California Marine Life Protection Act Initiative

Regional Profile of the MLPA South Coast Study Region

(Point Conception to the California-Mexico Border)

June 25, 2009

This is the 2nd printed edition, June 25, 2009.
First printed edition September 15, 2008.

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Acknowledgements and credits:

The Marine Life Protection Act Initiative thanks the many persons and organizations who supplied information in response to the first printed draft of this profile.

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How to Use This Document

This is the second printed edition of the *Regional Profile of the South Coast Study Region (Point Conception to the California-Mexico Border).* Both versions have been created with the intention of supplying stakeholders with knowledge crucial to the process of developing and evaluating proposals for Marine Protected Areas in the study region.

How We Have Made the Book Easier to Use

- The list of acronyms and abbreviations has been placed inside the back cover, where it is easy to find.
- We have made it easier to find the full details for works cited in the text. In all cases in which an organization is cited by an acronym, we have inserted the the full reference in the References Cited list by *exactly* the acronym used in the inline citation in the text. In these cases, the full name of the entity is included in the first entry for that entity in the References Cited list.
- We have moved the list of References Cited to the very back of the book, to make it easier to find.
- Except for the gallery of maps, the entire contents of the book—including appendices—are page-numbered in a single sequence, and all tables and figures, including those in appendices, are listed in the tables of Tables and Figures at the front of the book.
- We have enhanced readability by the removal of unnecessary box borders in tables. This change has also made the tables more compact, so that in many cases, a table which had used multiple pages now appears on a single page.

How to Learn More

The list of References Cited, at the end of this book, lists over 400 works which were consulted in the document's creation. In the case of many academic papers, a trip to a good library is still necessary. But, increasingly, valuable documents are to be found online; we have supplied a URL in every case where we were able to identify an online source for a document.

MLPA Initiative staff have compiled and developed spatial data layers and have conducted geographic information system (GIS) analyses to support the planning process. This regional profile includes maps of only selected spatial data layers. Additional spatial data layers for the study region are available through the online tool, MarineMap (http://www.marinemap.org/marinemap/). Data layers available at the date of printing are listed in Appendix B.

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Note that the tables in this regional profile are numbered based on the section of the profile in which they occur. For instance, Table 3.1-1 is the first table presented in section 3.1.

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Note that the figures in this regional profile are numbered based on the section of the profile in which they occur. For instance, Figure 3.1-1 is the first figure presented in section 3.1.

Maps

Maps follow page 170.

Note that the maps in this regional profile are numbered based on the section of the profile where the map data are discussed. For instance, the information displayed on map "3.1-1" is discussed in section 3.1 and is the first map discussed in that section. Map 3.1-2 is the second set of maps discussed in section 3.1.

Executive Summary

The Marine Life Protection Act Initiative is a public-private partnership designed to help the State of California implement the Marine Life Protection Act (MLPA) using the best readily available science, as well as the advice and assistance of scientists, resource managers, experts, stakeholders and members of the public. The MLPA requires the state to redesign existing state marine protected areas (MPAs), and to establish a cohesive network of MPAs to protect, among other things, marine life, habitats, ecosystems and natural heritage, as well as to improve recreational, educational and study opportunities provided by marine ecosystems.

A regional approach is being used to redesign MPAs in state waters along California's 1100 mile coast. Implementation of the MLPA will occur in five study regions: the central coast, the north central coast, the south coast, the north coast, and San Francisco Bay. As part of the MLPA Initiative, a master plan was created to provide a framework to guide the planning process within individual study regions. The central coast study region (Pigeon Point to Point Conception) was the first study region for which the MLPA planning process was completed; the California Fish and Game Commission adopted 29 central coast MPAs in April 2007. Planning has also concluded for the north central coast study region (Alder Creek to Pigeon Point) and MPA proposals are under review with the California Fish and Game Commission. The south coast study region (Point Conception south to the California/Mexico border) is the third study region to for which the MLPA Initiative planning process has been started. After the south coast process, the MLPA Initiative will address the north coast study region (Alder Creek north to the border of Oregon), and finally the San Francisco Bay study region (from the Golden Gate Bridge to the Carquinez Bridge).

Marine protected areas within the MLPA South Coast Study Region will be evaluated and redesigned with input from a regional stakeholder group, a science advisory team, a blue ribbon task force, the California Department of Fish and Game (DFG), the California Department of Parks and Recreation, and other interested parties. This document, the *Regional Profile of the MLPA South Coast Study Region*, is intended to support the MPA planning process by providing background information and data on the biological, oceanographic, socioeconomic, and governance characteristics of the south coast study region. The regional profile has been reviewed and revised based on input from regional stakeholders. This profile will assist stakeholders and decision-makers in evaluating existing MPAs in the study region and developing alternative proposals for a network of MPAs which meet the goals of the MLPA and which form a component of the statewide MPA network.

Regional Overview

The MLPA South Coast Study Region spans a straight-line distance of approximately 557 miles of the California coastline (with about 1,046 miles of actual shoreline) from Point Conception in Santa Barbara County to the California/Mexico border. Encompassing 2,351 square miles of coastal waters, the study region extends from the shoreline (mean high tide) to a maximum depth of approximately 3,938 feet off the northeast corner of San Clemente Island. The study region includes state waters surrounding the Channel Islands and other offshore rocks. The population, broad range of interests, sensitive marine ecosystem, and the unique conditions of the Southern California Bight combine to create a complex setting. Some of the unique features of the study region include:

- the intersection between two major biogeographic regions at Point Conception (cold, temperate Oregonian province from the north and the warm, temperate San Diegan province from the south), in the northern portion of the study region;
- a complex system of oceanographic currents, including a large gyre known as the Southern California Eddy, which circulates in a counter-clockwise direction;

- diverse habitats ranging from sandy beaches and rocky coasts to soft- and hard-bottom deep habitat, with more than 30% of the study region shoreline composed of sandy beaches;
- deep offshore areas, including channels, basins, and canyons, interspersed by shallow ridges, situated on a broad continental shelf;
- kelp forests dominated by giant kelp and associated species assemblages;
- nearly 40 estuaries and lagoons with tidal influence, including Anaheim Bay, Upper Newport Bay, Bolsa Chica, and many others;
- high biodiversity, including 481 species of fish, 4 species of sea turtles, 195 species of birds, 7 species of pinnipeds, and more than 5000 species of invertebrates;
- the Channel Islands, which are made up of 8 major islands as well as smaller rocks and islets, and support large numbers of marine birds and mammals and provide for consumptive and non-consumptive recreational activities;
- several large urban centers, including Los Angeles and San Diego, located adjacent to the study region, whose populations utilize coastal resources for recreational activities and commercial industries, while presenting unique challenges for water quality;
- productive commercial and recreational fisheries, targeting a wide diversity of species, that help support economies of coastal communities and provide fresh seafood to the region and world;
- the majority of California's individuals participating in non-consumptive activities, such as diving, surfing, kayaking, beach-going, swimming, and shore and boat-based wildlife viewing; and
- nearly half the existing state MPAs in California, as well as several federally managed areas, including the Channel Islands National Marine Sanctuary, Channel Islands National Park, Santa Monica Mountains National Recreation Area, and Cabrillo National Monument.

Ecological Setting

The MLPA South Coast Study Region is characterized by high productivity, high biodiversity, diverse habitat types, and the unique oceanographic conditions of the Southern California Bight. The biodiversity of this study region was one of the driving factors in the designation of the Channel Islands National Marine Sanctuary, the Channel Islands National Park, and the associated ten state marine reserves and two state marine conservation areas implemented in 2003.

All of the habitats listed in the MLPA or recommended by the science advisory team for representation within MPAs, with the exception of seamounts (which do not occur within state waters) are found within the study region. For most of these habitats, there are some mapped data available for use in the planning process.

The following are some notes on the habitat types and ecologically distinctive areas within the study region:

- Most of the study region is relatively shallow and is less than 330 feet in depth, although some areas, such as the basins, canyons, and areas near the southern Channel Islands, are much deeper.
- Intertidal zones include sandy beaches, rocky shores, tidal flats, coastal marsh and man-made structures.
- Estuaries, with their associated open water, soft bottom, coastal marsh, tidal mud flats, and eelgrass beds, exist throughout the study region. There are two types of estuaries in the south coast: those permanently or semi-permanently open to the ocean and those seasonally separated from the ocean by sand bars. While there are some large estuaries (Anaheim Bay

and upper Newport Bay) in the study region, most are small and are periodically closed to tidal influence. Some of the species that depend on these estuaries seasonally, or at some point in their life history, include the Pacific staghorn sculpin, bay pipefish, arrow goby, and sharks.

- Eelgrass (*Zostera sp*.) beds are found throughout the study region in estuaries (e.g., Mugu Lagoon) and along the coast (e.g., along the Santa Barbara coast). Surfgrass (*Phyllospadix sp*.) is common in the study region and is associated with open ocean habitat (e.g., northern Channel Islands and along the San Diego coast).
- Giant kelp (*Macrocystis pyrifera*) dominates the study region with dense canopies that support diverse marine life. Kelp beds have been mapped at a fine-scale resolution in six annual surveys (1989, 1999, 2002, 2003, 2004, and 2005) and are found off rocky headlands, including Point Conception, Point Dume, Palos Verdes, La Jolla, and other locations. Kelp forests are also abundant in waters surrounding the Channel Islands.
- Hard-bottom habitats (rocky reefs) are less common (7% of the total study region area) than soft-bottom habitats in the study region in all depth zones. The species composition for hard substrate varies with depth zone. Kelp forests are associated with shallow rock bottoms, while deep-sea corals and sponges are found in deep rock habitat.
- Sandy and soft-bottom habitats dominate both shorelines and subtidal substrates in the south coast study region. These habitats do not have the relief or structural complexity of hard-bottom habitats, but do host a number of unique species adapted to the dynamic environment and the low-relief physical characteristics. Invertebrates and bottom-dwelling fish are the most common species found in soft substrate.
- Underwater pinnacles are submerged rocky cones or outcrops that can be important areas where fish and other species aggregate. Underwater pinnacles exist in the study region, especially near the Channel Islands, but have not been well mapped. On substrata maps, these features are not categorized separately from hard-bottom habitats.
- Several submarine canyons exist within the study region. Notable canyons are found off Point Mugu, Palos Verdes Point, and La Jolla, among other areas. Canyons provide important habitat for deep-water communities and young rockfish, and provide foraging areas for seabirds and marine mammals.
- The Channel Islands, which include eight major islands and a number of rocks and smaller islets, provide a unique ecological setting. The northwestern islands are associated with cooler, nutrient-rich waters and the southeastern islands are associated with warmer waters. This dynamic oceanographic setting and existence of high-relief rocky habitats at a variety of depths allows for a high level of biodiversity.
- The Southern California Bight creates complex oceanographic conditions in the south coast study region and results in unique ecological assemblages. A large gyre circulates water counter-clockwise and a number of smaller eddies and countercurrents add to the complexity of the oceanographic setting. A large upwelling center exists near Point Conception and draws deep, nutrient-rich waters to the surface. In addition, plumes following storm events contribute fresh water, sediment, and pollutants to the coastal marine environment.

The diverse habitats of the south coast study region host a wide diversity of species that may benefit from MPAs. This document describes some of the species that have special relevance to the MPA planning process, including:

- Regionally important species that are likely to benefit from MPAs identified by the SAT;
- Depressed or overfished species, which include abalone, bocaccio, canary rockfish, cowcod, widow rockfish, and steelhead trout;

- Species targeted by commercial and/or recreational fisheries, which are an important component of the study region's economy, including California sheephead, California halibut, grunion, spiny lobster, and many others; and
- Special-status species that are protected under either state or federal law, including a number of pinnipeds, cetaceans, seabirds, and sea turtles, as well as steelhead trout, giant sea bass, garibaldi, and the tidewater goby (listed in Appendix C(ii)).

Land-Sea Interaction

Ecological linkages between the marine and terrestrial environments include:

- Fish that live offshore but move to estuaries, bays, and other more sheltered habitats to reproduce. Plainfin midshipman, staghorn sculpin, and leopard sharks are among the species that depend on the marine and coastal habitats for their life histories.
- Anadromous and catadromous fish that migrate between the ocean and coastal rivers in their life history for spawning, rearing, and dying. Steelhead (anadromous) and striped mullet (catadromous) are found within the study region.
- Shorebirds and waterfowl that inhabit coastal lagoons, estuaries, and salt marshes (estuaries and bays of the study region form part of the Pacific Flyway, one of the four principal bird migration routes in North America).
- Marine mammals, including the California sea lions, northern elephant seals, and harbor seals, which use coastal rocks, sandy beaches, tidal flats, and estuaries as haul-outs and for rookery sites.
- Coastal and estuarine vegetation and nutrients, which are carried to the open ocean, where they provide temporary food and shelter to species including juvenile fish.

Terrestrial activities can have significant impacts on coastal water quality and habitat condition. Nearly 8,366 square miles of land in 19 major watersheds drain directly to the ocean. Some of the most important water quality issues include:

- Impaired rivers and waterbodies that have been identified under Section 303(d) of the federal Clean Water Act and have a total maximum daily load (TMDL) for pollutants;
- Recognized water quality management areas including state water quality protection areas (SWQPAs), areas of special biological significance (ASBSs), and California critical coastal areas (CCAs);
- The highest number of beach closures in California, mostly due to high bacteria levels from sewage spillages;
- Sediment contamination, with 94% of the study region sediments being affected by one or more contaminants. Contamination can be linked to pollutants transported via urban runoff and released into the ocean from outlets, industrial discharges, wastewater discharges, and port activities, the most notable example being the Palos Verdes shelf, where a superfund site was established due to high levels of dichloro-diphenyl-trichloroethane (DDT) and Polychlorinated biphenyl (PCBs) from decades of wastewater discharge;
- Point sources of pollution that empty into the coastal environment at specific locations and may cause localized impacts. Examples of point sources of pollution in the study region are wastewater treatment facilities, desalination plants, and stormwater outfalls;
- Nonpoint source pollution, which is a leading cause of degraded water quality and eutrophication in the study region, but it is difficult to identify sources as it derives from diffuse locations. Five major sources of nonpoint source pollution are agriculture, urban areas, resource extraction, hydromodification, and ports and associated vessels; and

- Coastal energy which involves development, extraction, and transportation of energy-related resources in coastal waters, as well as offshore. Projects include oil drilling, liquid natural gas, and coastal power plants.

Socioeconomic Setting

The MLPA South Coast Study Region has a complex socioeconomic setting which includes a large population, certainly highly urbanized areas, and industries and economic sectors dependent on marine resources. Recreational and commercial fishing, tourism and non-consumptive activities make significant contributions to coastal economies in the five counties of the study region. Several types of socioeconomic information are included in this regional profile:

- Brief descriptions of the five coastal counties in the study region (Santa Barbara, Ventura, Los Angeles, Orange, and San Diego counties), including overall economic and population statistics and the wages paid in ocean-based economies.
- Commercial fishing statistics. Major commercial fisheries within the study region include Market squid, sea urchin, spiny lobster, coastal pelagic finfish, spot prawn, California halibut, and others. Over the past decade, average annual landings in the study region totaled nearly 254 million pounds with average annual ex-vessel revenue being $67.6 million. However, the overall number of commercial fishing vessels has decreased in recent years. The three major commercial fishing port complexes in the study region, as defined by DFG, are Santa Barbara, Los Angeles, and San Diego. Individual ports and harbors include Santa Barbara Harbor, Ventura, Port Hueneme, San Pedro, Terminal Island, Dana Point, Newport Beach, San Diego, Point Loma, and many others.
- Locations of kelp harvest and aquaculture leases in the study region. Administrative kelp beds exist throughout the study region, while aquaculture sites occur only in Santa Barbara County and San Diego County. Forty-eight kelp beds exist in the study region, of which 23 are open, 3 are closed, and 22 are leaseable. Land-based aquaculture operations include raising abalone, mussels, keyhole limpets, and fishes. Shellfish aquaculture operations with active state water-bottom leases cover a total area of 241 acres. White seabass are also reared within the study region at a number of locations.
- Recreational fishing statistics. Some of the major recreational fisheries within the study region include basses, rockfish, yellowtail, white seabass, surfperch, Pacific mackerel, Pacific sardine, and silversides. Common fishing modes include boat-based (Commercial Passenger Fishing Vessels, kayak angling and private/rental vessels), shore-based (beach/ bank fishing and from manmade structures), and other (spearfishing, clamming). In 2007, fishing from manmade structures was the most common mode and accounted for 1,341,343 recorded angler days. The second most common mode was beach and bank fishing with 766,709 angler days.
- Information on scientific collecting, for which approximately 1,950 permits were issued in 2007 by DFG.
- Information on coastal tourism, including coastal park visitation rates. Los Angeles County experienced the highest travel spending for the study region. Five of California's ten most visited state parks are located in the study region adjacent to the coast; they include Huntington, Bolsa Chica, San Onofre, Doheny, and Cardiff state beaches.
- Descriptions of non-consumptive activities, including beachgoing, surfing, boating, scuba diving, kayaking, tidepooling, and wildlife viewing.
- Information on alterations to the coast. Alterations include beach nourishment, beach grooming, dredging, coastal armoring, and coastal lighting. In the study region, coastal alterations are common with over 600 nourishment projects, more than 100 miles (160 km) of groomed beaches, and 298 miles of armored coast.

- Vessel traffic. The south coast study region includes three of the busiest port complexes in the country: the Port of Los Angeles, the Port of Long Beach, and San Diego Harbor. Transportation of oil and petroleum products is a major activity of vessels traveling in and out of these ports.

Institutions for Research, Public Outreach, and Education

There are a number of institutions with marine research or educational objectives in the study region. The locations of major research institutions and scientific collecting/monitoring sites (including Partnership for Interdisciplinary Studies of Coastal Oceans and Multi-agency Rocky Intertidal Network sites) have been mapped. In addition, information on monitoring and educational programs and organizations has been compiled in this regional profile, demonstrating potential opportunities for future research and education associated with MPAs.

Jurisdiction and Management

Numerous federal, state and local government bodies have jurisdiction in the study region. A large percentage of terrestrial lands adjacent to the study region are owned and operated by the California Department of Parks and Recreation and the U.S. Department of Defense. In addition, 19 federally recognized Native American tribes, as well as numerous federally unrecognized groups of Native American people, are located within coastal areas adjacent to the study region.

Existing MPAs, Marine Managed Areas, and Coastal Protected Areas

Existing state MPAs, marine managed areas, fishery closures, and other coastal protected areas are described for the region, including:

- Descriptions of the 42 existing state MPAs and 3 special closures, which cover 7.7% of the total study region area;
- Information on other marine managed areas within or adjacent to the study region (such as national marine sanctuaries) and fishery closures (such as the rockfish conservation areas and no-trawl or no-bottom-contact zones established for the protection of groundfish essential fish habitat);
- Information on areas of limited access due to military operations or power plant closures; and
- Information on terrestrial protected areas, such as national monuments, national parks, wildlife refuges, state beaches and parks, and county beaches, which may have relevance to MPAs for public access and management purposes.

Conclusion

The MLPA South Coast Study Region contains a diverse array of habitats located in a dynamic oceanographic setting at the intersection of two major biogeographic regions. Complex bathymetry, including deep submarine canyons and offshore ridges and islands on a broad continental shelf make this region unlike any other in California. These underlying geographic, geologic, and oceanographic characteristics have contributed to the creation of biologically productive marine ecosystems that support hundreds of species. Rocky reefs, sandy beaches, giant kelp forests, and numerous estuaries each support unique assemblages, along with many other habitats. Point Conception, Santa Monica Bay, Point Loma, and the Channel Islands are just a few of the areas of ecological significance. Such abundant marine resources are important for both recreational and commercial activities, both of which are important to the economies of the five counties located

adjacent to the study region. The study region's biological productivity and high degree of human use have been driving factors in the designation of management areas on the federal level, such as the Channel Islands National Marine Sanctuary, and on the state level, such as the large number of state MPAs. This document summarizes key information relating to the study region, so that these state MPAs may be efficiently redesigned to better protect California's marine heritage in accordance with the Marine Life Protection Act.

Appendices

Eight appendices provide more detailed information on many aspects of the study region. The MLPA South Coast Study Region has been divided into seven subregions for ease of data display and to facilitate identification of important local issues. Appendix A summarizes the main ecological, socioeconomic, and management attributes of each subregion. The seven subregions are:

- Point Conception (Government Point) to Rincon Point (subregion 1)
- Rincon Point to Point Dume (subregion 2)
- Point Dume to Newport Beach (subregion 3)
- Newport Beach to Agua Hedionda (subregion 4)
- Agua Hedionda to California - Mexico border (subregion 5)
- Northern Channel Islands (subregion 6)
- Southern Channel Islands (subregion 7).

The appendices also include comprehensive lists of available spatial data layers, species likely to benefit from MPAs and special-status species found in the study region, species referenced in the regional profile, impaired water bodies in the study region, and academic research and education institutions with a focus on coastal and marine ecosystems. The appendices also include detailed statistics on major commercial fisheries by county and characteristics and statistics on recreational fisheries in the south coast study region.

1. Introduction

The Marine Life Protection Act (MLPA) was signed into law in 1999. The MLPA mandates the redesign of a statewide system of marine protected areas (MPAs) that function, to the extent possible, as a network. Central to the MLPA are six goals intended to guide the development of MPAs within California's state waters. The six goals of the MLPA are:

- Goal 1: To protect the natural diversity and abundance of marine life, and the structure, function, and integrity of marine ecosystems.
- Goal 2: To help sustain, conserve, and protect marine life populations, including those of economic value, and rebuild those that are depleted.
- Goal 3: To improve recreational, educational, and study opportunities provided by marine ecosystems that are subject to minimal human disturbance, and to manage these uses in a manner consistent with protecting biodiversity.
- Goal 4: To protect marine natural heritage, including protection of representative and unique marine life habitats in California waters for their intrinsic value.
- Goal 5: To ensure that California's MPAs have clearly defined objectives, effective management measures, and adequate enforcement, and are based on sound scientific guidelines.
- Goal 6: To ensure that the MPAs are designed and managed, to the extent possible, as a component of a statewide network.

After several unsuccessful attempts to implement the MLPA, the California Resources Agency, the California Department of Fish and Game (DFG), and Resources Legacy Fund Foundation signed a memorandum of understanding launching the MLPA Initiative in August of 2004, which began the implementation of the MLPA along the central coast. Among other actions, the MLPA Initiative established the MLPA Blue Ribbon Task Force, MLPA Master Plan Science Advisory Team (SAT), a statewide stakeholder interest group, and MLPA Initiative staff.

A regional stakeholder group was convened for the first MLPA study region, along California's central coast (Pigeon Point to Point Conception), in June of 2005. By March of 2006, several alternative proposals for MPA design had been generated by the MLPA Central Coast Regional Stakeholder Group and reviewed by the MLPA Blue Ribbon Task Force, which forwarded a preferred alternative proposal to the California Department of Fish and Game. The Department of Fish and Game then forwarded a recommendation to the California Fish and Game Commission. After over a year of ensuing public comments and deliberations, the California Fish and Game Commission unanimously adopted a preferred alternative proposal for MPAs in the central coast in April of 2007. These MPAs were ultimately implemented in September of 2007.

A second memorandum of understanding, effective January 1, 2007, continued the public-private partnership for planning marine protected areas (MPAs) in the second MLPA Initiative study region along California's north central coast (Alder Creek, just north of Point Arena, to Pigeon Point). The MLPA North Central Coast Regional Stakeholder Group was convened in May of 2007 and worked for nearly a year to generate three alternative proposals for MPAs on the north central coast by April of 2008. In June of 2008, the MLPA Blue Ribbon Task Force forwarded these three stakeholder-generated proposals, as well as an "Integrated Preferred Alternative" to the California Fish and Game Commission for consideration in the regulatory process.

In December of 2007, California Secretary for Resources Mike Chrisman announced the order in which the remaining portions of the California coastline would be considered under the Marine Life Protection Act, with the goal of completing the planning process by 2011. Secretary Chrisman announced that the MLPA Initiative would move to the south coast study region in 2008, followed by

the north coast study region (California/Oregon border in Del Norte County to Alder Creek near Point Arena in Mendocino County,), and finally the San Francisco Bay study region (from the Golden Gate Bridge to the Carquinez Bridge). In February of 2008, the California Fish and Game Commission formally adopted a working version of the *California Marine Life Protection Act Master Plan for Marine Protected Areas* (DFG 2008d), which includes guidelines for developing MPAs.

MPA planning within the MLPA South Coast Study Region (Point Conception in Santa Barbara County to the California/Mexico border in San Diego County, including offshore islands within state waters) represents the third step in the MLPA Initiative process, with a formal amendment to the 2007 memorandum of understanding signed in July 2008. This regional profile includes background information on the biological, oceanographic, socioeconomic, and governance setting for the MLPA South Coast Study Region and is intended to provide basic regional information to support stakeholders and policy-makers in their understanding of the marine resources and heritage of the region so that they may effectively reexamine and redesign MPAs in accordance with the Marine Life Protection Act. This information is provided in the form of text summaries, tables, selected maps (with links to other computer-accessible maps), and technical appendices. The MLPA South Coast Regional Stakeholder Group and MLPA Master Plan Science Advisory Team will provide additional information to augment this profile through a joint fact-finding process.

The best readily available data are being compiled for use in the south coast study region MPA planning process. This regional profile provides an overview of some of that data. Additional data in a spatial geographic information system (GIS) format are being housed in the California Marine Geodatabase at the University of California, Santa Barbara and are viewable using the online tool MarineMap (http://www.marinemap.org/marinemap/), released in the fall of 2008. Appendix B provides a list of the data layers that are available for MPA planning.

2. Description of the MLPA South Coast Study Region

The MLPA South Coast Study Region covers state waters extending from a line extending due west of Point Conception (in Santa Barbara County) to the California/Mexico border. The study region also includes state waters surrounding offshore islands, including the islands of San Miguel, Santa Rosa, Santa Cruz, Anacapa, Santa Barbara, Santa Catalina, San Nicolas and San Clemente (Map 2.0 -1), as well as a number of offshore rocks, such as Richardson, Begg, and Castle rocks. In general, state waters extend three nautical miles offshore. The shoreward boundary of the study region is drawn at mean high tide in most locations and at the extent of tidal influence and estuarine vegetation in estuaries and lagoons. Lagoons that are mostly or entirely closed to tidal inundation and dominated by brackish-freshwater species are not included in the MLPA South Coast Study Region.

To facilitate the display of information, the study region has been divided into seven subregions. These subregions are designed simply to show data at a reasonable scale and are not based on any biogeographic criteria; nor are they used as the basis for any MPA evaluations. Subregions for the south coast study region are:

1. Point Conception (Government Point) to Rincon Point
2. Rincon Point to Point Dume
3. Point Dume to Newport Beach
4. Newport Beach to Agua Hedionda
5. Agua Hedionda to the California - Mexico border
6. Northern Channel Islands
7. Southern Channel Islands

The study region coastline covers an alongshore, straight-line distance of 557 statute miles (unless otherwise noted, all distance measurements in this document are measured in statute miles (mi) and all area measurements are measured in square statute miles (mi^2)). The actual shoreline length is much longer due to undulations in the coastline and covers a distance of approximately 1046 miles (based on the NOAA Environmental Sensitivity index linear shoreline data). The study region encompasses 2,351 square miles of area, including 1,287 square miles surrounding the offshore islands. Offshore waters within the study region contain a number of channels, basins, and canyons, which extend to a maximum depth of 3,938 feet off the northeast corner of San Clemente Island. These deeper areas, interspersed with shallower ridges, have been characterized as a “continental borderland” (Shepard and Emery 1941, Norris and Webb 1990) and are a defining characteristic of the study region. A diverse array of habitats exist within the study region, ranging from sandy, rocky, and estuarine intertidal areas to deep hard and soft habitats on the continental shelf and slope. In comparison to other areas in California, the south coast study region contains mostly soft-bottom habitats, although rocky reefs and rock piles are also present.

The study region is located in the northern portion of the Southern California Bight, which extends from Point Conception to Baja California in Mexico (Dailey 1993). The Southern California Bight is located within the greater context of the California Current Large Marine Ecosystem (LME), one of only four temperate upwelling systems in the world. The California Current LME is considered globally important for biodiversity because of its high productivity and the large numbers of species it supports (WWF 2000). The California Current LME extends from Vancouver Island to Baja California and is a very productive ecosystem fueled by nutrient-rich upwelling which supports blooms of phytoplankton that form the foundation for a food web that includes many species of invertebrates, fish, marine mammals and seabirds. The MLPA South Coast Study Region is in the southern portion of the California Current LME and lies immediately south of Point Conception, where the cool

California Current meets the relatively warmer California Countercurrent. The confluence of these two oceanographic currents marks the interface between two biogeographic provinces, each with distinct biota and ecosystems: the Oregonian province to the north (and extending to parts to the Channel Islands) and the San Diegan (or Californian) province to the south (NCCOS 2005).

The majority of the south coast study region is dominated by a counter-clockwise circulating gyre called the Southern California Eddy. This oceanographic feature comprises a complicated set of seasonally varying currents (more in section 3.1.11), but generally forms when the southward-moving California Current bends shoreward near San Diego and northward along the Southern California Bight as the Southern California Counter Current (Jones 1971). This feature is most well developed in the summer/fall months and less developed during the winter/spring (Lynn and Simpson 1987, Hickey 1993) and moves at average speeds of 10-20 centimeters per second (Oey 1999).

Upwelling occurs in the northern portion of the study region and is centered on Point Conception, where the California coastline angles abruptly to the east and marks the northern boundary of the Southern California Bight (Love et al. 1999). During the upwelling season (March through September), cold, nutrient-rich waters are brought to the surface near Point Conception and move eastward along the western edge of the Santa Barbara Channel (Hickey 2000, Atkinson et al. 1986). These nutrient-rich waters provide for diverse ecosystems, fueled by a productive pelagic food web that includes phytoplankton, krill, coastal pelagic species (anchovies, sardines, squid, etc), fish, seabirds, marine mammals, and sharks. Coastal geography and wind patterns minimize the occurrence of upwelling in the southern portion of the study region although upwelling does occur in a number of locations including Palos Verdes and Point Loma (see section 3.1.11).

Freshwater plumes following major storm events play a significant role to the south coast study region oceanographic context (Warrick et al. 2007). These plumes of water can be visibly tracked with aerial imagery and contribute freshwater, sediments, nutrients, and pollutants to nearshore ecosystems and can be correlated with fluctuations in biologic productivity (Otero and Siegel 2004). Depending on a variety of factors, including magnitude of the storm event, watershed size and associated land uses, freshwater plumes in southern California can cover hundreds of square kilometers over a period of 1-2 days and persist for days or even weeks (Nezlin et al. 2005).

The primary ocean cycles affecting the study region include the Pacific Decadal Oscillation (PDO) and periodic El Niños and La Niñas. The PDO consists of alternating warm and cold regimes lasting 10 to 30 years, whereas the warm El Niños and cold La Niñas last two to three years. These oceanic events affect the distribution and abundance of species in the study region during and after their occurrence. PDO warm regimes and El Niños warm the waters, giving temporary advantage to warm-water species, allowing them to become more abundant and widespread. PDO cold regimes and La Niñas have the opposite effect, causing cold-water species to grow more abundant and widespread, while warm-water species become less so.

The ecology of the study region has been relatively well characterized in several publicly available summary documents (DFG 2002a, NCCOS 2005, CINMS 2007) as well as numerous scientific studies (e.g. Dailey et al. 1993). The following is a general overview of important geographic and ecological features of the region, generally described from north to south. More specific information is provided in habitat descriptions (section 3) and subregional summaries (Appendix A).

Point Conception, a rocky headland that marks the beginning of the Southern California Bight, is the northern limit of the study region. Cold waters from central California and warm waters from southern California contribute to a diverse array of marine life in this location. The coastline trends eastward along the Santa Barbara coastline from this point, paralleling the Santa Barbara Channel just offshore, where offshore oil seeps exist. This portion of the coast is relatively protected from ocean swells by the northern Channel Islands, and thus hosts unique marine life such as soft-bottom

kelp. A number of streams meet the sea along the coastline, as well as the Ventura and Santa Clara rivers further south. Some of these terminate in estuaries, such as Goleta Slough, Malibu Lagoon, and Mugu Lagoon.

Palos Verdes Peninsula is a rocky headland located near the center of the study region, with Santa Monica Bay to the north and the ports of Los Angeles and Long Beach to the south. The western slope of the peninsula is among the steepest and deepest areas in the study region. Santa Monica Bay contains a wide variety of habitats, including rocky reef, sandy beach, and submarine canyons, and supports some 5,000 species in close proximity to the largest population center in California. Also within Santa Monica Bay is Marina Del Rey, one of the nation's largest man-made small craft harbors (MDRCVB, 2008). Santa Monica Bay was designated an estuary of national significance in 1988 and as such is the focus of a National Estuary Program aimed at ensuring the long-term health of the bay and its watershed (ANEP 2001). The Ports of Los Angeles and Long Beach, two of the busiest ports in the country, lie to the south of the peninsula at the mouth of the Los Angeles River. Broad, fine- to medium-grain sandy beaches exist on either side of Palos Verdes, with mostly soft bottom in the sub-tidal zone. South of Palos Verdes are several river mouths and estuaries including the San Gabriel and Santa Ana Rivers, Upper Newport Bay, and the Bolsa Chica Wetlands.

The coastline along Orange and northern San Diego counties can be characterized as sandy beaches backed by wave-cut platforms and mostly sandy subtidal areas. Numerous small creeks and rivers form a large number of coastal estuaries and lagoons, which vary in tidal influence. Some of the larger rivers include San Luis Rey and San Dieguito rivers. Dana Point Headlands provides rocky intertidal areas, and further south, the rocky points of La Jolla and Point Loma provide for hard-bottom habitat and nearshore kelp forests. A submarine canyon reaches the nearshore area near La Jolla. Mission Bay, San Diego Bay, and the Tijuana Estuary are major estuaries in this far-southern portion of the study region.

The Channel Islands, which lie between 12 and 75 miles offshore, are made up of eight major islands as well as a number of smaller rocks and islets. The northern Channel Islands, which include Anacapa, Santa Cruz, Santa Rosa, and San Miguel islands, lie on a submarine ridge between the shallower Santa Barbara Channel and the deeper Santa Cruz basin. Among the northern Channel Islands, Anacapa Island is the closest to shore, approximately 12 miles from Point Hueneme. The waters surrounding the mostly rocky islands are highly productive and support diverse species, in part due to the mixing between colder water from the California Current in the western portion of the islands and warmer water from the Southern California Counter Current in the eastern portion of the islands.

Farther south lie the islands of Santa Barbara, San Nicolas, Santa Catalina, and San Clemente. Santa Barbara, located 55 miles from Ventura County, is one of the smallest Channel Islands and the peak of a larger submerged bank. San Nicolas, 75 miles west of Los Angeles, is one of the most remote Channel Islands and is situated on a similar offshore bank. Both islands are mostly rocky and support diverse marine life. Of the southern Channel Islands, Santa Catalina is the closest to shore, just 20 miles from Palos Verdes headland and located between the Santa Monica-San Pedro basin and the Catalina Basin. San Clemente, 78 miles west of San Diego, is the furthest south of the Channel Islands, with a relatively shallow slope to the west and a much steeper slope to the east, where the deepest point in the study region is located. Both Santa Catalina and San Clemente have larger portions of sand than the other Channel Islands and have similar species assemblages.

The study region abuts five coastal counties: Santa Barbara, Ventura, Los Angeles, Orange, and San Diego. Areas along the entire coastline of the study region support large numbers of people and extensive development, although the largest urban centers occur in the cities of Los Angeles and San Diego. A large commercial fishing fleet as well as recreational fishing community, including shore-based, private boaters, and "party boat" operations, is supported by the abundant marine resources in the study region, with major ports in Long Beach Harbor and San Diego Bay, as well as

numerous other locations. A variety of non-consumptive activities are also popular within the study region, including diving, kayaking, surfing, beach-going, swimming, and a number of different shore- and ship-based wildlife viewing activities.

3. Ecological Setting

The MLPA South Coast Study Region includes unique ecosystems and encompasses habitats and species that are important for regional marine biodiversity, sustainable resource use, and natural heritage. The Southern California Bight hosts a wide diversity of species, including at least 481 species of fish, 492 species of algae, 4 species of seagrass, 4 species of sea turtles, 195 species of birds, at least 33 species of cetaceans, 7 species of pinnipeds, and over 5000 species of invertebrates (CIMNS 2007). Several of these species have special status under California and/or Federal Endangered Species Act, including white abalone, tidewater goby, green sea turtles, California Brown Pelicans, California Least Terns, Southern sea otters, and Guadalupe fur seals (DFG 2008b). This diverse assemblage of species reflects the wide range of habitats that exist in the south coast study region – from deep ocean basins to offshore islands and ridges to a variety of estuarine and intertidal environments. Biogenic habitats, such as kelp forests and seagrass beds, host numerous species, and geologic processes, such as oil seeps, create unique ecological conditions. Some habitats, such as soft-bottom kelp beds, exist few other places in the world. A dynamic oceanographic context further increases the biological complexity of the Southern California Bight, with complicated current patterns, upwelling, retention zones, freshwater plumes, and the interaction of warm and cold biogeographic regimes all playing a role.

These unique species, habitats, and oceanographic conditions have contributed to the establishment of several state and federal management areas within the study region. Nearly half of the existing state MPAs in California are located within the study region as well as 31 state parks. Three areas managed by the National Park Service (NPS) - the Santa Monica Mountains National Recreation Area (established in 1978), the Cabrillo National Monument (established in 1913), and the Channel Islands National Park (established in 1980) - are also located within or adjacent to the study region. In particular, the Channel Islands have been recognized for their unique ecological conditions. Anacapa and Santa Barbara islands were established as a National Monument in 1938 and in 1949 one nautical mile around each of these islands was included within the Monument boundary. In 1977, the Channel Islands National Monument was designated by UNESCO as a part of the International Man and Biosphere Reserve program. In 1980, Anacapa, Santa Barbara, Santa Rosa, Santa Cruz, and San Miguel islands and one nautical mile surrounding each of the islands were designated as Channel Islands National Park. Also in 1980, Channel Islands National Marine Sanctuary was established. Additionally, the Tijuana River National Estuarine Research Reserve and the Tijuana Slough National Wildlife Refuge were designated a Ramsar site, or wetland of international importance, in 2005, one of only 24 in the United States.

A significant amount of research has taken place within the south coast study region and has contributed to a large body of literature regarding the unique ecological characteristics of the study region. This regional profile has drawn from many of these sources, which can serve as further references. Some key synthetic reports and publications that provide an overview of the study region include:

- Ecology of the Southern California Bight (Dailey et al. 1993)
- The Sea Off Southern California: A Modern Habitat of Petroleum (Emery 1960)
- NOAA Channel Islands Biogeographic Assessment of the Channel Islands National Marine Sanctuary (NCCOS 2005)
- Final 2002 Environmental Document: Marine Protected Areas in the National Oceanographic and Atmospheric Administration's Channel Islands National Marine Sanctuary (DFG 2002a)
- The draft management plan for the Channel Islands National Marine Sanctuary (NMSP 2006)
- The Channel Islands final EIS (CINMS 2007)

A variety of data layers, including information on distribution of habitats and species in the study region, are available in MarineMap, an online tool developed by the MLPA Initiative, available at: http://marinemap.org/marinemap. In addition to this tool, other interactive maps are available online that may serve as further references. For instance, the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) has an online "subtidal community survey map" that allows users to see species and habitat characteristics of PISCO research locations. This tool can be accessed at: http://www.piscoweb.org/data. PISCO also has a rocky intertidal biodiversity survey website (http://cbsurveys.ucsc.edu) that provides species lists and habitat features for 38 shore sites in southern California. Reef Check California recently released a similar interactive map service where a database of information collected by scientifically trained volunteers (citizen scientists) regarding both species and habitat can be viewed. This tool is available online at: http://ned.reefcheck.org. An associated report displaying similar information by specific location can be found at: http://www.reefcheck.org/rcca/2yr.php (appendix 1 of the Reef Check California report contains statistical information by specific site). The San Diego Nearshore Program has developed another tool for displaying habitat types as well as other information in the southern portion of the study region. This tool can be found online at: http://nearshore.ucsd.edu. Additional information regarding other research programs and information available online can be found in section 6.0 of this document.

3.1 Marine Habitats and Communities

This section further describes the diverse marine habitats that occur within the MLPA South Coast Study Region. The MLPA specifically mentions the following habitats in reference to their inclusion in California's system of MPAs: intertidal zones, rocky reefs, sandy or soft ocean bottoms, kelp forests, submarine canyons, seagrass beds, underwater pinnacles, and seamounts. In the earlier stages of the MLPA Initiative process, the Science Advisory Team (SAT) recommended further consideration of specific depth zones, estuaries, upwelling areas, retention areas, and freshwater plumes from coastal rivers, and different geologic substrata as additional habitats for MPA siting (DFG 2008d). These habitats, as identified within the MLPA and by the SAT, vary in their abundance along the California coastline. One habitat identified in the MLPA, seamounts, does not occur within state waters. Other habitats, such as pinnacles, are not well mapped. This document provides the best readily available information for each of these habitats, so that they can be considered in MPA planning. For instance, the MLPA requires that MPAs (specifically SMRs) in each of California's two biogeographic regions encompass a representative variety of marine habitats and communities across a range of depths and environmental conditions (section 2857(c) of the MLPA).

The SAT considers the habitats present in southern California and compares them to those outlined in the MLPA as well as previous study regions. Consideration of these habitats within the MLPA Initiative process is then tailored to the study region, with the SAT considering the relative abundance and spacing of habitats, and altering evaluation methods and guidance appropriately. The SAT has developed a list of key and unique habitats for the south coast study region, and has produced a description of and further information on those key habitats, including several habitats not considered in previous MLPA study regions, such as: purple hydrocoral (*Stylaster californica*)*,* elk kelp (*Pelagophycus porra*)*, oil seeps* and *shallow hydrothermal vents.*

Regional habitats are described below and spatial data on the distribution of most habitats has been provided, to the extent possible, given readily available information (Maps 3.1-1 and 3.1-2). Table 3.1-1 provides a summary of the amount of each habitat in the study region, the biogeographic region (Point Conception to the California/Mexico border), and the state (California/Oregon border to the border with Mexico, excluding San Francisco Bay). This summary shows the relative abundance of different habitats within the study region, as well as the contribution of the study region towards total amount of each habitat in the biogeographic region and state. Note that coastal habitats change

over time due to currents, climate change, rising sea level and human manipulation, and table 3.1-1 provides data on the current distribution of habitats.

During the south coast study region process, the MLPA Master Plan Science Advisory Team will consider relative abundance and distribution of these habitats to delineate several smaller biogeographic subregions, referred to as bioregions, for the purpose of evaluating MPA proposals. Creation of these bioregions is based on a number of factors, including underlying geology, oceanographic patterns, and species distributions.

Table 3.1-1. Amounts of habitat types in state waters, in the region and statewide

Habitat	Amount in Study Region	% of Study Region Area	Amount in State Waters	% of State Waters Area	GIS Data Source / Comments
Total Area (area, mi^2)	2,350.88		6947		
Total Shoreline (Length, mi)	1,046.45		2826.5		N2, N6
Shoreline Habitats (Length, mi) [a]					
Intertidal: Rocky shores	280.72	26.83%	944	33.40%	N2, N6
Intertidal: Sandy beaches	379.63	36.28%	1293.5	45.76%	N2, N6
Intertidal: Coastal marsh	59.49	5.69%	320.3	11.33%	N2, N6
Intertidal: Tidal Flats	28.76	2.75%	280.3	9.92%	N2, N6
Hard and Soft Bottom Habitats and Canyon (Area, mi^2) [b]					
Total Hard- and Soft-Bottom and Canyon Habitat	1,667.54		6947		
Rocky Habitat 0-30 meters	111.73	4.75%	209.1	3.01%	MB, FP, UG, OI, SA
Rocky Habitat 30-100 meters	47.79	2.03%	233.7	3.36%	MB, FP, UG, OI, SA
Rocky Habitat 100-200 meters	3.89	0.17%	139.3	2.01%	MB, FP, UG, OI, SA
Rocky Habitat >200 meters	2.16	0.09%	144.2	2.08%	MB, FP, UG, OI, SA
Total Rocky Habitat (all depths)	165.57	7.04%	726.2	10.45%	MB, FP, UG, OI, SA
Soft Bottom Habitat 0-30 meters	437.18	18.60%	2023.3	29.12%	MB, FP, UG, OI, SA
Soft Bottom Habitat 30-100 m	672.06	28.59%	3033.7	43.67%	MB, FP, UG, OI, SA
Soft Bottom Habitat 100-200 m	158.39	6.74%	385.4	5.55%	MB, FP, UG, OI, SA
Soft Bottom Habitat >200 m	234.34	9.97%	593.7	8.55%	MB, FP, UG, OI, SA
Total Soft Bottom (all depths)	1,501.97	63.89%	6036.1	86.89%	MB, FP, UG, OI, SA
Underwater Pinnacles	NA		NA		Data not available
Estuarine and Nearshore Habitats (Area, mi^2)					
Kelp 2005	30.4	1.29%	42.2	0.60%	F5
Kelp 2004	31.1	1.32%	45.5	0.70%	F4
Kelp 2003	26.3	1.12%	49.3	0.70%	F3
Kelp 2002	13.1	0.56%	36.6	0.50%	F2
Kelp 1999	11.6	0.49%	23	0.30%	F9
Kelp 1989	17.8	0.76%	53.6	0.80%	F8
Average Kelp	21.7	0.92%	41.7	0.60%	
Estuary	42.95	1.83%	148.5	2.10%	NW; ND; N2; GT
Seagrass: Surfgrass (Length, mi, % of shoreline)	72.43	6.92%	NA		MA
Seagrass: Eelgrass[c]	4.69	0.20%	41.7	0.60%	M8
Oceanographic Habitats					
Upwelling center[d]	1 major center at Point Conception		5 major centers		CW

Habitat	Amount in Study Region	% of Study Region Area	Amount in State Waters	% of State Waters Area	GIS Data Source / Comments
Retention area	Gyre within Southern California Bight acts as a retention zone		NA		Wing et al. 1998, Largier 2004
Freshwater plume	Coastal river mouths		NA		

Sources: CW = NOAA Coastwatch Sea Surface Temperature; F2 = DFG 2002a aerial survey; F3 = DFG 2003 aerial survey; F4 = DFG 2004a aerial survey; F5 = DFG 2005 aerial survey; F8 = DFG 1989 aerial survey; F9 = DFG 1999 aerial survey; FP = Fugro Pelagos Inc..; GT = USGS Topos; M8 = Merkel & Associates 2008; MA = Mineral Management Service 1980-1982 aerial surveys; MB = Seafloor Mapping Lab at California State University Monterey Bay (CSUMB); N2 = NOAA-ESI 2002; N6 = NOAA-ESI 2006; ND = California Natural Diversity Database; NW = National Wetlands Inventory; OI = Ocean Imaging; SA = San Diego Association of Governments (SANDAG); UG = USGS

[a] Shoreline percentages may add up to more than 100% since more than one type can be present in a given location. Not all shoreline types, such as hardened shorelines, are listed here. Please see Table 3.1-4 for a list of all shoreline types and their distances in the study region.

[b] Substrate data represent a union of data collected by Rikk Kvitek from the Seafloor Mapping Lab at California State University Monterey Bay (CSUMB), Fugro Pelagos Incorporated, United States Geological Survey (USGS), Ocean Imaging, and the San Diego Association of Governments (SANDAG).

[c] Eelgrass data is comprised of mapped eelgrass in bays and estuaries and does not include areas of eelgrass on the open coast, for which only simple presence/absence data are available.

[d] Upwelling occurs when surface waters, driven offshore by prevailing westerly winds, are replaced by deep, cold nutrient-rich waters that flow up over the continental shelf to the suface (CCC 2003). Major upwelling centers in the state include: Cape Mendocino, Point Arena, Davenport, Point Sur, Point Conception.

3.1.1 Depth Categories

Based on information about fish depth distributions in California (Allen 2006), the SAT has recommended considering habitats as they are represented in the depth zones identified in Table 3.1-2.

Table 3.1-2. Depth zones identified by the SAT

Meters (m)	Fathoms (fm)	Feet (ft)
Intertidal	Intertidal	Intertidal
Intertidal to 30 m	Intertidal to 16 fm	Intertidal to 98 ft
30 m to 100 m	16 fm to 55 fm	98 ft to 328 ft
100 m to 200 m	55 fm to 109 fm	328 ft to 656 ft
great than 200 m	greater than 109 fm	greater than 656 ft

Note: All depth figures above and throughout this document have been converted from the SAT guidelines, which are provided in meters. The above numbers have been converted from meters and are rounded to the nearest whole number. For reference, 1.00 m = 0.55 fm = 3.28 ft.

The intertidal zone includes habitats such as sandy beaches, rocky shores, tidal flats, and coastal marsh that are subject to periodic tidal inundation. The zero-to-thirty meter depth zone is considered the euphotic zone where light penetrates to support photosynthetic activity. Beyond thirty meters, light penetration diminishes and different assemblages of species occur. The depth zone from 100-200 meters is the approximate depth of the shelf-slope break, which is an area of high diversity characterized by both shelf and slope assemblages. At 200 meters and below, the continental slope drops down to the abyssal plain where deep sea communities occur.

Several of the seven habitats mentioned in the MLPA occur in only one depth zone, while others may occur in several depth zones. The area of each subtidal depth range within the study region are provided in Table 3.1-3, based on DFG (2008) delineation of depth zones using Geophysical Data System 91m resolution data. Most of the study region is less than 100 meters in depth, although there are significant portions that are deeper, especially on the edges of the basins and canyons of the Southern California Bight. Subregion 1 (the Santa Barbara coast) is the shallowest portion of the study region, with a maximum depth of 911 feet. Subregion 7 (the southern Channel Islands) is the

deepest portion of the study region, with a maximum depth of 3,938 feet off the northeast corner of San Clemente Island. A number of deeper basins lie between the Channel Islands, outside of state waters, the deepest of which lies between Santa Cruz, San Nicolas, and Santa Barbara islands.

Table 3.1-3. Depth zone as percent of south coast study region

Depth Zone	Area (mi^2)	Percentage of Study Region
Intertidal to 30 meters (0 to 16 fm)	702.75	29.89%
30 to 100 meters (16 to 55 fm)	933.37	39.70%
100 to 200 meters (55 to 109 fm)	275.29	11.71%
200 meters and deeper (109 fm and deeper)	438.49	18.65%

3.1.2 Intertidal Zones

The shoreline represents a transition zone between the marine and terrestrial environments and includes many important intertidal ecosystems and communities. Intertidal zones that have been mapped as linear features along the coastline include rocky shores, sandy beaches, tidal flats, coastal marsh along the shores of estuaries and lagoons, and man-made structures such as jetties and seawalls (Map 3.1-1). Table 3.1-4 is a summary of the linear length and percentage of total shoreline (approximately 1,046 miles as measured following the contours of the coastline) for each shore type in the study region based on data from NOAA-ESI (2006). Sandy beaches dominate the shoreline, although rocky areas also are present, especially on the Channel Islands. Marsh and tidal flat habitats are less common in the study region and generally found in sheltered bays and estuaries.

Table 3.1-4. Amounts of shoreline habitats

Shore Type	Length in Study Region (mi)	Percentage of Total Shoreline in Study Region
Exposed rocky cliffs	125.4	12.0%
Wave cut rocky platforms	150.6	14.4%
Exposed wave cut platforms in bedrock	4.1	0.4%
Sheltered rocky shores	0.6	0.1%
Fine to medium grained sand beaches	246.3	23.5%
Coarse-grained sand to granule beaches	59.5	5.7%
Mixed sand and gravel beaches	29.2	2.8%
Gravel beaches	105.8	10.1%
Salt marshes	59.5	5.7%
Exposed tidal flats	20.4	2.0%
Sheltered tidal flats	14.3	1.4%
Sheltered man-made structures	191.4	18.3%
Exposed seawall (man-made)	12.4	1.2%
Riprap (man-made)	135.4	12.9%
Total shoreline length in study region	1046.45	100%

Notes: Shoreline percentages may add up to more than 100% since more than one type can be present in a given location.

Rocky Shores: Rocky shore habitats and their associated ecological assemblages make up less than one-quarter of the study region shoreline (not including man-made hardened shorelines). Along the mainland coast, rocky shores are relatively rare and are mostly found in the vicinity of headlands such as Point Conception, Palos Verdes, La Jolla Point, and Point Loma. In contrast, much of the shoreline of the eight Channel Islands is dominated by rocky coast. Exposed rocky cliffs and

platforms are the most common types of rocky shores, whereas sheltered rocky shores are relatively rare.

Rocky intertidal communities, from the splash zone to the lower intertidal, vary in composition and structure with tidal height and wave exposure (Ricketts et al. 1985) and with underlying geology (Foster et al. 1988). Mussel beds (*Mytilus* spp.), algal beds (*Endocladia muricata*, *Hesperophycus californicus*, *Silvetia compressa*, and many other species), and surfgrass (*Phyllospadix* spp.) are distributed patchily along rocky shores and support high biodiversity as these organisms create structure to which larval organisms can settle and juveniles can find protection from predators and harsh environmental conditions. Such areas are sometimes characterized as "biogenic habitats." In addition, intertidal boulders, platforms, cliffs, and tidepools are home to many species of snails, algae, barnacles, mussels, anemones, crabs, sea stars, and fish. Also, the mostly rocky shores of the Channel Islands and sandy beaches near rocky points on the mainland coast host a variety of rookery/haulout sites for pinnipeds, including harbor seals, California sea lions, and Northern elephant seals, and colony/roosting areas for seabirds, including Pigeon Guillemots, Pelagic and Brant's Cormorants, and Xantus's Murrelets.

The following rocky shore types have been mapped in the south coast study region by NOAA for the Environmental Sensitivity Index (ESI) program (NOAA-ESI 2006) (Table 3.1-4):

- **Exposed rocky cliff** is a steep intertidal zone (greater than 30 degrees slope) with little width and little sediment accumulation. Strong vertical zonation of intertidal communities; barnacles, limpets, mussels and algae are key species groups associated with exposed rocky cliffs. Over half of the rocky shoreline in the study region falls into this category.
- **Wave-cut rocky platform** includes flat rocky bench of variable width with irregular surface and tidepools. The shore may be backed by scarp or bluff with sediments or boulders at base. There may be some sediment accumulation in pools and crevices. Wave-cut rocky platform habitat may support rich tidepool and intertidal communities. Barnacles, limpets, rockweed, mussels, turfweed and surfgrass are key species groups associated with wave-cut rocky platforms. Nearly half of the rocky shoreline in the study region falls into this category; a small amount, near Point Conception, is cut into bedrock.
- **Sheltered rocky shores** are bedrock shores of variable slope (cliffs to ledges) that are sheltered from wave exposure. Algae, sea anemones, barnacles and snails are key species groups associated with sheltered rocky shores. Sheltered rocky shores (not including man-made hardened shoreline) are rare in southern California and exist in limited locations on Santa Cruz and Santa Catalina islands, as well as in Buena Vista Lagoon (Table 3.1-4).

Sandy Beaches: Over one third of the study region is covered by sandy shorelines with the majority of the mainland coast dominated by nearly continuous sandy beaches. Sandy beach communities are structured in large part by grain size, slope of the beach, and wave energy. While most of southern California beaches are made up of fine-grained sand, a significant number of coarse-grained gravel beaches exist as well, especially on the Palos Verdes headland. Beaches with intermediate sand grain sizes also exist throughout the study region.

Beaches are dynamic systems that change with wind and waves; generally sand is eroded from beaches in the winter and redeposited in the summer, resulting in annual changes in beach slope and width. Seasonal fluctuations in sand abundance are affected by the creation of hardened shores and of sand-retention structures such as groins. Sandy beaches also change over time, and these long term changes and erosion rates are also affected by what backs the beach (Habel and Armstrong 1978). Beach nourishment, the intentional addition of sand to beaches, occurs within the study region in several locations (see section 5.11)

A variety of invertebrates live in the sand and in wracks of decaying seaweed and other detritus on the sand surface, although accumulation of these materials is moderated in many locations (see section 5.11). Snails, bivalves, crustaceans, insects, spiders, isopods, amphipods, and polychaetes are among the organisms that inhabit sandy beaches, and several serve as food sources for larger vertebrates, including the federally endangered Western Snowy Plover. Other species, including the Western Snowy Plover and California Least Tern and many pinnipeds, utilize sandy beaches for resting or rearing young. Sandy beaches play a central role in the lifecycle of some fish species, such as the California grunion, which lays its eggs on southern California beaches throughout the south coast study region (Dugan et al. 2000).

Intertidal habitat data used in this document, including sandy intertidal data referenced in this section, are from the NOAA-ESI dataset. These data were collected and classified looking primarily at oil-retention characteristics of the habitat. Note that gravel and boulder beaches are combined in the NOAA-ESI dataset for this reason, despite ecological differences between these two habitats. Beach types in the south coast study region have been mapped as linear shoreline features and classified based on grain size:

- **Fine- to medium-grained sand beach** is flat, wide, and hard-packed beach which undergoes significant seasonal changes in width and slope. Upper beach fauna are scarce; lower beach fauna include sand crabs**.** These beaches make up nearly one-fifth of the study region and a large percentage of the mainland shore.
- **Coarse-grained sand beach** is moderate-to-steep beach of variable width with soft sediments. It may be backed by dunes or cliffs; fauna are scarce. These beaches are less abundant in the south coast study region than fine-grained and gravel beaches. They are often located near river mouths and estuaries.
- **Mixed sand and gravel beach** is moderately sloping beach with a mix of sand and gravel, possibly including zones of pure sand, pebbles or cobbles. The sand fraction of such beaches may be transported offshore in winter. More stable substrata support algae, mussels, and barnacles. This is the least abundant beach type in southern California, occurring mostly in the Channel Islands and in isolated pockets on the mainland coast.
- **Gravel beach** is a type of beach composed of sediments ranging from pebbles to boulders, often steep and with wave-built berms. Lower stable substrata host attached algae and small invertebrates. Gravel beaches, including boulder beaches, make up approximately one-tenth of the shoreline in the study region, occurring on the mainland as well as offshore islands, with large portions on Palos Verdes, Santa Catalina, and San Clemente. Although intertidal boulder fields are included with gravel beaches in the NOAA-ESI dataset, they can be ecologically similar to rocky intertidal habitats.

Coastal Marsh and Tidal Flats: Coastal marshes support high levels of productivity and provide habitat for many species. Marshes also regulate the amount of fresh water, nutrient, and sediment inputs into the estuaries and improve water quality through filtration and other natural mechanisms (such as plant uptake). The position of marshes throughout the south coast study region along estuarine margins and their dense stands of persistent plants also make them essential for stabilizing shorelines and for storing floodwaters during coastal storms. Vegetation patterns and dominant species in coastal brackish marshes vary with the salinity regime, which is defined by precipitation patterns and changes in freshwater inputs.

Tidal flats and marshes occur throughout the study region and are often associated with coastal creeks and rivers as well as bays and estuaries (e.g. Santa Clara River, Upper Newport Bay, and San Diego Bay). Constituting less that three percent of the study region, these sandy or muddy expanses that are exposed during low tides provide important foraging grounds for shorebirds due to the abundance of invertebrates such as clams, snails, crabs, and worms.

The following shoreline types have been mapped as linear features of the coastline:

- **Salt marshes** include intertidal areas with emergent salt marsh vegetation. The width of marsh varies from a narrow fringe to extensive areas and provides important habitat for a variety of species. Salt marsh occurs throughout the study region, including upper Newport Bay, Bolsa Chica, and numerous smaller estuaries in San Diego County.
- **Exposed tidal flats** include intertidal flats composed of sand and mud, occurring in bays and lower sections of rivers. The presence of some wave exposure generally results in a higher presence of sand than in sheltered tidal flats. Sediments in tidal flats are generally water-saturated with the presence of infaunal community that attracts foraging shorebirds. Exposed tidal flats are used by birds as roosting sites. Exposed tidal flats are generally more abundant than sheltered tidal flats in the south coast study region.
- **Sheltered tidal flats** include intertidal flats composed of silt and clay, such as mudflats. Present in calm-water habitats and sheltered from wave exposure, they are frequently bordered by marsh. Soft sediments support large populations of worms, clams, and snails, making them important foraging grounds for migrating shorebirds. Sheltered tidal flats are relatively rare in the south coast study region.
- **Hardened (Human-Built) Shorelines:** Nearly one-third of the southern California shoreline is composed of jetties, seawalls, and other man-made structures. Shorelines in and around major ports and harbors, especially the ports of Long Beach and San Diego, tend to be dominated by this shoreline type. Hardened shores are not a habitat type specifically identified by the MLPA or the SAT in previous study regions. Further information on hardened shorelines can be found in section 5.11.2.

3.1.3 Estuaries and Lagoons

Estuaries form at the mouths of rivers and streams where freshwater and saltwater meet. Specific characteristics of estuaries vary based on salinity. This salinity may change seasonally and over longer timeframes depending upon freshwater inputs and creation or removal of barriers between the estuary and the open coast. Two kinds of estuaries exist within the south coast study region: bodies of water that are permanently or semi-permanently open to the ocean and bodies of water that are seasonally separated from the sea by sand bars. The latter of these types, known as “bar-built estuaries,” generally have a low level of freshwater inputs and are referred to as “lagoons” in this document. Estuaries in the south coast study region contain open water and soft-bottom habitats, as well as coastal marsh and tidal flats (described in section 3.1.2) and eelgrass beds (described in section 3.1.4).

Within estuaries and lagoons, the shoreward boundary of the south coast study region was determined by evaluating the extent and presence of mapped salt marsh or brackish vegetation, presence of saltwater species, and the known extent of tidal influence. Information used in this analysis included the NOAA Environmental Sensitivity Index (NOAA-ESI) shoretype data, the National Wetlands Inventory data, satellite imagery, and expert knowledge from DFG biologists. This information was used to determine which estuaries and lagoons were included in the south coast study region and within the MLPA Initiative process. In general, lagoons and estuaries that are open, at least periodically, and are characterized by estuarine vegetation and tidal influence were included in the study region. Lagoons that are rarely open and characterized by more freshwater species (such as Topanga Lagoon near Malibu) were not included. Coastal streams and small rivers that empty directly into the Pacific Ocean also were not included within the study region.

The south coast study region contains at least a portion of nearly 40 estuaries and lagoons (Maps 3.1-1a to 3.1-1g). Some of these estuaries are described in more detail below. The largest estuaries in the study region include Anaheim Bay, Newport Bay and San Diego Bay, which are large systems with significant habitat diversity, including mudflats, shallow areas, and deeper channels (Allen et al.

2006b). Several other estuaries, such as Mugu Lagoon and Bolsa Chica Estuary, are relatively large, while most other estuaries and lagoons are under 0.5 square miles in area. Many of these smaller estuaries are seasonally closed to tidal influence by sand bars. The southern portion of the study region, particularly from the Long Beach waterfront to the California/Mexico border, has a number of medium- to small-sized estuaries and lagoons. The aerial extent of estuaries in the entire south coast study region totals 36.6 square miles, or 1.6% of the region (Table 3.1-1, Map 3.1-1).

The location and extent of some estuaries and lagoons have changed in recent years as a result of coastal restoration projects. Estuarine restoration projects within the study region that have occurred in recent years include efforts within Mugu Lagoon, the Ballona Wetlands, Malibu Lagoon, Bolsa Chica Estuary, and the Tijuana River Estuary, among others. Estuarine restoration efforts have focused on fostering the growth of native plant species, restoring estuarine substrata, and reestablishing tidal exchange. The general goal of restoration projects is to bring the environment back to a natural, or pre-disturbance, condition. However, in practice, the outcomes of restoration projects are generally unpredictable, and such projects may require occasional maintenance. Throughout the study region, especially in the vicinity of major ports and harbors, areas that were historically estuaries have been lined with seawalls, riprap, and other man-made structures (see section 3.1.2).

Estuaries and lagoons are productive coastal ecosystems that play a key role as nursery habitat for many coastal invertebrates and fish. Unlike systems in northern California, estuaries in southern California tend to have low freshwater inputs, and therefore generally lack freshwater and anadromous species, such as salmon. Exceptions include small runs of Pacific lamprey as well as small runs of federally endangered southern steelhead (Allen et al. 2006b). In addition, some estuaries host striped mullet, which is the only species in California to live mostly in freshwater, but return to the ocean to breed. Key species that spend most of their lives in southern California estuaries include Pacific staghorn sculpin, bay blenny, bay pipefish, and gobies (arrow, cheekspot, and shadow) , as well as California killifish, basses (spotted and barred), and several species of anchovy and the federally endangered tidewater goby (Allen et al. 2006b). Species that utilize estuaries seasonally, or for part of their life cycle, include topsmelt, California halibut, yellowfin croaker, stingray, sharks, and several species of perch and turbot (Allen et al. 2006a). In addition, coastal bays and estuaries in the region, such as the Tijuana River Estuary, San Diego Bay, Bolsa Chica, Mission Bay, and Mugu Lagoon, are an important part of the Pacific Flyway and host thousands of shorebirds and waterfowl on their migrations (Page et al. 1999, Ramer 1991).

Since estuaries and lagoons provide important habitat linkages between marine, aquatic and terrestrial habitats, their condition is closely tied to the condition of the surrounding watershed. Estuaries provide critical ecosystem services such as filtering sediments and nutrients from the watershed, stabilizing shorelines, and providing flood and storm protection. Further information on the condition of southern California watersheds is included in section 4.2, and information on impaired water bodies in the south coast study region is included in Appendix F. Estuaries are also utilized for many recreational activities such as fishing, boating, kayaking, wildlife viewing, and interpretation/education activities (further information can be found in sections 5.6, 5.8, 5.9, and 6.3).

Following are brief descriptions of some of the major estuaries and lagoons within the study region:

Devereux Lagoon (Slough): This lagoon and associated finger sloughs are part of 70 acres of wetland habitat inside the 117 acre Coal Oil Point Reserve owned by the University of California Natural Reserve System. The University of California, Santa Barbara's (UCSB) Long Range Development Plan designates the Coal Oil Point Reserve as an Environmentally Sensitive Habitat Area. As a part of the University of California Natural Reserve System, the area is reserved for habitat and wildlife preservation, public education, and academic research. The slough is tidally influenced only during short periods in the winter. A beach berm forms at the mouth of the slough during drier months. Five estuarine fish species are known to occur in the lagoon and several

special status coastal birds (Common Loon, American White Pelican, Brown Pelican, Double-crested Cormorant, White-faced Ibis, Osprey, Bald Eagle, Northern Harrier, Peregrine Falcon, Snowy Plover, California Gull, Elegant Tern, and Black Tern). In 1996, a restoration project was completed on the South Finger Slough including removing fill and re-contouring the site, increasing tidal action, controlling erosion, removing exotic plants, and planting with native species (CERES 2000).

Goleta Slough: This small estuary is part of a larger fragmented wetland area around the UC Santa Barbara Storke Campus, Santa Barbara Municipal Airport and the campus of UC Santa Barbara. Within the wetlands area is approximately 101 acres of salt marsh, 15 acres of mudflat, and 4 acres of salt flat. Extensive areas of the historic marsh below the high tide line are isolated from tidal influence by berms and dikes. Tidal flooding is limited to the south-central portion of the slough, extending into several of the major tributaries. A beach berm is mechanically breached periodically to maintain tidal flooding. Fish species in the slough are predominately grunion (which spawn near the mouth), killifish, topsmelt, arrow goby, and mosquitofish. Twenty special status bird species have been identified including: California Brown Pelican, Southern Bald Eagle, Peregrine Falcon, Snowy Plover, Sandhill Crane, Common Loon, American White Pelican, Double-Crested Cormorant, White-faced Ibis, Fulvous Whistling-Duck, Harlequin Duck, Northern Harrier, Golden Eagle, Osprey, Long-billed Curlew, California Gull, Elegant Tern, and Black Skimmer. The Goleta Slough Management Committee, composed of agency representatives, property owners and public interest groups, has been established to make recommendations and review the Goleta Slough Ecosystem Management Plan and its ongoing implementation (CERES 1997a).

Carpinteria Salt Marsh: This salt marsh and associated reserve are located in Santa Barbara County, due west of the city of Carpinteria, and 20 miles east of the UCSB campus. The total habitat area for the entire reserve is 230 acres, of which the University of California owns 120 acres. This reserve includes an estuary, extensive wetland and channel habitats, and some upland habitats. The reserve supports many sensitive plants, such as the salt marsh bird's-beak, and bird species, such as the Light-footed Clapper Rail and Belding's Savannah Sparrow. It is also an important regional nursery area for California halibut and other marine and estuarine fish. As part of the Ash Avenue Restoration Project, an on-site interpretative center, a teaching amphitheater, and a nature trail have been provided to enhance public outreach at the Carpinteria Salt Marsh Nature Park (UC NRS 2008).

Mugu Lagoon: This lagoon is part of a wetlands area owned by the U.S. Navy and is within the Point Mugu Naval Air Warfare Weapons Station. The lagoon comprises 287 acres of open water, 128 acres of tidal flats, 40 acres of tidal creeks, and 944 acres of tidal marsh. The tidal connection is through an inlet in the barrier beach, which migrates seasonally. The tidal prism is described as large relative to the volume of water remaining in the lagoon at low tide. Fish surveys collected 18 species, with topsmelt, California killifish, mosquitofish, arrow goby, staghorn sculpin, and arroyo chub occurring most frequently. The following special status birds have been reported within the lagoon: Pacific Loon, Ashy and Black storm-petrels, American White and California Brown pelicans, Double-crested Cormorant, Least Bittern, White-faced Ibis, Fulvous Whistling-Duck, Harlequin Duck, Barrow's Goldeneye, Osprey, Bald Eagle, Northern Harrier, Swainson's Hawk, Peregrine Falcon, Sandhill Crane, Long-billed Curlew, Laughing Gull, California Gull, Elegant Tern, Black Tern, Black Skimmer, Xantus's Murrelet, Rhinoceros Auklet, Long-billed Savannah Sparrow, and Tricolored Blackbird. Harbor seals use the beach and sand bars near the lagoon mouth for hauling out and pupping. Several wetlands restoration projects have been undertaken by the Navy in the lagoon since 1995. (CERES 1997b)

Malibu Lagoon: The California Department of Parks and Recreation owns this lagoon, which is located at the mouth of a canyon where Malibu Creek meets the Pacific Ocean, and comprises 28 acres of estuarine open water, tidal channels and mudflats. An additional 18 acres of salt marsh are adjacent to the lagoon. Year-round flow, caused by irrigation water inputs, creates a higher summer

water level than would occur naturally. Treated wastewater is discharged upstream of the lagoon as well, although it is prohibited during the dry season (April through November). A number of estuarine species, including grunion, as well as endangered southern steelhead and tidewater gobies, utilize the estuary (Allen et al. 2006b). Special-status birds, including the California Brown Pelican, California Least Tern, Double-crested Cormorant, California Gull, Western Snowy Plover, and Elegant Tern, have been reported from the lagoon. Restoration efforts are underway to increase tidal circulation, create additional islands for bird usage, and expand salt marsh habitat.

Ballona Wetlands: The Ballona Wetlands are adjacent to Marine Del Rey in Los Angeles County. The Ballona Wetlands are divided into three areas totaling 543 acres in size, although historically the wetlands covered over 2,000 acres. Ballona Wetlands are divided by Ballona Creek and several major roads. There is also Freshwater Marsh, built between 2001 and 2003, on the southeastern edge of the wetlands. Ballona Creek is channelized through the wetlands; the sides are lined with concrete, paving stones and riprap, although the channel bottom is not armored. Ballona Creek watershed drains 130 square miles. Approximately 170 species of plants, 44 species of fish, and numerous bird species are found in and around the wetlands. California Least Terns and Peregrine Falcons, both endangered species, forage at Ballona Wetlands, while many other species of bird make their home there. Extensive restoration efforts have taken place in the wetlands in recent years, and continue today. Much of the area was recently designated the Ballona Wetlands Ecological Reserve by the California Fish and Game Commission. Public access to the wetlands includes bike and walking trails (Philip Williams & Associates, Ltd. 2006).

Anaheim Bay: At 956 acres, Anaheim Bay is one of the largest estuaries in southern California. Designated as a National Wildlife Refuge in 1972, this relatively undisturbed salt marsh is highly productive and has provided for rapid growth of some fish species (Land and Hill 1975). Fish species found within the bay include topsmelt, goby, anchovy, killifish, grunion, and pipefish. Special status birds found within the bay include California Least Tern and Light-footed Clapper Rail, Brown Pelican, Double-crested Cormorant, Western Snowy Plover, California Gull, and Elegant Tern. Establishment of the U.S. Naval Weapons Station at Seal Beach has limited access to the area and contributed to the preservation of this wetland. Dredging of the mouth of the bay has allowed for tidal flow (Allen et al. 2006a).

Bolsa Chica Wetlands: Bolsa Chica historically encompassed 2300 acres of tidally influenced wetlands and large expanses of freshwater wetlands, but this area has been greatly altered over the last 100 years. The Bolsa Chica wetlands are located in the unincorporated portion of Orange County, surrounded by the City of Huntington Beach, and bordered to the west by the Pacific Coast Highway. Beginning in 1899, much of the historical marsh area had been removed from tidal influence through the construction of a dam, duck hunting ponds, oil drilling pads and attendant access roads. However, in 2006 nearly 600 acres of Bolsa Chica were returned to tidal flow as the result of the construction of a new ocean inlet. The new inlet was part of a $148 million restoration project begun in 2004. Inner and Outer Bolsa Bays are not connected to the newly restored wetland. It appears this restoration project is achieving its goals based on biological, physical, and beach monitoring for one year (Bolsa Chica Report 2008). Outer Bolsa Bay is directly connected to Huntington Harbor. A portion of these wetlands is owned by DFG and designated an ecological reserve (California Code of Regulations [CCR] Title 14, §630). Both the Bolsa Chica Ecological Reserve and the Inner Bolsa Bay have a controlled tidal regime (through the use of flood gates to Outer Bolsa Bay), which fluctuates around mean sea level. A total of 18 different species of fish have been identified in the Outer Bolsa Bay, with topsmelt and arrow gobies being the most abundant. California killifish, bay pipefish, Pacific staghorn sculpin, longjaw mudsuckers, diamond turbot, grunion, and California halibut are also present. Forty-one fish species have been identified in the newly restored full tidal basin. Special status bird species include: the Common Loon, American White Pelican, California Brown Pelican, Double-crested Cormorant, Reddish Egret, Elegant Tern, White-face Ibis, Light-footed Clapper Rail, Western Snowy Plover, Long-billed Curlew, California Gull, California Least Tern, Black Tern, Elegant Tern, Black Skimmer, and Northern Harrier. A state

marine park exists within this wetland, in addition to the Bolsa Chica Ecological Reserve (CERES 1998).

Huntington Beach Wetlands Complex: The complex is located in Orange County near the mouth of the Santa Ana River. The entire complex includes the 168-acre muted tidal Newport Slough, which connects to the ocean through the tidal prism of the Santa Ana River. The Huntington Beach Wetlands Conservancy owns 118 acres of wetlands between the Santa Ana River and Newland Street. These wetlands are divided into parcels and include Talbert Marsh, Brookhurst Marsh, Magnolia Marsh, Newland Marsh and the Waterfront Wetlands. The restored Talbert Marsh, 25 acres in extent, is the only portion of the wetlands complex connected directly to the ocean through an inlet on Huntington State Beach, and it serves as a refuge for 100 species of birds, fish and other wildlife (HBWC 2008).

Upper Newport Bay: Upper Newport Bay is located in the town of Newport Beach and receives water from a 154-mile watershed with San Diego Creek and Santa Ana-Delhi Channel draining into the bay (NBNF 2008). Many different habitat types exist in Upper Newport Bay, including brackish marshes, riparian zones, upland, open water, and mud flats. The diversity of these habitat types help support a broad and diverse group of species. Upper Newport Bay is considered one of the most important birding sites in North America (CCC 2008a). Approximately 200 resident birds inhabit the bay and another 30,000 birds may rest there during migratory season (NBNF 2008). In the mid-1900's, interest arose in developing hotels in tideland areas of the bay. To block the development, a local couple purchased and preserved much of the Upper Newport Bay (NBNF 2008). In 1975, the Upper Newport Bay Ecological Reserve was established and, over the years, the acreage has grown to 752 acres of open space. The Reserve is managed by DFG (CCR §630). The Community-Based Restoration and Education Program has been established in Upper Newport Bay to address environmental degradation within the estuary, including pollution from nonpoint and point sources and siltation (Table F-3, Appendix F) (NBNF 2008, CCC 2008a). This program has initiated water quality monitoring, annual clean-up events, exotic weed eradication, and habitat restoration efforts (CCC 2008a).

San Mateo Creek and Lagoon: San Mateo Creek is one of the few undammed creeks in southern California, also making it one of the few creeks where southern steelhead can be found (Allen et al. 2006b, TU 2008). San Mateo Creek flows 22 miles from its headwaters to the Pacific Ocean where it exits just south of the City of San Clemente. At the mouth of San Mateo Creek lies the San Mateo lagoon, located in the San Onofre State Park. The lagoon is a blind estuary protected from the Pacific Ocean by a sandbar that is breached only after heavy storms (CCY 2008). A restoration project to return a sustainable population of southern steelhead to the creek has been initiated with funding from Proposition 12, passed in 2000 (TUCA 2008).

Agua Hedionda Lagoon: Agua Hedionda Lagoon is 388 acres in size and located in the City of Carlsbad (City of Carlsbad 2008). The associated watershed, which is 29 square miles, drains into the lagoon via Aqua Hedionda Creek, and Buena Creek (CERES 1997c). The lagoon hosts a number of species, including 81 species of birds, 91 species of fish, and at least 76 benthic invertebrate taxa (CERES 1997c, Tenera Environmental 2007). The lagoon has been divided into three sections due to transportation infrastructure (e.g. Interstate 5, City of Carlsbad 2008). Culverts connect the three sections of the lagoon. The Encina Power Plant, owned by NRG Energy, is situated along the southern edge of the two outermost lagoon sections (Map 4.5-1b). The power plant is permitted to withdraw up to 860 million gallons of seawater per day from the lagoon for once-through cooling (SWRCB 2008a). There is also a commercial aquaculture facility, Carlsbad Aquafarm, which uses the outer lagoon for growing oysters, mussels, clams, and other seafood, and the Hubbs Sea World Research Institute operates a lab facility on the northern edge of the lagoon which produces hatchery-reared white seabass for ocean enhancement. A portion of the inner lagoon is considered an impaired water body, as it exceeds standards for coliform bacteria and

sediment (Table F-3, Appendix F) (SWRCB 2008b). The mouth of the lagoon is periodically dredged to maintain tidal flow (Elwany et al. 1999).

Batiquitos Lagoon: Batiquitos Lagoon is a tidal wetland situated between Carlsbad and Encinitas (Port of LA 2008) and is home to 185 bird species, 65 fish species, and a diverse group of marsh, wetland and upland plants (BLF 2008). This coastal lagoon includes upland, intertidal, and open-water habitats (BLF 2008). The lagoon is 610 acres in size and associated with a particularly large watershed, of 55,000 acres, which drains into the lagoon (BLF 2008). As part of a mitigation plan with the Port of Los Angeles, the Batiquitos Lagoon Enhancement Project has been established in recent years (Port of LA 2008) and restoration efforts took place from 1994 to 1997 which focused on removing sediment buildup, restricting further fine sediment deposition, and reestablishing tidal flow into the lagoon.

San Elijo Lagoon: The San Elijo Lagoon is a shallow-water estuary located between Solana Beach and Encinitas which supports a well-established community of 319 species of birds, 23 species of fish, 20 species of amphibians and reptiles, and 400 different plants (SELC 2006). An 80-square mile watershed drains into the lagoon, mainly via Escondido Creek (SELC 2006). This lagoon as been altered by the construction of the railroad, the Pacific Coast Highway, and Interstate 5, which all run through this wetland and divide it into restricted basins (SELC 2006). This division caused natural water flow and exchange between the fresh and salt water to be restricted with a reduction in water circulation and a loss of tidal flow (SELC 2008). Over time, this land alteration, in combination with increasing pollution from land uses has resulted in environmental impacts in the lagoon (SELC 2008; SELC 2006). Through a joint public-private partnership with the County of San Diego, state and federal agencies, and a local conservancy, the 1,000 acre San Elijo Lagoon Ecological Reserve was established in 1983. A need for restoration was identified in the early 1990s and efforts have included periodic dredging and reestablishment of tidal flow (SELC 2008).

San Dieguito River Mouth Estuary: The San Dieguito Lagoon is part of the San Dieguito River system, which is located in central San Diego County in the city of Del Mar (San Diego 2006). The lagoon extends to the Del Mar Beach, although it is often closed off by the beach berm. The watershed drainage area is 346 square miles (San Diego 2006). Surrounding land uses include undeveloped land (greatest area), open space, and urban areas (least area) (San Diego 2006). Land-use impacts on San Dieguito Lagoon include urban runoff, historic sewage outfalls (closed in 1974), and sedimentation infill (SDRP 2008, San Diego 2006). Various restoration efforts have taken place over the years to improve the health of the lagoon's ecosystem. In 1983, a dredge project removed the bottom substrate in the lagoon, which included sediment and sludge from the historic sewage outfalls (SDRP 2008; San Diego 2006). In addition, a major restoration effort is underway as a result of Southern California Edison's mitigation project. The project included dredging sediment deposits to increase tidal flushing and keep the river outlet open to the ocean (SCE 2008).

Los Peñasquitos Lagoon: Los Peñasquitos Lagoon is 636 acres in size and located north of San Diego in between La Jolla and Del Mar (CERES 2007) and supports a broad range of plants, fish, birds, and invertebrates (CDPR 2006). The majority of this lagoon is set aside as a state preserve and is part of Torrey Pines State Natural Reserve (CDPR 2006, CERES 2007). Approximately 60,000 acres of watershed drain into the lagoon from Carmel Creek and Los Peñasquitos Creek, as well as other small tributaries (California State Parks 2008). Shallow channels, open water, marshes, mudflats and tidal flats are the major habitats within the lagoon (California State Parks 2008). Los Peñasquitos Lagoon has been degraded over the years due to various land-use changes and development (California State Parks 2008, CERES 2007). Like other estuaries in this region, Los Peñasquitos Lagoon has had its tidal influence restricted; Highway 1, the railroad, and the sewer system have all had this effect (CERES 2007). Two sewage outfalls drain into Los Peñasquitos (Map 4.5-1b). Urban runoff has contributed to degraded water quality (Table F-4, Appendix F), while sedimentation has reduced ocean flow (California State Parks 2008). In response to the anthropogenic impacts on this lagoon's ecosystem, an enhancement program was developed

in 1983 (California State Parks 2008). This program was able to make open-space land acquisitions, dredge to restore tidal flow, restore habitat, and restore water flow under the infrastructure (California State Parks 2008, CERES 2007).

San Diego Bay: The third-largest bay-estuary system in the State of California, after San Francisco Bay and Humboldt Bay, San Diego Bay encompasses 22 square miles and contains a number of diverse habitats, including tidal flats, salt marsh, and eelgrass beds, especially in the southern portion of the bay. These habitats support many fish species, including anchovy, topsmelt, stingray, bat ray, sand bass, and grunion (Allen et al. 2002). Eelgrass beds in San Diego Bay also support the threatened Pacific seahorse (*Hippocampus ingens*) and endangered green sea turtle (*Chelonia mydas*) (Stinson 1984, Jones et al. 1988). Several federally listed bird species also utilize the bay, including California Least Tern, Light-footed Clapper Rail, California Brown Pelican, Least Bell's Vireo, and Western Snowy Plover (Unified Port of San Diego 2008). Sweetwater Marsh, located adjacent to the southern portion of San Diego Bay, encompasses 316 acres of habitat and is designated as a National Wildlife Refuge. The marsh is one of very few locations where salt marsh bird's beak exists.

Tijuana River Estuary: This approximately 2,500-acre estuary was established as a National Estuarine Research Reserve in 1981 and a Wetland of International Importance by the Ramsar Convention in 2005. The estuary is surrounded by the cities of Tijuana, Imperial Beach, and San Diego, and 75% of its watershed is in Mexico. Over 370 bird species use the Tijuana Estuary, which is a key stopover location on the Pacific Flyway. These bird species include the endangered Light-footed Clapper Rail, California Least Tern, Least Bell's Vireo and the California Brown Pelican. The Tijuana River Estuary is highly variable due to extreme changes in streamflow between wet and dry years. The habitats found within the estuary include beaches, dunes, mud flats, salt marshes and riparian zones. The estuary is home to at least 29 species of fish, including longjaw mudsucker, California killifish, and arrow goby (NERRS 2008). The Tijuana River Estuary has had problems with water quality and sedimentation (Zedler 2001) and continues to be threatened by inflows from the watershed containing urban, agricultural, and industrial pollutants (Table F-4, Appendix F) (CCC 2006; Project Clean Water 2008).

3.1.4 Seagrass Beds

Seagrass habitats are extremely productive ecosystems that support an abundant and biologically diverse assemblage of aquatic fauna. The most common type of seagrass in estuaries and sheltered coastal bays in California is *Zostera marina*, or eelgrass (Abbott and Hollenberg 1976). A second variety of eelgrass occurs along the open coast in southern California, *Zostera pacifica*, which has wider blades than *Z. marina* (Coyer et al. 2008). Eelgrass is a flowering plant that can form extensive and dense beds which provide a variety of important functions. The long leaves and dense, matted root system of eelgrass beds help prevent erosion and maintain stability in nearshore areas by slowing down water flow, which consequently enhances sediment accumulation and increases recruitment of animal species. Eelgrass beds also provide refuge, foraging, breeding, or nursery areas for invertebrates, fish, and birds (Hoffman 1986).

Eelgrass beds are known to be located in protected estuaries and bays throughout the south coast study region (e.g. San Diego Bay, Newport Bay, Mission Bay, and Mugu Lagoon historically). Eelgrass beds are also located along the mainland coast. For example, eelgrass has been found at six of the eight Channel Islands (Santa Rosa, Santa Cruz, Anacapa, San Nicolas, Santa Catalina, and San Clemente islands) and along the Santa Barbara coast (Engle and Miller 2005, Coyer et al. 2008). Mapped estuarine eelgrass beds total 4.69 mi2, or 0.2% of the study region area, though this figure under-represents the amount of eelgrass present in the study region as it does not include open coast eelgrass beds (Map 3.1-1).

The most common type of seagrass along the open coast is surfgrass (*Phyllospadix* spp.), also a flowering plant, which forms beds that fringe rocky coastline areas at the zero-tide level to approximately ten to fifteen feet below the zero-tide level. Surfgrass habitat in the study region is not well mapped, although its distribution has been mapped by Woodward-Clyde Consultants (1982) as linear segments that total 72 miles or 6.9% of the shoreline, located mostly off the northern Channel Islands as well as off Point Conception, and along the San Diego County coast. Surfgrass serves as an important nursery habitat for a variety of fish and invertebrates, including the California spiny lobster (Engle 1979), and as habitat for algae (Stewart and Myers 1980).

3.1.5 Kelp Forests

Two different types of kelp forests that occur in the state, giant kelp (*Macrocystis pyrifera*) and bull kelp (*Nereocystis lutkeana*), have been identified as separate habitats for the purposes of MPA siting, since each type of kelp forest hosts distinguishable assemblages of organisms. Except for a few records from San Miguel Island, bull kelp does not occur in southern California; however, the related deepwater elk kelp (*Pelagophycus porra*) occurs at depths of 60-270 feet on rock and sand along the mainland (e.g., Point Loma) and at several of the Channel Islands (Santa Catalina, San Clemente, Santa Barbara and Santa Cruz islands), (Abbott and Hollenberg 1976, Miller et al. 2000). Other kelps typically are smaller or low-lying and may be referred to as understory canopy kelps. These include palm kelps (*Eisenia arborea*, *Pterygophora californica*), boa kelp (*Egregia menziesii*), and oarweeds (*Laminaria* spp., *Agarum fimbriatum*) (Foster and Scheil 1985). Giant kelp make up the most well-known type of kelp forest in the south coast study region.

Giant kelp form dense canopy areas that are utilized by many kinds of marine life. Abundance of kelp varies seasonally over time and is affected by biotic and abiotic factors (Ebling et al. 1985, Harrold et al. 1988, Zimmerman and Robertson 1985). Kelp harvesting is allowed within the south coast study region and regulated by the DFG. Section 5.5.1 contains more information on commercial kelp harvest within the study region.

Giant kelp forests generally form over rocky substrate and thus are somewhat limited within the study region. Areas of particular kelp abundance include Point Conception, Point Dume, Palos Verdes Point, La Jolla Point, Point Loma, and in the vicinity of the offshore islands, most notably San Miguel, Santa Rosa, San Nicolas, and San Clemente islands. Giant kelp forests within the study region are well mapped at fine-scale resolution. The DFG conducted aerial kelp assessments in 1989, 1999 and annually since 2002. Prior to 2002, kelp assessments were performed using various methods of collection and processing. The 2002 to 2007 aerial kelp assessments were collected and processed by DFG staff. The digital images contain an infrared band used to identify kelp and were collected primarily between July and October using a Digital Multi-Spectral Video system. Areas where kelp tends to persist over multiple years can be seen in Map 3.1-1. Total kelp abundance in the study region over the seven survey years has ranged from a low of 12 square miles in 1999 to a high of 31 square miles in 2004.

Studies have shown that distribution and abundance of kelp beds are affected by climatic and oceanographic changes, abundances of grazers, and fishing and other anthropogenic influences (Pearse and Hines 1979; Tegner et al. 1997; Tegner and Dayton 2000). Grazers, especially sea urchins, can play a large role in the abundance and distribution of kelp. Urchin populations can be directly affected by predation by animals such as sea otters, by urchin fishing, and by higher ocean temperatures which may promote disease development or physiological stress which increases mortality (Tegner & Dayton 2000, DFG 2001a). Lobsters and California sheephead, which also are commercially fished, play an important role in limiting urchin populations and, therefore indirectly affect the abundance of kelp. Sea otters, a major urchin predator, are found only in small numbers on the south coast. Reefs denuded of kelp by sea urchins (e.g., at Santa Barbara, Anacapa, and

Santa Cruz islands) would probably return to productive kelp forests in the presence of sea otters or by high recruitment of other urchin predators such as California sheephead (Cowen 1983).

Typically, giant kelp flourishes in wave-exposed areas of nutrient-rich, cool water ranging from 20 to 120 feet deep, and generally occurs on bedrocks, boulders, and reefs (North 1971a). The kelp attaches to rocky areas on the sea floor by means of a root-like structure called a holdfast. Under optimal conditions with high nutrient levels and low ocean temperatures (50° to 60° F), kelp fronds can grow up to two feet per day (Clendenning 1960). Fronds can reach a length of more than 150 feet, and large plants can have more than 100 fronds. As the fronds mature, die, and break away, young fronds take their place. Although giant kelp plants can live for up to seven years, individual fronds last for only about six to nine months, and individual blades live only about four months (Rosenthal et al. 1974; Dayton et al. 1984; North 1971b).

Kelp forests are among the most productive marine habitats along the coast of California providing habitat, feeding grounds, and nursery areas for many species of fishes and invertebrates (Foster and Schiel 1985). Juveniles of many nearshore rockfish species occur in the midwater or upper kelp canopy (Allen et al. 2006a). Juveniles and adults of many nearshore rockfish species, as well as cabezon, greenlings, lingcod, and many other species, associate with bottom habitats in kelp forests (Allen et al. 2006a). Giant kelp also provides nutrient subsidies to sandy beaches as wrack washed in tides, forming the basis of the detritus food chain for beach invertebrates and shorebirds (Karen Martin, Pepperdine University, personal communication).

While most giant kelp is established on hard or rocky substrate, which allows newly-formed haptera (root-like structure) to attach, there have been documented cases of kelp utilizing polychaete worm tubes as substrate in the soft sediment (Neushul 1971, Kelco 1992). After such a kelp organism dies the attached holdfast remains, leaving a substrate for more kelp to grow from (Neushul 1971). Large giant kelp beds of this nature have grown in the nearshore water off of Santa Barbara County, and existed there until the early 1980s. After large storm events from the 1982/1983 El Niño, most of the giant kelp was ripped out of this area and this unique soft sediment kelp community was nearly wiped out (McPeak and Barilotti 1993). Subsequent restorations attempts where performed in this area and are described below.

During the 1950s and 1960s, forests of giant kelp that were once productive off Orange, San Diego, and Los Angeles Counties began to deteriorate. Several factors may have contributed to this decline. These factors include: pollution from domestic and industrial wastes, increased water turbidity from urban runoff, increased sea urchin grazing caused by a reduction in predators, storms, and low nutrients and high temperatures caused by El Niño conditions

(Wilson and McPeak 1983, Tarpley and Glantz 1992). In an attempt to reverse the decline of southern California kelp forests, kelp restoration was undertaken in 1963. The first groups to do this were the Scripps Institution of Oceanography and Kelco Inc. (a kelp harvesting company), who worked collaboratively to develop techniques to protect and restore kelp forests. Their first efforts were at Point Loma in San Diego County and they proved successful (North 1967). Kelp canopies at Point Loma increased from approximately 60 acres to nearly 2,000 acres (North 1968). The dramatic recovery at Point Loma was probably the result of several factors, including restoration, changes in water quality, and changes in oceanographic conditions (Wilson and McPeak 1983). Kelco continued restoration work in San Diego County after 1968, and this work continued through mid-1993.

Other organizations also have made efforts to restore kelp forest in southern California. Past restoration efforts have occurred in the following locations with varied success rates:

- Del Mar, San Diego County
- between Newport Beach and Laguna Beach, Orange County

- Reef Point, Orange County
- along the inside of the Long Beach Breakwater, Los Angeles County
- Palos Verdes Peninsula, Los Angeles County
- Escondido Beach, Los Angeles County
- Carpinteria Reef, Santa Barbara County
- Tajiguas Kelp Habitat, Santa Barbara County
- Gaviota and Hope Ranch, Santa Barbara County

Currently, there are three active kelp-restoration projects in the study region: 1) Since 1996 the Santa Monica Bay Keepers have been actively restoring the kelp beds off of Escondido Beach in Malibu and Palos Verdes Peninsula. 2) The Aquarium of the Pacific hosts a community-based kelp restoration effort with monitoring which has been active since 2001 in Crystal Cove State Park and Laguna Beach. 3) MBC Applied Environmental Sciences began restoring some of the kelp beds in Laguna Beach, from 2002 to 2005. After deterioration occurred in the beds in 2006, MBC continued the restoration project in 2007. MBC's work is considered off-site, out-of-kind mitigation for impacts to eelgrass in San Diego Bay for which no onsite, in-kind mitigation opportunities were available. A fourth project by the Algalita Marine Research Foundation is working to restore an area of the beds off of Crystal Cove, Orange County and to continue past work performed along the inside of the Long Beach Breakwater.

Several techniques have been used to redevelop and restore kelp beds or create artificial reefs that have either been lost or destroyed by natural or manmade processes. Some of these techniques include; sea urchin control, kelp transplanting, competitive seaweed control, suitable substrate addition, using concentrated sporophyl bags to seed the restoration site, and securing plants into the sediment (as was done in the case of the kelp beds near Santa Barbara).

Kelp also can be restored or introduced into areas through the use of properly designed artificial reefs. Artificial reefs, such as Mission Beach, Topanga, and Pitas Point, may be designed to provide habitat for kelp. All three reefs listed above have produced kelp canopies. In 1999, Southern California Edison constructed an extensive experimental reef designed to recruit and sustain kelp canopies off San Mateo Point as part of an agreement to mitigate for canopies lost due to the operation of the San Onofre Nuclear Generating Station. This experiment proved to be successful and led to a larger reef which was completed in 2008. The reef was constructed with quarry rock from Santa Catalina Island and spans approximately 150 acres (more information on artificial reefs can be found in section 5.11.2). This reef was designed specifically to mimic natural reefs (Reed et al. 2006).

3.1.6 Hard-bottom/Rocky Reefs

Hard- and soft-bottom habitats have been mapped at a fine scale (3 meter or better cell resolution) for most of the study region (Map 3.1-2) by Fugro Pelagos, Inc. and California State University Monterey Bay Seafloor Mapping Lab during the summer of 2008. For the mainland coast and Santa Catalina Island, vessel-based multi-beam sonar was used to collect data to a shoreward depth of 10-20 meters, depending on shoreline navigation hazards and kelp. These data have been classified as either rocky or soft substrata through rugosity analysis, and divided into one of four depth categories as defined by the MLPA Science Advisory Team. In some locations where fine-scale data are lacking, including San Nicolas Island, San Clemente Island, and parts of the northern Channel Islands, coarse-scale data from Greene et al. (2004) are used to approximate hard- and soft-bottom habitats. Some areas of the northern Channel Islands, particularly in and around MPAs, have been mapped by the U.S. Geological Survey (USGS) using side scan sonar (G. Cochrane USGS). In some cases, proxies such as presence of kelp are used to identify rocky substrata in near-shore areas.

Rocky substrata are much less common than soft substrata in the south coast study region at all depth zones, covering about seven percent of the study region (Table 3.1-5). The species that associate with hard bottoms differ greatly with depth and type of substratum; the amount of topographic relief changes with gravel, cobble, boulders, and smooth rock outcrop (Cross and Allen 1993). Rocky reefs provide hard substratum to which kelp and other algae can attach in the nearshore zone (<100 feet depth). In addition, many invertebrates such as deep sea corals, sea fans, sponges, and anemones require hard substratum for attachment in deeper waters (Engle and Coyer 1981). In addition to attached organisms, the structural complexity of rocky reefs provides habitat and protection for mobile invertebrates and fish (Carr 1991; DFG 2001c). Hard-bottom habitats in each depth zone are considered by the SAT to be separate habitats due to differences in associated species (DFG 2005a). In addition, the ecological assemblages associated with rocky habitats also can be influenced by the type of rock, as for example, sedimentary versus granitic reefs, or size of substrata, such as cobble versus boulder (Pondella et al. 2005). Rocky reefs in each of these geologically-different zones are considered by the science advisory team to support distinct ecological assemblages (DFG 2005a).

Table 3.1-5. Hard- and soft-bottom habitats by depth zone

Depth Zone	Hard Substrata (mi^2) (% of depth zone area)	Soft Substrata (mi^2) (% of depth zone area)
0-30 meters	111.73 (4.75%)	437.18 (18.60%)
30-100 meters	47.79 (2.03%)	672.06 (28.59%)
100-200 meters	3.89 (0.17%)	158.39 (6.74%)
>200 meters	2.16 (0.09%)	234.34(9.97%)
Total	165.57 (7.04%)	1501.97 (63.89%)

Note: Substrate data represent a union of data collected by Rikk Kvitek from the Seafloor Mapping Lab at California State University Monterey Bay, Fugro Pelagos Incorporated, United States Geological Survey (USGS), Ocean Imaging, and the San Diego Association of Governments (SANDAG). Gaps in the data exist in the vicinity of the offshore islands as well as along the mainland nearshore area, shallower than approximately 20 meters, and these areas are classified as unknown.

A number of artificial reef structures exist within the south coast study region (Map 3.1-2). These artificial reefs are designed to mimic rocky reef habitats and have been constructed from a variety of materials. More information on artificial reefs is included in section 5.11.2.

3.1.7 Sandy/Soft Bottoms

Soft-bottom habitats are the predominant habitat on the continental shelf and slope throughout the south coast study region (Dailey et al. 1993). Nearshore and offshore environments include soft-bottom habitats in areas that range from flat expanses to slopes and basin areas. Soft-bottom habitats lack the structural complexity and relief of hard-bottom substrata (Schiff et al. 2003, Allen et al. 2006a). Despite the flat and seemingly featureless physical characteristics of soft-bottom habitats, they can vary depending on the type of sediment (Schiff et al. 2003). For example, sediments made up of silt and clay are high in organic carbon, and polychaetes and gastropods dominate the infauna. By comparison, sediment composed mainly of sand particles has less organic carbon and the most common infauna are ostracods, amphipods, and pelecypods (Dailey et al. 1993). Soft-bottom habitats can be highly dynamic in nature as sediments shift due to wave action, bottom currents, and geological processes.

Soft-bottom habitats are more common, yet less diverse than hard-bottom habitats at all depth zones, covering over 60 percent of the entire study region (Allen et al. 1998) (Table 3.1-5, Map 3.1-2). Species richness is lower in soft-bottom habitats compared to hard-bottom habitats, in part due to the limited features on sandy bottoms (Allen et al. 1998). Soft bottom species are generally bottom-dwelling invertebrates and fishes, and many have special adaptations for the habitat, such as

flattened bodies and concealing coloration (Allen et al. 2006a). The distribution of species in soft-bottom habitats is approximately 80% crustaceans, 10% microbenthos, 5% demersal fish, and 5% macrobenthos (Dailey et al. 1993). Soft-bottom habitats in different depth zones should be considered separate habitats (DFG 2005a, Schiff et al. 2000). In shallow waters, marine communities are less diverse in wave-influenced, ripple-marked sand habitats compared to calm-water, stable sand bottoms that can host a variety of invertebrates and fishes within and above the sand, as well as algae attached to worm tubes and eelgrass beds providing biogenic habitat. In deeper soft-bottom habitats, the population density lowers with depth, while the standing crop increases with depth; this makes for unique species assemblages at the various depths (Allen et al. 2006a, Schiff et al. 2000, Allen 2006). Anthropogenic discharge has been associated with the degraded health and quality of soft-bottom habitat and studies have found demersal fish are negatively impacted by outfall discharge (Schiff et al. 2000). (More information on outfalls can be found in section 4.3.)

3.1.8 Underwater Pinnacles

Pinnacles are defined within the California Master Plan for Marine Protected Areas (DFG 2008d) as a habitat to be considered within the MLPA process. Pinnacles are vertical rocky features that are tens of meters in diameter and height, with a cone-shaped geometry. Pinnacles can be distinguished from large boulders by their geologic origin. Pinnacles are generally a product of in-place erosional processes acting on rocky outcrops, while boulders are the result of erosional processes in other locations and resulting movement of large rocks (G. Greene, Moss Landing Marine Laboratory, pers. comm). Pinnacles are located in state waters along the south coast, especially near the Channel Islands, but have not been well mapped; they can be important bathymetric features that attract certain fish and invertebrate species (Carr, 1991, DFG, 2001). On substrata maps (Map 3.1-2), pinnacles in the study region are not categorized separately from other hard-bottom habitats.

3.1.9 Submarine Canyons

Several submarine canyons are located within the south coast study region. The most important canyons are located in waters near Point Hueneme, Point Mugu, Point Dume, Santa Monica Bay, Palos Verdes Point, Huntington/Newport Beach, La Jolla, and at the Channel Islands (Maps 3.1-2 a-g). Submarine canyons provide areas of high bathymetric complexity, support unique deep water communities, and affect local and regional circulation patterns. Submarine canyon habitats receive sediment and detrital material from adjacent shallow areas and act as conduits of energy to deeper offshore habitats (Vetter and Dayton 1998). Canyons provide habitat for young rockfish and flatfish that settle in nearshore waters to grow and move offshore as adults. In addition, concentrations of forage species found near submarine canyons are important for seabirds and marine mammals (Yen et al. 2004).

3.1.10 Offshore Rocks and Islands

Southern California has several large offshore islands, as well as numerous offshore rocks, that play a significant role within the south coast study region. Eight major islands, as well as many smaller rocks and islets, are located within state waters within the south coast study region and are described below. While offshore rocks and islands are not identified as a separate habitat within the California Master Plan for Marine Protected Areas (DFG 2008d), these areas do represent unique areas within the study region. Some of these islands and offshore rocks are described below.

The Channel Islands: The Channel Islands comprise two distinct biogeographic regions. In the first of these, San Miguel, Santa Rosa, and San Nicolas islands, and the west side of Santa Cruz Island, are bathed in the cooler, nutrient-rich waters of the California Current. Thus this area resembles the

Oregonian biogeographic province which lies to the north. In the other bioregion, the east end of Santa Cruz Island and Anacapa, Santa Barbara, Santa Catalina, and San Clemente islands are bathed in the warmer waters of the California Countercurrent and share a unique suite of associated species.

Waters surrounding the Channel Islands are utilized by a number of consumptive and non-consumptive users. Top commercial fisheries in the Channel Islands include market squid, red sea urchin, California spiny lobster, rock crab, sea cucumber, and rockfish (more in section 5.4). Both private vessels and Commercial Passenger Fishing Vessels (CPFVs or “party boats”) access the Channel Islands targeting calico bass, white seabass, halibut, barracuda, yellowtail, as well as a variety of rockfish (more in section 5.6). Consumptive activities make up a large proportion of all recreational activities at the Channel Islands (CINMS 2007). Non-consumptive ocean activities are also popular in the Channel Islands and include kayaking, whale watching, wildlife viewing, diving and snorkeling. Several companies offer trips from the mainland coast to watch gray, blue, and humpback whales as well as dolphins and other cetaceans (more in section 5.9).

The five northern Channel Islands—San Miguel, Santa Rosa, Santa Cruz, Anacapa, and Santa Barbara—and their surrounding waters out to one nautical mile were designated as a National Park, and waters surrounding the islands up to 6 nautical miles offshore were designated as a National Marine Sanctuary in 1980. In 2002, the California Fish and Game Commission established a network of state MPAs at the five islands within the sanctuary and these MPAs were implemented in April 2003. In 2006 and 2007, NOAA implemented the second phase of this MPA planning process to include areas within federal waters, consistent with the original plan for a network of MPAs within the sanctuary. A five-year evaluation of ten state marine reserves and two state marine conservation areas was completed in 2008 by a group of scientists coordinated through the efforts of the DFG, PISCO, Channel Islands National Marine Sanctuary (CINMS) and Channel Islands National Park. The complete evaluation can be viewed at http://www.dfg.ca.gov/marine/channel_islands/fiveyears.asp

San Miguel Island: A part of Santa Barbara County, San Miguel is the westernmost of the Channel Islands and is 14.5 square miles in size. The U.S. Navy owns San Miguel Island, and manages it jointly with the Channel Islands National Park. It is closest of the Channel Islands to Point Conception. There is a large marine mammal haulout at Point Bennett and seabird breeding colonies at Prince Island, Castle Rock and Richardson Rock. The island is surrounded by submerged pinnacles covered with invertebrates. Intertidal habitats surrounding San Miguel Island include significant amounts of sand habitat (Littler & Littler 1979).

Santa Rosa Island: A part of Santa Barbara County, Santa Rosa is the second largest of the Channel Islands at about 83 square miles in size. There is a large reef on the north side of the island at Talcott Shoal. The island is known for coastal terraces, sandy beaches, and the largest coastal lagoon in the Channel Islands, as well as a Torrey pine grove onshore. Sandy beaches on Santa Rosa provide breeding habitat for the Western Snowy Plover.

Santa Cruz Island: A part of Santa Barbara County, Santa Cruz is the largest of the Channel Islands at over 96 square miles in size. The island lies in a transition zone between cool waters of the California Current and warm waters of the California Countercurrent. There are large sea caves along cliffs on the island and a high degree of recreational use due to a large number of anchorages.

Anacapa Island: Anacapa Island, which lies within Ventura County, is the Channel Island closest to the mainland coast at a distance of 12 miles and is just over one square mile in size. Giant sea bass aggregate on the north side of the island and California Brown Pelican, Xantus’s Murrelet and Western Gull have breeding colonies on the island. In addition, 130 seacaves on Anacapa provide nesting sites for many birds. Anacapa Island and its surrounding waters receive a high degree of recreational use.

Santa Barbara Island: A part of Santa Barbara County, Santa Barbara Island is the smallest of the Channel Islands at 639 acres (about one square mile). The island hosts a California sea lion rookery and over 11 species of breeding seabirds, including California Brown Pelican and Xantus's Murrelet.

Santa Catalina Island: Located 22 miles off of Los Angeles, Santa Catalina Island is approximately 75 square miles in size. Santa Catalina Island is one of three islands in the archipelago that is not part of the Channel Islands National Marine Sanctuary (Catalina Island Conservancy 2008). However, it is an important visitor location with several permanent settlements located on the island, including Avalon and Two Harbors. Macrofauna around Santa Catalina Island are warm-water species, unlike the northern Channel Islands, where cold-water species are more typical (Dailey et al. 2003, Seapy and Littler 1980). Catalina Island also has the largest offshore salt marsh, Catalina Harbor, of the seven marshes found along the islands in the south coast study region (Dailey et al. 1993). Intertidal habitats surrounding Catalina Island include 35% bedrock, 50% boulder beach, and 15% sand habitats (Littler & Littler 1979).

San Nicolas Island and San Clemente Island: Both San Nicolas and San Clemente islands are owned by the U.S. Navy, and are about 22 square miles and 57 square miles in size, respectively. While both islands are more remote than the other six Channel Islands, they are utilized by both commercial and recreational fishing operations. The deepest point in the study region is located off the northwest corner of San Clemente Island. Aside from Catalina Island, San Clemente is the only other island with macroinvertebrates communities dominated by warm-water species (Seapy and Littler 1980, 313-319) and intertidal habitats there include 69% bedrock, 17% boulder beach, and 14% sand (Littler & Littler 1979). San Nicolas Island, located between the warm- and cold-water sites, has different macrofauna at various sites around the island (Seapy and Littler 1980). Intertidal habitats around San Nicolas Island include rock as well as significant amounts of sand (35% of the shoreline) (Littler & Littler 1979).

Other rocks/islets: Statewide, over 20,000 islands, rocks, exposed reefs and pinnacles are included in the California Coastal National Monument, managed by the Bureau of Land Management (BLM). The monument was designated by presidential proclamation in January of 2000 and extends along the entire California coast (1,100 miles). The monument was designed to protect the biological and geologic values of offshore rocks and islets and the important forage and breeding grounds of associated marine birds and mammals.

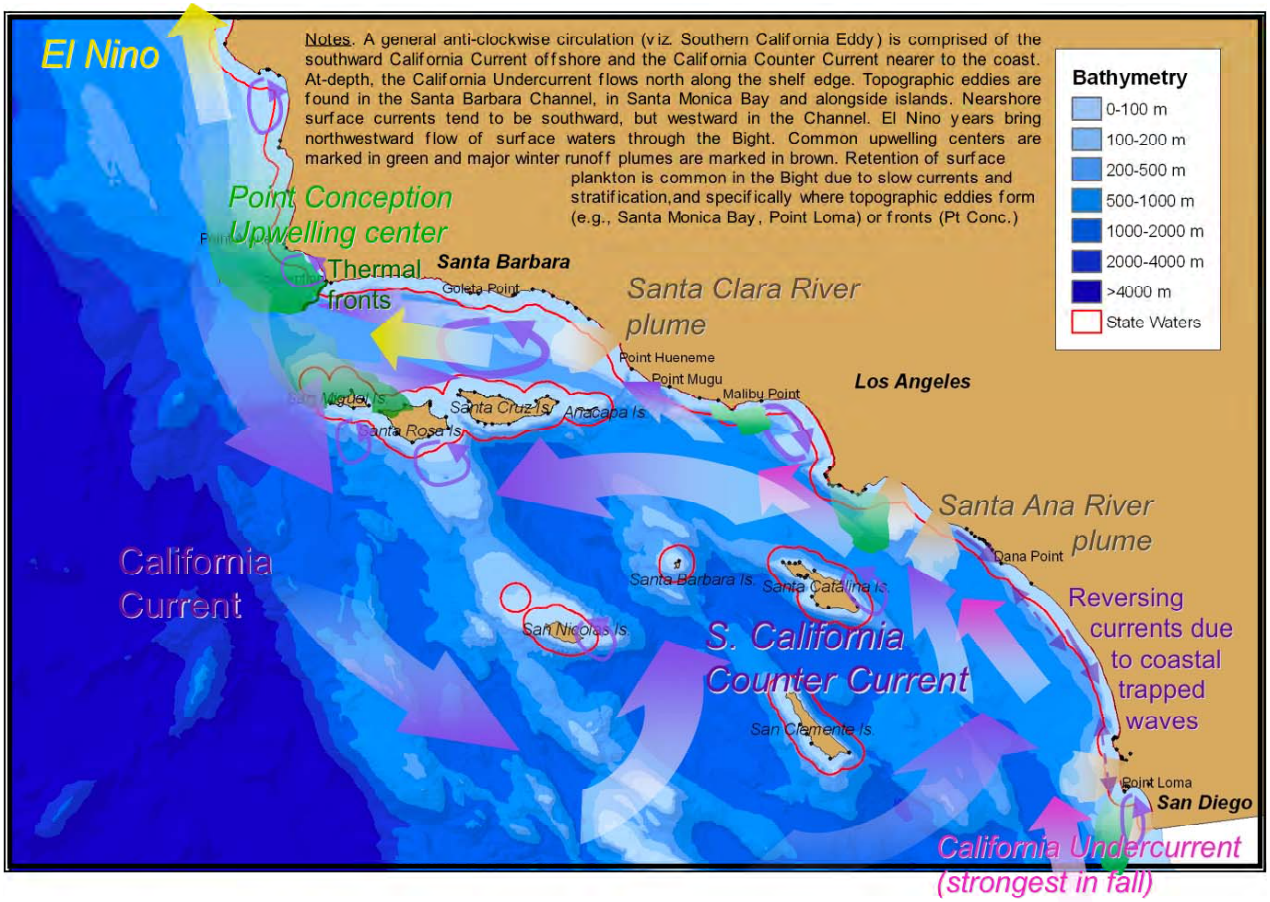
3.1.11 Oceanographic Habitats

Oceanographic patterns have significant effects on ecological assemblages, productivity, recruitment, and a number of other biogeographic characteristics. For this reason, the California Master Plan for Marine Protection Areas (DFG 2008d) recommends that oceanographic conditions be considered in evaluating a study region. Upwelling centers, retention areas, and freshwater plumes are specific oceanographic features that will be considered in MPA planning in the MLPA process. A general overview of the oceanographic setting of the south coast study region is found in section 2. Here the circulation of the region is described in more detail with a view to better characterizing both population connectivity and pelagic habitats (including the distribution of both biogenic water properties and water-borne contaminants).

The south coast study region is within the Southern California Bight, which is part of the west-coast-wide California Current System. However, the strong prevailing northerly winds that characterize the California Current System are found offshore in the Southern California Bight, west of the islands and well away from the mainland coast – resulting in the absence of upwelling in the Southern California Bight. As for the wind, the core of the California Current passes the Bight west of the Channel Islands. Nevertheless, the Southern California Bight is influenced by and a part of the larger California Current System. The Bight exhibits a counter-clockwise circulation comprising the

southward California Current along the outer edge of the Southern California Bight and the northward Southern California Countercurrent closer to the mainland (Hickey 1992). This Southern California Countercurrent brings warmer, low-chlorophyll waters into the Bight, but also entrains recently upwelled waters from the Ensenada upwelling center (about 50 miles south of the US-Mexico border). Recent observations suggest that there are two branches to the Southern California Countercurrent, probably due to topographic passages east and west of the Catalina-Clemente island pair. An eastward flow has often been inferred in the southern Southern California Bight, joining the southward California Current and the northward Southern California Countercurrent. Together these currents make up the Southern California Eddy, as shown in Figure 3.1-1. However, there is little direct evidence of surface drifters following this route, and the position and strength of this eastward flow is unclear.

Figure 3.1-1. Circulation in the Southern California Bight



The circulation of the Southern California Bight is largely driven by the winds offshore. In spring, however, winds are found closer to the coast leading to a tendency for southward flow through the Bight and coastal upwelling (Di Lorenzo 2003). As spring turns to summer, winds in the Southern California Bight weaken but remain strong offshore, leading to a westward (offshore) migration of upwelling that is due to the wind-driven Ekman divergence now found mid-Bight. A ridge of high density (and trough of low sea level) is expected along the axis of upwelling extending southwest from Point Conception – and associated with this is a geostrophic flow onshore in the southern Southern California Bight and northward along the mainland (the Southern California Eddy). This counter-clockwise Southern California Eddy strengthens through the summer and into the fall (Lynn and Simpson 1987, Hickey 1993), exhibiting average speeds of 10-20 centimeters per second (Oey 1999). Although the exact form and dynamics of the Southern California Eddy remains a topic of active research, there is clearly a surface divergence in the Southern California Bight due to the strong offshore Ekman transport associated with northerly winds over the outer Southern California Bight. An upward flux of deeper waters is expected. This is evident in the shallow thermocline found throughout the Bight and a variety of features in which sub-thermocline waters are observed breaking the surface. Cold surface temperatures are observed in the wakes of many islands, as well as in headland wakes at Point Dume, Palos Verdes, and Point Loma – and more extensive upwelling is observed at times along the mainland coast. While a subsurface chlorophyll maximum characterizes much of the Bight, surface chlorophyll plumes are visible nearshore, specifically downstream of upwelling sites (e.g., Point Loma, Roughan et al. 2005).

Circulation at depth is dominated by the California Undercurrent, which flows northward along the continental slope. The California Undercurrent is strongest in summer and fall and can be seen breaking the surface where the shelf is narrow (e.g., Palos Verdes peninsula, Noble et al. 2008).

The northern end of the Bight is characterized by intense upwelling at Point Conception, a major upwelling center at the end of the wind-driven coastal upwelling region that characterizes the central and northern California coast. Not only is upwelling active along the mainland coast at Point Conception and to the north, but these cold upwelled waters are transported south into the south coast study region by the strong southward coastal current. This current separates from the mainland at Point Conception and flows past the westernmost Channel Islands, immersing San Miguel and Santa Rosa islands in cold nutrient-rich waters. At times this current will curve into the Santa Barbara Channel, transporting cold water along the northern shores of San Miguel, Santa Rosa and Santa Cruz islands. Thus, the Santa Barbara Channel and northern Channel Islands represent a dynamic region where two oceanographic regimes meet—cold northern waters mixing with warm southern waters—and the western end of the Channel is characterized by strong fronts. The mainland coast is characterized by a warm westward flow, leading to a cross-channel shear in currents. In summer, one will often see the persistent Santa Barbara Channel Eddy (e.g., Nishimoto and Washburn 2002). Harms and Winant (1998) describe six modes of circulation in the Channel: upwelling, relaxation, cyclonic, propagating cyclones, eastward flow, and westward flow.

Over the shelf along the mainland south of the Channel, water tends to flow southward, in contrast to the up-coast currents offshore and in the Channel. However, these coastal currents exhibit strong synoptic variability associated partly with local winds but more so with remote forcing due to coastal trapped waves generated by synoptic variability in wind forcing off the coast of the Baja peninsula. These features propagate up-coast, resulting in weakening or reversal of southward shelf currents (and upwelling of colder waters) on time scales of several days (Pringle and Riser 2004, Hamilton et al. 2006).

Given the topographic complexity of the Southern California Bight, one can expect topographic flow features such as island wakes and headland wakes. Although observations are incomplete, it is clear that wind and current wakes are associated with the numerous islands and headlands in the region (Dong and McWilliams 2007). Specific features that have received attention are the Catalina Eddy (see Caldeira and Marchesiello 2005), recirculation over the San Pedro shelf south of Palos Verdes (Noble et al. 2008), the Santa Barbara Channel Eddy (Nishimoto and Washburn 2002) and recirculation in Santa Monica Bay (Hickey et al. 2003). Santa Monica Bay exhibits clockwise mean circulation, with northward flows along the shelf edge and southward currents nearshore. Wind shadows can yield areas of warmer surface temperatures and stronger stratification, e.g., west of Santa Catalina Island (Caldeira and Marchesiello 2005). In contrast, the dynamics of current wakes can yield localized upwelling of cold waters, as discussed above (e.g., southwest of Palos Verdes).

This general Southern California Bight circulation is not constant. Seasonal fluctuations have been described above, generally increasing in intensity through the summer. During winter, the region experiences southerly wind events and downwelling during the passage of cold fronts, although winds turn to westerly behind the cold front and this results in down-coast (southward) transport of runoff plumes (Warrick et al. 2007). During fall, the relaxation of winds along the coast north of Point Conception is more frequent and one observes westward flow through the Santa Barbara Channel and up the mainland coast past Point Conception. The strongest northward flow around Point Conception is observed in El Niño years, when Southern California Bight waters may be transported north to San Francisco (Dever et al. 1998). In fact, during El Niño there is a general northward transport Bight-wide, and warmer southern waters are imported into the region. Also during fall, nearshore oceanography may be locally influenced by strong offshore Santa Ana winds. This higher frequency variability, superimposed on the seasonal circulation, includes synoptic wind-driven flow features as described above, and also eddies that are shed from islands or that develop on the sheared flow (particularly in the fall, Di Lorenzo 2003). At higher frequencies, currents vary with the tide and tidal currents over the shelf often exceed the mean current, so that flow reverses twice a day (e.g., Hamilton et al. 2006). Internal tides are also important, given the shallow thermal stratification in this region. Over the inner shelf, this internal tidal energy is typically seen as packets of higher frequency internal waves that lead to cold sub-thermocline waters swashing shoreward

and breaking the surface nearshore. This process has been shown to be important in nearshore larval dispersal (Pineda 1994), nearshore productivity and nearshore water quality (Boehm et al. 2002).

Surface waves in the Southern California Bight are typically small, but they can be large at specific places and times. While much of the Bight is sheltered from northerly swell generated in the storms in the northern Pacific, large swells generated at lower latitudes or during storms in the austral winter in the southern Pacific may enter and influence much of the Bight. The Santa Barbara coast is well sheltered, owing to the Channel Islands offshore, and, likewise, the island coasts facing the mainland are characterized by low wave forcing.

Land runoff to the Southern California Bight is very low most of the year, but large episodic events may affect significant areas and much of the nearshore water and shoreline in the Bight, contributing freshwater, sediments, nutrients, and pollutants to nearshore ecosystems. Depending on storm magnitude, watershed size and land uses, freshwater plumes in southern California can cover hundreds of square kilometers over a period of 1-2 days and persist for days or even weeks (Nezlin et al. 2005). These acute events carry high particle loads and significant toxic pollutants. Chronic effects, due to more persistent low-level runoff, are confined to nearshore and shoreline environments near to creeks and storm-drains, as has been observed through beach monitoring for fecal indicator bacteria (e.g., Kim et al. 2003). However, during the dry seasons, tidal outflow from bays and harbors continues and larger plumes are observed, which may impact larger areas (e.g., Chadwick and Largier 1999).

Circulation within harbors, bays and lagoons is important in shaping habitat and in the dispersal of larvae, eggs and spores. The larger bays in the region are best classed as low-inflow estuaries (in the sense of Largier et al. 1997) throughout the long dry season, with long-residence inner waters. The outer bays are typically well flushed by tides, and enhanced by thermal exchange in some bays. The smaller bar-built estuaries are typically closed in the dry season, with minimal hydrological links to the ocean via groundwater fluxes through the sand bar. However, the first outflow of these lagoon waters in the fall poses a significant concern for water quality in nearshore ocean waters and along nearby coastlines.

3.2 Important Regional Species

A brief discussion of regional species likely to benefit from establishment of MPAs, species currently described as depleted or overfished, fished species of interest, and species that receive special protections due to their legal status (protected, threatened, or endangered) is provided below. Appendix C(i) also provides a list of special status species likely to occur in the south coast study region.

3.2.1 Species Likely to Benefit From MPAs

The MLPA requires that species likely to benefit from MPAs be identified. The identification of these species will contribute to the identification of habitat areas that will support achieving the goals of the MLPA. The south coast study region's SAT has reviewed and refined the "list of species likely to benefit from MPAs" developed during previous central and north central coast study region processes, in order to make the list applicable to the south coast study region. This list is included as Appendix C(i). As new information regarding species likely to benefit becomes available, this list and accompanying rationale will be updated by the SAT. Species on this list must occur within the study region and possess life history characteristics that allow the species to benefit from protection in MPAs. Specific information about the life history attributes for species likely to benefit is not included

in this section. However, the SAT will use life history, human impacts and habitat degradation information as criteria to populate a list of species likely to benefit from MPAs.

3.2.2 Depleted, Depressed and Overfished Species

This section describes depleted, depressed and overfished species that occur within the south coast study region. The terms “depleted”, “depressed” and “overfished” referenced here are designations in state and federal legislation, regulations, and fishery management plans (e.g., California Fish and Game Code, Marine Mammal Protection Act, Magnuson Stevens Fishery Conservation and Management Act, California Nearshore Fishery Management Plan, Federal Groundfish Fishery Management Plan). When describing these species, several definitions of “depleted,” “depressed,” and “overfished” may be considered.

The MLPA refers to the term “depleted” in reference to marine life populations under “Program Goals” in Fish and Game Code (FGC) §2853(b)(2). However, additional definitions of this term exist. The federal Marine Mammal Protection Act (MMPA) has defined “depleted” as follows: “….a species or population stock is below its optimum sustainable population; … or a species or population stock is listed as an endangered species or a threatened species under the federal Endangered Species Act (ESA)” (16 USC §1362(1)). The term “depressed” is found in the Marine Life Management Act (FGC §90-99.5) which includes the following definition of a “depressed” fishery: “….the condition of a marine fishery that exhibits declining fish population abundance levels below those consistent with maximum sustainable yield” (FGC, §90.7). Similarly, the Pacific Fishery Management Council defines “overfished” as “Any stock or stock complex whose size is sufficiently small that a change in management practices is required to achieve an appropriate level and rate of rebuilding.” (PFMC 2008). In the California Nearshore Fishery Management Plan, overfished means a population that falls below the threshold of 35% of the unfished biomass (under data-moderate circumstances with improved single-species management), or 25% of the unfished biomass (under data-rich circumstances with ecosystem-based management).

It should be noted that many species have not yet had their populations assessed. General information on what is known about the status of harvested species can be found at http://www.dfg.ca.gov/marine/education.asp and http://www.dfg.ca.gov/marine/status/index.asp (DFG 2001a, DFG 2004a). In addition, information on species managed by the Pacific Fishery Management Council can be found at http://www.pcouncil.org/groundfish/gfcurmgmt.html.

The following are descriptions of several species that may be considered to be depleted, depressed, or overfished, under the definitions provided above are described below.

Groundfish (rockfishes, flatfishes, etc): The federal Pacific Coast Groundfish Fishery Management Plan, implemented by the Pacific Fishery Management Council in 1982, includes more than 90 species of bottom-dwelling marine fishes. Species and species groups managed under the Pacific Coast Groundfish Fishery Management Plan include all rockfishes occurring in the northeast Pacific Ocean (about 60 species), sablefish, thornyheads, lingcod, Dover sole and other flatfishes (not including California or Pacific halibut), Pacific whiting, and some sharks and rays. For federally managed fisheries, any stock assessed to be between 25% and 40% of unfished biomass is managed under “precautionary zone” management, where harvest rates are reduced to slow the depletion rate. Species currently managed under precautionary zone measures include cabezon, petrale sole, sablefish, and the California portion of the west coast blue rockfish and lingcod stocks.

The Pacific Fishery Management Council adopted new rebuilding analyses for seven rockfish species (*Sebastes* spp.) that are, or were previously, designated as “overfished” (less than 25% of their unexploited spawning population size remains). All seven of these species are known to occur in the south coast study region, but only four of these commonly occur: bocaccio, cowcod, and

canary and widow rockfishes. Cowcod are found from Baja California to Oregon, while bocaccio, widow rockfish, and canary rockfish ranges extend to Alaska. Juvenile bocaccio tend to settle in kelp beds after their pelagic larval stage and move to deeper rocky reefs (60-1550 feet) as adults. Most adult bocaccio occur at depths of 250-750 feet. Juvenile canary rockfish also tend to stay closer to the surface before moving to deeper benthic habitats as adults. In southern California, canary rockfish are most abundant around depths of 500 feet, but go as deep as 900 feet. Widow rockfish juveniles stay near the surface after their pelagic larval stage, and move to deeper waters as adults. Most widow rockfish occur in depths of 450 to 750 feet but have been found as deep as 1050 feet. Adult widow rockfish of the same size class tend to move together from area to area, and show seasonal movement among adjacent grounds. Cowcod juveniles prefer fine clay and soft sediment including oil platform shell mounds, oil pipelines and other complex substrate at depths of 132 to 740 feet. Adult fish move to rocky reefs and isolated outcroppings from 300 to 1,620 feet but are most common around 495 feet (Love et al. 2002). All four of these species of rockfish take years to reach reproductive maturity. The rebuilding process for most “overfished” rockfish species to reach healthy population levels is expected to require many years or even decades (DFG 2001a).

The commercial fishery for these species is generally regulated by a combination of depth-based area closures, trip limits, restricted access, gear restrictions and in-season adjustments to prevent catches from exceeding harvest limits. The recreational fishery for these species is also regulated using depth-based area closures, daily bag limits, gear restrictions, and seasons.

Cowcod, and other “overfished” federal groundfish species, are protected with very low incidental catch limits, which constrains fishing opportunities for other species found in association with the “overfished” species. Two Cowcod Conservation Areas were created off southern California (50CFR §660.390(f)) to further protect cowcod populations. Bottom fishing is prohibited in these two conservation areas in waters greater than 120 feet, one of which includes the state waters surrounding Santa Barbara and San Nicolas islands. The gear specific, depth-based Rockfish Conservation Areas, implemented in 2003, continue to be used to protect species of concern by closing the primary depth range of the species to groundfish fishing (Map 8.2-2) (50CFR §660.390(j)). The Rockfish Conservation Area closures are expected to remain in place until “overfished” stocks are rebuilt or a new management approach is adopted. The Rockfish Conservation Area depth boundaries have been modified to accommodate sustainable fisheries as much as possible and the depth closures change throughout the year to increase or restrict access as needed.

Steelhead Trout: Steelhead (*Oncorhynchus mykiss*) is a sea-run (anadromous) form of rainbow trout and is a popular gamefish in California. Steelhead migrate to the ocean where they usually spend 2-6 years before returning to freshwater to spawn. Age at first migration varies, and can be as young as less than one year, although some steelhead never migrate to the ocean. Known spawning populations of steelhead are found in coastal rivers and streams from San Mateo Creek in north San Diego County to the Smith River near the Oregon border. The present distribution of steelhead in California has been greatly reduced from historical levels. The decline of California steelhead appears to be part of a more prevalent West Coast steelhead decline. This decline prompted NOAA’s National Marine Fisheries Service to list nearly all of California’s steelhead populations under the Endangered Species Act. Statewide, the major factors contributing to steelhead decline in California include freshwater habitat loss and degradation, which has resulted mainly from three factors: inadequate stream flows, blocked access to historic spawning and rearing areas due to dams, and human activities that discharge sediment and debris into watercourses (DFG 2001a).

Southern California steelhead (those occurring south of San Francisco Bay) is listed as an endangered species. Southern steelhead were formerly found in coastal drainages as far south as the Santo Domingo River in northern Baja California and were present in many streams and rivers of southern California including San Mateo Creek (San Diego County), Malibu Creek (Los Angeles

County), and Ventura River (Ventura County) (see Appendix A for steelhead streams by subregion). Major adverse impacts to southern steelhead include fish migration barriers (dams and culverts, such as the Rindge Dam and Crag's Road crossing in Malibu Creek), urbanization, water impoundment and diversion, and invasive plant species (DFG 2007a).

Giant Sea Bass: Within California, giant sea bass (*Stereolepis gigas*) are rarely found north of Point Conception. Adult giant sea bass seem to prefer the edges of nearshore rocky reefs at depths of 35 to 130 feet. Giant sea bass reach a maximum size of 7 feet and 563 pounds. Estimated growth-rates suggest that they take six years to reach 30 pounds, 10 years to reach 100 pounds, and 15 years to reach 150 pounds. Male fish have been observed to be mature at 40 pounds, and females at 50 to 60 pounds. Giant sea bass are susceptible to overfishing and suffered serious decline in numbers because they grow slowly and mature at a relatively old age (DFG 2001a).

A 1981 law prohibited the take of giant sea bass for any purpose, with the exception that commercial fishermen could retain and sell two fish per trip. This law was amended to one fish per trip in 1988, if caught incidentally in a gillnet or trammel net. Incidental mortality of giant sea bass was probably further reduced with the banning of inshore gillnets from state waters, although the California population of giant sea bass remains well below historical levels, recent evidence indicates that giant sea bass may be staging a comeback (DFG 2001a, Pondella & Allen 2008). Currently, giant sea bass may not be taken by recreational anglers in California waters. All fish taken incidentally to other fishing activities must be immediately returned to the waters where taken (Fish and Game Code (FGC), Title 14, §28.10).

Abalone: Seven species of abalone (*Haliotis* spp.) are found in California: red, white, black, green, pink, pinto, and flat. DFG applies the term "depleted" to five species of abalone within the south coast study region. The California Legislature closed the commercial and recreational abalone fishery south of San Francisco Bay in 1997 due to a decline in the populations and the progression of disease (DFG 2008a).

The California Fish and Game Commission adopted the Abalone Recovery and Management Plan (ARMP) in December 2005. The ARMP outlines restoration strategies for depleted abalone stocks in central and southern California and describes the management approach to be used for northern California red abalone and eventually for other recovered abalone stocks. Abalone data and survey information provided below comes from the ARMP and the Fisheries Forum Annual Report for 2008. Historical and current management information on the abalone fishery can be found at http://www.dfg.ca.gov/marine/armp/index.asp.

Red Abalone: These abalones, whose range extends from Oregon into Baja California, are exclusively subtidal in southern California, and associated with rocky kelp habitat (DFG 2001a). The ARMP allows for the potential reopening of abalone fisheries at specific locations. The San Miguel Island stock of red abalone is first up for consideration (DFG 2005a). Accordingly, the DFG has initiated the necessary evaluation of San Miguel Island red abalone to help inform future decisions by the California Fish and Game Commission, and has appointed members of an Abalone Advisory Group to support this work. Assessment surveys began in 2005 as part of the initial task of monitoring population recovery under the draft ARMP. Populations at Santa Rosa, Santa Cruz and San Miguel islands do not yet meet the size range recovery criterion outlined in the ARMP.

White Abalone: These abalones range from Point Conception to central Baja California, Mexico and usually inhabit depths greater than 75 feet. They prefer deep rocky bottoms from 60 to 200 feet often associated with deep living kelp beds, such as *Pelagophycus porra* or elk kelp beds. They feed on bacteria, diatoms and kelp (DFG 2001a). Baby Abalone Recruitment Trackers deployed at Santa Cruz Island have been monitored at least once a year since their deployment in 2004, but no white abalone have yet been seen. A 2007 research cruise around Anacapa Island, Santa Barbara Island

and the east end of Santa Cruz Island found no live white abalone. White abalone is listed as a federally endangered species under the Endangered Species Act.

Black Abalone: This species is found from Oregon to southern Baja California. Black abalone habitats include rocky intertidal areas (to depths of 20 feet in southern California), often within the high energy surf zone. Adult black abalone congregate on rocks and in tidepools (DFG 2001a). Black abalone populations in southern California remain severely depressed since the closure of the fishery in 1993. Black abalone density around San Clemente Island is approximately one abalone per 9150 meters squared, or less than 0.1 percent of historic levels, with no evidence of recruitment (Tierra Data Inc. 2008). However recent evidence shows some recruitment at San Nicolas and Santa Cruz islands. Current restoration research efforts have been focused on finding some sort of genetic-based disease resistance to withering syndrome, a disease that has devastated once abundant black abalone populations, and successful captive propagation of the species for recovery out-planting. Black abalone is currently listed as a species of concern by the National Marine Fisheries Service (NOAA Fisheries). A draft black abalone status review report released by NOAA stated that black abalone is in danger of extinction throughout its range unless effective measures to counter the effects of withering syndrome are found (NMFS-SW 2008b). Black abalone was listed as an endangered species under the federal ESA as of February 13, 2009 (74 FR 1937).

Pink Abalone and Green Abalone: Both these species are found on open coast shallow rocky habitat from Point Conception to Bahia Magdalena, Baja California, Mexico. Pink abalone and green abalone feed on algae, and pink abalone are found at greater depths than green abalone, which center around 10 to 20 feet deep (DFG 2001a). Surveys were conducted at Santa Catalina Island in 2005 and more southern island sites at Santa Catalina and San Clemente islands were surveyed in 2007. Size frequency data at the survey sites showed evidence of recent reproduction and recruitment success for green abalone. Based on these surveys, it appears that achieving the first criterion level of recovery in the ARMP will take a considerable time period. Surveys at the southern Channel Islands will be completed by the winter of 2008. A study off Point Loma found many pink abalone recruits, although the source of the recruits is unknown and the density of the population is much lower than the minimum spawning density needed for the population to persist (Button 2008). DFG began an aggregation study of pink and green abalone to monitor their growth rates, movement and survival at Santa Catalina, San Clemente and Santa Cruz islands in summer 2008.

An extensive effort to survey the Channel Islands ran from 2007 until the fall of 2008. Surveys for pink and green abalone were conducted mostly at Anacapa and Santa Cruz islands, and revealed low densities of abalone. Higher densities of pink abalone were found at the east side of Santa Cruz Island. These densities were below the level of recovery.

Pinto and Threaded Abalone: Pinto abalone is uncommon in southern California (Gotshall et al. 1974) and today they are very rare throughout northern California, making up less than 1% of the population (Rogers-Bennett et al. 2002). Threaded abalone is the least common of the abalone species found off California and is rarely found north of San Diego County (Cox 1960). Sea urchins divers reported a population of pinto abalone and a population of threaded abalone in the study region to Scripps Institute of Oceanography. Both species were not a major component of the commercial and recreational fisheries in California.

For more information on abalone, go to DFG's Marine Region website:
http://www.dfg.ca.gov/marine/armp/index.asp
http://www.dfg.ca.gov/marine/abalone.asp

3.2.3 Fished Species of Interest

Commercial and recreational fisheries are an important component of California's economy. Below, some of the species that make up these fisheries are discussed. More information on commercial and recreational fisheries can be found in 5.4 and 5.6 respectively.

Fish

Nearshore Finfish: DFG uses the term "finfish" to define fish that are aquatic vertebrates of the super class Pisces, breathing by gills throughout life, and having limbs in the form of fins. The California Nearshore Fishery Management Plan (2002) guides the management of 19 nearshore finfish species: rockfishes (black, black-and-yellow, blue, brown, calico, China, copper, gopher, grass, kelp, olive, quillback, and treefish), cabezon, California scorpionfish, kelp and rock greenlings, California sheephead and monkeyface prickleback. The first sixteen of these 19 species are also included in the federal Pacific Coast Groundfish Fishery Management Plan (DFG 2008a). To review the Nearshore Fishery Management Plan, go to DFG's Marine Region website: http://www.dfg.ca.gov/marine/nfmp/.

A restricted access program began in 2003 for the commercial nearshore fishery that affected the take of 10 nearshore species. The shallow nearshore group consists of black-and-yellow, China, gopher, grass, and kelp rockfishes; kelp and rock greenlings; California scorpionfish; California sheephead; and cabezon. A total statewide participant capacity goal of 61 permits was specified for these 10 species, although as of 2007, 186 permits remain with 155 of the permits actively fished (i.e., annual landings of permit species exceeded 100 pounds). A restrictive permit program also began for eight species of deeper nearshore rockfishes: black, blue, brown, calico, copper, olive, quillback, and treefish. Black rockfish is uncommon in the study region. The number of permits for these species decreased from 292 in 2003 to 239 permits in 2007 with 105 of the permits actively fished (i.e., annual landings of permit species exceeded 100 pounds).

California Sheephead: The California sheephead (*Semicossyphus pulcher*) occurs on nearshore rocky reef and kelp forests, and is found to depths of 280 feet. With the exception of 1982-1983 El Niño, the population seems to increase during El Niño conditions and this is reflected in increased recruitment. Although California sheephead range from Monterey Bay, California to the Gulf of California, Mexico, it is not common north of Point Conception. California sheephead begin life as a female with older, larger females developing into secondary males. Female sexual maturity may occur in three to six years and fish may remain female for up to fifteen years. Timing of the transformation to males involves population sex ratio as well as size of available males; sometimes it does not occur at all (DFG 2001a). California sheephead show high site fidelity and a small home range, but increase their movement range with warmer seasonal waters (Topping et al. 2006). California sheephead feed mainly on invertebrates including urchins and other echinoderms, mussels, clams, gastropods, crabs, spiny lobster, barnacles, squid, bryzoans, and polychaetes.

The California sheephead is fished by sport divers, anglers, and especially the live fish commercial industry (Appendix C, Appendix D). The recreational catch is regulated by location, time period, depth limit, daily bag limit, and a minimum size limit. The commercial fishery is also regulated by an annual commercial allocation, broken into two-month cumulative trip limits, and minimum size limit.

White Seabass: The white seabass (*Atractoscion nobilis*) is the largest member of the croaker family (*Sciaenidae*) in California, capable of reaching lengths over five feet in length and weights in excess of 90 pounds. White seabass range from Magdalena Bay, Baja California, Mexico to the San Francisco Bay area. They are also found in the northern Gulf of California, Mexico. Genetic data indicates that the white seabass population may be composed of several reproductive stocks (Franklin 1997). Fisheries related data suggests that the center of the white seabass population may

have shifted southward since the inception of the fishery and presently appears to be off central Baja California (DFG 2002b).

White seabass aggregate nearshore and around coastal islands to spawn (Skogsberg 1939; Thomas 1968). Spawning occurs from March to August and peaks in May, the majority of spawning events occurring over the two-hour period following sunset (Skogsberg 1925; Aalbers 2008). Larvae have been collected from Santa Rosa Island, California to Magdelena Bay, Baja California. California Cooperative Oceanic Fisheries Investigations (CalCOFI) data collected between 1950 and 1978 revealed larval white seabass concentrations along the inshore areas of Sebastian Viscaino and San Juanico Bays, Baja California, indicating that considerable spawning occurs off central Baja California (Moser et al. 1983). Acoustical findings indicate that kelp forest habitat is particularly important to white seabass spawning aggregations (Aalbers and Sepulveda, in prep).

Young-of-the-year white seabass inhabit shallow coastal waters (12 to 30 feet deep) where they associate with bits and pieces of drift algae along sandy ocean bottoms. Most juveniles between one and three years old occur in shallow, open coastal areas with a very small portion entering bays (Allen et al. 2008). Older juveniles are caught off piers and jetties and around beds of giant kelp. Adult white seabass occupy a wide range of habitats including kelp beds, rocky reefs, offshore banks and sandy bottoms (DFG 2002b). White seabass mainly feed on highly mobile coastal pelagics such as herring, anchovies and squid.

Today, catches of white seabass are concentrated in the nearshore waters of the Southern California Bight including the Channel Islands. Regulations covering white seabass include a minimum size limit (28 inches), closed seasons, bag limits, and fishing gear restrictions.

Beginning in 1983, the DFG initiated the Ocean Resources Enhancement and Hatchery Program to test the feasibility of raising white seabass for population enhancement. Over one million juvenile white seabass have been released into the wild, and DFG has verified over 100 legal-sized tag returns (T. Larinto, pers. comm.). Locations of the hatchery and grow-out pens for white seabass have been mapped and are shown on map 3.2-2. Recent evidence indicates that the white seabass fishery in Southern California is returning due mainly to the nearshore, commercial gill net ban that went into effect in 1994 (Allen et al. 2007)

For more information on white seabass, go to the DFG's Marine Region website: http://www.dfg.ca.gov/marine/status/

California Halibut: California halibut (*Paralichthys californicus*) is an important nearshore flatfish species in both the commercial and recreational fisheries of central and southern California. California halibut prefer soft-bottom coastal habitats in depths less than 300 feet deep, and are greatest in abundance in depths of 100 feet or less.

California halibut spawn in nearshore areas from approximately February to July (Allen 1988). Fertilized eggs float in the upper 98 feet of the water column shoreward of the 250-foot isobath (Lavenberg et al. 1986, Moser and Watson 1990). At 30 days post-fertilization, the eggs hatch and the yolk-sac larvae emerge. The larvae are planktonic and they are typically concentrated in the upper 65 feet of the water column shoreward of the 250-foot isobath (Barnett et al. 1984, Lavenberg et al. 1986, Moser and Watson 1990), although they have been collected from the sea surface down to a depth of 250 feet (Barnett et al. 1984). The transformation of halibut larvae into juvenile fish coincides with their settlement in both nearshore protected habitats (i.e., bays and estuaries) and exposed open coast areas of southern California approximately 20 days post-hatching (Allen 1988, Allen and Herbinson 1990, Kramer 1990, 1991, Gadomski et al. 1990, Fodrie and Mendoza 2006).

Adults eat such nearshore finfish as Pacific sardine and white croaker and market squid (Wertz and Domeier 1997). California halibut can grow to five feet in total length and weigh as much as 72

pounds. Results from extensive tagging studies conducted by DFG indicated juvenile and adult halibut remain localized within an eight-mile range but larger adult fish are known to travel over 200 miles (Domeier and Chun 1995). Their results also indicated halibut movement was conducted parallel to the coast line, and northward migrations were of significantly greater distances than southward. However, tagged halibut recaptures south of the international boundary with Mexico may have gone unreported, limiting our knowledge of southward migrations.

California halibut is taken commercially using three types of gear: bottom trawl, set gillnet, and hook-and-line. Gill and trammel nets are prohibited in state waters along the mainland within the study region and in waters less than 420 feet deep or within one nautical mile, whichever is less, around the Channel Islands (FGC §8610.2). Currently, the mesh size must be at least 8.5 inches to harvest California halibut (FGC §8625). Bottom trawling is prohibited in all state waters, except within the California Halibut Trawl Grounds (FGC §8495) (DFG 2008e). These trawl grounds are located in certain state waters not less than one mile from mainland shore from Point Conception (Santa Barbara County) and Point Mugu (Ventura County) (DFG 2008e); see section 5.4 and Appendix D for more information about the commercial fishery. Recreational anglers target halibut from shore and boat-based modes including Commercial Passenger Fishing Vessels (CPFV), private and rental boats, and kayaks; section 5.6.1 for more information about recreational modes of fishing.

Kelp Bass: Kelp bass (*Paralabrax clathratus*) is one of the most important recreationally fished nearshore species in the study region (Appendix E). The most productive California fishing areas for kelp bass in recent years have been off Point Loma and La Jolla in San Diego County; Dana Point and Laguna Beach in Orange County; Santa Catalina Island and Horseshoe Kelp in Los Angeles County; and around the Channel Islands in Santa Barbara and Ventura Counties. Kelp bass are targeted exclusively by sport anglers; the commercial harvest of this species has been illegal since 1953. Kelp bass are typically found in shallow water (surface to 150 feet) being closely associated with high relief structure, including kelp forests and rocky reefs. Kelp bass range throughout the water column, but seem to concentrate between eight and 70 feet. Early tag-and-recapture studies showed little movement for the majority of tagged kelp bass and concluded that if they move at all, it is to nearby rocky reefs or short distances to gather into breeding assemblages. Acoustic tracking studies conducted at Santa Catalina Island revealed that kelp bass had relatively small home ranges and stayed in the same general area throughout the one year study (Lowe et al. 2003 and Mason 2008). However, movement patterns of kelp bass can vary, as tagging studies in the northern portion of the Southern California Bight indicated that kelp bass were quite mobile with some fish traveling as far as 50 miles (DFG 2001a). Kelp bass are carnivorous ambush predators, feeding on a variety of small fish and invertebrates, including other kelp bass, pipefishes, flatfishes, blacksmith, surfperch, crabs, squid, polychaetes, tunicates, and hydrozoans. Kelp bass also scavenge urchins from sheephead attacks. DFG surveys show that anglers catch a large number of age-classes, indicating a stable spawning population (DFG 2004a).

Barred Sand Bass: Barred sand bass (*Paralabrax nebulifer*) have consistently ranked among the top 10 species in the southern California marine sport fish catch. The major barred sand bass fishing sites include the Silver Strand, Del Mar, and San Onofre in San Diego County; Huntington Flats area off Orange County; the inshore portion of northern Santa Monica Bay off Pacific Palisades and Santa Monica in Los Angeles County; and the Ventura Flats area off northern Ventura County. Barred sand bass are targeted exclusively by sport anglers; the commercial harvest of this species has been illegal since 1953. Although lacking some of the sporting qualities of kelp bass, barred sand bass are much more susceptible to hook-and-line gear and are somewhat easier to catch. Sport anglers target large spawning aggregations of barred sand bass, which form over soft-bottom habitat at depths between 60 and 120 feet from June through August. Barred sand bass chiefly inhabit the shallow waters near the southern California mainland and are rare north of Point Conception. While barred sand bass occur as deep as 600 feet, they are typically caught in depths less than 90 feet. Young sand bass are abundant in very shallow water (five to 30 feet). Barred sand bass are usually closely associated with sand/rock interfaces of rocky reefs, kelp and seagrass

beds, and artificial structures and are rarely found out over sandy expanses during non-spawning periods. DFG tagging studies have revealed that barred sand bass are capable of movements of from five to 40 miles (DFG 2001a). Results from a recent acoustic tracking study of barred sand bass movements at Santa Catalina Island indicated they had small home ranges and that individuals remained in their home ranges throughout the one-year study. These results suggests that some barred sand bass may spawn within home ranges, while others migrate to large spawning aggregations (Mason 2008). Barred sand bass are carnivorous ambush predators, feeding on a variety of small fish and invertebrates including surfperch, sardines, anchovies, midshipman, crabs, clams, and squid.

Surfperch: The surfperch family (*Embioticidae*) comprises a colorful set of fish that are sought after primarily by recreational anglers (Appendix E). Surfperch was the second most popular species group in terms of the number of fish landed (kept and/or released) by recreational anglers fishing ocean waters statewide in 2006. Surfperch also support a comparatively minor hook-and-line commercial fishery. Barred, redtail, and calico surfperch may not be taken commercially south of Point Arguello (FGC Title 14, §112). The barred surfperch (*Amphisticus argenteus*) is the primary species taken by recreational beach anglers in Orange County. Barred surfperch are found along sandy beaches near sources of food and cover such as piers and jetties. Several species of surfperch prefer similar habitat while others prefer rocky reefs or kelp beds. Surfperch are usually found in 60 feet or less, although the pile perch and rubberlip surfperch will go to depths of 150 feet, and barred surfperch have been found as deep as 240 feet. Surfperch stay near the shoreline in relatively shallow water, making them vulnerable to coastal development and pollution (DFG 2001a).

For more information on surfperch, go to the DFG's Marine Region website:
http://www.dfg.ca.gov/marine/status/

California Grunion: The grunion (*Leuresthes tenuis*) is a member of the New World silversides family, Atherinopsidae, along with the jacksmelt and topsmelt. They normally occur from Point Conception, California, to Point Abreojos, Baja California, but are now being found farther north to Monterey Bay, San Francisco Bay and Tomales Bay (Roberts et al. 2007). These northern populations may not be self-sustaining, but rather occasionally re-colonized from southern California populations. Genetic data indicate recent colonization in the northern sites and mobility between southern spawning sites (Johnson et al. 2009). They inhabit the nearshore waters from the surf to a depth of 60 feet. Limited tagging studies indicate they are nonmigratory, but neither do they show site fidelity. Spawning occurs from March through August, and occasionally in February and September. Peak spawning is late March to early June. The eggs are deposited during the highest tides of the month and incubate in the sand during the lower tide levels, safe from the disturbance of wave action, and hatch during the next high tide series about 10 days later. Despite local concentrations, grunion are not abundant within California. The most critical issue facing the grunion resource is the loss of spawning habitat caused by beach erosion, harbor construction, beach manipulation, and pollution.

Grunions are not a commercially targeted species but make up a small portion of the commercial "smelt" catch. Sport fishers with a sport fishing license may take grunion using only their hands. There is no bag limit, but grunion may only be taken from June through March (DFG 2001a).

Nearshore Sharks and Rays: Nearshore sharks and rays (Class *Chondrichthyes*) occur in shallow waters and utilize bays and estuaries as nursery sites. These species tend to grow slowly, live many years, and have low reproductive rates. In the Eastern Pacific, Pacific angel sharks (*Squatina californica*) are found from southeastern Alaska to the Gulf of California and from Ecuador to Chile. Pacific angel sharks are bottom-dwelling species found at depths of three to over 600 feet. They are often found in sandy, soft bottoms between rocky reefs, and are sometimes taken in the commercial California Halibut trawl fishery and discarded as bycatch (Steven Wertz, DFG, Pers. Comm). According to tagging studies, Pacific angel sharks often stay in the same vicinity as tagged, although

angel sharks tagged at the islands did tend to move around the islands. Pacific angel sharks eat mostly queenfish, blacksmith and market squid. The Pacific angel shark fishery is regulated with gear restrictions and a minimum size limit (DFG 2001a).

Sport and commercial fishermen take nearshore sharks and rays throughout California (Appendix D, Appendix E), except for the shovelnose guitarfish, which is rare north of Monterey Bay. Take of many shark, skate, and ray species occurs as bycatch, so some species are possibly taken and discarded in trawl and other fisheries because of their low value. Although not targeted by sport or commercial fishermen, the spiny dogfish probably makes up a significant amount of the bycatch in some fisheries (DFG 2002b). Bat rays are taken by sport and commercial fishermen, then discarded. Leopard sharks are primarily found in bays, estuaries, and shallow nearshore waters where they are easily taken by sport fishermen. Declines in the Pacific angel shark, thresher shark, spiny dogfish and soupfin shark fisheries were observed prior to effective management by DFG (DFG 2001b). Threats other than targeted fishing and bycatch include loss of nursery habit and illegal take of pups for marine aquaria trade.

For more information on leopard and shortfin mako sharks, go to the DFG's Marine Region website: http://www.dfg.ca.gov/marine/status/

Invertebrates

Market Squid: The market squid (*Loligo opalescens*) is found from Baja California, Mexico to Alaska. During the day, they are usually found at depths from 325 to 2,000 feet. They migrate to the top 325 feet of water at night. Spawning market squid aggregate over sandy areas from October to May in southern California. Paralarvae are dispersed from spawning grounds and are found mostly inshore, but their later migration patterns are unknown. Juvenile squid feed on copepods and euphasiids, but as adults eat fish, polychaete worms, squid, and crustaceans. Little is known about their population status, but it is suggested that their stock is replaced annually (DFG 2005b), and their life span is about 250 days (CalCOFI 1999). The commercial fishery for market squid is one of the largest in California, both by volume and value (Appendix D). Traditional fishing areas for squid are found within the Monterey Bay region of central California north to Año Nuevo and the Farrallon Islands (northern fishery) and in the south coast study region around the Channel Islands (southern fishery) including Santa Catalina Island. The southern fishery season operates during the fall and winter.

The California Fish and Game Commission adopted the Market Squid Fishery Management Plan in 2005. It established a restricted access program, which mandated permits for vessels participating in the fishery, a series of fishery control rules, and a seasonal harvest guideline of 107,047 metric tons (about 235.9 million pounds) (DFG 2008a).

For more information, go to the DFG's Marine Region website: www.dfg.ca.gov/marine/marketsquid/index.asp

Red Sea Urchin: The red sea urchin (*Strongylocentrotus franciscanus*) is an echinoderm (along with sea stars) which feeds primarily on algae, including kelp (Strathmann 1971). They are found from Baja California to Alaska in relatively shallow water (low-tide line to 300 feet). Red sea urchins prefer rocky ground near kelp and seaweeds (MarineBio 2008). Sea urchins can dramatically reduce kelp abundance, creating urchin barrens (Tegner and Dayton 1991). Red sea urchins are harvested for their roe, which is sold mostly as an export product to Japan, although recent years have seen a shift from export to domestic uses. Statewide landings of red sea urchins in 2007 were 11.2 million pounds, with 9.6 million pounds landed in southern California, an amount near the long-term average. The statewide catch has remained in a relatively narrow range from 10.7 to 14.0 million pounds since 2002 (Appendix D). There is a small amount of recreational take of sea urchins from

tide pool areas. The red sea urchin fishery is a restricted-access fishery with 300 permit holders, of whom about 120 are active divers.

For more information on the history of the fishery and current reports, go to the DFG's Marine Region website:
http://www.dfg.ca.gov/marine/asfr_2003.pdf
http://www.dfg.ca.gov/marine/seaurchin/index.asp

Rock Crab: Rock crabs are found from Baja California to British Columbia and are found in low intertidal waters to depths of 300 feet or more. The commercial catch is made up of three species: the yellow rock crab (*Cancer anthonyi*), the brown rock crab (*C. antennarius*), and the red rock crab (*C. productus*). Upon landing, all three species are often categorized as "unspecified rock crab" (*Cancer spp.*) in catch statistics presented in this document (Appendix D). Brown and red rock crabs prefer rocky reefs, while yellow crabs prefer open sand or soft-bottom habitat. Rock crabs feed on a variety of invertebrates. Rock crabs have been known to move several miles, but no migration pattern or large-scale movement is apparent (DFG 2004a).

The vast majority of commercial rock crab landings occur south of Morro Bay (which is outside the study region). Santa Barbara Harbor alone accounted for almost 68% of the fishery landings between 2000 and 2007. Other notable rock crab ports are Avila-Port San Luis (north of the study region), Oxnard, Ventura, Redondo Beach, San Pedro and the San Diego area ports. The commercial fishery, a limited entry fishery, has size restrictions and requires a valid general trap permit and either a southern or northern rock crab permit. The recreational fishery also has size restrictions and a bag limit of 35 crabs per day (DFG 2008a).

For more information on rock crab, go to DFG's Marine Region website:
http://www.dfg.ca.gov/marine/status/

California Spiny Lobster: California spiny lobsters range from Manzanillo, Mexico to Monterey Bay. Adult spiny lobsters prefer rocky areas and are found from the intertidal zone to depths of 240 feet or more. Spiny lobster larvae drift with the current up to 350 miles offshore and to depths of over 400 feet. Adult lobsters forage at night, and feed on a variety of algae, fishes, invertebrates, including urchins, snails, mussels, and clams, (DFG 2004a). The commercial fishery for California spiny lobster (*Panulirus interruptus*) uses baited traps that are individually buoyed and deployed along the mainland coast from Point Conception to the California border with Mexico and at all the Channel Islands. There is also a large recreational fishery, involving skin and scuba divers, and anglers with hoop nets. The fishery is strongly influenced by the weather and El Niño and La Niña events.

The commercial fishery is regulated with size limits, a season, gear requirements (escape ports on traps for undersized lobster) and permits. Recreational fishers are regulated with size limits, a season, daily bag limits, and gear regulations. Fishing intensity tends to be highest at the start of the season (in the fall) when fishing efficiency is the highest (Parnell et al. 2007). The California Fish and Game Commission recently approved a lobster report card in order to provide data on total recreational catch. The lobster report card will be required of all recreational lobster hunters, regardless of age or gear type, starting the fall of 2008 (DFG 2008a).

For more information on the California spiny lobster, go to DFG's Marine Region
http://www.dfg.ca.gov/marine/asfr_2003.pdf

Sea Cucumbers: The California sea cucumber (*Parastichopus californicus*), also known as the giant red sea cucumber, and the warty sea cucumber (*P. parvimensis*) are fished commercially in California (Appendix D). Both ranges extend south to Baja California and the California sea cumber is found all the way to Alaska while the warty sea cucumber's range extends only to Monterey Bay.

The warty sea cucumber inhabits the low intertidal to 90 feet, the California sea cucumber to 300 feet. Sea cucumbers feed on organic detritus, sea stars and small organisms in the nearshore rocky environment. Sea cucumbers move about 12 feet per day, but without pattern (DFG 2001a).

The warty sea cucumber is fished almost exclusively by divers, and populations at fished sites have declined due to fishing mortality (Schroeter et al. 2001). The California sea cucumber is caught principally by trawling in southern California. A special permit to fish for sea cucumbers commercially was required beginning with the 1992-1993 fishing season. There is no significant sport fishery for sea cucumbers in California and sport fishing regulations forbid their take in nearshore areas in depths less than 20 feet (DFG 2001a).

Kellet's Whelk: The Kellet's whelk is a large subtidal snail (*Kelletia kelletii*) which occurs intertidally and is common subtidally to 230 feet on rocky reefs, gravel bottoms, kelp beds, and sand from Isla Asuncion, Baja California, Mexico to Monterey Bay (Shoffler 2005). Spawning occurs in the spring, and during spawning the snails aggregate into groups of up to 20 individuals (Morris et al. 1980). This species is harvested commercially (Appendix D) and Los Angeles and Orange County ports received over half the Kellet's whelk landings in 2006 followed by San Diego, Santa Barbara, and Ventura County ports. Although not one of the top five invertebrate fisheries by landings, the Kellet's whelk fishery is growing rapidly. There are no regulations for harvest of this species, except that Kellet's whelks cannot be taken within 1,000 feet from the shore, except incidentally by lobster and/or rock crab traps (FGC §8250.5, §8284).

3.2.4 Special-Status Species

Some species within the south coast study region have been designated with a special status under either state or federal law. Both the California state and federal Endangered Species Acts provide for special protections for a variety of fish, marine mammals, birds, and plants. In addition, marine mammals are protected under the Marine Mammal Protection Act, and migratory seabirds and shorebirds in the study region are protected under the Migratory Bird Treaty Act.

In addition, DFG maintains a list of taxa they are interested in tracking, regardless of the legal or protection status of that taxa. This list of "species at risk" or "special status species" is those taxa considered to be of greatest conservation need. DFG has also designated certain vertebrate species as "Species of Special Concern" because declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction. Not all "Species of Special Concern" have declined equally; some species may be just starting to decline, while others may have already reached the point where they meet the criteria for listing as a "Threatened" or "Endangered" species under the state and/or federal endangered species acts. More information is available at: http://www.dfg.ca.gov/wildlife/species/ssc/index.html.

A listing of the DFG-designated species of special concern is available online at http://www.dfg.ca.gov/wildlife/species/ssc/

A complete listing of state listed endangered or threatened species can be found at http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/TEAnimals.pdf (animals) and http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/TEPlants.pdf (plants).

A complete listing of federally listed endangered or threatened species can be found at http://www.fws.gov/endangered/wildlife.html

The section below includes descriptions of several special-status species that exist within the south coast study region. A more comprehensive list of these species is included in Appendix C(i). Some

portions of the study region that include large numbers of special-status species are further described in section 3.3 on Areas of Biodiversity Significance.

Plants

Salt Marsh Bird's Beak: Salt marsh bird's beak (*Cordylanthus maritimus ssp. maritimus*) grows in the higher reaches of coastal salt marshes to intertidal and brackish areas influenced by freshwater input. It is designated an endangered species at both the state and federal levels. The population of this species has declined due to loss of habitat and non-native plant competitors. Historically, salt marsh bird's beak was widespread in coastal salt marshes from Morro Bay in San Luis Obispo County to San Diego County and northern Baja California. Presently, it occurs only in scattered sites at fewer than 10 salt marshes. Half of the original occurrences are now extirpated. In California, it is currently found at Tijuana Estuary and Sweetwater Marsh in San Diego County, Upper Newport Bay and Anaheim Bay in Orange County, Ormond Beach and Mugu Lagoon in Ventura County, Carpinteria Marsh in Santa Barbara County, and Morro Bay in San Luis Obispo County. The interaction between tidal flows, and local surface and subsurface freshwater flows is complex and important to the species survival. Salt marsh bird's beak is found in the DFG's Upper Newport Bay Ecological Reserve (DFG 2008c).

Ventura Marsh Milk-Vetch*:* Ventura marsh milk-vetch (*Astragalus pycnostachys var. lanosissimus*) is a short-lived, herbaceous perennial in the pea family (*Fabaceae*). It is both a state and federally listed endangered species. Historically, Ventura marsh milk-vetch occurred in back dune habitat, coastal meadows and near coastal salt marshes from Ventura County to Orange County. Over the last century six historical occurrences have been known to exist (N. Jensen 2007). Ventura marsh milk-vetch was extirpated from these sites and was, therefore, thought to be extinct until a U.S. Fish and Wildlife Service biologist rediscovered it in June 1997 at a proposed development site. Today, this one population of Ventura marsh milk-vetch is the only known population to exist near the City of Oxnard, Ventura County, California (DFG 2008c). However, one source has reported Ventura marsh milk-vetch in the Ballona Wetlands (CNPS 2006).

Fish

Two special-status fish species, steelhead trout and giant sea bass, are described in section 3.2.2 on depleted and overfished species. Other special-status species include:

Tidewater Goby: The tidewater goby (*Eucyclogobius newberryi*), which is endemic to California, is distributed in brackish-water habitats along the California coast from Cockleburr Canyon in San Diego County to the Tillas Slough in Del Norte County (USFWS 2007). They used to range farther south to Agua Hedionda Lagoon (San Diego County) (Swift et al. 1989). Tidewater goby is federally listed as an endangered species (ESA), although the 5-year review by the Ventura Fish and Wildlife Office recommended changing the listing to threatened (USFWS 2007). Tidewater goby feed on invertebrates and generally live one year. They reproduce throughout the year resulting in constant variability in local abundance and making accurate population estimates difficult. They are threatened by habitat loss or degradation and predation by native and exotic predators (USFWS 2007).

Garibaldi: The garibaldi (*Hypsypops rubicundus*), California's official state marine fish, ranges from Monterey Bay to Guadalupe Island, Baja California. Garibaldi are territorial, sometimes using the same nest site for several years, and do not migrate. Their diet consists mainly of invertebrates. Garibaldi can range from shallow subtidal to depths of 95 feet. Commercial take of Garibaldi has been banned since 1995, and current populations are in good condition (DFG 2007b).

Reptiles

Sea Turtles: Four species of sea turtles (superfamily *Chelonioidea*) occur off the Southern California Bight – green, loggerhead, olive ridley, and leatherback turtles (NMSP 2006). Sea turtles spend most of their time at sea, and come ashore to nest on beaches. Sea turtles are not common within state waters of southern California, although they are regularly sighted in the warm water effluent channel of the San Diego Gas and Electric Power Company in San Diego Bay. Green turtles forage in San Diego Bay and are the most common turtle seen there (McDonald and Dutton 1990). The San Gabriel River also has a small colony of green sea turtles, attracted by the warm-water effluent from the Los Angeles Department of Water and Power's Haynes Generating Station (CaliforniaHerps 2008). Green turtles feed primarily on algae and seagrasses. Sightings of loggerhead, olive ridley and leatherback turtles are more rare (Stebbins 2003).

Birds

A variety of seabirds and shorebirds with special status roost, forage, and form breeding colonies in the south coast study region (Map 3.2-1). Seabirds utilize offshore islands within the south coast study region as well as numerous offshore rocks (many of which are included in the California Coastal National Monument, managed by the U.S. Bureau of Land Management). Eight special status seabirds are found within the northern Channel Islands: Ashy Storm-Petrel, Black Storm-Petrel, California Brown Pelican, California Least Tern, Double-crested Cormorant, Rhinoceros Auklet, Western Snowy Plover, and Xantus's' Murrelet (NCCOS 2005). Shorebirds aggregate and forage in the many estuaries found within the study region (see section 3.1.3) as well as along sandy beaches, which are important shorebird foraging habitat in southern California (Hubbard and Dugan 2003), and rocky intertidal areas. A few examples of special status bird species are described below:

American Bald Eagle: Bald Eagles (*Haliaeetus leucocephalus*) historically nested on the Channel Islands but disappeared completely by the 1960s. In 1980, a program to reintroduce bald eagles to Santa Catalina Island began through a partnership between federal and state agencies and non-profit organizations. Those efforts have translocated dozens of bald eagles to Santa Catalina Island as chicks or eggs from wild nests on the mainland or from captive breeding (IWS 2008). In 2002, the Channel Islands National Park and The Nature Conservancy began a successful reestablishment program for Bald Eagles. Sixty-one juvenile eagles were introduced to the park between 2002 and 2006. The first successful bald eagle nests occurred in 2006 on Santa Cruz Island (NPS 2007). American Bald Eagles nest near bodies of open water and have a diverse diet consisting of fish, small mammals, birds, mollusks, and crustaceans (Watson 2002). In 2007 they were delisted from the Endangered Species Act and their current protection comes from the Bald and Golden Eagle Act. On the west coast, they can be found from Baja California to Alaska. American Bald Eagles feed mainly on fish, but also on invertebrates, other birds, and mammals. Bald Eagle prey include rockfish, surfperch, pile perch, cabezon, midshipman, California sheephead, bocaccio, gulls, California mussels, limpets and other bivalves (Erlandson et al. 2007a, Sharpe 2002). On the Channel Islands, adults bring bocaccio, rockfish, halfmoon, white seabass, California Sheephead, topsmelt, other fish, gulls, and mammals back to the nest for juvenile eagles (Sharpe 2002).

Ashy Storm-Petrel*:* The total population size of the Ashy Storm-Petrel (*Oceanodroma homochroa*) is less than 10,000 pairs and declining (DFG 2001a). Ashy Storm-Petrels feed on larval fish, squid, and zooplankton, and forage on the edges of upwelling zones and in waters just seaward of the continental slope. They generally nest in rocky crevices, such as those found around sea caves in the Channel Islands (USFWS 2005).

Belding's Savannah Sparrow: The Belding's Savannah Sparrow is found from Morro Bay south to El Rosario, Baja California. They were listed by the DFG as endangered in 1974. They occupy coastal saltmarshes and estuaries where pickleweed is dominant. They eat a variety of crustaceans

as well as seeds of pickleweed and may forage in other nearby habitats including along rock jetties. Breeding pairs have been regularly nesting at Point Magu, the Ballona Wetlands, Upper Newport Bay, and Bolsa Chica (Philip Williams & Associates, Ltd. 2006).

Black Storm-Petrel: Pitman and Speich discovered the only known breeding site for Black Storm-Petrel (*Oceanodroma melania*) in the United States on Sutil Island, an islet off Santa Barbara Island, in 1976. Only one nest was found, but an estimated 10 birds were heard in the vicinity, and the maximum number of breeding pairs was thought to be 10-15 (Pitman and Speich 1976). The population may have been present previous to the discovery, and was estimated at 25 breeding pairs in later surveys (Remsen 1978). Black Storm-Petrels are most common in the warm coastal waters of the Southern California Bight over the continental shelf off central California. They forage in surface waters near shore at thermal fronts adjacent to upwellings, tide rips, shelf-break fronts, and other areas of high ocean productivity. Their diet probably consists of small fish, crustaceans, and squid (USFWS 2005).

California Brown Pelican: The California Brown Pelican (Pelecanus occidentalis californicus), currently listed as endangered under provisions of the California Endangered Species Act (CESA; FGC § 2050, et seq.), has been approved for delisting by the Fish and Game Commission, though their decision must be reviewed by the Office of Administrative Law before California Brown Pelicans can be officially removed from the list. The California Brown Pelican, also protected as endangered under the ESA, is a federally proposed delisting candidate as of February 2008. The California Brown Pelican is also a fully protected species under §3511 of the Fish and Game Code and the Migratory Bird Treaty Act. In California, the pelicans usually nest on two of the Channel Islands in southern California: West Anacapa and Santa Barbara islands. Nest sites generally occur on the ground or in low shrubbery of steep coastal slopes on small islands, isolated from ground predators and human disturbance. California Brown Pelicans utilize local vegetation to build nests of sticks, grasses, and other debris each year. The majority of their diet is fish, primarily captured by plunge-diving. California Brown Pelicans feed close to shore, primarily in shallow (<150 meters depth) waters of estuaries and the continental shelf, usually within 20 kilometers of shore. Their diet in the Channel Islands consists almost exclusively of small schooling fish; in particular, northern anchovy (*Engraulis mordax*) and Pacific sardine (*Sardinops sagax*). They also roost and loaf in groups during the day, on sand bars or jetties, or on man-made structures such as piers and docks (DFG 2001a). North American populations underwent dramatic declines during the 1960s and early 1970s due to eggshell thinning induced by dichloro-diphenyl-dichloroethylene (DDE), the primary metabolic breakdown product of dichloro-diphenyl-trichloroethane (DDT). Although populations have recovered substantially from these declines, there is considerable interannual variation in productivity as related to prey availability, disturbance at colonies, and disease outbreaks. Breeding effort, productivity, and survival are lower during El Niño events. Nesting success on Santa Barbara and Sutil island has been very high, with over 2,000 young chicks fledged from 2001 to 2003 (Burkett et al. 2007).

California Least Tern: The California Least Tern (*Sternula antillarum brownii*) is the subspecies of least terns nesting along the west coast of North America, from Baja California, Mexico, to San Francisco Bay. California Least Terns establish nesting colonies on sandy soils with little vegetation along the ocean, lagoons, and bays. Their nests are shallow depressions lined with shells or other debris. California Least Terns are generally present at nesting areas between mid-April and late September, often with two waves of nesting during this time period. California Least Terns feed on California killifish, sculpins, surfperch, silverside smelt, anchovy, Northern anchovy, Pacific saury (although not in years when other food is abundant), cabezon, and rockfish (Robinette and Howar 2008). Beach-nesting adults feed juvenile grunion and other small fish to their chicks. This species was listed as endangered by the U.S. Secretary of the Interior in 1970 and the California Fish and Game Commission in 1971 due to a population decline resulting from loss of habitat. A survey in 2007 estimated 6,744 to 6,989 California Least Tern breeding pairs, established 7,667 nests, and produced 2,293-2,639 fledglings at 48 documented locations. Numbers of nesting California Least

Terns were not uniformly distributed across all sites. Camp Pendleton, Naval Base Coronado, Los Angeles Harbor, and Batiquitos Lagoon represented 55% of the breeding pairs while Venice Beach, Camp Pendleton, Huntington Beach and Naval Base Coronado produced 52% of the fledglings (Marschalek 2008).

Elegant Tern: Although thousands of Elegant Terns (*Sterna elegans*) from Mexico spend the summer and fall along the California coast, the only breeding colonies in the United States are at Bolsa Chica, Pier 400 at Terminal Island, and the salt work dikes at the south end of San Diego Bay (Collins 2006). Limited breeding colonies in the United States make the elegant is highly vulnerable to extirpation in this part of its range. Human disturbance at nesting sites also threatens the population (Remsen 1978). Elegant terns feed primarily on fish, such as topsmelt and anchovy, and forage in bays and protected areas (Collins 2006).

Double-Crested Cormorant: Double-crested Cormorants (*Phalacrocorax auritus*) are found throughout the Southern California Bight, although in southern California they breed only on the Channel Islands (Remsen 1978). The Channel Islands' populations declined due to eggshell thinning from DDE contamination and, to some extent, human disturbance at nest sites (Gress et al. 1973), but the population is currently considered stable-to-increasing in California (DFG 2001a). Double-crested Cormorants live in both fresh- and salt-water environments. They eat primarily fish such as sardines and herring (DFG 2001a).

Osprey: Although Osprey (*Pandion haliaetus*) are found within the study region, few nesting locations exist in the south coast. Ospreys have been seen through the summer months at such former or potential nesting areas as Newport Bay (Orange County), and Buena Vista Lagoon (San Diego County). The removal of nesting trees, degradation of river and lake environmental quality, boating, and shooting may have contributed toward the decline of Osprey, which disappeared from southern California populations before pesticides were introduced (Remsen 1978). Ospreys have a large global range, including every continent but Antarctica. They feed almost exclusively on fish, and nest near bodies of water. Some Ospreys migrate to South America for the winter but do not nest there. Ospreys are protected under the Migratory Bird Act, but are not currently listed as a species of special concern in California (Kirschbaum and Watkins 2000).

Western Snowy Plover: The Western Snowy Plover (*Charadrius alexandrinus*) occurs throughout the study region, and its breeding range extends from Baja California, Mexico to southern Washington. During the winter, Western Snowy Plovers are found on beaches, estuarine sand and mud flats, and in man-made salt ponds; during the breeding season (March–September) they nest on beaches. Western Snowy Plovers feed on invertebrates in the wet sand and surf-cast kelp, and occasionally on insects from low-growing plants (USFWS 2001). During a breeding-season range-wide survey in June 2002, an estimated 1501 individuals were found; most were in California (Fancher et al. 2002). Human harassment and direct destruction of nest sites and breeding habitat, expanding predator populations, and introduced species contributed to the decline of, and continue to threaten, Western Snowy Plovers (USFWS 2001).

Pinnipeds

At least seven species of pinnipeds historically occur within the Southern California Bight, including the Channel Islands. Pacific harbor seals, California sea lions, and northern elephant seals are the three most common species. Guadalupe fur seals are less commonly found within the study region and northern fur seals are rarely seen. Steller sea lions and ribbon seals are extremely rare within the study region.

Harbor Seals: Harbor seals (*Phoca vitulina*) are widely distributed in the coastal areas of the northern Pacific and northern Atlantic. Harbor seals in the eastern Pacific range from the Pribilof

Islands in Alaska to Isla San Martin off Baja California. Between the Mexican and Canadian borders, harbor seals have been managed as three separate stocks, one of which is the stock off California. After passage of the Marine Mammal Protection Act in 1972, harbor seal abundance grew rapidly until 1990, when stocks leveled off. There has been no net population growth in California since 1990 (Carretta et al. 2004). In 2002 the population was estimated at 27,863 animals. The southern Channel Islands have the largest concentration of harbor seals in California. The seals are year-round residents at most of the haulout sites depicted on the maps (Map 3.2-1), but their abundance varies seasonally, the highest numbers of seals being present during the breeding season (March-June) and the molt (June-July). San Nicolas Island, Point Conception, Mugu Lagoon and Point Mugu are home to some of the largest haulout sites (Map 3.2 -1). Harbor seals also haul out on buoys, jetties, floating docks, and in harbors. Harbor seals eat a wide variety of pelagic and benthic prey, including small schooling fishes such as northern anchovy, many species of flatfishes, bivalves, and cephalopods (Antonelis and Fiscus 1980; Weise and Harvey 2001, and references therein). In southern California, harbor seals were found to eat mostly rockfish, octopus, spotted cusk-eel, and plain midshipman (Stewart and Yochem 1994).

California Sea Lion: The range of the California sea lion (*Zalophus californianus*) extends from the Pacific coast of Baja California to southern British Columbia. These animals breed primarily on offshore islands in the southern part of their range from the Gulf of California to San Miguel Island. California sea lions can be seen around Santa Cruz, Anacapa, San Miguel, and Santa Rosa islands, and Seal Rocks at Santa Catalina Island. California sea lions also haul out on buoys, jetties, floating docks, and in harbors. In the late 1920s, only 1000–1500 California sea lions were counted on the shores of California. Since a general moratorium on hunting marine mammals was imposed with passage of the Marine Mammal Protection Act in 1972, the population has grown substantially to a current estimate of 237,000–244,000 animals. California sea lions are opportunistic feeders on a variety of prey, especially seasonally abundant schooling species such as Pacific hake, northern anchovy, Pacific sardine, spiny dogfish, and squid. They tend to feed in cool upwelling waters of the continental shelf (Weise and Harvey 2005).

Northern Elephant Seal: Elephant seals (*Mirounga angustirostris*) are found from Baja California to the Gulf of Alaska and Aleutian Islands, and the current population is over 150,000 animals. Elephant seals haul out two times per year, during the breeding season, December through March, and during the molt, April through August. They migrate north to feeding grounds twice a year. Most breeding sites are also molting haulout sites. In the study region, Northern elephant seal haulout sites are on San Miguel, San Clemente, Santa Rosa, Santa Barbara, and San Nicolas islands. Juvenile seals also haul out in high numbers at these traditional sites during the fall preceding the breeding season. When not on land, northern elephant seals spend most of their time under water, and probably feed on deep-water, bottom-dwelling marine species such as rockfish, squid, swell sharks, and ratfish. Pups feed on fish, squid and small sharks (Marine Mammal Center 2008).

Guadalupe Fur Seal: Guadalupe fur seals (*Arctocephalus townsendi*) are listed as threatened under the CESA and depleted under the MMPA. The Guadalupe fur seal is a pelagic species throughout most of the year, occurring in Pacific Ocean waters from Isla de Guadalupe, Mexico, to the Channel Islands of southern California. When ashore, this seal occupies rocky caves and crevices and sandy beaches. Breeding occurs solely on Isla Guadalupe from May to July. Male seals are occasionally observed on rocky beaches of the southern Channel Islands. It is believed that Guadalupe fur seals feed in deep waters on species of krill, squid, and small schooling fish. The most recent population estimate of 7,408 fur seals was made in 1994. Counts taken between 1954 and 1994 suggest that the rate of population growth as of 1994 was approximately 14% (DFG 2000).

Fissipeds

Southern Sea Otter: Once ranging from northern California to Japan to Punta Abreojos in Baja California Sur, southern sea otters (*Enhydra lutris*) are rare within the study region and occur mostly along California's central coast. California sea otters are federally listed as a threatened species (ESA). The statewide population of sea otters was drastically reduced during the 18th and 19th centuries due to commercial hunting and has been generally increasing from as few as 50 individuals in 1914 (USFWS 1995, 2003). From 1987 to 1990, an effort was made to relocate 139 southern sea otters to San Nicolas Island. Because fewer than 25 sea otters were observed around the island nine years after the last translocation, this effort was considered a failure (USFWS 1999). In 2003, however, 33 individuals were observed around San Nicolas Island (Sanders 2008). Sea otters in California rarely eat fish. Their diet is made up almost entirely of large invertebrates, including abalones, crabs, sea urchins, clams, snails, mussels, octopus, barnacles, scallops, sea stars, chitons and worms (MMS 2006). Current sightings of sea otters within the study region are relatively rare (NCCOS 2005). Sightings of juvenile males and adult males are becoming more common in the northern portion of the study region. Male sea otters come south to feed, but return north to breed (Sanders 2008), and their movements are being monitored by surveys conducted by USGS. The coast south of Point Conception was identified as an 'otter free' management zone in 1986 at the same time San Nicolas Island was identified as a translocation zone (Public Law 99-625). Sea otters in the 'no-otter' zone are subject to non-lethal removal. The USFWS released a biological opinion in 2000 stating that the continued, passive expansion of the sea otter's range was necessary for its survival and recovery (USFWS 2000). Currently, sea otters are not being removed, and the containment program is under review, with a final Environmental Impact Statement due out in early 2009.

Cetaceans

The Southern California Bight hosts a rich diversity of cetacean species (order Cetacea), with at least 33 species occurring within the study region (Leatherwood et al. 1982, Leatherwood et al. 1987). Blue whales, humpback whales and gray whales enter the study region following migration routes between warm southern waters and cold northern waters. Gray whale northward and southward migrations overlap and animals can be seen heading both north and south off southern California in January and February. Blue whales can be spotted from June to December as they migrate north. Humpback whales can be seen from spring until early fall, and their total United States west coast population is estimated at 597 individuals (CINMS 2003). Several other species vary seasonally in their abundance, with Pacific white-sided dolphin, Risso's dolphin, common dolphin, and northern right whale dolphins more common in winter and fin whales occurring more in the summer (Forney and Barlow 1998). Bottlenose dolphins forage for bottom fish year round in the Santa Monica Bay (Bearzi 2005). All cetaceans are protected under the Marine Mammal Protection Act, and many are also protected under the Endangered Species Act. See Table 3.2 -1 for a list of common cetaceans found in the study region.

Table 3.2-1. Common cetaceans of the study region

Common Name	Scientific Name
Gray Whale	*Eschrichtus robustus*
Humpback Whale	*Megaptera novaeangliae*
Blue Whale	*Balaenoptera musculus*
Fin Whale	*Balaenoptera physalus*
Sperm Whale	*Physeter macrocephalus*
Baird's Beaked Whale	*Berardius bairdii*
Minke Whale	*Balaenoptera acutorostrata*

Common Name	Scientific Name
Pilot Whale	*Globicephala macrohynchus*
Killer Whale	*Orcinus orca*
Sei Whale	*Balaenoptera borealis*
Bryde's Whale	*Balaenoptera edeni*
Right Whale	*Eubalaena glacialis*
Risso's Dolphin	*Grampus griesus*
Dall's Porpoise	*Phocanenoides dalli*
Pacific White-sided Dolphin	*Lagenorhynchus obliquidens*
Northern Right-whale Dolphin	*Lissodelphis borealis*
Common Dolphin	*Delphinus delphis*
Bottlenose Dolphin	*Tursiops truncatus*

Source: CINMS 2003

3.3 Areas of Biodiversity Significance

Spatial data are available to begin identifying specific locations in the study region that have high biodiversity significance based on the guidelines provided in the master plan framework (DFG 2005a) and on results of regional scientific research and mapping efforts. Specific locations can be identified using existing maps, by overlaying relevant data layers, or conducting more sophisticated GIS analysis. The following is a partial list of types of areas that have regional biodiversity significance.

- areas where numerous habitats are found in close proximity and areas with unique combinations of habitats
- areas of high bathymetric complexity which provide topographic relief and a variety of habitats in close proximity
- rocky substrata in all depth zones, since rocky habitat is much less common than soft-bottom habitat and is important for many species (Map 3.1-2)
- rocky intertidal shores, especially wave-cut rocky platforms (which provide habitat at diverse tidal elevations), boulder fields, and rare sheltered rocky shores (Map 3.1-1)
- sandy beaches utilized by grunion, California Least Tern, Western Snowy Plover, and other species, including areas above mean high tide
- large kelp beds (Map 3.1-1) and nearshore rocky reefs (Map 3.1-2)
- large open estuaries (e.g. Anaheim Bay, Bolsa Chica, Mission Bay, San Diego Bay, and the Tijuana River Estuary) with eelgrass beds, tidal flats, and coastal marsh (Map 3.1-1)
- marine areas off headlands, especially those with kelp forests
- offshore islands and associated habitats
- islets, offshore rocks, and underwater pinnacles.
- submarine canyons, which create areas of complex bathymetry (Map 3.1-2)
- marine areas which offer retention adjacent to upwelling centers, especially those with kelp forests and rocky reefs
- areas of smaller-scale, localized upwelling.
- areas of known species spawning aggregations and aggregations of juvenile individuals
- seabird colonies and marine mammal rookeries and haulouts (Map 3.2-1)
- areas of high seabird or fish diversity and/or density and abundance (Maps 3.2-1 and 3.2-2)

4. Land-Sea Interactions

Important land-sea interactions occur across variable time scales and wide geographic ranges. The type and intensity of land-sea interactions significantly varies along the coastal region depending on a unique combination of factors. Biotic and abiotic factors include climate, geomorphology, land use, ocean currents, and other activities. Studying associations between watersheds and coastal waters from multiple perspectives and beneficial uses—biological, ecological, human, etc.—helps managers understand how modification of these linkages may impact the effectiveness of an MPA in meeting its objectives. The consequences of these complex interactions at the land-sea interface can be beneficial (e.g., critical riverine and estuarine nursery habitats for coastal marine and anadromous species) or detrimental (e.g., point and nonpoint sources of pollution) (Stoms et al. 2005).

Many associations exist between coastal watersheds and coastal and marine waters. For example, watershed bring freshwater and sediments to bays, estuaries, and the ocean. Episodic and seasonal factors influence terrestrial input to marine environments. In the study region, nutrient loading from terrestrial sources can be significant at local scales especially during high flow periods. Substantial net export from rivers and estuaries to the ocean usually occurs during the rainy season and primarily during storm events (Coastal Reserves Working Group, 2005).

Four main classes of land-sea interaction should be considered when examining the effects of land use on the marine ecosystems of California's south coast:

- watershed processes and the export of sediment and materials of terrestrial origin to estuaries and the ocean (particularly nutrients, persistent toxic chemicals, and pathogens)
- sediment input from coastal erosion, landslides, and disposal
- use of land and streams by marine-dependent species (e.g., steelhead migrations, harbor seal haulouts, sea bird rookeries, grunion breeding areas)
- socioeconomic interactions between land and sea at the coastal margin where degraded water and sediment quality (e.g. beach closures or seasonal bans) may affect ecotourism and management of environments

These four classes of land-sea interactions specifically affect nearshore and estuarine dependent species and habitats as well as marine species that spend some portion of their life cycle on land or freshwater (Coastal Reserves Working Group, 2005).

Understanding these watershed-coastal water linkages and land-sea interactions may provide important input to the design of MPAs, and help MPA managers prevent future degradation of protected areas. Impacts on coastal watersheds (i.e. a stream or estuary) have repercussions for the entire coastal ecosystem. Estuaries and bays are particularly vulnerable to development, pollution, and introduction of invasive species. In southern California, coastal development and alteration of both estuaries and sandy beach habitats play a significant role in affecting the function and services of coastal ecosystems.

The following sections discuss the importance of these watershed-coastal water associations, the effect of land use and watershed modification on rivers and coastal waters, and important regional programs related to coastal water quality.

4.1 Ecological Linkages

Watersheds and coastal waters have many complex ecological linkages/associations. Watersheds carry freshwater, nutrients, and sediments to bays, estuaries, and the ocean. In southern California,

growth of urban areas has significantly changed the nature of many watersheds. Many rivers and streams, for example the Los Angeles River, have been channelized, which affects transport of sediment, nutrients, and pollution to coastal environments. Numerous smaller streams and rivers flow into small estuaries, in which mixing and dilution occur. Many of the estuaries, embayments, coastal lagoons, and remaining wetlands have high importance relative to their small size and the number of resident and migrating species (see section 3.1.3). Studies have shown that some species, including flatfish, rely on intricate associations between estuarine and coastal environments during different life stages (Brown 2006).

Some examples of critical ecological associations along the south coast study region are described below for selected marine species (based on Airamé et al. 2003, updated through pers.comm).

- **Marine Fish** such as sole, sablefish, hake, and rockfish, live as adults on the continental shelf and slope or in submarine canyons. They produce pelagic larvae that recruit to estuaries, bays, kelp forests, rock outcrops, and cobble fields. Eelgrass beds are important for spawning and juvenile habitat for certain species, such as shiner perch and barred sand bass (Valle et al. 1999, Allen et al. 1995, Hart 1973). The structure of eelgrass beds provides protection from predation for juvenile invertebrates and fishes. Bat rays, leopard and smoothhound sharks, plainfin midshipman, staghorn sculpin, several surf perch, jacksmelt, and topsmelt mate and bear their young in estuarine habitats.
- **Anadromous fish** produce eggs and juveniles in fresh water. The juveniles then pass through estuarine environments to mature at sea and return through the estuaries as adults to migrate upstream in coastal rivers to reproduce. Rivers within the south coast study region once supported large numbers of anadromous species. However, due to degradation of watersheds and freshwater ecosystems and the presence of barriers to fish passage, stocks of native anadromous fish, such as steelhead trout, are limited in southern California.
- **Catadromous fish** live in fresh water, but travel to marine environments to breed. Some estuaries in southern California, such as the Ballona Wetlands, host striped mullet (Williams 2006), which is one of the few catadromous species that exists in California.
- **Shorebirds and waterfowl**, such as Black-bellied Plover, Black-necked Stilts, Killdeer, and Ruddy ducks, in addition to special-status species such as California Least Tern, Western Snowy Plover and Belding's Savannah Sparrow, inhabit coastal lagoons, estuaries, and salt marshes as well as areas near sandy beaches. Large numbers of shorebirds and diving ducks are attracted to eelgrass beds, where they feed on the eelgrass, fish, and invertebrate eggs and young. Many bird species use salt marshes, shallow intertidal flats, and lagoons during their annual migrations. The estuaries, bays and sandy beaches of coastal California form part of the Pacific Flyway, one of the four principal bird migration routes in North America.
- **Marine mammals**, such as California sea lions, northern elephant seals, and harbor seals, have many haulout sites, as well as a few rookeries, on secluded rocks and sand beaches, tidal flats, and estuaries in the region.
- **Coastal and estuarine vegetation**, include plants such as macroalgal mats, cordgrass (*Spartina foliosa*) and pickleweed (*Sarcocornia pacifica*). For example, macroalgal mats composed primarily of *Macroystis*, *Ulva* and *Enteromorpha* spp., may be carried on tides or currents to the open ocean, where they provide shelter and food for numerous organisms, notably juvenile fishes. Eventually, these mats may wash up on shore, where they supply nutrients to sandy beach and rocky intertidal communities.

Understanding associations between watersheds and coastal waters may help to inform MPA planning for resource protection and recreation and other uses, as well as take into account land-use impacts and existing water quality conditions(see 4.4 below for a more detailed description of the effects of land use on coastal waters).

4.2 Coastal Watersheds and Land Use in Study Region

For the purpose of the MLPA Initiative, watersheds are described using a classification system developed by the California Department of Water Resources, which identifies surface waters by hydrologic units, areas, and subareas. Specifically, hydrologic units are defined as surface drainage divides, which include the total watershed area, both water-bearing and non-water-bearing formations, and two or more small contiguous watersheds with similar hydrologic characteristics draining from one mountain body (SDRWQCB 2007). The MLPA South Coast Study Region extends for over 1046 miles along the Californian coast, includes 2351 square miles of ocean, and drains over 10,000 square miles from the 19 hydrologic units or major watersheds. The largest coastal watersheds of the region include the Santa Clara-Calleguas and the Los Angeles-San Gabriel (see Table 4.2-1).

Table 4.2-1. Major watersheds in the study region

Major Hydrologic Unit	Area (mi^2)
South Coast[a]	375
Pitas Point[b]	22
Ventura River[b]	300
Santa Clara-Calleguas[b]	1,760
Malibu[b]	242
Los Angeles-San Gabriel[b]	1608
San Pedro Channel Islands[a, b]	156
Santa Ana River[a]	1972
San Juan[c]	500
Santa Margarita River[c]	750
San Luis Rey River[c]	565
Carlsbad[c]	210
San Dieguito[c]	350
Penasquitos[c]	170
San Diego River[c]	440
Pueblo San Diego[c]	60
Sweetwater River[c]	230
Otay River[c]	160
Tijuana River[c]	470
TOTAL	10,340

[a] source: State Water Resources Control Board GIS layer
[b] source: LARWQCB 1994.
[c] source: SDWQCB 2007.

A variety of land uses can have negative impacts on adjacent to coastal and estuarine water, including urban residential, agriculture, commercial and industrial (Clark 1996). Impacts may result, but are not limited to nutrient loading and associated eutrophication, runoff, siltation, habitat loss, and decrease in fish populations (CSCOR 2008). However, other land uses, such as open space, can serve as a buffer and reduce terrestrial impacts on nearby water bodies. The California Environmental Quality Act (CEQA) is the state law that requires state and local agencies to identify and reduce, if feasible, the significant, negative environmental impacts of land use decisions.

In the south coast study region, land use varies considerably from county to county. For example, in the highly urbanized Los Angeles County, residential, commercial, and industrial uses predominate. By contrast, the major land uses in Ventura County are agricultural and open space, although there is an increasing trend towards urban residential and commercial land use (LARWQCB 1994). The Santa Ana Region is “one of the most rapidly growing areas in the state,” according to the Santa

Ana Regional Water Quality Control Board (SARWQCB 2006a). In San Diego County, the primary land uses are: residential, agriculture, and undeveloped, although there has been rapid economic development and urbanization recently. Approximately 40 per cent of the undeveloped land in San Diego County is proposed for development (Project Clean Water 2008). Map 4.2-1 shows coastal basins adjacent to the study region as classified by the percentage of urban area and percentage of agricultural area (see 4.4.2, “Nonpoint Sources”).

4.3 Coastal Water Quality

Coastal water quality information is important in MPA planning to ensure that areas of poor water quality can be considered in MPA siting. *The Water Quality Control Plan for Ocean Waters of California* (California Ocean Plan) was prepared by the State Water Resources Control Board (SWRCB) in 1972. It is regularly updated and was most recently reviewed in 2005. This plan establishes water quality standards for ocean waters, and the requirements and management of waste discharge to the ocean. The California Ocean Plan also identifies specific beneficial uses, water quality objectives, effluent limitations, monitoring program requirements, and regulation of areas of special biological significance which are a subset of the recently formed state water quality protection areas (SWRCB and EPA 2005). Additional water quality regulations can be found in the following locations: the SWRCB Thermal Plan; California’s Porter-Cologne Water Quality Act; the Federal Clean water Act; the Federal Marine Protection, Research and Sanctuaries Act; the Coastal Zone Management Act; and the California Toxics Rule. Taken together these regulations establish water quality standards for all coastal, bay, lagoon and estuarine waters of the State of California.

Included under the umbrella of the SWRCB are nine regional boards throughout the state, each of which monitors a separate SWRCB region. There are four regional boards with regions that overlap with the MLPA South Coast Study Region. The Central Coast Regional Water Quality Control Board (RWQCB) manages Region 3. This regional board has only a small area of jurisdiction that falls within the study region from Point Conception down to Rincon Point. Directly south, the Los Angeles Regional Water Quality Control Board (LARWQCB) manages Region 4, which includes coastal drainages between Rincon Point and the eastern Los Angeles County line (LARWQCB 1994). Usually the regions are based on hydrologic divides, but the boundary between the Los Angeles Regional Water Quality Control Board and Santa Ana Regional Water Quality Control Board is the Los Angeles County line. The Santa Ana RWQCB manages Region 8, has jurisdiction over the upper and lower Santa Ana River watersheds, the San Jacinto River watershed, and several other small drainages (SARWQCB 2008). The San Diego RWQCB manages Region 9, which includes Laguna Beach in the north, east to the Laguna Mountains and south to the California/Mexico border (SDRWQCB 2007).

Each RWQCB has a unique “water quality control plan” (or “basin plan”), which contains three main types of information. First, each plan lists all of the water bodies in the region and the beneficial uses designated for those water bodies (e.g. recreation, wildlife, spawning, etc.). Second, each plan defines the water quality that must be maintained to support those beneficial uses. Last, each basin plan contains an implementation plan that describes the various regional programs, projects, and other actions that are necessary to achieve the water quality standards established in the plan. Beneficial uses along with the numeric or narrative objectives established to protect those uses jointly constitute federal water quality standards. These implementation plans include a description of nonpoint source programs, such as the Water Discharge Program implementation and municipal wastewater management, as well as regional surveillance and monitoring programs and models, such as the Toxic Substances Monitoring Program. For more information on the basin plans for the regional water quality control boards in the south coast, visit the RWQCB’s website at www.waterboards.ca.gov/plans_policies.

4.3.1 Existing Water Quality Protection Designations

A number of different water quality designations exist in California. These designations include: state water quality protection areas, areas of special biological significance, and critical coastal areas. The designations are made by various organizations.

State Water Quality Protection Areas

State water quality protection areas (SWQPAs) are "designated to protect marine species or biological communities from an undesirable alteration in natural water quality…" (Public Resources Code Section 36700[f]). SWQPAs are one of six categories of managed areas described in the Marine Managed Areas Improvement Act. (The other categories under the Marine Managed Areas Improvement Act include the following: state marine reserve, state marine park, state marine conservation area, state marine cultural preservation area, and state marine recreational management area.) The SWRCB designates SWQPAs, under which waste discharge is prohibited.

Areas of Special Biological Significance

Areas of special biological significance (ASBSs), which were established through the California Ocean Plan, are considered a subset of the SWQPAs. However, at this time all SWQPAs are also ASBSs. Individuals may nominate areas for designation as an ASBS. Criteria for nomination include areas that are "intrinsically valuable or have recognized value to man for scientific study, commercial use, recreational use, or esthetic reasons." Areas proposed for ASBS designation should have the potential to benefit from protection beyond that offered by standard waste discharge restrictions and other measures.

There are 14 existing ASBSs in the study region (Table 4.3-1, Map 4.3-1). They occur in three of the four regional water quality control board regions lying adjacent to the study region and total 280.52 square miles in area.

Table 4.3-1. Areas of special biological significance

ASBS Site	RWQCB Region	Area (mi2)	SWQPA ID Number
San Miguel, Santa Rosa, and Santa Cruz Islands	3	429	17
San Nicolas Island and Begg Rock	4	99.47	21
Santa Barbara and Anacapa Islands	4	54.47	22
San Clemente Island	4	76.82	23
Laguna Point to Latigo Point (Malibu)	4	18.50	24
Northwest Santa Catalina Island	4	20.68	25
Western Santa Catalina Island	4	3.51	26
Farnsworth Bank (Santa Catalina Island)	4	0.06	27
Southeast Santa Catalina Island	4	4.31	28
Newport Beach Marine Life Refuge ASBS	8	0.34	32
Irvine Coast	8, 9	1.47	33
La Jolla	9	0.71	29
Heisler Park	9	0.05	30
San Diego- Scripps	9	0.14	31

Sources: SWRCB and EPA 2005 (The Ocean Plan); GIS layer coastn27 from the State Lands Commission 1994.

Note: All the ASBS sites listed are also SWQPAs.

Critical Coastal Areas

California critical coastal areas (CCAs), designated by the California Coastal Commission, significantly overlap with SWQPAs. These CCAs serve the dual goals of "improving degraded water quality, and providing extra protection from nonpoint source pollution to marine areas with recognized high resource value" (CCC 2002). Twenty-six areas in the study region have been designated as CCAs (Table 4.3-2) (CCAs not also designated as SWQPAs are notated by * following the name). This list of CCAs includes "impaired water bodies" identified in the section 303(d) list, as well as marine managed areas, wildlife refuges, waterfront parks, and beaches and ASBSs.

Table 4.3-2. Critical coastal areas

Critical Coastal Area Name	CCA ID Number
San Miguel, Santa Rosa, and Santa Cruz Islands	55
Santa Barbara and Anacapa Islands	56
Mugu Lagoon/Revelon Slough*	58
Mugu Lagoon to Latigo Pt	59
Malibu Creek*	60
Topanga Canyon Creek*	61
Santa Monica Canyon*	62
Ballona Creek*	68
Santa Catalina Island Sub-Area 1	63
Santa Catalina Island Sub-Area 2	64
Santa Catalina Island Sub-Area 3	65
Santa Catalina Island Sub-Area 4	66
San Nicolas Island and Begg Rock	57
San Clemente Island	67
Upper Newport Bay*	69
Newport Beach Marine Life Refuge	70
Irvine Coast Marine Life Refuge	71
Heisler Park Ecological Reserve	72
Aliso Creek*	73
San Juan Creek*	74
Batiquitos Lagoon*	75
San Elijo Lagoon*	76
Los Peñasquitos Lagoon*	77
San Diego-Scripps Marine Life Refuge	79
San Diego-La Jolla Ecological Reserve	78
Tijuana River Estuary*	80

Source: California's Coastal Commission 2006 and 2002.

Note: * Indicates which CCAs not designated as SWQPAs.

4.3.2 Offshore Water Quality Issues

Offshore areas of the south coast study region have several documented water quality problems. However, on the whole, offshore water quality has improved in the last two decades because of enacted discharge regulations (California Cooperative Ocean Fisheries Investigations 2002). There are six key factors affecting offshore water quality issues: 1) regulated industrial and municipal wastewater discharges, 2) stormwater discharges, 3) harmful algal blooms, 4) contaminated sediment, 5) oil spills, and 6) invasive species.

Regulated wastewater discharges: (discussed in Section 4.4)

Stormwater plumes: (discussed in Section 4.4)

Harmful algal blooms: Certain species of phytoplankton and cyanobacteria pose threats to marine waters and associated life through rapid production or release of toxins. Harmful algal blooms occur naturally in surface waters under the following conditions: elevated water temperature, high nutrient levels, and reduced water flow and circulation (CDPH 2008; Blue Green Algae Work Group 2007). However, not all species of cyanobacteria produce toxins. There are two genera in California that are commonly associated with harmful algal blooms, *Alexandrium* and *Pseudo-nitzschia* (NCCOS 2008). The primary exposure risk is that of consuming contaminated shellfish and fish. A slight risk exists through inhalation in activities such as swimming, diving, surfing, and water skiing (NCCOS 2008a, Blue Green Algae Work Group 2007). Algal blooms can also impact dissolved oxygen levels (NOS 2008). In 2007, southern California experienced a major bloom that caused historic levels of toxins in planktons, shellfish, and other wildlife (NCCOS 2008). That year, the California Department of Public Health's monitoring program found the highest concentrations of toxins at offshore sites near Santa Barbara and Ventura County (CDPH 2007).

Contaminated sediments: The south coast study region has a number of areas with contaminated sediments. Twenty-five of those sites have been designated as a superfund site by the federal government (see Table 4.3-3). These sites are identified under the Comprehensive Environmental Response, Compensation and Liability Act as sites to be placed on the National Priorities List (USEPA 2008b). These sites are considered to pose a "relatively high" threat to human health or the environment (USEPA 2008c). The U.S. Environmental Protection Agency, which oversees the program, will determine remediation efforts to clean up sites, hold responsible parties accountable, and implement long-term monitoring of contaminated sites (USEPA 2008b). These sites are at various stages of contamination and remediation (USEPA 2008d). A well-known superfund site in the study region is the Palos Verdes Shelf site located offshore near Los Angeles. The site was deemed to pose risks to humans and marine life due to over twenty years of wastewater discharge into the Pacific Ocean (USEPA 2008e). Details about the sediment contamination associated with this site can be found in Section 4.3.5.

Table 4.3-3. Superfund Sites

County	Superfund Site
Santa Barbara	Casmalia Resources
Ventura	PACIFIC COAST PIPE LINES
Los Angeles	COOPER DRUM CO.
Los Angeles	Del Amo Facility
Los Angeles	JET PROPULSION LABORATORY (NASA)
Los Angeles	Montrose Chemical Corp
Los Angeles	OMEGA CHEMICAL CORPORATION
Los Angeles	Operating Industries, Inc. Landfill
Los Angeles	Palos Verdes Shelf
Los Angeles	Pemaco
Los Angeles	SAN FERNANDO VALLEY (ALL AREAS)
Los Angeles	SAN FERNANDO VALLEY (AREA 1 North Hollywood and Burbank)
Los Angeles	SAN FERNANDO VALLEY (AREA 2 Glendale)
Los Angeles	SAN FERNANDO VALLEY (AREA 3 Verdugo)
Los Angeles	San Fernando Valley (Area 4 Pollock)
Los Angeles	San Gabriel Valley (All Areas)
Los Angeles	SAN GABRIEL VALLEY (AREA 1) El Monte, South El Monte, Whittier Narrows
Los Angeles	SAN GABRIEL VALLEY (AREA 2) Baldwin Park
Los Angeles	San Gabriel Valley (Area 3) Alhambra

County	Superfund Site
Los Angeles	SAN GABRIEL VALLEY (AREA 4) CITY OF INDUSTRY, PUENTE VALLEY
Los Angeles	WASTE DISPOSAL, INC.
Orange	EL TORO MARINE CORPS AIR STATION
Orange	McColl
Orange	RALPH GRAY TRUCKING CO.
San Diego	Camp Pendleton Marine Corps Base

Oil Spills: In the south coast study region, the risk of oil spills is high due to heavy tanker traffic, dozens of oil platforms located off the coast, and pipelines running from platforms to onshore. Three agencies have jurisdiction and/or responsibilities to prepare and respond to oil spills; jurisdiction is determined by whether the spill occurs in state waters (0-3 nautical miles offshore) or federal waters (3 to 200 nautical miles). The Minerals Management Service (MMS), which is part of the U.S. Department of the Interior, is the agency responsible for regulating energy in federal waters, including the oil and gas platforms. The United States Coast Guard is responsible for responding to spills occurring in federal waters, including the submerged lands, subsoil, and seabed. The National Park Service, US Fish and Wildlife Service, Bureau of Land Management, and NOAA are public trustees for wildlife and habitat. In state waters, the California State Lands Commission has jurisdiction over the state's tide and submerged lands along the coastline out to the western extent of state waters. The Office of Spill Prevention and Response (OSPR) is responsible for spills that occur in state waters and has pollution response authority, as well as public trustee authority for wildlife and habitat.

In federal waters adjacent to the south coast study region, there have been 4 notable oil spill events since 1990, all in the Santa Barbara Channel and all from platform incidents (MMS 2008a, County of Santa Barbara 2002, MMS 1998, MMS 1995). The single most important oil spill event in California's history was the oil spill in 1969 from Union Oil's Platform "A" off Santa Barbara. This spill caused an estimated 80,000 barrels of crude oil to escape into the ocean, which covered an area of 800 square miles and affected thirty-five miles of coastline (County of Santa Barbara 2002, MMS 2008b). There were serious ecological consequences, as approximately 4,000 waterbirds died, marine mammals were poisoned and suffocated, and many fisheries were adversely affected (County of Santa Barbara 2002). There has been no spill of the same magnitude in southern California since then (County of Santa Barbara 2002).

In state waters, there have been four notable oil spills since 1990. The causes of these spills include pipeline breaks and a tanker accident. The cause of one spill remains unknown. Unlike the incidents in federal waters, there have not been any significant spills related to platforms in state waters (Hemphill 2008). The spills have had direct and indirect impacts on marine life. For example, more grunion than seabirds were killed in the American Trader spill (Martin, pers comm. 2008). In addition, spills pose serious threats to grunion eggs, and the last four have occurred in grunion spawning habitat (Martin, pers comm. 2008). Table 4.3-4 summarizes the four state water events. Additional information on oil development in state and federal waters off of California is below in Section 4.5.2.

Table 4.3-4. Oil spill incidents in state waters,1990-2008

Name	Date	Location	Cause	Pollution	Resource Impact
American Trader Oil Spill	02/7/90	Huntington Beach	Tanker incident	416,598 gal crude oil	3,400 birds killed Fish contaminated Restricted recreational activities

Name	Date	Location	Cause	Pollution	Resource Impact
McGrath Oil Spill	12/25/93	McGrath State Beach, Ventura County	Pipeline break	87,150 gal crude oil	206 birds killed Damaged riparian and coastal habitat
Torch/Platform Irene Oil Spill	09/28/97	Northern Santa Barbara County (offshore and coastline)	Pipeline break	6,846 gallons of petroleum products	700 birds killed Sandy and rocky beach habitat affected Restricted recreational beach use
Ventura County Oil Spill	01/13/05	Santa Barbara to Ventura	Unknown	Oil- type, amount, and Unknown	86 birds killed

Source: California Office of Spill Prevention and Response (OSPR) 2008, OSPR 2005, American Trader Trustee Council 2001, California Department of Parks and Recreation, California Department of Fish and Game, and United States Fish and Wildlife Service 2005.

Invasive species: Aquatic invasive species (AIS) present another potential water quality issue in the south coast study region and may be a source of impairment through the production of toxins. For example, *Caulerpa taxifolia* is an invasive alga found in the region; it infested coastal waters in Orange and San Diego Counties and took 6 years and $7 million dollars to remove from the ecosystems (Falkner et al. 2007, LAWQCB 2008, NMSF-SW 2008a). If unchecked, the damage of invasive species such as *C. taxifolia* could be catastrophic (NMSF-SW 2008a).

Other: Other factors also exist that can compromise offshore water quality. For example, localized nearshore coastal areas face a number of problems, including, but not limited to elevated levels of nutrients, sedimentation/ siltation, pesticides, PAHs, metals, pathogens, oils, and other persistent organic pollutants. These contaminants can result in a variety of biological impacts, including bioaccumulation, reduced recruitment of anadromous species (e.g. steelhead, that migrate from salt water to spawn in fresh water), acute and chronic toxicity, pathogen contamination, harmful algal blooms and reductions in certain fish and invertebrate populations. These adverse water quality impacts can impair designated beneficial uses.

4.3.3 Impaired Water Bodies in the South Coast Study Region

When a water body does not meet established water quality standards, it is placed on an impaired waters list mandated by §303(d) of the federal Clean Water Act. For this reason, this list is often called the 303(d) list, and waters on this list are referred to as “impaired” waters. States are required to update this list every two years and work towards resolving problems associated with the listed water bodies. Typically, a total maximum daily load (TMDL) is developed for each impaired water body. A TMDL determines the total amount of the pollutant/stressor (e.g., pathogens, sediment, nutrients) that the water body can receive and still meet water quality standards, and an allocation of that amount to the pollutant’s sources (USEPA 2008f). An implicit or explicit margin of safety is also factored into this analysis. The TMDL then allocates the allowable loading to all point and nonpoint sources to the water body and establishes an implementation plan to ensure that the allocations and water quality standards are achieved.

Based on data from 2006, the south coast study region has a far greater number of water bodies designated as impaired compared to other MLPA study regions in the state (Map 4.3-1). There are 21 impaired water bodies and one TMDL in the South Coast Hydrologic Unit, which is the only unit within its SWRCB region (region 3) that is located in the south coast study region. The Los Angeles Regional Water Quality Control Board has the most impaired water bodies in the study region with one hundred and sixty-one waterbodies deemed impaired; however, it also has the most TMDLs in the study region with a total of thirty-six TMDLs. Santa Ana Region Water Quality Control Board has 33 impaired water bodies and fourteen TMDLs. The San Diego Regional Water Quality Control

Board has the second highest number of impaired water bodies, with 99 listed on the 303(d) list and 29 TMDLs in place. Appendix F includes four tables that show impaired water bodies in each of the regional water quality control boards that fall within, or drain into the south coast study region. These impaired water bodies are separated out by those 1) containing any 303d list impairment, but must include impairment(s) besides those associated with human health concerns, and 2) containing only impairments known to affect humans through recreational contact. Other information provided in the appendix is the type of pollutants or stressors involved, the general source of impairment, and the status of TMDLs for each location.

Illustrative examples of some of the water bodies in the south coast for which TMDLs have been established include the following:

Los Angeles River: The Los Angeles River is only 52 miles long yet drops 795 feet in elevation from the headwaters of the San Fernando Valley and empties into the estuary in Long Beach. Unlike most rivers, much of the Los Angeles River has been channelized with concrete lining originally intended to reduce floods. However, this factor in combination with most of the watershed being developed with impervious surface has increased the volume and flow of water funneled into the concrete channel. It carries 183,000 cubic feet of water per second during peak flow, but the flow varies dramatically depending on the season and amount of rain. During the heavy rains, the river has a strong, powerful current, but it is nearly dry during droughts. The Los Angeles River has poor water quality conditions in the mid and low sections of the river from urban, industrial, and commercial runoff. Some of the water quality impairments include bacteria, metals, organics, oil, nutrients, and trash. However, the Los Angeles River does have active TMDLs for metals, trash, and nutrients, such as nitrogen (LARWQCB 2002; City of Los Angeles 2007). In 2007, the Ad Hoc Committee on the Los Angeles River finalized the Los Angeles River Revitalization Plan, which is a 25-year plan for the LA River to improve water quality, wildlife habitat, recreational opportunities, and community enhancement (City of Los Angeles 2007).

Newport Bay: Newport Bay, which has two areas separately identified on the state's Clean Water Act §303(d) list, is one of the major impaired water bodies in the Santa Ana Hydrologic Unit. The bay's water quality has been impacted by metals, pesticides, and priority organics (SARWQCB 2006b). Surrounding land uses are the major factors associated with the poor water quality. These land uses include urban areas, boatyards, agriculture, as well as unknown sources.

Tijuana River and Estuary: There are two associated water bodies impaired in the Tijuana River Hydrologic Unit: the Tijuana River and the Tijuana Estuary. This hydrologic unit is complex, as it straddles the California and Mexico border. While the majority (73%) of this watershed is located in Mexico, the Tijuana River discharges in California (SDRWQCB 2005). These two water bodies have been adversely impacted by nonpoint agricultural sources from California, and a number of point and nonpoint sources from Mexico (SDRWQCB 2005). As a result, a significant water quality problem exists for the Tijuana River and Estuary; these water bodies are amongst the most severely impaired water bodies in San Diego County (SDRWQCB 2005).

More information on these water bodies, including GIS data and in-depth information on pollutants, sources, and TMDLs, is available at http://www.waterboards.ca.gov/water_issues/programs/tmdl/303d_lists2006_epa.shtml.

4.3.4 Beach Closures, Postings, and Rain Advisories

Beach closures, postings, and rain advisories are direct indicators of the negative impacts to beneficial uses at beaches. The State of California has mandated beach water monitoring, which began in 1999. Weekly monitoring is required between April and October for beaches with more than 50,000 visitors annually or located adjacent to storm drains flowing during the summer. The

waters are tested for coliform, including fecal, and enterococcus bacteria. Whereas beach closures prohibit water contact due to sewage spillages, beach postings are advisories that the public not contact water based on monitoring information that indicates high bacteria levels. Rain advisories are a preventative measure put in place that warns people not to swim during a rain event or for three days after a rainstorm due to predictions of poor water quality.

The south coast study region has experienced more beach closures by comparison to the rest of California. The southern extent of the study region has had the most closures. A comparison of beach closures versus beach postings in the south coast study region is provided in Table 4.3-5. The table lists the number of closures and postings in "beach mile days" (the distance of beach posted or closed multiplied by the number of days of posting or closure) from 2004-2007 by county within the study region. Table 4.3-6 lists all beach closures in the study region from 2007-2008. Water quality conditions remain a concern for the south coast study region. Seven of the ten beaches with the highest water pollution in the state are located in the study region, with five of those in Los Angeles County. In addition, Los Angeles County continues to receive the poorest water quality reports for the state with the Los Angeles River outlet having "very poor water quality" in 2008 (Heal the Bay 2008). Many beaches in California are long and sometimes closings are targeted for a certain section of the beach. Therefore, some beaches may have more than one closing at the same time. Multiple closures at the same beach have been aggregated in this list.

Table 4.3-5. Beach closures and postings by county, year-to-year comparison

	2004		2005		2006		2007	
County	Closure	Posting	Closure	Posting	Closure	Posting	Closure	Posting
Santa Barbara	0.0	8.5	0.0	18.4	0.0	25.5	0.0	26.0
Ventura	0.0	25.0	0.0	21.7	0.0	3.5	0.0	2.1
Los Angeles	4.3	106.6	3.9	136.8	66.2	175.6	0.0	131.7
Orange	11.5	470.9	71.7	198.5	15.0	809.9	1.7	497.7
San Diego	248.8	28.1	357.5	52.6	418.6	70.5	327.7	34.1
Study Region Counties Total	264.7	639.1	433.0	428	499.8	1085.0	329.4	559.9
California Total	345	692	439	518	501	1129	346	718

Source: State Water Resources Control Board, Beach Watch 2008.
Note: Units are expressed in Beach Mile-Day. Beach Mile-Day is the distance of beach posted or closed times the number of days of posting or closure.

Table 4.3-6. Beach closures in 2007-2008

County	Beach	Duration (# Days)
Los Angeles	Belmont Pier, east side	11
Los Angeles	Belmont Pier, west side	11
Los Angeles	Cabrillo Beach, harborside at boat launch	5
Los Angeles	Cabrillo Beach, harborside at lifeguard tower	5
Los Angeles	Cabrillo Beach, oceanside	5
Los Angeles	Castlerock Storm Drain, Castle Rock Beach	4
Los Angeles	Dockweiler State Beach, Ballona Ck mouth	5
Los Angeles	Dockweiler State Beach, Culver Blvd. drain	5

County	Beach	Duration (# Days)
Los Angeles	Long Beach City Beach, 10th Pl	11
Los Angeles	Long Beach City Beach, 16th Pl	11
Los Angeles	Long Beach City Beach, 36th Pl	11
Los Angeles	Long Beach City Beach, 3rd Pl	11
Los Angeles	Long Beach City Beach, 54th Pl	11
Los Angeles	Long Beach City Beach, 55th Pl	11
Los Angeles	Long Beach City Beach, 5th Pl	11
Los Angeles	Long Beach City Beach, 62nd Pl	11
Los Angeles	Long Beach City Beach, 72nd Pl	11
Los Angeles	Long Beach City Beach, Coronado Ave.	11
Los Angeles	Long Beach City Beach, Granada Ave.	11
Los Angeles	Long Beach City Beach, Molino Ave.	11
Los Angeles	Long Beach City Beach, Prospect Ave.	11
Los Angeles	Santa Ynez Storm Drain, Castle Rock Beach	4
Los Angeles	Venice Beach, Topsail St.	5
Orange	San Clemente, north beach, Avenida Pico	3
Orange	Seal Beach, 1st Street	2
San Diego	Border Field State Park, Border Fence, north	106
San Diego	Border Field State Park, Monument Rd.	106
San Diego	Coronado at North Beach (near Navy fence)	6
San Diego	Coronado, NASNI Beach	6
San Diego	Coronado, Ave. del Sol	6
San Diego	Coronado, Loma Ave.	6
San Diego	Coronado, Silver Strand	25
San Diego	Imperial Beach- Camp Surf Jetty	46
San Diego	Imperial Beach, Imperial Beach Pier, north	68
San Diego	Imperial Beach, Carnation Av.	65
San Diego	Imperial Beach, Cortez Av.	65
San Diego	Imperial Beach, Palm Av.	65
San Diego	Imperial Beach. south end of Seacoast Dr.	41
San Diego	Mission Bay, Sail Bay, Whitting Ct.	6
San Diego	Mission Bay, Santa Clara Cove, Portsmouth Ct.	6
San Diego	Ocean Beach, San Diego River outlet (Dog Beach)	2
San Diego	Oceanside, Buccaneer Beach, Loma Alta Ck	4
San Diego	Oceanside, Buena Vista Lagoon Outlet	3
San Diego	Oceanside, Cassidy St.	8
San Diego	Oceanside, St. Malo Beach (downcoast from St. Malo Rd.)	8
San Diego	Point Loma, Lighthouse	2
San Diego	Point Loma, Point Loma Treatment Plant	2
San Diego	San Diego Bay, Bayside Park, J Street	4
San Diego	San Diego Bay, Glorietta Bay Park, boat launch	4
San Diego	San Diego Bay, north of Kellogg St.	4
San Diego	San Diego Bay, Silver Strand	4

County	Beach	Duration (# Days)
San Diego	Sunset Cliffs, downcoast of Newbreak Beach	2
San Diego	Tijuana Slough NWRS, 3/4 mile no. of Tijuana River	106
San Diego	Tijuana Slough NWRS, Tijuana Rivermouth	109

Source: Heal the Bay 2008.

4.3.5 Sediment Quality and Areas of Impairment

Sediment quality is another important characteristic to consider when examining the conditions of coastal and marine resources. For the south coast study region, sediment contamination is prevalent and can result in ecological and human health risks. A recent study was conducted as part of the Southern California Bight Regional Monitoring Program that looked at sediment throughout the region (Schiff, Maruya and Christensen 2006). Three hundred fifty-nine sediment samples were taken from the following types of areas: onshore, offshore, embayments, estuaries, and Publicly Owned Treatment Works. This study found that 94% of all sediment samples contained at least one contaminant (Schiff, Maruya and Christensen 2006). The greatest DDT contamination was found in coastal areas near outfalls, where urban runoff was the probable source of contamination. Similarly, the highest concentrations of trace metals were in embayments, where there is minimal opportunity for contaminant flushing, as water circulation is restricted. In contrast, the Channel Islands experience constant ocean flow and quickly moving currents, such that this area had the least sediment contamination, in terms of both accumulation and concentration (Schiff, K., K. Maruya and K. Christensen 2006).

Although most of the study region had contaminated sediment (Schiff et al. 2006), the majority of this contamination was not found to have significant biological impacts. For example, only approximately 20% of the sampling sites had levels frequently associated with adverse biological impacts (referred to as the Effects Range Median), and only 1% were deemed to exhibit “moderate to high risk” (Schiff, K., K. Maruya and K. Christensen 2006). Marinas, Los Angeles estuaries, and large publicly owned treatment works outfalls were the highest at-risk areas. DDT, heavy metals, and PCB (Polychlorinated biphenyl) were among the most common sediment contaminates. In addition, recent studies as part of the Bight monitoring found pyrethroid as an “emerging new contaminant of concern” in coastal waters for sediment toxicity, such as Ballona Creek (SCCWRP 2008b). Total DDT was the most commonly found organic contaminant; approximately 71% of sediment samples contained that persistent contaminant. The area with the highest DDT concentrations was Palos Verdes (Schiff, K., K. Maruya and K. Christensen 2006). The Southern California Bight Monitoring Program has found minimal change in the area where sediment contamination exists; it is slowly degrading and has not spread in the last decade according to their region-wide sampling (Schiff, K., K. Maruya and K. Christensen 2006).

The most notable example of significant sediment contamination is the Palos Verdes Shelf superfund site. The site has high levels of DDT and PCBs in its sediment from historic wastewater discharge via outfalls (NRT 2006). The chemicals eventually settled out and formed an “effluent-affected sediment layer” (USEPA 2008e). As part of a major settlement, Montrose Chemical Corporation, among others companies, were found responsible for releasing harmful chemicals into the ocean, and were held responsible for remedial action (USEPA 2008e). In addition, the Montrose Settlements Restoration Project was developed to address natural resource impacts (see Section 4.6 for more details). The USEPA has established an Institutional Controls Program to protect public health while they evaluate the best method for remediating contaminated sediment (FCEC 2008).

Recently, the State of California has made efforts to try to address sediment quality issues. The SWRCB has initiated a process to develop sediment quality objectives that will be included in the

Water Quality Control Plan for Enclosed Bays and Estuaries of California (BPTCP 2008, SWRCB 2008g). Sediment quality objectives will establish “an adequate margin of safety” for water bodies to ensure beneficial uses (SWRCB 2008h). The SWRCB targets enclosed bays and estuaries, as they are the most prone to sediment contamination (BPTCP 2008).

4.4 Effects of Land Use on Coastal Waters

Ecological interactions between the land and the sea may be considered in MPA site selection as modification of watershed land cover and ecological processes can affect downstream rivers and coastal waters. A variety of land use practices in watershed areas results in degraded quality of receiving waters. Map 4.2-1 show the “human footprint” in coastal watersheds in the study region as described by percent of land cover in agriculture and urban usage. Generally, pollution caused by such practices is not concentrated at any one point, but is diffuse in nature. This type of pollution is called nonpoint source pollution. Additionally, there are spatially specific discharges of pollutants associated with industrial sources or wastewater treatment that are considered point sources. In order to understand how human activities in watersheds can affect the quality of receiving waters in the south coast study region, it is useful to begin with a consideration of how local geology plays a role in watershed processes.

4.4.1 Impacts of Local Geology on Water Quality

The northern boundary of the study region is where mountains known as the Transverse Range, which are oriented east-west, create a boundary between central and southern California (CCC 2003). The region is characterized by changing coastal features, such as beach loss, cliff retreat, and coastal erosion (CABRILLO 2008).

The land adjacent to the ocean plays an important role in land-sea processes and water quality. Depositional and erosional coastal features are discussed in this section. Depositional features are coastal landforms or features, large in scale, that result from deposition of sediment over time (Garrison 2004, pg. 287). Conversely, erosional features are produced by erosive forces that cut away the coastline over time (Garrison 2004, pg. 278).

Depositional features: The south coast study region exhibits some notable depositional coastal features that include: beaches, coastal plains, deltas, spits, and barrier islands. Examples of some of these features are described here. The study region has a series of floodplain areas, referred to as coastal plains. Waters traveling down the watershed will drop sediments and other suspended particles out once they reach the floodplains and are an important source of sand for beach replenishment (CCC 2003). However, many rivers in the study region flow intermittently. The Los Angeles Coastal Plain is the largest in southern California, which is also an urban and industrial area (Perry 2008). This factor in combination with implications of urban development has created erosion and receding beaches (CCC 2003). Deltas, such as the Malibu Delta, are another landform feature in the south coast. The extent of this feature varies depending on the volume of water. During heavy rain events, deltas can be quite pronounced (Perry 2008). Prior to the development of the Los Angeles/Long Beach Harbor, a strip of land protected a shallow lagoon and mainland from the open ocean. That geologic feature no longer exists and probably has affects on the natural systems.

Erosional features: Terrestrial processes, such as stream flow and mass wasting, can create coastal features that are susceptible to erosion. Marine processes, such as wave action and currents, can have a similar role in erosional coastal features (Perry 2008). These coastal features include: headlands, coastal cliffs, and submarine canyons. Headlands are pinnacle features along the coast and can create the boundaries for littoral cells or geographic segments along the California coast (CCC 2003). Point Loma is an example of a headland formed by erosional processes. Coastal

cliffs are another geologic feature subject to erosion by wave energy and wind. They have steep cliff faces that experience mass wasting, where erosional forces cause massive slides or rock falls into the ocean (Perry 2008). Another erosional feature, the wave-cut platform, is created by the combination of wave erosion and the collapse of a cliff cut thereby. Natural landslides and erosional processes provide sediment needed for coastal processes, as well as nutrients such as iron that are often limited in near-shore waters; however, increased sediment delivery results in disruption of biological communities due to the smothering of marine habitats and increasing turbidity of the nearshore water column (MBNMS 2003).

4.4.2 Point Sources

There are specific locations (point sources) where industrial pollution enters coastal waters; these are generally regulated by state or federal agencies. The origin of these point sources include municipal wastewater treatment and disposal systems and industrial sites, such as desalination plants, power plants, aquaculture sites, and research marine laboratories. There are 18 municipal wastewater treatment plants, three desalination plants, 12 “once-through” cooling power plants, and six other permitted pollution discharge sites which include; aquaculture wastewater, marine lab waste seawater, refinery wastewater and treated sanitary waste from oil platforms (See Table 4.4-1). Only the municipal wastewater sites and the power plant cooling intakes are considered to have major effects on the aquatic system.

Each of these discharge sites is assigned a “major” or “minor” pollution discharge rating, the criteria differing for municipal versus industrial sites. For municipal discharge, the rating is based on flow: sites having a flow equal to or greater than 1 million gallons per day (MGD) are rated major; lesser flows receive the “minor” rating. For industrial discharge, rating is on the basis of environmental risk, any environmental risk being sufficient to merit a “major” rating (Jauregui 2008).

Municipal Wastewater Treatment Facilities

Approximately 20 municipal wastewater treatment facilities are located adjacent to the south coast study region, and at least eighteen discharge directly into the ocean (Table 4.4-1). The largest treatment facility is the City of Los Angeles’ Hyperion Treatment Plant. It is one of the biggest dischargers of wastewater in the state, with an average discharge of 340 million gallons per day when operating, as it is now, at about 76% of its capacity (Dojiri 2008). Hyperion discharges directly into Santa Monica Bay through two outfalls five and seven miles offshore (outside of the study region), but some of the secondary effluent is transported offsite. The second largest discharge is the County of Los Angeles, which discharges approximately 310 million gallons per day (County Sanitation Districts of Los Angeles County, pers comm 2008). This plant is servicing regional municipal waste, industrial wastewater, and sludge from other county plants located upstream. The discharge is treated and then released via outfalls into the Pacific Ocean two miles off the Palos Verdes Peninsula (CSDLA 2008). In other areas of the study region, such as the San Diego Region, individual on-site waste treatment and disposal systems are increasingly becoming permanent alternatives to centralized sewage systems (SDRWQCB 2007). These on-site facilities have significant potential to cause water pollution, health hazards, and nuisance if not properly sited, designed, constructed, and maintained.

Desalination Plants

Desalination is a process that utilizes water-producing technologies that convert salt water into drinking water. There are two methods available for desalination, they include: 1) reverse osmosis, and 2) distillation (CCC 1993). Both processes involve feed water or input water, and concentrate

discharge. The discharge typically contains returned ocean water, ocean water concentrate ("brine"), and may include trace amounts of other approved chemicals.

The technologies differ in how they process the feed water to yield drinking water and the associated by-products. Reverse osmosis involves processing water through high-pressure, permeable membranes that remove dissolved minerals (including salt). Distillation is a process that heats the water to separate out the dissolved minerals by evaporation. Seawater intake options generally include ocean water (open intake), subsurface ocean water intake wells, and brackish (nearshore or inland) groundwater wells. There are three ways desalination by-products are disposed. They can be discharged directly into the ocean, into a sewer for treatment, or dried on site and transported to a landfill (CCC 1993). Environmental concerns associated with ocean water desalination include the potential for the water intake processes to harm marine organisms, and the effects discharge (direct ocean discharge) may have on local marine communities (CCC 2004). Several intake technologies are available or under investigation that could potentially reduce or eliminate impacts, such as subsurface intake and passive wedge wire screens.

Designs for new desalination plants are currently being developed in southern California. There are only three existing plants in the study region (see Table 4.4-1). In addition to these three plants, Poseidon Resources' Carlsbad Desalination Project was recently approved for construction by the California Coastal Commission and State Lands Commission (Poseidon Resources 2008). Furthermore, several other desalination plants are being proposed in the study region. Some of these sites may be co-located with power plant locations (CCC 2004). However, the SWQCB is engaged in a process to eliminate the use of such intakes for power generation (SWRCB 2008i).

Power Plants

Power Plants will be discussed in section 4.5.

Table 4.4-1. Pollutant point sources

Point Source	Effluent
Municipal Wastewater Treatment Facilities	
City of Los Angeles Hyperion Treatment Plant	treated sanitary wastewater
LA County Sanitation Districts' Joint Water Pollution Control Plant (JWPCP)	treated sanitary wastewater
Orange County Sanitation District's Sewage Treatment Plant	treated sanitary wastewater
San Diego, City of, Metro WW Dept's Point Loma Outfall	treated sanitary wastewater
San Elijo Joint Powers Auth.'s San Elijo WPCF	treated sanitary wastewater
Encina Wastewater Authority's Encina Ocean Outfall	treated sanitary wastewater
City of Oceanside's Oceanside Ocean Outfall	treated sanitary wastewater
Southeast Regional Reclamation Authority's SERRA Ocean Outfall	treated sanitary wastewater
City of Oxnard's Waste Water Treatment Plan (WWTP)	treated sanitary wastewater
South Orange County Wastewater Authority's (SOCWA) Aliso Ocean Outfall	treated sanitary wastewater
Int'l Boundary & Water Commission's South Bay IWTP	treated sanitary wastewater
City of Santa Barbara's El Estero WWTP NPDES	treated sanitary wastewater
Goleta Sanitary District's WWTP	treated sanitary wastewater
Carpinteria Sanitary District's WWTP	treated sanitary wastewater
Montecito Sanitary District's WWTP	treated sanitary wastewater
City of Avalon's WWTP NPD	treated sanitary wastewater
Summerland Sanitary District's WWTP	treated sanitary wastewater
U.S. Navy Naval Air Station, North Island's San Clemente Island	treated sanitary wastewater

Point Source	Effluent
Industrial- Desalination Plants	
Chevron U.S.A. Inc.'s Gaviota Oil, Gas, and Desalination	desalination brine
U.S. Navy Naval Air Station's San Nicholas Island	desalination brine
Southern California Edison Co's Pebbly Beach Desalination Plant	desalination brine & possibly cooling water
Industrial- Power Plants	
Southern California Edison Co.'s SONGS Unit 3 (San Onofre)	cooling water
Southern California Edison Co.'s SONGS Unit 2 (San Onofre)	cooling water
AES Corporation's Redondo Beach Generating Station	cooling water
Cabrillo Power LLC's Encina Power Plant	cooling water
Reliant Energy's Ormond Beach Generating Station	cooling water
El Segundo Power LLC's Generating Station	cooling water
AES Hunting Beach LLC's AES Huntington Beach	cooling water
Los Angeles City's Scattergood Generating Station	cooling water
Reliant Energy's Ocean Vista Power Station at Mandalay Beach	cooling water
Southern California Edison Co.'s Songs Unit 1	cooling water
Other Industrial Permitted Discharge Sites	
Cultured Abalone Aquaculture	Aquaculture wastewater
UC San Diego, Scripps Inst. Of Oceanography	Marine lab & public aquarium waste seawater
USC Wrigley Institute Marine Science Center	Marine lab waste seawater
Chevron U.S.A.'s El Segundo Refinery	Refinery wastewater
Nuevo Energy Company's Platform Esther	Treated sanitary waste from oil platform
Nuevo Energy Company's Platform Eva	Treated sanitary waste from oil platform

Source and pollution rating: DFG GIS data, State Water Resources Control Board 2003.
Point Sources shown in bold have a discharge rating of "major." All others have a rathing of "minor."

Stormwater Discharge

Another kind of point source within the study region includes outfalls for untreated stormwater. Stormwater discharge can pose a threat to water quality at outfalls, as it contains a variety of pollutants, such as bacteria, trash, and heavy metals from runoff. These outfalls exist throughout the study region. For example, in the City of Los Angeles, there are 60 storm drain outfalls that release approximately 100 million gallons of untreated water each day into Santa Monica and San Pedro Bays (City of Los Angeles 2008). Some municipalities are beginning to employ methods of treating stormwater before it discharges into the ocean in an effort to meet their total daily maximum loads (TMDLs). While stormwater outfalls are considered a point source, they are closely related to the topics discussed in the following section, 4.4.3.

4.4.3 Nonpoint Sources

Nonpoint source pollution is the leading cause of degraded water bodies in southern California and across the country (SWRCB 2004, EPA 2002). Unlike point sources, nonpoint source pollution is difficult to control and address because it derives from many diffuse sources. In the study region, nonpoint source pollution occurs during rain events where runoff moves over the land, picks up and transports pollutants, and deposits them into surface waters (e.g. estuaries, coastal waters, the ocean). Common nonpoint source pollutants are sediment, pesticides, fertilizers, trash, salt, oils, heavy metals, grease, bacteria, and nutrients, among many other substances (SWRCB 2000).

There are five major categories of nonpoint source pollution: 1) agriculture, 2) urban, 3) resource extraction, 4) hydrologic modification, and 5) marinas and recreational activities. Each of these sources is described below.

Agriculture

The agriculture industry is an essential part of California's economy. The primary crops vary in the study region from north to south. In Ventura County fruits, nuts, vegetables, and nursery plants are the commonly grown crops, while farms in the San Diego region grow avocados, citrus, cut flowers, and nursery plants (LARWQCB 1994, SDRWQCB 2007). The nonpoint source pollution typically associated with agriculture includes nutrients, animal waste, sediments, and pesticides that enter receiving waters by direct runoff to surface waters or seepage into ground water. These pollutants degrade aquatic habitats by causing eutrophication, turbidity, temperature increases, toxicity, and decreased oxygen (SWRCB 2008b). Agricultural activities are regulated by state and regional water boards through point source and nonpoint source programs (LARWQCB 1994, SDRWQCB 2007, SARWQCB 2008). To help address water quality issues related to agriculture, the regional water boards work with local governments to promote the incorporation of Best Management Practices. Best Management Practices along with small grants are part of an incentive approach to encourage growers to reduce runoff and conserve water (Map 4.2-1).

Urban Areas

Southern California is the most populated coastline in the country, and hosts two of the California's largest coastal cities, Los Angeles and San Diego (SWRCB 2008b). The study region is largely urbanized, and the modification to land surface caused by that development affects runoff magnitude and type of runoff pollutants (Booth and Jackson 1997). Urban areas include buildings, roads, parking lots, and other residential, industrial, or commercial paved surfaces. Replacement of natural land cover with impervious surfaces increases stream channel erosion, flooding, water contamination, sedimentation, and degradation of aquatic habitat (Center for Watershed Protection 2003). This may result in increased runoff as well as higher concentrations of harmful pollutants within runoff. The pollutants commonly found in the study region's urban runoff are sediment, urban debris, plastics, road salts, viruses, pathogenic bacteria, heavy metals, pesticides, and petroleum hydrocarbons (LARWQCB 1994, SWRCB 2008b). Smaller municipalities and road construction also generate urban nonpoint source pollution (map 4.2-1. Santa Monica Bay is one example of a water body impacted by pollutant loading from urban runoff. On average, 30 billion gallons of storm and urban runoff reach the Santa Monica Bay each year by way of over 200 outlets (SMBRC 2004, LARWQCB 1994). This location is currently part of a restoration effort to improve water quality.

Resource Extraction

Resource extraction is another source of nonpoint source pollution that can have impacts on water quality from even minor pollution incidents (SWRCB 2000). This category includes activities that extract resources from the earth, such as mining and the drilling and pumping of petroleum products. There are a several reasons why resource extraction can impact water quality. One reason is that extraction can cause erosion or sedimentation into nearby streams. Another indirect impact may include leaching or discharge of harmful chemicals. In addition, oil extraction poses a threat to water quality because during extraction and transportation spills may occur, even the smallest of which may have notable impacts on local ecosystems. Nonpoint sources associated with oil and gas productions are spills during transportation, water runoff from work sites, and seeping and overflow issues related to reserve and production pits (LARWQCB 1994, SWRCB 2000).

Industries involved with resource extraction in the study region are important to local economies. California is ranked third in the country for non-fuel mineral production, such as sand and gravel (Kohler 2007). Sand and gravel mining are the most common mining activities in the Los Angeles area and the San Diego Region (LARWQCB 1994 and SDRWQCB 2007).

Hydrologic Modification

Floodplains are a landscape feature that collect water traveling down the watershed and reduce flows. As a result, water and pollutants have the opportunity to settle out and/or infiltrate into the soil (Booth and Jackson 1997). They serve as natural buffers by removing suspended solids and contaminates from the water. In urban settings, where the flood control services of floodplains are lost, hydrologic modifications are used in lieu of the natural feature. In general, hydrologic modifications are designed to control water flow (LARWQCB 1994). A number of activities fall within the category of hydrologic modifications, such as alteration of stream and river channels, installation of dams and water impoundments, and dredging (SWRCB 2000).

While hydrologic modifications are intended to address urban flood control, they can lead to degraded water quality (SWRCB 2000). Hydrologic modification is a notable nonpoint source in the south coast due to urbanization in the region (LARWQCB 1994). It can reduce the quality of aquatic habitats by altering temperature and sediment transport (SWRCB 2008b).

Ports, Harbors, Marinas and Associated Vessels

Marinas, as well as other embayments, along with associated vessels can have particularly adverse impacts on water quality, as most pollutants are directly discharged into the water (SWRCB 2008b). In the south coast study region, recreational boating is an important activity in terms of social and economic benefits (CADMV 2008, Rust and Potepan 1997). For example, there were 301,098 recreational vessels measuring less than 13 feet with a motor in the study region in 2007(CADMV 2008). Southern California's small vessels make up about 30% of the state's total and 99% of the vessels in the study region are pleasure boats (CADMV 2008). The boating industry is an important part of the economy, contributing $11.0 billion in southern California, and provides 183,000 jobs (Johnson 1998, Rust and Potepan 1997) (more in section 5). Unfortunately, boating-related activities can also cause water pollution from antifouling paint, sewage, spills, wastewater, and trash (SWRCB 2008b).

Antifouling paint used on boat hulls to reduce fouling growth contains harmful chemicals, such as copper and lead (USEPA 1993, Carson et al. 2002). These chemicals can have adverse effects on aquatic species (e.g. mussels, sea urchins) by impeding growth, reproduction, spawning, eating, and survival (Carson et al. 2002). In San Diego and Newport Bay, levels of dissolved copper exceed water quality standards (USEPA 2001, Carson et al. 2002). Efforts are in place to transition boats over to non-metal antifouling paints.

There are state-wide collaborative efforts, which include organizations in the study region, to address pollutants of concern in local small-craft harbors, which include oils, sewage, heavy metals such as copper, marine debris, and invasive species. One such organization is the Santa Monica Bay Restoration Commission's Boater Education Program, which educates marine businesses and boaters about clean boating practices including sewage pumpouts, bilge pad exchange, and certified in-water hull cleaners. The Boater Education Program is also the facilitator for the southern California chapter of the California Clean Boating Network (CCBN), a program designed to improve clean boating education efforts in California through collaboration. Other such groups include the Inter-agency Coordinating Committee for Marinas and Recreational Boating and California Integrated Waste Management Board Information Exchange Program (CCBN 2007, SMBRC 2008).

Commercial vessels are another potential source of pollution. There are a number of different types of commercial craft, such as ferries, tugs, crew and supply boats, commercial fishing vessels, and boats for charter fishing and other excursions. In 2004, roughly 300 commercial vessels identified their home port within southern California (ARB 2004). However, a much larger numbers of vessels transit in and through the study region. The majority of these transits are large commercial vessels, such as container ships and bulk product carriers, which travel within two miles of shore and carry up to one million gallons of bunker fuel, which is similar to crude oil.

The historical number of oil spills along the Pacific Coast is small, but the potential size and impact of such a spill on the marine environment can be significant (MBNMS 2006). While southern California has only experienced a few big oil spill events, on a daily basis there are small oil and fuel spills that individually may not have significant ecological impacts but cumulatively do (Taylor 1998). These incidental spills generally occur in marinas and harbors where there is minimal or no flushing to dilute the spill. Fishing boats, pleasure crafts, the Navy, and facilities are some of the minor spill sources in the study region (Taylor 1998). For more detailed information on the large-scale oil events in the study region, review Section 4.3, on Coastal Water Quality.

Ballast water from commercial vessels and cruise ships, which is regulated by the State Lands Commission, is another concern, as it is a potential source of non-indigenous species. Non-indigenous species are organisms not native to an area. Once established, they can cause negative effects on the marine environment (Falkner et al. 2006). Some known non-indigenous species associated with ballast waters include the Zebra mussel, Chinese mitten crab, Japanese shore crab, and Amur river clam (Falkner et al. 2006). Southern California, on average, has more introduced species in its coastal waters, bays, and harbors, than sites north of Point Conception (Maloney et al. 2006).

Nonpoint source water quality improvements

In response to water quality issues related to nonpoint source pollution, significant effort is made to address these issues in Southern California. Among these efforts, the state has formed a Beach Water Quality Workgroup (BWQWG) that focuses on reducing bacteria impairment, and the Clean Beaches Initiative that appropriates funds for CBI grant projects prioritized by BWQWG (CBI 2005). Water quality projects include stormwater diversions, low-impact development ordinances, water recycling facilities, and trash capture devices (CBI 2008). This grant program has had success improving water quality conditions on a local scale. For example, Santa Monica Bay beaches experienced noticeable improvements in water quality after stormwater diversions were installed (Heal the Bay 2008).

4.5 Coastal Energy Projects

There are a large number of active energy projects within and adjacent to the south coast study region. Some of these projects may have effects on the marine ecology of the study region by impacting water quality, oceanographic patterns, habitat suitability, and other environmental conditions. Some of these energy projects are briefly described below and may be considered in MPA planning.

Energy demand in California is increasing by an average rate of 1.6% each year. In 2007 nearly 11.9% of California’s electricity supply came from renewable resources, such as wind and geothermal, while the remainder came from fossil fuels, nuclear power and large hydro-electric plants (energyalmanac.ca.gov). Coastal energy production is greater in the south coast study region than in any of the study regions (Larson 2002). This energy production comes in the form or offshore oil drilling, nuclear power plants and natural gas power plants, among other sources.

California's demand for energy is reflected in its oil consumption. California is the third largest oil-producing state in the country but the second largest oil consumer in the nation. California consumes more oil than it produces (Larson 2002). Therefore, California is heavily dependent on marine transportation for crude oil and refined petroleum products. Approximately 50% of crude oil used in the state comes by ocean tanker. A total of 21.3% comes from Alaska, while the remaining 29.3% comes from foreign sources. (Larson 2002).

4.5.1 Oil Platforms

California has a permanent moratorium on offshore oil and gas leasing in state waters but the federal moratorium was lifted in 2008. New federal leases may be granted in the future, and existing state leases may still occur within offshore areas leased prior to the implementation of the state's leasing restrictions. There is also a proposal to utilize existing platforms located in federal waters for directional drilling into state leases. The proposal entails the use the existing Federal Platform Irene to produce oil and gas from the Tranquillon Ridge Field, located under State Tide Lands. The Tranquillon Ridge Field is located east of Platform Irene, approximately 6 miles west of Point Pedernales in approximately 240 feet of water. Another proposal to expand operation around platform Holly which is located in state waters and to construct a new oil pipeline near the city of Goleta, Santa Barbara County, is underway (State Lands Commission, 2008).

The 1969 blowout and oil spill from Union Oil of California's (UnoCal) platform A in the Santa Barbara Channel received international attention and was a major catalyst in the development of modern environmental law in the United States. The spill influenced the passage of major state and federal legislation, such as the National Environmental Protection Act (NEPA), Clean Water Act, California Environmental Quality Act (CEQA), California Coastal Initiative in 1972 (Proposition 20), and California Coastal Act of 1976. Pursuant to these and other statutes, development permits for onshore and offshore oil and gas facilities cannot be issued without provisions to protect terrestrial, marine, visual, recreational, and air resources.

As of May, 2008, there are 26 production platforms, one processing platform, and six artificial oil and gas production islands located in the waters offshore California (CERES 2006a). Of these 27 platforms, four are located in state waters offshore Santa Barbara and Orange Counties (Map 4.5-1a), and 23 are located in federal waters offshore Santa Barbara, Ventura, and Los Angeles Counties (Map 4.5-1a,1b). There are also 80 marine terminals in state waters and numerous land-based oil production, transportation, and storage facilities. Most of these marine terminals are located in the south coast study region.

There have been several oil industry facilities that have been decommissioned in the study region. Seven platforms have been removed which include one in 1974, two in 1988 and four other platforms in state waters off Santa Barbara County in 1996. Other types of oil industry facilities decommissioned in state waters include a number of oil piers, an offshore treatment and storage facility (the Exxon SALM), and the Belmont Oil Island. A number of power cables and intra-field and field-to-shore pipelines as well as parts of Platform Hazel, a gravity base structure, have been decommissioned in-place.

4.5.2 Electric Generating Power Plants

As of 2002, there were 1,200 generators producing power statewide. Coastal power plants account for 41% of California's electric generating capacity (Larson 2002). However, over the past several years, many of the older plants have operated at very low levels or have been shut down entirely for long periods due to their relative inefficiency compared to new combined cycle plants which have improved technology and plant designs (www.energy.ca.gov). In 2005, there were 21 coastal power

plants capable of producing 50 mega-watts of power or greater, and 13 of these plants are located in the south coast study region (Map 4.5-1).

Power plants in California are located on the coast in part because most of California's population lives within 50 miles of the coastline. Thus, fewer costly high-voltage transmission lines are needed and the power is more reliable. Other siting factors relate to large volume oil transportation and importation to marine oil terminals, and the availability of abundant cooling water.

In 1978, the State Coastal Commission produced a set of maps placing most of the coast off-limits to new power plants, although existing sites could be used for expansions. Starting in the 1980's through the present, many small coastal power plants (less than 50 mega-watts) were built for use by hospitals, local municipalities, academic institutions, hotels, and private companies. These coastal power plants generate electricity for their own use; however, they can sell surplus electricity to California's Independent System Operator.

Many large coastal power plants (at least 50 mega-watts of generating capacity) use a once-through cooling system that withdraws water from nearby open water source such as a bay, estuary, or ocean (Ferry-Graham et al., 2008). California coastal power plants are permitted to withdraw and discharge approximately 16,700 million gallons of cooling water per day. Generating electricity involves burning fuel in a boiler to turn water into superheated steam. The spent steam is condensed back into water, often using ocean water to absorb the heat. The heated ocean water is then discharged back to the ocean up to 20 degrees warmer than when it was withdrawn. This withdrawal and discharge of cooling water has an impact on ocean organisms and habitats. For instance, drawing water from coastal waters can lead to impingement and entrainment. Impingement means aquatic organisms are trapped against or within components of the cooling system. Entrainment means aquatic organisms are drawn through the cooling system. Impingement usually affects larger organisms such as fish that are trapped within or against the cooling water system structures and either die of starvation or exhaustion (Ferry-Graham et al. 2008). Entrainment usually kills smaller organisms in early life stages by exposing them to water temperature increases, mechanical damage, and/or toxic stress. For a large power plant, the adverse effects to marine life caused by entrainment can stretch up to dozens of miles along the coast. Owners of coastal power plants are experimenting with deterrents to keep marine organisms out of water intake systems.

Owners of coastal power plants are upgrading their facilities to use systems other than once-through cooling or are experimenting with deterrents to reduce the number of marine organisms in their water intake systems. In some instances, mitigation has been and may continue to be required for plants that continue to use once-through cooling water. In the 1990s, the California Coastal Commission required environmental impact mitigation for Southern California Edison's San Onofre coastal power plant. Southern California Edison spent $5 million on the white seabass hatchery in Aqua Hedionda Lagoon, a restoration project in the San Dieguito wetlands near Del Mar, and $50 million to build a 150-acre artificial reef a half-mile offshore (See Map 3.1-1e and Map 3.1-2d). This artificial reef is considered to be the largest such structure in the country (more information on this artificial reef is included in section 5.11.2). More recently, the California Energy Commission, Regional Water Boards, and the California Coastal Commission have required mitigation in the form of restoring wetlands, preserving associated uplands to reduce sedimentation, or funding other similar projects. As an example, the California Coastal Commission required the Huntington Beach Power Plant to restore local wetlands as mitigation for impingement and entrainment impacts associated with the re-powering of the plant.

The SWRCB is in the process of developing a state policy for water quality control to establish requirements for implementing section 316(b), of the federal Clean Water Act for existing coastal and estuarine power plants (SWRCB and CEPA 2008a). The Substitute Environmental Document for the proposed plan is scheduled for release some time in early 2009. Section 316(b) of the Clean Water Act requires that power plants use the best technology available for intake structures to

minimize ecological damage caused by impingement and entrainment during operational procedures. The U.S. Environmental Protection Agency (USEPA) determined the best technology available to meet the requirements of Section 316(b) to be closed-cycle wet cooling and case law requires any technology employed to perform as well as the best technology under optimal conditions (40 CFR § 125.84, 2nd Cir. 2007, SWRCB 2008). Efforts by the USEPA to adopt regulations to implement section 316(b) have been unsuccessful, which is why the SWRCB has decided to address this issue. At least two plants plan on changing from once-through cooling systems to a closed cycle system. El Segundo will switch all its units to a closed system while the Encina plant will be converting two of its cooling units to a closed system.

4.6 Water Quality Projects in the South Coast Study Region

There are a number of water quality projects in the south coast study region. Some of these projects are dedicated to analyzing regional and local water quality, while others focus on restoring water quality and other ecological characteristics. The subsections below describe some of the major water quality monitoring programs and provide examples of the region's restoration projects.

4.6.1 Water Quality Monitoring Programs

The following are some of the regional water quality monitoring programs that exist or have existed in the south coast study region:

- **Southern California Bight Regional Monitoring Program** is a regional monitoring program with standardized data collection methods to assess and analyze sediment conditions, water quality and contaminant input sources for southern California. This regional effort involves local, state and federal entities and is coordinated by the Southern Coastal Water Research Project (SCCWRP). There have been three surveys implemented and completed and another is currently underway. The methods, data collection, and results require the participation of a diverse network of citizens and scientists. The information developed is vetted by a multi-party review. This regional monitoring effort was established when the National Research Council identified the need to better coordinate and link up local monitoring efforts. More information about the Bight Monitoring Program can be found at http://www.sccwrp.org/sitemap.html#Regional.
- **California Coastkeeper Alliance** is a non-profit organization that focuses on clean water and a healthy coastal environment by advocating for relevant community-based policy that aims to support both clean water and healthy ecosystems. The Alliance is made up of regional Waterkeeper organizations. In the study region, there are five Coastkeeper organizations: Santa Barbara, Ventura, Santa Monica, Orange County, and San Diego. The Alliance coordinates with the regional organizations working on local projects to connect their individual efforts. To help improve and/or maintain healthy water quality, Waterkeeper members throughout the study region participate in monthly watershed water quality monitoring (California Coastkeeper Alliance 2008). These results are posted on the regional organizations' websites (http://www.cacoastkeeper.org/water-quality-maps.php).
- **Stormwater Monitoring Coalition** is a collaborative program with southern California stormwater management agencies to better align monitoring efforts, create consistency, provide technical guidance and tools, and share information. Stormwater Monitoring Coalition participants include: County of Orange, County of Los Angeles, County of San Diego, Ventura County Watershed Protection District, City of Long Beach, City of Los Angeles, SWRCB, Regional Water Quality Control Boards Los Angeles Region, Santa Ana Region and San Diego Regions, EPA Region 9, Southern California Coastal Waters Research Project, and CalTrans. (SCCWRP 2008a)

- **Local Ocean Water Monitoring Programs:** There are seven programs within the study region. They are responsible for regularly sampling beaches and sewage outfalls in the study region to monitor bacteria levels. High bacteria levels can result in unsafe water quality, where beaches may be posted or closed. Typically, high rains or sewage spills increase levels of bacteria in beach areas. The six local or county monitoring programs include:
  - County of Santa Barbara, Environmental Health Services, Ocean Monitoring Program (http://sbcphd.org/ehs/ocean.htm)
  - County of Ventura, Environmental Health Division, Ocean Water Quality Monitoring Program (http://www.ventura.org/rma/envhealth/programs/ocean/index.htm)
  - County of Los Angeles, Department of Public Health, Ocean Water Monitoring Program (http://www.lapublichealth.org/eh/progs/envirp/rechlth/ehrecoc.htm)
  - City of Los Angeles, Department of Public Works, Environmental Monitoring Division (http://www.lacity.org/SAN/EMD/index.htm)
  - City of Long Beach, Heath and Human Services, Water Quality Program (http://www.longbeach.gov/health/organization/eh/water/water_samples.asp)
  - City of Dana Point, Southern California Coastal Water Research Project, and the University of California, Berkeley, Dana Point Partners (http://www.danapoint.org/Modules/ShowDocument.aspx?documentid=3193)
  - County of Orange, Health Care Agency, Environmental Health Division, Ocean Water Protection Program (http://www.ocbeachinfo.com/)
  - County of San Diego, Department of Environmental Health, Beach and Bay Program (http://www.sdcounty.ca.gov/deh/water/beach_bay.html)
- **Surface Water Ambient Monitoring Program (SWAMP)** is a statewide surface water quality monitoring effort between the SWRCB, Regional Water Quality Control Boards, and other monitoring efforts. Information on SWAMP can be found at: http://www.swrcb.ca.gov/water_issues/programs/swamp/. There are several programs under SWAMP; they include:
  - Clean Water Team is a citizen monitoring effort out of the SWRCB to collect information on water quality, fish habitat, bird populations, and stream health. (http://www.swrcb.ca.gov/water_issues/programs/swamp/cwt_volunteer.shtml)
  - State Mussel Watch Program/ Toxic Substance Monitoring Program was a site-specific monitoring program in place for over twenty years that sampled mussels and clams to detect and assess the existence of toxic substances. This effort ended in 2003. During its existence, it focused data collection on water bodies with known or suspected water quality problems. (http://www.waterboards.ca.gov/water_issues/programs/swamp/mussel_watch.shtml
  - Toxic Substance Monitoring Program is another program that existed within SWAMP that was discontinued in 2003 but had been in existence for 27 years. That program was also site-specific and sampled fish and other aquatic specimens from known or suspected impaired water bodies. Specimens were analyzed for trace elements, pesticides, and organic compounds, such as PCBs. (http://www.swrcb.ca.gov/water_issues/programs/swamp/programs.shtml)

4.6.2 Water Quality Restoration Projects

In addition to water quality monitoring programs, the study region also includes a number of restoration projects. Examples of such restoration projects include Montrose Settlements Restoration Project and the Santa Monica Bay Restoration Commission's Bay Restoration Plan. Tidal wetlands restoration is the focus of the Montrose Program, created to improve fish nursery habitat as part of a mitigation plan for DDT-contaminated waste that discharged from Montrose

Chemical Corporation's plant for over thirty years (Natural Resource Trustees 2006). The Santa Monica Bay Restoration Commission was established under the National Estuary Program and the program's responsibility is to restore and protect the health of the Santa Monica Bay and implement a restoration plan (LARWQCB 1994, SMBRC 2007). On a local level, the City of Dana Point partnered with federal, state, district, and local organizations to install a facility to treat urban runoff before it discharges out near local beaches (City of Dana Point 2008). Based on the results of the facility to treat runoff, beaches now qualify to be considered for removal on the 303(d) list for human recreation contact impairments. Additional information on restoration projects in the study region are detailed section 3.0 on the ecological setting of the study region and locations of some restoration projects are shown on map 3.1-1.

5. Socioeconomic Setting

California's marine and coastal environments form part of the state's identity and support important economies that depend on healthy ocean resources. Socioeconomic conditions affect marine resource use patterns, coastal livelihoods, and human activities. A brief overview of coastal counties, ocean economy, demographics, and resource use in the study region is provided as regional context for MPA planning.

Information provided in this section has been collected from a variety of sources. Data from the U.S. Census Bureau, California Department of Finance, California Employment Development Department, the National Ocean Economics Program, and Dean Runyan Associates were compiled for each county and are discussed below. Furthermore, information has been collected from public documents (general plans, resolutions, etc,) related to marine uses from coastal public entities (counties, cities, special districts, parks).

For each county, two types of information are provided: general economic data on top industries for the county and specialized information on top ocean-related industries. Information describing the overall economy came from the California Economic Development Department. The California Economic Development Department reports on industry sectors identified in the North American Industry Classification System. The specialized information on the ocean-related economy came from the National Ocean Economics Program, which also is based on the North American Industry Classification System. The industry sectors referenced by the two types of information were not necessarily the same because the sectors central to the ocean economy may not have a proportional impact on the overall economy.

The National Ocean Economics Program's Ocean Sector and Industry Data provide information for industries, which depend on and derive their source from the ocean and shoreline. These data are referenced below for five ocean industry sectors (defined by the National Ocean Economics Program), and include the number of establishments, number of people employed, wages paid, and gross state product. The ocean industry sectors include:

1. Coastal Construction (marine construction).
2. Living Resources (fishing, fish hatcheries and aquaculture, seafood markets and seafood processing).
3. Offshore Minerals (limestone, sand and gravel; oil and gas exploration and production)
4. Tourism and Recreation (amusement and recreation services, boat dealers, eating and drinking places, hotels and lodging places, marine recreational vehicle parks and campgrounds, scenic water tours, sporting good retailers, zoos and aquaria).
5. Transportation (deep-sea freight transportation, marine passenger transportation, marine transportation services, search and navigation equipment, and warehousing).

Please note that recreational fishing is included in the Tourism and Recreation category and not in the Living Resources category. The grouping of these categories was determined by the National Ocean Economics Program and cannot be adjusted for the purposes of this planning process. While the MLPA Initiative recognizes some of the drawbacks to such groupings, it is the best readily available information.

5.1 Coastal Counties

There are five coastal counties located adjacent to the south coast study region. Each of the counties is briefly discussed below. They include, from north to south, Santa Barbara, Ventura, Los Angeles, Orange and San Diego.

It should be recognized that individuals residing outside of these five counties also utilize the coast and oceans within the study region and that the socioeconomic importance of marine resources within the south coast has broader effects beyond the counties described below.

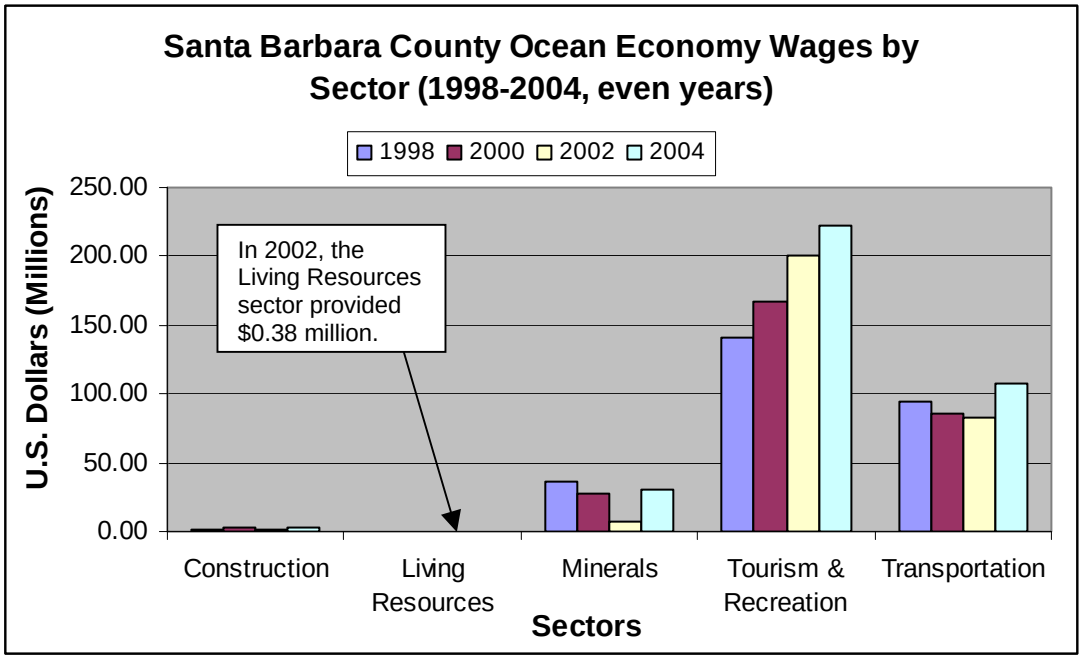
5.1.1 Santa Barbara

Santa Barbara County encompasses 2,738.5 square miles and has a shoreline span of roughly 249.2 miles (U.S. Census 2008, data comes from related GIS data layer). Santa Barbara is one of the larger counties in the study region but has the smallest population and also has the fewest people per square mile (see Table 5.3-1).

The top employers in Santa Barbara are predominately service-based, not resource-based industries. Services, government, trade and transportation, and goods producing are the primary industries in the county (Economic Development Department 2008 and U.S. Census 2006). Approximately 35% of employment comes from the service industry; no other industry provides more than 5%. The tourism industry falls within the services sector. In 2006, travel spending in Santa Barbara totaled $1,443.0 million annually (Dean Runyan Associates 2008).

Economic information was gathered for the ocean-related sectors found in the study region. These sectors, which depend upon ocean resources, include construction, living resources, minerals, ship and boat building, tourism and recreation, and transportation. Wages by sector provide an economic comparison of how important each sector is in any given county. Note that not all sectors were represented in the counties. For Santa Barbara County, the tourism and recreation sector provided the highest economic contribution, in terms of wages, compared to all other ocean-related sectors with an average $182.9 million per year (National Ocean Economics Program 2008). Transportation was the second highest sector with wages averaging $92.8 million annually. The other remaining sectors were roughly $25 million per year or less. The living resources sector only provided data in 2002 with approximately $0.38 million dollars (See Figure 5.1-1).

Figure 5.1-1. Santa Barbara County ocean economy wages by sector



Source: National Ocean Economics Program 2008.

Note: Values were not converted to year-2000 equivalents. The Living Resources sector only provided wages during 2002, but the amount was not large enough to show on the graph, given the scale.

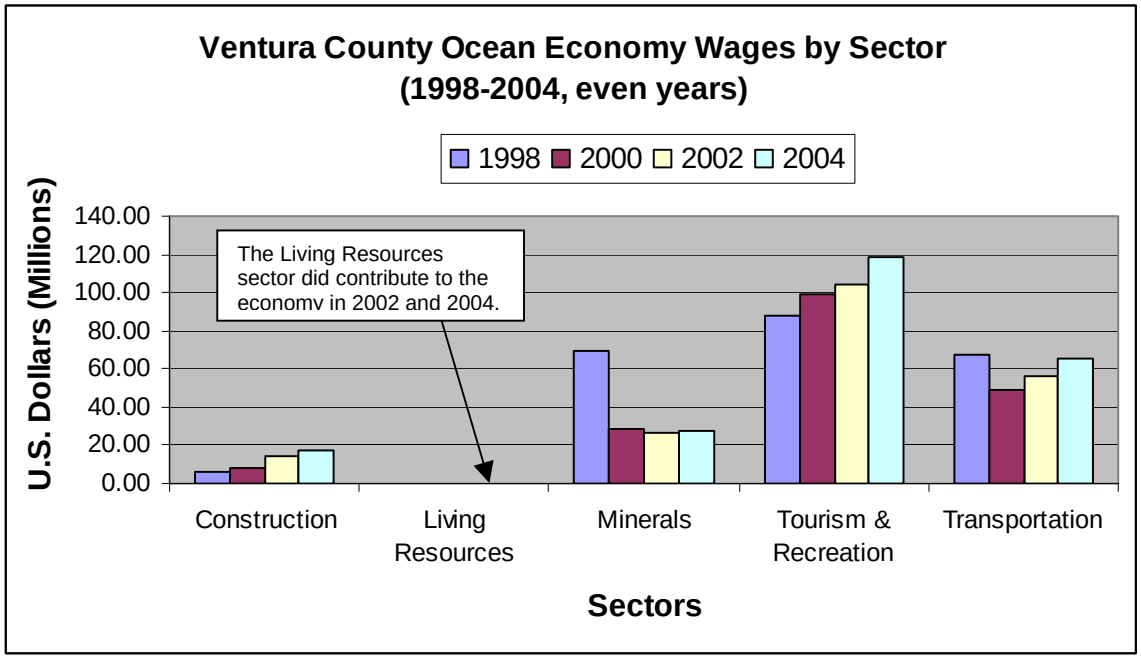
5.1.2 Ventura County

Ventura County encompasses 1,845.3 square miles and has a shoreline span of roughly 116.9 miles (U.S. Census 2008, data comes from related GIS data layer). It is one of the least populated counties in the study region (see Table 5.3-1). The economic condition in Ventura County, similar to Santa Barbara, is reflective of the less crowded, smaller population.

Ventura County's top non-defense industries are service-related industries with approximately 33% of the county's employment (Economic Development Department 2008). The third- and fourth-largest industries in Ventura County are goods producing and trade, transportation and utilities. The relative contribution to employment by these top industries has a similar pattern to that in Santa Barbara, the third, fourth, or fifth ranked industries providing a much smaller percentage of Ventura's employment with 5% or less than the top industries (Employment Development Department 2008). Tourism provides only 3% of employment and the industry provides Ventura County with $1,282.7 million annually in travel spending (Dean Runyan Associates 2008).

For ocean-related sectors, the tourism and recreation industry contributed the most in wages from 1998-2004 (looking at even year data) with an average of $102 million per year (National Ocean Economics Program 2008). Included in that sector is recreational fishing, which is considered an important part of Ventura County's heritage, social identity, and economy. Squid is an important fishery, both recreationally and commercially, in Ventura (Langdon-Pollock 2004). The transportation sector followed but provided slightly more than half the earnings provided by tourism and recreation. There was a dramatic drop in the minerals sector from 1998 to 2000 and that nearly $40 million loss in wages per year that has not recovered. The smallest sector is living resources with less than half a million dollars annually in wages and data was unavailable for 1998 and 2000 (Figure 5.1-2).

Figure 5.1-2. Ventura County ocean economy wages by sector



Source: National Ocean Economics Program 2008.

Note: The Living Resources sector only provided wages during 2002 and 2004 and the average contribution was not large enough to show on the graph, given the scale.

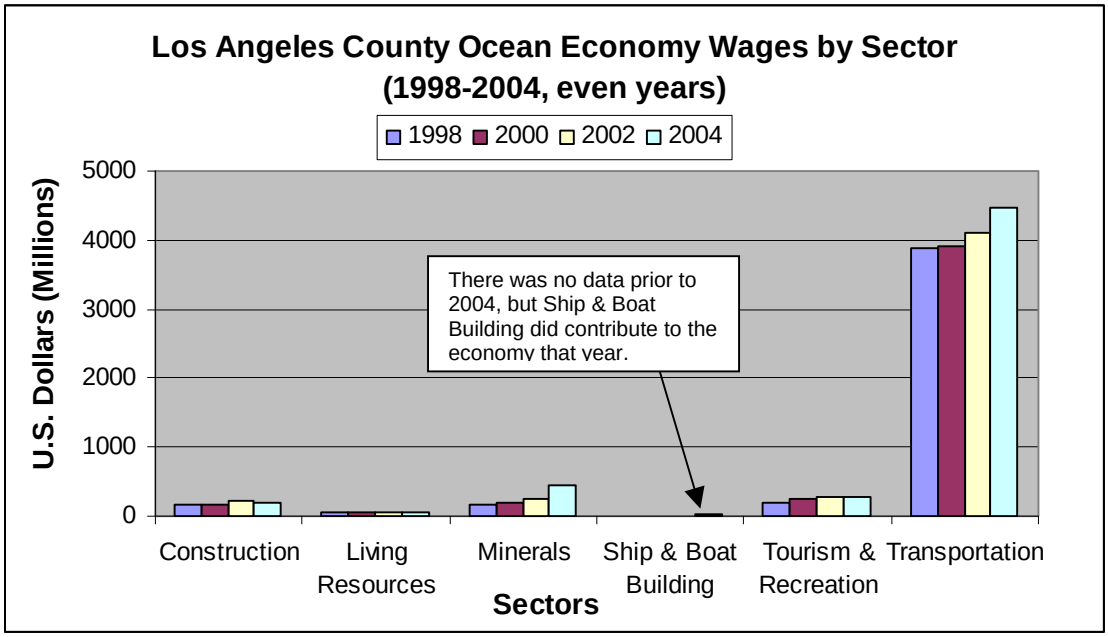
5.1.3 Los Angeles County

Los Angeles County encompasses 4,060.9 square miles, including San Clemente and Santa Catalina Islands, and has a shoreline span of 333.0 miles (U.S. Census 2008, data comes from related GIS data layer). Its mainland coast has a shoreline span of roughly 65.8 miles. While Los Angeles County has one of the largest land areas, it also has the largest population with nearly 10 million people estimated in 2006 (U.S. Census Bureau 2008). Approximately 16.7% of that population lives below poverty level, which is the highest poverty level in the study region (U.S. Census Bureau 2008).

The county has a diverse, evenly distributed economic base. While the services, goods producing, government, and manufacturing sectors each provided between 4 to 6 million jobs statewide in 2006, they each only make up 3–4% of employment within Los Angeles County(Economic Development Department 2008).. Tourism is not as important to the county's economy as it is in the study region's other counties. Only 6.2% of sales tax receipts are visitor-related (Dean Runyan Associates 2008).

The transportation sector, by far, provides the highest contribution to wages within Los Angeles County's ocean economy. Total wages for the transportation sector are in the billions, whereas all other sectors are in the millions (Figure 5.1-3). The tourism and recreation and the construction sectors follow with average wages of roughly $247 million and $184 million respectively (National Ocean Economics Program 2008). Moving from the north, Los Angeles County is the first with a consistent living resources sector, which produced on average roughly $46 million annually in wages. While ship and boat building showed about $17 million annually in wages for 2004, there was no data for the prior three years (Figure 5.1-3).

Figure 5.1-3. Los Angeles County ocean economy wages by sector



Source: National Ocean Economics Program 2008.

Note: There was no data for Ship and Boat Building for 1998, 2000, or 2002.

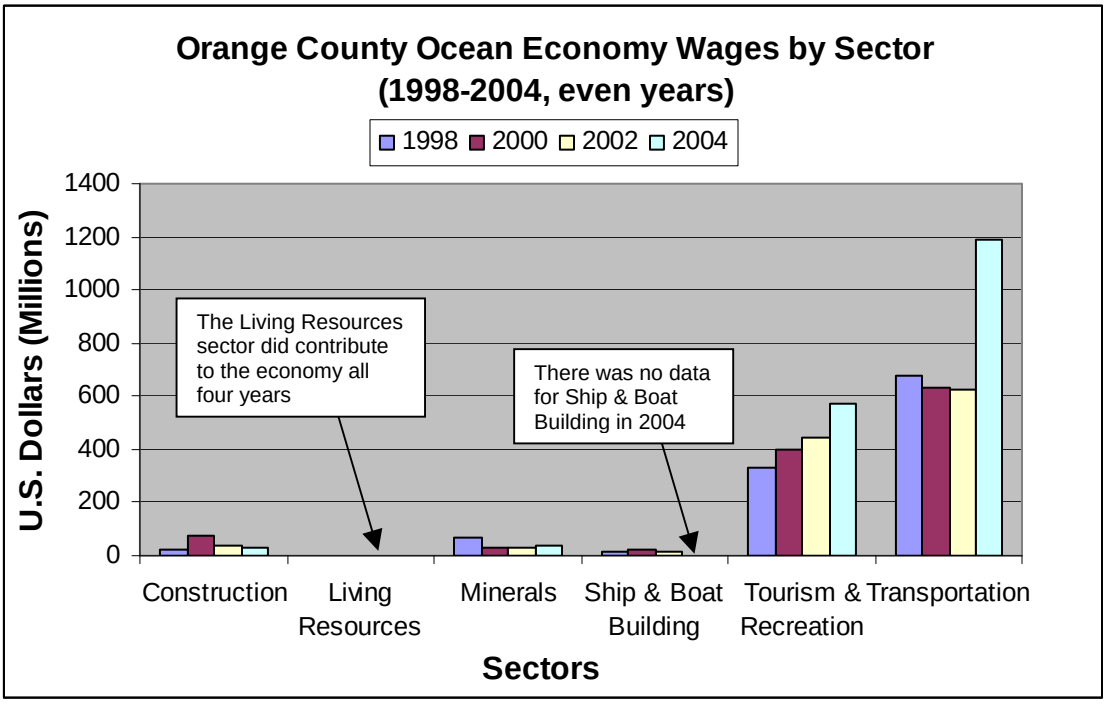
5.1.4 Orange County

Orange County encompasses 789.4 square miles and has a shoreline span of 123.7 miles (U.S. Census 2008, data comes from related GIS data layer). While Orange County is the smallest in area, it has one of the largest and densely populated in the study region as shown in Table 5.3-1 (U.S. Census 2008). Despite the large population, it has the lowest unemployment rate in the study region and only a small percentage living below poverty (U.S. Census 2008).

The type and distribution of top industries for Orange County are similar to that of Santa Barbara County. Again, there is a pattern where the top industry(s) accounts for a much greater percentage of the employment than the subsequent top five industries. The services industry, broken into three groups, employed the most people in 2007 (34% of the total employment). Government, and trade and transportation are the next highest sectors with each accounting for 4% of employment. Tourism in this county only accounts for 4.2% of total employment (Dean Runyan Associates 2008).

The ocean-related economy for Orange County is unique compared to the rest of the study region. Transportation was the top sector and provides on average $780.8 million annually in wages. Note that transportation experienced a significant increase in 2004, at this time it is unclear if there was some isolated event or a dramatic upward trend. The tourism and recreation sector followed with an average of $437.9 million in annual wages produced. The remaining four sectors only contribute a small percentage to the total wages in Orange County's ocean-related economy (Figure 5.1-4).

Figure 5.1-4. Orange County ocean economy wages by sector



Source: National Ocean Economics Program 2008.

Note: There was data for Living Resources for all four years but its contribution in wages was too small to be captured in the figure based on the scale used. There was no data for Ship and Boat Building for 2004.

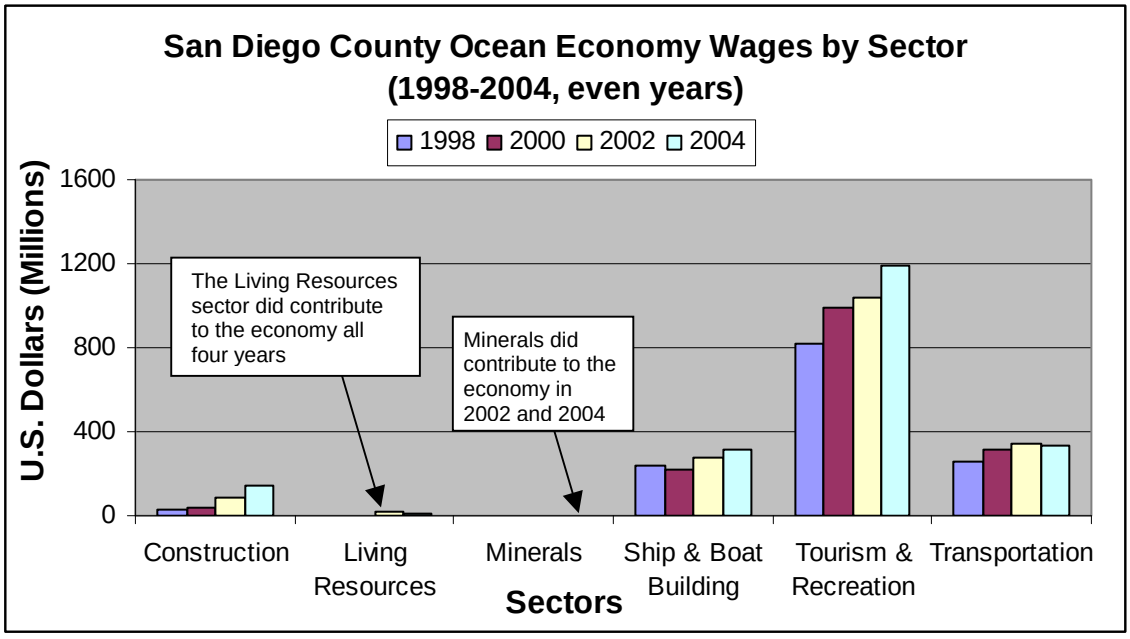
5.1.5 San Diego County

San Diego County has a shoreline span of roughly 224.0 miles and encompasses 4,199.9 square miles, making it the largest county in the study region (U.S. Census 2008, data comes from related GIS data layer). The population of 2.9 million people is the third highest, behind Los Angeles and Orange County (U.S. Census Bureau 2008). Furthermore, Mexico is adjacent to San Diego County and has a major metropolitan center in Tijuana. Studies have found that the San Diego economy is influenced by the flow of labor, goods, and services from Tijuana and vice versa (Bae 2005).

San Diego has a broad range of industries that support the county's economy. The services, trade and government sectors make up the economic base (Economic Development Department 2008). The services sector employed the highest number of people in 2007 with 34% of total employment. Tourism falls within that sector but does not make up a significant portion of the employment. The industry is still important to the overall economy; San Diego County received the second highest percentage of visitor-related tax receipts in the study region with 9.9% of total tax receipts for in 2006 (Dean Runyan Associates 2008).

Although tourism does not have a significant effect in the county's overall economy, it does play an essential role in the ocean-based economy. On average, the tourism and recreation sector contributes $1,010 million in annual wages and it is steadily increasing (National Ocean Economics Program 2008). This figure is not surprising given that recreational fishing is very popular in this region and there is wide support for this industry (Langdon-Pollock 2004). Transportation, and ship and boat building followed respectively with $314 and $262 million annually. Data on wages was unavailable for the minerals for 1998 and 2000 (Figure 5.1-5).

Figure 5.1-5. San Diego County ocean economy wages by sector



Source: National Ocean Economics Program 2008.

Note: There was no data for Minerals for 1998 and 2000.

5.2 Major Coastal Communities

It is important to look at major coastal cities within the study region when considering socioeconomic factors, as important community-level characteristics may be missed if only county statistics are considered. Therefore, the following section provides a closer look at six of major coastal communities located adjacent to the Pacific Ocean in the study region. To characterize the coastal cities' populations and economic conditions, statistics regarding unemployment rate, income level, and percent below poverty are provided (see Table 5.2-1).

Table 5.2-1. Major coastal cities, population and economic characteristics

City	County	Total Population 2003 Estimate)[a]	Unemployment rate (2000)[b]	Per-capita income (1999)[a]	Median household income (1999)[a]	Percent below poverty (1999)[a]
San Diego	San Diego	1,266,753	4.9%	$23,609	$45,733	14.6%
Long Beach	Los Angeles	475,460	8.4%	$19,040	$37,270	22.8%
Los Angeles	Los Angeles	3,819,951	5.6%	$20,671	$36,687	22.1%
Chula Vista	San Diego	199, 060	5.9%	$18,556	$44,861	10.6%
Huntington Beach	Orange	194,248	5.0%	$31,964	$64,824	6.6%
Oxnard	Ventura	180,872	5.6%	$15,288	$48,603	15.1%

Sources: [a] U.S. Census Bureau 2008.
[b] U.S. Census Bureau 2006.

5.3 Population Projections

Most of the population of California lives near the coast. Approximately 76% of California's population lives in coastal counties that represent only 25% of the state's total area (Kildow and Colgan 2005). In particular, the south coast study region has highly urbanized population centers directly on the coast. As of 2000, Orange and Los Angeles Counties have the greatest population densities (Table 5.3-1). Orange County has the least amount of land, while Los Angeles County has the most people. San Diego County has a similar population size to Orange County but has the land size of Los Angeles. The major cities adjacent to the Pacific Ocean within The study region include: San Diego (1.3 million), Los Angeles (3.7 million), Long Beach (0.5 million), Chula Vista (0.2 million), Huntington Beach (0.2 million), and Oxnard (0.2 million) (CDOF 2008). These major metropolitan areas are not only experiencing population growth, but also a swell in cultural diversity. The South Coast Study Region is also one of the most culturally diverse regions in the country (Wolch 2001 and Wolch and Zhang 2004).

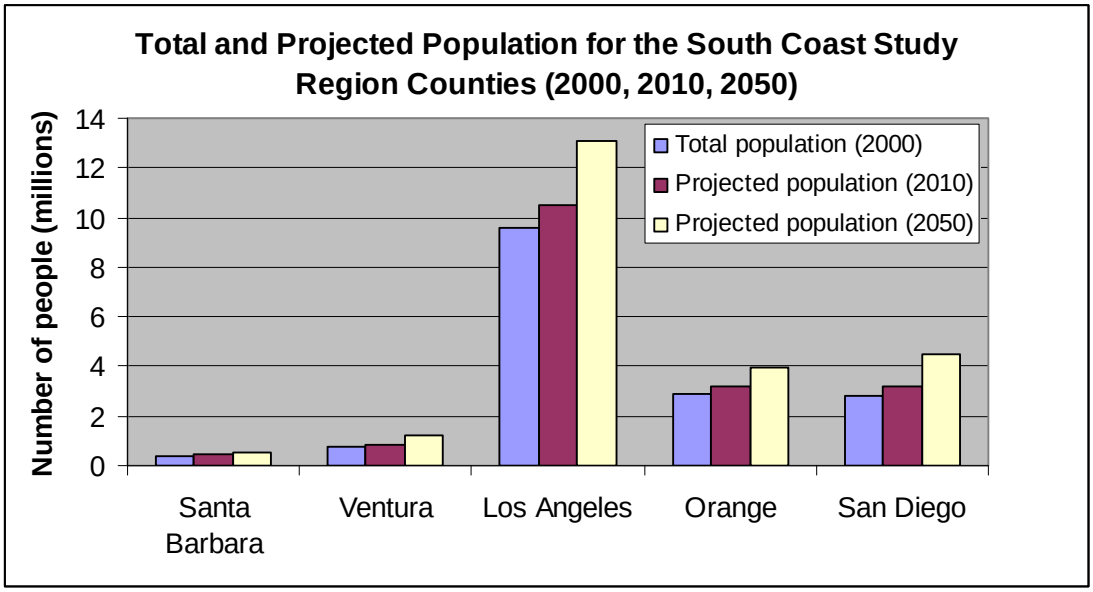
Population growth trends in coastal counties may result in increasing pressure on and impacts to coastal and marine resources and habitats. Based on a demographic model that incorporates fertility, migration, and survival rates, population projections indicate that Ventura County will have the highest percent change in population growth over the next fifty years, followed by San Diego County with similar growth (see Figure 5.3-1). The other three counties adjacent to the study region are expected to see a similar growth pattern, where there will be a slight population increase within this decade and a much larger percent population change from 2000 to 2050. Santa Barbara, which has the smallest population and the lowest density, will experience the least growth and percent population change between 2000 and 2050. Aside from Santa Barbara, rapid growth is occurring in the counties where the average population density is currently the lowest.

Table 5.3-1. Population, population change and density

County	Population 2000[a]	Population 2010[a]	Change 2000-2010[a]	Population 2050[a]	Change 2000-2050[a]	Population density 2000 (people/mi[b])[b]
Santa Barbara	401,115	434,497	8.3%	534,447	33.2%	145.9
Ventura	758,884	855,876	12.8%	1,229,737	62.0%	408.2
Los Angeles	9,578,960	10,514,663	9.8%	13,061,787	36.4%	2,344.10
Orange	2,863,834	3,227,836	12.7%	3,987,625	39.2%	3,607.50
San Diego	2,836,303	3,199,706	12.8%	4,508,728	59.0%	670

Sources: [a] CDOF (California Department of Finance) 2007.
[b] U.S. Census Bureau 2008.
Note: Population figures for 2010 and 2050 are projected.

Figure 5.3-1. Total and projected population by county, 2000, 2010, and 2050



Source: CDOF (California Department of Finance) 2007.

5.4 Commercial Fisheries

DFG collects landings data for all commercial fish landed at California ports. Fish dealers and receivers are required to report poundage and ex-vessel revenue (price paid to fisherman when catch is offloaded to the dealer) by species or species groups, gear type, area fish were caught, date fish were landed, vessel name, fisherman name, and fish business name (dealer that purchased the fish) on landing receipts. These receipts must be submitted to DFG on or before the first and fifteenth of each month. The data provided in this section were extracted from the Commercial Fisheries Information System (CFIS), which houses California's commercial landings data. Data are available electronically from this database from 1969 to the present. Longer landings data are available for many species statewide starting in 1916. Commercial fish landings data have been published in the DFG Fish Bulletin publication series and are available online at www.ceo.ucsd.edu/fishbull/. For purposes of this section, data from the past 10 years (1998-2007) were extracted from the CFIS database. All fish and invertebrate species caught in waters within the defined study area are included in the landings data analyses. Appendix D and Map 5.4-1 show commercial landings data for the following fisheries: spiny lobster, prawns, market squid, white seabass, Pacific bonito, sea urchin, rock crabs, nearshore sharks, coastal pelagic species (Pacific sardine, jack mackerel, Pacific mackerel, and northern anchovy), rockfish, sanddabs, and California halibut. For most species, mapped data are from landing receipts submitted to DFG from fish processors. For some species (including halibut, lobster, squid, and urchin), logbook data submitted by fishermen are mapped, as these data sets are considered to have higher accuracy than landing receipts. Further information regarding the geographic location of where various commercial fisheries occur has been collected by Ecotrust and is available for use by stakeholders in the MLPA South Coast Study Region process.

Gear Types: A variety of gear types are deployed by commercial fishermen. Some of the gear types utilized in the study region include various forms of round haul nets, hook-and-line, trawl, trap, entangling nets (including gill net), and hand capture by divers. Round haul nets are used to encircle coastal pelagic species along the mainland coast and Channel Islands. Hook-and-line gear is used extensively in the nearshore finfish fisheries. Trawl gear is used to capture various bottom species such as California halibut, ridgeback prawn, and sea cucumbers. Traps are utilized to capture

various invertebrates and finfish such as spiny lobster, rock crabs, spot prawn, and California sheephead. Entangling nets are used to take species such as California halibut and white seabass. Sea urchin fishermen dive for red sea urchins using air supplied via hose directly from a compressor system on the boat ("hookah"). The divers use hand-held rakes to collect the sea urchins into mesh bags.

5.4.1 Port Complexes

For historical reporting purposes, DFG organizes California ports geographically into nine major port complexes along the entire state. The study area encompasses three of these major port complexes: Santa Barbara (Santa Barbara and Ventura counties), Los Angeles (Los Angeles and Orange counties), and San Diego (San Diego County). For this regional profile, commercial fish landings data was not organized by these three major port complexes, as these groupings were too broad to be useful in MPA planning. Therefore, landings and ex-vessel revenue summaries are presented for each of the five coastal counties within the study area. In recent years (1998 to 2007), average annual landings in the south coast study region totaled nearly 254 million pounds with an average annual ex-vessel revenue of $68 million (adjusted for inflation from 2007$ values) (Table 5.4-1).

Table 5.4-1. Commercial landings and ex-vessel revenue by county, 1998-2007

	Average Annual	
Coastal County	Landings (lb)	Ex-vessel Revenue
Santa Barbara	6,808,887	$7,903,694
Ventura	82,170,596	$19,973,947
Los Angeles	161,048,211	$30,844,663
Orange	543,694	$2,111,740
San Diego	3,123,792	$6,797,586
Study Region Total	253,695,179	$67,631,630

Note: Dollar values are adjusted for inflation (2007$).
2007 data are preliminary (May 1, 2008).

Fishing Communities and Aquaculture Activities

A brief profile of major ports within the county is given below.

Santa Barbara: Santa Barbara Harbor is the only major port in this county. In 2007, there were 175 commercial vessels, 222 commercial fishermen, and 61 fish businesses and two aquaculture businesses that reported landings in Santa Barbara County (CFIS, May 2008). From 1998 through 2007, the top ten fisheries based on average annual landings in pounds were, in decreasing order, sea urchin, market squid, rock crab, ridgeback prawn, sea cucumber, spiny lobster, California halibut, shark (sharks, skates, and rays, excluding white and angel sharks), white seabass, and nearshore fishes (Table 5.4-2). Aquaculture products grown were red abalone, mussels and oysters. Appendix D lists the top commercial species and their fisheries in the study region.

The top ten most valuable fisheries from 1998 through 2007 were, in decreasing order, sea urchin, spiny lobster, rock crab, ridgeback prawn, California halibut, nearshore fishes, spot prawn, sea cucumber, market squid, and white seabass (Table 5.4-3).

Ventura: The Ventura County major ports include Ventura, Port Hueneme, and Oxnard (Channel Island Harbor). In 2007, there were 184 commercial vessels, 232 commercial fishermen, and 89 fish businesses that reported landings in these ports (CFIS, May 2008). The top ten fisheries, based on average annual landings in pounds from 1998 through 2007 were (in decreasing order) market squid, Pacific sardine, mackerel/anchovy, sea urchin, sea cucumber, rock crab, California halibut, ridgeback prawn, Pacific bonito, and tuna (Table 5.4-2). It should be noted that highly migratory fishes, such as for example tuna, are caught primarily outside of the study region. However, these fisheries are still considered economically important to this county.

The top ten most valuable fisheries from 1998 through 2007 were, in decreasing order, market squid, sea urchin, spot prawn, spiny lobster, California halibut, mackerel/anchovy, Pacific sardine, sea cucumber, rock crab, and ridgeback prawn (Table 5.4-3).

Los Angeles: The Los Angeles County major ports are San Pedro and Terminal Island. Minor ports include Long Beach, Redondo Beach, Marina Del Rey, Avalon, Wilmington, and Santa Monica. In 2007, there were 265 commercial vessels, 304 commercial fishermen, and 77 fish businesses that reported landings in these ports (CFIS, May 2008). The top ten fisheries, based on average annual landings in pounds from 1998 through 2007 were, in decreasing order, Pacific sardine, market squid, mackerel/anchovy, tuna, sea urchin, swordfish, Pacific bonito, sharks (sharks, skates, and rays, excluding white and angel sharks), sea cucumbers, and white seabass (Table 5.4-2). It should be noted that highly migratory fisheries (e.g. tuna and swordfish) are caught primarily outside of the study region. However, these fisheries are still considered economically important to this county.

The top ten most valuable fisheries from 1998 through 2007 were, in decreasing order, market squid, tuna, swordfish, Pacific sardine, sea urchin, mackerel/anchovy, spiny lobster, California halibut, spot prawn, and DTS (Dover sole, thornyhead, sablefish) complex (Table 5.4-3).

Orange: The Orange County ports include Dana Point, Newport Beach, Huntington Beach (Huntington Harbor), and Seal Beach. In 2007, there were 81 commercial vessels, 72 commercial fishermen, and 46 fish businesses that reported landings in these ports (CFIS, May 2008). The top ten fisheries, based on average annual landings in pounds from 1998 through 2007 were, in decreasing order, DTS complex, spiny lobster, sea urchin, spot prawn, swordfish, mackerel/anchovy, rock crab, croakers, market squid, and California sheephead (Table 5.4-2). It should be noted that highly migratory fisheries (e.g. swordfish) are caught outside of the study region. However, these fisheries are still considered economically important to this county.

The top ten most valuable fisheries from 1998 through 2007 were, in decreasing order, spiny lobster, spot prawn, DTS complex, swordfish, sea urchin, California sheephead, croaker, rock crab, mackerel/anchovy, and slope rockfish (Table 5.4-3).

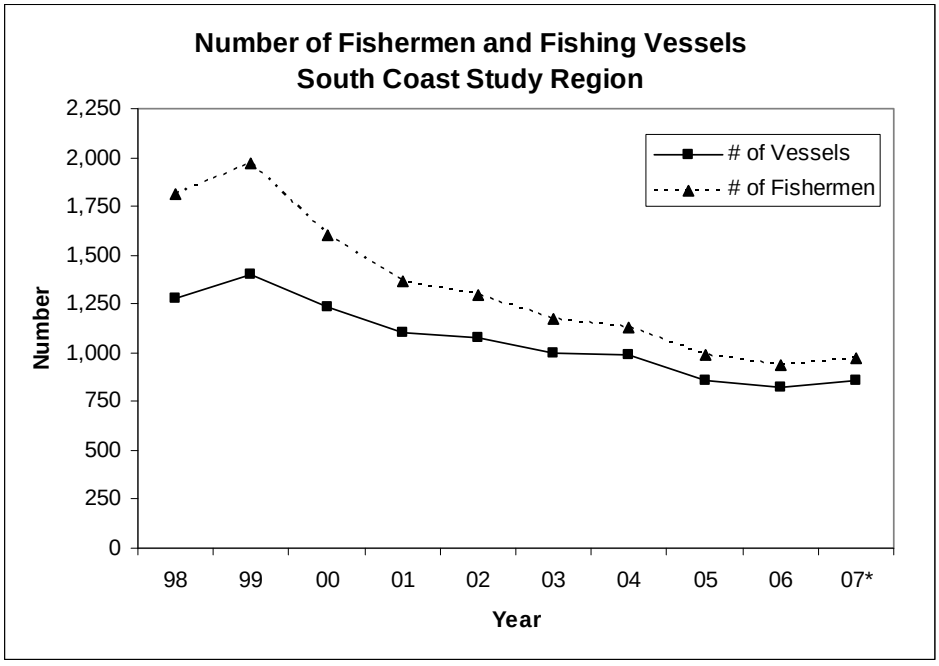
San Diego: The San Diego County major ports include San Diego, Mission Bay, Oceanside, and Point Loma. Aquaculture takes place in Carlsbad Lagoon. In 2007, there were 153 commercial vessels, 145 commercial fishermen, 53 fish businesses and one aquaculture business that reported landings in these ports (CFIS, May 2008). The top ten fisheries, based on average landings in pounds from 1998 through 2007 were, in decreasing order, tuna, sea urchin, swordfish, spiny lobster, Pacific sardine, sharks (sharks, skates, and rays, excluding white and angel sharks), rock crabs, DTS complex, spot prawn, and California sheephead (Table 5.4-2). Aquaculture products consisted of mussels and oysters. It should be noted that highly migratory fishes (e.g. tuna and swordfish) are caught primarily outside of state waters and the study region. However, these fisheries are still considered economically important to this county and are included in the analyses.

The top ten most valuable fisheries from 1998 through 2007 were, in decreasing order, spiny lobster, swordfish, tuna, sea urchin, spot prawn, DTS complex, sharks (sharks, skates, and rays, excluding white and angel sharks), rock crab, California sheephead, and California halibut (Table 5.4-3).

Fishermen and Vessels

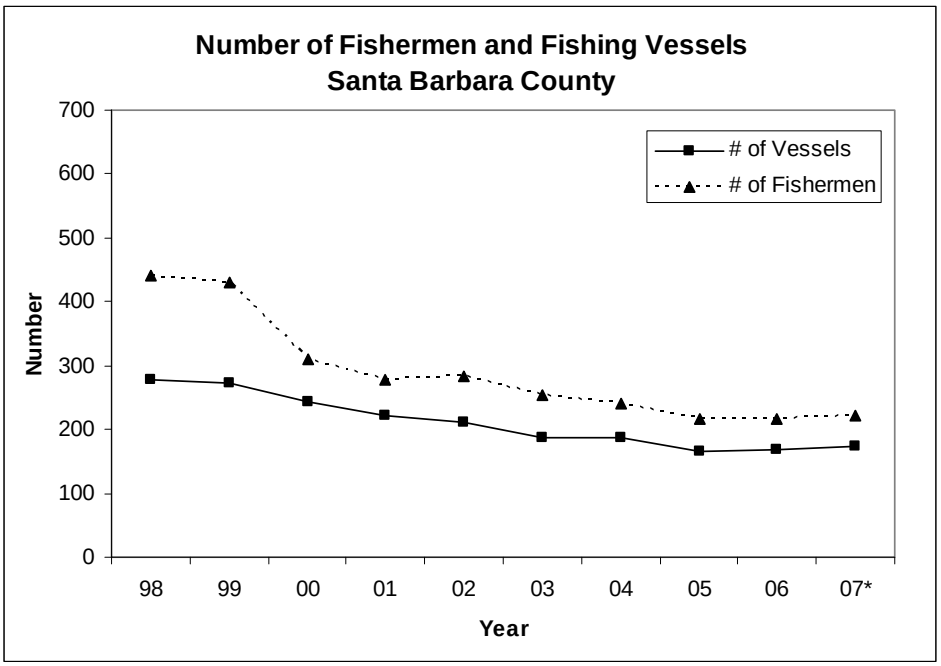
The overall number of commercial fishermen and vessels for the study region combined has declined during the period from 1998 through 2007 (Figure 5.4-1). The total number of fishermen and vessels by county can be viewed in Figures 5.4-2 through 6. The number of fishermen, by county and fishery, can be viewed in Appendix D. The number of fishermen shown in Figures 5.4-1 through 5.4-6, and in Appendix D, may not reflect the number of participants who have their primary residence in a county since fishermen can make multiple landings in any county throughout the state. The counts of fisherman and vessels represent those making at least one landing in that county.

Figure 5.4-1. Commercial fishermen and vessels for all ports in the region, 1998-2007



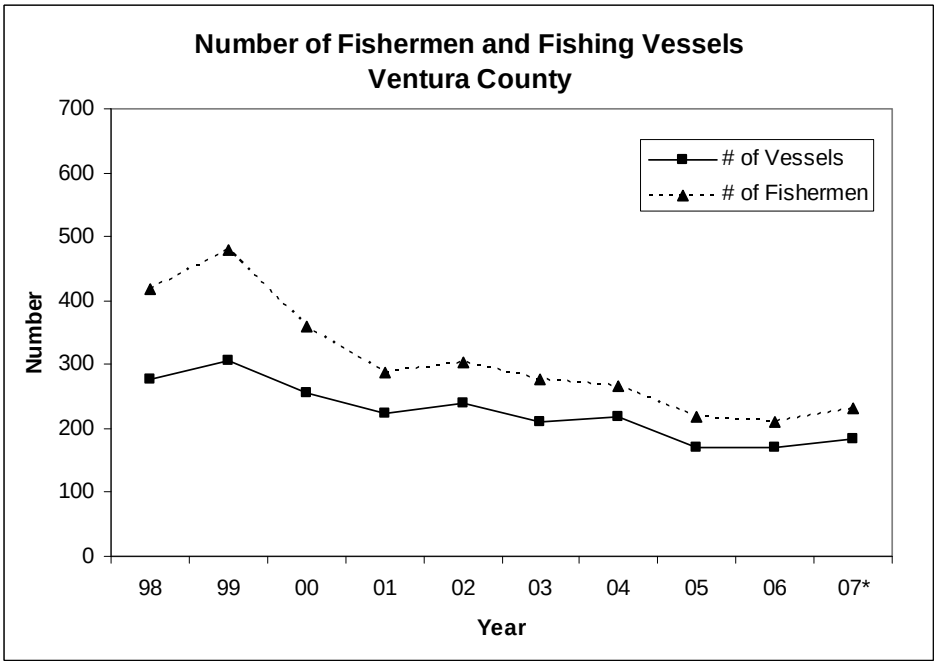
Source: Data were compiled from the Commercial Fishery Information System database (extraction date: May 8, 2008). 2007 data are preliminary.

Figure 5.4-2. Commercial fishermen and vessels, Santa Barbara County, 1998-2007



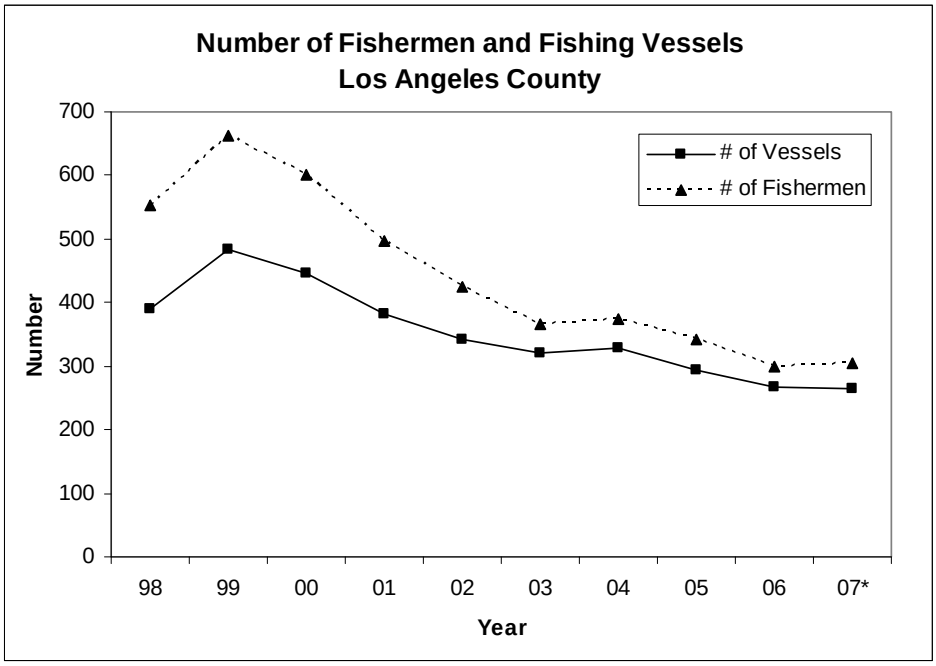
Source: Data were compiled from the Commercial Fishery Information System database (extraction date: May 8, 2008). 2007 data are preliminary.

Figure 5.4-3. Commercial fishermen and vessels, Ventura County, 1998-2007.



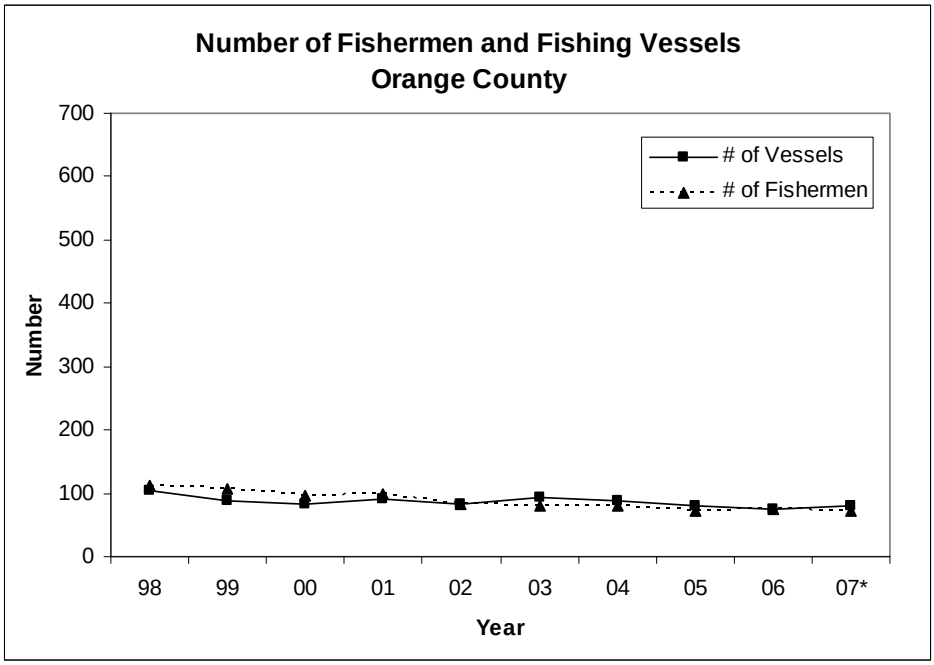
Source: Data were compiled from the Commercial Fishery Information System database (extraction date: May 8, 2008). 2007 data are preliminary.

Figure 5.4-4. Commercial fishermen and vessels, Los Angeles County, 1998-2007



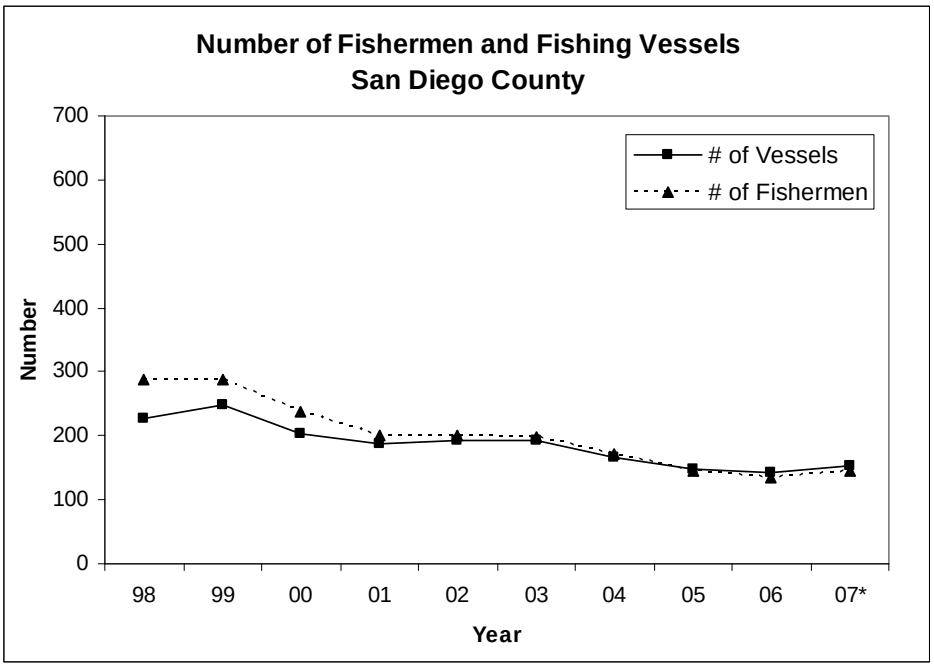
Source: Data were compiled from the Commercial Fishery Information System database (extraction date: May 8, 2008). 2007 data are preliminary.

Figure 5.4-5. Commercial fishermen and vessels, Orange County, 1998-2007



Source: Data were compiled from the Commercial Fishery Information System database (extraction date: May 8, 2008). 2007 data are preliminary.

Figure 5.4-6. Commercial fishermen and vessels, San Diego County, 1998-2007



Source: Data were compiled from the Commercial Fishery Information System database (extraction date: May 8, 2008). 2007 data are preliminary.

5.4.2. Average Annual Commercial Fisheries Landings and Ex-vessel Revenue for Species or Market Category by County, 1998-2007

Commercial catch is reported either by species or, in certain cases, "market categories." Market categories include a variety of similar species, or species commonly sold as a generic category of fish, such as, minor shelf rockfish. This section provides landings information for the principle commercial species or market categories landed in the study region by county. Table 5.4-2 shows the average annual landings for these principle fisheries from 1998-2007. See Table 5.4-3 for a similar summary for the average annual ex-vessel revenue of landings.

Table 5.4-2. Landings by principle commercial market category, 1998-2007

Species and Market Category	Santa Barbara	Ventura	Los Angeles	Orange	San Diego	Region Total
California halibut	74,669	147,759	119,248	2,181	31,113	374,970
California sheephead	16,545	35,552	23,883	13,292	36,671	125,942
California yellowtail	1,664	4,005	51,113	1,046	16,274	74,102
CPFS[a]	2,066	12,229,004	96,182,113	40,407	249,555	108,703,145
Crab[b]	616,610	190,475	111,882	34,395	149,234	1,102,594
Croaker	242	18,020	42,291	29,774	477	90,804
DTS[c]	660	97,234	108,635	112,307	131,686	450,522
Kellet's whelk	32,959	1,675	27,173	7,745	12,720	82,273
Market squid	807,180	66,144,244	53,017,529	22,841	14,937	120,006,731
Nearshore fishery[d]	35,099	17,667	22,241	4,029	4,299	83,335
Other flatfish[e]	5,376	16,896	23,097	592	490	46,451
Ridgeback prawn	361,313	139,297	23,234	23	18	523,885
Sea cucumber	192,232	310,523	137,818	752	9,625	710,950

Species and Market Category	Santa Barbara	Ventura	Los Angeles	Orange	San Diego	Region Total
Sea urchin	4,299,401	2,217,951	2,189,611	79,275	745,921	9,532,159
Sharks, Skates, and Rays[f]	64,679	69,824	181,056	4,955	198,118	518,632
Shelf rockfish	5,019	27,038	23,606	3,380	9,401	68,444
Slope rockfish	306	45,695	13,487	8,827	17,719	86,034
California spiny lobster	172,837	85,299	113,511	105,233	237,866	714,746
Spot prawn	19,101	82,712	38,158	33,645	47,112	220,728
White seabass	55,479	79,816	131,454	402	21,909	289,060
Grand Total	6,763,437	81,960,686	152,580,140	505,101	1,935,145	243,804,509
Percent of total landings	3%	34%	62%	0%	1%	

Notes:

2007 data are preliminary.
[a] Pacific mackerel, Pacific sardine, jack mackerel, northern anchovy, and bonito.
[b] Rock crabs and sheepcrab.
[c] Dover sole, thornyhead, sablefish.
[d] Includes nearshore fishery management species, excluding California sheephead.
[e] Sanddabs spp. sole spp., and flatfish other than California halibut.
[f] Includes all sharks and rays except white shark and angel shark.

Table 5.4-3. Ex-vessel revenue by commercial market category, 1998-2007

Species and Market Category	Santa Barbara	Ventura	Los Angeles	Orange	San Diego	Region Total
California halibut	283,311	527,847	440,615	11,714	102,807	1,366,294
California sheephead	47,232	113,318	84,767	48,134	141,152	434,603
California yellowtail	1,968	5,297	51,227	1,740	20,573	80,805
CPFS[a]	658	681,070	4,972,436	24,072	30,189	5,708,425
Crab[b]	767,382	241,779	149,882	38,181	162,896	1,360,120
DTS[c]	1,059	195,824	296,602	253,641	350,262	1,097,388
Market squid	109,862	11,154,992	9,202,089	5,688	2,835	20,475,466
Nearshore fishery[d]	205,233	60,446	51,032	8,706	13,038	338,455
Other flatfish[e]	4,371	13,275	34,531	1,178	760	54,115
Ridgeback prawn	461,139	219,153	30,165	10	75	710,542
Sea cucumber	148,112	292,233	150,338	558	7,787	599,028
Sea urchin	2,966,611	1,645,686	1,873,095	66,899	586,068	7,138,359
Sharks, Skates, and Rays[f]	76,249	71,511	172,586	4,601	254,657	579,604
Shelf rockfish	11,602	39,398	39,217	5,977	14,924	111,118
Slope rockfish	346	44,416	21,657	17,035	23,942	107,396
Spiny lobster	1,345,167	676,436	861,080	816,755	1,766,956	5,466,394
Spot prawn	147,713	715,277	358,942	304,995	393,870	1,920,797
White seabass	108,325	180,954	247,217	944	51,878	589,318
Grand Total	$6,686,340	$16,878,912	$19,037,478	$1,610,828	$3,924,669	$48,138,227
Percent of total landings	14%	35%	40%	3%	8%	

Notes: Reported ex-vessel revenue are adjusted for inflation (2007$). 2007 data are preliminary.
[a] Pacific mackerel, Pacific sardine, jack mackerel, northern anchovy, and bonito.
[b] Rock crabs and sheepcrab.
[c] Dover sole, thornyhead, sablefish.
[d] Includes nearshore fishery management species, excluding California sheephead.
[e] Sanddabs spp. sole spp., and other flatfish.
[f] Includes all sharks and rays except white shark and angel shark.

5.4.3. Total Commercial Landings

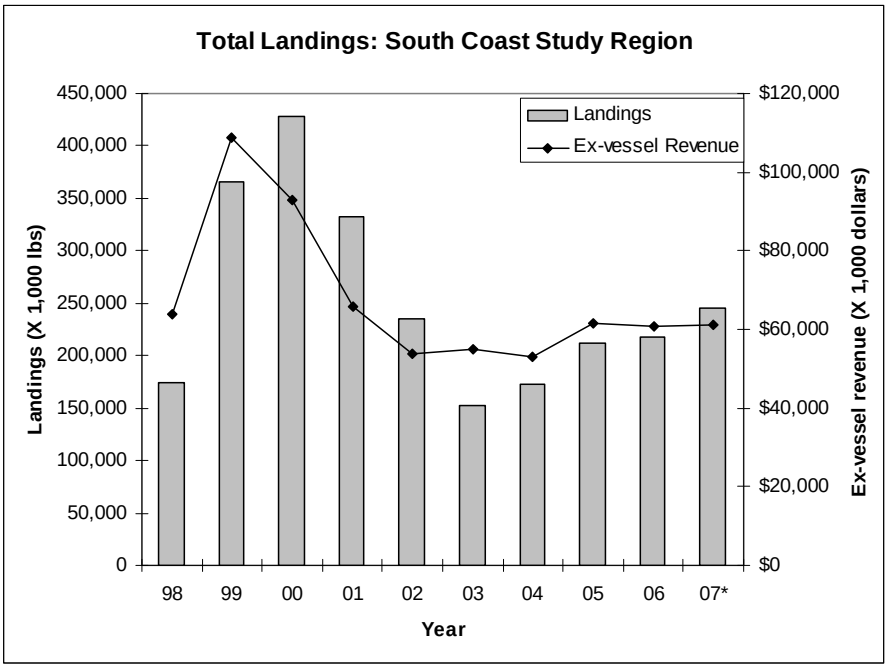
In general, total landings and ex-vessel revenue by county are dependent on species availability in the study region over the period 1998 through 2007 (Figures 5.4-7 through 12). This is particularly true of market squid landings since the availability of this species is affected by oceanic conditions such as El Niño and La Niña events. Some fisheries have added value to landings over time, such as landing and selling fish live (e.g., nearshore rockfish and California halibut) and the way some fish species are handled at sea (e.g., tuna processed for sushi-grade). Graphs of landings and ex-vessel revenue for each major commercial fishery are provided in Appendix D.

The live bait fishery supplies product for several recreational fisheries in the South Coast Study Region. An estimated 20 percent of this harvest is sold to private fishing vessels, with the remainder to the Commercial Passenger Fishing Vessel (CPFV) fleet, where payment to the bait haulers is on a percentage basis of the CPFV revenues (Thomson *et al.* 1994). Live bait catch generally includes both Pacific sardine and northern anchovy; the predominant species depends on biomass levels and local availability. Landings estimates from 1998 to 2007 averaged approximately 7.3 million pounds statewide in both State and federal waters, with effort increasing in summer months. Since the sale of live bait in California does not require a landing receipt, similar to that used for all commercial sales of fish and shellfish, location of catch and estimates of tonnage and value are reported on a voluntary basis and are imprecise.

A critical component of commercial fisheries related to establishing or modifying MPAs is the area in which each fishery occurs. More specifically, the relative effort occurring in specific areas, and the relative ex-vessel revenue derived from these areas, are key components to MPA planning. Landing receipts collected by DFG require that catch locations for all market categories be included. These data are reported by coded 10-minute blocks. However, these data are usually filled in by the processors, rather than by the fishermen, and contain inaccuracies. Data regarding areas of stated importance for commercial fisheries was gathered by Ecotrust in 2008 in an attempt to provide better information on the spatial distribution of fisheries, and is available to stakeholders in the MLPA Initiative south coast process for use in MPA planning.

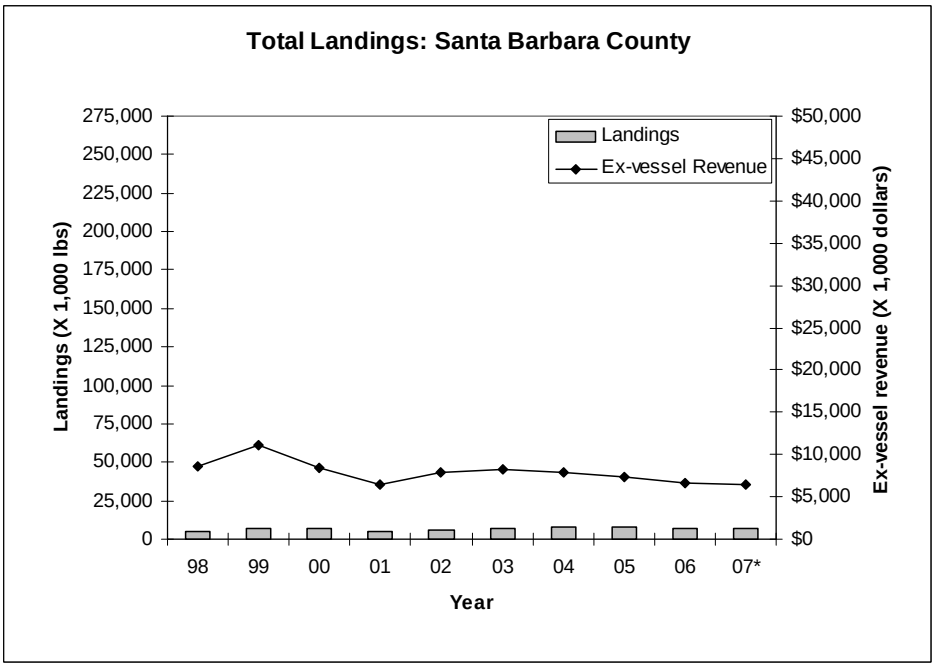
More information on commercial fisheries is included in Appendix D, including fishery summary tables, including number of fishermen and vessels, gear types, and average annual landings (1998-2007)

Figure 5.4-7. Region-wide landings and ex-vessel revenue, 1998-2007



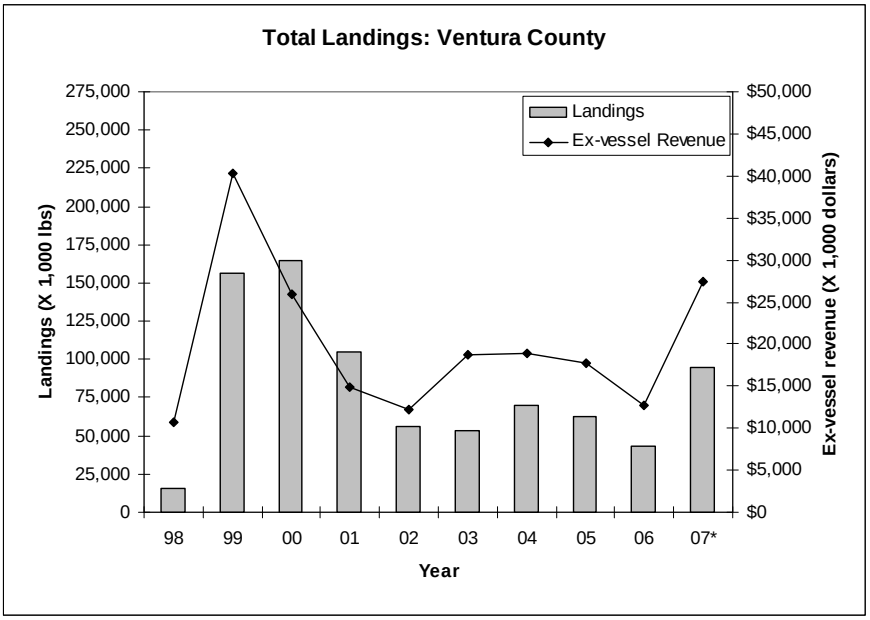
Source: Data were compiled from the Commercial Fishery Information System database (extraction date: May 2, 2008). Data for 2007 are preliminary.
Note: Ex-vessel revenue were adjusted for inflation (2007$).

Figure 5.4-8. Landings and ex-vessel revenue, Santa Barbara County, 1998-2007



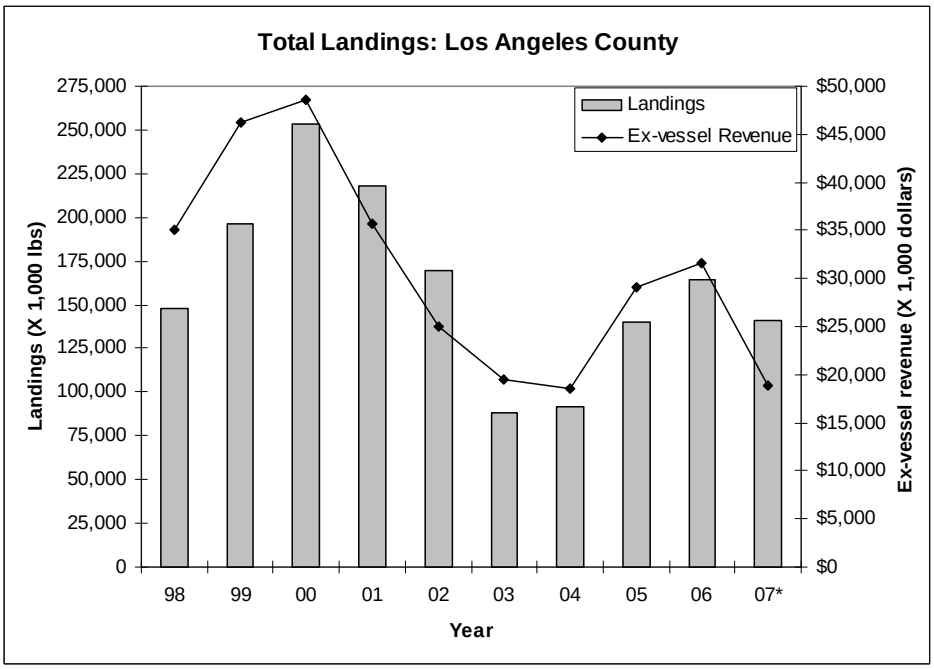
Source: Data were compiled from the Commercial Fishery Information System database (extraction date: May 2, 2008). Data for 2007 are preliminary.
Note: Ex-vessel revenue were adjusted for inflation (2007$).

Figure 5.4-9. Landings and ex-vessel revenue, Ventura County, 1998-2007



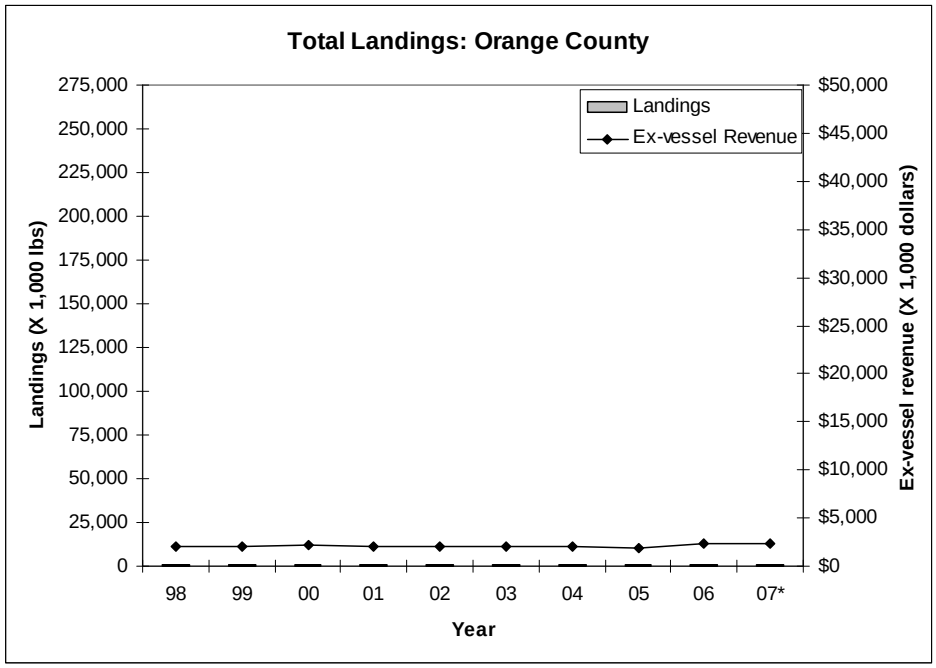
Source: Data were compiled from the Commercial Fishery Information System database (extraction date: May 2, 2008). Data for 2007 are preliminary.
Note: Ex-vessel revenue were adjusted for inflation (2007$).

Figure 5.4-10. Landings and ex-vessel revenue, Los Angeles County, 1998-2007



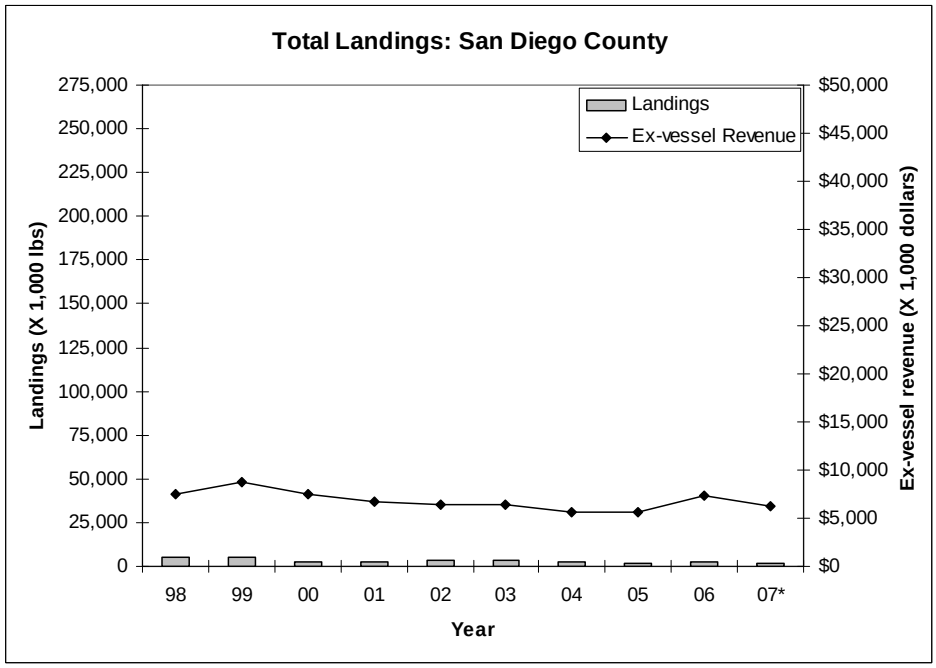
Source: Data were compiled from the Commercial Fishery Information System database (extraction date: May 2, 2008). Data for 2007 are preliminary.
Note: Ex-vessel revenue were adjusted for inflation (2007$).

Figure 5.4-11. Landings and ex-vessel revenue, Orange County, 1998-2007



Source: Data were compiled from the Commercial Fishery Information System database (extraction date: May 2, 2008). Data for 2007 are preliminary.
Note: Ex-vessel revenue were adjusted for inflation (2007$).

Figure 5.4-12. Landings and ex-vessel revenue, San Diego County, 1998-2007



Source: Data were compiled from the Commercial Fishery Information System database (extraction date: May 2, 2008). Data for 2007 are preliminary.
Note: Ex-vessel revenue were adjusted for inflation (2007$).

5.5 Kelp and Aquaculture Leases

Kelp harvest and aquaculture activities both occur in the MLPA south coast study region. These activities are described below and may be considered in MPA planning.

5.5.1 Synopsis of Kelp Bed Lease Status, Kelp Harvest Regulations, and Algae Harvest

Administrative kelp bed areas in California waters are numbered (CCR, Title 14, §165.5 (j)(1)(2)(3)), defined by compass bearings from known landmarks, and have applicable commercial regulations (see CCR, Title 14, §165 and 165.5) pertain to the harvest of giant kelp (*Macrocystis pyrifera*) or bull kelp (*Nereocystis lutkeana*) only. The entire coastline, including all the Channel Islands, is divided up into numbered administrative kelp beds, although not all areas contain kelp beds. The administrative kelp beds are designated as closed, leasable, leased (from the state), or open. Closed beds may not be harvested. Leased beds provide the exclusive privilege of harvesting to the lessee. Open beds may be harvested by anyone with a kelp harvesting license.

Giant kelp was first harvested along the California coast during the early 1900s. Since 1917, kelp harvesting has been managed by the DFG under regulations adopted by the California Fish and Game Commission. Regulations currently allow kelp to be cut no deeper than four feet beneath the surface, although the surface canopy can be harvested several times each year without damaging kelp beds (North 1968, Barilotti et al. 1985). Kelp harvesting licenses are required to take kelp for commercial use. Currently there are 29 kelp harvesting licenses, but these numbers slightly fluctuate from year to year. Anyone can acquire a kelp harvesting license which cost $125.75. There are no seasonal restrictions nor limits to the amount of kelp harvested in this study region with a commercial license.

There are 74 designated giant kelp beds which can be leased for up to 20 years; however, no more than 25 square miles or 50% of the total kelp bed area (whichever is greater) can be exclusively leased by any one harvester. In addition to leased beds, there are open beds that can be harvested by anyone with a valid kelp harvesting license.

There are 48 administratively numbered kelp beds within the south coast study region. Of the 48 kelp beds 23 are open, 4 are closed, 20 are leaseable, and 1 bed is currently leased (Table 5.5.1-1 and Map 8.2-1). Bed 27, located from Goleta Point to Coal Oil Point, is currently being leased. This bed has a five-year lease which was signed in March of 2008. The kelp harvested from this bed is used as feed for an abalone farm.

Table 5.5-1. Kelp bed, locations and lease status

Bed Number	Lease Status	Geographic Extent
		Mainland Beds
1	Open	California/Mexico International Boundary to southern tip of San Diego Bay
2	Open	Southern tip of San Diego Bay to southern tip of Point Loma
3	Leaseable	Southern tip of Point Loma to south jetty of Mission Bay
4	Leaseable	South jetty of Mission Bay to Scripps Pier
5	Leaseable	Scripps Pier to mouth of San Dieguito River
6	Leaseable	Mouth of San Dieguito River to middle of Loma Alta Lagoon (at South Oceanside)
7	Open	Middle of Loma Alta Lagoon to middle of the city of San Onofre

Bed Number	Lease Status	Geographic Extent
8	Open	Middle of the city of San Onofre to the middle of San Juan Creek
9	Open	Middle of San Juan Creek to Abalone Point
10	Closed	Abalone Point to the south jetty of Newport Bay
13	Open	San Pedro Breakwater Lighthouse to Point Vincente
14	Open	Point Vincente to southern tip of the Redondo Beach Breakwater
15	Closed	Santa Monica Pier to Malibu Point
16	Leasable	Malibu Point to Point Dume
17	Leasable	Point Dume to Point Magu
18	Open	Middle of mouth of Ventura River to Pitas Point
19	Leasable	Pitas Point to Rincon Point
20	Leasable	Rincon Point to Loon Point
21	Leasable	Loon Point to eastern boundary of the Montecito Hotel
22	Closed	Eastern boundary of the Montecito Hotel to the tip of the Santa Barbara Breakwater
23	Open	Tip of the Santa Barbara Breakwater to Santa Barbara Lighthouse
24	Closed	Santa Barbara Lighthouse to middle of Rogue Creek (Arroyo Burro)
25	Open	Middle of Rogue Creek to middle of Hope Ranch Creek
26	Leasable	Middle of Hope Ranch Creek to Goleta Point
27	Leased	Goleta Point to Coal Oil Point
28	Open	Coal Oil Point to middle of Gato Canyon
29	Leaseable	Middle of Gato Canyon to middle of Refugio Creek
30	Leaseable	Middle of Refugio Creek to middle of Canada de Molino
31	Leaseable	Middle of Canada de Molino to middle of Alegria Canyon
32	Leaseable	Middle of Alegria Canyon to Point Conception
		Channel Island Beds
101	Open	San Clemente Island. Pyramid Head to China Point
102	Leaseable	San Clemente Island. China Point to Seal Cove
103	Leaseable	San Clemente Island. Seal Cove to Northwest Harbor
104	Open	San Clemente Island. Northwest Harbor to Pyramid Head
105	Open	Santa Catalina Island. Entire Island
106	Leaseable	Santa Barbara Island. Entire Island
107	Leaseable	San Nicolas Island. South of a line drawn 75º from the east end to a line drawn 283º from the west end.
108	Leaseable	San Nicolas Island. North of a line drawn 283º from the west end to a line drawn 75º from the east end.
109	Open	Anacapa Island. All islands.
110	Open	Santa Cruz Island. San Pedro Point to Bowen Point
111	Leaseable	Santa Cruz Island. Bowen Point to West Point
112	Open	Santa Cruz Island. West Point to San Pedro Point
113	Open	Santa Rosa Island. Skunk Point to South Point
114	Open	Santa Rosa Island. South Point to Sandy Point
115	Open	Santa Rosa Island. Sandy Point to Carrington Point
116	Open	Santa Rosa Island. Carrington Point to Skunk Point
117	Open	San Miguel Island. (south) Cardwell Point to Point Bennett
118	Open	San Miguel Island. (north) Point Bennett to Cardwell Point

Note: These data accurate as of December 4, 2008.

Giant kelp is harvested from Imperial Beach in San Diego County, near the California/Mexico border, north to Santa Cruz (Santa Cruz County). The annual harvest has varied from a high of 395,000

tons in 1918 to a low of 887 tons in 2007 (Table 5.5.1-2). Such fluctuations are primarily due to market supply and demand, climate change, predation, and natural growth cycles (See Section 3.1.5 for more background information). It has not been found that kelp growth is inhibited or negatively affected by harvesting (North 1968, Barilotti et al. 1985). The dramatic decrease in kelp harvesting after 2005 resulted from the departure of a large kelp harvesting company, which moved its operations overseas. In addition to giant kelp, a small amount of edible seaweed/agar has been harvested at Santa Cruz Island.

Marine aquatic plants, including kelp, may be harvested in certain areas within the study region by recreational fishermen (CCR, Title 14, §30.00(a)). For the non-commercial use of authorized marine plants, there is no closed season, closed hours, or minimum size limit, and the daily bag limit on all marine aquatic plants is 10 pounds wet weight in aggregate. No eelgrass (*Zostera* sp.) or surfgrass (*Phyllospadix* sp.) may be cut or disturbed in the process of recreational or commercial kelp harvest (CCR, Title 14, §30.00(b)).

Table 5.5-2. Commercial kelp harvest (tons)

Year	Pt. Conception to California/Mexico Border mainland (tons)	Channel Islands (tons)	Combined (tons)
2002	22,652	3,110	25,762
2003	28,455	18,788	47,243
2004	17,289	21,966	39,255
2005	22,954	45,954	68,908
2006	1,362	0	1,362
2007	887	0	887

Source: Kelp Harvester's Monthly report (logbook). Kelp harvesting consists primarily of giant kelp (*Macrocystis pyrifera*).
Note: The 2007 data may change due to the late intake of Kelp Harvester's Logs.

5.5.2 Aquaculture and Leases of State and Private Water Bottoms

Each owner of an aquaculture facility must register with DFG by March 1 of each year. The California Fish and Game Commission may lease state water bottoms or water columns to any person for aquaculture. Additionally, private water bottoms on Tide Land Grants may be leased for aquaculture.

Aquaculture Facilities

All the aquaculture facilities in the south coast study region are land based and utilize private lands or water bottoms. While some are outside the study region, such as the Port Hueneme Harbor Aquaculture Park, others are inside the study region and have rearing pens within the study region. These sites include a facility at the Santa Barbara Harbor and one at the Aqua Hedionda Lagoon. These facilities are approved to raise a range of products which includes abalone, mussels, keyhole limpets and fishes.

Sea water is pumped into these facilities and discharged back into the ocean. In the past, most facilities raising abalones were infected with a parasitic South African sabellid worm (*Terebrasabella heterouncinata*) that deforms the shell on these animals and increases mortality. Native snails and limpets around one discharge site in the central coast study region were also infected by this worm which caused deformed shell growth. Low levels of infestation of this worm at aquaculture facilities are difficult to detect and control. Currently there are four abalone farms that are certified as sabellid worm free. Waste water monitoring does occur at the facilities' outfall sites.

DFG funds a marine hatchery through its Ocean Resources and Enhancement and Hatchery program. This facility is located on Agua Hedionda Lagoon in Carlsbad. The primary function of the hatchery is to provide juvenile white seabass (*Atractoscion nobilis*), two-three inches in length, to field-rearing systems (rearing pens). This hatchery facility is outside the study region boundaries; however, the rearing pens are within the study region in the following locations: Oxnard (Channel Islands Harbor), San Diego, Mission Bay, Dana Point, Newport Beach, Huntington Harbor, Alamitos Bay, Santa Catalina Island, King (Redondo) Harbor, Marina Del Rey, Port Hueneme, and Santa Barbara.

There are also facilities working on abalone genetic and disease research aiding DFG's recovery and enhancement efforts. These facilities are land based operations outside the south coast study region.

State Water Bottom Leases

There are active shellfish aquaculture leases in Santa Barbara County where oysters, clams, mussels, scallops, and abalone are grown for commercial sale and consumption. There are three active leases in the south coast study region, and all of these leases are in Santa Barbara County covering 106.7 acres (Table 5.5-3).

An active state water bottom lease is defined as a lease which has 1) California Fish and Game Commission approval in the form of a lease, 2) time remaining on the lease period, and 3) is currently meeting planting and harvesting requirements as set forth in CCR, Title 14, §237, (i) through (j). A lease defines the boundary and acreage of a specified state water bottom parcel and defines the terms and conditions of usage of that area for a specified time at an annual cost based on a rate per acre as a result of a competitive bidding in a lease auction. No changes to terms or conditions of the lease can be made without California Fish and Game Commission approval (Tom Moore, DFG Marine Region Aquaculture Coordinator, personal communication).

Table 5.5-3. Active south coast state water bottom aquaculture leasess

Lessee	Lease Number	Lease Acreage	Acreage in Use (esti.)	Approved Species For Cultivation in Lease Agreement	Approved Culture Methods in Lease Agreement
Eaglenet Sea Farms, Inc.	M-653-09	10	0	Red Abalone	Anchored Ocean Habitats
Neushul Mariculture, Inc.	M-654-03	25	1	Algae Cultivation only: *Macrocystis* spp., *Pelagophycus* spp., *Gelidium* spp., and *Euchema uncinatum* (male only).	All algae shall be planted in a manner approved by the lessor
Santa Barbara Mariculture Co.	M-653-02	71.7	35	Rock, speckled, and Japanese scallops, manila clams, Pacific and Kumamoto oysters, and Mediterranean mussels	Longline, Rafts, Rack and Bag, Longline on Stakes, Rack and Tray, Groundline and Bag, Bottom Culture, and Floats
Active Aquaculture Lease Totals in Region	3 leases	106.7	36		

Source: Tom Moore, DFG Marine Region Aquaculture Coordinator, State Water Bottom Lease Summary Information May 29, 2008.

5.6 Recreational Fisheries

Recreational fisheries within the south coast study region are variable and diverse due to the high degree of species richness in the Southern California Bight and the predominance of target species that are migratory and/or influenced by large-scale oceanographic events. According to data collected by the DFG's California Recreational Fisheries Survey (CRFS), 145 finfish species were harvested within state waters by recreational anglers in the study region from 2005 to 2007. Spatial information for where some recreational fisheries occur is shown on maps 5.6-1, 5.6-2, and 5.6-3. Also, additional information regarding areas of stated importance for recreational fisheries has been gathered by Ecotrust and has been provided to stakeholders in the MLPA south coast process for use in MPA planning.

The basses (*Paralabrax* spp.), rockfishes (*Sebastes* spp.), California scorpionfish (also known as "sculpin"), yellowtail, white seabass, and Pacific barracuda are all examples of important species targeted by boat-based anglers throughout the study region (Table 5.6-1). Tunas, billfishes and other highly migratory species are also important targets, although catches occur primarily outside of state waters. Surfperches (*Embiotocidae* spp.), Pacific mackerel, Pacific sardine, silversides (topsmelt and jacksmelt), and croakers (*Scianidae* spp.) are examples of fishes commonly targeted by shore-based anglers.

Also important to the recreational fishery in the south coast study region are the harvest of invertebrates such as California spiny lobsters, rock scallops, marine snails and limpets, various species of clams, and in recent years, Humboldt squid. Invertebrates such as market squid, mussels, and ghost shrimp are also harvested by recreational anglers for use as live bait.

Fishes and invertebrates in the south coast study region are targeted using a variety methods, including but not limited to hook-and-line fishing with live and dead baits and artificial lures, flies and jigs, spear fishing, hoop-netting, and hand capture. While many fishery participants intend to harvest their catch, some participants practice "catch and release" fishing.

Table 5.6-1. Estimated average annual recreational catch, 2005-2007

Type of fish	Shore catch	Boat catch	Total catch	Dominant catch species	Species harvested
tunas and mackerels	1,757	196	1,953	Pacific mackerel and Pacific bonito	5
salmonid family[a]	0	0	0	Chinook salmon	2
croaker family	501	102	603	queenfish and white croaker	8
anchovies	580	5	585	northern anchovy	2
silversides	569	12	581	topsmelt and jacksmelt	2
herring family	446	3	449	Pacific sardine	2
basses	29	365	394	barred sandbass and kelp bass	5
striped bass[a]	0	0	0	striped bass	1
surfperch family	342	9	351	barred surfperch	15
rockfishes	7	299	306	vermilion rockfish	36
other fishes	82	38	120	California lizardfish and ocean whitefish	22
sea chubs	41	33	74	halfmoon and opaleye	3
flatfishes	12	55	67	Pacific sanddab and California halibut	13
jack family	31	27	59	yellowtail and jack mackerel	3

Type of fish	Shore catch	Boat catch	Total catch	Dominant catch species	Species harvested
scorpionfish	11	46	57	California scorpionfish (AKA "sculpin")	1
barracuda	1	53	54	Pacific barracuda	1
sharks and rays	20	4	24	shovelnose guitarfish and leopard shark	17
wrasses	6	16	22	California sheephead	3
greenlings	0	7	7	lingcod	3
sculpin family	3	2	5	cabezon	2

Source: CRFS data extracted from the RecFIN database at: http://www.recfin.org/forms/est2004.html. Query consists of harvested catch (A+B1) by supergroup in inland and ocean waters within three miles of shore for southern California. Extraction date: August 27, 2008.
[a] Average annual catch for striped bass and salmonids is less then 500 fish

5.6.1 Modes of Fishing

The distribution of recreational fishing catch (see Table 5.6-2) and effort varies by mode of fishing and availability of access. A fishing mode is the method of access used to fish. The following are common modes of recreational fishing throughout the south coast study region:

- Boat-based modes
  - Commercial passenger fishing vessels (CPFVs)
  - Private and rental boats
- Shore-based modes
  - Beach and bank fishing
  - Fishing from man-made structures

Statistics on catch and effort for recreational fishing modes are from the CRFS and additionally from fishing activity logbooks for CPFV mode. Catch and effort data on recreational invertebrate fisheries are currently only available from CPFV logbook records. However, beginning with the 2008-2009 season, DFG will implement a California spiny lobster report card program. This program will provide information on all recreational take of California spiny lobster in the future. More information on recreational data sources is available in the Recreational Fishery Profile, Appendix E.

Table 5.6-2. Percentage of catch by type of fish and fishing mode, 2005-2007

Type of fish	Man-made	Beach and bank[a]	CPFV	Private and rental boats
anchovies	99%	0%	0%	1%
basses	5%	2%	50%	43%
scorpionfish (AKA "sculpin")	18%	2%	58%	23%
croaker family	68%	15%	1%	16%
flatfishes	13%	5%	26%	56%
greenlings	3%	4%	31%	63%
herring family	99%	0%	0%	1%
jack family	53%	0%	14%	33%
other fishes	59%	9%	18%	14%
Pacific barracuda	2%	1%	70%	27%
rockfishes	1%	1%	69%	29%
salmonid family	0%	0%	64%	36%
sculpin family	19%	44%	4%	33%

Type of fish	Man-made	Beach and bank[a]	CPFV	Private and rental boats
sea chubs	30%	25%	25%	20%
sharks and rays	75%	9%	1%	14%
silversides	81%	17%	0%	2%
striped bass	0%	0%	0%	100%
surfperch family	53%	44%	0%	2%
tunas and mackerels	90%	0%	3%	7%
wrasses	20%	8%	37%	35%

Source: CRFS data extracted from the RecFIN database at http://www.recfin.org/forms/est2004.html. Query based on A+B1 catch by mode for fish supergroup for inland and marine waters less than 3 miles from shore in southern California. Extraction date: September 4, 2008.

Catch proportioned by numbers of fish harvested.

[a] Beach bank catch estimates are based on samples from the Santa Barbara/ San Luis Obispo County line to the California/Mexico border.

Boat-Based Modes

Commercial Passenger Fishing Vessels (CPFVs): CPFVs, also called party boats, are crewed vessels that carry recreational anglers to ocean fishing locations for a fee. CPFVs are generally limited by travel time, and can be characterized by trip duration (multi-day, overnight, three-quarter day, half day, twilight). CPFVs in the study region operate out of ports in all five south coast counties from Santa Barbara to San Diego. There are over 200 CPFVs operating in the south coast study region, ranging in passenger capacity from two to 150 persons, with an average passenger load of 35 persons per trip (CFIS 2008). CPFVs in the study region fish in nearshore waters of the mainland coast, Santa Catalina, Santa Barbara, San Nicholas, and San Clemente islands, and around the Channel Islands, as well as in Mexican waters and offshore banks.

Consumptive Diving from CPFV's: Most CPFVs primarily cater to anglers using hook-and-line gear. However, a small proportion of vessels engage in consumptive diving trips. Recreational dive boats must submit a CPFV fishing activity logbook record for trips when fishing occurs. Within the study region, approximately 50 recreational dive vessels have submitted logbook records for trips where take occurred, although three to five vessels have accounted for 50 to 75% of this consumptive trip effort (CFIS 2008). Catch species reported in logbooks typically include California spiny lobster, rock scallop, rockfishes, basses, and California sheephead.

Private and Rental Boats: Private boats are privately owned vessels, and rental boats are vessels that are rented without a crew. The private and rental boat category includes kayaks, float tubes, sailboats, skiffs, and large motor boats. In general, these vessels fish the same areas within the study region as CPFVs, although areas accessed vary by vessel type and size.

The south coast study region coastline is well protected, and distribution of fishing effort is dependent on the population size of the counties rather than limited access points or rough sea conditions. Some fishermen travel farther to find good fishing during fair weather. Similarly, in larger boats, anglers will venture to offshore banks and coastal islands within the study area for highly migratory species.

Kayaks in the Private and Rental Boat Fishery: Kayak fishing activity is part of the private and rental boat fishery. However, kayak effort is not well represented in the recreational survey data due to the low level of sampling effort at beach access points and geographic dispersal of the fishery. Species favored by kayak anglers include yellowtail, California halibut, basses and white seabass (Table IV-4). In addition to finfish, kayakers also target California spiny lobster.

Consumptive Diving in the Private and Rental Boat Fishery: Dive trips aboard private vessels are also a component of the private and rental boat fishery. Private boat divers target California

spiny lobster, rock scallop, and a variety of finfish. Finfish commonly targeted by private boat spear fishermen are referenced in Appendix E.

Shore-Based Modes

Shore-based modes include all land-based fishing access, including beaches, rocky shores, and man-made structures. Shore trips also include scuba and free dive trips where the point of access was shore based and no vessel was used.

Beach and Bank: The beach and bank mode consists of shore-based anglers and divers and is sampled by CRFS. Primary target species and species groups in this region include surfperches, croakers, California halibut, silversides and nearshore rockfishes (Table IV-3).

Shore access areas in ocean and estuarine waters are numerous throughout the south coast study region due to public roads and highways built parallel to the coastline and numerous state, county, and local beach access sites from Point Conception to the California/Mexico border. Limited access does occur in some locations in northern Los Angeles and Orange counties due to limited public parking. Other limited access sites to the general public are large coastal military bases such as Camp Pendleton and Point Mugu Airbase.

Clamming from Beaches and Banks: Recreational clamming effort is mostly concentrated in estuaries and bays and open ocean beaches throughout the south coast study region. Clamming involves digging into mud or sand flats and ocean beaches with rakes, pitch forks, shovels, or trowels to harvest clams out of the substrata. The target species includes common littleneck, Washington, gaper, and Pismo clams. Statistics on catch and effort are not available.

Hand take of Grunion from Beaches: Grunion fishing is a popular sport in southern California. Since these fish leave the water to deposit their eggs, they may be picked up while they are briefly stranded. The spawning season extends from late February or early March to August or early September, varying slightly in length from year to year. Grunion spawn only on three or four nights after the highest tide associated with each full or new moon and then only for a one to three hour period each night following high tide. Grunion may be taken by hand only, and the season is closed during April and May. There is no documentation of catch and effort for this fishery by CRFS, as CRFS does not conduct night sampling.

Consumptive Diving from Beaches and Banks: Information on shore-based spear fishing and diving is sparse. Estimates of effort are also not well represented due to the low level of sampling effort at beach access points and geographic dispersal of the fishery. An important fishery in the south coast study region is the California spiny lobster fishery. Additional target species include white seabass and nearshore rockfishes.

Man-made Structures: Man-made structures consist of piers, jetties, and breakwaters. If these structures are public, a fishing license is not required. These structures are relatively numerous throughout the south coast study region and are sampled by CRFS (Map 5.6-3). Primary target species and species groups for this mode of fishing typically include Pacific sardine, Pacific mackerel, surfperches, croakers, and silversides.

Inland and Open Ocean Marine Fishing Areas

Catch estimates for marine recreational fisheries within the south coast study region can be divided into inland and open ocean marine areas due to differences in habitats, fishing modes, and species compositions (Table 5.6-3). The inland marine areas are those that are protected from ocean waves by natural or man-made structures and typically include harbors, bays, and estuaries. Recreational

fisheries in these areas have different catch proportions and species composition than coastal fisheries. For example, black perch is the dominant surfperch catch in inland marine fisheries, while barred surfperch is more common in coastal fisheries. Some fisheries, such as bonefish and spotted sandbass, occur only in inland marine habitats. Open ocean areas are exposed and subject to wave action, and recreational catch species include species such as yellowtail, kelp bass, and rockfishes which are not typically caught in bay habitats.

Table 5.6-3. Top catch species by mode, inland marine waters versus open ocean

	Inland marine waters	Ocean waters within three miles of shore
	Man-made structures	
1	northern anchovy	Pacific mackerel
2	Pacific mackerel	Pacific sardine
3	jacksmelt	northern anchovy
4	white croaker	queenfish
5	topsmelt	jacksmelt
6	Pacific sardine	Pacific bonito
7	queenfish	yellowfin croaker
8	yellowfin croaker	walleye surfperch
9	black perch	barred surfperch
10	California lizardfish	topsmelt
	Beach and bank	
1	topsmelt	barred surfperch
2	white croaker	yellowfiin croaker
3	yellowfin croaker	opaleye
4	spotfin croaker	jacksmelt
5	jacksmelt	California corbina
6	spotted sandbass	walleye surfperch
7	black perch	spotfin croaker
8	California corbina	black perch
9	bonefish	grass rockfish
10	Pacific mackerel	halfmoon
	Private and rental boats	
1	barred sandbass	Pacific mackerel
2	spotted sandbass	white croaker
3	Pacific mackerel	kelp bass
4	California halibut	barred sandbass
5	kelp bass	vermilion rockfish
6	black perch	Pacific sanddab
7	Pacific bonito	Pacific bonito
8	opaleye	Pacific barracuda
9	California scorpionfish (AKA “sculpin”)	yellowtail
10	yellowfin croaker	California scorpionfish (AKA “sculpin”)
	Commercial passenger fishing vessels	
1	n/a	barred sandbass
2	n/a	kelp bass
3	n/a	Pacific bonito
4	n/a	Pacific barracuda
5	n/a	vermilion rockfish
6	n/a	California scorpionfish (AKA “sculpin”)
7	n/a	Pacific mackerel

	Inland marine waters	Ocean waters within three miles of shore
8	n/a	blue rockfish
9	n/a	halfmoon
10	n/a	bocaccio

Source: CRFS data extracted from the RecFIN database at: http://www.recfin.org/forms/est2004.html

Query consists of harvested catch (A+B1) by common name in inland and ocean waters within three miles of shore by mode for southern California. Extraction date: August 8, 2008

5.6.2 Recreational Fishing Effort

Recreational fishing effort differs by fishing mode and area in the study region (Table 5.6-4). The highest effort occurs within the open ocean and shore modes.

Table 5.6-4. 2007 estimated angler trips by fishing mode

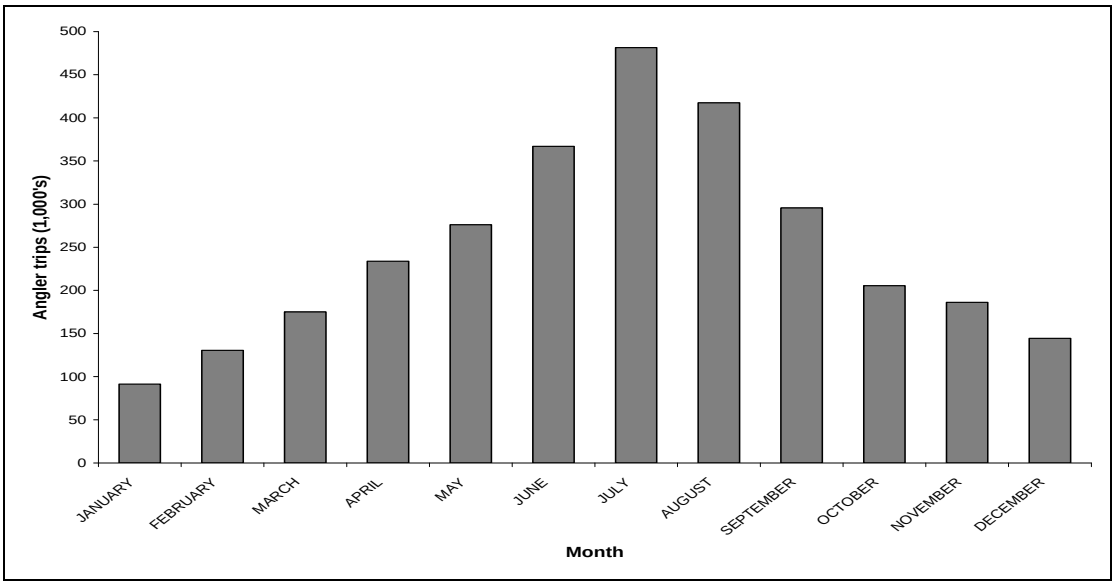
Fishing mode	Effort open ocean	Effort inland marine	Effort total
CPFVs	377,345	N/A	377,345
Private and rental boats	366,160	122,775	488,935
Beach and bank	406,840	359,869	766,709
Man-made structures	975,972	365,371	1,341,343

Sources: CPFV fishing activity logbooks submitted to DFG by CPFV operators were used for the estimates of CPFV effort; CRFS data extracted from the RecFIN database at: http://www.recfin.org/forms/est2004.html (extracted August 28, 2008) were used for effort in the other fishing modes.

Fishing occurs year round in the study region, although effort markedly increases in the summer months, peaking in July. According to effort estimates produced by CRFS, over 40 percent of fishing trips occur in the months of June, July and August (Figure 5.6-1).

Overall, sport fishing effort in the study region appears to be in decline according to license sales. In addition to an annual license, an Ocean Enhancement stamp is required when fishing under the authority of an annual sport fish license when fishing south of Point Arguello which is located just north of Point Conception, except that an Ocean Enhancement stamp is not required for one and two day licenses or when fishing from public piers. Sales on enhancement stamps have declined steadily from about 422,000 in 1990 to roughly 275,000 in 2007, representing a 35 percent decrease. However, sales have been relatively stable since 2001 (Figure 5.6-2).

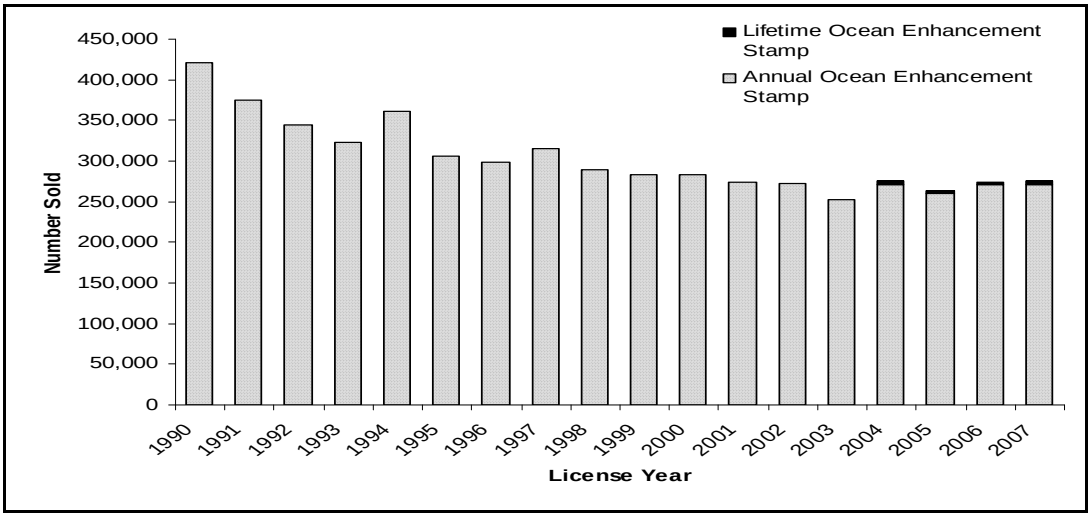
Figure 5.6-1. Estimated average annual finfish trips by month, 2005 to 2007



Source: CRFS data extracted from the RecFIN database at: http://www.recfin.org/forms/est2004.html

Query consists of angler trips for all modes in inland and ocean waters within three miles of shore for southern California. Extraction date: August 18, 2008.

Figure 5.6-2. Ocean Enhancement stamps for sportfishing south of Point Arguello, 1990-2007



Source: License statistics obtained from DFG License and Revenue Branch :
http://www.dfg.ca.gov/licensing/statistics/statistics.html#Sport%20Fishing%20Licenses

5.6.3 Spatial Distribution of Fishing Effort

Recreational fisheries within the south coast study region which have the greatest potential to be affected by the implementation of new or expanded MPAs are those which target primarily residential, non-migratory species such as nearshore rockfishes, California sheephead, ocean whitefish, kelp bass, surfperches, and California spiny lobster. Recreational fisheries for coastal migratory species associated with reef habitats, such as yellowtail, could also be affected. Spatially explicit data on recreational fishing effort are provided from these two primary sources:

1. DFG has compiled CRFS data (for sampled trips from 2005 to 2007) for CPFV fishing effort which focused on primary target species. This provides an estimate of the relative number of fish landed in discrete locations, which is in turn an estimate of the relative value of particular

locations to the CPFV industry. These data are available as a series of maps panning the south coast study region (Map 5.6-1).

2. For private and rental boat recreational fishing, DFG has compiled spatially-explicit data within the south coast study region from 2005 to 2007. These data are presented in microblock (one minute of latitude by one minute of longitude) maps (Map 5.6-2). The microblocks compiled are those reported by fishermen and provided to CRFS samplers.

Additional information on areas of stated importance for some recreational fisheries in southern California has been gathered by Ecotrust and is available to stakeholders in the MLPA south coast process for use in MPA planning.

5.6.4 Socio-economics of the Recreational Fishery

Socio-economic data for marine recreational fisheries of California are collected by NOAA Fisheries and can be accessed online at: http://www.st.nmfs.noaa.gov/st5/index.html. Marine recreational fishery expenditure and economic impact data for California was last collected in 2006. In 2006, the marine sportfishing industry employed over 23,000 people and generated over 1 billion dollars in income statewide (Gentner and Steinback 2008).

A new sportfishing economic survey for California is being conducted by NOAA in 2009 to estimate the economic impact of California's marine recreational fishery, evaluate the importance of groundfish as a component of boat-based catch in southern California, and assess changes in angler behavior associated with groundfish regulatory changes in northern California.

5.6.5 Recreational Fishery Profile

Appendix E contains reference information for the south coast study region's recreational fishery. It has been organized into the following sections:

(i) Data Used to Characterize the Fishery

(ii) CRFS Fishery Statistics, 2005 to 2007

(iii) Historic MRFSS Fishery Statistics, 1998 to 2003

(iv) CPFV Logbook Data ,1998-2008: Invertebrate Catch Statistics

(v) Synopsis of Applicable Regulations

5.6.6 Commercial and Recreational Fisheries

Principle target species for Commercial and Recreational Fisheries

Many species are important targets in the south coast study region for both commercial and recreational fisheries. Due to changes in statistical methods used to estimate catch and effort for the recreational fishery, catch estimates prior to 2004 are not comparable to current CRFS estimates. To compare catch proportions for principle fisheries targeted by both sectors, annual landings were averaged from 2005 through 2007. The principle fisheries including corresponding market categories for the commercial and recreational fisheries are provided in Table 5.6-5.

Table 5.6-5. Average annual landings, commercial and recreational fisheries

	Commercial		Recreational	
Principle market category	Average annual landings (lbs), 2005-2007	Percentage of combined landings	Average annual landings (lbs), 2005-2007	Percentage of combined landings
California halibut	486,061	70%	206,319	30%
California sheephead	242,316	82%	52,852	18%
California spiny lobster	762,089	----------not available----------		
coastal pelagic species[a]	97,144,796	99%	1,022,826	1%
croakers[b]	84,414	24%	268,845	76%
nearshore fishes[c]	77,441	25%	229,021	75%
other flatfishes[d]	38,527	57%	29,469	43%
rockfish unspecified	25,168	37%	43,304	63%
sharks, skates and rays[e]	275,824	52%	256,548	48%
shelf rockfish	77,318	19%	320,470	81%
Slope rockfish	65,491	99%	435	1%
White seabass	224,207	74%	78,661	26%
Yellowtail	155,546	34%	304,774	66%

Sources: Commercial data includes all landed catch for all ports within the south coast study region. Extracted: May 8, 2008. Recreational catch estimates were obtained from RecFIN and include (A+B1) catch for southern California for all modes and all waters (does not include Mexico catch). Data extracted September 2, 2008.

Notes: [a] Pacific mackerel, Pacific sardine, jack mackerel, northern anchovy, and Pacific bonito

[b] All croaker species excluding white seabass

[c] Nearshore Fishery Management Plan species excluding California sheephead

[d] All flatfishes excluding California halibut

[e] All sharks, skates and rays excluding white shark

Commercial Fisheries Important to Recreational Fishing

The southern California recreational fishery, especially private boaters and CPFV's, depend on the use of live baits, particularly northern anchovy, Pacific sardine, and market squid. These baits are primarily supplied to recreational fishery participants by the commercial live bait industry, and are critical to targeting popular sportfish species such as albacore, kelp bass, barred sand bass, white seabass and yellowtail. Information on the commercial live bait fishery is covered in section 5.4

5.7 Scientific Collecting

California Code of Regulations, Title 14, Section 650 authorizes the take or possession of marine plants or animals for scientific, educational, or propagation purposes with a permit issued by the DFG. Permits may be issued to:

- Employees of local, state and federal agencies who take specimens in connection with their official duties.
- Faculty, professional staff, college level students or individuals hired by public or private companies, educational institutions, and zoological gardens or aquariums in or out of state.
- Individuals who take wildlife or marine plants for other permittees or pursuant to environmental protection documents required by law.
- Individuals who possess a valid federal Bird Marking and Salvage Permit. Holders of this federal permit are not required to obtain a state permit to take migratory birds, other than raptorial birds.

Three types of permits are issued for take and non-lethal research such as tagging studies and tissue collection: resident, non-resident, and student. Resident and non-resident permits are valid for two years, and student permits are valid for one year. In general, a permittee is restricted to daily marine fish, invertebrate, and aquatic plants ocean sport fishing bag limits, fishing seasons and size limits. However, exceptions are made under certain circumstances supported by justification on a case-by-case basis. Additional specific restrictions may apply in some areas. For example, scientific collecting in MPAs is prohibited, except on case-by-case basis in all three classifications of state MPAs. There are standard exceptions to the scientific collecting permit, including state and federally-listed and protected species, for which additional state and/or federal authorizations must be obtained.

As part of the application process, a permit justification form is required for all activities including permit renewals. Permit requestors must indicate the following components on their justification form:

- Purpose
- Methods/techniques
- Species and numbers to be collected
- Collection locations
- Disposition of specimens

For more information about DFG's scientific collecting permit program, go to DFG's Marine Region website: http://www.dfg.ca.gov/licensing/specialpermits/specialpermits.html

DFG has an electronic database for processing scientific collecting permit applications, which is recorded on a statewide basis. The total number of permits issued in California from 1989 through 2007 is shown in Table 5.7-1. The trend in the number of permits issued clearly reflects the bi-annual permit cycle from 1989 through 2001, with a relatively constant trend in number of permits issued. However, an annual cycle emerged beginning in 2002 until the present. The trend has been an increase in the number of scientific collecting permits issued with 1,950 being issued in 2007.

Table 5.7-1. Scientific collecting permits issued by DFG statewide, 1989-2007

Year	Permits	Year	Permits
1989	1,654	1999	1,169
1990	455	2000	975
1991	1,347	2001	1,078
1992	812	2002	1,218
1993	1,229	2003	1,306
1994	931	2004	1,740
1995	1,207	2005	1,717
1996	989	2006	1,804
1997	1,212	2007	1,950
1998	913		

Scientific collecting permits for marine organisms are authorized by category to be collected (e.g. marine fishes, marine aquatic plants, and marine invertebrates). Table 5.7-2 shows number of permits issued in California for marine authorizations in 2005 and 2007.

Table 5.7-2. Scientific collecting permits with marine organism authorizations

Year	Marine Fishes	Marine Aquatic Plants	Marine Invertebrates	Marine Fishes, Aquatic Plants and Invertebrates[a]
2005	552	484	714	846
2006	680	531	762	917
2007	574	501	695	814

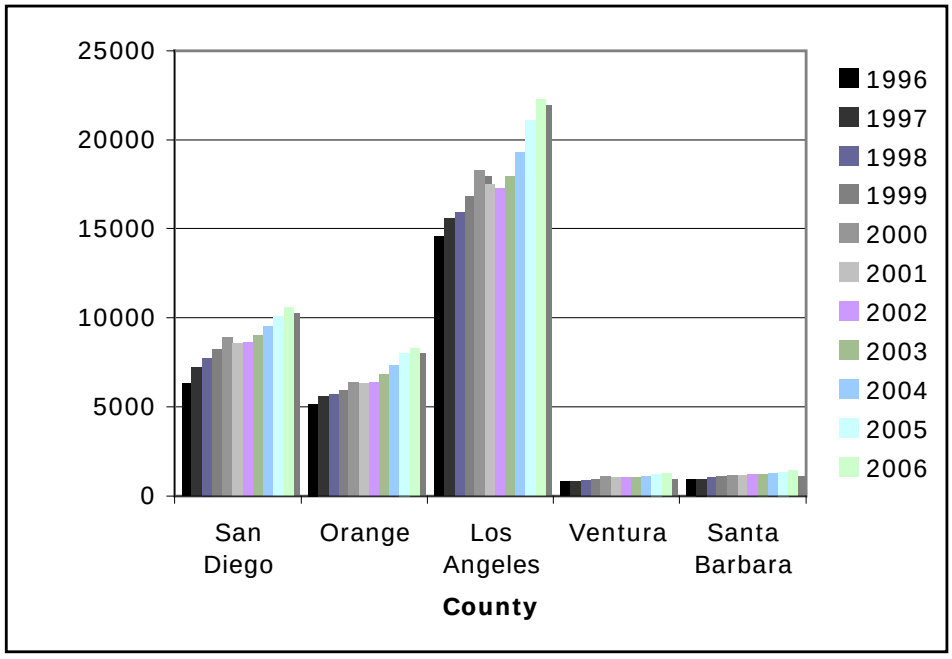
Note: [a] Each permit may have multiple authorizations, and therefore the numbers are not additive.

A total of 814 scientific collecting permits were issued to collect marine organisms in 2007. This represents approximately 42% of the total applications issued for this 12-month period. In addition, the National Park Service (NPS) has a scientific collecting permitting program for shore (island) based studies only, and roughly 25% of their permits are issued for studies in the marine environment. For more information on the NPS scientific collecting permitting program, go to the NPS's website: http://science.nature.nps.gov/research/ac/ResearchIndex).

5.8 Coastal Tourism

California is the most visited state in the U.S. (California Travel and Tourism 2006). In 2006, California received approximately 14.6 million international visitors, over half of whom visited the Los Angeles-Long Beach area (CIC Research, Inc. 2008). California also received approximately 352.3 million domestic visitors, 84.9% being Californians (D.K. Shifflet & Associates, Ltd. 2007). From 1998 to 2002, the travel-and-tourism industry was the third largest employer in California and the fifth largest contributor to the gross state product (Kildow and Colgan 2005; CLIA 2008). According to a report by Dean Runyan Associates (2008), tourists' total direct travel spending in California reached $96.7 billion in 2007, a 3.6% increase from 2006. The year 2007 also represented the fifth straight year of positive growth. Travel spending directly supported 924,100 California jobs in 2007, down 0.5% from 2006, although earnings increased by 5% to total $30 billion. Travel spending generated the greatest number of jobs in accommodation and food service (534,000), and arts, entertainment and recreation (226,500).

Figure 5.8-1. Total travel spending by county, 1996-2006



Source: Dean Runyan Associates 2008.

Coastal tourism and recreation contributed $12.4 billion to California's gross state product in 2000 (Kildow and Colgan 2005). Visits to the beach and waterfront activities are the third most popular recreational activities in California after "sightseeing", and "theme and amusement parks" (CTTC 2006). Theme and amusement parks also represent interest in the coastal and ocean ecosystems. Sea World in San Diego, with an entrance fee of $55-$65, was the fourth most visited theme/amusement park in California, receiving a total of 4.1 million visitors in 2005 (CTTC 2006). The south coast study region is also home to aquariums, nautical and maritime museums, and monuments, fleets and processors that represent the historic fishing community; all of which draw tourists interested in coastal communities, history, and ecosystems. Tourism and recreation are economic drivers in the south coast study region. Within the study region, Los Angeles County has the highest travel spending, increasing from $14 to $22.3 billion between 1996 and 2006, followed by San Diego and Orange counties, which also showed increasing trends in spending. Traveling spending in Ventura and Santa Barbara counties has remained fairly constant, but significantly below the travel spending in Los Angeles, San Diego and Orange, possibly due to a less developed tourist infrastructure, smaller cities, or fewer attractions (see Figure 5.8-1).

The south coast study region boasts seven of California's ten most visited state parks; of this seven, five are adjacent to the coast. Old Town San Diego Historic State Park, the most visited state park in the state, received 5,431,333 visitors in 2005/2006, and, while not adjacent to the coast, is within a mile of the ocean. The five parks adjacent to the shore are the Huntington, Bolsa Chica, San Onofre, Doheny, and Cardiff state beaches, which received over 11 million visitors in 2005/2006 (see Table 5.8-1). The region also contains two coastal national parks. Cabrillo National Monument, one of the top ten national parks in the state, received 826,615 visitors in 2005 (CTTC 2006). The Channel Islands National Park, which encompasses Anacapa, Santa Cruz, Santa Rosa, San Miguel, and Santa Barbara islands and extends one mile offshore around all these islands, received 434,107 visitors in 2005 (National Park Service 2006a). Also adjacent to the coast in the study region is the Santa Monica Mountains Recreation Area, which receives 553,866 visitors in 2005 (National Park Service 2007b) and the San Diego National Wildlife Refuge. Tourists also visit the coastal San Diego Bay National Wildlife Refuge, Seal Beach National Wildlife Refuge, and the Tijuana Slough National Wildlife Refuge.

Table 5.8-1. Attendance at coastal California state parks, 2005/2006

Park Name	Attendance	County	Park Name	Attendance	County
Huntington State Beach	2,899,770	Orange	Malibu Creek State Park	332,198	Los Angeles
Bolsa Chica State Beach	2,735,919	Orange	San Buenaventura State Beach	234,556	Ventura
San Onofre State Beach	2,418,209	San Diego	McGrath State Beach	167,357	Ventura
Doheny State Beach	2,049,666	Orange	El Capitan State Beach	100,395	Santa Barbara
Cardiff State Beach	1,715,856	San Diego	Refugio State Beach	79,865	Santa Barbara
Carlsbad State Beach	1,671,327	San Diego	Emma Wood State Beach	54,621	Ventura
South Carlsbad State Beach	1,514,203	San Diego	Gaviota State Park	43,910	Santa Barbara
Torrey Pines State Beach	1,501,778	San Diego	Border Field State Park	26,095	San Diego
San Elijo State Beach	996,646	San Diego	Dockweiler State Beach	NR	Los Angeles
Carpinteria State Beach	779,822	S. Barbara/Ventura	Point Dume State Beach	NR	Ventura
Malibu Lagoon State Beach	620,187	Los Angeles	Santa Monica State Beach	NR	Los Angeles
Leo Carrillo State Park	557,235	L.A./Ventura	Will Rogers State Beach	NR	Los Angeles
San Clemente State Beach	545,528	Orange	Mandalay State Beach	NR	Ventura
Crystal Cove State Park	523,282	Orange	Corona del Mar State Beach	NR	Orange
Robert H. Meyer Memorial State Beach	501,864	Los Angeles	Leucadia State Beach	NR	San Diego
Point Mugu State Park	370,102	Ventura	Moonlight State Beach	NR	San Diego
Silver Strand State Beach	343,108	San Diego			

Source: California Department of Parks and Recreation 2006

The south coast study region is also home to a large number of county and city beaches; therefore, total beach attendance for the study region is much greater than the numbers reported for state beaches alone (Table 5.8-1a). Beach attendance estimates for southern California range from 100 to over 151 million beach visits annually (Dwight et al. 2007, Kildow and Colgan 2005). Dwight et al. found annual beach visits to be 129 million after surveying 75 beaches in Los Angeles, Orange and San Diego counties from 2000-2004 (2007). Average annual beach visits ranged from a low of about 27,000 at Surfside in Orange County to a high of over 7 million at Zuma in Los Angeles County (Dwight et al. 2007).

5.9 Non-consumptive Uses

Non-consumptive uses include beach-going, swimming, surfing, sailing, kayaking, diving, wildlife viewing, photography, and other activities that do not involve the take or extraction of marine resources. In 1999 and 2000, more than 43% of all Americans participated in some form of marine recreation (Leeworthy and Wiley 2001). Americans flock to beaches and shores to swim, sunbathe, boat, and view the natural scenery. In coming years, populations in the coastal zone are expected to grow and the total number of people participating in all forms of marine recreation is expected to increase with the largest increases expected for beach going activities (Leeworthy et al. 2005). Despite this expected increase in the total number of Americans participating in marine recreation, the percentage of all Americans engaged in marine recreation is expected to decrease (Leeworthy et al. 2005). California ranks second to only Florida in the number of participants in coastal recreation nationwide with nearly 18 million participants, most of whom participate in one of the 17

non-consumptive activities listed in Table 5.9-1 (Leeworthy 2001). Preliminary results from the California Coastal User Survey suggest the majority of activities for local coastal users from the south coast study region were non-consumptive. Los Angeles County residents reported that 92% of their activities during their last trip to the coast were non-consumptive, while 84% of activities for both Ventura County and Santa Barbara County residents were non-consumptive (Pendleton and LaFranchi 2008).

The National MPA Science Center and the Marine Biology Conservation Institute are conducting a study entitled 'The California Ocean Uses Atlas Project'. They will compile comprehensive data on all human uses of the ocean. Their study will produce maps of human uses, including many non-consumptive uses such as boating, beach going, kayaking, and scuba diving. Data and maps from this study are expected to be available in 2009 for the MLPA south coast process.

Table 5.9-1. Participation in coastal recreation in California

Coastal activity	Estimated participants statewide
Visit Beaches	12,598,069
Visit Waterside Besides Beaches	1,500,965
Swimming	8,398,997
Snorkeling	706,998
Scuba Diving	288,023
Surfing	1,114,372
Wind Surfing	82,201
Motorboating	1,549,289
Sailing	1,087,755
Personal Watercraft Use	680,309
Canoeing	190,948
Kayaking	433,209
Rowing	280,265
Water-skiing	265,533
Bird Watching in Saltwater Surroundings	2,581,958
Viewing Other Wildlife in Saltwater Surroundings	2,551,711
Viewing or Photographing Scenery in Saltwater Surroundings	4,175,372

Source: Leeworthy 2001. Note: Data includes civilian non-institutionalized population 16 years and older as sampled Sept. 1999. Extrapolated from a sample of 27,854 households.

5.9.1 Recreational Beach Use

The study region's approximately 690 miles of mainland coastline and 354 miles of island coastline provide not only intrinsic natural and aesthetic values, but also recreational opportunities for its users and great economic benefits to the local, regional, and state economies. In 1998, California's beaches statewide generated $14 billion in direct revenue ($73 billion including indirect and induced benefits), $2.6 billion in federal tax revenue, and 883,000 jobs (King 1999). A more recent study by Kildow and Colgan estimates that direct expenditures by beach goers in California average roughly $25 per person per day and total spending by beach goers in the state is approximately $3.75 billion (Kildow and Colgan 2005). Revenues at state parks adjacent to the coast in the study region from user fees and concessions reached nearly $25 million during the 2005/2006 fiscal year (Table 5.9-2) (California Department of Parks and Recreation 2006). The highest revenues—also the highest attendance—were at Bolsa Chica State Beach, Huntington State Beach, and San Onofre State Park (Table 5.9 – 1). These three parks account for over one third of the total revenue earned by state parks adjacent to the coast in the study region.

Table 5.9-2. Revenue from coastal state parks, 2005/2006

Park	Revenue	County	Park	Revenue	County
Bolsa Chica State Beach	$3,099,729	Orange	Malibu Creek State Park	$485,873	Los Angeles
Huntington State Beach	$2,838,061	Orange	Gaviota State Park	$215,770	Santa Barbara
San Onofre State Park	$2,791,464	San Diego	Emma Wood State Beach	$228,073	Ventura
South Carlsbad State Beach	$2,006,050	San Diego	Malibu Lagoon State Beach	$162,698	Los Angeles
Doheny State Beach	$1,874,237	Orange	San Buenaventura State Beach	$85,920	Ventura
Carpinteria State Beach	$1,809,601	S. Barbara/Ventura	Cardiff State Beach	$75,110	San Diego
San Elijo State Beach	$1,733,429	San Diego	Robert H. Meyer Memorial State Beach	$66,700	Los Angeles
San Clemente State Beach	$1,280,786	Orange	Border Field State Park	$233	San Diego
Crystal Cove State Park	$1,086,114	Orange	Dockweiler State Beach	$0	Los Angeles
Leo Carrillo State Beach	$1,080,466	LA/Ventura	Point Dume State Beach	$0	Ventura
El Capitan State Beach	$976,707	Santa Barbara	Santa Monica State Beach	$0	Los Angeles
Silver Strand State Beach	$876,544	San Diego	Will Rogers State Beach	$0	Los Angeles
Point Mugu State Park	$832,560	Ventura	Mandalay State Beach	$0	Ventura
McGrath State Beach	$668,622	Ventura	Carlsbad State Beach	$0	San Diego
Rufugio State Beach	$618,978	Santa Barbara	Torrey Pines State Beach	($125)	San Diego

Source: California Department of Parks and Recreation 2006.

Note: [1] Some state parks do not charge an entrance fee nor a parking fee. Therefore, there is no revenue listed for these parks. Some state parks are managed by an entity other than State Parks, and any revenue received by those entities is not included here.

California beaches are owned by the public, and as a result, one does not necessarily need to pay to visit the beach. Beach visitors may value the beach beyond their direct expenditures such as gas or parking fees. This value, known as consumer surplus, has been estimated to range from a low of $10.98 (in 2001 dollars) for visits to Cabrillo Beach in Los Angeles County to a high of over $70 (in 2001 dollars) per person per trip for visits to San Diego beaches. Using a conservative estimate of $15/visit, the cost of parking alone at some Los Angeles beaches, for the value of a beach day and a conservative estimate of beach attendance of 150 million beach days annually, Kildow and Colgan estimate the non-market value of beach visits in California (85% of which occur in Los Angeles, Orange, and San Diego counties) to be approximately $2.5 million annually (Kildow and Colgan 2005). They also go on to estimate that the total value of going to the beach, including market and non-market values, may exceed $5 billion annually (Kildow and Colgan 2005).

The impact of California's beaches on the state and national economy continues to grow; in comparison to Delaware, which ranks just behind California in overall federal funding for shoreline preservation, California generates 20 times more economic activity per federal dollar (King 1999).

In addition to the 30 state parks adjacent to shore, the counties and many of the cities in the south coast study region maintain one or more public beaches. The study region's miles of state, county, and city beaches, from thin ribbons of sand below steep cliffs to long, wide strips of sand, offer non-consumptive recreational activities such as swimming, sunbathing, sailing, diving, sightseeing, hiking, surfing, kayaking, canoeing, and whale watching.

Approximately 1.1 million surfers live in California, surfing at popular spots along the coast, many of which are in the study region (NOAA 2000). Huntington Beach is one example of popular surfing locations in the south coast study region. Huntington Beach draws surfers and spectators alike from

around the world during the more than thirty surfing events held there. The 10-day long U.S. Open of Surfing, the world's biggest surfing event, takes place at Huntington Beach and draws over 250,000 tourists and locals alone (StockTeam 2007). Table 5.9-3 lists additional surf spots in the region. Surfing culture also supports a $7.48 billion dollar surf industry (in 2006) in the U.S. (SIMA 2007). Further spatial information on surfing locations in the MLPA south coast study region is available in MarineMap at: http://www.marinemap.org/marinemap/

Table 5.9-3. Popular surfing spots in the south coast study region

		Santa Barbara County	
Governments	Little Drakes	Haskell's	Miramar
Coho	Big Drakes	Sands	Serena Point
Perkos	Razors	Devereux Point	Carpinteria State Beach
Little Malibu	Poison Oak Point	Campus Point	Loon Point
Lefts and Rights	Lorainne's	Poles	Sandy Point
Middle Peak	Edwards	Hendry's	Tar Pitz
St. Augustine's	Refugio	Leadbetter	Jelly Bowl
Rights and Lefts	El Capitan	Sandspit	Rincon
Utah's	Naples	1000 steps/ Mesa Lane	
Rennie's	Driftwood Point	Hammond's	
		Ventura County	
Little Rincon/	Faria	C Street	Oxnard Shores
Mussel Shoals	Mondos	Ventura Harbor	Hollywood
Hobsons	Solimar	Dredge	Silverstrand
RV wall	Ventura Overhead	Santa Clara River mouth	Pier/Port Hueneme
Faria	Emma Wood	McGrath	Mugu
Gold Coast Beachbreaks	Ventura River mouth	Mandalay	Supertubes
Pitas Point	Fairgrounds	Oxnard	
		Los Angeles County	
County Line	Topanga	Chevron Reef	Torrance Beach/Haggerty's
Leo Carrillo	Chart House	El Porto	PV Cove
Zuma	Sunset Blvd	Manhattan Beach	Lunada Bay
Point Dume	Santa Monica Pier	Hermosa Beach	Cabrillo Beach
Latigo Point	Venice Beach	Redondo Breakwater	Dockweiler State Beach
Malibu			
		Orange County	
Seal Beach	17th Street	The Wedge	Salt Creek
South Side/13th Street	HB Pier, Northside	Corona del Mar	Strands
Surfside	HB Pier, Southside	Rockpile	Doheny
Anderson Street	54th & 56th Streets	Thalia Street	T-Street/San Clemente St. Park
Bolsa Chica	36th St. Newport	Brooks Street	Cottons
Goldenwest	Newport Pier	Aliso Creek	40 St. Newport
		San Diego County	
Upper Trestles	Grandview	Del Mar Cliffs	Old Man's/Tourmaline
Lower Trestles	Beacons	Torrey Pines	Pacific Beach
Middles	Moonlight Beach	Blacks	The Wave House
Church	D Street	Scripps	Mission Beach and Jetty
San Onofre	Swami's	La Jolla Shores	Ocean Beach and Jetty
Trails	Pipes	La Jolla Reef Breaks	Sunset Cliffs
Oceanside North Jetty	San Elijo	Horseshoes	Ralph's

Oceanside Harbor	Cardiff Reef	Windansea	Coronado Beach
Oceanside Pier NS	Seaside Reef	North Birdrock	Imperial Pier
Tamarack	Del Mar Rivermouth	South Birdrock	Imperial Beach
Terra Mar Point	Del Mar Beachbreak	PB Point	Tijuana Slough
Ponto			

Source: Surfline 2008.

A complete list of individual breaks in the south coast study region can be found at http://www.wannasurf.com/spot/North_America/USA/index.html

Kite surfing, or kite boarding, is also a rapidly growing sport in California. Kite surfers prefer many of the same beaches popular with surfers, alfthough they tend to be on the water when the weather is less ideal for surfers. Along with surfing and kite surfing, windsurfers also frequent many of the study region's beaches, although they are not as numerous as surfers.

The *California Coastal Access Guide* gives a brief description of the location, type of access and amenities at each public access coastal area along California's 1,100 miles of continent abutting the Pacific Ocean. There are dozens of coastal destinations between Point Conception in Santa Barbara County and the California/Mexico border, the region encompassed in this study (Table 5.9-4). For many coastal access points, the parking area abuts the beach it provide access to, but in other locations a path or stairway must be taken to reach the coast and these are noted in Table 5.9-4. Also in Table 5.9-4, fishing sites refer to locations that have a fishing pier, fish cleaning facility or are commonly used for fishing according to the *California Coastal Access Guide.*

Table 5.9-4. Facilities at beaches in the south coast study region

County	# Campgrounds	# Stairways to Beach	# Paths to Beach	# Biking Trails	# Boating Facilities	# Fishing Sites
Santa Barbara	8	7	7	8	3	22
Ventura	10	4	9	10	5	14
Orange	9	24	27	19	24	46
Los Angeles	6	18	22	13	8	36
San Diego	8	29	23	14	19	62

Source: California Coastal Commission, California Coastal Access Guide, 2003.

5.9.2 Boating

Boating is a popular and economically important activity in the south coast study region. In 2000, over four million people in California were involved in activities related to marine boating (National Ocean Economics Program 2005). The contribution of boating to the gross state product was $11 billion in 1995, representing 1.2% of the state economy (Rust and Potepan 1997). The nearshore ocean waters in the study region are fairly protected because of the geographic orientation of the Southern California Bight with its east-west orientation protecting the regions from large oceanic events. The Channel Islands also provide protection on the leeward side (south-east side) of each island. There are numerous bays, estuaries and harbors in the study area that provide protected waters that are conducive to boating.

The California Department of Boating and Waterways published a report titled "California Boating Facilities Needs Assessment" (California Department of Boating and Waterways 2002) as a survey and assessment of boating and boating facilities needs in California. The California Boating Facilities Needs Assessment breaks the state into regions, two of which encompass the south coast study region. Santa Barbara, Ventura, Los Angeles, and Orange Counties make up one of the two regions, and San Diego County the other. According to this study, the 25 most used waterways (including

freshwater waterways) for residents from Santa Barbara through Orange County included the marine waterways of the Pacific Ocean (i.e. ocean waters not defined by another name), Channel Islands Harbor, Marina Del Rey, Mission Bay, Newport Harbor, Los Angeles-Long Beach Harbor, Dana Harbor, Santa Barbara Channel, San Pedro Bay, Santa Catalina Island, and Alamitos Bay. The Pacific Ocean was the most used waterway in Santa Barbara and Orange Counties with 7% of all boaters in the region using this waterway.

For residents of San Diego County, the 20 most used waterways (including freshwater waterways) included the marine waterways of the San Diego Bay, Mission Bay, Pacific Ocean, and Oceanside Harbor. San Diego Bay was the most used waterway in the region with 21.5% of all boaters in San Diego County using this waterway (California Department of Boating and Waterways 2002).

Non-consumptive boat data is also collected as supplemental data from the DFG's CRFS program. The purpose of the CRFS is to estimate total marine recreational finfish catch and effort in California. CRFS staff conduct interviews of anglers returning to public launch ramps. Under the Primary Private Boat Survey, boaters are interviewed at primary launch ramps approximately eight days per month (Van Buskirk, Pacific States Marine Fisheries Commission 2007, personal communications). "Primary" launch ramps are defined as "those where the majority of the managed species, in any particular month, are landed" (Pacific States Marine Fisheries Commission 2007). Supplemental data collected include the number of private and rental boats that are not recreationally fishing for finfish. Note that, the goal of the CRFS is to produce marine recreational fishery-based data to inform management of recreational fisheries and, therefore, may underestimate the number of non-consumptive boat users because it focuses on public launch ramps where the majority of managed species are landed rather than a random sampling of public launch ramps.

CRFS samplers intercepted a total of 22,278 private and rental boats within the study region. The most surveys took place in San Diego County while the fewest took place in Santa Barbara County. San Diego County also had the highest rate of boats that had fished for finfish recreationally (69%), and Santa Barbara County had the lowest rate (45%). Santa Barbara County had the highest percentage of commercial fishing or non-finfish vessels at approximately 10%. San Diego County had the lowest percentage of vessels not fishing (28.5%), while Los Angeles County had the highest (46.1%). See Table 5.9-5 for a complete summary of the CRFS results for all counties in the study region.

The number of registered vessels has been increasing in the study region. According to the California Department of Motor Vehicles, the study region had approximately 301,098 registered recreational vessels as of December 31, 2007, an increase of 21,984 since 1990 (Table 5.9-6).

Table 5.9-5. Activities for which recreational vessels were used in 2007, by county

	Santa Barbara		Ventura		Los Angeles		Orange		San Diego		Study Region	
	vessels	%	vessels	%	vessels	%	vessels	%	vessels	%	vessels	%
Fished recreationally for finfish	656	45.3	1,549	50.3	3,267	51.1	1,839	59.4	5,673	68.7	12,984	58.3
Intended to fish recreationally, but no gear in water	11	0.8	53	1.7	114	1.8	38	1.2	76	0.9	292	1.3
Recreational shellfish	4	0.3	14	0.5	10	0.2	3	0.1	8	0.1	39	0.2
Recreational squid only					3	--	2	0.1	1	--	6	--
Fished commercially	132	9.1	154	5	50	0.8	37	1.2	150	1.8	523	2.4
Total Vessels Fishing	803	55.5	1,770	57.5	3,444	53.9	1,919	62	5,908	71.5	13,844	62.2
Recreational cruising	376	26	807	26.2	2,478	38.8	965	31.2	1,684	20.4	6,310	28.3
Burial at sea			2	--					6	0.1	8	--

	Santa Barbara		Ventura		Los Angeles		Orange		San Diego		Study Region	
	vessels	%	vessels	%	vessels	%	vessels	%	vessels	%	vessels	%
Bird watching									1	--	1	--
Diving, non-consumptive	18	1.2	48	1.6	57	0.9	38	1.2	135	1.6	296	1.3
Enforcement (public agency)	3	0.2	18	0.6	11	0.2			36	0.4	68	0.3
Hunting, gun									2	--	2	--
Boat maintenance	72	5	160	5.2	207	3.2	85	2.7	215	2.6	739	3.3
Research (public agency)	52	3.6	21	0.7	13	0.2	6	0.2	40	0.5	132	0.6
Whale watching	1	0.1	4	0.1			12	0.4	6	0.1	23	0.1
Other commercial activity	26	1.8	108	3.5	29	0.5	3	--	65	0.8	231	1.1
Removing boat from slip, no trip	95	6.6	143	4.6	148	2.3	65	2.1	143	1.7	594	2.7
Unidentified	1	--	1	--	1	--	5	0.2	22	0.3	30	0.1
Total Vessels Not Fishing	644	44.5	1,312	42.5	2,944	46.1	1,179	38	2,355	28.5	8,434	37.8
Total All Boats	1,447	100	3,082	100	6,388	100	3,098	100	8,263	100	22,278	100

Table 5.9-6. Registered vessels as of December 31, 1990 and December 31, 2007

County	Registered vessels, 1990	Pleasure vessels, 1990	Registered vessels, 2007	Pleasure vessels, 2007
Santa Barbara	9,083	8,636	10,679	10,253
Ventura	22,299	21,896	26,558	26,136
Los Angeles	123,824	122,027	124,420	123,145
Orange	67,545	66,528	70,014	69,126
San Diego	56,363	55,037	69,427	68,087

Source: CDMV 2008.

There are at least 160 marina and launch ramp facilities in the south coast study region (roughly half of coastal marinas and ramps statewide), with over 35,000 boat slips and tie-ups according to information compiled by DFG (Sadrozinski, pers. comm.). Ports with marinas, public launch ramps, and hoists in the study region are listed in Tables 5.9-7 and 5.9-8.

Table 5.9-7. Ports with marinas

County	Ports with Marinas	
Santa Barbara	Santa Barbara Harbor	
Ventura	Ventura Harbor	Port Hueneme
	Channel Islands Harbor	
Los Angeles	Marina Del Rey	Alamitos Bay
	King Harbor	San Pedro Bay
	Port of Los Angeles	Avalon Harbor
	Port of Long Beach	
Orange	Huntington Harbor	Dana Point Harbor
	Newport Harbor	
San Diego	Oceanside Harbor	San Diego Harbor
	Mission Bay	

Note: This table lists port areas having marinas. Each port may contain many marinas.

Table 5.9-8. Public boat launch or hoists locations

County	Launch or hoist locations	
Santa Barbara	Santa Barbara Launch Ramp	Goleta Pier/Hoist
	Gaviota Pier/Hoist	
Ventura	Ventura Launch Ramp	Channel Islands Launch Ramp
Los Angeles	Marina Del Rey Launch Ramp	Mother's Beach (hand launch)
	Davies Launch Ramp	South Shore Launch Ramp
	Claremont Ramp	Cabrillo Launch Ramp
	Granada Ramp	Avalon Pleasure Pier/Hoist
	Marine Stadium Ramp	King Harbor Launch Ramp/Hoist
Orange	Dana Point Launch Ramp	Sunset Aquatic Launch Ramp
	Newport Dunes Launch Ramp	North Star Beach (hand launch)
	Huntington Harbor Ramp	
San Diego	Shelter Island Launch Ramp	Glorietta Launch Ramp
	Oceanside Launch Ramp	National City Launch Ramp
	Agua Hedionda Lagoon Launch Ramp	Ski Beach Launch Ramp
		South Shores Launch Ramp
	Santa Clara Point Launch Ramp	De Anza Cove Launch Ramp
	Dana Basin Launch Ramp	La Jolla Shores (hand launch)
	Chula Vista Launch Ramp	

Source: California Coastal Commission, *California Coastal Access Guide*, 2003, Boat Ramps Locator 2008.

The south coast study region is also home to a large sailing community. At least 55 sailing or yacht clubs exist in the study region and many sponsor regattas and other sailing events (Yacht Club Guide 2008). Some people make their sailboat their primary residence. Many harbors have waiting lists for live aboard permits that can be years long.

5.9.3 Recreational Scuba Diving

Scuba diving is a popular activity within the study region, especially around the Channel Islands. About 20% of California's 1.5 million certified divers are "active," meaning they dove within the past 12 months and plan to dive within the next year. California, which accounts for an estimated 12% total of the national revenue generated by recreational scuba diving, generates approximately $180 million annually in revenue from diving; equipment sales produce an additional $60 million (Hornsby 2005). Growth in the sector was estimated at 10-20% per year in the 1980s and 5-7% in the 1990s (Weinstein). Diving also fosters related business, such as underwater photography and art galleries, and produces direct and indirect revenue via services and facilities serving the region. There are over thirty dive shops in San Diego County alone. Some of these shops specialize in the increasingly popular activity of underwater photography while others focus on custom wetsuits or equipment sales. Many of these shops also offer dive boat trips and scuba instruction. Guided Discoveries, a non-profit organization, runs a summer camp located in Toyon Bay on Santa Catalina Island where teenager campers can become scuba certified.

The clear waters, numerous dive sites, and diverse marine life draw divers to the Channel Islands from around the world. Diving trips to the Channel Islands require boat access. Many dive sites also exist along the mainland coast, and some of the popular diving sites are listed in Table 5.9-9. Some shore dive locations are shown on Map 5.6-3.

Table 5.9-9. Popular scuba diving sites exclusive of the Channel Islands

		Santa Barbara County	
Naples Reef	Tajiguas	Isla Vista	Mesa Lane
Carpinteria Reef	Refugio State Beach	Arroyo Burro Park	Hammonds
Gaviota State Beach	Ellwood	Leadbetter	
		Ventura County	
Rincon Reef	Long Walk	Deer Creek Road	Neptune's Net
La Jennelle	North Deer Creek	Staircase	
		Los Angeles County	
Leo Carrillo (Beach, Lil Cove and No. Lot)	Paradise Cove	Corral Beach	White Point
Nicholas Canyon	Escondito Creek	Big Rock	Big Rock
La Piedra	Latigo Beach	Topaz Jetty	Gladstone's
El Pescador	Latigo Canyon	Malaga Cove	Vet's Park
El Matador	Point Dume	Marineland	Cardiac Hill
		Orange County	
Corona Del Mar	Shaw's Cove	Cleo Street Barge	Dana Point Harbor
Little Corona	Fisherman's Cove	Cress/Mountain Street	Moss Point
Reef Point	Heisler Park	Wood's cove	Treasure Island
North Crescent Bay	Diver's Cove	Montage Resort	Aliso Beach
South Crescent Bay	Main Beach		
		San Diego County	
La Jolla Canyon	Hospital Point	Quast Hole	Rockslide
Scripps Canyon	The Wreck of the Ruby E	Sunset Cliffs	Point Loma Kelp Beds
Goldfish Point	Marine Room	Osprey Point	Swami's
La Jolla Cove	Boomer Beach		

Sources: Beach Crabs 2008 and Franko's Maps 2008.

5.9.4 Boardwalks, Kayaking, and Other Activities

Visitors and locals take advantage of the boardwalks and bike paths that line many of southern California's most popular beaches. Beachgoers can walk, jog, skateboard, bike and more along these paths. Beach goers and visitors support the many bike rental companies, retail stores, restaurants, and hotels that operate along these boardwalks such as the Venice Beach boardwalk, Santa Barbara's West Beach bike path, and the Mission Beach boardwalk in San Diego.

More than one-half million people participated in some form of kayaking in California in 1999, 2.5 million people participated in wildlife viewing, and more than 4 million people took photos at the beach (Leeworthy and Wiley 2001). Kayaking, whale watching, and nature observation have all increased in popularity (Weinstein). There are at least 32 kayak rental shops in the coastal counties in the study region and some popular kayak trips are listed in Table 5.9-10.

Table 5.9-10. Partial list of popular kayak trips in the south coast study region

Santa Barbara County

- Refugio State Beach to El Capitan State Beach
- Naples Reef to Goleta Pier
- Hendry's County Beach to Santa Barbara Harbor
- Butterfly Lane to Sharks Cove
- Loon Point to Sand Point (including Carpinteria Reef)
- Santa Cruz Island: Cueva Valdez to Arch Rock

Ventura County

- Anacapa Island

Los Angeles County	
• Royal Palms State Beach to Carillo Beach	• Port of Los Angeles
Orange County	
• Newport Harbor to Reef Point	• Reef Point to Aliso Beach County Park
San Diego County	
• San Diego Bay	• La Jolla Shores to Mission Bay

Source: Trails.com 2008

The coast of southern California is heavily populated, and southern California's beaches offer a location for residents and visitors alike to gather for a wide variety of other recreational activities. Beach volleyball courts are located on many public beaches. Frisbee games, yoga classes, open water swim events, lifeguard competitions, triathlons, and more are regular occurrences on the beaches of the south coast study region.

Southern California's boardwalks and beaches are also host to a variety of music and art festivals and events, harbor festivals, sandcastle contests and more. Film, television and commercials shoots take place on the beaches, and several popular television shows are set in coastal communities in the study region.

5.9.5 Tidepool Visitors and Wildlife Watching

Tidepool visitation is another popular recreational activity within the study region. While tidepool visitation is a non-consumptive activity in theory, careless tidepool visitors or great numbers of visitors can cause damage and disturb the habitat during their visit by trampling or handling tidepool species (Ambrose and Smith 2004). Ambrose and Smith found that even low use-sites in Santa Monica Bay received 1600 to 4300 visitors annually, and half these visitors walked in the intertidal zone while one-third handled organisms (2004). Several agencies and organizations have tidepool awareness programs to teach proper tidepool etiquette including some of the state parks, Long Beach Marine Institute, Cabrillo National Monument, and the Orange County Marine Protected Areas Committee (See section 6.3 for more details).

Tidepool locations in the study region were taken from "California Coastal Access Guide" by the California Coastal Commission, and the NPS (2006b), San Diego Natural History Museum (2008), and Orange County Parks (2008) websites and are listed in Table 5.9-11. Tidepool locations within the Channel Islands National Park are limited to only the most accessible areas; therefore, Table 5.9-11 does not represent an exhaustive list of tidepooling sites in the study region. Tidepool locations which coincide with monitoring sites shown in Maps 6.1-1 are also noted. For more information on monitoring organizations and programs please see section 6.2.

Table 5.9-11. Tide-pooling sites

Santa Barbara County	
Gaviota State Park	**Carpinteria State Beach**
El Capitan State Beach	Rincon Point
Refugio State Beach	**Santa Cruz Island - Smuggler's Cove**
Devereux Point	**Anacapa Island - Frenchy's Cove**
Arroyo Hondo	Santa Rosa Island - Becher's Bay
Leadbetter Point	**San Miguel Island - Cuyler Harbor**
Ventura County	
Emma Wood State Beach	**Mussel Shoals Beach**
Los Angeles County	
Leo Carrillo State Beach	Bluff Cove
Stairs to Beach at Latigo Beach	**Point Fermin Reserve**
Palos Verdes Estates Shoreline Preserve	Royal Palms County Beach
Malaga Cove - south end	
Orange County	
Little Corona Del Mar Beach	**Treasure Island Beach**
Crystal Cove State Park	Three Arch Cove Beach
Heisler Park State Marine Reserve	Doheny State Beach
Dana Point	San Clemente State Beach
San Diego County	
Cabrillo National Monument	**Bird Rock**
San Elijo State Beach	Sun Gold Point
Cardiff State Beach	Ocean Beach Park
Scripps Beach	**San Onofre State Beach**
La Jolla Underwater Marine Park	

Note: Bold indicates monitoring site.

Whale watching and wildlife viewing are also very popular in the study region especially due to the number of marine mammals that pass through the Santa Barbara Channel. There are at least 21 boats that participate in whale watching activities from Santa Barbara to San Diego, many of which participate in both whale ;watching and sportfishing depending upon the season. Boats out of Santa Barbara offer whale watching tours throughout the year. At least one helicopter company out of Long Beach offers tours of Santa Catalina Island and the southern coast of California.

Watching wildlife from shore is also a popular activity in the south coast study region. Pinnipeds, cetaceans, seabirds, and shorebirds can be viewed from numerous locations. Pinniped rookeries and haulouts are shown in Maps 3.2 -1c-d; Maps 3.2-1a-b give seabird diversity and colony location information. Piers and many prominent points of land can be used to view whales and other cetaceans, while estuaries in the study region are often locations used for viewing resident and migrating waterfowl, seabirds and shorebirds. Wildlife watching from shore includes fish too. From March to August on the right nights, observers can watch grunion runs on many beaches in the study region. Youth groups and schools organize trips to watch the grunion run, and a statewide

volunteer monitoring program records grunion runs and associated conditions on numerous sandy beaches (Martin et al. 2007).

5.10 Cultural Uses

The south coast study region is one of the most populated and culturally diverse regions in the country (Wolch 2001, Wolch and Zhang 2004). The discussion regarding cultural uses becomes quite complex, as there are many cultural groups that utilize the ocean and its resources. Some cultural groups known to use marine resources are the Latino and Asian-Pacific Islander communities (Wolch and Zhang 2004). The interaction and use of marine resources is probably unique for each group. These groups engage in both non-consumptive and consumptive activities along the coast. In many cases, English may not be the first language of these cultural groups, which can make it challenging to engage these communities in marine-related planning processes. However, within the study region there exists a number of groups and organizations, such as WiLDCOAST/COSTASALVAjE, Heal the Bay, Aquarium of the Pacific, and Cabrillo Marine Aquarium that provide targeted outreach and educational materials in a variety of non-English languages.

In addition to cultural groups, Native American tribes also utilize the ocean and its resources. While not considered a cultural group, their interactions with the ocean have cultural significance (Anderson 2006). These groups are discussed in more detail in sections 5.10.1, and 7.1.4.

5.10.1 First Nations of California

The first nations' maritime peoples have inhabited the south coast study region, utilizing the ocean and its marine resources, for more than 13,000 years (Erlandson et al. 2007b, Anderson 2006). At the time of the first European contacts in the 16th century, they lived in numerous and well-populated island, coastal, and inland villages. Listed in order from north to south, the Chumash, Tongva/Gabrieleño, Acjachemem/Juaneño, Luiseño, Kumeyaay and other maritime tribal groups were all interconnected by complex social and trade networks. Historical events resulted in the displacement of many first nations' people and, in many cases, they moved inland – by force or by choice (Castillo 1998). Nonetheless, these groups still live in the south coast study region today, while some may no longer live within close proximity to the ocean.

Native American people view themselves as an intrinsic part of the ecosystem (Eglash 2002). This can be seen in their interactions with the land, the ocean, and the various resources and animals. This group was able to live off the land for thousands of years, with minimal environmental consequences based on their traditional ecological knowledge (Anderson 2006, Heizer and Elsasser 1980). There are also examples where the Native people did negatively impacted the resources, such as black abalone (*Haliotis cracherodii*) on some of the Southern Channel Islands (Anderson 2006). Native people's diet includes more than twelve different shellfish and fish and it is speculated that at one time 150 types of marine fishes and shellfish made up their diets (Anderson 2006, Cordero pers comm. 2008). Some of the important species include Pacific bonito (*Sarda chiliensis*), herring, crabs, lobsters, mussels, abalone, clams, oysters, chitons, and other gastropods (Anderson 2006, Cordero pers comm. 2008).

Native people rely on the coast and ocean for a variety of important uses, such as spiritual ceremonies, songs, dances, rituals, diving, and subsistence harvesting and gathering (Anderson 2006). Historically, they manufactured tools to harvest fish and shellfish, as well as hunted sea mammals. Some of their techniques included nets, traps, and hook-and-line (Cordero pers comm. 2008). Grasses were also collected from coastal marshes to weave into baskets. In addition to living resources, Native people also utilized salt from the ocean (Anderson 2006).

Historic value is another important consideration. For example, certain areas along the coast are also highly valued for their historic significance, such as submerged burial grounds (Erlandson et al. 2007b). Extensive cobble mortar/bowls are found off the coast from Point Conception down to Tijuana (Guassac pers comm. 2008). These past and present uses are relevant in marine planning, as decisions affect such traditions.

5.11 Structural Alterations of Coastal Environments

A number of activities that occur within the south coast study region result in structural changes to coastal environments. Some of these activities are described below and may be considered in MPA planning.

5.11.1 Beach Nourishment, Grooming, and Dredging

Sandy beaches dominate the southern California coast and are important for ecological, social, and economic reasons (Dugan et al. 2000, DFG GIS habitat data). Sandy beaches are a productive habitat with high biodiversity, abundance, and biomass for many species including macroinvertebrates, shorebirds, surf fish, and crabs (Peterson and Bishop 2005, Dugan et al. 2003). In particular, macroinvertebrates are an important food source for higher trophic levels (Dugan and Hubbard 2006). These biodiversity hotspots can be affected by some beach altering activities, such as grooming and armoring (Dugan personal communication 2008).

In addition to ecological considerations, sandy beaches also support a high level of recreational and human use. These coastal areas are managed to support the variety of biological and human activities (CSMW 2008). The following subsections explore processes and management efforts that alter coastline features and discuss how those alterations may affect marine ecosystems.

Beach Nourishment

Beach nourishment (i.e., replenishment) is the term used to describe the introduction of sand onto a beach to supplement a diminished supply of natural sediment (particularly sand), for the purpose of beach restoration, enhancement or maintenance (Dean et al. 2008, CDBW 2002). Nourishment activities are commonly used to combat shoreline retreat, particularly for beaches of high recreational value, and involves transporting material from outside the area from at least one dredge site or a terrestrial source (CSMW 2008). Most beach nourishment projects in California take place in the study region and occur below mean high tide line (CSMW 2008). Beach nourishment does not address the underlying causes of beach erosion and may require installing retaining devices (e.g. jetties) to retain sand. As a result, the nourishment material can be considered sacrificial, and nourished beaches require periodic maintenance. In cases where the nourishment material does not match the natural sand, the beach might begin to erode faster than under the natural condition (CDBW and SCC 2002).

There are a number of benefits of beach nourishment. It is typically used as part of a coastal defense scheme to provide storm protection to the coastline and shorefront properties (CDBW and SCC 2002). The practice also addresses sand budget issues by introducing new sediment into the system (Dean et al. 2008). Finally, the additional beach area creates more recreational space, which is particularly important yet limited in populous areas like southern California (Dean et al. 2002, CDBW and SCC 2002).

Beach nourishment can have widespread effects on sandy beach habitat. Some studies have found that beach nourishment can adversely affect sandy beach ecosystems and nearshore coastal habitats (Peterson and Bishop 2005). Nourishment projects have been associated with reduction of

productivity, diversity, and species recruitment (Schlacher et al. 2007). One major issue is that the placement of sand fill can bury plants and organisms and alter habitats on which species depend. For example, grunion eggs are at risk of being buried and smothered if beach nourishment projects are sited in spawning areas during their incubation period (Martin, pers. comm.). However, there are monitoring studies in the study region that found replenishment projects did not have long-term environmental impacts on beach ecosystems, such as the San Diego Regional Beach Sand Project involving 12 sites between Oceanside and Imperial Beach (EDAW 2008). In that particular study, beach nourishment did not create turbidity, harm grunion spawning, or have adverse impacts on offshore habitat, such as kelp, rocky intertidal, or subtidal habitat (EDAW 2008).

Many of the beaches in the study region have beach nourishment projects. To date, there have been almost 600 beach nourishment projects in the study region (Coyne 2000).

Beach Grooming

Beach grooming is an aesthetic management practice of removing loose debris (natural and unnatural) from sandy beaches. Much of the southern California mainland coast (>100 miles) and over 45% of the beaches are mechanically groomed to remove macrophyte wrack and trash at least seasonally (Dugan et al. 2003). There are many approaches to grooming, including: the use of heavy equipment to remove cobbles, kelp plants, carrion and large woody debris and more specialized grooming using machines that rake, sift, and smooth. The disposal of wrack also varies and can include burial in the intertidal or supralittoral zones, removal from beach to land fills or transfer stations, and deposition downcoast.

This management practice can alter the beach ecosystem and have effects on invertebrate macrofauna community by reducing the food and nutrient source (drift macrophytes). It not only reduces community abundance but also reduces species richness (Dugan et al. 2003). Grunion, a fish species that spawns on sandy beaches, are also affected because their eggs can be exposed or crushed by the equipment during grooming (Martin et al. 2006). In the study region, over 160 km of sandy beaches are regularly groomed (Dugan et al. 2003). However, at some beaches, grooming practices have been modified slightly to prevent some of the more extreme environmental impacts (Martin, pers. comm.).

Dredging

Dredging is an excavation activity used in coastal waterways and ports to keep them navigable by deepening channels (SWRCB 2003). It involves the physical removal of substrate, where large equipment gathers up bottom sediment and deposits the dredge spoils outside the waterway in deeper waters (USEPA 2008a). Dredging is also used to import sediment in beach nourishment projects. There are environmental consequences associated with dredging, which include: general disturbance to aquatic ecosystems, reduction in population and biodiversity of benthic communities, mortality of fish species, loss of spawning areas, and damage or loss of habitat (Newell, Seiderer, and Hitchcock 1998). These impacts affect both the area where material is removed and the area where it is deposited. However, the impacts can be minimized with proper management plans. Southern California has a regional dredging team that develops Dredge Material Management Plans, which include efforts to minimize ecological impacts (National Dredge Team 1998). In addition, dredge activities are regulated under the Clean Water Act Section 401 and under California SWRCB's Water Quality Order (SWRCB 2003).

5.11.2 Coastal Structures

The location and impacts of coastal structures may need to be considered when identifying sites for marine protected areas. Some structures can enhance marine ecosystems, while others have been found to have adverse impacts on marine living resources and habitats. The key types of coastal structures discussed in the following subsections are coastal armoring, artificial reefs, and underwater cables.

Coastal Armoring

Armoring is a technique used to protect coastal development from storms, waves, and other erosional forces. Hard structures, such as seawalls and rock revetments, are placed in front of beaches and coastal properties to prevent further erosion. In southern California, coastal armoring has been extensively used to counteract the receding coastline by local and state authorities and private landowners (Dugan and Hubbard 2006). Approximately 298 miles, or 29%, of the study region is armored (DFG GIS data). In some areas, such as Ventura County (65%), a greater percentage of the coast is lined with hard structures (Griggs 1998).

Environmental impacts of coastal armoring may be both physical and ecological (Dugan and Hubbard 2006). Once a structure is in place, it may exacerbate beach erosion and may prevent natural sand replenishment (Dugan et al. 2008). Armoring also may cause a loss of some habitats, loss or reduction of the intertidal zone, change in beach wrack composition, and reduction in macroinvertebrates and other marine species (Dugan and Hubbard 2006).

Artificial Reefs

A number of artificial reef structures exist within the south coast study region (see map 3.1 – 2). These structures are intentionally sunk in the ocean to provide hard-bottom habitat (NERRS 2008). Common uses of artificial reefs are for fisheries enhancement and as an environmental mitigation tool (Reed et al. 2006). In the south coast study region, there are at least 30 artificial reefs (DFG 2001) and at least 25 of these reef structures were planned and constructed by DFG as part of an artificial reef program that began in 1958. These artificial reefs are designed to mimic rocky reef habitats and have been constructed from a variety of materials. Some of the initial reefs were made from sunken automobiles (Paradise Cove in 1958) and boxcars (Redondo Beach in 1958). Other efforts utilized tires or sunken ships, which proved less successful. Quarry rock and concrete boxes have been used in the most recent efforts and have been shown to attract and concentrate marine species. Since 1980, many of these quarry rock/concrete reefs have been constructed, including artificial reefs at Pendleton, Carlsbad, near the California/Mexico border (international artificial reef), Bolsa Chica, and Mission Bay (Bedford 2001). The most significant artificial reef project in recent years is the San Onofre Nuclear Generation Station (SONGS) Mitigation Project, offshore from San Clemente in Orange County. In 1999, an experimental reef covering an area of over 22 acres was completed and monitoring for the project began (CCC 2006). Currently, expansion of this initial reef is underway with the expected size being 150 total acres.

There are potential benefits of reefs, such as creating new habitat and the potential to increase localized fish stocks (Reed et al. 2006, Kruer and Causey 2005, DFG 2001). However, artificial reefs may also pose risks to marine ecosystems. Studies have found that artificial reefs can actually decrease fish stocks because the fishing effort increases around the reef (Grossman, Jones and Seaman 1997). All these considerations are taken into account before an artificial reef can be placed in the ocean. An artificial reef cannot be constructed until it has gone through an extensive permit process (CCC 2007). Proposed projects must demonstrate how they minimize adverse environmental impacts.

Underwater Cables

Underwater fiber optic cables exist offshore in the south coast study region. Cables are buried in sandy bottoms, anchored to the substrate where the bottom is rocky. Cables can only be installed offshore upon review and approval of a coastal development permit by the California Coastal Commission (State of California 2008). For example, the U.S. Navy has two optic cable lines that extend between Point Mugu and San Nicholas Island in the study region. In the installation, maintenance, and repair of cables can pose potential impacts offshore to marine resources, such as marine species that reside near proposed site and water quality. There are also onshore considerations, where construction activities may result in erosion, destabilization, damage habitat, and sedimentation. The California Coastal Commission (CCC) considers environmental impacts when reviewing proposed projects to install underwater cables. (CCC 2005a).

5.11.3 Coastal Lighting

Coastal lighting is a complex issue, which involves the consideration of beach lighting and its effects on marine life. The issue lacks sufficient data to draw conclusions on environmental impact (Martin, pers comm, 2008). In locations outside of the study region, artificial lighting on the shoreline has been found to have negative affects on certain species related to their survival or reproductive activities. For example, in Florida scientists determined that artificial lighting causes turtle hatchlings to move towards the light, instead of towards the ocean (Salmon et al 1995). Coastal lighting is used in several places throughout the study region. However, there is little known about effects of coastal lighting on species that inhabit California's beaches. The California Coastal Commission has created special conditions to minimize lighting impacts on marine and fauna resource when reviewing permits that involve coastal lighting (CCC 2008b).

5.12 Navigation

5.12.1 Lighthouses and Navigation Aids

The study region has a rich maritime heritage including lighthouses which are both inactive and active today (Table 5.12-1). These lighthouses serve not only as navigational aids, but are also popular tourist destinations.

Table 5.12-1. Lighthouses listed in alphabetical order

Lighthouse	Location	County	Status
Anacapa Island	Entrance to Santa Barbara Channel	Ventura	Active Aid to Navigation
Long Beach	San Pedro Middle Breakwater of Long Beach Harbor[a]	Los Angeles	Active Aid to Navigation
Los Angeles Harbor	San Pedro Breakwater	Los Angeles	Active Aid to Navigation
Point Conception	West Entrance to Santa Barbara Channel	Santa Barbara	Active Aid to Navigation
Santa Barbara	Santa Barbara Point	Santa Barbara	Active Aid to Navigation
Point Fermin	Point Fermin/San Pedro Harbor	Los Angeles	Inactive
Port Hueneme	East Entrance to Santa Barbara Channel	Ventura	Active Aid to Navigation
Point Loma (New)	Southern End of Point Loma	San Diego	Active Aid to Navigation
Point Loma (Old)	Southern End of Point Loma	San Diego	Inactive
Point Vicente	Palos Verdes/North of Los Angeles Harbor	Los Angeles	Active Aid to Navigation

Source: www.nps.gov/history/maritime/light/ca.htm.

Note: [a] Controlled from Los Angeles Harbor Light.

In addition, the U.S. Coast Guard (USCG) maintains lights, sound signals, buoys, day beacons, and other navigational aids at the Channel Islands, and waters within the study region. A listing of these navigation aids can be found at www.navcen.uscg.gov/pubs/LightLists/v6COMPLETE.pdf.

5.12.2 Vessel Traffic

The busiest port complexes in the Untited Sates are located in the south coast study region. The Port of Los Angeles complex occupies 7,500 acres (30 km^2) of land and water along 43 miles (69 km) of waterfront (http://www.portoflosangeles.org/about/facts.asp). The container volume was 7.4 million twenty-foot equivalent units in fiscal year 2004 and 6.7 million twenty-foot equivalent units in fiscal year 2003. The Port of Los Angeles is the busiest port in the United States by container volume, the eighth-busiest container port internationally (fifth-busiest when combined with the neighboring Port of Long Beach). Alone, the Port of Long Beach is the second-busiest seaport in the United States and the tenth busiest port internationally. The third busiest port complex in the south coast study region is the San Diego Harbor. This port handled 3.3 million metric tons of total cargo in fiscal year 2007-2008 (July 1 through June 30 the fiscal year). The San Diego Harbor also has a large volume of military vessel traffic.

Substantial volumes of crude oil and petroleum products are transported off the California coast from Alaska, from foreign countries, and between California production sources. The Los Angeles/Long Beach and San Francisco Bay harbors receive a majority of the oil imported into the United States, and have a large number of refining facilities. Unfortunately, collisions or ship groundings off the California coast, or within its congested ports or harbor areas, have the potential to occur as a result of these operations.

Vessel Accidents

The most recent major vessel collision off the California coast occurred in 1987 when the Atlantic Wing (a car carrier) and the Pac Baroness (a dry bulk carrier) collided off Point Conception, sinking the Pac Baroness. The spill of fuel oil was relatively small, but a cargo of toxic copper pellets went down with the ship. The decade of the 1990's began with two major spills in southern California that occurred during routine mooring operations at offshore marine terminals. In 1990, the tanker vessel American Trader grounded on its own anchor during mooring operations at the Golden West marine terminal off Huntington Beach. This accident caused an oil spill which affected a substantial portion of the Orange County coastline, but gained even more notoriety because it occurred within months of the tanker vessel Exxon Valdez grounding in Alaska. In 1991, a mooring accident involving the tanker vessel Omi Dynachem occurred at the Chevron marine oil terminal off El Segundo. During mooring operations, the tanker's anchor got hooked on a 26-inch undersea pipeline and ruptured it, spilling oil into the nearshore ocean waters.

State and Federal Legislation

In the aftermath of Alaska's Exxon Valdez (1989) and California's American Trader (1990) oil spills, the California legislature passed the Oil Spill Prevention and Response Act of 1990 (Chapter 1248, Stats.1990; commonly referred to as SB (Senate Bill) 2040) and the U.S. Congress passed the Oil Pollution Act of 1990 (33 U.S.C. 2701 to 2761 - and other related sections). Both the state and federal legislation address a variety of issues regarding vessel traffic safety, emphasizing the need to prevent spills through the implementation of marine terminal operation standards and inspections, port safety measures, and overall vessel traffic safety. The DFG's Office of Spill Prevention and Response (OSPR; formerly known as the Office of Oil Spill Prevention and Response) is the lead agency for implementing SB 2040 under the direction of its Administrator. The State Lands Commission operates the State's marine terminal inspection and monitoring program, as required by SB 2040, which is coordinated with OSPR and the USCG.

Navigation Designations and Organizations

A variety of measures have been established to help reduce the risk of vessel mishaps off the coast or within California ports. To facilitate a better understanding of the options for improving vessel traffic safety, several terms and organizations are described below.

Areas to be Avoided: There are currently two internationally adopted "Areas to be Avoided" off the Pacific coast which restrict the movement of tankers and barges carrying oil as cargo. The Areas to be Avoided off the California coast include recommendations that all cargo carrying ships avoid the area which encompasses the Channel Islands National Marine Sanctuary, except those bound to and from ports at one of the islands.

Harbor Safety Committees: Senate Bill 2040 established harbor safety committees for the harbors of San Diego, Los Angeles/Long Beach, Hueneme, San Francisco, and Humboldt. With representatives from shipping, fishing, tug operation, vessel pilot, government, and environmental organizations, these committees have developed harbor safety plans for each port, identifying key safety issues and making recommendations to the OSPR Administrator. Issues facing these committees include questions regarding the need for escort tugs, required capabilities of escort tugs, and the need for new or enhanced vessel traffic information systems to monitor and advise vessel traffic.

Precautionary Areas: Precautionary areas are designated in congested areas near harbor entrances to set speed limits, prescribe vessel routing, or establish other safety precautions for ships entering or departing a port.

Safety Fairways: Offshore waters in high-traffic areas can be designated as safety fairways to prohibit the placement of surface structures such as oil platforms. The Army Corps of Engineers is prohibited from issuing permits for surface structures within safety fairways, which are frequently located between a port and the entry into a Traffic Separation Scheme.

Traffic Separation Schemes: A "Traffic Separation Scheme" is an internationally recognized vessel routing designation which separates opposing flows of vessel traffic into lanes, including a zone between lanes where traffic is to be avoided (Map 5.6-3). Traffic Separation Schemes have been designated to help direct offshore vessel traffic along portions of the California coastline such as the Santa Barbara Channel. Vessels are not required to use any designated Traffic Separation Scheme, but failure to use one, if available, would be a major factor for determining liability in the event of a collision. Traffic Separation Scheme designations are most often in international waters and proposed by the USCG, but must be approved by the International Maritime Organization which is part of the United Nations.

Vessel Traffic Information Services: Vessel Traffic Service or Vessel Traffic Information Service refer to shipping services operated by the USCG or public-private sector consortiums. These services monitor traffic in both approach and departure lanes, as well as internal movement within harbor areas. These services use radar, radio, and visual inputs to gather real-time vessel traffic information and broadcast traffic advisories and summaries to assist mariners. California has one Vessel Traffic Service located in San Francisco Bay which is federally funded and operated by the USCG. A Vessel Traffic Information Service is located at the entrance of the Ports of Los Angeles/Long Beach which is funded and operated through a public/private partnership.

Information for Section 5.12.2 was obtained from the California Environmental Resources Evaluation System (CERES 2006b).

6. Academic Institutions, Research, Public Outreach, and Education

Academic and research institutions, government agencies, and non-governmental organizations in the south coast study region contribute to marine research, education, and public outreach. Locations of research institutions and long-term monitoring sites are shown on Map 6.1-1.

6.1 Major Marine Research Institutions in the South Coast Study Region

Major academic institutions that conduct research in coastal and marine ecosystems in southern California include several campuses of the University of California, including Los Angeles, San Diego, and Santa Barbara; several campuses of the California State University, including Channel Islands, Dominguez Hills, Fullerton, Long Beach, Los Angeles, Northridge, and San Diego; and private colleges, including Occidental College, Pepperdine University, and the University of Southern California. The Ocean Studies Institute is a consortium of California State Universities who decided to pool their resources to more effectively explore the ocean and coastal regions. Southern California Marine Institute is an alliance of 12 universities in southern California that support marine research, monitoring and education.

Marine laboratories in the south coast study region include Scripps Institution of Oceanography, University of Southern California's Wrigley Center, University of California, Santa Barbara's Marine Science Institute, Long Beach Marine Institute, Southern California Marine Institute, Pfleger Institute for Environmental Research, and Marine Applied Research & Exploration. Southern California Coastal Water Research Program coordinates and conducts monitoring of coastal ecology, water quality and shoreline microbiology in the south coast study region. The Southern California Coastal Ocean Observing System is a collaborative network of research institutions and laboratories, which are conducting research on a variety of topics, including water quality, fisheries management, climate change, and predicting and mitigating coastal hazards. Ocean research using remote sensing is conducted at the Jet Propulsion Laboratory in Pasadena.

Several government agencies contribute to research in the south coast study region, including DFG, California Sea Grant, Santa Monica Bay Restoration Commission, NOAA Channel Islands National Marine Sanctuary, Channel Islands National Park, Southwest Fisheries Science Center, Tijuana River National Estuarine Research Reserve, NOAA National Marine Fisheries Service, and the U.S. Geological Survey.

Non-governmental organizations also contribute to research in the south coast study region, including Reef Check California, Reef Environmental Education Foundation, Santa Barbara Channelkeeper, Santa Monica Baykeeper, Heal the Bay, Catalina Island Conservancy, San Diego Coastkeeper, Orange County Coastkeeper, the Surfrider Foundation, WiLDCOAST, Natural Resources Defense Council, the Ocean Conservancy, and the Marine Mammal Care Center at Fort MacArthur, among many others.

6.2 Scientific Research and Collecting

Scientific research conducted within the south coast study region is diverse, ranging from intertidal ecology to studies of the pelagic zone and deep ocean (Table 6.2-1). Much of the research in the south coast study region is concentrated around marine laboratories and universities.

California State University, Monterey Bay, Seafloor Mapping Laboratory has mapped habitats in a majority of the south coast study region using sidescan sonar.

The Marine Science Institute at the University of California, Santa Barbara supports research that spans 14 disciplines, including marine ecology, coastal/nearshore oceanography, environmental toxicology, biochemistry, molecular biology, physiology, ocean engineering, and marine biotechnology. The Marine Science Institute is home to the Channel Islands Research Program with funding from the Tatman Foundation. This program has conducted 182 multi-day expeditions to the islands since 1978, with surveys emphasizing the distribution and abundance of nearshore plants, invertebrates, and fishes. Specific monitoring projects include a sea-urchin-dominated ecosystem at Anacapa Island, a mantis shrimp population and seastar populations at Santa Catalina Island, and fish surveys at all eight Channel Islands. Centers associated with the Marine Science Institute include the Coastal Research Institute, the Marine Biotechnology Center, the Ocean and Coastal Policy Center, and the National Center for Ecological Analysis and Synthesis.

The University of California, Santa Barbara hosts the Santa Barbara Coastal Long Term Ecological Research project, which is part of the US Long Term Ecological Research Network. Santa Barbara Coastal Long Term Ecological Research focuses on processing and transport of nutrients to giant kelp forests, and the impacts of climate change/variability and disturbance on nearshore population dynamics, community structure, and ecosystem processes. Available data include information about current and hydrography from moorings and cruises, profiles of seawater constituents, climate data, stream discharge and chemistry, stable isotopes, benthic cover and temperature, and kelp, invertebrate and fish abundance and density; and macroalgal wrack. (http://www.lternet.edu/sites/sbc/)

Jet Propulsion Laboratory is a NASA center staffed and managed by Caltech, a private university. Jet Propulsion Laboratory has 20 spacecraft conducting active missions. Scientists at Jet Propulsion Laboratory launched TOPEX/Poseidon in 1992 to provide a three-year global view of the Earth's oceans, improve understanding of ocean current and improve forecasting of global climate. Jason 1, launched in 2001, monitors global ocean circulation, investigates the links between oceans and atmosphere, improves global climate predictions, and monitors events such as El Niño. Ocean Surface Topography Mission (OSTM)/Jason 2, launched in 2008, measures ocean surface topography, ocean circulation, sea level, and tides. (www.jpl.nasa.gov)

The Los Angeles Audubon conducts bird surveys for Western Snowy Plovers on Los Angeles County beaches and California Least Terns at Venice Beach. The Audubon also provides grant monies for scientists researching birds, including birds dependent on marine ecosystems such as the Western Snowy Plover and the California Least Tern. They also support and provide education, conservation, and restoration opportunities.

The Ocean Conservation Society, since 1996, has been studying dolphins in the Southern California Bight for their L.A. Dolphin Project. They have focused their studies on the inshore population of dolphins. The Ocean Conservation Society maintains the 47 foot Research Vessel Annie Jo.

PISCO (Partnership for Interdisciplinary Studies of Coastal Oceans) is a large-scale interdisciplinary marine research program based at four academic institutions on the U.S. west coast, including the University of California, Santa Barbara. Interdisciplinary research focuses on how currents, upwelling, and other physical and ecological processes affect the plants and animals of coastal marine ecosystems; how coastal ocean ecosystems respond to shifts in water temperature, currents, and other factors that may vary with global climate change; and how ocean circulation affects the dispersal of marine organisms in their earliest larval stages. PISCO's intertidal monitoring extends throughout southern California and subtidal monitoring includes the northern part of the study region and the northern Channel Islands. (www.piscoweb.org)

Scripps Institution of Oceanography supports more than 300 interdisciplinary research programs applied to questions about how the physical ocean environment affects life and the consequences of

changes tied to global climate, ocean pollution and human activities. Research activities at Scripps include the study of atmosphere and climate, biology, chemistry, engineering, geosciences, oceanography, and physics. Scripps is also home to the California Current Ecosystem Long Term Ecological Research, which investigates the effects of El Niño and lower-frequency forcing and the role of top-down impacts on pelagic ecosystem of the California Current. (http://cce.lternet.edu/) Scripps maintains four research vessels: R/V Roger Revelle, R/V Melville, R/V New Horizon, and R/V Robert Gordon Sproul.

The Southern California Coastal Ocean Observing System, which is a collaborative network of research institutions and laboratories, conducts research policy- and management-relevant topics, such as water quality, fisheries management, climate change, and predicting and mitigating coastal hazards, in the Southern California Bight. Available data products include information from automated and manual shore stations, bathymetry, moorings, meteorological observations, winds and rainfalls forecasts, satellite imagery, shoreline water quality, surface current mapping, wave conditions, cast data from ships and gliders, chlorophyll and harmful algal blooms, plume tracking, ROMS model output and information about ports and harbors. (http://www.sccoos.org/)

Southern California Coastal Water Research Project was formed in 1969 as a joint powers agency to gather information about effects of wastewater and other discharges to the southern California coastal marine environment. Southern California Coastal Water Research Project coordinated monitoring throughout the Southern California Bight in 1994, 1998, 2003, and 2008. Regional monitoring was conducted primarily by local municipalities working cooperatively toward a regional assessment of coastal conditions. Participants used standardized methods throughout the region once every five years. In 2003, the monitoring effort focused on coastal ecology, water quality and shoreline microbiology. The 2009 Research Plan focuses on release, transfer, fate, and effects of contaminants; effects of stormwater runoff on aquatic ecosystems; and microbiology at beach environments and detection of harmful pathogens. Data are available on sediment toxicity, shoreline microbiology, fish and invertebrate abundance and biomass, and tissue chemistry. (http://www.sccwrp.org/)

Southern California Marine Institute supports marine research, monitoring and education. Southern California Marine Institute maintains two research vessels, R/V Sea Watch and R/V Yellowfin, for the purpose of research and education. For several years, Southern California Marine Institute has served as a technical advisor to the Los Angeles Regional Citizen Monitoring Steering Team to collaborate on water quality monitoring. Southern California Marine Institute works with scientists and volunteers to conduct a Seasonal Bacteria Study to quantify the amount of harmful bacteria in 13 sites located near or in the LA/Long Beach harbor complex and 20 sites in the greater Los Angeles basin. (http://scmi.us/)

Research at the Southwest Fisheries Science Center is focused on population dynamics, ecological linkages, and economics of Pacific coast groundfish, including rockfishes, flatfishes, Pacific whiting, sablefish and lingcod, and Pacific salmon, including coho, chinook and steelhead. Southwest Fisheries Science Center scientists conduct aerial surveys of pinnipeds and cetaceans.

The University of Southern California Philip K. Wrigley Institute for Environmental Studies operates the Wrigley Marine Science Center on Santa Catalina Island. The Wrigley Marine Science Center supports eight laboratories that accommodate up to 24 researchers and groups of up to 60 students. Research includes the San Pedro Ocean Time Series, basic hydrographic, nutrient and biological measurements over a 900 meter water column; University of Southern California fish surveys, research on larval growth and development, human health and ocean recreation; ocean biology, plankton ecology and global climate (National Science Foundation biocomplexity), population genetics of marine animals, biocomplexity, microbial observatories and ecosystems, environmental assessment, ocean biogeochemistry, harmful algal blooms, geobiology, and international fisheries management. (http://wrigley.usc.edu/)

Hubbs Sea World Research Institute conducts research on marine ecology, physiology, bioacoustics, and aquaculture. Research projects have focused on population dynamics of northern elephant seals; energetics of manatees, sea lions, and gray whales; the movements and migrations of Weddell seals, monk seals, whale shark, fishes, and leatherback turtles; the reproduction and physiology of manatees; bioacoustics of polar bears, killer whales and manatees; polar bear acoustic ecology; and white seabass and rockfish enhancement.

6.1.1 Government Agencies

Government agencies in the south coast study region sponsor, coordinate, collaborate, and conduct scientific research.

The Channel Islands National Marine Sanctuary collaborates to support research projects conducted by scientists at a variety of research institutions in southern California. Monitoring efforts have focused on habitat mapping, kelp forest monitoring, ROV surveys to assess finfish abundance inside and outside of marine reserves, acoustic monitoring to estimate dispersal by tagged fish, seabird reproductive success and population size, and white abalone restoration and monitoring. The Sanctuary Aerial Monitoring and Spatial Analysis Program, initiated in 1998, monitors locations of vessels, marine mammals and spilled oil or other marine debris in the Channel Islands region. The sanctuary also supports the research vessel R/V Shearwater. The Channel Islands National Marine Sanctuary is also one of five National Marine Sanctuaries on the west coast of the United States that participate in the West Coast Observation Project, which gathers data on ocean temperature, currents, oxygen, salinity, wind speed, turbidity, fluorescence, and other indicators. (http://www.mbnms-simon.org/sections/obs/nmsp_wco.php) (http://channelislands.noaa.gov/)

Channel Islands National Park maintains monitoring and research programs focused on native plants, kelp forests, rocky intertidal habitats, sandy beaches, seabirds and bald eagles, and Santa Cruz Island foxes, among other topics. Since 1982, park scientists have conducted annual surveys of algal, invertebrate, and fish abundances at 16 different kelp forest sites around the five northern Channel Islands as part of the Kelp Forest Monitoring Program. (www.nps.gov/chis/)

Cabrillo National Monument has had marine research conducted there since the 1970s, and has had a rocky intertidal monitoring program since 1990.

The DFG is initiating the Resource Assessment Program to inventory, monitor, and assess the distribution and abundance of priority species, habitats, and natural communities in California, bringing together many efforts to collect, compile, and disseminate information. (www.dfg.ca.gov/regions/region3.html/) The DFG has also partnered with the California Wetfish Producers Association and NOAA on a market squid collaborative research program. The DFG has also collaborated with the Sea Urchin Advisory Committee, Sea Grant, Marine Science Institute, University of California, Santa Barbara, and commercial urchin divers in the Sea Urchin Larval Settlement Monitoring Project (ongoing since 1990).

California Sea Grant, administered by the University of California, focuses on research, conservation and use of coastal and marine resources. The statewide program works in partnership with scientists and engineers at public and private universities, and with industry, government, and the public to conduct research on water quality, aquaculture, fisheries, fish habitat, and non-indigenous species.
(http://cemarin.ucdavis.edu/Agriculture_and_Natural_Resources123/Marine_Resources.htm)
Each year, the University of Southern California Sea Grant Program (NOAA) runs a peer-reviewed competition to disperse about $1 million in federal funds on the theme “Urban Ocean.”

The U.S. Geological Survey is engaged in research and dissemination of information about marine ecosystems in southern California, specifically seafloor mapping around the Channel Islands region.

Santa Monica Bay Restoration Commission is an independent state organization focused on pollution prevention and habitat restoration, regional monitoring, and funding programs to raise public awareness about the Santa Monica Bay. The Commission has supported research on a variety of topics including marine habitats, wetlands, airborne toxic contaminants, pathogens and other pollutants in stormwater, and health risks associated with swimming and consumption of seafood.

The National Estuarine Research Reserve System supports long-term research and monitoring by staff, visiting scientists, and graduate students, and aims to protect estuarine sites in all biogeographic regions of the United States. The Tijuana River National Estuarine Research Reserve was established as a federal-state partnership between NOAA and the California Department of Parks and Recreation to act as a representative of the estuarine systems present in the Southern California Bight. Tijuana River National Estuarine Research Reserve staff, volunteers, and students conduct research, restoration, and monitoring on water quality, plants, fish, amphibians, reptiles, invertebrates, and birds at the Tijuana Estuary.

The US Navy conducts research and participates in joint research efforts with other organizations such as the San Diego Unified Port District and the US Coast Guard. Navy efforts include research on underwater technologies used by the Navy, biological surveys of San Diego Bay and offshore marine resources, eelgrass bed restoration, meteorology observations, marine mammal acoustic studies, and long-term water and sediment quality monitoring of dredging project sites and stormwater point sources. Outreach efforts are aimed at educating the public about the variety of research and environmental protection work the Navy conducts.

The Minerals Management Service started the Pacific Outer Continental Shelf Region Environmental Studies Program in 1973 and has cumulatively funded 189 studies at a value of almost $124 million. Many of these studies concern the Southern California Bight and topics include physical oceanography, biology, protected species, social sciences, and baseline studies. For example, the Minerals Management Service funds PISCO efforts. The Coastal Marine Institute, housed at the University of California, Santa Barbara, is cooperative research and research training program involving the Minerals Management Service, the State of California and the University of California.

6.1.2 Non-Governmental Organizations

Several non-governmental organizations also contribute to research in the south coast study region. A few examples of these organizations include Catalina Island Conservancy, Orange County Coastkeeper, Reef Check California, Santa Barbara Channelkeeper and Santa Monica Baykeeper (note that this is not a comprehensive list).

Catalina Island Conservancy engages in ecological restoration on Catalina Island through the process of removal or exclusion of invasive non-native species; monitoring of sensitive organisms and habitats; and propagation of native plants. The Conservancy has supported research projects on bald eagles, Catalina Island foxes and shrews, and oak woodlands and other sensitive native plants.

Orange County Coastkeeper conducts extensive water monitoring throughout the Santa Ana River Watershed and conducts marine research including water, sediment and benthic organism monitoring in Newport and Huntington Harbors. Orange County Coastkeeper works with local

agencies to reduce the use of copper antifouling paint in Newport Harbor and with the Santa Ana Regional Water Quality Control Board to collect metals data in Newport Bay.

Reef Check California, a program of the international Reef Check Foundation, works with volunteer divers (citizen scientists) to survey nearshore reefs. The purpose of surveys is to assess relative abundance and size distribution of target species, including fish, invertebrates, and algae, and to evaluate changes over time. The volunteers are trained in a rigorous scientific methodology for data collection that has been developed with numerous leading scientists and sanctioned by the DFG through a Memorandum of Understanding.

Santa Barbara Channelkeeper monitors local watersheds to identify sources of pollution and train local citizens. Channelkeeper trains volunteers to monitor water quality in the Ventura River and Goleta Slough watersheds. Channelkeeper works with Channel Islands National Marine Sanctuary to evaluate impacts of recreational boaters on water quality around the Channel Islands. Channelkeeper also participates in the annual “California Coast-wide Snapshot Day” by organizing local volunteers to conduct water quality monitoring.

The Citizen Watershed Monitors of Orange County program trains and organizes local environmental groups and colleges to participate in two annual volunteer monitoring events: the Coastwide Snapshot Day and World Water Monitoring Day.

Santa Monica Baykeeper protects and restores Santa Monica and San Pedro bays through enforcement, fieldwork, and community action. Baykeeper engages volunteers to restore kelp forests and monitor storm drains.

Cooperative Programs

Programs developed as partnerships between universities, laboratories, scientists, government agencies, and non-governmental organizations also contribute to research in the south coast study region.

California Cooperative Oceanic Fisheries Investigations (CalCOFI) is a partnership of the DFG, the NOAA Fisheries Service and the Scripps Institution of Oceanography. The investigations focus on the ocean off the coast of California, including physical and chemical properties of the California Current System and organisms that live there. Quarterly, at each of 75 stations off southern California, CalCOFI scientists measure temperature, salinity, oxygen, currents, nutrients, primary production, phyto- and zooplankton biomass and diversity, and distribution and abundance of fish eggs and larvae, marine mammals, and seabirds. (www.calcofi.org)

The Cooperative Research and Assessment of Nearshore Ecosystems (CRANE) is a California statewide monitoring program for rocky reefs and kelp forests developed by the DFG in cooperation with other research scientists. The program was implemented in 2004 but has not continued at all sites. (www.dfg.ca.gov/regions/region3.html/)

Grunion Greeters has been operating since 2002, and monitors sandy shores for grunion spawning. Hundreds of trained volunteer citizen scientists have monitored sandy shores statewide for grunion spawning runs every year during the closed season, April and May. The organization is based at Pepperdine University and partners with the National Marine Fisheries Service- Southwest Region, Habitat Conservation Division, numerous government agencies, environmental organizations, aquariums, and academic institutions. (http://www.Grunion.org)

The Multi-Agency Rocky Intertidal Network (MARINe), a partnership of local, state, and federal agencies, universities, and private organizations, monitors rocky intertidal life at 98 sites along the

west coast (45 in southern California), including the islands, on a long-term basis. Many of the sites have been monitored for 15-20 years, and some as long as 27 years. Core biannual surveys follow abundance trends in key species assemblages. MARINe cooperates with biodiversity surveys conducted by PISCO which map rocky intertidal habitats and derive comprehensive species diversity and abundance data at 119 sites from Alaska to Mexico (38 in southern California). (www.marine.gov)

Plumes and Blooms is a joint collaboration among University of California, Santa Barbara faculty, students and staff, researchers at the Institute of Computational Earth System Science, NOAA researchers at the Coastal Services Center (Charleston, SC) and the NOAA sanctuary managers of the Channel Islands National Marine Sanctuary. Since August 1996, scientists have conducted monthly research cruises to collect measurements of temperature and salinity, ocean color spectra, and water column profiles of red light transmission and chlorophyll fluorescence (indexes of suspended particulate load and phytoplankton abundance) in the Santa Barbara Channel. (http://www.icess.ucsb.edu/PnB/PnB.html)

6.3 Public Outreach and Education

Local, state, and federal agencies and private institutes throughout the south coast study region offer public outreach and education about coastal and marine ecosystems. Appendix G lists some key academic, research, and education institutions in the south coast study region that focus on coastal or marine ecosystems, including:

- Public education and student and teacher training are available through aquariums in the south coast study region, including the Aquarium of the Pacific, Cabrillo Marine Aquarium, the Ocean Institute, Sea World, Stephen Birch Aquarium, and the Ty Warner Sea Center as well as through smaller community-driven aquariums including Santa Monica Pier Aquarium, the SEA Lab, and the Roundhouse Aquarium.
- Dedicated education programs, such as California Center for Ocean Sciences Education Excellence and Southwest Marine and Aquatic Educators' Association develop, distribute, and train teachers to use curricula on ocean science, linked to California state teaching standards.
- University and graduate education in marine science, management, and conservation is available through numerous educational institutions including those listed in 6.1.
- Marine research institutions, such as the Marine Science Institute at UCSB, the Scripps Institution of Oceanography, and Wrigley Institute for Environmental Studies, provide opportunities for hands-on learning in the marine environment for students, teachers, and the public.
- State and federal agencies, including the California Coastal Commission, Channel Islands National Marine Sanctuary, Channel Islands National Park, and Cabrillo National Monument, provide opportunities for public education, K-12 education, and training for teachers and docents.

Aquariums

Public education is the primary focus of aquariums.

Cabrillo Marine Aquarium in San Pedro offers public classes, marine laboratory workshops, and field trips for all ages as well as a research library that offers resources related to marine science.

Hubbs Sea World Research Institute in San Diego provides research opportunities, training and hands-on experience for new scientists and teachers. Institute scientists give public lectures throughout the U.S. and the world. Sea World provides opportunities for children and adults to observe and learn about marine animals.

Aquarium of the Pacific in Long Beach provides programs for children, adults, and families; educational tours of the aquarium; and online resources, including dozens of activities that meet California science standards for K-12.

Santa Monica Pier Aquarium offers school groups, families and visitors a unique view into the ocean world through interactive displays, tide pool touch tanks and several large habitat tanks featuring animals and habitats found in the Santa Monica Bay. Families can also learn about marine conservation and other environmental issues at the Santa Monica Pier Aquarium by watching short educational films, participating in crafts, and visiting the Kid's Corner.

The Ocean Institute is an educational facility specializing in marine and social science programs. The institute maintains a learning center for K-3 with marine life tanks, wet-tables, video-microscopes, a digital imaging lab, and a children's theater. The institute also has an at-sea learning center focused on grades 4-6. The institute offers curricula on a range of topics in ocean science, based on California state standards, for K-12, as well as summer camps and shipboard excursions on three vessels: Pilgrim, Spirit of Dana Point and R/V Sea Explorer. A mobile educational van brings ocean science to special-needs and underserved students.

The Stephen Birch Aquarium, affiliated with Scripps Institution of Oceanography, offers school programs for pre-school through 12th-grade students to learn about the ocean, earth, and atmosphere. Elementary school teachers, science specialists, and informal educators can participate in workshops at the Birch Aquarium that provide inquiry-based training designed to meet California science standards.

The Santa Barbara Museum of Natural History Ty Warner Sea Center engages visitors of all ages in interactive exhibits and scientific research activities, such as sampling and testing ocean water, studying animal behavior, and examining microscopic marine life.

The Roundhouse Aquarium in Manhattan Beach promotes the public study of, and interest in, the oceans, tidelands and beaches of southern California. The aquarium educates visitors with live exhibits, and offers K-12 programming, summer camps, and field trips.

The SEA Lab is a hands-on coastal science education center for K-12 students in Redondo Beach that employs and mentors young adults for the purpose of instilling the message of stewardship of our natural resources. Managed by the Los Angeles Conservation Corps, the SEA Lab focuses on building awareness of the direct link between the urban and ocean environments through educational programs and community service projects. College students operate all of the activities with aid from more than 100 dedicated local volunteers.

Dedicated Education Programs

Dedicated education programs provide educational materials linked to California state teaching standards, including curricula, lab and field activities, and provide opportunities for teachers to learn how to integrate ocean science into their classrooms.

The California Center for Ocean Sciences Education Excellence (COSEE) is working to increase awareness about ocean issues, focusing on conveying the seven principles of ocean literacy, among K-12 students and their communities. COSEE provides ocean-related educational

materials for K-12 schools and opportunities for scientists to connect with schools in the greater Los Angeles area. COSEE also distributes an undergraduate and graduate course, “Communicating Ocean Science.” In addition, COSEE hosts a public lecture series to encourage interaction between scientists, educators, students, and the public.

Southwest Marine and Aquatic Educators’ Association (SWMEA) brings together teachers and educators from aquariums and museums who focus on aquatic and marine science. For example, at the Birch Aquarium, SWMEA offers a 2-day workshop to “train educators about regional marine-science education programs, cutting-edge research on climate change and shark conservation, and strategies for implementing hands-on science activities.”

Educational Opportunities for Undergraduate and Graduate Students

Research institutions often develop educational opportunities for undergraduate and graduate students. Some research institutions expand education programs to include K-12 students, teachers and community members.

University of Southern California’s Wrigley Institute for Environmental Studies offers an array of opportunities for informal education through lectures, outdoor activities, laboratory studies, tours, and workshops for school groups and the general public. College junior and seniors can immerse themselves in a 15-week intensive “Catalina Semester.” The Wrigley Institute supports fellowships for undergraduate student research and internships for graduate students. The institute also offers intensive summer courses from middle to graduate school levels. University of Southern California Sea Grant sponsors the “Island Explorers” program to bring teachers and their students to Catalina Island. The institute is also used as a venue for special conferences on topics that are relevant to local communities such as storm-water runoff.

University of California, Santa Barbara’s Marine Science Institute offers training for graduate students and postdoctoral students as well as opportunities for undergraduates and high school students to participate in research activities. Marine Science Institute supports the Research Experience and Education Facility, or REEF, which provides opportunities for learning through an aquarium, touch tank, and Mobile Reef Program for school children (K-12 and undergraduate). Marine Science Institute also maintains a Floating Lab for on-the-water teaching and learning about how to conduct scientific research.

Jet Propulsion Laboratory provides a variety of student and educator resources, including educator professional development, a resource center for teachers, kids’ activities, student programs for K-12, and educational podcasts and videos. Jet Propulsion Laboratory hosts a series of speakers and public events to increase awareness about atmospheric and oceanic sciences. Jet Propulsion Laboratory also supports a pre-college bridge program for high school students, undergraduate student research programs and scholarships, and opportunities for graduate and postdoctoral studies.

Southern California Marine Institute, an alliance of 12 universities in southern California, provides training and hands-on experience to students at all levels (K-12 and college) and works to increase public awareness. Education programs, on topics including marine ecology, oceanography, environmental monitoring, marine tetrapods, and Catalina Island marine biology, can be designed to meet the specific needs and interests of a class or instructor, and the California science standards for grades K-12. Southern California Marine Institute conducts demonstration cruises to collect information about water quality and organisms inside and outside of Los Angeles Harbor. In 1994, Southern California Marine Institute started Coastal Ecology Day to engage students and volunteers in surveys of rocky intertidal beaches.

Southern California Coastal Ocean Observing System (SCCOOS) provides a 9-week curriculum on “Weather and Water” for 5th grade as well as the opportunity for teachers to learn the material offered in the curriculum through a “Train-the-Trainer” program. SCCOOS also offers teachers and students access to real-time data from ocean observing instruments and historical weather data.

The Marine Mammal Care Center at Fort MacArthur is involved in the education of students, school teachers and the general public in conjunction with the Center for Marine Studies.

Outreach Programs of State and Federal Agencies

Some state and federal agencies have developed education and outreach programs to increase public awareness about coast and ocean issues:

Cabrillo National Monument has ranger-led education programs and a volunteer docent program with approximately 100,000 visitors a year to the intertidal area. For the general public, ranger-guided walks and talks on the lighthouse, 16th century navigation and armaments, and natural history are offered. Park staff also offer on-site curriculum-based education programs for visiting elementary school groups on topics including Juan Rodriguez Cabrillo and exploration, Life in the Old Point Loma Lighthouse, Tidepool Exploration, Life in Coastal Sage Scrub, and Kumeyaay Uses of Native Plants.

The California Coastal Commission Public Education Program offers information on Coastal Cleanup Day (third Saturday in September), Coastweeks (annual three-week celebrations of coastal and water resources), Boating Clean and Green, and educational materials for teachers and students, grades three through twelve. The Coastal Commission offers three classroom activity guides: “Waves, Wetlands, and Watersheds,” “Our Wetlands, Our World,” and “Save Our Seas.”

The California Department of Parks and Recreation offers education programs for students, teachers, and the public at many of the state parks and state beaches in the south coast study region. These education programs range from annual events such as the Whale Festival at Point Mugu State Park, to programs on tidepools for elementary school children, and for teachers like the Tidepools for Teachers program at Leo Carrillo State Park. Docent-led programs and visitors’ centers also provide educational opportunities to school groups and the general public. Many of these programs focus on tidepool education and proper etiquette.

California Sea Grant regularly conducts public workshops about water quality, fish habitat needs, and land use for both large and small agricultural landowners.

The Channel Islands National Marine Sanctuary (CINMS) provides brochures; participates in outreach events; hosts teacher trainings, lecture series and field seminars; and plans coastal signage. CINMS education staff develops and distributes curriculum guides, scripted slide shows, field trips for teachers, and web-based educational materials. CINMS also offers an opportunity for teachers to work alongside researchers on seabird population studies, marine reserves ROV monitoring, and other research projects in the sanctuary.

LiMPETS (Long-term Monitoring Program and Experiential Training for Students) is an environmental monitoring and education program for students, educators, and volunteer groups supported by the Channel Islands National Marine Sanctuary education and outreach program. This hands-on program was developed to monitor the ocean and coastal ecosystems of California’s National Marine Sanctuaries to increase awareness and stewardship of these important areas. Two monitoring programs make up the core of the LiMPETS network: the Rocky Intertidal Monitoring Program and the Sandy Beach Monitoring Program. (http://limpets.noaa.gov/)

Together, **the Channel Islands National Park and Channel Islands National Marine Sanctuary** train dozens of volunteers about physical, biological, and cultural aspects of the Santa Barbara Channel and Channel Islands; the volunteers serve as docents on whale-watching trips and island hikes.

The Santa Monica Bay Restoration Commission administers several education and outreach programs in support of its mission including the Public Involvement and Education Grant Program, a Clean Bay Restaurant Certification Program, and the Boater Education Program. The Public Involvement and Education program provides grants to communities, local organizations, and businesses that choose to take a leadership role in educating peers and residents about the need to protect and restore the Santa Monica Bay through innovative community outreach (www.santamonicabay.org).

Channel Islands National Park rangers and educators teach schoolchildren about the Park's resources in the field and classroom. The park offers hour-long, in-class programs for grades 2-5 in local schools and programs at the visitors' center in Ventura for all ages. Channel Islands National Park has also been conducting an interactive underwater video from Anacapa Island for 20 years. The State of California curriculum is tied to this program, which is now able to be broadcast to the mainland and into the Ventura County schools with the partnership assistance of the Ventura County Office of Education.

Tijuana River National Estuarine Research Reserve offers tours, lectures, and hands-on education programs for students and adults. The Reserve website also provides teaching materials for K-12 on a variety of topics, including ecology, geology, history, language arts and human use.

Education and Outreach by Non-Governmental Organizations

Non-governmental organizations also contribute to education and outreach in the south coast study region.

The Catalina Island Conservancy, located in Avalon on Catalina Island, focuses on island conservation, education, and research. The Conservancy offers natural history programs for all ages through the nature center and island hikes and special educational programs for local schoolchildren. In addition, the Conservancy provides itineraries and teaching aids for educators who bring students to Catalina Island.

Santa Barbara Channelkeeper offers interactive marine education, focused on water quality, eelgrass beds, and kelp forests, to schools throughout Santa Barbara and northern Ventura counties.

Heal the Bay is a non-profit organization dedicated to making southern California coastal waters safe, healthy and clean. Heal the Bay also provides free professional development for teachers (K-5) and instruction for students at the Santa Monica Pier Aquarium and at the beach. Heal the Bay developed and distributes interdisciplinary curricula on the subject of watershed stewardship for K-12 students. In addition, Heal the Bay organizes volunteers to participate in Coastal Cleanup and Adopt a Beach in Los Angeles County.

The Laguna Ocean Foundation began in 2003 with the Tidewater Docent program which has trained over 200 volunteers to provide interpretive education at local intertidal areas. They have expanded their program to include shorebird monitoring, teacher development, enforcement workshops, and education outreach. (http://www.lagunaoceanfoundation.org/)

Long Beach Marine Institute offers educational opportunities to help students learn about marine science and explore the ocean. The institute offers shipboard excursions, summer camp and teen programs, and educational visits to tidepools, Catalina Island, and Aquarium of the Pacific.

The Orange County Marine Protected Areas Committee has six education programs at different locations including Newport Beach, Crystal Cove State Park, Laguna Beach, Treasure Island, Dana Point Harbor, Heisler Park, and Doheny State Beach. They work with the Ocean Institute, the Laguna Ocean Foundation, and local and state agencies to provide educational opportunities for all age groups.

Reef Check California conducts public education and outreach from Santa Barbara to San Diego. Invited hour-long presentations are given to dive clubs, community groups, K-12 schools, and other groups on reef issues, marine policy and management, and consumer solutions. General public education on these same topics is conducted through mass outreach events such as Earth Day festivals, as well as through web forums and partnerships with children's groups such as The Jane Goodall Institute's Roots & Shoots.

Santa Monica Baykeeper conducts public outreach and education programs to teach local citizens and schoolchildren about local coastal resources. Baykeeper sponsors public workshops about the Clean Water Act and makes in-class presentations about kelp reforestation and urban runoff.

San Diego Coastkeeper, Orange County Coastkeeper, and Ventura Coastkeeper, members of the international Waterkeeper Alliance, are watchdog organizations working on coastal water pollution issues for the region. Coastkeeper conducts education and outreach to the public and decision-makers through community events and directed campaigns. For example, San Diego Coastkeeper's Project SWELL teaches children in San Diego about the importance of their recreational waterways and human-water interaction through a comprehensive and hands-on water quality and pollution-prevention curriculum. SWELL is currently in four grade levels at 130 San Diego school, reaching more than 40,000 students from every socioeconomic demographic segment of the population. Orange County Coastkeeper runs several education and outreach programs including the W.H.A.L.E.S. education program, which connects high school students to their watersheds through field trips, and the Citizen Watershed Monitors of Orange County.

The Southwest Wetlands Interpretive Association, founded in 1979, is dedicated to the interpretation, preservation, restoration, and acquisition of wetlands in southern California. The Southwest Wetlands Interpretive Association works in collaborative partnerships with federal, state, and local agencies. The Southwest Wetlands Interpretive Association purchased critical lands around the Tijuana River National Estuarine Research Reserve and funded an award-winning visitor center, numerous interpretive exhibits, restoration projects, and a native plant garden.

The Southern California Wetlands Recovery Project is also dedicated to the preservation, restoration and acquisition of wetlands from Point Conception to the border with Mexico. The Southern California Wetlands Recovery Project is a partnership chaired by the California Natural Resources Agency and supported by the State Coastal Conservancy, that has public agencies, non-profits, scientists, and local communities working cooperatively to acquire and restore rivers, streams, and wetlands in coastal southern California.

Surfrider Foundation has nine chapters in the south coast study region from Santa Barbara to San Diego. Surfrider Foundation's core activities and programs include the Blue Water Task Force, a water-monitoring, advocacy, and education program, as well as the Respect the Beach program, which is designed for K-12 classrooms.

WiLDCOAST designs programs and activities to inform and educate both the English-and Spanish-speaking communities of the south coast study region. Programs and campaigns center around

conserving marine wildlife and ecologically significant coastal marine areas in and around Baja California and the California/Mexico border coast.

Safety Education

Some government and non-government public education programs focus specifically on safety education for consumptive users.

The US EPA is implementing an Institutional Controls program that involves education and outreach about the risks of consuming certain species of fish. This program is primarily implemented through a Fish Contamination and Education Collaborative that involves local community groups, agencies, healthcare professionals, and other stakeholders.

Heal the Bay and Cabrillo Marine Aquarium have run the Fish Contamination Education Initiative Angler Outreach Program since 2003. They educate more than 10,000 anglers a year in Los Angeles and Orange counties about the risks of consuming fish contaminated with DDT, PCBs and mercury. Additionally, the Angler Outreach program disseminates information to 30 different bait shops and fishing supply stores near the piers. Since the stakeholder group is diverse, outreach efforts are conducted in nine languages including Spanish, Tagalog, Chinese and Khmer.

Where to Learn More

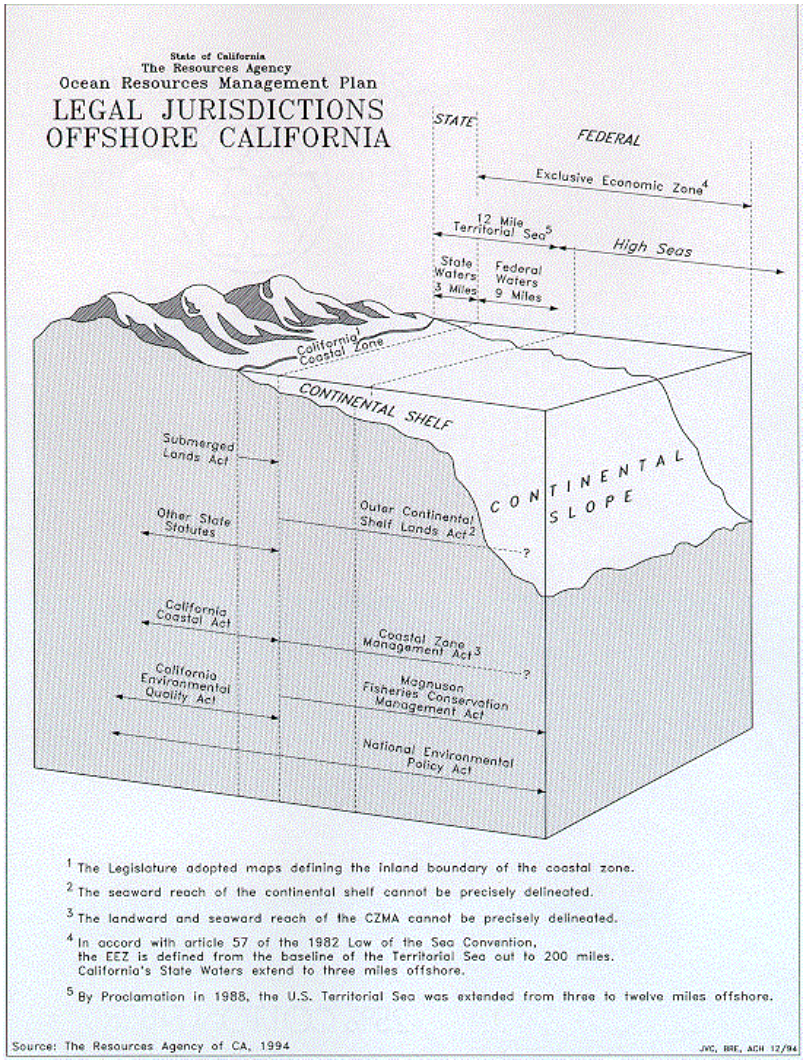
Web site and contact information for many of the academic, research, and education institutions listed above may be found in Appendix G. Note that this list provides examples of many organizations that operate in southern California and does not constitute a comprehensive list.

7. Jurisdiction and Management

7.1 Federal, State, Local and Native American Jurisdiction and Programs

No single federal, state, or local agency has complete jurisdiction over the coastal and marine environment. Rather, jurisdiction varies spatially and with respect to the resource being managed. Figure 7.1-1 illustrates the division of jurisdictions between state and federal agencies offshore of California. Some key federal, state, local, and Native American entities are highlighted below with a brief description of the role and responsibility of each.

Figure 7.1-1. Legal jurisdictions offshore California



Source: California Resources Agency 1994.

7.1.1 Federal Agencies and Programs

The **U.S. Department of Commerce** has several agencies with responsibility for ocean and coastal resources, which are described below:

The National Oceanic and Atmospheric Administration (NOAA) conducts research and manages ocean resources through five units which have direct interest in MPA issues: the National MPA Center, the National Marine Sanctuary Program, NOAA Fisheries (CCMA 2004), Pacific Fisheries Management Council, and the National Estuary Research Reserve System.

The National MPA Center was established by Executive Order 13158 in 2000 to oversee efforts to create a national system of MPAs and to assist government agencies participating in this effort. The National MPA center is located in Silver Springs, Maryland and supports two regional institutes which specialize in the technical aspects of the order. The National MPA Center's Training and Technical Assistance Institute is located in Charleston, South Carolina and serves as a training facility for resource managers. The second office, known as the National MPA Science center, is located in Santa Cruz, California and handles the scientific aspects behind planning, research, monitoring, and policy analysis of the national system of MPAs. The National MPA Center also supports the MPA Federal Advisory Committee established under the executive order (mpa.gov).

The National Marine Sanctuary Program manages 14 MPAs that encompass more than 150,000 square miles of marine and Great Lakes waters from Washington State to the Florida Keys, and from Lake Huron to American Samoa. The system includes 13 national marine sanctuaries and the Papahānaumokuākea Marine National Monument. Since 1972, the National Marine Sanctuaries Program (NMSP) has worked cooperatively with the public and federal, state, and local officials to protect sanctuary resources while allowing compatible commercial and recreational activities. Increasing public awareness of marine heritage, scientific research, monitoring, exploration, educational programs, and outreach are the principal tools the NMSP uses to fulfill its mandates. Sanctuaries have authority for establishing regulations under the National Marine Sanctuaries Act (Brookhart 2006). The Channel Islands National Marine Sanctuary lies within the south coast study region.

NOAA Fisheries (the National Marine Fisheries Service or NMFS) has regulatory authority for marine finfish, invertebrates, and marine mammals other than sea otters in waters from three to two hundred nautical miles from shore. NOAA Fisheries derives its authority from the Magnuson-Stevens Fisheries Conservation and Management Act of 1976 (Magnuson-Stevens Act), the Marine Mammal Protection Act of 1972, and the federal Endangered Species Act of 1973. Under the Magnuson-Stevens Act, NOAA Fisheries manages any fishery that is the subject of a fishery management plan developed by regional fishery management councils (see below) as well as some non- fishery management plan species (www.nmfs.***noaa***.gov).

The Pacific Fishery Management Council (PFMC) is one of eight regional fishery management organizations established by the Magnuson-Stevens Act. The PFMC develops fishery management plans for fisheries between three and two hundred nautical miles from shore, and these plans must be approved by the Secretary of Commerce and are implemented by NOAA Fisheries. The Secretary of Commerce, acting through NOAA Fisheries, has management authority for more than 100 species of finfish, primarily those associated with the bottom (groundfish), but also others such as highly migratory and coastal pelagic species for the contiguous Pacific coast states.

The National Estuarine Research Reserve System (NERRS) is a network of terrestrial and aquatic areas established for long-term research, education, and stewardship. Within California, there are three national estuarine research reserves, one in Elkhorn Slough, the San Francisco Bay, and the Tijuana River which is in the south coast study region. NOAA manages them jointly with DFG, San Francisco State University, and California Department of Parks and Recreation, respectively. Long-term research, stewardship, and public education are the main objectives of the reserves. NOAA provides 70% of the sites' funding, while the state partner is required to provide the remaining 30%. Wildlife enforcement activities generally are the responsibility of the state partners (Goldfarb 2005).

The Tijuana River NERRS also works with the **International Boundary and Water Commission (IBWC)**. The (IBWC) is a member of the management authority at the reserve working on issues affecting the estuary as needed and as appropriate. The mission of IBWC is to provide bi-national solutions to issues that arise during the application of U.S./Mexico treaties regarding boundary demarcation, national ownership of waters, sanitation, water quality, and flood control in the border region. In addition to working with this commission, the Tijuana River NERRS is also a Ramsar site which is part of the Convention on Wetlands of International Importance. For more information on this and other Ramsar sites please go to http://www.ramsar.org.

The U.S. Department of the Interior also has several agencies with responsibility for ocean and coastal-resources, which are described below.

The U.S. Fish and Wildlife Service (USFWS) conserves, protects, and enhances populations of fish, wildlife, and plants, and manages the system of National Wildlife Refuges (NWR). This system includes the following coastal refuges in California: Castle Rock, Humboldt Bay, San Pablo Bay, Marin Islands, Farallon, Don Edwards San Francisco Bay, Salinas River, Guadalupe-Nipomo Dunes, Seal Beach, and the Tijuana Slough. The Seal Beach NWR, the Tijuana Slough NWR, and the San Diego NWR Complex are the only refuges within the south coast study region.

The National Park Service (NPS) has several park lands located along the California coast including Redwood National Park, Point Reyes National Seashore, Golden Gate National Recreation Area, and the two in the study region are the Channel Islands National Park and the Cabrillo National Monument. Both are underwater parks; the seaward boundary of Channel Islands National Park is one nautical mile around each of the five park islands (Anacapa, Santa Cruz, Santa Rosa, San Miguel, and Santa Barbara Island), and Cabrillo National Monument's seaward boundary is 300 yards seaward of mean low water.

The **Bureau of Land Management (BLM)** has management responsibility for the California Coastal National Monument established in 2000. The California Coastal National Monument consists of thousands of small rocks and pinnacles above mean high tide, including many rocks and islets in the south coast study region and extends from shore to 12 nautical miles seaward. BLM is only responsible for the part of the rocks and pinnacles that are above mean high tide. The primary purpose of the monument is to protect geological values, including habitat. Due to the nature of the California Coastal National Monument, the BLM co-manages living marine resources within the monument in cooperation with DFG and the California Department of Parks and Recreation. A memorandum of understanding formalizes this co-management agreement. (Hanks 2006; www.blm.gov).

The **U.S. Minerals Management Service (MMS)** manages the nation's natural gas, oil, other mineral resources, alternative energy projects (wind, wave and current), and alternative uses of existing facilities, on the outer continental shelf in federal waters.

The **U.S. Geological Survey (USGS)** is the earth science research and information agency and has conducted research on the continental shelf in the study region.

The **U.S. Department of Defense (DOD)** has numerous bases and installations in the South Coast Study Region. The DOD supports nearly 400,000 jobs either through direct employment such as civilian, military and contract personnel, or indirectly through spending. DOD also imports dollars into the study region in the tens of billions of dollars, making it an important component in the region's economic activity (Department of Defense 2008; SDMAC 2008). The DOD has installations along the California coast for which there may be a conflict between military activities and protection of natural resources offshore of the bases. The DOD and DFG have made efforts in the past to allow for military activities within MPAs located offshore of military installations. Governor Schwarzenegger's *California's Action Strategy* of September 2004 declares that state agencies

should coordinate with the DoD on all ocean and coastal management activities that impact military facilities or operations (CRA and CEPA 2004). In some cases, access to military use areas is restricted (see section 8.3). The Navy and Marine Corps have active conservation programs in place for the protection of endangered species and practice responsible stewardship of their lands and natural resources, and under the Sikes Act have Integrated Natural Resource Management Plans (INRMP) for all bases and installations. Large areas of Navy property are set aside for habitat preservation, including Mugu Lagoon, Anaheim Bay salt marsh, and the Silver Strand Training Complex California Least Tern and Western Snowy Plover reserve in San Diego. The Navy and Marine Corps support numerous partnerships with federal, state, local, and private resource groups to protect America's natural resources, including, with the San Diego Zoological Society, a several-year-old captive-rearing and conservation program for the San Clemente Island Loggerhead Shrike. The Navy also has strong water and energy conservation programs, including efforts such as the installation of artificial turf and large photovoltaic systems.

The **U.S. Coast Guard (USCG)** is the primary maritime law enforcement agency (www.uscg.mil*)*. The USCG has stations and centers in the following locations within the south coast study region (Table 7.1-2). USCG is now part of Transportation Services Agency.

Table 7.1-2. Coast Guard facilities in the south coast study region

Name of Facility	County
Integrated Support Command San Pedro	Los Angeles
Air Station Los Angeles	Los Angeles
Marine Safety Office Long Beach	Los Angeles
Group Long Beach	Los Angeles
Flotilla 27 Newport Beach	Orange
Air Station San Diego	San Diego
Marine Safety Office San Diego	San Diego
Group San Diego	San Diego

The **U.S. Army** has no bases in the south coast study region.

The **U.S. Air Force** has one base in Los Angeles County. The Los Angeles Air Force Base is located in El Segundo and supports the headquarters of the Air Force Space Command's Space and Missile Systems Center. More information about this base can be found on their website at http://www.losangeles.af.mil. Vandenberg Air Force Base is located just north of the study region.

The **U.S. Marine Corps** has Camp Pendleton Marine Corps Base located in San Diego County. This base is the Marine Corps' largest west coast expeditionary training facility, encompassing more than 125,000 acres of southern California terrain. More information about this base can be found on their website at http://www.pendleton.usmc.mil. Additionally the Marine Corps Recruit Depot is located on San Diego bay near the airport and Marine Corps Air Station Miramar is located approximately 15 miles north of San Diego.

The **U.S. Navy** has numerous bases, air stations, ranges, and operating areas in and adjacent to the south coast study region as described in Table 7.1-3. Comprising hundreds of interconnected, instrumented and non-instrumented ranges, the Southern California (SOCAL) Range Complex covers 45,000 acres of land, 113,000 square nautical miles of airspace and 120,000 square nautical miles of ocean training areas. Within the south coast region study area, the SOCAL Range Complex extends from the ocean floor up to an altitude of 80,000 feet, and from shore facilities and ranges to almost 200 nm offshore (Figure 9.1) (http://www.scisland.org/). The Navy also owns and manages San Clemente, San Miguel, and San Nicolas islands. San Clemente Island was acquired by the Navy in 1934. San Clemente Island uniquely supports training that cannot be conducted anywhere

else, including ship-to-shore live fire bombardment, Naval Special Warfare full mission profile, and U.S. Marine Corps Military Operations Spotter training, to name a few. The Navy is in the process of completing an Environmental Impact Statement (EIS)/Overseas EIS and all regulatory compliance documentation on all naval operations occurring in SOCAL, including San Clemente Island. The Silver Strand Training Complex (SSTC) also known as Naval Amphibious Base, was turned over to the Navy as an amphibious training area and port and supports over 4,000 annual operations, including strategic sealift; special operations; amphibious operations; Research, Development, Test and Evaluation (RDT&E); mine countermeasure and neutralization; and communication training. San Nicolas Island was acquired by the Navy in 1933. It is an integral part of the Pacific Missile Range and has several target sites used in missile testing. San Miguel is owned by the U.S. Navy and managed by the National Park Service under a Memorandum Of Understanding.

Table 7.1-3. Navy facilities in the south coast study region

Name of Coastal Facility	County
Point Mugu Naval Air Station	Ventura
Port Hueneme Construction Battalion Center	Ventura
Seal Beach Naval Weapons Station	Orange
Coronado Naval BaseFleet and Industrial Supply Center	San Diego
Coronado Naval Amphibious Base, Coronado CA	San Diego
Silver Strand Training Complex	San Diego
North Island Naval Air Station North Island	San Diego
Point Loma Naval Base Point Loma	San Diego
San Diego Naval Station Base San Diego	San Diego
San Diego Naval Mine and Anti-Submarine Warfare Training Center Command	San Diego
Naval Outlying Landing Field- Imperial Beach	San Diego
Balboa Naval Hospital	San Diego
San Clemente Island	San Diego
San Nicolas Island	Ventura

The **U.S. Army Corp of Engineers (USACE)** plans, designs, constructs, operates, and maintains a wide variety of water infrastructure to support U.S. national economic interests, such as, navigation structures, channels, shore protection, and restoration projects (www.usace.army.mil).

The **U.S. Environmental Protection Agency (USEPA)**, Office of Water, is responsible for implementing the Ocean Dumping Act, Clean Water Act, and Safe Drinking Water Act, and other portions of laws focused upon pollution prevention and watershed management (www.epa.gov).

The **National Estuary Program (NEP)** is a successful community-based program to restore and maintain the water quality and ecological integrity of estuaries of national significance by among other things establishing key partnerships among Federal, State, and local agencies; non-profit organizations; industry; academia; environmental and business groups; and community residents. Within California there are three NEPs: the San Francisco Bay, Morro Bay, and the Santa Monica Bay, which is in the south coast study region. Each program is managed locally and funded jointly by the USEPA and the state. The Santa Monica Bay is one of the few that is designated in state law (EPA 2008).

7.1.2 State Agencies and Programs

The **California Department of Fish and Game (DFG)** is a trustee agency and has management authority over living marine and estuarine resources and their habitats within state waters (generally between zero and three nautical miles from shore or around offshore islands and including estuarine areas) as well as authority to regulate fisheries that deliver catch to California ports. Thus, DFG has

some authority beyond state waters and often enforces regulations in this area. In addition, the DFG regulates marine aquaculture within state waters (See Section 5.5.2).

The **California Department of Parks and Recreation (CDPR)** is responsible for almost one-third of California's scenic coastline and manages coastal wetlands, estuaries, beaches, and dune systems within state park system units. Through State Water Bottom Leases, the CDPR has management authority over 15 underwater areas, although it does not have authority to restrict the take of living marine resources. The California Park and Recreation Commission has the authority to establish, modify, or delete state marine reserves, state marine parks, and state marine conservation areas, but must have the concurrence of the California Fish and Game Commission on any proposed restrictions to the extraction of living marine resources (California Public Resources Code, §6725). Of the 15 underwater areas, four can be found in the south coast study region and are under lease from the State Lands Commission until 2029. The statutory names of these four areas were re-designated after the enactment of the Marine Managed Areas Improvement Act in 2000. State Parks adjacent to the coast in the south coast study region include those listed in Table 7.1 - 4.

Table 7.1-4. California State Parks located adjacent to shore

Santa Barbara County	
• Refugio	• Carpinteria
• El Capitan	
Ventura County	
• Emma Wood	• Mandalay
• San Buenaventura	• Oxnard
• McGrath	• Point Mugu
Los Angeles County	
• Leo Carrillo	• Point Dume
• Robert H. Meyer Memorial	• Malibu Lagoon
Orange County	
• Bolsa Chica	• Doheny
• Huntington	• San Clemente
• Corona del Mar	• Calafia
• Crystal Cove	
San Diego County	
• San Onofre	• San Elijo
• Carlsbad	• Cardiff
• South Carlsbad	• Torrey Pines
• Leucadia	• Silver Strand
• Moonlight	• Border Field*

Source: California Department of Parks and Recreation 2008

* Border Field State Park is adjacent to TR NERR; they are managed cooperatively. TR NERR is not a state park.

The **California State Lands Commission** is responsible for leasing state lands, including submerged lands in state waters. Additionally this commission has jurisdiction over oil and gas development, manages the removal of hazardous structures such as old piers and submerged oil and gas structures, issues permits for dredging in harbors and waterways, issues leases for marina, harbor, or pier development, and has programs established for oil spill prevention. For more

information on any additional responsibilities this commission has please see their website at http://www.slc.ca.gov.

The **California Coastal Commission (CCC)** regulates the use of land and water in a legislatively-designated coastal zone. The coastal zone varies between several hundred feet above mean high tide in highly urbanized areas and up to five miles in rural areas and extends to the state water offshore boundary. This jurisdiction extends into federal waters because of the federal consistency review responsibilities delegated to it under the Coastal Zone Management Act of 1972. Any proposed action by a federal agency that will have a reasonably foreseeable impact on resources within the coastal zone must be consistent with the policies of the state's federally-approved coastal zone management program. Activities proposed by nonfederal applicants for federal licenses or permits, and state agencies or local governments applying for federal funds, are also subject to the federal consistency requirement. The establishment of MPAs may require a coastal development permit from the CCC if public access is limited or if there is any physical development, such as signage (CCC 2005b).

The **California State Coastal Conservancy (CSCC)** protects, restores, and improves coastal resources, and provides access to shore. The CSCC manages the Critical Coastal Areas (CCA) Program which fosters collaboration among local stakeholders and government agencies to focus resources and efforts to reduce polluted runoff in coastal zone watersheds (www.scc.***ca***.gov). For a list of CCAs, see section 4.3.

The **State Water Resources Control Board (SWRCB)** has regulatory authority over discharges into marine waters from point and nonpoint sources, as well as other aspects of water quality. SWRCB has authority to create state water quality protection areas and areas of special biological significance (ASBS). Regional water quality control boards are the units within the SWRCB that oversee local management issues throughout the state (www.waterboards.ca.gov). For a list of ASBSs, see section 4.3.

The **California Department of Water Resources (CDWR)** protects, conserves, develops, and manages California's water supplies in coordination with other agencies. These activities directly impact water quality and quantity in estuaries and nearshore ocean environments (www.water.ca.gov).

The **California Ocean Protection Council (COPC)** was created by the California Ocean Protection Act of 2004. The COPC is currently chaired by the Secretary of Natural Resources and includes the State Lands Commission Chair, the Secretary for Environmental Protection, two public members, and two non-voting, ex-officio members of the California Legislature.

The purpose of the COPC is to:

- coordinate activities of ocean-related state agencies to improve the effectiveness of state efforts to protect ocean resources within existing fiscal limitations;
- establish policies to coordinate the collection and sharing of scientific data related to coastal and ocean resources between agencies;
- identify and recommend to the Legislature changes in law; and
- identify and recommend changes in federal law and policy to the Governor and legislature.

The COPC approved a five-year strategic plan in June 2006 which calls for the creation of a State Agency Steering Committee composed of senior representatives of state agencies with responsibility for coastal and ocean management. The State Agency Steering Committee met for the first time in September 2006.

The purpose of the State Agency Steering Committee is to:

- identify top priorities for each fiscal year;
- identify strategies and projects within and across agencies to address these top priorities;
- assess the capabilities of agencies to carry out their ocean and coastal protection responsibilities;
- identify necessary funding for priority actions, either through redeploying existing funds, developing cross-cutting budgets, or identifying new funding; and
- recommend any necessary legislative action or regulatory changes to implement priority actions and strategies (California Ocean Protection Council).

The COPC approved funding for seafloor mapping of the south coast study region to support MPA planning under the MLPA. Additionally they have funded the MPA Monitoring Enterprise and they have also supported two years of baseline characterization in the central coast study region.

The **California Public Utilities Commission (CPUC)** regulates privately owned telecommunications, electric, natural gas, water, railroad, rail transit, and passenger transportation companies, in addition to authorizing video franchises. In the south coast study region, the CPUC regulates LNG projects, electric generating power plants, and wave energy projects.

The Southern California Wetlands Recovery Project (SCWRP) is a broad-based partnership, chaired by the Resources Agency and supported by the State Coastal Conservancy, that has public agencies, non-profits, scientists, and local communities working cooperatively to acquire and restore rivers, streams, and wetlands in coastal southern California. The SCWRP's geographic scope is from Point Conception in Santa Barbara County to the California border with Mexico. The goal of the SCWRP is to accelerate the pace, the extent, and the effectiveness of coastal wetland restoration through developing and implementing a regional prioritization plan for the acquisition, restoration, and enhancement of southern California's coastal wetlands and watersheds. Ultimately, the SCWRP's efforts will result in a long-term increase in the quantity and quality of the region's wetlands (www.scwrp.org).

7.1.3 Local Government Programs

Counties and cities within the south coast study region manage and maintain beaches. Many of these beaches were previously within the California Department of Parks and Recreation. A list of these beaches by county is as follows:

Santa Barbara County: Isla Vista, Goleta Beach County Park, Arroyo Burro, Mesa Lane, Hammonds, Miramar, Lookout, Leadbetter, West, East, Butterfly, Carpinteria City, Rincon, Rincon Point.

Ventura County: La Conchita, Mussel Shoals, Oil Piers, Hobson, Rincon Parkway, Faria, Solimar, Surfer's Point, Promenade, Marina Park, Marine Cove, Mandalay, Hollywood, Channel Islands Harbor, Silver Strand, Port Hueneme, Oxnard, Thornehill Broome, Sycamore Cove

Los Angeles County: Nicholas Canyon, Zuma, Dan Blocker, Las Tunas, Topanga, Will Rogers, Santa Monica, Venice, Marine Del Ray, Dockweiler, Manhattan Beach, Hermosa, Redondo, Torrence, White Point/ Royal Palm, Cabrillo, Long Beach, Belmont Shore, Anaheim Bay.

Orange County: Seal Beach, Seal Beach Pier, Surfside, Sunset, Bolsa Chica State Beach, Huntington State Beach, Huntington Harbor, Huntington City, West Newport Park/ Santa, Ana River County Park, Newport Beach, Newport Pier, Los Arenas Park, Little Corona Del Mar, Crescent Beach and Shaw's, Cove, Divers, Picnic and Rockpile, Heisler, Main, Stairs to Beaches, Ruby

Viewpoint, Pocket, Aliso Creek, Camel Point, 1000 Steps, Salt Creek, Dana Point Harbor, Swim, Louise Leyden, Capistrano, Poche, North, Linda Lane, San Clemente Pier, San Clemente City.

San Diego County: Oceanside City, South Oceanside, Carlsbad City, Ponto, Beacon's, Encinitas, Stone steps, Moonlight, D Street, Boneyard, Swami's, Tide, Fletcher Cove, Seascape, Del Mar City, Black's Beach, La Jolla Shores, La Jolla Cove, Children's Pool, Marine Street, Windansea, La Jolla Strand, Tourmaline, Pacific, Mission, Mission Bay Beaches (with eight distinct designated swimming areas), Mission Bay Park, Ocean Beach Park, Ocean Beach City, Coronado City, Imperial Beach City.

Local Coastal Programs (LCP)

The federal Coastal Zone Management Act passed in 1972 encouraged coastal states to develop polices to protect coastal resources. The California Coastal Act of 1976 established the CCC as a permanent coastal management and regulatory agency. The CCC retains permanent permit jurisdiction for proposed projects within a designated coastal zone, ranging from several hundred feet to several miles from the coast.

However, local government may assume permit jurisdiction once the CCC approves its LCP. Each LCP includes a land-use plan that prescribes land-use classifications, types and densities of allowable development, goals and policies concerning development, and zoning and other ordinances and administrative procedures needed to implement the plan.

After an LCP is approved, the CCC's permitting authority is delegated to the local county/city government. The CCC retains appeal authority over certain local government permit decisions. It also retains original permit jurisdiction over development on tidelands, submerged lands, and public trust lands. All amendments to approved LCPs must be submitted to the Commission for review and approval. Within the south coast study region, all five coastal counties have certified LCPs. In addition, the following cities have approved LCPs or Land Use Plans (LUPs) as of January 2008:

Santa Barbara County: Santa Barbara, Carpinteria

Ventura County: San Buenaventura, Oxnard, Port Hueneme

Los Angeles County: City of Malibu, Santa Monica (LUP), El Segundo, Manhattan Beach, Hermosa Beach (LUP), Redondo Beach, Palos Verdes Estates, Rancho Palos Verdes, Long Beach, Avalon

Orange County: Huntington Beach, Newport Beach (LUP), Irvine, Laguna Beach, Laguna Niguel, Dana Point, San Clemente (LUP)

San Diego County: Oceanside, Carlsbad, Encinitas, Del Mar, San Diego, Coronado, National City, Chula Vista, Imperial Beach

Other Local Government Programs

Local governments in the MLPA south coast study region may have other programs relevant to the MPA planning process. For instance, the City of Dana Point has recently created a Natural Resource Protection Officer position that is in charge of local management of MPAs falling within city limits of Dana Point. The position was based on the Marine Protection Officer position in Laguna Beach. The City of Dana Point is also starting a volunteer tidepool docent program. Other cities in Orange County that have dedicated resources to localized management, enforcement and education of MPAs, include the City of Newport Beach and City of Laguna Beach.

7.1.4 Native American Jurisdiction/Treaty Rights

The US Constitution recognizes Native American tribes as separate and independent political communities within the territorial boundaries of the US. Tribes promulgate and administer their own laws and operate under their own constitutions. However, there are other groups of Native American people not formally recognized by the federal government that live in the south coast study region.

There are 106 federally recognized Native American tribes in California as listed by the US Bureau of Indian Affairs, and 19 of these lie within two coastal counties of the south coast study region. Please note that the Kumeyaay and Diegueño tribes are part of the same nation. Out of the five coastal counties in the south coast study region, only Santa Barbara and San Diego counties have federally-recognized tribes within their boundaries. In addition, there are numerous tribes petitioning to be federally recognized.

Federally recognized tribes in coastal counties in the south coast study region include:

- Santa Barbara County
  - Santa Ynez Band of Mission Indians, Chumash
- San Diego County
  - Pauma (and Yuima) Band of Mission Indians. Luiseño
  - Pala Band of Mission Indians. Luiseño-Cupeño
  - Rincon Band of Mission Indians, Luiseño
  - La Jolla Band, Luiseño
  - Sycuan Rancheria, Kumeyaay (Diegueño)
  - La Posta Band, Kumeyaay
  - Jamul Band of Mission Indians, Kumeyaay
  - Viejas Tribal Council, Kumeyaay
  - Manzanita General Council, Kumeyaay
  - San Pasqual Band, Kumeyaay
  - Capitan Grande, Kumeyaay (Diegueño)
  - Campo Band of Mission Indians, Kumeyaay
  - Cuyapaipe Band of Mission Indians, Diegueño, Kumeyaay
  - Los Coyotes Band of Mission Indians, Cahuilla, Cupeño
  - Mesa Grande Band of Mission Indians, Diegueño
  - Santa Ysabel Band of Mission Indians, Diegueño
  - Barona Indian Reservation, Ipai-Tipai (Diegueño)
  - Inaja & Cosmit Band of Mission Indians (Diegueño)

The California Fish and Game Code is not applicable to recognized members of Native American tribes within the boundaries of the reservation or rancheria, although the sale of birds, mammals, fish, or amphibia is still prohibited (Fish and Game code §12300). However, outside reservation or rancheria property, Native American citizens are subject to the Fish and Game Code. The DFG grants permits to Native American citizens for the collection of seaweed for religious or ceremonial purposes. California's Assembly Joint Resolution (AJR) No. 60 recognized the Kumeyaay/Diegueño band's aboriginal territory from the Pacific Ocean to the desert, extending from Southern California into Baja California. It was the first resolution of its kind in the country.

7.2 Non-governmental Organizations and Programs

There are dozens of non-governmental organizations in the study region that focus on a variety of coastal environmental issues. Most organizations use a combination of professionals and community volunteers to promote environmental education, ecosystem and water quality, and habitat restoration programs. Many organizations are also heavily involved in legislative efforts focused on environmental issues. Many of these organizations are described in more detail in section 6.0.

8. Existing Marine Protected Areas and Coastal Protected Areas

A variety of areas within the study region are afforded some degree of protection by existing state or federal regulations. These areas include existing MPAs as well as fisheries management measures, power plant closures, and military use areas. In addition, some terrestrial areas adjacent to the study region are protected and include coastal or marine resources.

8.1 Existing State Marine Protected Areas in the Study Region

The Marine Life Protection Act requires that existing state MPAs in state waters be assessed and redesigned to meet the goals of the Act. According to California State law, an MPA is a discrete geographic area that has been designated by law, administrative action, or voter initiative, to protect or conserve marine life and habitat. As part of the MLPA Initiative process, existing state MPAs within the study region will be evaluated to determine how they may contribute to the statewide network of MPAs. During the MLPA planning process, existing state MPAs may be retained without change, be modified in boundaries or regulations, or be eliminated.

Preliminary site characterizations and evaluations of existing MPAs in the entire state were completed by DFG in 2004 (DFG 2004b) but a more formal evaluation of existing state MPAs, based on guidelines in the California master plan for MPAs, will be conducted by the SAT in conjunction with MLPA Initiative and DFG staff.

There are 42 existing state MPAs within the south coast study region, as well as three special closures (Map 2.0-1, Table 8.1-1). These existing state MPAs include 15 state marine reserves (SMRs) (covering 6.7% of the study region), 8 state marine parks (SMPs) (covering 0.1% of the study region), and 19 state marine conservation areas (SMCAs) (covering 0.9% of the study region). All together, these MPAs and special closures cover 181.5 square miles, or 7.7% of the study region. One existing MPA in southern California, the Buena Vista SMP, was determined by DFG to lie outside of the study region and is not tidally influenced.

Twelve of the 42 existing MPAs within the south coast study region were created during the Channel Islands MPA planning process. Channel Island MPAs in state waters were implemented in 2003. Of the MPAs created during this process, 10 are SMRs and two are SMCAs. An additional MPA, Footprint SMR, was created in the Channel Islands in 2007. The largest of these MPAs is Richardson Rock SMR, located off the northwest end of San Miguel Island, which covers 40.8 square miles in state waters. The smallest of these MPAs is Skunk Point SMR, on the eastern end of Santa Rosa Island, which covers 1.4 square miles in state waters.

In 2008, the Channel Islands National Marine Sanctuary and the DFG completed a five-year review of monitoring efforts for the Channel Island MPAs. Data collection included: socioeconomic surveys, commercial fisheries landings, abundance, biomass and size differences inside and outside MPAs, recreational fishing effort, and vessel distribution and boating and boater activities surveys. Documents related to this five-year review can be found at: http://www.dfg.ca.gov/marine/channel_islands/monitoring.asp. The MPAs created during the Channel Islands process were designed with guidelines distinct from those found in the MLPA and California Master Plan for MPAs. However, the contribution of these MPAs to meeting the goals of the MLPA will be considered in the MLPA Initiative planning process.

With the exception of the MPAs designated during the Channel Islands process, most of the existing state MPAs within the study region were established in the late 1960s and throughout the 1970s and 1980s. The oldest MPA in the study region is the San Diego-Scripps SMCA, which was originally designated as a Marine Life Refuge in 1957. The largest of these MPAs is Big Sycamore Canyon

SMR (2.44 square miles) near Point Mugu (Ventura County), while the smallest is Agua Hedionda Lagoon SMR (0.01 square mile) (San Diego County). Most of the existing MPAs are small; all but five of the MPAs not created during the Channel Islands National Marine Sanctuaries (CINMS) process are under 1 square mile in area. Excluding the Channel Islands MPAs, none of these existing MPAs extend to deeper, offshore waters as recommended in the Master Plan for MPAs.

Several of these existing MPAs have been included in research and monitoring efforts. For example, Catalina Marine Science Center SMR was established in 1988 and hosts a number of research and monitoring efforts (e.g. Lowe et al. 2003). Similarly, the San Diego-Scripps, La Jolla, and Mia J. Tegner SMCAs have been studied by a number of researchers from Scripps Institution of Oceanography as well as other organizations (e.g. Parnell et al. 2005 and 2006). Big Sycamore Canyon SMR was established as part of the Marine Ecological Reserves Research Program and is periodically studied as well. Although these and several other existing MPAs have hosted research by various organizations, many MPAs have not been extensively studied (DFG 2004b).

Most of the MPAs established outside of the CINMS process were created in an ad hoc, uncoordinated manner. As a result, the boundaries of MPAs overlap in several instances, creating potential management and enforcement difficulties. For the purposes of planning within the south coast study region, when two MPAs overlap, the more stringent regulations will be considered. There are three instances of overlapping MPAs in the south coast study region: Crystal Cove SMCA overlaps with Irvine SMCA, Heisler Park SMR overlaps with Laguna Beach SMP, and Doheny SMCA overlaps with Doheny Beach SMCA. In these three cases, Irvine SMCA, Heisler Park SMR, and Doheny Beach SMCA have more restrictive regulations, which for planning purposes will be applied in the overlapping areas.

Table 8.1-1. Existing state MPAs and special closures in the study region.

MPA	Allowed Take	Other Restrictions	Area (mi2)	% of Total Region
Refugio SMCA	Prohibits all recreational take except for chiones, clams, cockles, rock scallops, native oysters, crabs, lobsters, ghost shrimp, sea urchins, mussels, worms[a], and finfish. Prohibits all commercial take except for algae (except for giant kelp and bull kelp), crabs, ghost shrimp, jackknife clams, sea urchins, squid, worms[a], and finfish	None	1.04	0.04%
Goleta Slough SMP	Prohibits all recreational take except for invertebrates and finfish. Prohibits all commercial take.	Boating, swimming, wading, and diving are prohibited. Other restrictions exist on accessible areas.	0.34	0.01%
Big Sycamore Canyon SMR	No take	Swimming, wading, diving, or using any diving equipment are prohibited (exceptions apply). Other restrictions exist regarding: boating, firearms, public entry, pesticides/herbicides, litter, aircraft pets and scientific collection.	2.44	0.10%
Abalone Cove SMP	Prohibits all recreational take except for finfish. Prohibits all commercial take.	None	0.1	< 0.01%
Point Fermin SMP	Prohibits all recreational take except lobster, rockfish (family Scorpaenidae), greenling, lingcod, cabezon, yellowtail, mackerel, bluefin tuna, kelp bass, spotted sand bass, barred sand bass, sargo, croaker, queenfish, corbina, white seabass, opaleye, halfmoon, surfperch (family Embiotocidae), blacksmith, barracuda, California sheephead, bonito. California halibut. sole. turbot and sanddab.	None	0.07	< 0.01%

MPA	Allowed Take	Other Restrictions	Area (mi2)	% of Total Region
	Prohibits all commercial take.			
Bolsa Chica SMP	Prohibits all recreational take except invertebrates and finfish. Prohibits all commercial take.	Boating, swimming, wading, and diving are prohibited. Other restrictions exist regarding: time of entry, accessible areas and allowed management activities.	0.49	0.02%
Upper Newport Bay SMP	Prohibits all recreational take except invertebrates and finfish. Prohibits all commercial take.	Restrictions exist regarding: swimming areas, boat speed, shoreline access and access fees.	0.99	0.04%
Robert E Badham SMCA	Prohibits all recreational take except lobster, rockfish (family Scorpaenidae), greenling, lingcod, cabezon, yellowtail, mackerel, bluefin tuna, kelp bass, spotted sand bass, barred sand bass, sargo, croaker, queenfish, corbina, white seabass, opaleye, halfmoon, surfperch (family Embiotocidae), blacksmith, barracuda, California sheephead, bonito, California halibut, sole, turbot and sanddab. Prohibits all commercial take except lobster.	None	0.02	< 0.01%
Crystal Cove SMCA	Prohibits all recreational take except chiones, clams, cockles, rock scallops, native oysters, crabs, lobsters, ghost shrimp, sea urchins, mussels, worms[a], and finfish. Prohibits all commercial take except algae (except giant kelp and bull kelp), crabs, ghost shrimp, jackknife clams, sea urchins, squid, worms[a], and finfish	None	1.46	0.06%
Irvine Coast SMCA	Prohibits all recreational take except lobster, rockfish (family Scorpaenidae), greenling, lingcod, cabezon, yellowtail, mackerel, bluefin tuna, kelp bass, spotted sand bass, barred sand bass, sargo, croaker, queenfish, corbina, white seabass, opaleye, halfmoon, surfperch (family Embiotocidae), blacksmith, barracuda, California sheephead, bonito, California halibut, sole, turbot and sanddab. Finfish shall be taken only by hook-and-line or by spear. Prohibits all commercial take except lobster.	None	0.35	0.02%
Heisler Park SMR	No take	Restrictions exist regarding: boat launching areas and anchoring times.	0.04	< 0.01%
Laguna Beach SMCA	Prohibits all recreational take except lobster, rockfish (family Scorpaenidae), greenling, lingcod, cabezon, yellowtail, mackerel, bluefin tuna, kelp bass, spotted sand bass, barred sand bass, sargo, croaker, queenfish, corbina, white seabass, opaleye, halfmoon, surfperch (family Embiotocidae), blacksmith, barracuda, California sheephead, bonito, California halibut, sole, turbot and sanddab. Finfish shall be taken only by hook-and-line or by spear.Prohibits all commercial take except lobster.	None	0.39	0.02%
South Laguna Beach SMCA	Prohibits all recreational take except lobster, rockfish (family Scorpaenidae), greenling, lingcod, cabezon, yellowtail, mackerel, bluefin tuna, kelp bass, spotted sand bass, barred sand bass, sargo, croaker, queenfish, corbina, white seabass, opaleye, halfmoon, surfperch (family Embiotocidae), blacksmith, barracuda, California sheephead, bonito, California halibut, sole, turbot and sanddab. Prohibits all commercial take except lobster.	None	0.05	< 0.01%
Niguel	Prohibits all recreational take except lobster.	None	0.51	0.02%

MPA	Allowed Take	Other Restrictions	Area (mi2)	% of Total Region
SMCA	rockfish (family Scorpaenidae), greenling, lingcod, cabezon, yellowtail, mackerel, bluefin tuna, kelp bass, spotted sand bass, barred sand bass, sargo, croaker, queenfish, corbina, white seabass, opaleye, halfmoon, surfperch (family Embiotocidae), blacksmith, barracuda, California sheephead, bonito, California halibut, sole, turbot and sanddab. Prohibits all commercial take except lobster.			
Dana Point SMCA	Prohibits all recreational take except lobster outside the intertidal zone (mean high tide and mean lower-low water lines), rockfish, greenling, ling cod, cabezon, yellowtail, mackerel, bluefin tuna, kelp bass, spotted sand bass, barred sand bass, sargo, croaker, queenfish, Corbina, white seabass, opaleye, halfmoon, surfperch, blacksmith, barracuda, sheephead, bonito, California halibut, sole, turbot, and sanddab outside the intertidal zone (mean high tide and mean lower-low water lines). Prohibits all commercial take except lobster.	Restrictions exist regarding: take and impact in the intertidal zone, scientific collection, and allowed management activities.	0.2	0.01%
Doheny SMCA	Prohibits all recreational take except chiones, clams, cockles, rock scallops, native oysters, crabs, lobsters, ghost shrimp, sea urchins, mussels, worms[a], and finfish. Prohibits all commercial take except algae (except giant kelp and bull kelp), crabs, ghost shrimp, jackknife clams, sea urchins, squid, worms[a], and finfish	None	0.19	0.01%
Doheny Beach SMCA	Prohibits all recreational take except lobster, rockfish (family Scorpaenidae), greenling, lingcod, cabezon, yellowtail, mackerel, bluefin tuna, kelp bass, spotted sand bass, barred sand bass, sargo, croaker, queenfish, corbina, white seabass, opaleye, halfmoon, surfperch (family Embiotocidae), blacksmith, barracuda, California sheephead, bonito, California halibut, sole, turbot and sanddab. Prohibits all commercial take except lobster.	None	0.15	0.01%
Buena Vista SMP[b]	Prohibits all recreational take except finfish. Prohibits all commercial take.	Boating, swimming, wading, and diving are prohibited. Other restrictions exist regarding: allowed management activities.	0.291	NA
Agua Hedionda Lagoon SMR	No take.	Restrictions exist regarding: allowed management activities.	0.01	< 0.01%
Batiquitos Lagoon SMP	Prohibits all recreational take except finfish. Prohibits all commercial take.	Boating, swimming, wading, and diving are prohibited. Other restrictions exist regarding: allowed management activities.	0.29	0.01%
Encinitas SMCA	Prohibits all recreational take except finfish. Prohibits all commercial take except for finfish.	None	0.11	< 0.01%
Cardiff-San Elijo SMCA	Prohibits all recreational take except chiones, clams, cockles, rock scallops, native oysters, crabs, lobsters, ghost shrimp, sea urchins, mussels, worms[a] and finfish. Allows all commercial take.	None	1.23	0.05%
San Elijo Lagoon SMP	Prohibits all recreational take except finfish. Prohibits all commercial take.	Boating, swimming, wading, and diving are prohibited. Other restrictions exist regarding: allowed management activities.	0.39	0.02%
San Dieguito Lagoon SMP	Prohibits all recreational take except finfish. Prohibits all commercial take.	Boating, swimming, wading, and diving are prohibited. Other restrictions exist regarding: boating, swimming, wading,	0.17	0.01%

MPA	Allowed Take	Other Restrictions	Area (mi2)	% of Total Region
		diving, access to the California Least Tern island, hours of entry, and allowed management activities.		
San Diego-Scripps SMCA	Prohibits all recreational take except finfish. Prohibits all commercial take except for finfish.	Allowances for scientific collection.	0.11	< 0.01%
La Jolla SMCA	Prohibits all recreational take. Prohibits all commercial take except for squid for the purpose of bait by hand-held net west of a line drawn due north from Goldfish Point.	Restrictions exist regarding: boat launching areas and anchoring times.	0.77	0.03%
Mia J Tegner SMCA	Prohibits all recreational take except finfish. Prohibits all commercial take except for finfish and marine aquatic plants.	None	0.02	< 0.01%
Richardson Rock SMR	No take	None	40.75	1.73%
San Miguel Island Special Closure	Boating prohibited within 300 yards from shore between Castle Rock and Judith Rock except as noted. Boats may approach no nearer than 100 yards from shore during the period(s) from March 15 through April 30, and October 1 through December 15. Commercial Sea Urchin Permittees may enter the portion of the closed area between the western boundary of the Judith Rock SMR and Castle Rock for the purpose of taking urchins.	None	1.27	0.05%
Judith Rock SMR	No take	None	4.55	0.19%
Harris Point SMR	No take	None	25.34	1.08%
South Point SMR	No take	None	13.05	0.55%
Carrington Point SMR	No take	None	12.76	0.54%
Skunk Point SMR	No take	None	1.39	0.06%
Painted Cave SMCA	Prohibits all recreational take except for lobster and pelagic finfish. Prohibits all commercial take.	None	1.78	0.08%
Gull Island SMR	No take	None	19.91	0.85%
Scorpion SMR	No take	None	9.63	0.41%
Footprint SMR	No take	None	7.05	0.30%
Anacapa Island SMCA	Prohibits all recreational take except for lobster and pelagic finfish. Prohibits all commercial take except for lobster.	None	11.54	0.49%
Anacapa Island SMR	No take	None	7.3	0.31%
Anacapa Island Special Closure	No entry January 1 to October 31. No commercial nets or traps shallower than 20 feet around entire island.	None	0.95	0.04%
Santa	No take	None	12.77	0.54%

MPA	Allowed Take	Other Restrictions	Area (mi2)	% of Total Region
Barbara Island SMR				
Arrow Point to Lion Head Point Special Closure	Prohibits all recreational take except marine aquatic plants and fishes. Allows all commercial take, though other species and gear restrictions apply.	None	0.64	0.03%
Catalina Marine Science Center SMR	No take	Restrictions exist regarding: anchoring or mooring vessels, and scientific collection.	0.06	< 0.01%
Farnsworth Bank SMCA	Prohibits all recreational take except finfish and invertebrates (prohibits take of purple coral). Prohibits all commercial take except marine aquatic plants, finfish, and invertebrates (prohibits take of purple coral).	None	1.66	0.07%
Lover's Cove SMCA	Prohibits all recreational take. Prohibits all commercial take except for kelp and finfish.	None	0.02	< 0.01%
Total Area of State Marine Reserves			157.1	6.67%
Total Area of State Marine Parks			2.8	0.12%
Total Area of State Marine Conservation Areas			21.6	0.92%
Total Area in State Marine Protected Areas in the South Coast Study Region			181.5	7.71%
Total Area in Special Closures			2.86	0.12%
Total Area of South Coast Study Region			2,354.69	

[a] In each case where the regulations for an MPA permit the take of marine worms, the following language is included: “except that no worms may be taken in any mussel bed unless taken incidentally to the take of mussels.”

[b] Buena Vista SMP has been determined by DFG to lie outside of the south coast study region as it is not tidally influenced and does not host marine vegetation. The area of this MPA is not included in the calculations above.

In some locations, local initiatives have resulted in additional protection for marine resources. For example, Avalon Underwater Park, commonly known as Casino Point Underwater Park, has been a non-profit underwater city park since 1965 on the island of Santa Catalina. Local law prohibits salvaging artifacts and makes this city park a no-take zone. Avalon Underwater Park is also closed to boat traffic and is a popular dive location (Divemaster 2008, Catalina Divers Supply 2008).

8.2 Marine Managed Areas and Other Fishery Closures

The south coast study region and adjacent areas have other marine managed areas where marine resource use is restricted. Some of these areas have permanent boundaries such as national marine sanctuaries, while other boundaries vary seasonally such as federal rockfish conservation areas, and the bottom trawl closure within the California Halibut Trawl Grounds (Map 8.2-2).

8.2.1 Federally Managed Areas

Channel Islands National Marine Sanctuary

The Channel Islands National Marine Sanctuary (CINMS) was designated on September 22, 1980 in part to protect "significant cultural, natural resources." Administered by the NOAA the 1,243 square nautical mile sanctuary surrounds the following islands and offshore rocks: San Miguel Island, Santa

Cruz Island, Santa Rosa Island, Anacapa Island, Santa Barbara Island, Richardson Rock, and Castle Rock extending seaward to a distance of approximately six nautical miles. The islands and rocks vary in distance from 12 to 40 nautical miles offshore from Santa Barbara and Ventura counties. The CINMS completely surrounds the Channel Islands National Park and overlaps the National Park boundary for the 1st nautical mile from shore which is within the National Park. The sanctuary includes the three nautical miles of California state waters plus three nautical miles of adjacent Federal waters. The sanctuary is an area of multiple uses and within the CINMS the harvesting of kelp, fish and invertebrates is permitted in most areas. Within the CINMS, the DFG manages marine resources in state waters, NOAA Fisheries manages marine resources in federal waters, and USFWS manages wildlife species listed under the Endangered Species Act. The sanctuary also regulates activities including: oil, gas, and mineral exploration, vessel discharge, seabed construction, seabird, marine mammal, and sea turtle protection, use of historical resources.

The current sanctuary regulations have been in place since 1980. NOAA is in the process of changing sanctuary regulations in order to: clarify and update existing vague and/or outdated sanctuary regulations; increase consistency with other national marine sanctuaries' regulations (especially the other three national marine sanctuaries in California); address priority resource issues; and address new, emerging, and other potential threats to sanctuary resources. For details about regulations in the CINMS please refer to http://channelislands.noaa.gov.

Channel Islands National Park

On March 5, 1980 the United States Congress established the Channel Islands National Park (CINP) to encompass San Miguel, Santa Rosa, Santa Cruz, Anacapa, and Santa Barbara islands, and submerged lands and waters within one nautical mile of each island. The park regulates landing and camping on the islands, access to cultural and archeological sites, and use of personal watercraft. Channel Islands National Park works closely with the CINMS and other public and private partners to coordinate the preservation and protection of the Channel Islands. More information on Channel Islands National Park can be found at http://www.nps.gov/chis/.

Other Federally Managed Areas

A variety of other areas within the MLPA south coast study region are managed under federal agencies and programs. These include federal ecological preserves as well as the California Coastal National Monument (described further in section 7.0).

8.2.2 Fishery Closures Within and Adjacent to the South Coast Study Region

Cowcod and Rockfish Conservation Areas

There are two Cowcod Conservation Areas off southern California, the Western and the Eastern (Map 8.2-2), which have been in place since January, 2001. The Western Cowcod Conservation Area is an area south of Point Hueneme that includes state waters surrounding Santa Barbara and San Nicolas islands. The Eastern Cowcod Conservation Area is a smaller area west of San Diego and does not include state waters. The Cowcod Conservation Areas are closed to all commercial and recreational fishing for groundfish except: 1) "other flatfish" is permitted as specified at §§ 660.382 to 660.384; 2) recreational fishing is permitted shoreward of the 20 fathom depth contour for minor nearshore rockfish, cabezon, all greenlings of the genus *Hexagrammos*, lingcod, and California scorpionfish; and 3) commercial fishing for rockfish and lingcod with limited entry fixed gear and open access non-trawl gear is permitted shoreward of the 20 fathom depth contour.

Commercial fishing vessels may transit through the Western Cowcod Conservation Area with their gear stowed and groundfish on board only in a corridor through the Western Cowcod Conservation Area bounded on the north by the latitude line at 33°00.50' north latitude, and bounded on the south by the latitude line at 32°59.50' north latitude.

Rockfish Conservation Areas also exist within the south coast study region (Map 8.2-2). The goal of Rockfish Conservation Areas is to minimize incidental take of overfished rockfish that are likely to co-occur with healthy stocks of groundfish. To achieve this goal, Rockfish Conservation Area boundaries generally occur along depth contours and may vary depending on gear type. The boundaries also vary depending on season (CoRIS 2008). Several different types of Rockfish Conservation Areas exist, including commercial trawl, commercial non-trawl, and recreational closures. Boundaries for these areas are based on depth and updated regularly by the National Marine Fisheries Service. Current boundaries for these areas will be available via an online mapping tool. Map 8.2-2 displays areas of overlap between the different types of RCAs, thus showing areas that are closed to all groundfish fishing year-round.

Descriptions and regularly updated information on these areas can be found at: http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/Groundfish-Closed-Areas/Index.cfm

Essential Fish Habitat Conservation Areas

Essential Fish Habitat (EFH) protection measures implement discrete area closures for specific gear types, effective June 12, 2006. These closed areas were identified by the Pacific Fishery Management Council (PFMC) and are intended to minimize to the extent practicable the adverse effects of fishing on groundfish EFH. Maps displaying EFH area closures to protect Pacific Coast groundfish habitat can be viewed at: www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/Groundfish-EFH/upload/Map-Gfish-EFH-Close.pdf

California Fish and Game Districts

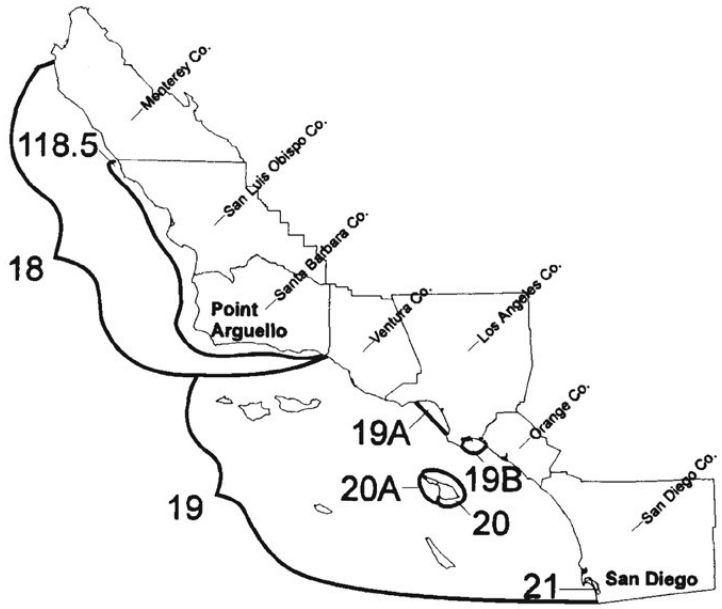
For the protection of fish and game, California is divided into Fish and Game Districts. These districts are defined in Sections 11000 through 11039 of Fish and Game Code (FGC).

These Fish and Game Districts are referenced in the FGC to prohibit the use of certain commercial fishing gear or the take of fish species in certain Districts. For example, “except as otherwise provided in this code, drift gill nets and set gill nets may be used in Districts 17, 18, 10, and 20A, except for the taking of salmon” (FGC §8693), and “(c) In District 19A, bait nets may be used only to take anchovies, queenfish, white croakers, sardines, mackerel, squid, and smelt for live bait purposes only. Bait nets may not be used within 750 feet of Seal Beach pier or Belmont Pier” (FGC §8780).

There are several smaller Districts in southern California, some of which have significant restrictions on fisheries. For instance, commercial fishing has been very limited in Santa Monica Bay, DFG fishing District 19A (Figure 8.2-1), since the 1950s. Fisheries restrictions for this District exist in several places in the FGC. A live-bait fishery using roundhaul nets continues to exist in Santa Monica Bay, but commercial fishing using lobster traps, set lines, trammel or gill nets, and handlines with more than two hooks has been prohibited (Schroeder and Love 2002, FGC §9026, §8694, §8725, §8757, §8780(b)). Finfish and hagfish traps may not be used within 750 feet of any piers, jetties, and breakwaters, but are allowed outside that area (FGC §9001, §9001.7(g)). The commercial take of rock crabs and lobster are also not allowed in the District (CCR T14 §122(a)(2), FGC §8282). Troll lines and spot prawn traps are allowed in the District (FGC §9025.5; FGC §9001,

§9015). District 19A is open to recreational fishers, and recreational fishing from shore and boats is still a popular activity within the bay (Schroeder and Love 2002).

Figure 8.2-1. California Department of Fish and Game fishing districts in the study region



8.3 Military and Power Plant Closures

Military Temporary Closures

Department of Defense (DoD) strives to conduct its operations in a manner that is compatible with commercial and recreational users by minimizing temporary access restrictions. These restrictions occur only when DoD needs to restrict public use of certain ocean areas during training operations for the safety of commercial and recreational users.

San Clemente Island

Sportsmen are allowed access to these areas off San Clemente Island (SCI) a majority of the time. However, the Navy has established safety zones to restrict public use of certain areas during training operations for the safety of commercial and recreational users; as described in the Code of Federal Regulations (CFR) Title 33 (Navigation and Navigable Waters), Part 334 (Danger Zone and Restricted Area Regulations) and Part 165 – Subpart F (Specific Regulated Navigation Areas and Limited Access Areas – Eleventh Coast Guard District). To facilitate planning by the fishing community, an interactive schedule and map of SCI has been established at the http://www.scisland.org web site (click on schedules).

San Nicolas Island

Access to areas off San Nicolas Island are allowed a majority of the time. However, temporary access restrictions occur when the Navy needs to restrict public use of certain safety zones during

testing and training operations for the safety of commercial and recreational users; as described in the CFR Title 33 (Navigation and Navigable Waters), Part 334.980 (Danger Zone and Restricted Area Regulations). Range marker poles are used as physical indicators of the three restricted zones and local Notices to Mariners are broadcast as needed to advise of area closures.

Vandenberg Air Force Base

Nine danger zones exist surrounding the base, which are periodically closed during launch activities. Danger zones 8 and 9 and Restricted airspace fall within the south coast study region, from Point Conception westward three nautical miles off shore and following the coastline eastward to Longitude West 120° 13' 00". Notices to Mariners, Notices to Harbor Masters, Notices to Airman and Notices to the Coast Guard are used to indicate closed areas to avoid.

Other Installations (Camp Pendleton, Seal Beach, Point Mugu, Port Hueneme, and San Diego-Area Facilities)

When not restricted by security, safety, and military training requirements, these waters are accessible for use by commercial and recreational fishing in accordance with applicable federal, state, and local laws and regulations.

Power Plant Closed Areas

Several coastal power plants are located within the study region and several have restricted coastal access for security reasons. San Onofre Nuclear Generating Station, for example, prohibits vessel traffic from entering, transiting, or anchoring within one nautical mile of the power plant (measured from 33° 22' 30" N, 117° 33' 50" W), though it does not prevent recreational activities in the surf zone or on the beach.

More information on U.S. Coast Guard Security/Precautionary Zones can be found at: http://www.dbw.ca.gov/PressRoom/2003/030702USCGSec.aspx.

8.4 Terrestrial Protected Areas in Coastal Watersheds

There are a variety of terrestrial protected areas within coastal watersheds of the region (Map 8.2-1). These areas include many state parks, state beaches, national wilderness areas, county and city beaches, national parks, national wilderness areas, and military lands along the coast that provide some protection for shoreline and estuarine habitats (Table 8.4-1).

Table 8.4-1. Terrestrial protected areas

Type of Protected Area	Locations	Number
National Parks	Channel Island National Park	1
National Recreation Areas	Santa Monica Mountains	1
National Monuments	Cabrillo	1
National Wildlife Refuges	Tijuana Slough, Seal Beach, San Diego Bay, and San Diego	4
State Beaches and Parks	Gaviota, Refugio, El Capitan, Carpinteria, Emma Wood, San Buenaventura, McGrath, Mandalay, Point Mugu, Leo Carrillo, Robert H. Meyer, Point Dume, Malibu Lagoon, Bolsa Chica, Huntington, Corona Del Mar, Doheny, San Clemente, Calafia, Crystal Cove, San Onofre, Carlsbad, South Carlsbad, Leucadia, Moonlight, San Elijo, Cardiff, Torry Pines, Silver Strand, Border Field,	30
National Forests	Los Padres, Angeles, Cleveland	3
State Reserves	Torrey Pines, Tijuana River National Estuarine Research Reserve	2
Santa Barbara County Beaches	Rincon, Carpinteria City, Lookout, Miramar, Hammonds, Butterfly, East, West, Leadbetter, Mesa Lane, Arroyo Burro, Goleta, and Isla Vista	13
Ventura County Beaches	Sycamore Cove, Ormond, Thorny Broome, Port Hueneme, Silver Strand, Channel islands, Hollywood, Mandalay, Marina Cove, Marina Park, Promenade Park, Surfer's Point, Solimar, Faria, Rincon Parkway North, Hobson, Oil Piers, Mussel Shoals, and La Conchita	18
Los Angeles County Parks	Nicholas Canyon, Zuma, Point Dume, Dan Blocker, Malibu, Las Tunas, Topanga, Will Rogers, Venice, Dockweiler, Torrence, Santa Monica, Marine Del Rey, Hermosa, Redondo, Torrance, Point Vincente, White Point Royal Palm, Cabrillo	18
Orange County Beaches	Seal, Surfside, Sunset, Huntington City, Santa Ana River, Newport, Balboa Beach, Newport Dunes, China Cove, Pirates Cove, Balboa Island, Little Corona Del Mar, Crescent Bay, Diver's Cove, Heisler Park, Main Beach, Stairs to Beaches, Ruby Viewpoint, Pocket, Aliso, Carmel Point, Salt Creek, Dana Point Harbor, Swim Beach, Louise Leyden, Capistrano, Poche, North, Linda Lane, and San Clemente City	31
San Diego County Beaches	Imperial, Coronado City, Ocean Beach, Mission, Pacific, Tourmaline, Windansea, Main Street, Children's Pool, La Jolla Cove, La Jolla Shores, Black's, Del Mar City, Seascape, Fletcher Cove, Tide, Swami's, Boneyard, D. Street, Moonlight, Stone Steps, Encinitas, Beacons, Ponto, Carlsbad, and Oceanside	26
Other Terrestrial Protected Areas	Point Mugu Naval Station, Camp Pendleton, San Diego Bay Naval Base, San Nicolas Island, San Clemente Island, and coastal power plants listed in section 4.5.3.	

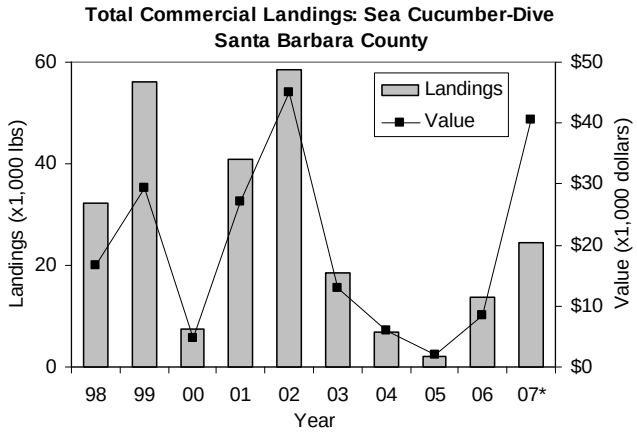
9. Conclusion

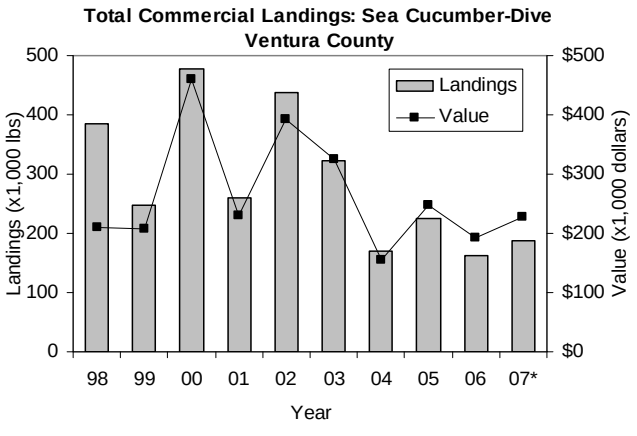
The MLPA south coast study region is the third region to begin the MLPA planning process and builds on lessons learned during the MLPA Central Coast and North Central Coast Projects. This regional profile summarizes and provides background information on the biological, oceanographic, socioeconomic and governance aspects of the region and will draw upon suggestions and information provided by regional stakeholders and the SAT. The profile serves as a foundation for evaluating existing MPAs and describing alternatives of potential new MPAs, and identifying needs for additional data and information.

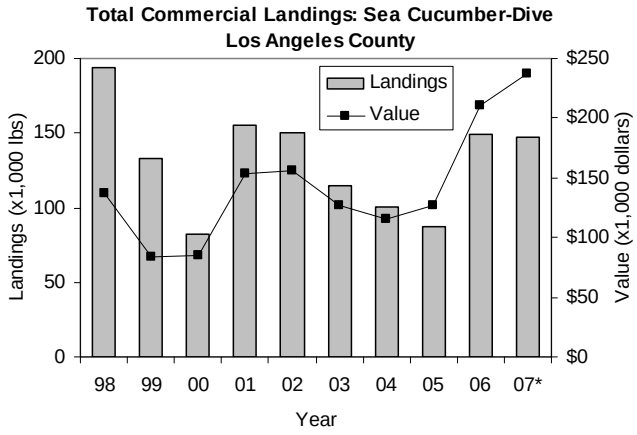
The MLPA has a number of goals that includes conservation of biodiversity and health of marine ecosystems, recovery of depleted marine populations, protection of representative and unique habitats for their intrinsic value, and improvement of recreational, educational, and study opportunities. The south coast study region is one of the most biologically productive and heavily used regions in the world. Furthermore, California's marine and coastal environments form part of the State's identity and support important economies that depend on healthy ocean resources, such as fisheries and coastal tourism.

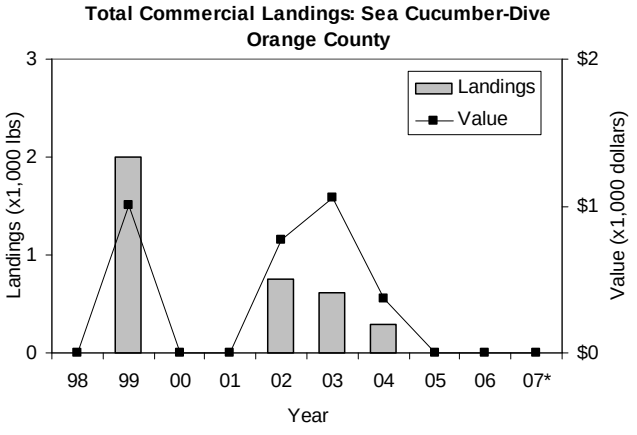
In summary, the south coast study region has many important and unique features including:

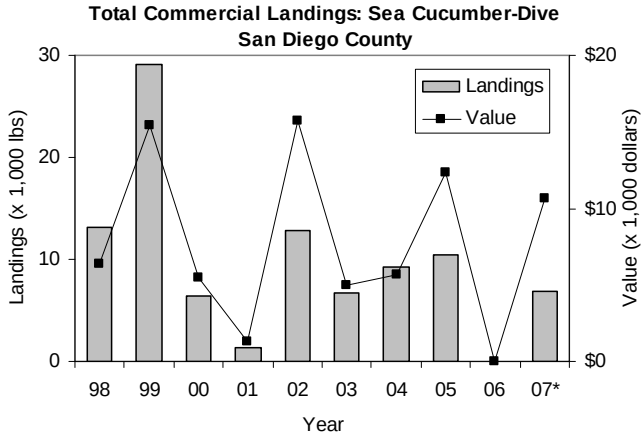
- A number of offshore islands situated in an area of complex bathymetry that support diverse ecological assemblages
- Unique oceanographic conditions, including the intersection between two distinct biogeographic regions
- Important kelp forests and rocky reefs and associated species assemblages
- Large expanses of sandy beaches and soft-bottom habitats important for a number of species as well as coastal activities
- Regionally important estuaries (e.g. Anaheim Bay, Upper Newport Bay, Bolsa Chica, San Diego Bay, and Tijuana River Estuary)
- High species diversity, including a number special status species
- High population density, with millions of people living in close proximity to the coast
- Rich and productive fisheries that have supported coastal communities and provided fresh seafood to the region and the world
- Large numbers of both consumptive and non-consumptive recreational coastal users
- Renown as a fishing, diving, kayaking, whale-watching and wildlife viewing destination where marine recreational activities help to support coastal tourism and coastal communities
- The Channel Islands National Marine Sanctuary
- Three National Park units adjacent to the study region, including the Santa Monica Mountains National Recreation Area, the Cabrillo National Monument, and the Channel Islands National Park
- An abundance of marine research and educational institutions and non-governmental organizations whose staff have explored and studied the region and helped to raise public awareness about marine ecosyste

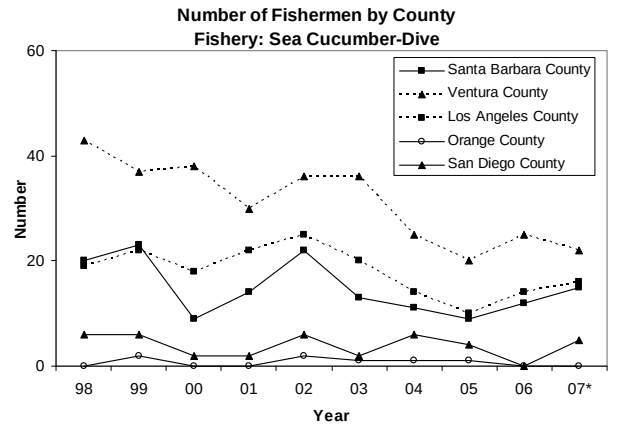












Fishery: Sea Cucumber—Bottom Trawl

Species Targeted: California sea cucumber (*Parastichopus californicus*)
Primary depth range: 120 to 360 feet (20 to 60 fathoms)
Primary habitat type(s): sand, mud bottom
Primary gear: Bottom trawl
Primary area of fishery: State waters ( ) Federal waters (x)
Synopsis of commercial regulations applicable to the south coast study region: In 1992 the Legislature established a sea cucumber harvest permit, required for trawlers and divers targeting sea cucumbers. Qualifying criteria for the permit included having a 50-pound documented landing of sea cucumbers during a calendar year between Jan 01, 1988, and June 30, 1991.