rapidly, taking advantage of the thin canopy cover and the increase in available light. When coupled with upwelling, which brings cold, nutrient-rich waters to the surface, these spring-time conditions allow some species of kelp to grow up to twelve inches per day.

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

The kelp canopy, stipes, and holdfasts increase the available habitat for nearshore species and offer protection to juvenile finfish. Sea otters reside within kelp forests. Seabirds, harbor seals, California sea lions, and even gray whales will visit kelp forests while foraging for food. Giant kelp and other algae support large populations of benthic invertebrates, which in turn attract higher-order predators. A variety of fishes are also common in kelp forests, such as the señorita (*Oxyjulis californica*), kelp surfperch (*Brachyistius frenatus*), blue rockfish (*Sebastes mystinus*), and vermilion rockfish (*S. miniatus*). Kelp forests and their associated flora and fauna are important resources for fisheries. The kelp forest canopies serve as nurseries for newly-recruited rockfishes, providing refuge during a vulnerable stage of the life cycle (Butler et al., 2012). As these rockfish grow, some leave the kelp forest for deeper waters and support commercial and recreational fisheries.

### Offshore Islands

Offshore from Point Año Nuevo, 46 miles south of San Francisco, is Año Nuevo Island. This 25-acre low-lying island is part of the 4,000-acre Año Nuevo State Reserve. Two hundred years ago, the island was connected to the mainland by a narrow peninsula. Currently it is separated from the mainland by a channel that continues to grow wider. The island is a highly sensitive habitat, and its use is restricted.

Año Nuevo Island supports an abundant wildlife population, primarily seabirds and pinnipeds. The island contains nesting colonies of sea birds, including the rhinoceros auklet (*Cerorhinca monocerata*), Cassin's auklet (*Ptychoramphus aleuticus*), Brandt's cormorant (*Phalacrocorax penicillatus*), black oystercatcher (*Haematopus bachmani*), and western gull (*Larus occidentalis*). California brown pelicans (*Pelecanus occidentalis*) are also seen there, although they do not use the island for breeding. Año Nuevo Island also serves as a breeding ground for northern elephant seals (*Mirounga angustirostris*), Pacific harbor seals (*Phoca vitulina*), California sea lions (*Zalophus californianus*), and Steller sea lions (*Eumetopias jubatus*). The northern elephant seal population is the most predominant and has recovered to the carrying capacity of the island, extending to the mainland. Northern fur seals (*Callorhinus ursinus*) and southern sea otters (*Enhydra lutris nereis*) are occasional visitors.

### Benthic Communities

The benthic community is made up of organisms that live in and on the ocean floor, which can consist of rocky reef or sediments. Benthic species include worms, clams, crabs, and sponges. Benthic communities occur in subtidal rocky reefs, kelp forests, soft bottom habitats, and deep ocean floor habitats. Benthic communities along the continental shelf are covered in part by a layer of mud. Deep reef areas provide important habitat for a unique assemblage of fishes and invertebrates and are very different from shallow water communities. For example, upwelling and substantial offshore transport occur off Point Sur, where a coastal current flowing northward and extending from the surface to 656 feet deep has been studied. This northward flow contributes to convergence and offshore transport of water at Point Sur, which in turn affects distribution, transport, and survival of young fishes. Seamounts, with their rocky substrate and higher elevations, support a high biomass with a diverse assemblage of species. Deep-sea communities contain unique species adapted to the extremely high pressure and low light conditions.

## 4.2.2 Invertebrates and Plants

Thousands of species of invertebrates are found in MBNMS, including sponges, anemones, jellies, worms, corals, urchins, sea stars, tunicates, snails, octopus, clams, squid, and arthropods, such as barnacles, crabs, and spot prawns. Most invertebrate species are not harvested commercially, with the exception of squid, spot prawn, red urchins, sea cucumbers, Dungeness crab, rock crab, and octopus. Invertebrates are found in all habitats from the intertidal to the deep sea. A wide variety of invertebrates, including anemones, barnacles, limpets, and mussels, compete for space with the algae in the intertidal zone. Common crustaceans seen at the beach include the beach hopper (*Megalorchestia californiana*), spiny mole crab (*Blepharipoda occidentalis*), and sand crab (*Emerita analoga*). In tidepools, observers often see hermit crabs, shore crabs, anemones, urchins, nudibranchs, and sponges.

The marine algae found in MBNMS range from microscopic phytoplankton that fuel the oceanic food web or giant kelp that create kelp forests along the shoreline. Kelp forests are prominent throughout nearshore waters in MBNMS and support a variety of species, including sea otters and sea urchins, marine mammals, fishes, algae, and invertebrates. Bat star (*Patiria miniata*), sea lemon (*Peltodoris nobilis*), barnacles (*Balanus* spp.), red volcano sponge (*Acarnus erithacus*), and urchin inhabit the kelp forest and rocky subtidal habitats.

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

Krill (euphausiids) is a crucial or "keystone" species in MBNMS. They are small, shrimp-like crustaceans that congregate in large dense masses called swarms or clouds. Two krill species form the primary forage for upper trophic levels in MBNMS. Krill feed on phytoplankton and are very important in the food web since many other species of seabirds, fish, and baleen whales consume krill. Krill form a key trophic link in coastal upwelling systems between primary production and higher trophic level consumers.

Invertebrate species protected under the ESA that are present in MBNMS are described in **Section 4.3.1.4.3**.

## 4.2.3 Fishes

The fish fauna in MBNMS constitute a diverse and important ecological resource. There are at least 525 fish species (Burton and Lea, in prep.) distributed across a wide variety of habitats, with each habitat having its own characteristic fish assemblage (ONMS, 2009). Estuaries and lagoons support a distinctive assemblage of fish species that tolerate a variety of salinity conditions. Some species (e.g., flatfishes, sharks, and rays) use estuaries during the juvenile phase, but move out onto the continental shelf as they mature. A number of small and specialized fishes, such as gunnels, pricklebacks, and tidepool sculpins, are found in tide pools along the rocky coast. Rockfishes (genus *Sebastes*) compose a very diverse group found in many subtidal habitats in the sanctuary, but they are especially common on rocky reefs. Flatfishes, skates and rays, sablefish, and Pacific hake are typical of soft bottom habitats on the shelf and

upper slope. Most deep-sea bottom fishes off central California belong to one of four families: grenadiers, eelpouts, codlings, and skates. Anadromous fish, including coho salmon, Chinook Salmon, and steelhead, are mobile, nonresidential, nearshore pelagic species. The open waters of the sanctuary are occupied by a large diversity of pelagic fishes ranging from small schooling fishes (e.g., anchovy, sardine, mackerel, and mesopelagic fishes like lanternfishes, deep-sea smelts, and bristlemouths) to large solitary predators (e.g., tuna and sharks).

The sanctuary is located at the southern end of the range of many species that are part of the very diverse, cold-temperate fauna that make up the Oregonian Province. Occasionally, southern species from the California Province (south of Point Conception) extend their ranges to central and northern California during warm oceanographic events, such as El Niño and the Pacific Decadal Oscillation. Many organisms, including some fishes, depend on ocean currents for larval dispersal and recruitment. Therefore, the variability of oceanographic features and events in MBNMS (e.g., upwelling and El Niño) affects fish populations. Rockfishes (genus *Sebastes*), for example, exhibit extreme variability in reproductive success.

Fish species protected under the ESA are described in **Section 4.3.1.4.1**. Designated EFH present in MBNMS is described in **Section 4.3.2**. Commercial fishing activities in MBNMS are discussed in **Section 4.4.3**.

### 4.2.4 Birds

Approximately 100 bird species use the sanctuary's marine environment, including open ocean and nearshore waters. Millions of seabirds migrate through sanctuary waters in spring and fall. Seabirds are relatively numerous at MBNMS compared to other portions of the west coast due to an abundance of prey. This abundance is a result of nutrient-rich waters brought to the surface by persistent upwelling plumes emanating westward from Año Nuevo Point and Point Sur. Seasonal shifts and temporal shifts in seabird distribution have been observed within MBNMS. There is some evidence that the numbers of marine birds, such as ashy storm petrel (*Oceanodroma homochroa*), using MBNMS habitat are declining, most likely due to a shift in ocean climate.

The waters of MBNMS provide wintering habitat for many species that use the sanctuary's rich prey resources for foraging. Very deep water occurs within a few miles of shore in MBNMS because of the presence of submarine canyons. As a result, surface waters overlying the submarine canyons (over 6,562 feet deep) can provide habitat for deep water pelagic birds, such as the black-footed albatross (*Phoebastria nigripes*), ashy storm petrel (*Oceanodroma homochroa*), and Scripps's murrelet (*Synthliboramphus scrippsi*) during summer and fall, and northern fulmars (*Fulmarus glacialis*) and black-legged kittiwakes (*Rissa tridactyla*) during winter and early spring. Along the continental shelf break, a relatively narrow habitat, seabird densities are also substantial. These waters are dominated by sooty shearwaters (*Ardenna grisea*) during spring and summer and by fulmars and gulls during winter. Other characteristic species of the continental shelf break are pink-footed shearwaters (*Puffinus creatopus*), Buller's shearwaters (*P. bulleri)*, black storm petrels (*Oceanodroma melania*), and rhinoceros auklets (*Cerorhinca monocerata*). Inshore of slope waters (greater than 656 feet deep), the prevalent bird species consist of sooty shearwaters, western grebes (*Aechmophorus occidentalis*), Pacific loons (*Gavia pacifica*), California brown pelicans (*Pelecanus occidentalis californicus*), Brandt's

(*Phalacrocorax penicillatus*) and pelagic cormorants (*P. pelagicus*), western gulls (*Larus occidentalis*), and common murres (*Uria aalge*).

In waters very close to shore, in the surf zone, are pelagic cormorants (*Phalacrocorax pelagicus*), surf *(Melanitta perspicillata*) and white-winged scoters (*M. fusca*), and marbled murrelets (*Brachyramphus marmoratus marmoratus*). Shorebirds, such as sanderlings and long-billed curlew (*Numenius americanus*), willet (*Tringa semipalmata*), and whimbrel (*Numenius phaeopus*), routinely forage in the receding surf, an indication that there are sand-dwelling crustaceans present there. Elkhorn Slough is one of California's last great coastal wetlands. Flushed by ocean tides in the heart of Monterey Bay, its waterways, mudflats, and marsh support a huge diversity of wildlife. Not only is the slough part of MBNMS, a portion of it is protected as a National Estuarine Research Reserve. Elkhorn Slough is part of the Pacific flyway and tens of thousands of birds migrate through the area every year. Over 340 species of birds have been identified in and around the slough. Various types of plovers, godwits, turnstones, sandpipers, hummingbirds, phalaropes, murrelets, auklets, terns, cormorants, egrets, hawks, and gulls can all be found in Elkhorn Slough.

There are a few breeding bird species in MBNMS. Since very little breeding habitat exists, locally breeding species typically occur in very small numbers, with the exception of the Brandt's cormorant (*Phalacrocorax penicillatus*), which breeds in large numbers in MBNMS. Otherwise, typical breeding species in MBNMS are the pelagic cormorant (*Phalacrocorax pelagicus*) and double-crested cormorants (*P. auritus*), western gulls, Caspian terns (*Sterna caspia*), common murres, pigeon guillemots (*Cepphus columba*), rhinoceros auklets, and marbled murrelets. Swallows, pigeon guillemot (*Cepphus columba*), and pelagic cormorants breed and feed along coastal bluffs. Nesting sites of the common murre (*Uria aalge*) occur at the Devil's Slide area and Hurricane Point near Big Sur.

Bird species protected under the ESA are described in **Section 4.3.1.4.5.**

## 4.2.5 Introduced Species

Introduced species (also known as nonnative, invasive, or exotic species) are present in the marine and estuarine environment in MBNMS and are a major environmental threat to living resources and habitats in the sanctuary. Invasive species are defined as organisms that invade ecosystems beyond their natural, historic range. Introducing invasive species into waters where they are not already established is considered a significant threat to water quality and is capable of disrupting native marine ecosystems. Introduced species threaten the diversity or abundance of native species (especially threatened and endangered species), alternative species composition, and interfere with the ecosystem's function, often threatening the ecological stability. They may cause local extinction of native species either by preying on them directly or by out-competing them. Introduced species may cause changes in physical habitat structure through ecosystem engineering. Once established, introduced species can be extremely difficult to control or to eradicate. Their presence may also harm commercial, agricultural, or recreational activities dependent on native ecosystems (USFWS, 2007). Hundreds of federal programs, state organizations, international organizations, and non-profit organizations have established databases, community outreach, monitoring, eradication, research, and education programs to deal with this ongoing threat to native biodiversity.

## 4.3 Protected Species and Habitats

This section describes biological species and associated habitats that are protected by the Endangered Species Act (ESA; 16 U.S.C. §§ 1531 *et seq.*), the Marine Mammal Protection Act (MMPA; 16 U.S.C. §§ 1361 *et seq.*), and the Magnuson-Stevens Fishery Conservation and Management Act (MSA; 16 U.S.C. §§ 1801 *et seq.*). The MMPA and MSA are administered by the National Marine Fisheries Service (NMFS). The ESA is administered jointly by the U.S. Fish and Wildlife Service (USFWS) and NMFS. See **Section 4.3.1** for an overview of ESA-protected species and designated critical habitat found in the action area. See **Section 4.3.2** for an overview of designated EFH found in the action area.

Section 7 of the ESA requires federal agencies to consult with USFWS and/or NMFS, as applicable, before initiating any action that may affect a listed species or designated critical habitat. NOAA ONMS notified NMFS and USFWS regarding the proposed federal action in its August 27, 2015 (80 FR 51973) notice of intent to initiate review of the sanctuary's management plan and regulations and to conduct public scoping. This EA provides information about the potential impacts of the proposed action on protected species and designated critical habitat in the project action area.

### 4.3.1 Species and Critical Habitat Protected Under the ESA or MMPA

Under the ESA, USFWS manages the protection of, and recovery effort for, listed terrestrial and freshwater species, and NMFS manages the protection of, and recovery effort for listed marine and anadromous species. The ESA protects plant, fish, and wildlife species (and their habitats) that are listed as **endangered** and **threatened**. A species is defined as **endangered** if it is at risk of extinction throughout all, or a significant portion of, its range. A species is defined as **threatened** if it is likely to become endangered within the foreseeable future. When USFWS or NMFS lists a species under the ESA, they are required to determine whether critical habitat exists. **Critical habitat** is defined as (1) specific areas within the geographical area occupied by the species at the time of listing that contain physical or biological features essential to conservation of the species and that may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species only upon a determination that such areas are essential for the conservation of the species (16 U.S.C. § 1532(5)(A)).

The MMPA, enacted by Congress on October 21, 1972, establishes a national policy to prevent marine mammal species and population stocks from declining beyond the point where they cease to be significant functioning elements of the ecosystems of which they are a part. The MMPA established a moratorium on the taking of marine mammals in U.S. waters. It defines "take" to mean "to harass, hunt, capture, collect, or kill" any marine mammal or attempt to do so (50 CFR § 216.3). Three federal entities share responsibility for implementing the MMPA. NMFS has the responsibility for the conservation and management of whales, dolphins, porpoises, seals, and sea lions. NMFS also prepares marine mammal stock assessment reports to track the status of marine mammal stocks. USFWS has responsibility for the conservation and management of walruses, manatees, sea otters, and polar bears. The Marine Mammal Commission provides independent, science-based oversight of domestic and international

policies and actions of federal agencies addressing human impacts on marine mammals and their ecosystems (NOAA NMFS, 2019b). Some marine mammals are also protected under the ESA. If a species or population stock is listed as an endangered species or a threatened species under the ESA, NMFS determines that such species or stock is below its optimum sustainable population and it is designated as a depleted stock under the MMPA.

#### *4.3.1.1 Action Area for Analysis of Impacts to Protected Species*

The implementing regulations for Section 7(a)(2) of the ESA states the action area "means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR § 402.02). The action area effectively bounds the analysis of ESA-protected species and habitats because only species that occur within the action area may be affected by the federal action.

For the purposes of this analysis of the proposed management plan, regulatory changes, and continued field activities at MBNMS, NOAA ONMS defined the action area as:

1) the boundaries of MBNMS;
2) the main routes vessels would travel to operate within the sanctuary;
3) shorelines adjacent to MBNMS where noise and human disturbance from MBNMS activities would impact wildlife or where onshore fieldwork would occur; and
4) rivers in the local watersheds within which NOAA staff and volunteers conduct periodic water sampling.

NOAA ONMS expects all direct and indirect effects of the proposed action to be contained within the action area as defined above. NOAA ONMS recognizes that while the action area is stationary, federally listed species can move in and out of the action area. For instance, a migratory bird species could occur in the action area seasonally as it forages or breeds at or near MBNMS. Thus, in its analysis, NOAA ONMS considers not only those species known to occur directly within the action area, but also those species that may passively or actively move into the action area for limited periods of time. NOAA ONMS then considered whether the life history of each species makes the species likely to move into the action area where it could then be affected by the proposed action. A detailed list of protected species, their habitat requirements, and potential to occur in the MBNMS action area is provided in **Appendix D**.

#### *4.3.1.2 Species and Critical Habitat Under USFWS Jurisdiction that may Occur Within the Action Area*

NOAA ONMS used the USFWS's Environmental Conservation Online System (ECOS) Information for Planning and Conservation (IPaC) tool to search for ESA-listed species that may be present in the action area. The ECOS IPaC tool identified 55 species listed as endangered or threatened under USFWS jurisdiction that could occur in the action area, as well as designated critical habitat for six species (western snowy plover, marbled murrelet, California red-legged frog, tidewater goby, robust spineflower, and Monterey spineflower) (USFWS, June 18, 2020; Consultation Code: 08EVEN00-2019-SLI-0565, and 08ESMF00-2019-SLI-2224).

As described in **Appendix D**, based on an evaluation of the species ranges, habitat use, and the components of the proposed action, NOAA ONMS determined that five ESA-listed species and

designated critical habitat for four species under USFWS jurisdiction may occur within the action area and could be affected by the proposed action. The five species are: southern sea otter, California red-legged frog, tidewater goby, marbled murrelet, and western snowy plover. The designated critical habitats are: western snowy plover, marbled murrelet, California red-legged frog, and tidewater goby.

### *4.3.1.3 Species and Critical Habitat Under NMFS Jurisdiction that may Occur Within the Action Area*

To compile the list of ESA-listed species under NMFS jurisdiction that may occur within the action area, NOAA ONMS used the NMFS West Coast Region Protected Resource Division's Threatened and Endangered Species Directory (accessed March 2020). These lists are composed of 10 marine mammal species or distinct population segments (DPS), two marine invertebrate species, seven fish species or DPSs, five sea turtle species, and 26 DPSs or evolutionarily significant units (ESU) of West Coast salmon and steelhead. Critical habitat is designated for 37 species or DPSs/ESUs under the jurisdiction of NMFS West Coast Region, in addition to proposed revisions to designated critical habitat for two species.

As described in **Appendix D**, based on an evaluation of the species ranges, habitat use, and the components of the proposed action, NOAA ONMS determined that 23 ESA-listed species (or DPS/ESUs) and designated critical habitat for four species under NMFS jurisdiction occur in the action area and could be affected by the proposed action. These species are: black abalone, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, California coastal Chinook salmon, Central California coast coho salmon, Central California coast steelhead, South Central California coast steelhead, North American green sturgeon southern DPS, longfin smelt, eulachon, leatherback sea turtle, green sea turtle, loggerhead sea turtle, olive ridley sea turtle, Guadalupe fur seal, blue whale, humpback whale, fin whale, sperm whale, killer whale, North Pacific right whale, Western North Pacific gray whale, and sei whale. These designated critical habitats are: green sturgeon southern DPS, three DPSs of salmon and steelhead, black abalone, and leatherback sea turtle. Proposed revisions to designated critical habitat for two species (southern resident killer whale and humpback whale) overlap with the action area. Marine mammals protected under the MMPA are discussed in **Section 4.3.1.4.2** below.

### *4.3.1.4 Species Descriptions*

Below are brief descriptions of the listed species most likely to occur within the action area that could be affected by the proposed action. A detailed list of species protected under ESA and MMPA, their habitat requirements, and potential to occur in the MBNMS action area is provided in **Appendix D**. These species listed below are identified in the table in **Appendix D** as having a high potential to occur in the action area or with critical habitat that intersects with the action area. NOAA ONMS compiled the information below and in **Appendix D** using species profiles in the USFWS's ECOS database, NMFS species directory, final rules published in the Federal Register for species listings and designations of critical habitat, and species status reviews.

#### 4.3.1.4.1 Fishes

Tidewater goby, listed as endangered, and the threatened southern DPS of North American green sturgeon inhabits MBNMS. Designated critical habitat for these species also overlaps with the action area. In addition, designated critical habitat for the endangered California Coastal evolutionarily significant unit (ESU) of coho salmon, and threatened Central California Coast and South Central California Coast DPS of steelhead overlaps with rivers in the action area where NOAA conducts annual water sampling during Snapshot Day. The likelihood of these species occurring in the action area is moderate or low and most likely during annual migration.

***Tidewater Goby (Eucyclogobius newberryi)***

The likelihood of occurrence of tidewater goby in the action area is low and seasonal. California's coastal estuaries, enclosed lagoons near the mouths of coastal streams, and brackish waters of adjoining marshes and streams provide habitat for endangered tidewater goby. These are dynamic environments subject to considerable fluctuations on a seasonal and annual basis. Tidewater goby are seasonally present in habitats adjacent to MBNMS, including Bennett Slough, the Salinas River, and occasionally in upper tributaries of Elkhorn Slough, all of which are outside of the action area. USFWS designated revised critical habitat for the species in 2013 (78 FR 8745). In total, 65 critical habitat units are designated for the tidewater goby throughout its range. Twenty of these units are adjacent to MBNMS from Rodeo Lagoon in the north to San Simeon Creek in southern MBNMS. These units are essential for the recovery of the tidewater goby as described in the 2005 Recovery Plan for the tidewater goby (USFWS, 2005).

***Green Sturgeon (Acipenser medirostris)***

The likelihood of occurrence of the Southern DPS of green sturgeon in the action area is moderate and seasonal. Within the marine environment, the Southern DPS occupies coastal bays and estuaries from Monterey Bay, California to Puget Sound, Washington. Individuals occasionally enter coastal estuaries to forage. Subadult and adult green sturgeon may undergo extensive seasonal migrations to reach productive feeding grounds, including Monterey Bay. On November 9, 2009, NMFS designated final critical habitat for the threatened Southern DPS of green sturgeon. Designated critical habitat areas found in or adjacent to the action area are: coastal U.S. marine waters 60 fathoms depth isobath from Monterey Bay to the U.S.-Canada border, and San Francisco Bay Estuary (74 FR 52299).

#### 4.3.1.4.2 Marine Mammals

The sanctuary has one of the most diverse and abundant assemblages of marine mammals in the world, including six species of pinnipeds (seals and sea lions), 32 species of cetaceans (whales, dolphins, and porpoises), and one species of fissiped (sea otter). Pinnipeds spend a large amount of time in offshore waters, or on offshore islands, but some rookeries or haul-out areas occur in nearshore habitats. California sea lions are the most common pinnipeds in the sanctuary, and their numbers continue to increase. Probably the fastest growing population of marine mammals in the sanctuary is the northern elephant seal, with haul-out sites at Año Nuevo, Point Piedras Blancas, and isolated Big Sur beaches. The most dramatic increase in their population has occurred at beaches near Point Piedras Blancas, from 400 adults in 1991 to more than 20,000 in 2015, according to observations from the U.S. Geological Survey. Año Nuevo Island serves as a breeding ground for northern elephant seal (*Mirounga angustirostris*),

Pacific harbor seal (*Phoca vitulina*), California sea lion (*Zalophus californianus*), and Steller sea lion (*Eumetopias jubatus*).

Numerous species of large whales occur occasionally in MBNMS, several of which are listed under the ESA, including humpback whales (*Megaptera novaeangeliae*), fin whales (*Balaenoptera physalus*), blue whales (*Balaenoptera musculus*), and, very rarely, North Pacific right whale (*Eubalaena japonica*). Gray whales (*Eschrichtius robustus*), delisted under ESA in 1994, are known migrants through MBNMS and pass through on both their southward and northward migratory routes. In addition, minke whales (*Balaenoptera acutorostrata*) and several toothed whale species, such as killer whales and beaked whales (family Ziphiidae), occur in MBNMS. Sperm whales (*Physeter macrocephalus*) can occur in waters of the continental slope and in the vicinity of seamounts in MBNMS where subsurface topography is steep.

Below are brief descriptions of the protected species most likely to occur within the action area which are indicated in **Appendix D** as having a high potential to occur in the action area or with critical habitat that intersects with the action area.

### *California Sea Lion (Zalophus californianus)*

The likelihood of occurrence of MMPA-protected California sea lions in the action area is high and seasonal. The species is the most abundant pinniped in MBNMS and uses the coastal waters of Monterey Bay for foraging with haul-out sites near Fisherman's Wharf and multiple other sites up and down the coast of MBNMS.

### *Harbor Seal (Phoca vitulina richardii)*

The likelihood of occurrence of MMPA-protected harbor seals in the action area is high and year-round. Harbor seals are year-round residents along the MBNMS coastline, occurring mostly close to shore. They use the offshore waters of Monterey Bay for foraging and beaches for resting. Harbor seals also occur on offshore rocks and on sand and mudflats in estuaries and bays.

### *Risso's Dolphin (Grampus griseus)*

The likelihood of occurrence of MMPA-protected Risso's dolphins in the action area is high and year-round. They are generally found in waters greater than 1,000m in depth and seaward of the continental shelf and slopes. However, they have been sighted associated with squid congregations in the nearshore environment of Monterey Peninsula.

### *Common Dolphin - Long-Beaked (Delphinus capensis)*

The likelihood of occurrence of MMPA-protected common long-beaked dolphins in the action area is high and year-round. The common dolphin is the most abundant cetacean found in the coastal waters of California, and the abundance within MBNMS has increased in recent years.

### *Humpback Whale (Megaptera novaeangeliae)*

The likelihood of occurrence of ESA endangered humpback whales in the action area is high and seasonal. The humpback whale ESA listing final rule (81 FR 62259, September 8, 2016) established 14 DPSs with different listing statuses. The California/Oregon/Washington humpback whale stock that occurs in MBNMS primarily includes whales from the endangered Central American DPS and the threatened Mexico DPS, plus a small number from the non-listed

Hawai'i DPS. The central California population of humpback whales migrates from their winter calving and mating areas off Mexico to their summer and fall feeding areas off coastal California. Humpback whales generally occur in Monterey Bay from late April to early December. Proposed critical habitat for the Central American and Mexico DPSs of humpback whales include the waters of MBNMS (84 FR 54354). NMFS lists the biggest threats to these DPSs as entanglement in fishing gear, ship strikes, and environmental pollutants.

### *Steller Sea Lion (Eumetopias jubatus)*

The likelihood of occurrence of Steller sea lions in the action area is low and seasonal, however, designated critical habitat for the species is found in the action area. A small population breeds on Año Nuevo Island and occasionally individuals use MBNMS waters in fall and winter for foraging. Steller sea lions were first listed under the ESA in 1990. In 1997, NMFS recognized two populations, classifying the eastern population as threatened and the western population as endangered. The eastern population has since recovered and is no longer listed.

### *Southern Sea Otter (Enhydra lutris nereis)*

The likelihood of occurrence of ESA southern sea otters in the action area is high and year-round. The threatened southern sea otter is a top carnivore in its coastal range and a keystone species of the nearshore coastal zone. The southern sea otter is commonly found in the nearshore waters and kelp forests of Monterey Bay, along the Big Sur coastline and in Elkhorn Slough, all of which are within the action area. Recent counts of the southern sea otter have made population trends difficult to interpret. A census was conducted from late April to mid-May 2018 along the mainland coast of central California and in April 2018 at San Nicolas Island in southern California. The three-year average of combined counts from the mainland range and San Nicolas Island was 3,128 individuals, a decrease of 58 sea otters from the previous year. The five-year average trend in abundance, including both the mainland range and San Nicolas Island populations, remains positive at 1.3% increase per year. Continuing lack of growth in the range peripheries likely explains the cessation of range expansion (Hatfield et al., 2018). **Figure 8** below shows local trends in abundance of sea otters along the mainland coast of central California using a five-year exponential rate of change based on the census results.

### *Western North Pacific Gray Whale (Eschrichtius robustus)*

The likelihood of occurrence of the Western North Pacific gray whales in the action area is low during the late fall-winter southward migration and again late winter to early summer during their northward migration. Information from tagging, photo-identification, and genetic studies show that some whales identified in the WNP off Russia have been observed in the eastern North Pacific (ENP), including coastal waters of Canada, the U.S., and Mexico (Lang, 2010; Weller et al., 2012; Urbán et al., 2013; Mate et al., 2015). Gray whales are known for their curiosity toward boats and are the focus of whale watching and ecotourism along the west coast of North America. Thus, they face threats from vessel strikes and disturbance on their migration route. Gray whales make one of the longest annual migrations of any mammal, traveling about 10,000 miles round-trip.

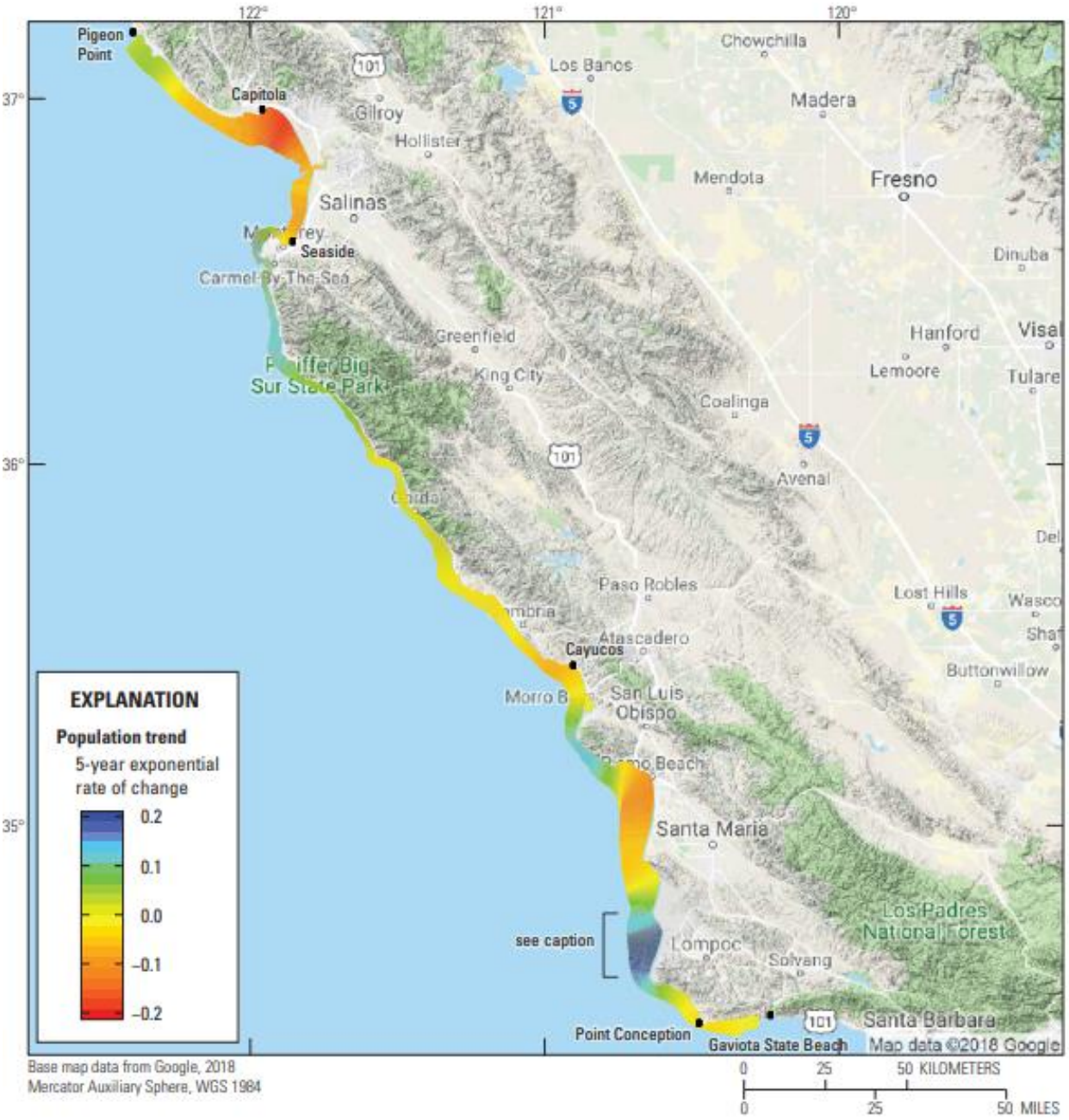


Figure 8. Abundance of sea otters along the mainland coast of central California using a five-year exponential rate of change. For more details see Hatfield et al., 2018.

### 4.3.1.4.3 Marine Invertebrates

#### *Black Abalone (Haliotis cracherodii)*

The likelihood of occurrence of endangered black abalone in the action area is moderate and year-round. Coastal and offshore island intertidal areas provide habitat for black abalone on exposed rocky shores where bedrock provides deep, protective crevices for shelter. In MBNMS, black abalone could be present on hard substrate in nearshore, intertidal areas. In 2011, NMFS designated approximately 140 square miles of rocky intertidal and subtidal habitat as critical

habitat for black abalone along five segments of the California coast (76 FR 66805). Año Nuevo Island and most of the MBNMS rocky shoreline is included in these areas, from the mean higher high water line to a depth of -6 meters (relative to the mean lower low water line), as well as the coastal marine waters encompassed by these areas.

#### 4.3.1.4.4 Amphibians and Reptiles

***Leatherback Sea Turtle (Dermochelys coriacea)***

The likelihood of occurrence of endangered leatherback sea turtles in the action area is low and seasonal. However, designated critical habitat for the species is found in the action area. The leatherback sea turtle is occasionally seen in MBNMS between July and October, when the surface water temperature warms to 15-16°C and large jellyfish, the primary prey of the turtles, are seasonally abundant offshore. In 2012, NMFS revised the designated critical habitat for the species to include additional areas within the Pacific Ocean (77 FR 4169). This designation includes approximately 16,910 square miles along the California coast from Point Arena to Point Arguello east of the 3,000-meter depth contour. On August 25, 2020, the California Fish and Game Commission declared the Pacific leatherback sea turtle a candidate species under the California Endangered Species Act.[10]

***California Red-Legged Frog (Rana draytonii)***

The likelihood of occurrence of the threatened California red-legged frog in the action area is low and seasonal. The California red-legged frog is the largest native frog in the western United States. It has been extirpated from 70% of its former range and now is found primarily in coastal drainages of central California, from Marin County, California south to northern Baja California, Mexico. The breeding season runs from November to April and mating depends on seasonal climatic patterns but commonly occurs in February or March. Adults are predominantly nocturnal but juveniles can be active during the day. California red-legged frogs may temporarily disappear from an area during periods of extended drought. In 2010, USFWS revised the designated critical habitat for the species (75 FR 12815). The California red-legged frog uses a variety of habitats. It requires a breeding pond, slow-flowing streams or deep pools which hold water long enough for the tadpoles to undergo metamorphosis. MBNMS conducts an annual water sampling event in the spring at rivers in the action area that occasionally overlap with designated critical habitat for the California red-legged frog. Primary constituent elements for the California red-legged frog identified by USFWS are aquatic breeding habitat, aquatic non-breeding habitat, upland habitat, and dispersal habitat.

#### 4.3.1.4.5 Birds

There are several species of protected bird species that are rarely observed in MBNMS, including the California least tern and short-tailed albatross, and were therefore not included in the USFWS consultation. The marbled murrelet and western snowy plover are described below. In addition, designated critical habitat for the threatened marbled murrelet and western snowy plover overlaps with the action area.

[10] https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=182813&inline

### *Marbled Murrelet (Brachyramphus marmoratus)*

The likelihood of occurrence of the threatened marbled murrelet in the action area is low and seasonal. The marbled murrelet, a small diving seabird of the family Alcidae, can be found in small flocks, predominantly north of Monterey Bay. They are more frequently sighted in MBNMS in the summer months although can occur year-round. USFWS listed the Washington/Oregon/California population of the murrelet as threatened on October 1, 1992 (57 FR 45328). In 2016, USFWS determined that the critical habitat for the marbled murrelet (*Brachyramphus marmoratus*), as designated in 1996 and revised in 2011, meets the statutory definition of critical habitat under the ESA (50 CFR Part 17, Vol. 81, No. 150). The current designation includes approximately 3,698,100 acres of critical habitat in the states of Washington, Oregon, and California. Throughout the forested portion of the species' range, the marbled murrelet typically nests in forested areas containing characteristics of unfragmented older coniferous forest types with nest platforms. For nesting habitat to be accessible to the marbled murrelet, it must occur close enough to the marine environment for marbled murrelets to fly back and forth. The farthest inland distance for a site with nesting behavior detections in California is 24 miles. Marbled murrelet reproductive success is strongly correlated with the abundance of mid-trophic level prey as it dives underwater to search for fish and invertebrates. Effects on the marine environment that impact the availability of that prey can occur through overfishing or oceanographic variation from weather or climate events.

### *Western Snowy Plover (Charadrius nivosus nivosus)*

The likelihood of occurrence of the threatened western snowy plover in the action area is common and year-round. On June 19, 2012, USFWS revised the designated critical habitat for the threatened western snowy plover (77 FR 36728). In total, the boundaries of the critical habitat designation encompass approximately 24,527 acres of coastline in Washington, Oregon, and California. This includes approximately 16,337 acres in 47 units within California, some of which overlap with the action area. Western snowy plover nest in the action area from March to September. Their habitat includes barren to sparsely vegetated sand beaches, dry salt flats in lagoons, dredge spoils deposited on beach or dune habitat, levees and flats at salt-evaporation ponds, river bars, and along alkaline or saline lakes, reservoirs, and ponds. Western snowy plovers make nests in a natural or scraped depression on dry ground.

## 4.3.2 Essential Fish Habitat

EFH is defined under the Magnuson Stevens Fishery Conservation and Management Act (MSA) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." EFH is described in fishery management plans developed by the Regional Fishery Management Councils, which on the west coast is the Pacific Fishery Management Council (PFMC). The MSA requires fishery management councils to minimize impacts on EFH from fishing activity and that they and federal agencies consult with NMFS about activities that may harm EFH. Habitat Areas of Particular Concern (HAPCs) are a subset of EFH designated to focus management and restoration efforts for habitats particularly susceptible to human-induced degradation, especially those that are ecologically important or located in an environmentally stressed area.

In 2006, through amendment 19 to the Pacific Coast Groundfish Fishery Management Plan, NMFS described EFH for groundfish off the west coast as waters and substrate in depths less than or equal to 3,500 meters to mean higher high water level. This groundfish EFH completely overlaps with the area of MBNMS. As a precautionary measure to mitigate the adverse effects of fishing on EFH, NMFS implemented the bottom trawl footprint closure west coast wide between 1,280 meters (700 fathoms) and 3,500 (1,094 fathoms), which is the outer extent of the groundfish EFH. The 700 fathom isobath is an approximation of the historic extent of bottom trawling in U.S. west coast waters. Deeper portions of MBNMS overlap with the bottom trawl footprint closure. In addition, to minimize impacts from fishing activity on ecologically important habitats of groundfish EFH, NMFS implemented coastwide 51 EFH Conservation Areas, which are areas closed to bottom trawl gear or all bottom contact gear (trawl and other bottom tending gear). Four of these EFH Conservation Areas prohibit bottom trawl gear (other than demersal seine) and cover large expanses of MBNMS. The EFH Conservation Areas in MBNMS are: Half Moon Bay, Monterey Bay/Canyon, Point Sur Deep, and Big Sur Coast/Port San Luis.

A different type of EFH Conservation Area overlaps with the Davidson Seamount Management Zone. This EFH Conservation Area prohibits bottom contact gear or any other gear that is deployed deeper than 914 meters (500 fathoms) to conserve the rich community of fragile deep sea corals and sponges on the seamount. NMFS identified HAPC types for groundfish as: estuaries, canopy kelp, seagrass, rocky reefs, and “areas of interest” (a variety of submarine features, such as banks, seamounts, and canyons). A number of these HAPC types occur in MBNMS.

In 2012, PFMC and NMFS initiated a five-year review of groundfish EFH. As part of that process, MBNMS submitted a collaborative proposal among Monterey Bay trawl fishermen, environmental groups, scientists, and others to the PFMC to modify groundfish EFH. The MBNMS collaborative approach used local stakeholder input combined with newly-collected benthic habitat and fisheries data, since amendment 19, with local fisherman knowledge, to develop a collaborative proposal for modifying boundaries of EFH Conservation Areas. The proposal uniquely considered new protections for groundfish EFH coupled with opportunities for fishermen to access valuable fishing grounds, by proposing to open portions of existing EFH Conservation Areas. The MBNMS proposal served as a model for the Coastwide Collaborative, which incorporated all the MBNMS-proposed modifications to groundfish EFH Conservation Areas into their proposal.

On November 19, 2019, NMFS issued a final rule establishing new and revised areas closed to bottom trawling to conserve and protect Pacific Coast groundfish EFH and re-opened areas that were closed to bottom trawling to rebuild previously-overfished groundfish stocks (84 FR 63966). The provisions of the final rule for amendment 28 of the groundfish Fishery Management Plan went into effect on January 1, 2020 and include a number of changes in EFH management measures for MBNMS. NMFS slightly modified the boundary line that approximates the 700 fathom isobaths of the bottom trawl footprint closure in Monterey Bay, resulting in relatively small re-openings and closures that affect less than 20 square miles. Portions of three EFH Conservation Areas designated in 2006 were reopened to trawl fishing: Monterey Bay/Canyon, Point Sur Deep, and Big Sur Coast/Port San Luis. The boundaries for the

Half Moon Bay and Davidson Seamount EFH Conservation Areas remained the same. NMFS also designated seven new EFH Conservation Areas that prohibit bottom trawl fishing: Pescadero Reef, Ascension Canyonhead, South of Davenport, West of Sobranes Point, La Cruz Canyon, and West of Piedras Blancas State Marine Conservation Area.

## 4.4 Human and Socioeconomic Setting

The California coastline adjacent to MBNMS has a rich history supporting diverse commercial, recreational, cultural, research, and education activities. This section describes the character of the sanctuary and adjacent areas, including human uses of the sanctuary, and the local economy, population, employment, and housing. For the purposes of this analysis, the discussion of the affected environment is focused on those areas immediately adjacent to the sanctuary. Additional discussion focuses on the commercial activity dependent on the sanctuary.

### 4.4.1 Local and Regional Economies

Five counties border MBNMS: Marin, San Mateo, Santa Cruz, Monterey, and San Luis Obispo. In addition to these five primary counties, there are several secondary counties that are inland. These inland counties do not directly border the sanctuary, but still may incur economic benefit or costs as a result of changes to resources used, extracted, or enjoyed from the sanctuary. These secondary counties are determined by looking at commuter flows in and out of the primary counties. For MBNMS, the secondary counties include: San Francisco, Alameda, Contra Costa, Santa Clara, and Solano. Each of these counties is diverse in population and economic base.

The northern region of MBNMS borders Marin County and the San Francisco Peninsula, and north of the San Mateo County line, day-to-day operations of the sanctuary are managed by the staff of Greater Farallones National Marine Sanctuary. In the southern region of MBNMS, Monterey County faces significant growth challenges. Agriculture is the leading industry, followed by tourism. San Luis Obispo County's economy focuses on agriculture, tourism, and education. These counties face significant economic and developmental challenges in addressing population growth. Limited infrastructure to accommodate the coastal population growth, a lack of labor supply for growing companies, a growing gap between the wealthy and other residents, and environmental pressures comprise the main constraints to urban expansion in this region.

Travel and tourism are one of the most significant industries in this region, with a total travel-spending revenue in 2017 of $10.3 billion for the five counties adjacent to MBNMS. San Mateo leads in total spending at $3.9 billion, followed by Monterey at $2.8 billion and San Luis Obispo at $1.7 billion (Dean Runyan Associates Inc., 2018). Agriculture is also an important industry in the MBNMS region and the area is a national leader in the production of artichokes, strawberries, and salad greens. In 2016, it was valued at $6 billion for the five counties adjacent to MBNMS (CDFA, 2018). Monterey County, valued at $4.25 billion, is by far the most significant producer in the region and ranks fourth highest statewide (Monterey County Agricultural Commissioner's Office, 2017). Other MBNMS-related industries include research, aquaculture, kelp harvesting, and commercial shipping (including cruise ships). The adjacent San Francisco Harbor is the largest harbor on the U.S. Pacific Coast with millions of tons of cargo passing under the Golden Gate Bridge annually. The main consumptive activities in

sanctuary waters are commercial and recreational fishing, shipping, shellfish collecting, and kelp harvesting.

Land use immediately adjacent to the sanctuary is a diverse combination of open space (including national, state, and local parklands), commercial uses (including agriculture, aquaculture, ocean related businesses, hotels, and restaurants), and single-family and multi-family residential. Land use is urbanized in these coastal areas in the cities of Pacifica, Half Moon Bay, Santa Cruz, the Monterey Peninsula, and Cambria. In these cities, development is denser than the rest of the coastal areas.

There are electricity generating power plants at Moss Landing and Morro Bay and sewage treatment facilities in coastal areas in San Mateo, Santa Cruz, Monterey, and San Luis Obispo counties. Due to threats to the Carmel River and limited water supply in the coastal counties, new water supply projects are being implemented, and desalination projects are being assessed for environmental impacts. There are also limited industrial uses in the project area associated with commercial and recreational fishing harbors at Half Moon Bay, Santa Cruz, Moss Landing, and Monterey harbors. Three of the harbors have ocean dredge disposal sites, as described in **Section 4.1.2.3**. In addition, every county adjacent to MBNMS contains coastal developments or beaches that serve as water-oriented recreational uses and much of the coastal area is set aside for open space (see **Section 4.4.4**, Public Access, Recreation, and Tourism).

## 4.4.2 Marine Transportation

Marine transportation is essential to California's economy. California seaports are a major economic force and are critically important elements to the growth of California and the nation's economy. Seaports depend on the goods movement chain to efficiently distribute freight around the globe and across the nation. California has 11 public ports, which include three "megaports" (Los Angeles, Long Beach, and Oakland); eight smaller niche ports (Hueneme, Humboldt Bay, Redwood City, Richmond, West Sacramento, San Diego, San Francisco, and Stockton); and one private port (Benicia). The ports of Oakland, Stockton, and West Sacramento are developing a new barge shipping service funded through a federal Transportation Investment Generating Economy Recovery (TIGER) grant.

The ports of Los Angeles and Long Beach comprise the largest port complex in the United States and are key players in global enterprise. Together, they handle a fourth of all container cargo traffic in the United States. The Port of Oakland, the fourth largest port in the nation, handles trade from the Pacific Rim countries, delivering 99% of the ocean containers passing through Northern California to the rest of the nation (California Department of Transportation, 2019).

Several thousand large commercial vessels (e.g., container vessels, tankers, dry bulk vessels, car carriers, and cruise ships) pass through MBNMS each year en route to California ports. Vessels larger than 300 gross tons typically transit through the sanctuary within one of four recommended tracks established by the International Maritime Organization (IMO) in 2000. The tracks (shown in **Figure 9**) were created specifically to keep routine shipping traffic far enough from MBNMS shorelines to allow for effective emergency response were a ship to become disabled or involved in a marine casualty and/or spill incident. The tracks lie parallel to the coastline between 15 and 35 miles offshore. The two tracks farthest offshore are reserved for

vessels carrying hazardous cargo in bulk. Many tankers typically operate at least 57 miles offshore (outside MBNMS boundaries), while others use the IMO recommended tracks within the sanctuary.

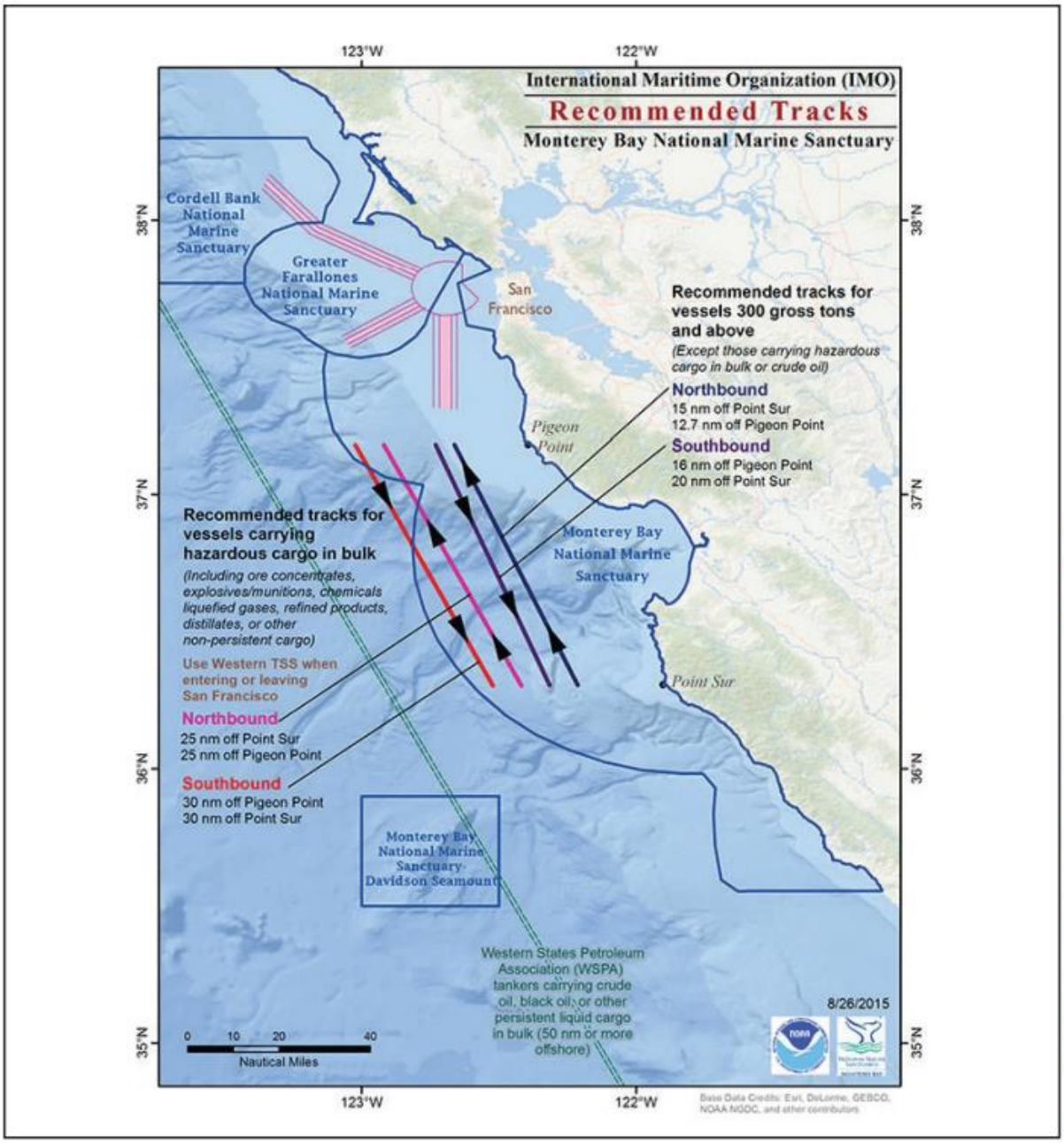


Figure 9. International Maritime Organization (IMO) recommended tracks for large shipping vessels (greater than 300 gross tons), including container ships, bulk freighters, hazardous materials carriers, and tankers. Western States Petroleum Association recommends tankers carrying crude oil, black oil, or other persistent liquid cargo in bulk to transit 50 nautical miles or more offshore. This graphic is from the 2015 MBNMS Condition Report Update.

The Port of San Francisco reported 85 scheduled cruise ship port calls for 2019 (Port of San Francisco, 2019). San Francisco serves as both a cruise ship port-of-call (visitation port) and an embarkation port (home port) for cruise ships. The city of Monterey reported 20 cruise ship port calls scheduled for Monterey Harbor in 2020 (Monterey Harbor, 2019). Most of the visiting

ships anchor off Monterey Harbor for one day en route to San Francisco, Los Angeles/Long Beach, or San Diego. Cruise ships have visited Monterey each year since 2002, and the number of annual port calls has varied from three to 20 ships.

## 4.4.3 Commercial Fishing and Aquaculture

### Commercial Fishing

The contribution of harvest revenue from commercial fishing to California's economy is relatively small, given that California's economy totals $2.7 trillion per year. Commercial fishing harvest revenue for the period 2012 to 2017 was $1.3 billion with an average of $264 million per year, which equates to less than one tenth of a percent of California's economy (NOAA NMFS, 2019a). The fishing industry in the area of MBNMS mirrors the statewide economic contribution regionally. However, commercial fishing is an important component of the historical, economic, and cultural fabric of the Monterey Bay region and the sanctuary. Most fish caught within MBNMS are landed at one of five main ports: Princeton/Half Moon Bay, Santa Cruz, Moss Landing, Monterey, or Morro Bay/Avila/Port San Luis.

An economic analysis of commercial fishing within MBNMS in 2010 to 2012 (Leeworthy et al., 2014) shows more than 600 commercial vessels fished within MBNMS in 2012, which was an increase from 374 vessels in 2010. More than 90% of the landings by weight were comprised of market squid (37%), Dungeness crab (32%), salmon (14%), coastal pelagics (sardine and northern anchovy; 5%), and spot prawn (5%). The gear used to target these species groups are purse seine (market squid and coastal pelagic), pots and traps (Dungeness crab and spot prawns), and troll gear (salmon). Trawling, typically for groundfish, accounted for between 2.4% to 4.3% of the value of catch from MBNMS. The groundfish complex comprises 92 species of fishes, predominantly from the rockfish family (64 species), flatfishes (12 species), and sharks and skates (six species). In the period from 2010 to 2012, the harvest value for all fisheries combined within MBNMS was between $24 million and $30 million annually. Beyond harvest revenue, additional revenue is generated from the businesses associated with commercial fishing operations, including marinas, harbors, maintenance, and fish processing and distribution.

According to California Sea Grant, commercial fishing in California over the past four decades has declined tremendously due to a combination of environmental, economic, and social factors that are constantly in flux (California Sea Grant, 2019). Increased regulations to conserve fishery resources and improve ecosystem health have contributed to the general decline in commercial fishing effort. In the past decade alone, state and federal fishery managers imposed emergency closures from 2008 to 2010 on salmon fishing in zones of California and Oregon marine waters. These emergency closures aimed to protect Sacramento River Chinook salmon, then in a state of collapse. The salmon populations were at historically low levels due to natural ocean variations and a host of threats in the Sacramento River Basin, such as dams, loss of suitable habitat, and lack of functional water flow. Many vessels departed the fishery during the salmon closure, but eventually returned when the salmon season reopened in 2011 and 2012. In 2019, the Dungeness crab fishery ended their season three months early on California's Central Coast (including the sanctuary) to avoid entanglement of endangered whale species in crab pot gear. The fleet was already recovering from losses suffered from the domoic acid outbreak in 2015,

which delayed the season opening. Warming ocean conditions contributed to nearshore habitat compression of colder waters with forage species, and likely also caused whales to venture closer to shore in search of food, where they interact more frequently with crab gear. These examples from two influential fisheries within the sanctuary highlight the variability in fishing effort caused by changing ocean and river conditions and the regulatory environment.

NMFS, with advice from the PFMC, manages federal fisheries along the Pacific Coast. The California Department of Fish and Wildlife and California Fish and Game Commission manage state fisheries. MBNMS does not manage commercial or recreational fisheries; however, it does play a role in protecting fishery habitat and conducting research on fish and fish populations. MBNMS staff also provide advice and recommendations to federal and state fishery managers. A noteworthy example of the role MBNMS staff plays with fishery management is the collaborative proposal MBNMS submitted to PFMC in 2013 as part of the five-year review of groundfish EFH. MBNMS staff led a collaborative effort of local trawl fishermen, environmental groups, and scientists in developing a proposal that modified EFH Conservation Areas within the sanctuary by adding protections to fragile deep sea coral and sponge communities, while also re-opening trawl effort to historically productive fishing grounds. The collaborative effort of MBNMS was hailed as a success by fishermen and fishery managers and duplicated off Oregon and other regions of California by a coastwide "Collaborative" led by fishermen and environmental groups. On November 19, 2019, NMFS issued a final rule establishing new and revised areas closed to bottom trawling to conserve and protect Pacific Coast groundfish EFH, and re-opening areas that were closed to bottom trawling to rebuild previously overfished groundfish stocks (84 FR 63966). The provisions of the final rule went into effect on January 1, 2020.

### Aquaculture

The U.S. Department of Agriculture's most recent Census of Aquaculture reports $84 million in sales generated in California in 2013 from aquaculture (USDA, 2014). Aquaculture in California occurs in some coastal waters and in ponds and tanks inland. However, none of these operations currently occur within the boundaries of MBNMS. Current coastal aquaculture operations in the region include oysters grown in the bays and lagoons of Humboldt, Tomales, Morro Bay, Agua Hedionda, and San Diego. Mussel farms exist in the Santa Barbara Channel and off of Long Beach. Abalone are raised on land close to the coast in Santa Barbara, Cayucos, and Davenport, and in the ocean under a wharf in the Monterey Harbor (California Sea Grant, 2019).

The California Department of Fish and Wildlife is the lead agency for leasing and permitting marine aquaculture on state and private water bottoms in bays and estuaries. Marine aquaculture in California is currently limited to oysters, abalone, clams, and mussels. Several other state agencies have regulatory authority over different aspects of aquaculture, such as:

- California Department of Public Health for disease and health,
- California State Lands Commission for leased lands,
- California Coastal Commission for coastal uses and public recreation and access,
- California State Water Resources Control Board for water quality, and
- local jurisdictions (counties, harbors, and special districts).

In federal waters many federal agencies have jurisdictional oversight over aquaculture facilities and operations. These agencies include: NOAA, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, USFWS, U.S. Department of Agriculture, and Department of Health and Human Services. In 2015, NOAA issued a final rule to revise the prohibition on the introduction of introduced species in state waters for MBNMS and Greater Farallones National Marine Sanctuary (80 FR 8778). The regulations allow for MBNMS specifically to authorize the state of California permits or leases for commercial aquaculture projects in state waters involving introduced species of shellfish. An authorization could be issued if the state management agencies and NOAA determined: (1) that the shellfish species is non-invasive, and (2) that the activity would not have significant adverse impacts to sanctuary resources or qualities. NOAA also entered into a memorandum of agreement with the state of California to describe how NOAA (i.e., MBNMS) will coordinate with the California Department of Fish and Wildlife, Fish and Game Commission, and Coastal Commission on any future proposals to develop commercial shellfish aquaculture projects involving a non-invasive introduced species.

### 4.4.4 Public Access, Recreation, and Tourism

Two of the main reasons given for travel to the central California coastal region include natural and scenic beauty and recreational opportunities. Popular recreational activities in the MBNMS area include pleasure boating, whale watching, kayaking, surfing, tidepooling, wildlife viewing, hiking, swimming, scuba diving (both consumptive and non-consumptive), personal watercraft use, horseback riding, dog walking, and beachcombing. The major marine recreational access areas within or adjacent to the sanctuary are the harbors at Monterey, Moss Landing, Santa Cruz, and Pillar Point. Sailing and powerboat clubs in Santa Cruz and Monterey Bay sponsor ocean and bay races at various times throughout the years; these races often use the calmer waters within Monterey Bay or may extend from San Francisco to the Farallon Islands (NOAA, 1980, 1984).

Onshore recreational uses of MBNMS predominantly occur in very shallow nearshore areas or along the shorelines adjacent to the sanctuary. These beach-related activities include: coastal hiking, nature observation, tidepooling, surfing, windsurfing, surf fishing, swimming, and duck hunting (in Elkhorn Slough only) (CDFG, 1979; NOAA, 1984). Several onshore locations adjacent to the sanctuary have become popular in recent years for wildlife watching. Large numbers of marine mammal enthusiasts and bird-watchers spend time along the sanctuary's coastal estuaries and shorelines observing marine mammals, seabirds, shorebirds, waders, and waterfowl. Some of the most popular places to view sea lions, harbor seals, and elephant seals include: Año Nuevo State Park, Cannery Row in Monterey, Pebble Beach, and San Simeon. Visitation to the Elkhorn Slough National Estuarine Research Reserve, a popular bird watching and recreational kayaking area in the sanctuary, has significantly increased from 20,000 visitors in the mid-1980s to over 50,000 visitors in the mid-1990s (Ehler, Leeworthy, and Wiley, 2003).

#### Motorized Personal Watercraft

Motorized personal watercraft, also known by the brand names of the models Jet Ski and Waverunner, are small, fast, and highly maneuverable craft that possess unconventionally high thrust capability and horsepower relative to their size and weight. This characteristic enables them to make sharp turns at high speeds and alter direction rapidly while maintaining

controlled stability. Their small size, shallow draft, instant thrust, and "quick reflex" enable them to operate closer to shore and in areas that can pose a hazard to conventional boats operating at comparable speeds. Many can be launched across a beach area, without the need for a launch ramp.

The two primary uses for motorized personal watercraft in MBNMS are public safety and recreation. The main public safety use is for search and rescue and occasional patrol work. Additionally, public safety organizations conduct motorized personal watercraft training sessions in the sanctuary (under an MBNMS-issued permit) in order to prepare for search and rescue work. Recreational use of motorized personal watercraft in MBNMS includes two categories: (1) general recreational riding and (2) tow-in surfing. Because the waters of MBNMS are generally cold and rough, few motorized personal watercraft owners choose to ride in the sanctuary, and as a result there is little of this type of recreational activity. Use for tow-in surfing or safety assist is the most common private use of motorized personal watercraft within the sanctuary.

Formal statistics documenting use of motorized personal watercraft within the sanctuary boundary of MBNMS are not collected by the California Department of Motor Vehicles, the California Department of Boating and Waterways, California State Parks and Recreation, or local harbormasters. The harbors at Monterey, Moss Landing, Santa Cruz, and Pillar Point are the primary locations for launching motorized personal watercraft within MBNMS. Morro Bay Harbor is also a launch site, but it is 15 miles beyond the southern boundary of MBNMS and sees very little launch activity related to the sanctuary. Based upon sanctuary staff observations and reports from harbormasters, motorized personal watercraft operation within three of the four zones in the sanctuary is infrequent and of low volume (on average, less than 10 trips per-year, per-zone).

The majority of recreational use occurs in the seasonal-conditional access zone at the Mavericks surf break off Pillar Point. Mavericks is a world-renowned big-wave surfing location one-quarter mile off the coast of Half Moon Bay within MBNMS. Motorized personal watercraft are typically used at this site for access, safety assists, and photography. The seasonal-conditional riding zone is only open when a High Surf Warning is in effect for San Mateo County during the months of December through February. Motorized personal watercraft operators can also access the zone at other times of the year by sanctuary permit. Activity at Mavericks easily exceeds 200 motorized personal watercraft trips per year, many of which are non-compliant with the regulatory seasonal and conditional terms for accessing the zone. Operators pass briefly through the year-round Half Moon Bay zone en route to Mavericks, but very few operate in the Half Moon Bay zone.

### 4.4.5 Research and Monitoring

Rich marine biodiversity and close proximity to the deep sea provide unparalleled research opportunities for approximately 25 marine science facilities operating in the vicinity of MBNMS. In 2017, these facilities employed almost 2,500 staff and researchers with a combined budget of over $350,000,000. This includes government agencies, public and private university research institutions, and private facilities such as the Monterey Bay Aquarium and the Monterey Bay Aquarium Research Institute.

MBNMS's research program focuses on science to inform resource management, including determining information gaps, developing collaborative studies to improve understanding of issues, and interpreting research for decision makers. MBNMS has conducted several large-scale programs to map habitats, assess biodiversity, and model ocean circulation. Research activities cover a broad spectrum, including monitoring birds, marine mammals, krill, gray whale migrations, kelp canopies, rocky shores, and water quality; characterizing pinniped rookeries, nearshore, offshore, and formerly restricted military zone seafloor habitats; and studying tidal erosion in Elkhorn Slough, distribution of introduced species, fishery impacts from trawling and gill net by-catch, coastal erosion, ship groundings and oil spills, restoring fragile and endangered species, and human use effects in kelp forest ecosystems.

NOAA developed the Sanctuary Integrated Monitoring Network (SIMoN) as a key regional source of scientific information. SIMoN is a long-term program that takes an ecosystem approach to identify and understand changes in the sanctuary. The program enables researchers (more than 200 of them) to monitor the sanctuary effectively by integrating the existing monitoring programs and identifying gaps in information. By avoiding duplication of these programs, resources can be more effectively directed towards observing and characterizing habitats, assessing the impact of natural processes or human activities on specific resources, and long-term monitoring. Further details about characterization, research, and monitoring projects in MBNMS can be found on the SIMoN website.

### 4.4.6 Education and Outreach

Sanctuary education and outreach efforts focus on two general areas:

1) community involvement, partnerships, and community program development (training programs, workshops, special events, school programs), and
2) product development (printed materials, website development, audio visual materials, interpretive signs, displays, and exhibits) as critical education and outreach tools.

Outreach activities and programs in MBNMS include public events, interpretive signs and displays at parks and beaches, volunteer trainings, water quality/urban runoff information, shipboard "teacher-at-sea" opportunities, intertidal monitoring programs for students, an annual Coastal Discovery Fair, and Get Into Your Sanctuary Day. In addition, NOAA manages two visitor centers – the Sanctuary Exploration Center in Santa Cruz and the Coastal Discovery Center in San Simeon – which provide a variety of interpretive displays and educational activities. Programs range from K-12 school field trips, teacher workshops, family learning programs, public lecture series, and volunteer docent training. Additional information on sanctuary education and outreach programs is available.

### 4.4.7 Visual Resources

Visual resources in MBNMS include ocean vistas, offshore islands, coastal landforms (e.g., rocky bluffs), coastal waves, and marine flora and fauna. One of the main reasons given for travel to this coastal region is its natural and scenic beauty. The sanctuary's spectacular coastal scenery, accessibility, moderate climate, abundance of marine life, and relatively clean ocean waters all draw large numbers of divers, kayakers, boaters, fishermen, surfers, tidepoolers, and bird and mammal watchers. With nearly 300 miles of shoreline, there are many viewing opportunities of

the sanctuary and the scenic coastline. Coastal topography varies greatly, encompassing steep bluffs, pocket beaches, long stretches of sandy beaches, sand dunes, rocky cliffs, and both low- and high-relief mountain ranges. The varied terrain contributes to the scenic qualities of the sanctuary and provides hikers with opportunities to view flora and fauna and scenic vistas.

The following human activities are also visible in MBNMS (U.S. Department of Commerce, 1989; NOAA, 2001a; NOAA, 2001b):

- commercial and recreational fishing,
- commercial shipping,
- training activities by the U.S. Navy and U.S. Coast Guard,
- operations of research vessels and whale watching or oceanic birding boats, and
- recreational activities (e.g., bird watching, coastal hiking, wildlife viewing, tidepooling, surfing, kayaking, canoeing, boardsailing, clamming, abalone diving, surf fishing, and duck hunting).

## 4.5 Historical and Cultural Setting

The area encompassed by the boundaries of MBNMS is rich in cultural and historical resources and has a long and interesting maritime history. Ocean-based commerce and industries (e.g., fisheries, extractive industries, export and import, and coastal shipping) are important to the maritime history, the modern economy, and the social character of this region (NOAA, 2003a, 2003b, 2003c). NOAA implements comprehensive management of historical and cultural resources within the sanctuary by regulating activities affecting the qualities, values, or purposes of resources; and facilitating, to the extent compatible with the primary objective of resource protection, all public and private uses of said resources. Under sanctuary regulations, removing or damaging any historical or cultural resource is prohibited within MBNMS. Additionally, the NMSA requires each sanctuary to inventory and document its maritime heritage resources.

A number of additional laws and executive orders govern the protection and management of maritime heritage resources in the sanctuary:

- The Abandoned Shipwreck Act of 1987 charges each state with preservation management for "certain abandoned shipwrecks, which have been deserted and to which the owner has relinquished ownership rights with no retention."
- The Federal Archaeology Program and Section 110 of the National Historic Preservation Act create preservation mandates for maritime heritage resources for federal agencies. Section 110 of the National Historic Preservation Act states that each federal agency shall establish a preservation program for the protection of historic properties.
- The Antiquities Act of 1906, Archaeological Resources Protection Act of 1979, the Sunken Military Craft Act, and Executive Order 13287 Preserve America, which all aim to improve federal stewardship of historic properties and protect heritage sites from illegal salvage, damage, and looting.

NOAA's Maritime Heritage Program is specifically designed to address and implement these preservation mandates and to inventory and protect these special resources for the benefit of the public. California state regulations prohibit the unpermitted disturbance of submerged cultural

and historical resources. Additionally, ONMS and the California State Lands Commission have an archaeological resource recovery permit system in place.

Given the existence of historically important shipwrecks in MBNMS, the likelihood of finding more shipwrecks, and the keen public interest in these resources, NOAA identified the following priorities:

1) to continue efforts to inventory and document archaeological resources, and
2) to develop a maritime cultural landscape-focused education and outreach program in the MBNMS region to educate and inform staff and the public along the California coast and throughout the country about the relationship between humans and the ocean.

A brief summary of the known historical and cultural resources located in MBNMS is provided in the following subsections: Native American Cultural Resources and Maritime Heritage Resources.

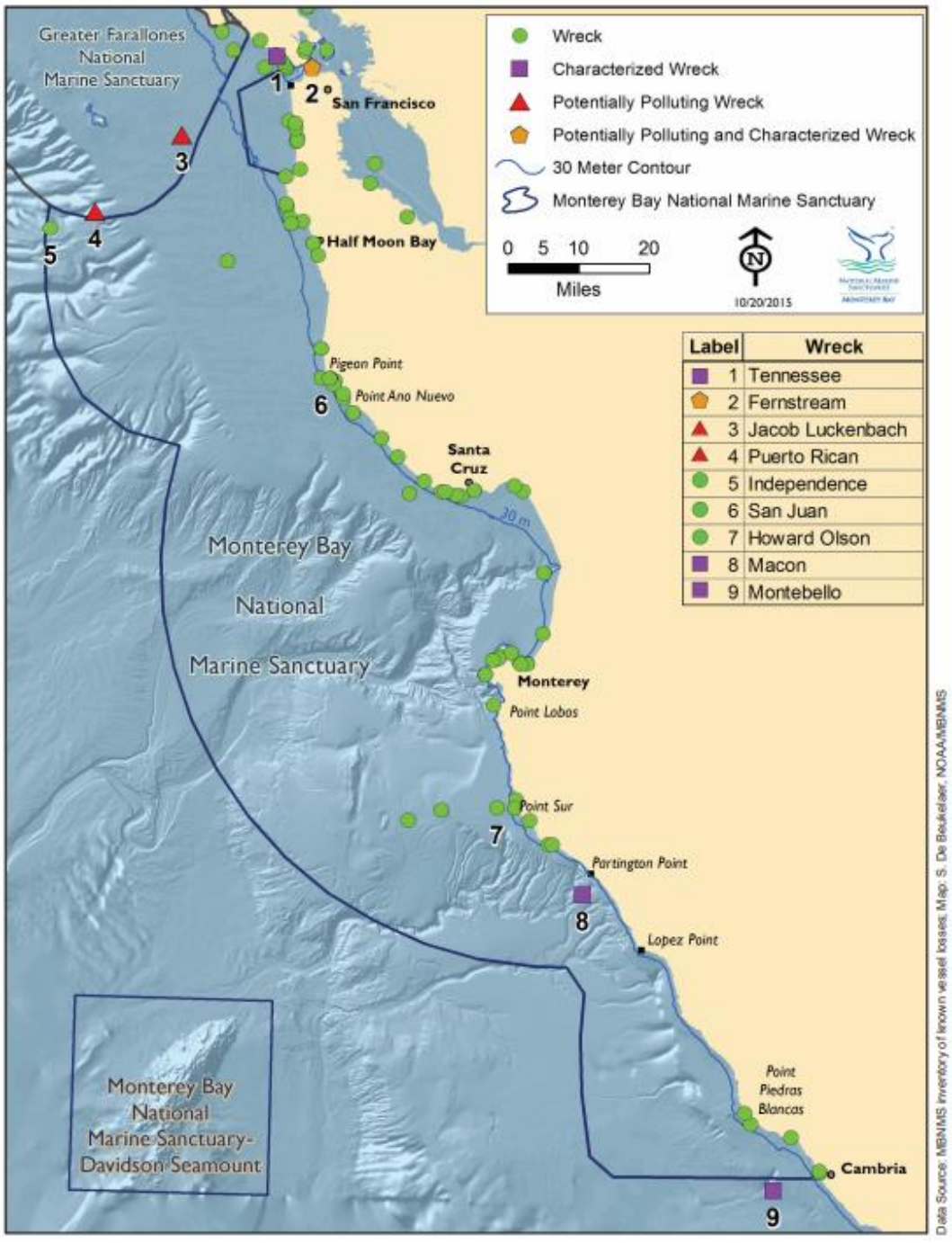


Figure 10. Approximate locations of known vessel losses in and adjacent to Monterey Bay National Marine Sanctuary from the sanctuary's inventory of submerged cultural resources. Three vessels have been characterized (purple square), two are considered to be "potentially polluting wrecks" (red triangle), and one vessel has been both characterized and determined to be a "potentially polluting wreck" (orange pentagon). For the rest of the vessels in the inventory, there is little to no verified location information (green circles). This graphic is taken from the 2015 MBNMS Condition Report update. Since the time of the creation of this graphic, the wreck of the Independence has been characterized.

### 4.5.1 Native American Cultural Resources

From the days of the early Ohlone inhabitants, to the exploration and settlement of California to the present, coastal waterways remain a main route of travel, subsistence, and supply. The coastal lands of central California contain numerous archaeological sites, most of which represent Native American cultural resources. There are approximately 718 reported and verified historical sites in the sanctuary and adjacent coastal zone (MMS, 1990). Traditional knowledge and archaeological evidence indicate that the coastal peoples subsisted largely on the products of the marine environment – harvesting salt, kelp, marine mammals, shellfish, and fish. Recent geologic history produced a number of geomorphic changes in the Monterey Bay area as a result of sea level change, tectonics, and changing erosion and sedimentation rates. Thus, there may be many additional undiscovered inundated historical and aboriginal sites within the sanctuary. To date no prehistoric sites underwater have been recorded.

The seafloor at MBNMS preserves remnants of the sites where people lived and of the vessels in which they conducted trade and fought wars. Ships, boats, wharves, lighthouses, lifesaving stations, whaling stations, prehistoric sites, and myriad other heritage treasures lie covered by water, sand, and time. Sanctuary staff have collaborated with state and federal agencies and the private sector to gather resource documentation and to create opportunities to locate and record submerged archaeological resources.

### 4.5.2 Maritime Heritage Resources

The history of California's central coast is predominantly a maritime one. In 2001, MBNMS staff commissioned a shipwreck inventory from established shipwreck databases, and a review of primary and secondary source documentation. These studies provide a foundation for an inventory of the historical resources in the sanctuary. The 2001 Maritime Heritage Resources Study includes a database of 445 reported vessel losses that occurred within the jurisdiction, or adjacent to the boundaries, of MBNMS (Smith and Hunter, 2003). Upon wrecking, vessels are known to drift at least 15 miles. Therefore, losses located just to the north of the sanctuary in Marin County and just to the south of the sanctuary in San Luis Obispo County are included. All wrecks on the Pacific side of San Francisco County (10) and those located in Greater Farallones National Marine Sanctuary (8) are included. These wrecks were a result of the significant maritime exploration and commerce which historically occurred in the region, coupled with a coastline dotted with shallow, rocky headlands, largely exposed to prevailing winds, storms, and fog.

There is one shipwreck located in MBNMS listed on the National Register of Historic Places. It is *Tennessee*, a California Gold Rush side-wheel passenger steamer. *Tennessee* sank in 1853 in MBNMS just north of the Golden Gate Bridge. In addition, the wreck of the USS *Macon* is listed on the National Register of Historic Places. The USS *Macon*, a dirigible airship, was lost offshore of Point Sur in 1935, along with four Curtiss Sparrowhawk F9C-2s bi-plane aircraft.

## *4.6 Resource Areas Not Further Analyzed*

**Sections 4.1** to **4.5** describe the physical, biological, human/socioeconomic, and historical or cultural resources relevant to the proposed action. As part of this analysis, NOAA determined

that several resource areas have no potential to be impacted by the proposed action. As such, the following resource areas are generally not discussed in this EA:

- Coastal and Offshore Energy Development – None of the proposed regulatory changes or management plan activities would affect coastal and offshore energy development at this time
- Hydrology and Flood Plains – None of the proposed regulatory changes or management plan activities would affect hydrology or flood plains within or around the sanctuary
- Public Safety – None of the proposed regulatory changes or management plan activities would cause public safety risks
- Military and Homeland Security Activities – None of the proposed regulatory changes or management plan activities would prohibit current military activities
- Population and Housing – None of the proposed regulatory changes or management plan activities would impact population and housing
- Growth-Inducing Effects – None of the proposed regulatory changes or management plan activities would result in direct or indirect effects that would induce changes in population density or growth rate
- Public Services and Utilities – None of the proposed regulatory changes or management plan activities would affect public services and utilities, including, wastewater treatment facilities and hazardous waste disposal

In Chapter 5, within the discussion of each resource area, the impact analysis addresses only those proposed field activities, management activities, or regulatory changes that have the potential to impact the specific resource. An action is not discussed when there is no potential for a proposed field activity, management action, or regulatory change to affect a particular resource.