Table 3.3-1
Beneficial Use Definitions for Water Bodies in the Study Area

Acronym	Use	Definition
MUN	Municipal and domestic water supply	Uses of water for community, military, or individual water supply systems, including but not limited to drinking water supply.
AGR	Agricultural supply	Uses of water for farming, horticulture, or ranching, including but not limited to irrigation, stock watering, or support of vegetation for range grazing.
PROC	Industrial process supply	Uses of water for industrial activities that depend primarily on water quality.
IND	Industrial service supply	Uses of water for industrial activities that do not depend primarily on water quality, including but not limited to mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well re-pressurization.
GWR	Ground water recharge	Uses of water for natural or artificial recharge of groundwater for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers.
NAV	Navigation	Uses of water for shipping, travel, or other transportation by private, military, or commercial vessels.
POW	Hydropower generation	Uses of water for hydropower generation.
REC-1	Water contact recreation	Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include but are not limited to swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.
REC-2	Non-contact water recreation	Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include but are not limited to picnicking, sunbathing, hiking, beachcombing, camping, boating, tide pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.
COMM	Commercial and sport fishing	Uses of water for commercial or recreational collection of fish, shellfish, or other organisms, including but not limited to uses involving organisms intended for human consumption or bait purposes.
WARM	Warm freshwater habitat	Uses of water that support warm water ecosystems, including but not limited to preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.
COLD	Cold freshwater habitat	Uses of water that support cold water ecosystems, including but not limited to preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.
EST	Estuarine habitat	Uses of water that support estuarine ecosystems, including but not limited to preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, or shorebirds).
MAR	Marine habitat	Uses of water that support marine ecosystems, including but not limited to preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals or shorebirds).
WILD	Wildlife habitat	Uses of water that supports terrestrial ecosystems, including but not limited to preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, or invertebrates), or wildlife water and food sources.
BIOL	Preservation of biological habitats	Uses of water that support designated areas or habitats, such as areas of special biological significance, established refuges, parks, sanctuaries, ecological reserves, or other areas where the preservation or enhancement of natural resources requires special protection.

Table 3.3-2
Summary of Beneficial Uses and Impairments Within Coastal Reaches and Channel Island Subareas of the Study Area

	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Offshore Channel Islands	Nearshore Channel Islands
Beneficial uses								
MUN	X	X	X	X	X		X	X
IND		X		X	X	X		
PROC				X				
NAV	X	X	X	X	X	X		X
GWR			I	X	I			X
AGR						X		X
REC 1	X, I	X, I	X, I	X	X, I	X	X	X
REC 2	X, I	X, I	X, I	X	X, I	X	X	X
COMM	X	X, I	X	X	X	X	X	X
WARM	X, I	X, I	X, I	X, I	X, I	X	X	
COLD	X			I				
EST	X	X		X	X		X	
MAR	X	X	X	X	X	X		X
WILD	X	X	X	X	X, I	X	X	X
BIOL	X	X		X	X		X	X
RARE	X	X	X	X	X	X	X	X
MIGR	X	X		X		X		
SPWN	X, I	X	X	X	X	X		X
SHELL	X	X	X	X	X	X		X
WET	X	X	X	X				
Impairments								
Abnormal fish histology				P				
Ammonia		P		P				
Beach closures	P	P	P	P				
Benthic community effects	P			P				
Coliform bacteria	P	P	P	P	P	P		
Debris		P						
DDT/PCB fish consumption advisory	P	P	P	P				
Enteric viruses	P	P						
Eutropic	P			P				
Exotic vegetation		P						
Fish barriers	P							
Habitat alterations		P						
Hydromodification		P						
Metals	P	P		P	P	P		
Nutrients (algae)	P			P				
Odors				P				
Polynuclear aromatic hydrocarbons (PAHs)		P		P				
Pathogens		P	P		P			
Pesticides		P	P		P			
Reduced tidal flushing		P						
Scum/foam	P			P				
Sedimentation	P							
Sediment toxicity		P		P				
Trash	P	P		P				

X = Present or potential beneficial use
P = Present
I = Intermittent beneficial use

The water quality objectives for surface waters in Coastal Reaches 1 through 6 are established by the Water Quality Control Plans for Regions 3 (Central Coast), 4 (Los Angeles), 8 (Santa Ana), and 9 (San Diego) (CRWQCB 1995a, 1995b, 1995c, and 1995d, respectively). The standards represent maximum levels that allow beneficial uses of the water basin to continue unimpaired.

Assembly Bill 411 includes new standards for concentrations of bacterial indicators that are used for beach postings and closures. The standards, known as the AB411 criteria, are applied in Southern California from April 1 through October 31, which represents the maximum public use period for Southern California beaches. The minimum protective bacterial concentrations are established by the AB411 criteria for waters adjacent to public beaches and public water-contact sports areas.

Watershed Descriptions

Watershed descriptions come from the Southern California Watershed Inventory (SCWI), which is part of the California Coastal Conservancy's Southern California Wetlands Recovery Project. SCWI has identified six major hydrologic units that discharge to the SCB within the six coastal regions defined in this project. The major hydrologic units are shown in Figure 3.3-1. The characteristics of the hydrologic units and the major watersheds and wetlands within them are presented in Table 3.3-3. The six major hydrologic units are:

- **Santa Monica Bay.** The Santa Monica Bay hydrologic unit covers an area of approximately 103,637 hectares (256,000 acres). The hydrologic unit is subdivided into 28 separate drainages that discharge to Coastal Reaches 1, 2, and 3.
- **Dominguez Channel.** The Dominguez Channel hydrologic unit covers an area of 4,102 hectares (10,131 acres). The Los Angeles Harbor is located within Coastal Reach 4.
- **Los Angeles River.** The Los Angeles River is a large hydrologic unit that encompasses 216,351 hectares (534,420 acres). The watershed drains into San Pedro Bay and is located within Coastal Reach 4.
- **San Gabriel River.** The San Gabriel River hydrologic unit covers an area of 183,778 hectares (453,960 acres). The main stem of the San Gabriel River discharges near the Los Angeles/Orange County Line. The mouth is located at the southern end of Coastal Reach 4.
- **Lower Santa Ana River.** The Lower Santa Ana River hydrologic unit covers an area of approximately 725,460 hectares (1,792,000 acres) and can be divided into two major watersheds. The Santa Ana River watershed of approximately 438,248 hectares (1,082,540 acres) and the San Diego Creek Watershed of approximately 39,900 hectares (98,560 acres). Both watersheds lie within Coastal Reach 5.
- **San Juan.** The San Juan hydrological unit covers an area of approximately 129,546 hectares (320,000 acres). The majority of the San Juan Hydrologic Unit lies within Coastal Reach 6. The two largest watersheds within this hydrologic unit are the Aliso Creek Watershed (7,876 hectares [19,456 acres]) and the San Juan Creek Watershed (34,693 hectares [85,696 acres]).

Table 3.3-3
Characterization of Watersheds and Coastal Features Within the Study Area

[illegible]

Table 3.3-3
Characterization of Watersheds and Coastal Features Within the Study Area

[illegible]

3.3.2 Coastal Reaches

The major watersheds and coastal features within each of the major hydrological units are characterized below by coastal reach. Under Section 303(d) of the 1972 Clean Water Act, states, territories, and authorized tribes are required to develop a list of water quality limited segments. These segments do not meet water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires that these jurisdictions establish priority rankings for water on the lists and develop Total Maximum Daily Loads to improve water quality. The Section 303(d)-listed water bodies are shown in Figure 3.3-1.

Coastal Reach 1

Several watersheds discharge along Coastal Reach 1, from Point Dume to Pacific Palisades (Figure 3.3-1). The majority are small watersheds that drain the deep and narrow canyons of the Santa Monica Mountains. The largest watersheds in this area are Malibu Creek and Topanga Creek. No harbors or marinas are located within Coastal Reach 1.

Malibu Creek is the largest watershed within Coastal Reach 1 (Figure 3.3-1). It drains an area of approximately 28,241 hectares (69,760 acres) (Table 3.3-3). Urban land use dominates the watershed, particularly in the upper segments. However, a large portion of the watershed is protected within Malibu Creek State Park. Outflow from the drainage empties into Santa Monica Bay through Malibu Lagoon. The streambed of Malibu Creek has not been channelized.

Many of the pollutants of concern in the Malibu Creek watershed are from non-point sources. They include excess nutrients, sediment, and bacteria. Malibu Creek is on the 303(d) list for fish barriers, high coliform count, nutrients, scum/foam-unnatural conditions, benthic community effects, enteric viruses, and eutrophic conditions.

The Topanga Creek watershed lies to the east of Malibu Canyon at the eastern end of Coastal Reach 1. It encompasses an area of approximately 5,091 hectares (12,575 acres) (Table 3.3-3). Topanga Creek is the sole tributary to the Topanga Lagoon, which is located at the mouth of the Creek. Topanga Creek is on the state's 303(d) list for excessive levels of lead.

Within Coastal Reach 1, 17 water bodies are on the state's 2002 303(d) list. Two of these (Malibu Creek and Topanga Canyon Creek) are in watersheds that drain to the study area. The rest are coastal water features that include numerous beaches and one lagoon (Malibu Lagoon). Most of the beach sites are listed for exceedances of standards related to concentrations of DDTs and PCBs in fish tissue and subsequent fish consumption advisories. In addition, Dan Blocker Memorial Beach was listed due to exceedances of coliform bacterial levels.

Coastal Reach 2

Ballona Creek is the largest drainage within Coastal Reach 2 (Figure 3.3-1). The watershed encompasses an area of approximately 23,059 hectares (56,960 acres) (Table 3.3-3). A large majority of Ballona Creek is channelized and paved, and the creek contains little in-stream or riparian habitat. The creek discharges to the Ballona wetlands by four concrete culverts.

Santa Monica Canyon is located on the northeast border of Santa Monica Bay (Figure 3.3-1). This watershed encompasses an area of approximately 11,127 hectares (27,485 acres)

(Table 3.3-3). Two major drainages occur in the watershed: Santa Monica Canyon Creek and Rustic Canyon Creek.

Coastal Reach 2 contains 17 water bodies on the state's 2002 303(d) list. Four of these are classified as rivers: Santa Monica Canyon (listed for high coliform count and lead), the Pico Kenter storm drain (listed for ammonia, copper, enteric viruses, and high coliform counts), Ballona Creek (listed for cadmium in the sediment), and Ballona Creek estuary (listed for chlordane in fish tissue and sediment). One tidal wetland (Ballona Creek wetlands) and one beach site (Manhattan Beach) occur. The remainder of the water bodies on the 303(d) list within Coastal Reach 2 are classified as a bay or a harbor. Most of these are listed for high coliform counts. However, Marina Del Rey is listed for a variety of contaminants, including organochlorine pesticides (including DDTs), PCBs, metals, and sediment toxicity. In addition, the offshore and nearshore areas of all of Santa Monica Bay are included on the 303(d) list in Coastal Reach 2. The list for Santa Monica Bay includes DDTs and PCBs (in sediment and fish), chlordane, polynuclear aromatic hydrocarbons (PAHs), and sediment toxicity.

Coastal Reach 3

Coastal Reach 3 encompasses the seaward portion of the Palos Verdes Peninsula (Figure 3.3-1). The entire reach lies within the Santa Monica Bay hydrologic unit. However, no sub-watersheds discharge directly to the coast within Coastal Reach 3. Also, no marinas or harbors are located within the reach.

Coastal Reach 3 contains 12 water bodies on Palos Verdes Peninsula, all of which are classified as a coastal shoreline or beach. Nearly the entire beach area on the Palos Verdes Peninsula is listed on the 303(d) list (Figure 3.3-1). All of the water bodies listed except Lunada Beach, Palos Verdes Shoreline Park Beach, and Point Vicente Beach are in exceedance of standards for DDTs and PCBs. In addition, the entire Palos Verdes area is covered by a fish consumption advisory.

Coastal Reach 4

Three major hydrologic units discharge to the coast within Coastal Reach 4: the Dominguez Channel, the Los Angeles River, and the San Gabriel River (Figure 3.3-1).

The Dominguez Channel hydrologic unit covers an area of 4,102 hectares (10,131 acres) (Table 3.3-3). The main drainage in the basin is the Dominguez Channel, which flows south and empties into the Consolidated Slip area of Los Angles Harbor in San Pedro Bay. The Dominguez Channel is on the state's 303(d) list for ammonia, pesticides (including DDTs in fish tissue and sediment), chromium, ChemA contaminants, and benthic community effects. The Consolidated Slip is one of the most polluted areas of Los Angeles Harbor. It is listed for DDTs and PCBs (in fish tissue and sediment) several metals, chlordane, dieldrin, toxaphene, and sediment toxicity.

The Los Angeles River hydrologic unit drains an area of approximately 216,351 hectares (534,420 acres) (Table 3.3-3). Two main tributaries discharge to the lower sections of the Los Angeles River: Compton Creek, which drains an area northwest of the Los Angeles River main stem, and Rio Hondo, which drains an area to the northeast. The Los Angeles River is completely channelized except for one small reach in the middle portion of the river called the narrows. Both the Los Angeles River and Queensway Bay, where the river discharges, are listed for several contaminants.

The Los Angeles and Long Beach Harbors are located in San Pedro Bay at the mouths of the Dominguez Channel and the Los Angeles River (Figure 3.3-1). Extensive modification of the area has taken place since the late 1800s, and the Los Angeles/Long Beach Harbor complex is now one of the largest ports in the country. Influences on water quality in the area include two generating stations in the inner harbor areas, numerous non-process waste dischargers, secondary treated effluent from a public-owned treatment works, and runoff from the Los Angles River and the Dominguez Channel, which drains a highly industrialized area.

Due to inputs of contaminants from the above sources, combined with poor tidal flushing in some areas of the Los Angeles/Long Beach complex, contaminant levels have repeatedly exceeded the standards for the area. Both nearshore and offshore zones of all of San Pedro Bay are on the state's 303(d) list for sediment toxicity and the following contaminants that have been found in the bay's sediment: chromium, copper, DDTs, PCBs, PAHs, and zinc. San Pedro Bay is also on the 303(d) list for fish consumption advisories for excessive levels of DDTs and PCBs that have been found in fish tissue. The Los Angeles Harbor Consolidated Slip (which receives runoff from Dominguez Channel), the Main Channel, Fish Harbor, the Southwest Slip, the Inner Breakwater, and Cabrillo Beach are all on the 303(d) list for a variety of contaminants, including DDTs and other pesticides, PCBs, PAHs, metals, sediment toxicity, and benthic community effects. A similar list of contaminants is found on the 303(d) list for several areas in Long Beach Harbor, including the Main Channel, the Southeast Basin, the West Basin, Pier J, and the Breakwater.

The San Gabriel River watershed encompasses an area of approximately 183,778 hectares (453,960 acres) (Table 3.3-3). Flow is dominated by effluent from several municipal wastewater treatment facilities and urban runoff. However, the San Gabriel River estuary and the lower portions of the river are on the 303(d) list only for abnormal fish histology.

One lake is on the 303(d) list within Coastal Reach 4: Machado Lake, which is located in Harbor Regional Park. Machado Lake has been impacted by industrial waste products in the past and is on the 303(d) list for a variety of constituents, including organochlorine pesticides (including DDTs), PCBs, ammonia, eutrophic conditions, and trash. Also, two beaches within Coastal Reach 4 are on the 303(d) list: Inner and Outer Cabrillo Beaches. Both beaches are listed for the presence of fish consumption advisories due to excessive levels of DDTs and PCBs.

Coastal Reach 5

Coastal Reach 5 extends from the Orange County jurisdictional boundary just south of the San Gabriel River to Corona Del Mar. All of this area lies within the Santa Ana River hydrologic unit (Figure 3.3-1). Three major watersheds terminate along the coast within Coastal Reach 5: the Anaheim Bay/Bolsa Chica wetlands, the Santa Ana River (including the Talbert/Huntington Beach wetlands), and the San Diego Creek/Newport Bay system (Table 3.3-3). Also, several coastal wetlands occur within Reach 5, including Anaheim Bay, Huntington Harbor, the Bolsa Chica and Santa Ana River/Huntington Beach wetlands, and Newport Bay.

Of the watersheds that terminate in Coastal Reach 5, the Santa Ana River watershed is the largest. It drains an area of approximately 438,250 hectares (1,082,500 acres) (Table 3.3-3). Surface diversions and groundwater pumping have eliminated most of the dry weather surface flows and most of the Santa Ana River is effluent dominated (CRWQCB 1995c). The Orange County Water District diverts and recharges nearly all the dry weather flows in the Santa Ana

River at the groundwater recharge areas near Anaheim. Downstream of this area, the Santa Ana River is normally dry.

The San Diego Creek watershed encompasses approximately 39,900 hectares (98,560 acres) (Table 3.3-3). Other drainages to Newport Bay include the Santa Ana-Delhi Channel, which discharges at the north end of the bay.

Seven water bodies within Coastal Reach 5 are on the 303(d) list. Only one, San Diego Creek (Reach 2), is classified as a stream or river. San Diego Creek is on the 303(d) list for metals and toxicity from unknown point sources. This creek is the main tributary to Upper Newport Bay. The water quality issues in Newport Bay are primarily non-point in nature. They are discussed under wetlands in Section 3.4.

The remainder of the water bodies on the 303(d) list in Coastal Reach 5 are Seal Beach, Huntington Beach Harbor, and Huntington Beach State Park. All three are listed for excessive levels of bacterial indicators.

Coastal Reach 6

Coastal Reach 6 extends from Corona Del Mar to Dana Point. Two major hydrologic units occur within Coastal Reach 6: the Santa Ana River and San Juan Creek (Figure 3.3-1).

The Los Trancos/Muddy Creek watershed lies within the Santa Ana River hydrologic unit. The watershed covers an area of approximately 2,902 hectares (7,168 acres) and consists of two drainages: Los Trancos Creek and Muddy Creek (Table 3.3-3). The creeks drain the San Joaquin Hills and discharge to the beach at Crystal Cove State Park. Los Trancos Creek is on the state's 303(d) list for excessive levels of fecal coliform bacteria. Beaches near the Los Trancos/Muddy Creek watersheds are on the state's 303(d) list for elevated levels of bacterial indicators.

The remainder of the watersheds that discharge within Coastal Reach 6 lie within the San Juan hydrologic unit (Figure 3.3-1). The Laguna Canyon Watershed covers an area of 2,720 hectares (6,720 acres) (Table 3.3-3) and discharges at Laguna Beach. The main drainage in the watershed is the Laguna Canyon Channel. The coastline at Laguna Beach is on the 303(d) list for elevated levels of bacterial indicators.

Aliso Creek is the second largest watershed within the San Juan hydrologic unit (Figure 3.3-1). It covers an area of 7,876 hectares (19,456 acres) (Table 3.3-3). Aliso Creek, which discharges at Aliso Beach, is the main drainage in the watershed. Aliso Canyon Wash is on the 303(d) list. Also, Aliso Creek, its mouth, and the shoreline at Aliso Beach are listed.

The Salt Creek Watershed is the smallest within Coastal Reach 6 (1,580 hectares [3,904 acres]) (Table 3.3-3) and the smallest in Orange County (OCWCRD 2003). Arroyo Salado is the major drainage in the watershed. It discharges at Salt Creek Beach Park, just north of Dana Point (Figure 3.3-1). Land use in the watershed is primarily urban. Salt Creek is on the state's 303(d) list for elevated bacterial indicators.

The San Juan Creek Watershed encompasses an area of 34,693 hectares (85,696 acres) (Table 3.3-3) and is the largest watershed within Coastal Reach 6 (Figure 3.3-1). San Juan Creek forms the main drainage in the watershed. Arroyo Trabuco and Oso Creek are major tributaries. At the mouth of San Juan Creek is the San Juan Creek wetland, which is discussed under wetlands in Section 3.4. San Juan Creek, its mouth, and the adjacent shoreline are on the state's 303(d) list for elevated levels of bacterial indicators.

Dana Point Harbor, located in the City of Dana Point, is the only harbor within Coastal Reach 6. The Harbor's Baby Beach is on the state's 303(d) list for elevated levels of bacterial indicators.

Northern and Southern Channel Islands

The Northern and Southern Channel Islands have minimal water quality problems. Except for limited development within Avalon on Santa Catalina Island, land use on the islands is predominantly open space. Surface runoff on the islands drains to the coast from intermittently flowing creeks in small valleys and canyons or through sheet flow over the ground surface (CRWQCB 1995b). The only water feature on any of the islands that is on the 303(d) list is Avalon Beach on Santa Catalina Island, which is listed for bacterial indicators.

3.3.3 Coastal Water Characteristics

The surface temperatures of the coastal waters within Coastal Reaches 1 through 6 range from about 11° to 23° Centigrade (C) (52° to 73° Fahrenheit [F]) (CLADPW 1982). Surface temperatures are affected most by variations in the California Current and the Southern California Countercurrent. At a depth of approximately 60 meters (200 feet), water temperatures in the area range from 10° to 15° C (50 to 59° F).

Historical levels of salinity have been fairly uniform in the surface waters of the SCB. Salinity ranges from 33.5 to 34.1 parts per thousand (ppt) in the California Current and from 33.4 to 34.6 ppt in the California Undercurrent (CLADPW and USEPA 1977). Within the study area, the salinity values of surface waters typically range from 32 to 34 ppt and tend to be fairly homogenous with depth, with differences of less than 1 ppt from surface to bottom waters.

Dissolved oxygen (DO) levels within the study area are usually highest in surface waters due to photosynthetic activity and contact with the atmosphere. At the surface, DO levels are generally near saturation, which varies with temperature and salinity. Historical DO values of surface water in the study area range from 5.0 to 11.6 milligrams per liter (mg/L). The pH of water along the Southern California coast generally has limited variability due to the high buffering capacity of seawater. Surface water pH values in the study area typically range from 7.5 to 8.6. As depth increases, pH levels decrease. A greater range of pH values is often observed in coastal embayments and estuaries due in part due to elevated levels of photosynthesis and respiration.

Turbidity is a result of particles suspended in the water column. In coastal areas and embayments, elevated turbidity levels can result from natural causes (e.g., plankton blooms, wave action, and watershed runoff) and from anthropogenic sources (e.g., urban runoff, wastewater discharge, and dredging disposal). Concentrations of contaminants are often higher in turbid waters due to adhesion to sediment particles. Turbidity levels generally are elevated in coastal embayments and lagoons due to shallow depths (mixing of bottom sediments), river discharges, storm water runoff, and algal blooms.

The density of seawater is a function of its temperature and salinity. Layers of distinctly different water densities (a pycnocline) can result from changes in temperature (a thermocline), salinity (a halocline) or a combination of the two. Pycnoclines form natural barriers to exchange of water between the two layers. Within the study area, a thermocline often develops in the spring as surface temperatures increase. When the surface temperature drops in the fall, the thermocline breaks down. Regional stratification may also occur (primarily in the spring) when storm water runoff produces a freshwater lens on the sea surface. Stratification is usually less distinct in shallow coastal embayments.

3.4 BIOLOGICAL RESOURCES

The distribution of marine habitats and species within the SCB is related to the complex hydrography and geology of the region. The mainland consists of rocky shores, sandy beaches, wetlands, and embayments of various types. Distributed between the mainland and the Channel Islands is a complex mosaic of submarine canyons, ridges, basins, and seamounts. This habitat complexity has contributed to abundant and diverse marine biota. More than 5,000 species of benthic invertebrates, 481 species of fish, and 496 species of algae and seagrasses occur within the SCB (Dailey et al. 1993). The SCB is also the seasonal residence of more than 200 species of coastal and offshore birds and 39 species of marine mammals.

Several sources of information were used to describe existing biological conditions within the study area. The primary sources of information were two regional surveys conducted in 1994 and 1998 (SCCWRP 2004); the data from the vicinity of the Palos Verdes Shelf were augmented by data from the Los Angeles County monitoring program for the wastewater outfall at Palos Verdes (LACSD 2002). Other important sources of information include the comprehensive volume *The Ecology of the Southern California Bight* (Dailey et al. 1993), monitoring programs conducted at the Channel Islands, information from the Southern California Wetlands Recovery Project (2004), environmental sensitivity index maps prepared by the CDFG, and several published and unpublished reports.

The discussion of biological resources is organized into three main subsections. Section 3.4.1 describes the marine and coastal habitats (pelagic, subtidal benthic, intertidal benthic, coastal wetlands, and the Channel Islands) that occur in the study area. Sections 3.4.2 through 3.4.5 discuss the animals of special relevance to the project (namely, fish, birds, marine mammals, and terrestrial mammals). Section 3.4.6 lists the threatened and endangered species in the study area. Because the injuries of the Montrose case focused on marine-associated species, terrestrial resources are not the primary focus of this discussion of biological resources. However, limited discussion of terrestrial resources is presented for the Channel Islands, as they represent breeding habitats for bald eagles, peregrine falcons, and a number of species of seabirds. Sensitive terrestrial species also are addressed, as appropriate, in the threatened and endangered species subsection.

3.4.1 Marine and Coastal Habitats of the Study Area

The marine environment is complex and three-dimensional; it supports a broad diversity of plants and animals. The Southern California marine environment includes 481 species of fish, over 5,000 species of invertebrates, over 400 species of marine macrophytes (plants and algae), 34 species of marine mammals, and 195 species of birds (Dailey et al. 1993). In this document, marine habitats are divided into pelagic, subtidal benthic (soft-bottom and hard-bottom), and intertidal benthic. This section also discusses coastal wetlands (sandy beach and rocky shoreline) and habitats on the Channel Islands (terrestrial, shoreline, and nearshore). The following sections provide brief descriptions of these habitats, discuss the fish and macrophytes associated with them, and outline how each habitat relates to the injuries of the Montrose case.

Pelagic Habitats

Pelagic habitats occur in open water and support free-swimming organisms. The pelagic zone provides important habitat for plankton, though plankton are not exclusive to pelagic habitats.

Plankton is a generic term that includes a broad and diverse group of plants and animals that are found everywhere in aquatic environments. Typically, the smallest plankton are microscopic plant organisms called phytoplankton. The most abundant and important components of phytoplankton are generally the diatoms and dinoflagellates, which range in size from a few micrometers to a few hundred micrometers. Larger planktonic animals include zooplankton, larvae of benthic invertebrates, and ichthyoplankton (larval fish and eggs). Bacteria, which play a critical role in the degradation of particulate organic matter, are also plankton.

Currents, water column stratification, and winds all can affect the movement and distribution of planktonic organisms. Plankton are generally short-lived organisms, or organisms that reside in the water column a short time (ranging from days to months). Thus, species composition and abundance patterns vary greatly on a seasonal and inter-annual basis in response to the fluxes of nutrients, trace elements, and other conditions that affect phytoplankton production.

The vast majority of life in the sea is dependent on the production of organic matter (photosynthesis) in the lighted surface layers (the euphotic zone). Ocean life is largely dependent either directly or indirectly on phytoplankton, tiny unicellular or colonial algae, and macrophytes (larger algae and plants). Phytoplankton provides over 90 percent of the basic organic material that supports marine food webs. Phytoplankton are grazed on by herbivorous zooplankton and small fishes such as anchovies, which in turn are fed upon by larger carnivorous creatures. Fish and seabirds also utilize pelagic habitats.

The role of plankton as a basis for pelagic food webs is critical in several of the restoration options considered in this Restoration Plan. Plankton communities appear to have much lower levels of DDT and PCB contamination than do benthic communities, which also act as the basis of some marine food webs. Fish species that primarily derive their food from plankton-based food webs tend to be lower in contamination than those that derive most of their food from benthic-based food webs. Thus, fish consumption advisories for pelagic fish species tend to occur in few areas and be less limiting than those applied to soft-bottom species (Table 3.4-1). This basic concept will be an important building block for restoring injuries to fish and fishing.

Table 3.4-1
Summary of Recreational Landings (Released Fish Excluded) and Fish Consumption Advisories for Species Targeted by Anglers in Southern California, 1999–2003

Species	Recreational landings (kg)			Consumption advisories
	Shore	Boat	Total	Most limiting (Number of Locations)[4]
Hard-Bottom Species				
Opaleye	47,783	72,317	120,100	
Sargo	9,606	14,752	24,358	
Kelp Bass	1,640	1,338,274	1,339,914	1 meal every 2 weeks (1)
Surfperches- BF[1]	152,770	29,441	182,211	1 meal a month (3)*
Surfperches – WCF[2]	21,886	712	22,599	1 meal a month (3)*
Rockfishes[3]	12,058	834,092	846,150	1 meal every 2 weeks (1)
California Sheephead	1,617	308,496	310,112	
Hard/Soft-Bottom Species				
Topsmelt	8,778	328	9,106	
Barred Sandbass	5,312	1,739,120	1,744,432	
Halfmoon	2,710	124,680	127,389	
California Scorpionfish	1,394	324,167	325,560	1 meal a month (2)
White Seabass	5,399	962,327	967,726	
Black Croaker	1,104	1,007	2,111	1 meal a month (2)
Pelagic Species				
Chub Mackerel	429,185	453,568	882,753	
Pacific Sardine	89,101	791	89,892	
Pacific Bonito	3,002	116,163	119,166	
Pacific Barracuda	1,031	1,632,729	1,633,761	
Yellowtail	91	1,544,432	1,544,523	
Soft-Bottom Species				
White Croaker	19,113	65,138	84,251	Do not consume (7)
Jacksmelt	41,690	25,170	66,860	
Yellowfin Croaker	58,574	8,779	67,353	
California Corbina	20,464	672	21,136	1 meal every 2 weeks (2)
California Halibut	27,285	1,478,456	1,505,741	
Shovelnose Guitarfish	45,502	23,189	68,691	
Queenfish	58,364	2,014	60,379	1 meal a month (3)

Note: Landings are divided into boat and shore modes, and fish species are organized into the habitats with which they are most frequently associated. Biomass estimates are developed from the Pacific Recreational Fisheries Information Network (RecFIN) data. Fishing advisories are as reported by California EPA's Office of Environmental Health Hazard and Assessment (OEHHA). "Shore" refers to all fishing from shore-based modes (beach/bank/pier), and "Boat" refers to boat-based modes 0 to 3 miles from shore. Species are grouped according to their habitats (based on the information presented in Allen 1999).

[1] The "Surfperches - BF" complex includes the following benthic feeding species of surfperch: white seaperch, barred surfperch, calico surfperch, pile perch, black perch, rainbow seaperch, dwarf perch, striped seaperch, and rubberlip seaperch.

[2] The "Surfperches - WCF" complex includes the following water column feeding species of surfperch: walleye surfperch, silver surfperch, spotfin surfperch, shiner perch, and kelp perch.

[3] The "Rockfishes" complex includes the entire *Sebastes* genus blue rockfish.

[4] Numbers indicate the number of locations (out of 11 possible locations) where fish consumption advisories are currently in place in the Southern California Bight. "Most limiting" refers to the advisory where the fewest meals per month are recommended for the species. Absence of a fish consumption advisory for a species may be due either to a lack of data or data indicating low concentrations of contaminants.

*Fish consumption advisories are given for surfperches as a group and are not broken into "BF" and "WCF" sub-categories.

Subtidal Benthic Habitats

Benthic habitats include the substrata and the boundary of the water column that is physically influenced by the substrata. Benthic habitats are typically characterized by water depth and substrate type. Within the SCB, both soft-bottom (i.e., sand and mud) and hard-bottom habitats (i.e., rock and sandstone reefs) are common and each type supports a unique biota. Organisms that live in the sediments are referred to as infauna, those that live on the surface are generally referred to as epifauna or epibenthic, and those that live near the bottom are generally called demersal.

Soft-bottom Habitats

Soft-bottom benthic communities show seasonal variability, with diversity and abundance typically highest in spring and summer and lowest in winter. Benthic communities can also be affected by winter storms (waves and rain) that can physically disrupt bottom communities and/or subsequent runoff that can transport sediment, debris, and nutrients to benthic habitats.

Soft-bottom communities show characteristic zonation related to water depth and (in the nearshore) wave energy and wave surge. Thus, regional surveys and monitoring studies have found distinct benthic communities organized along depth gradients (Jones 1969, Fauchald and Jones 1983, Thompson et al. 1987, Thompson et al. 1993, Diener et al. 1995, Bergen et al. 1999). Soft-bottom subtidal habitats in the SCB support several thousand benthic invertebrate species, which in turn are preyed upon by a variety of demersal fish species.

The types of benthic invertebrates living on and within sediment also vary according to sediment type, depth, and environmental stress. The Inner Shelf has fewer invertebrate species and smaller populations than the Middle and Outer Shelf assemblages. Polychaete worms and small, mobile crustaceans dominate the Inner to Middle Shelf infaunal communities. The infauna of the Outer Shelf include annelid polychaetes, echinoderms, bivalve mollusks, and crustacean ostracods. Epibenthic invertebrates of the Inner Shelf and Middle Shelf include echinoderms (e.g., sand stars and sea stars), crustaceans (e.g., rock crabs and hermit crabs), and mollusks (e.g., sea slugs and sea pens). The Outer Shelf epibenthic invertebrates include sea urchins, brittlestars, and rock shrimp.

Nearshore soft-bottom areas of the SCB support a high abundance of species such as flatfish, surfperch, and croakers. Middle and Outer Shelf species include numerous kinds of flatfish, sulpin, combfish, midshipman, and rockfish. The number of fish species caught, abundance, and biomass increase with water depth out to the Outer Shelf. In many cases, soft-bottom species derive much of there food from benthic infauna and are therefore more highly contaminated with DDTs and PCBs in areas where sediment contamination levels are high. For example, white croaker, which is typically found in soft-bottom areas and feeds primarily on benthic infauna has some of the highest levels of DDT and PCB contamination among the fishes commonly caught in the SCB. Thus, fish consumption advisories are more widespread and more limiting (i.e., "do not consume" in some areas) for this species than for other species (Table 3.4-1).

Eelgrass (*Zostera* spp.) is the primary plant species found in soft-bottom habitat; this species generally grows in beds on mud or sand in protected habitats such as bays, coastal lagoons, and estuaries. It is found from 0 to 6 meters (20 feet), but occurrences at depths shallower than 3 meters (10 feet) are rare, as turbidity from resuspension of fine sediments is a chronic problem. Eelgrass distribution is controlled by depth, substrate stability, and light (Backman and Barilotti

1976). Two species have been reported within the study area. *Z. marina* is the species most commonly reported within the SCB. *Z. asiatica* recently was reported in a few locations south of Point Conception; however, it generally ranges northward to Tomales Bay (Phillips and Echeverria 1990). The characteristics of these species intergrade, and it is not clear what species occur in the Channel Islands (CINMS 2000).

Eelgrass habitat is known to be ecologically important habitat for a variety of invertebrates and fish. Nearly twice as many invertebrates and fish have been reported to occur within eelgrass beds than on surrounding sand habitats (CINMS 2000). Eelgrass provides nursery habitat for a variety of recreationally and commercially important fish and shellfish. Baitfish, such as anchovies and other small fish (e.g., topsmelt), spend an extensive portion of their early life in eelgrass beds. Seabirds such as California brown pelicans and terns prefer baitfish and often forage on the invertebrates and fish associated with eelgrass beds. Waterfowl such as the black brant feed nearly exclusively on the plants. In addition to these apparent biological values, eelgrass plays an important role in stabilizing sediments, recycling nutrients, generating oxygen, and trapping suspended particulates.

Eelgrass beds are found along the coast of Southern California, including shallow water habitats in Los Angeles Harbor, Alamitos Bay, Anaheim Bay, Huntington Harbor, Newport Harbor, and Dana Point (MEC Analytical Systems 1997, MEC Analytical Systems 2000). Eelgrass also occurs in sheltered coves on Anacapa, Santa Cruz, and Santa Rosa Islands. It is not known at this time whether eelgrass occurs on the other Channel Islands.

Hard-bottom Habitats

Hard-bottom and rocky reef habitats are considered to be very productive ecosystems that support a variety of plants and animals. Natural hard-bottom habitats are common in the subtidal areas of the narrow mainland shelf, and they become more abundant as one proceeds from the southeast to the northwest along the coast. Hard-bottom habitats are especially characteristic around the Channel Islands (Thompson et al. 1993). The types of hard-bottom habitats include submerged rock and sand/mud platforms, deformed sedimentary substrate, and boulder and cobble fields. Rocky shores constitute about 20 percent of the SCB (Bakus 1989), but beyond the depth of 30 meters (98 feet) only about 3 percent of the sea floor is hard substrate (Thompson et al. 1993). The distribution of subtidal hard-bottom habitats is less well known than the distribution of intertidal hard-bottom habitats due to a lack of large-scale mapping studies. Often nearshore reefs are found where rocky intertidal habitat occurs; kelp beds are generally good indicators of subtidal reefs (Ambrose et al. 1989).

Many hard-bottom fish species derive their food via pelagic or kelp-based food webs (Cross and Allen 1993) and therefore are typically lower in DDT and PCB contamination than species associated with and feeding from soft-bottom habitats (LACSD 2002). Thus, fish consumption advisories for the hard-bottom species commonly targeted by Southern California anglers tend to be less broadly distributed (i.e., occurring in fewer locations) and less limiting than those applied to soft-bottom species (Table 3.4-1).

Artificial hard-bottom habitats have become common in the SCB either incidentally from development of coastal resources (e.g., construction of piers and wharves, offshore platforms and pipelines, and ocean outfalls) or by design to enhance fisheries, environmental mitigation, and/or recreational uses (e.g., artificial fishing reefs or sunken ships for scuba diving). Lewis and

McKee (1989) provides a list of the artificial reefs that the California Department of Fish and Game has built in the SCB. Many of the wastewater ocean outfalls provide large hard-bottom habitats that function as reefs. An ongoing scientific debate exists about whether artificial hard-bottom habitats contribute to greater productivity and biomass (e.g., Cross and Allen 1993). Some studies report comparable or greater fish density and biomass on artificial reefs than on natural reefs (e.g., Turner et al. 1969, Stephens et al. 1984, Jessee et al. 1985, Ambrose and Swarbrick 1989, Thompson et al. 1993). Other studies have found lower biomass on artificial reefs, which may be related to different reef sizes and complexity (Ambrose and Swarbrick 1989, DeMartini et al. 1989). Nonetheless, artificial reefs do alter the benthic community by providing habitat that displaces soft-bottom species and by recruiting reef-dwelling species. These effects of artificial reefs on local community structure, coupled with the fact that many reef-dwelling species derive there food from sources other than soft-bottom infauna (i.e., pelagic or hard-bottom macrophyte-based food webs) are important aspects of the options considered in this Restoration Plan.

In the SCB, the dominant macrophitic communities associated with hard-bottom habitats are kelp forests. These forests are typically dominated by the giant kelp (*Macrocystis pyrifera*) but include several hundred other species of marine algae. Giant kelp grows well in wave-exposed areas of nutrient-rich, cool water at depths of 6 to 36 meters (20 to 120 feet) (Leet et al. 1992). Kelp attaches to hard substrate by means of a holdfast. Kelp fronds originate from the holdfast and grow to the water surface. Each frond has several leaf-like blades with bladders that buoy the fronds in the water column. The density and abundance of the kelp canopy vary by location, season, and year. Kelp beds in Southern California commonly deteriorate to some degree during summer and fall when temperatures are higher and nutrient concentrations are lower (Foster and Schiel 1985, Tegner and Dayton 1987). Yearly variations in the spatial extent of kelp beds are common.

Although the spatial extent of kelp beds varies seasonally, persistence of kelp within a bed is related to hard substrate size and relief. Point Loma and La Jolla kelp beds in San Diego are typified by large, complex, and high rocky relief and almost always sustain kelp (persistence over large areas for longer than 10 years). Factors that affect kelp persistence include turbidity and/or sedimentation. Kelp are adversely affected by burial, scour, or reduced ambient light levels (Devinny and Volse 1978, Foster and Schiel 1985). Temperature and nutrient concentrations also contribute to yearly differences. El Niño conditions, which result in higher than average temperatures and low nutrient concentrations, have been linked to periodic widespread reductions in kelp canopy (Tegner and Dayton 1987, Dean and Jacobsen 1986).

The presence of kelp on a rocky habitat greatly enhances the community by providing food, shelter, substrate, and nursery areas for many species of fish and invertebrates. Invertebrates found in kelp beds are similar to those found in other hard-bottom habitats. They include lobster, sea stars, sea urchins, and mollusks. Brown, green, and red (fleshy and coralline) algae occur in kelp beds. Surfperch and rockfish (*Sebastes* spp.) usually dominate the fish assemblages (Ebeling et al. 1980, Foster and Schiel 1985, Bodkin 1986). Species generally associated with the kelp canopy include mysids, fouling organisms (e.g., bryozoans), gastropods and crustaceans living on and within the fronds, transient fish (e.g., mackerel [*Scombridae*], Pacific barracuda [*Sphyraena argentea*], Pacific bonito [*Sarda chiliensis*], silversides [*Atherinidae*]), and canopy-associated fish (e.g., kelp perch [*Brachyistius frenatus*], señorita [*Oxyjulis californica*], halfmoon [*Medialuna californiensis*], blacksmith (*Chromis punctipinnis*), rockfish, kelp bass [*Paralabrax* *clathratus*], and kelp fish [*Clinidae* spp.]) (Feder et al. 1974). California sheephead (*Semicossyphus pulcher*), garibaldi (*Hypsypops rubicunda*), and opaleye (*Girella nigricans*) are common in Southern California kelp beds (U.S. Navy 1997a, 1997b). Many kelp-bed fish species are also found in areas of shallower vegetated and unvegetated rocky reefs (Figure 3.4-1). However, the abundance of fish is greater on reefs with high densities of kelp compared to those with low kelp densities (Larson and DeMartini 1984, Cross and Allen 1993). Kelp beds also provide a large food supply for marine birds and mammals (Foster and Schiel 1985). Cormorants are the birds most closely associated with California kelp beds; however, gulls commonly scavenge on the surface canopy, and California brown pelicans and terns exploit schooling fish along the canopy's edge (Foster and Schiel 1985). Mammals such as sea lions, seals, and whales use kelp beds as transitory foraging areas (Foster and Schiel 1985). Kelp (genus *Macrocystis)* is commercially harvested for use in a variety of food products, pharmaceuticals, adhesives, paper products, paints and finishes, rubbers, and textiles (Bakus 1989).

Surfgrass (*Phyllospadix* sp.) generally forms beds on hard-bottom substrate in the lower intertidal and shallow subtidal zones, an area characterized by high turbidity and sedimentation. Surfgrass may form conspicuous beds in the low intertidal to shallow subtidal zones of rocky beaches and generally is found from about 0 to 6 meters (0 to 20 feet). Both the vegetative shoot density and the number of flowering shoots of surfgrass decrease with increasing depth, indicating that light is a limiting resource for both growth and reproduction (Williams 1995). Photoperiod and temperature are major environmental factors controlling reproduction in surfgrass. In Southern California, plants flower all year long, though most reproduction takes place between May and August, especially during June and July. Predators on surfgrass include grazers such as fish, particularly opaleye, and crabs (Williams 1995).

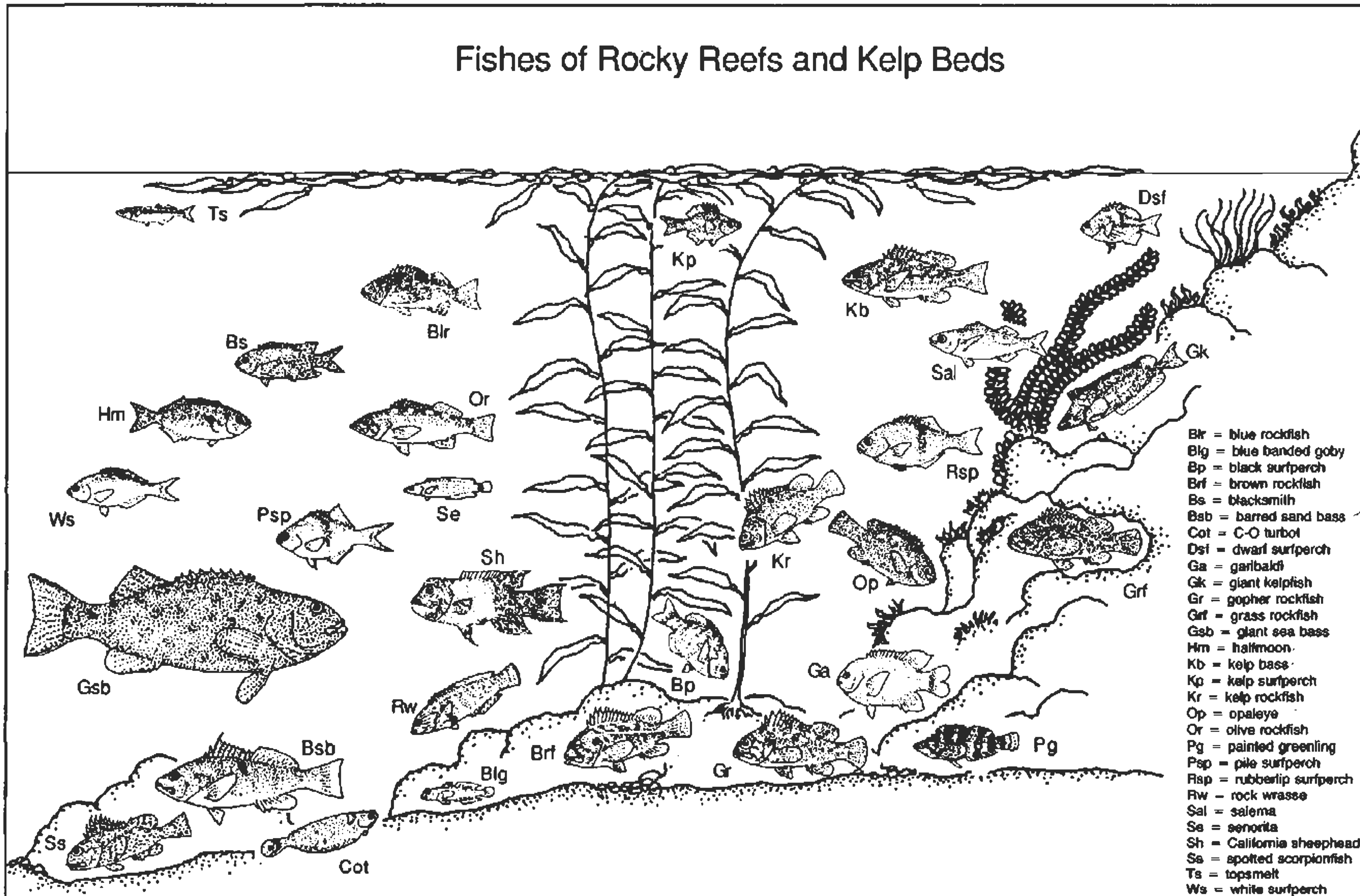
Surfgrass beds provide an important habitat for a diverse assemblage of algae, invertebrates, and fish (Stewart and Myers 1980). In the SCB, surfgrass serves as a nursery for the California spiny lobster (*Panulirus interruptus*) (Williams 1995, Engle 1979). Abundant species of fish found in surfgrass habitats on low-relief, sandstone rock include topsmelt (*Atherinops affinis*), blacksmith, walleye surfperch (*Hyperprosopon argenteum*), señorita, opaleye, and black perch (*Embiotoca jacksoni*) (DeMartini 1981). Garibaldi, surfperch, barred sand bass (*Paralabrax nebulifer*), the gorgonian (*Muricea californica*), California spiny lobster, brown algae (*Egregia menziesii* and *Eisenia arborea*), coralline algae, and a red alga (*Erythroglossum californicum*) are common to abundant in areas where reef and surfgrass are more developed.

Intertidal Benthic Habitats

Intertidal benthic habitats are those ocean bottom environments that exist between mean high tide and mean low tide (sometimes also called the littoral zone). Generally, about 70 percent of the mainland shoreline is sandy shores, and about 70 percent of all rocky shores in the SCB are found on the Channel Islands. Generalized summaries of the sandy beach and rocky intertidal habitats within the SCB are presented below.

Sandy Beach Habitat

Open coast sandy beaches are dynamic environments that undergo sand accretion in summer due to reduced wave energy and erosion in winter as a result of larger, higher-energy waves. This seasonal change in the amount of sand on the beach results in a greater variety and abundance of



Source: Thompson et al. 1993

Figure 3.4-1. Schematic diagram of fishes within rocky reef and kelp bed habitats.

invertebrates inhabiting the intertidal portion of the beach during late spring through summer. The benthic invertebrates in turn provide prey for a variety of shorebirds, including migratory species whose abundance increases in the SCB from summer through fall.

The dynamic nature of sandy beach habitats results in relatively low organic content in the sediments relative to subtidal soft-bottom areas. An inshore-offshore gradient occurs in the levels of DDT and PCB contamination in sediment because DDTs and PCBs adhere more readily to organic sediments and because the primary source of these contaminants (i.e., the White Point wastewater outfall) is in deep, offshore water (LACSD 2002). Thus, the lowest sediment contamination levels are in the intertidal areas, and the soft-bottom species that forage in these areas (e.g., California corbina) have lower contamination levels and consequently less pervasive and restrictive fish consumption advisories (Table 3.4-1).

Although more than 200 species of invertebrates have been reported from surveys of beaches within the SCB, most of these species have been washed ashore or dislodged from adjacent rocky habitats. It is probable that only about 20 species regularly occur on sandy beaches (Straughan 1982, Parr et al. 1978).

Common species of the upper intertidal habitat include insects such as beach hoppers (*Orchestoidea*) and worms such as the bloodworm (*Euzonus mucronata*), which can burrow deeply and is patchily distributed (Parr et al. 1978, Straughan 1982, Thompson et al. 1993). The middle to low intertidal is often dominated by the common sand crab (*Emerita analoga*).

Three species of fish are associated with sandy beach habitat. The best known is the California grunion (*Leuresthes tenuis*), which is managed as a game species by the CDFG. Grunion travel from their habitat in nearshore waters to spawn at night on sandy beaches on the first few nights following each new and full moon between March and August. Spawning occurs 1 to 3 hours after high tide with the eggs being deposited deep into the sand. The eggs are exposed on subsequent high tides, about 10 days later and as they are washed out of the sand they hatch. Grunion are most often found on long and gently sloping beaches with moderately fine grain size. The other two fish species associated with sandy beach habitat include the California corbina (*Menticirrhus undulatus*) and the barred surfperch (*Amphistichus argenteus*), which can often be found foraging for sand crabs in the shallow subtidal habitat of the lower beach (Cross and Allen 1993).

Rocky Shoreline Habitat

Rocky intertidal habitats are varied; they include submerged rock platforms, deformed sedimentary rock, and boulder cobble fields. The organisms of rocky intertidal communities show vertical zonation in response to the extremes of the physical environment (e.g., temperature, tidal exposure, surf exposure, availability, and type of substrate) and biological interactions (e.g., food availability, predation, and population density). The variability among these vertical strata results in different species compositions among rocky habitats: of the 315 species of macroinvertebrates found at 22 sites throughout the SCB, only 14 species were common to all sites (Littler 1979).

The upper intertidal is characterized by acorn barnacles (*Chthamalus*), periwinkles (*Littorina planaxis*), and the western sea roach (*Liga occidentalis*), which is a nearly terrestrial isopod. The middle intertidal zone is often referred to as the mussel zone, with its mussels (e.g., *Mytilus californiensis* and *M. galloprovincialis*) and barnacles (e.g., *Pollicipes polymerus)*. Several of the mid-intertidal species extend into the lower intertidal, and other species such as sea urchins (*Strongylocentrotus purpuratus*), ochre sea star (*Pisaster ochraceum*), bat star (*Asterina miniata*), sea hares (*Aplysia californica*), sand tube worm (*Phragmatopoma californica*), and algae are more abundant in the lower intertidal.

Only six species of fish are resident in the rocky intertidal zones of the SCB (Cross and Allen 1993). Wooly sculpin (*Clinocottus analis*), reef finspot (*Paraclinus nigripinnis*), rockpool blenny (*Hypsoblennis gilberi*) spotted kelpfish (*Gibbonsi elegans*), and California clingfish (*Gobiesox rhessodon*) spend all but their larval life in the intertidal, and the dwarf surfperch (*Micrometrus aurora*) often releases its young into tide pools. Most of these residents feed on small crustaceans and worms, and the opaleye is mostly herbivorous. Most of these fish are small and difficult to see, as they spend much of their time hiding in holes, crevices, or beneath algae.

Coastal Wetlands

Wetlands, which are areas of soft and marshy land, occur where aquatic habitats meet terrestrial habitats. The wetlands in the study area include mudflats, salt panne, saltwater marshes, and freshwater marshes. Wetlands provide many ecological benefits, such as improving water quality, reducing erosion and flooding, and providing habitat for wildlife. Coastal wetland habitats have declined over the past decades due to human population growth and development. However, the loss of wetland habitat and an increased appreciation of wetland benefits have resulted in increased efforts to restore coastal wetlands. Although the extent of wetlands in the SCB has been drastically reduced from historical levels, several coastal wetlands within the study area still support diverse plant and animal communities. Unfortunately, many of these wetlands suffer from restricted flows, habitat degradation, and polluted urban runoff.

Wetlands represent important habitats for over 200 species of resident and migratory birds as well as for a variety of other wildlife. The Southern California coastal wetlands provide important habitat for various bird species, including shorebirds, marsh birds, water birds, and terrestrial birds. Both year-round residents and migratory species use these habitats to breed and forage. Large numbers of migratory birds (including sandpipers, plovers, and many species of ducks) migrate to and from Southern California during the fall and spring months. Some of the bird species that migrate to Southern California wetlands in the summer include terns, avocets, stilts, and skimmers. A small suite of bird species, including great blue herons, mallards, and killdeer, are considered year-round residents of the Southern California coastal wetlands. Table 3.4-2 provides basic information on the size and habitat characteristics of wetlands in the study area.

Table 3.4-2
Summary of Wetland Size and Habitat Types in the Study Area

Wetland	Approximate Wetland Size (hectares/acres)	Open Water	Tidal Flats (non-vegetated)	Tidal Flats (vegetated)	Salt Marsh	Brackish/ Freshwater Marsh	Riparian	Seasonal Wetlands
Malibu Lagoon	37(92)	12 (28)			7 (18)		19 (46)	
Topanga Lagoon	0.85 (2)						0.85 (2)	
Ballona Lagoon	7 (16)	6 (15)	0.6 (1.5)[1]					
Ballona Wetlands	78 (192)		10 (24)	19 (48)	43 (105)		6 (15)	
Los Angeles River	95 (234)[2]					Present*		
Los Cerritos Wetlands	> 57 (140)	39 (95)	3 (8)[3]		8 (19)[4]	7 (18)		
Hellman Ranch	11 (27)		4 (10)[5]		6 (15)			0.8 (2)
Anaheim Bay	387 (956)	89 (220)	61 (151)		229 (566)	0.81 (2)	7 (17)	
Bolsa Chica Wetlands	365 (900)	69 (171)	144 (355)		149 (368)	2 (6)[6]		
Huntington Beach Wetlands	Total acreage data not available	5 (13)	2 (4)		51 (125)	Present*		
Santa Ana River Mouth Estuary	Total acreage data not available		9 (21)		60 (147)	Present*	Present*	
Upper Newport Bay	550 (1357)	366 (904)	27 (67)		155 (382)	2 (4)	0.8 (2)	
San Joaquin Marsh	153 (378)					59 (145)	30 (73)	65 (160)
San Juan Creek mouth	1 (3)						1 (3)	
Buena Vista Lagoon	90 (223)	51 (127)				15 (36)	Present*	6 (14)
Batiquitos Lagoon	212 (524)	141 (348)		34 (85)	40 (100)	3 (7)		

Notes:

Information provided in format of hectares (acres).

*Habitat present, but acreage data not available.

[1]Intertidal; numerous non-native species occupy the higher elevations.

[2]Brackish/freshwater and riverine habitats are present, but acreage data not available.

[3]Intertidal mud flats.

[4]Salt marsh (7.7 acres [19 acres]); salt pan: salt flats are present; acreage data not available.

[5]Tidal channel (1.2 hectares [3 acres]); salt panne: alkaline flats (2.8 hectares [7 acres]).

[6]Freshwater pond (0.4 hectares [1 acre]); freshwater marsh (2.0 hectares [5 acres]).

Source: Southern California Wetlands Recovery Project 2004.

Channel Islands

Terrestrial Habitats

The climate of the Channel Islands is cool and wet in the winter and hot and dry in the summer, though the extremes of temperature are moderated by the maritime influence of the ocean currents, which produce frequent fog. This mild maritime climate has allowed a number of species to persist on the islands even though their mainland counterparts are found near or to the north of San Francisco Bay, or have been completely extirpated on the mainland due to climatic and other factors (Raven 1967). Documentation of the original range and distribution of island endemics is complicated by the current domination of non-native plants that have "only become naturalized on the islands since their introduction by Euro-Americans during the last 200 years" (USFWS 1995b). The spread of non-native and invasive plants on the Channel Islands has been facilitated by overgrazing and trampling of native vegetation by domestic animals (Raven 1967, Thorne 1967, Philbrick 1980).

The general terrestrial native habitats of the Channel Islands are maritime scrub, island chaparral, grasslands, coastal dunes, riparian scrub, riparian woodlands, wetlands, and coastal bluffs. Several treatments of plant communities exist in the literature. Junak et al. (1995), as cited in NPS (1999), developed the detailed list of communities for the Northern Channel Islands based on these treatments. Scrub and non-native grassland communities dominate the landscapes of the Channel Islands. Woodlands are sparse on the islands, though they may have been more extensive before the island habitats were denuded by introduced grazers.

San Miguel Island was dominated by blowing dunes that buried fertile grazing lands through the late 1800s and early part of this century. However, evidence of a scrubland environment on the coast of San Miguel Island exists in the form of trunks that were carbonized in pre-historic fires and the evidence of forests represented by the fossilized "caliche forest" (Johnson 1980, NPS 1999). San Nicolas Island has a history of drought, vegetation stripping by herbivores, and dune formation that mirrors that of San Miguel's. After vegetation stripping, blowing sands turned rocky coastal shores to sandy beaches and wiped out kelp forests that surrounded the islands. Today the islands have mostly recovered their rocky shores and kelp.

Only Santa Rosa, Santa Cruz, and Santa Catalina Islands have significant arborescent woodlands. Santa Rosa Island has been affected by dune formation after vegetation denudation, but one woodland exists on the north-central part of the island. A variety of oak species occur in woodlands on Santa Rosa, Santa Cruz, and Santa Catalina Islands along with endemic ironwood. A small woodland of the federally endangered Catalina Island mountain mahogany (*Cercocarpus traskiae*) grows on Santa Catalina Island in Wild Boar Canyon. Significant Bishop pine woodlands are found on three mostly north-facing slopes on Santa Cruz Island (Hobbs 1980). Riparian woodlands are uncommon in spite of the many suitable canyon streams because they have been impacted by erosion and vegetation denudation, though a few woody riparian species can be found on most islands (Minnich 1980).

Shoreline and Nearshore Habitats

The Northern Channel Islands experience strong northerly winds that produce active dunes on the windward side of the islands and a zone of strong onshore flow that leaves beaches rocky or gravelly (NPS 1999, Dailey et al. 1993). Sandy beaches account for 20 to 35 percent of the shoreline on San Miguel, Santa Rosa, and Santa Cruz Islands, and are more common on the lee side of the islands or in protected coves (Table 3.1-2).

The Southern Channel Islands have a combination of hard substrate, and sand and gravel beaches (Table 3.1-2). Rocky shores are a predominant habitat, and gravel and/or sandy beaches account for most of the remaining shoreline.

Ocean upwelling from deep basins on the south sides of the Northern Channel Islands provides a rich source of nutrients for plankton and the food chain that supports the island species. Kelp beds favor the northwest and south shores of these islands providing additional habitat and cover to support abundant marine and bird life.

3.4.2 Fish

Fish are an important resource relevant to the Montrose Settlements Restoration Program (MSRP). Although no direct impacts from DDTs and PCBs were demonstrated to have occurred on fish in the Montrose case, fish habitat was demonstrated to have been impacted by these chemicals in a way that compromised the services rendered by fish (Dixon and Schroeter 1998). The Southern California fish fauna comprises over 129 families with over 450 species (Cross and Allen 1993). This diverse assemblage of fish makes use of all habitats, from shallow wetlands and intertidal areas to open pelagic and deepwater benthic habitats (see Section 3.4.1 for more details). The fish assemblage also has a broad size range and a wide range of life-spans. For example, the blue-banded goby (*Lythrypnus dalli*) rarely exceeds 1 inch and typically lives no more than a year, whereas the giant (black) sea bass (*Stereolepis gigas*) may exceed 7 feet, reach a weight of 500 pounds, and live as long as 75 years (Love 1996). This diversity of fish in the SCB results in the broad ecological, recreational, and commercial value of this resource. Fish are important predators of all sizes of prey and are therefore an important structuring force in marine communities. Fish are a major prey item for birds, marine mammals, other larger fishes, and humans, and are therefore a principal transfer pathway of DDTs and PCBs through the food web to species in which the effects of the contaminants of the case were demonstrated (Figure 3.4-2). As a result, fish contamination advisories have been released for several of the fish species that anglers commonly target in the SCB (Table 3.4-1). The fish of the SCB also support important commercial and recreational fisheries and attract thousands of scuba and free divers to the inshore and offshore waters of the SCB every year for sightseeing, fish-counting, hunting, and underwater photography.

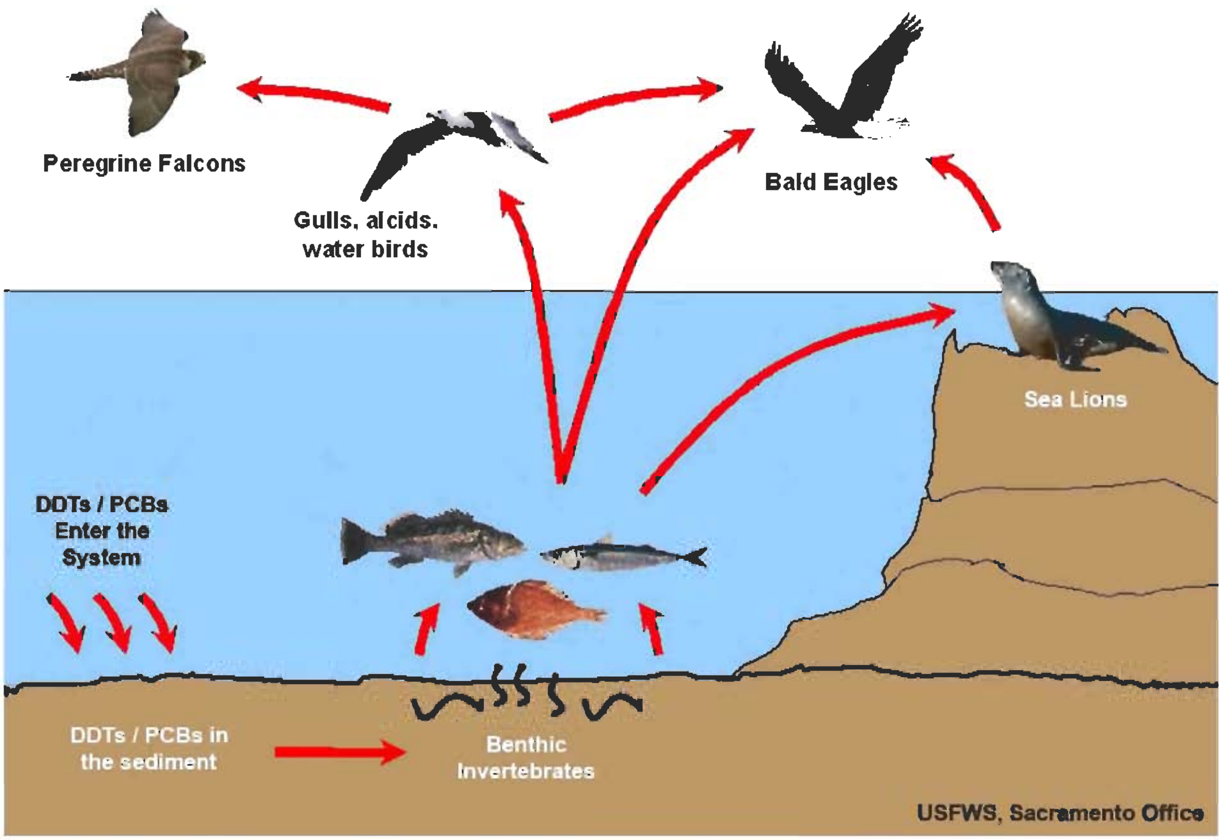


Figure 3.4-2. Major DDT/PCB pathways and the role of fish in the transfer of DDTs and PCBs to upper trophic levels.

The recreational fisheries of the SCB are of particular importance in the Montrose case because the court accepted the lost use of fish resources due to DDT- and PCB-related consumption advisories as an injury in the case. Recreational fishing occurs along the entire Southern California coast, from near Point Conception to the U.S.-Mexico border. The Marine Recreation Fisheries Statistics Survey from 1980 to the present (RecFin 2004) provides a basis for assessing where and how recreational fish species are caught and how the catch has changed over time.

Studies of seafood consumption by recreational anglers indicate that the fish consumption rate in Southern California exceeds the national average (Puffer et al. 1982). A study conducted in the early 1990s found that chub mackerel (*Scomber japonicus*) is the most frequently caught species, but the most frequently consumed species are kelp bass, barred sand bass, rockfishes, Pacific barracuda, and California halibut (*Paralichthys californicus*) (Allen et al. 1996). A more recent review of the fishes retained by anglers in the SCB based on data from the Pacific Recreational Fisheries Information Network (RecFIN 2004) found that the most commonly consumed fish were barred sand bass, Pacific barracuda, yellowtail (*Seriola lalandi*), California halibut, and kelp bass, and that chub mackerel were not the most commonly captured species (Table 3.4-1). Angler consumption rates of potentially contaminated species (e.g., white croaker) varied by ethnic group, indicating that health risk advisories should target the languages and habits of high-risk anglers.