The Status of Habitats and Water Quality in California's Coastal and Marine Environment

Importance of Healthy Waters and Habitats to Marine Life

Clean water is essential to a healthy coastal and marine environment. Seventy-five percent of all commercial fish in the United States depend on estuaries and associated coastal wetlands for some portion of their life-cycle. Unfortunately, these are probably the most threatened of all habitats in California today.

Because pollution impairs the breeding grounds for many species of sea life, it is a substantial contributing factor to declines in these species. Impacts to coastal-dependent species include declines in the species' populations, reproductive problems, birth defects, behavioral changes, and increased susceptibility to disease. For example, illnesses and deaths of sea otters and other marine mammals from viruses, many of which had had little effect on the animals only a few years ago, are on the rise in California. Studies indicate that coastal pollution may be a significant factor in these increased illnesses and deaths, possibly due to its negative impacts on immune systems responses.

Pollution can come from direct discharges ("point sources") and runoff from land-based activities ("nonpoint source pollution"). Plumes of contaminated runoff can float on top of the heavier seawater and have been shown to extend 25 or more miles offshore. Nutrient pollution, such as from farms, can create toxic algal blooms, or "red tides," in marine waters. One 1998 toxic algal bloom produced domoic acid, a harmful biotoxin that affects the nervous system in animals and humans. This algal bloom resulted in the death of more than 50 California sea lions along California's central coast. Inland, nonpoint source pollution from logging and other activities impair critical habitats for marine life, including north coast streams essential to threatened and endangered species such as Pacific Coast coho salmon.

The health, safety, and welfare of California residents who use marine resources similarly depends upon clean coastal and ocean waters. Eighty percent of Californians live within 30 miles of the coast. Industries such as fishing and tourism that depend on a healthy coast and ocean contribute more than 17 billion dollars to the state's economy every year, and provide 370,000 jobs to California's citizens.

Health of Coastal and Marine Water Quality and Habitats

Monitoring and Assessment Information

Good water quality and healthy aquatic habitats depend upon the activities that occur nearby. Land use practices, population densities, point and nonpoint source discharges, agriculture, urbanization, industry, and recreation all influence the water quality and habitat of a specific locality or region. To determine the nature and extent of impacts that these activities have on water quality and habitat, monitoring and assessment programs are conducted at the state, federal, and local levels. The state's Bay Protection and Toxic Cleanup Program and Mussel Watch Program, the San Francisco Bay Regional Monitoring Program, the Southern California Bight Regional Study, and the National Oceanographic and Atmospheric Administration's Status, and Trends Program are but a few examples of the many programs underway in California. Monitoring and assessment information is used to determine compliance with state and federal statutes such as the federal Clean Water Act and the state's Porter-Cologne Water Quality Control Act, as well as with permit regulations and water quality standards protecting marine resources and their habitats.

Though monitoring efforts in the state are limited and can be much improved, some conclusions can be drawn about the health of certain state's waters. For example, existing data indicate that uses of 100 percent of the state's surveyed tidal wetlands, 71 percent of surveyed bays and harbors, 91 percent of surveyed estuaries, 78 percent of surveyed freshwater wetlands, 71 percent of surveyed lakes and reservoirs, and 81 percent of surveyed rivers and streams are impaired or threatened in some way by water pollution. Examples of uses that are being impaired or threatened by pollution include drinking water, fish consumption, aquatic life support, swimming, and aquaculture. It should be noted that these figures are only for those waters that are monitored, which may overrepresent the more contaminated waters in the state. On the other hand, a recent federal report indicates that the number of impaired waters is likely much higher than that currently recorded.

The state's latest report on water quality generally describes the major water pollution concerns along the California coast. In the north coast region, nonpoint

source pollution from logging and agriculture pose the most significant problems. In the San Francisco Bay area, point source discharges from petroleum refineries and cities along the bay, and nonpoint source runoff from Marin County dairies and farms in the Central Valley and Napa County, cause coastal pollution problems. Along the central coast, agriculture creates the most significant pollution problems. Along the densely populated southern California coast, storm-water pollution is a major problem, though agricultural runoff and sewage discharges also are important pollution sources.

States are required to identify water bodies within the state's jurisdiction that do not meet water quality standards. To this end, the State Water Resources Control Board, in conjunction with the state's nine Regional Water Quality Control Boards, has used monitoring data to develop a list of impaired water bodies for the State of California. A water body can be listed as impaired for any number of chemical constituents or conditions such as nutrients, heavy metals, petroleum products, sediment toxicity, bacteria, pesticides, polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), etc. California has over 500 water bodies that are "impaired," that is, they are not meeting water quality standards under current regulations; many of these are coastal.

Waters from the Oregon border to north of San Francisco Bay are listed as "impaired" primarily because of sediments. There are, however, some northern embayments, (*e.g.*, Humboldt Bay and Tomales Bay) that have been identified as impaired by other assorted constituents such as heavy metals and nutrients. southern California, with a substantially higher number of impaired coastal waters, bays, and estuaries, faces problems from a much wider variety of sources and contaminants, with urban runoff playing a prominent role. A southern California example is Santa Monica Bay, which has been listed as impaired for several heavy metals, marine debris, sediment toxicity, chlordane, DDT, PAHs, and PCBs. San Pablo Bay, located in the northern San Francisco area, has been identified as impaired for several heavy metals, exotic species, diazinon, PCBs, chlordane, DDT, dieldren, dioxin, and furan compounds. In central California, Morro Bay is impaired because of heavy metals, sedimentation/siltation, and pathogens. San Diego Bay has been listed for copper, sediment toxicity, and benthic community effects; and Lower Newport Bay for a variety of pesticides, metals, nutrients and pathogens. In many of these areas, degraded subtidal and intertidal habitat has also been identified.

The coastal waters of California have been utilized for waste disposal for many years. Ocean outfalls for the discharge of treated sewage, power plant cooling waters, and various industrial discharges are common throughout the state. Add to this the substantial volumes of nonpoint source discharges and it becomes readily apparent that impacts to marine and estuarine resources are inevitable.

Some improvements, however, have been realized over the years as a result of additional controls and requirements applied to point source discharges, and due to phase out of particularly toxic chemicals. For example, a recent study reports that concentrations of DDT and PCBs in livers of bottom fish collected throughout the southern California coastal shelf are at concentrations 95 percent lower than 20 years ago, though health advisories still exist for these constituents. The major challenge remaining is the control of nonpoint source pollution.

Data Limitations/Gaps

Existing water quality and habitat data are not as complete or comprehensive as needed to assess the overall health of marine ecosystems. California does not yet have a system to comprehensively monitor water quality in the inland watershed, enclosed waters, or nearshore ocean zones, and the vast majority of California's waterways and small estuarine systems are not monitored by the state on a regular basis. For example, over 90 percent of California's rivers and streams and about half of the state's coastal shoreline are simply never monitored by the state. Sediment and water quality assessment programs such as the statewide Mussel Watch Program, Bay Protection and Toxics Cleanup Program and the San Francisco Bay Regional Monitoring Program, all need to be continued and expanded. These programs have, over recent years, supplied critical data on the health of the coastal, bay, and estuarine waters of the state. However, years of funding cuts have left the health of much of California's waters unknown.

Programs that will collect data on contaminants and marine life populations, as well as pollutant source identification, are necessary to ensure that adequate information is available to make sound regulatory and management decisions regarding water quality issues. In addition, a statewide baseline inventory of various habitats such as rocky intertidal, subtidal, kelp beds, rock reef, beach areas, mudflats, and subtidal vegetation is critical to make sound scientifically-based resource management decisions. Additional information also needs to be gathered on marine and estuarine habitat restoration and enhancement opportunities.

In 1999, the Legislature passed a law that required the State Board to prepare a comprehensive, statewide surface water quality monitoring program by November 2000. This will serve as the blueprint for much-needed improvements in coastal water quality monitoring.

Sources of Impairment of Water Quality and Habitats

Point Source Discharges

Point source discharges are generally those that have a discrete, identifiable source, such as a pipe carrying treated waste from a pulp mill or a sewage treatment plant. Point sources also include municipal, industrial, and construction storm water discharges and offshore oil well platforms.

Point source discharges into the marine environment contain a variety of contaminants. They include suspended and dissolved solids, heated water, petroleum hydrocarbons, heavy metals, nutrients, pesticides, chlorine, brines, fresh water, and oil and grease. All discharges into the marine or estuarine environment are required to be in compliance with provisions of the State Water Resources Control Board's California Ocean Plan or the respective Basin Plans developed by the Regional Water Quality Control Boards. Conditions on permitted discharges are supposed to be set so that discharge of pollutants will not be deleterious to fish, wildlife and other resources.

Point source discharges to marine waters of the state are substantial both in volume and pollutant load. Many millions of gallons of treated effluent from sewage treatment plants, cooling water discharges from power plants, storm water, and other point sources flow into marine and estuarine waters every day.

Historically, there have been many discharges of pollutants that, although discontinued, continue to have adverse impacts upon the environment. For example, in the 1960s and 1970s, regional industrial facilities discharged DDT and PCBs into what is now the County of Los Angeles Joint Water Pollution Control Plant, which discharged these toxins directly into the Pacific Ocean at the Palos Verdes shelf. Today, the discharge area is identified as a U.S. EPA superfund site and is undergoing extensive evaluation and remediation planning.

One of today's foremost issues with respect to ongoing coastal water quality and habitat impacts is storm-water discharge. Although storm water discharges are regulated by National Pollution Discharge Elimination System (NPDES) permits, the current contribution of pollutant load by this source to waters of the state is staggering. In the *National Water Quality Inventory: 1998 Report to Congress*, U.S. EPA found that urban runoff and storm sewers are the leading source of pollution in coastal waters. Urban runoff and storm water discharges include pollutants such as heavy metals, pesticides, salts, sediments, trash, debris, nutrients, bacteria, petroleum products, and sewage overflows. This problem is heightened in the City of San Francisco, which is one of the few major cities left in the nation that has a combined storm water and sewage system. This aging system frequently overloads during heavy storm events and discharges raw sewage to the Pacific Ocean.

Sewage treatment plants discharging into the marine environment are another significant pollution source. The discharges for those plants that provide secondary treatment to the waste stream contain low levels of heavy metals, pesticides, nutrients, and high volumes of fresh water. Some heavy metals, though discharged at low levels, bioaccumulate up the food chain. These have the potential to alter body burdens in fish and other marine life feeding in the vicinity of the discharge pipe. While levels at the end of the pipe in the water column may be considered relatively insignificant, over the reproductive life of the affected marine organisms, effects may be significant. This is particularly true in areas where discharges receive only primary treatment to remove solids. For example, San Diego uses only "advanced primary" treatment for the city's sewage, which it then deposits into the ocean.

Point source discharges lead to a variety of impacts. Beach closures, degraded bay and estuarine habitats, increased levels of contaminants in marine sediments, bioaccumulation of pollutants in the tissues of marine organisms, degraded benthic communities, loss of kelp beds, and sediment toxicity are some of the more notable impacts identified. Beaches are posted or closed for thousands of beach days each year due to point source discharges from combined sewer overflows and storm water. Nonpoint source pollution, which is not confined to a discrete and easily regulated source, plays an even greater role in water pollution and habitat degradation in California.

Nonpoint Source Discharges

Nonpoint source pollution occurs when water from rainfall, snowmelt, floods, or irrigation runs over land or through the ground, picks up pollutants, and deposits them into rivers, lakes, bays, estuaries, nearshore coastal waters or groundwater. In California, nonpoint source discharges have been categorized into eight large groupings: agricultural, urban, silviculture, marinas and boating, grazing, mine drainage, on-site sewage treatment systems, and hydromodification.

According to the U.S. EPA, agriculture is the leading contributor nationwide to water quality impairments, degrading most of the impaired river miles and lake acreage surveyed by states, territories, and tribes. By contrast, runoff from urban areas is the largest source of water quality impairments to surveyed estuaries. The most common nonpoint source pollutants are sediments and nutrients.

Some examples of impacts from nonpoint source pollution in central California include agricultural runoff releases of DDT into the Salinas River Lagoon and Monterey Bay National Marine Sanctuary at levels that have been demonstrated to be deleterious to aquatic life; and severe oxygen depletion and eutrophication, as well as shellfish contamination, in Tomales and Bodega bays and their tributaries due to nutrients from dairy runoff. Data from the National Shellfish Register document that in 1995 (the most recent year reported) shellfish harvesting was prohibited for 9,000 out of 24,000 acres of harvesting areas in California due to water quality concerns. Coastal nonpoint source pollution, including both urban and agricultural runoff, also contributes to the thousands of days of beach closures and postings in the state each year.

Alteration of water flow (hydromodification) and channel erosion are two nonpoint source pollution categories that have been linked to the decline of anadromous fisheries (*e.g.*, chinook salmon), especially in habitat areas where spawning success is determined. The increased sedimentation, siltation, and turbidity resulting from these pollution sources lead to habitat loss and modification. These impacts may then adversely affect species population numbers.

Harbors and marinas provide their share of nonpoint source pollutants including oily bilge water, detergents from the washing of decks and hulls, runoff from shipyards with paint flakes containing heavy metals and organotins, and dish detergent and occasionally sewage material from live-aboards. Marinas and harbors also can add a significant sediment plume to local waters during dredging activities for channel and basin depth maintenance, as well as associated pollutant and sediment loads from the dumping of these dredged materials into coastal waters.

Spills

Oil Spills

Of all deleterious materials spilled into the marine environment, crude oil and refined petroleum products are the most common. Oil enters state waters from many sources, such as storm drains and runoff from roadways, as well as medium-to-large oil spills. Oil spills come in many forms, from the discharge of oily bilge water by tens of thousands of boats plying the waters of California, to breakage in oil pipelines due to earthquakes or age. From 1991 to 1998, "significant" oil spills released at least 18,650 barrels of oil into California's coastal waters. Data complied by U.S. EPA of significant California spills from 1971 to February 2000 record 627,415 barrels of oil spilled that resulted in identified environmental damage. The actual number of spills and amount of damage is likely much higher, but current resource limitations make full detection impossible.

In nearly all cases, wildlife are injured or even killed by contact with oil. Aquatic birds, shorebirds, and marine mammals, particularly sea otters, are the sea life most visibly affected. However, birds collected at an oil spill site often may die with no external signs of oil contact because they have ingested oil while cleaning it off their feathers. Once ingested, the oil is almost always fatal to the birds. Impacts to fish and other aquatic organisms are not often observed because the affected organisms sink out of sight.

The use of oil dispersants to prevent an oil slick from coming ashore generally serves to break up the spill's integrity. However, they allow the oil to remain emulsified in the water column, and add dangerous chemicals that may adversely affect water column communities below the surface. Oil spills that do come ashore impact coastal and marine wildlife as well as valuable rocky intertidal, sand beach, and coastal wetlands habitats.

In 1991, the California Department of Fish and Game created the Office of Spill Prevention and Response (OSPR) to implement legislation to address oil pollution issues in the marine environment. In 1997 (last year for available data), 767 marine oil spills were reported to OSPR. Again, these are only reported spills; the actual amount of oil discharged into coastal waters is likely far higher than reported. For example, these figures do not include the 8.5 to 20 million gallons of diluent released over many years at the Unocal/Guadalupe oil field near the City of San Luis Obispo.

Other Spills

Sewage spills are the most common of non-oil related spills. Effects can range from minimal losses to thousands of fish and other marine animals killed or impaired. A recent sewage spill into the Salinas River resulted in a portion of the river becoming completely depleted of oxygen and in the loss of hundreds of fishes, including steelhead trout (a federally listed species). Sewage spills also have the potential to release harmful chemicals into the environment, as the sewage has not reached the treatment plant where these chemicals normally are removed or reduced to non-toxic levels prior to discharge. Sewage spills are a significant source of beach closings and health advisories each year.

Even some chemical compounds commonly thought to be non-toxic can have an adverse effect on wildlife when spilled into an aquatic environment. For example, the release of 2,300 gallons of vegetable oil into Monterey Bay in 1997 impacted a variety of birds species. Among other things, birds were poisoned through ingestion of the oil, and oil on feathers made the birds less buoyant and more

susceptible to hypothermia. Several hundred birds died, while hundreds more were rehabilitated and released.

Dredging and Disposal of Dredged Material

Dredging is the deepening or enlargement of a navigational channel, harbor/marina basin, or berthing area. Construction of new channels, basins, or berthing areas involves the removal of previously undisturbed sediment, while "maintenance dredging" removes accumulated sediment from previously dredged areas. Maintenance dredging also occurs at the mouths of coastal lagoons, creeks, and rivers where accumulated sediment is removed to keep the system open to the ocean.

At the ports of San Francisco, Oakland, Los Angeles, Long Beach, and San Diego, increasing global economic pressures have resulted in the need for larger, deeper draft ships to transport cargo. This has led to a demand for new construction dredging to widen and deepen channels, turning basins, berths, and slips to accommodate the larger vessels. Maintenance dredging has similarly increased. More often, dredging activities are permitted for annual or multiannual maintenance of previously dredged areas. Although infrequent, dredging activities are increasingly being used for wetland restoration and enhancement projects such as the dredging of Batiquitos Lagoon in San Diego County, the Port of Los Angeles' shallow water habitat, and the Port of Oakland's middle harbor enhancement area.

The selection of a disposal site for dredged sediments is dependent upon the physical and chemical characteristics of the material to be placed. Physically and chemically suitable material (*i.e.*, appropriate grain size and minimal contamination) may be disposed of at unconfined, open-water disposal sites authorized by the U.S. EPA and U.S. Army Corps of Engineers, such as the deep-ocean disposal site near the Farallon Islands off San Francisco.

In some instances, clean material may be beneficially reused for structural fill, wetland construction and restoration, habitat improvement and enhancement, capping material for sites with contaminated sediments, or for beach nourishment. Dredge material has been used in Los Angeles Harbor to regain acreage of shallow water habitat historically lost to past dredge and fill projects. In the Los Angeles Harbor project, clean dredge material was used to cap contaminated sediments. A recent Port of Oakland channel deepening project resulted in the creation of the Sonoma Baylands, a more than 300-acre tidal wetland restoration project located in Sonoma County. In San Diego Bay, the Navy has proposed a 30-acre shallow water habitat site to be built with dredge material from their homeporting project. Upland or aquatic disposal for beneficial reuse is encouraged throughout the state to minimize open-water unconfined disposal at authorized in-bay (*e.g.*, San Francisco Bay), nearshore (*e.g.*, Moss Landing) or ocean (*e.g.*, Los Angeles, San Diego, Eureka, etc.) disposal sites. Dredged material that is physically suitable, but is chemically unsuitable for aquatic disposal because of elevated levels of certain contaminants, may be used as fill, or in certain wetland construction and habitat improvement projects, provided the contaminated materials are confined (*e.g.*, parking lots, container piers, etc.).

Beach nourishment is one of the more common reuses of clean dredge material from routine dredging projects. Compatible material, which matches the receiving beach in grain size and quality, is usually pumped directly onto the beach and then spread by use of heavy equipment, or directly placed in the nearshore environment where it will be transported onshore through natural littoral processes. Large-scale beach nourishment projects, using material from offshore borrow areas, are currently being planned for southern California, particularly in San Diego County.

Dredging activities can cause significant negative impacts to marine life, including a direct loss of benthic habitat, as well as potential loss or injury to slow moving or immobile benthic species such as polychaete worms, crabs, seastars, clams, and bottom-dwelling fishes. Studies have shown that benthic invertebrate species can re-colonize in the dredged area as early as six months after a dredging project has been completed. However, this type of recovery can be delayed indefinitely if there is repeated dredging activity. Depending on the scale of dredging, there also could be a loss of marine plants such as eelgrass. In addition to the direct loss of habitat and associated infauna and epifauna, dredging operations displace mobile fish and invertebrates, affect the foraging habits of marine birds, and displace other water birds such as ducks, geese, terns, loons, grebes, and cormorants. Newly dredged substrate also is more susceptible for colonization by opportunistic and invasive non-endemic organisms.

Dredging may also result in the resuspension and redistribution of sediments, potentially increasing marine and estuarine life to exposure to chemical contaminants, as well as a temporary decrease in dissolved oxygen. Increases in turbidity and suspended solids decrease light penetration, resulting in reduced photosynthesis by phytoplankton, kelp, eelgrass, and surfgrass. Prolonged turbidity can clog the apparatuses of filter-feeding invertebrates and the gills of fishes. Turbidity also reduces the ability of sight-foraging birds, such as the federal- and state-endangered California least tern and brown pelican, to successfully capture prey items.

For small dredging projects, many impacts are assumed to be short term and temporary; however, the larger the

dredging project, the longer the duration of the dredging and the greater the impacts to marine organisms. The method of dredging also affects turbidity and resuspension of sediments. For example, a clamshell dredge results in more turbidity at the dredging site than a hydraulic dredge, but at the disposal site the opposite occurs.

There are a number of ways to minimize some of the impacts associated with dredging. Mitigation measures include the use of silt curtains to contain fine sediments, water-tight clamshell buckets for minimizing the dispersion of contaminants, and seasonal restrictions (*e.g.*, no dredging during the nesting seasons of least terns and snowy plovers, or during the migration of endangered salmonid species).

Open-water disposal buries most immobile epibenthic and infaunal organisms within the footprint of the disposal site, and there are expectations that the site will be degraded over time. Approved ocean disposal sites are designed to minimize adverse impacts to living marine resources outside of the site boundaries. Beach replenishment can also have negative impacts on marine resources and their habitats. Sensitive and valuable habitats including kelp beds, rocky reefs, and surfgrass could be potentially buried by nearshore disposal operations. Direct placement of sand on the beach may also bury incubating California grunion eggs, destroy nests of western snowy plover and least tern, and preclude shorebird foraging.

Invasive Species

Invasive species are the number two threat to endangered and threatened species nationwide, second only to habitat destruction. Specific environmental threats include consumption of native species and their food sources, dilution of native species through cross-breeding, and poisoning of native species through bioaccumulation of toxics that are passed up the food chain. Commercial fishermen nationwide are seeing significant impacts to fish and shellfish populations due to invasive marine life. Moreover, unlike threats posed by most chemical or other types of pollution, biological pollution by non-indigenous species has permanent impacts, as aquatic invasive species are virtually impossible to eradicate once established.

Though many areas along California's coast have been impacted, San Francisco Bay has seen some of the most significant damage from invasive species. Extensive studies confirm that at least 234 alien plant and animal species now live in San Francisco Bay, and that recently introduced alien species are finding a viable niche in the bay and delta at the rate of one new species every 14 weeks. Those invasive species that have been positively identified as permanent residents of the bay include the Asian clam, the European green crab, the New Zealand sea slug, the Chinese mitten crab, several species of sponges, jellyfish, several species of fish, and numerous species of anemone, snails, mussels, clams, and barnacles.

It is widely accepted that the discharge of ballast water is the primary mechanism by which coastal invasive species are spread. For example, from 53 percent to up to 88 percent of the aquatic non-indigenous species introduced into San Francisco Bay in the last decade originated in ballast water discharges. Other sources include aquaculture imports and deliberate introductions (the possible source of the invasive Chinese mitten crab in the San Francisco Bay Estuary).

This topic is addressed in more detail in the chapter on invasive species.

Habitat Loss, Destruction and Alteration

Nearshore coastal and estuarine habitats are significantly impacted by fill, residential and commercial development, and flood control projects. Fill, or the placement of sediments, pilings, bulkheads, retaining walls, piers, etc. in marine waters, has occurred in every major port and many other developed coastal areas. The man-made Ports of Los Angeles and Long Beach were created by the dredging and filling of the former 3,450-acre Wilmington Lagoon. Large-scale fill projects continue today as increasing economic pressures dictate a need for additional container terminals. In fact, the Port of Los Angeles just recently completed an over 580-acre landfill project for its Pier 400 project. In the San Francisco Bay area, the San Francisco International Airport is proposing a runway reconfiguration project that would potentially fill up to 1,500 acres of San Francisco Bay.

The filling of marine waters with large volumes of sediment clearly has significant adverse impacts on the nearshore marine and estuarine environment, permanently eradicates benthic habitat, and likely kills most epibenthic and infaunal organisms within the footprint of the fill. Additionally, fill removes the surface-air interface, reducing foraging areas for surface feeding species, and reduces water column habitat, adversely affecting plankton, fishes, diving birds, and marine mammals.

Structures, such as wharves, piers, seawalls, groins, and breakwaters, also impact and modify the marine and estuarine environment. There is often a permanent loss of habitat from the fill used to install the structure, such as pilings for piers. Some overlying structures (*e.g.*, pier platforms) cover a portion of the water column, resulting in the loss of foraging habitat for sight-feeding marine birds such as terns and pelicans. Additionally, the structure may shade marine plants such as eelgrass, as well as algae

and benthic invertebrates. Groins and breakwaters may deflect wave or water current energy and influence water currents, flushing, sedimentation, and normal sediment transport. Materials used to construct structures exposed to water may have negative impacts on water quality, such as creosote-treated wood products. The operation of the structure may also result in additional water quality impacts, such as runoff from piers and platforms.

In addition to the structures themselves, construction activities associated with projects also impact the marine environment, and, although the impacts are not permanent, they may have significant effects on resources. This is particularly true for large-scale or long-term projects or where there are multiple small project phases in the same area. Surface turbidity caused by dredging is one of the major impacts from in-water construction activities affecting marine plants, birds, and fishes. Shock waves from demolition and pile driving can further impact foraging birds by making prey more difficult to capture. They are also capable of breaking up concentrated schools of fish, forcing schools to seek deeper waters or avoid an area altogether. Noise associated with construction operations also displaces marine birds and mammals.

Groins and breakwaters convert one habitat type to another resulting in a change in community structure. For example, placement of riprap over subtidal/intertidal habitat converts a soft bottom surface to a rocky habitat. Habitat conversion becomes an issue when a majority of the habitat in the area has already been altered. For example, in San Diego Bay, only 26 percent of the bay's shoreline remains natural, whereas the remainder is covered with man-made structures.

Flood control projects can be another source of habitat loss and alteration. The natural hydrology of bays and estuaries has been greatly affected by human activities in an attempt to control flooding. Flood control methods such as channelization of rivers and streams have impacted or destroyed riparian habitat and increased the rate of sedimentation into bays and estuaries. Breaching of sand bars on coastal rivers and streams for the purpose of flood control has changed riverine habitat from fresh water to brackish or tidal. One of the many functions of wetland habitat is to provide flood control during high flow years, but development on coastal wetlands has, among other things, removed this natural benefit.

Coastal habitats such as wetlands and estuaries are vital to the survival of numerous invertebrates, fishes, birds, mammals, and plants. Already an essential component of commercial and sport fishing industries worth hundreds of millions of dollars, these habitats help fuel the state's economy and support California's diverse marine wildlife population. California's coastal wetlands also are valued for their capacity to recharge groundwater and cleanse runoff.

However, these habitats are an increasingly scarce resource. For example, 90 percent of California's coastal wetlands have been diked, paved over, developed or otherwise destroyed, and only five percent of the state's coastal wetlands remain intact. Development continues to pose a significant threat to the few remaining natural coastal wetlands. The vast majority of California's population lives within a short drive from the coast, and the number of people settling in coastal counties continues to grow.

Development not only can directly destroy coastal habitats, but also can contaminate them through the urban runoff and other discharges generated by the development activities. Increased controls on urban runoff will be implemented shortly through a new round of regulations on smaller municipalities, helping to control this problem somewhat, but it is unclear whether this effort will be outweighed by the sheer rate of growth in these areas.

The California Coastal Act limits the filling of wetlands and estuaries to certain types of projects including port, energy, and coastal-dependent industrial facilities, entrance channels for new or expanded boating facilities; new boating facilities in a degraded wetland; and restoration, nature study, and aquaculture. Despite these protections, coastal wetlands are still being developed today. Development projects are currently anticipated at Bolsa Chica, Ballona, and Los Cerritos wetlands, some of the few remaining wetlands in southern California.

Water Flow

Freshwater Discharges

The two principal sources of freshwater discharges into marine and estuarine habitats are sewage treatment plants and power plant cooling water. Sewage treatment plants discharge treated wastewater into coastal waters and bays. There, the freshwater dilutes the salinity of the receiving environment, impacting and changing that habitat. This problem is particularly acute in south San Francisco Bay, which has a low flushing rate.

With respect to power plant discharges, California has more power plants discharging into salt and brackish water than any other state. Although these plants use once-through cooling systems, the water is heated to several degrees above ambient during transit through the plant. Impacts from heated water can vary depending upon where the discharge structure is located. Discharges into environments that normally experience wide temperature ranges during tidal and annual cycles (*e.g.,* estu-

aries) are more resistant to changes from thermal effects than those that do not normally experience such changes. Power plant discharges can result in decreased diversity and density of species at the community and ecosystem levels. In addition to heat, power plant discharges can contain high levels of suspended solids, which decrease light penetration of the water column and affect adjacent kelp bed production.

Power plants also cause problems related to water flow. Electricity generating power plants take in billions of gallons of water on a daily basis. Diablo Canyon Nuclear Power Plant circulates 2.5 billion gallons of water per day, which pulls in creatures in the seawater en route to passing the water through the plant in its once-through cooling cycle. This water circulation causes temperature increases in the area of discharge (thermal pollution), impingement (marine animals caught on water intake screens), and entrainment (destruction of marine animals pulled inside the plant). Entrainment is generally limited to those organisms not capable of swimming against the intake current (*e.g.*, larval forms). Most energy company-sponsored studies of power plant entrainment limit analysis to effects on larval fish, arguing that plankton losses are too difficult to enumerate and analyze for ecosystem effects. It has been estimated, however, that plankton losses can significantly increase the estimates of overall wildlife losses due to entrainment. Larval entrainment losses are often estimated at 100 percent due to a multiplicity of factors, including physical changes in pressure, discharge velocity, turbulence, and temperature increase effects. If the power plant has a mechanism to return impinged organisms to the water (most do not), those losses are lower, but do contribute to the cumulative effects of power plants on the ecosystem.

Hydromodification

Dams in California range from large, permanent structures to small, temporary structures. Millions of gallons of water, often diverted from rivers that empty into the ocean or estuaries, are stored for agricultural use, drinking water supplies, flood control, or groundwater recharge. Dams change the landscape both at the construction site and the downstream conveyance to the ocean or estuary. Loss of upstream habitat due to water diversion has the effect of reducing the production capability of anadromous species that depend on continuous summer flows for rearing and transport of juveniles that travel downstream to the ocean for growth prior to returning to natal streams. Diversion of freshwater inflow to estuarine systems also reduces the productivity of the estuaries by reducing the nutrient input which diatom and other bottom trophic level organisms require. Dams also change stream morphology by altering sediment flow, by smothering gravels with silt during high flow releases, and by emptying summer rearing pools. Dams also contribute to poor water quality by releasing warm surface water that has been mostly depleted of oxygen; or by releasing water, through spillways, that may contain oxygen levels too high for fish survival (supersaturation). The lakes that are formed by large dams cover miles of former spawning riffles, and many dams have been built without passage facilities, blocking the upstream migration of anadromous fish trying to find suitable spawning habitat.

Water conveyance structures (*i.e.*, water canals) remove essential water from rivers and streams that historically produced the bulk of California's salmon runs. These structures not only remove water, they also alter existing habitat. For example, canals that leak repeatedly create riparian habitat entirely dependent on that leakage. When these canals are repaired, the ecosystem that has developed over the years is lost. Water canals also have the potential to transport fish between watersheds and introduce species into unfamiliar habitats. Many newly created reservoirs behind dams contain non-native fish that also have the potential to escape from the lake into the outlet stream, such as the in the case of the northern pike introduced into Lake Davis.

Recreational and Commercial Activities

Boating

Cruise ships, yachts, and other large recreational vessels discharge sewage, gray water, toxic chemicals, oil and gas, and air pollutants into sensitive coastal waters. Smaller vehicles also can do significant harm.

Jet Skis (Motorized Personal Watercraft)

For example, jet skis, more generically referred to as "motorized personal watercraft" (MPWC) can do significant nearshore harm. For example, their noise, which is rated at 85-105 decibels, can disrupt wildlife communities through alteration of behavior and nest abandonment. MPWCs also pollute more than other boats. From 25 to 33 percent of the oil and gasoline used by MPWCs is discharged unburned, impacting local water quality. A two-hour ride on an MPWC can discharge up to three gallons of unburned gasoline and oil, or the same amount of pollution as driving 139,000 miles in a 1998 passenger car. The impact of accumulated oil pollution in the marine environment is particularly significant in sensitive nearshore environments such as estuaries and bays. This pollution can have cumulative effects throughout the food web as the hydrocarbons bioaccumulate, posing a threat to larger marine life.

For these reasons, MPWC regulations have been established in sensitive areas such as the waters of the Monterey Bay and Gulf of the Farallones National Marine Sanctuaries. In justifying the regulation of MPWC, the National Oceanic and Atmospheric Administration noted that, "the small size, maneuverability and high-speed of these craft is what causes these craft to pose a threat to resources. Resources such a sea otters and sea birds are either unable to avoid these craft or are frequently alarmed enough to significantly modify their behavior such as cessation of feeding or abandonment of young." Indeed, the narrow draft and smaller size of MPWCs allows them to access the most fragile nearshore habitats, causing significant environmental impacts including: flight responses in shorebirds and alteration of nesting habits; destruction of critical bird and fish habitat, including eelgrass beds; and harassment of or collisions with marine mammals (several of which are federally protected species under the Endangered Species Act) and other wildlife. While these impacts are most critical in the nearshore environment, the risk of collision with or harassment of marine mammals and seabirds is significant throughout areas frequented by MPWC.

Fishing

There is growing evidence that fishing has a significant impact on coastal habitats. For example, the complexity of the marine habitat can be altered by the scraping, shearing and crushing effects of fishing gear. Physical effects of trawling include plowing and scraping of the sea floor and resuspension of sediments. Resulting benthic troughs can last as little as a few hours or days in mud and sand sediments over which there are strong tides or currents, to between a few months to over five years in sea beds with a mud or sandy-mud substrate at depths greater than 100 meters with weak or no current flow. Longline gear has similarly been observed to shear marine plants and sessile organisms from the bottom. Pot gear may damage demersal plants and animals as it settles, and longlined pots may drag through and damage bottom fauna during gear retrieval. Boat anchors also can inflict serious, though localized, damage in some areas.

In addition to directly altering the bottom habitat, fishing can result in lost gear that is left to "ghost fish," thereby causing additional habitat alterations. Fishing activities also affect the water column through discharge of offal from fish processed at sea. These discards in deeper water could redistribute prey food away from midwater and bottom-feeding organisms to surface-feeding organisms; in low-current environments, these discharges can decompose and create anoxic bottom conditions. The water column also can be impacted by fuel leaks from fishing boats.

Measures to minimize these impacts include prohibiting the use of damaging gear in sensitive areas and modifying gear so that damage to bottom habitats is minimized.

Ecosystem-wide Implications

An ecosystem can be defined as the balanced and sustained interaction of a biological community with its physical and chemical environment. The fish, invertebrate, marine mammal, aquatic bird, and aquatic plant populations in California's coastal, bay, and estuarine waters are all components of a vast array of discrete and overlapping communities and ecosystems. Although most members of a biological community are linked through elaborate food webs based upon predation, competitive and mutualistic relationships also play an important role. Add to this complexity the myriad of effects on individual organisms and populations from changes in the chemical and physical environment, and measuring and evaluating ecosystem responses to these changes becomes a challenging task.

The current state of environmental science allows us to use both individual evaluation measures and combinations of measures depending upon the information at hand. These may include population numbers and structure, biological testing (*e.g.*, bioassays, bioaccumulation, etc.), concentration of contaminants in organisms or the surrounding habitat, movement of contaminants into aquatic ecosystems, and size and/or availability of habitat. Based upon these and other measurements, it appears that bay and estuarine ecosystems are much more threatened than those of the nearshore coastal environment with regard to habitat quality and quantity. This is particularly true with regard to contaminants in the water column and benthic sediments, and impacts from dredging and filling, point and nonpoint source discharges, oil spills, and nonindigenous species introduction. On a localized or regional basis, however, areas of the nearshore coastal environment may be in worse condition than our bays and estuaries with regard to specific contaminants or conditions. Examples include DDT-laden sediments in the area of the Palos Verdes shelf and radioactive waste dumped near the Farallon Islands.

Although California's population continues to increase, thereby putting added pressure on our limited resources and habitats, there are a number of efforts and initiatives underway in the state to begin to curtail impacts and improve the quality and quantity of our marine and estuarine habitats. These efforts include greater regulation of point and nonpoint source discharges, improved identification of toxic hot spots, increased emphasis on beneficial reuse opportunities for dredged materials, reduction of the frequency and extent of oil

spills, development and coordination of large-scale water quality and habitat monitoring and assessment programs, restrictions on the import of non-indigenous species in ballast water, and increased marine habitat restoration and enhancement projects.

Regulatory Structure for Addressing Water Quality and Habitat Issues

Federal

Clean Water Act

The Environmental Protection Agency is the foremost federal agency with responsibility for protecting the health of the nation's waters. The Federal Water Pollution Control Act ("Clean Water Act") addresses the major categories of discharges into coastal and marine waters with varying degrees of stringency. California's State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCB) currently hold the authority, delegated by U.S. EPA, to implement the Clean Water Act in state waters.

Permit Program

Section 301(a) of the Clean Water Act prohibits the discharge of "any pollutant by any person" into waters of the United States, unless done in compliance with specified sections of the Act, including the permit requirements in Section 402. Under the National Pollutant Discharge Elimination System (NPDES) set up under Section 402, U.S. EPA requires permits for most point source discharges of waste. These permits contain discharge conditions, including technology-based controls and water-quality-based effluent requirements, to ensure that the discharges meet all applicable standards set to protect uses of the water body, such as use by aquatic life and for fishing.

NPDES permits for discharges into the territorial sea also must comply with "ocean discharge criteria" specifically designed to prevent the degradation of those waters, pursuant to Clean Water Act Section 403. These permit requirements may increase in stringency in the near future due to a recent presidential Executive Order on this topic.

Nonpoint Pollution Program

Section 319 of the Clean Water Act sets up a voluntary program to control polluted runoff. This program was established through the 1987 Clean Water Act amendments, and states soon thereafter submitted nonpoint source pollution management plans to EPA in order to receive federal 319 funds for projects to control polluted runoff. Significant limitations of this program include low levels of funding in comparison with the significance of the problem and the fact that the programs are voluntary. As a result, over a decade after establishment of the "319 program," polluted runoff continues to be the major - and growing - source of pollution into the nation's waters.

Regulation of Discharges into Impaired Waters

Section 303(d) of the Clean Water Act requires states to identify specific water bodies where water quality standards are not expected to be met even after full implementation of required permit controls and other conditions imposed on point source discharges. States must then establish a priority ranking of those impaired waters and identify the pollutant stressors that are causing the water quality problems. In accordance with those rankings, the state must then establish limits on all pollution discharges, both point and nonpoint, in order to ensure attainment of water quality standards within a "margin of safety." These limits are referred to as the "total maximum daily loads" (TMDL) for the identified pollutants and waters. The state's impaired water body list currently tops 500, with more likely to be listed. Because many of these waters are vital to the health of the state's coastal ecosystems and wildlife, full and prompt implementation of these TMDLs is essential to a thriving marine ecosystem.

Discharges under Federal Licenses or Permits

Section 401 of the Clean Water Act requires a certification from a state that federal agency actions and permits comply with state water quality standards and other Clean Water Act requirements. Congress stated in enacting this provision that the purpose of Section 401 is to "provide reasonable assurance that no license or permit will be issued by a federal agency for any activity that through inadequate planning or otherwise could in fact become a source of pollution." When implemented fully, this adds an important layer of protection over existing regulations protecting coastal water quality and habitat health.

Dredge Disposal and Fill

Section 404 of the Clean Water Act grants the U.S. Army Corps of Engineers authority to regulate any project involving fill, construction, or modification of the waters of the United States. This would include, for example, dredging and filling of coastal harbors. Corps actions are subject to Clean Water Act Section 401 certification that the proposed activities will not violate state water quality standards.

U.S. EPA sets the standards for suitability of dredge material destined for federally approved sites in the ocean

beyond three miles from shore. These standards are found in the 1991 Ocean Disposal Testing Manual, or "Green Book," which specifies the physical, chemical, and biological tests required to determine suitability. Disposal within state waters (*i.e.*, inside three miles) is authorized by state and federal agencies which use standards from the "Inland Testing Manual." State agencies involved in authorizing disposal within state waters through a permitting process include the Regional Water Quality Control Boards, State Lands Commission, California Coastal Commission, and the San Francisco Bay Conservation and Development Commission. Federal agencies involved in the permitting process for the disposal of dredged materials in state waters include U.S. EPA and the U.S. Army Corps of Engineers. Federal and state resource agencies such as the Department of Fish and Game, U.S. Fish and Wildlife Service, and National Marine Fisheries Service act as consulting agencies on dredging projects.

Antidegradation

The Clean Water Act and accompanying regulations state that both point and nonpoint source pollution control programs must specifically address antidegradation, or preventing further pollution of the nation's waters. Water quality standards, which all waters must meet, consist of three elements: (1) the designated beneficial use or uses of a water body; (2) the water quality criteria necessary to protect the uses of that water body; and (3) an antidegradation policy. Both federal and state antidegradation policies must ensure that water quality improvements are conserved, maintained and protected.

Despite the fact that antidegradation in general, and protection of relatively clean waters in particular, is a specific component of the water quality standards, it is given relatively little attention in point source pollution control and permitting programs, and essentially no attention in nonpoint pollution control programs. A lack of attention to maintaining the health of cleaner waters threatens those waters with impairment that will be far more expensive to address than prevention. Water quality programs should contain specific descriptions of how new and continued discharges into all waters, both impaired and clean, will be reduced.

Ocean Dumping Act

Title 1 of the Marine Protection, Research, and Sanctuaries Act (Ocean Dumping Act), prohibits the unpermitted dumping of "any material transported from a location outside the United States" into the territorial sea of the United States, or into the zone contiguous to the territorial sea, to the extent discharge into the contiguous zone would affect the territorial sea or the territory of the United States. "Dumping" is defined broadly as "a disposition of material." The statute contains only a few, very specific exemptions from this term. The Act is administered by U.S. EPA and is on top of any Clean Water Act requirements.

The National Environmental Policy Act

The National Environmental Policy Act of 1969 is the basic national directive for the protection of the environment. NEPA requires that federal agencies prepare an Environmental Impact Statement (EIS) for "major Federal actions significantly affecting the quality of the human environment." In doing so, the agencies must provide a "full and fair discussion of significant environmental impacts" of the proposed project.

An EIS is intended to help public officials make decisions that are based on an understanding of the potential environmental consequences and decide whether to take actions that avoid these consequences. The EIS also must "inform decision makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts" and must analyze such project alternatives comprehensively. In addition, the EIS must discuss "appropriate mitigation measures not already included in the proposed action or alternatives." Finally, the lead agency must state at the time of its decision "whether all practicable means to avoid or minimize environmental harm from the alternative selected have been adopted, and, if not, why not."

Endangered Species Act

The federal Endangered Species Act (ESA) is the nation's charter for protection of threatened and endangered species, including coastal and marine life. The Endangered Species Act contains both consultation requirements and a substantive requirement prohibiting certain activities that threaten listed species. Under Section 7 of ESA "[e]ach Federal agency shall, in consultation with and with the assistance of the Secretary [of the Interior and/or Commerce, as appropriate], insure that any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species . . . ." In addition, federal agencies must consult with the Secretary of the Interior and/or Commerce, as appropriate "on any agency action which is likely to jeopardize the continued existence of any species proposed to be listed . . . or result in the destruction or adverse modification of critical habitat proposed to be designated for such species."

Section 7 is an important tool that can be used to protect and conserve the habitats of threatened and endangered coastal and marine wildlife. ESA Section 7 is used, for

example, to require the U.S. Army Corps of Engineers to consult with U.S. Fish and Wildlife Service and the National Marine Fisheries Service regarding how proposed Corps dredging projects will affect listed species.

In addition, Section 9 of ESA prohibits the transport or take of listed species, and Section 4 sets up a program to acquire lands and habitat associated with listed species to enhance recovery efforts.

Marine Mammal Protection Act

The federal Marine Mammal Protection Act (MMPA) protects the marine mammals that make their home in the waters off California's shores. One of the more significant provisions of the MMPA prohibits the "take" of marine mammals. "Take" is defined broadly to include actions that kill or "harass" marine mammals, where "harassment" refers to "any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including . . . feeding . . . ." As defined, "take" is not limited to a direct physical taking of the animal, but also other actions that indirectly harm the animal.

National Marine Sanctuaries Act

Title 3 of the Marine Protection, Research, and Sanctuaries Act is the National Marine Sanctuaries Act (NMSA), which protects the nation's most unique marine habitats, waters and wildlife. California is fortunate to have four National Marine Sanctuaries: Channel Islands, which lies nine to 46 miles offshore and encompasses 1,658 square miles of marine waters and habitats; Monterey Bay, which lies adjacent to the central coast and is 5,328 square miles; Gulf of the Farallones, which lies adjacent to shore along Marin County and extends 12 miles out to the Farallon Islands, encompassing 1,255 square miles; and Cordell Bank, the smallest at 526 square miles, which lies near the continental shelf seven to 23 miles offshore (adjoining the Gulf of the Farallones Sanctuary). The NMSA is designed to "maintain, restore, and enhance living resources by providing places for species that depend on these marine resources to survive and propagate." NOAA's Sanctuary offices use the NMSA to provide for "comprehensive and coordinated management" of these unique marine areas.

To meet these goals, the NMSA requires federal agencies to consult with sanctuary officials if federal actions are likely to injure sanctuary resources. So, for example, U.S. Army Corps of Engineers staff would need to consult with sanctuary staff on proposed dredging in sanctuary waters. The NMSA also makes it illegal to "destroy, cause the loss of, or injure any sanctuary resource managed under law or regulations for that sanctuary," with specified actions allowed under sanctuary permits or authorizations. Under the NMSA, management plans must be prepared for each sanctuary and reviewed every five years. These plans must take into account management of the diverse marine wildlife in California's sanctuaries.

Like the Ocean Dumping Act, the NMSA adds an extra layer of protection for marine resources in certain areas. For example, the San Francisco and Central Coast Regional Water Quality Control Boards report to the Monterey Bay NMS office on proposed new and revised permits for discharges into sanctuary waters and allow for staff review and comment. Sanctuary staff may in some instances place conditions on these permits as needed to protect Sanctuary resources. Violations of these permits is an infraction of both state water quality law and the NMSA, subjecting the violator to fines under both acts.

The Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) of 1972 established a federal-state partnership to manage development and use of the coastal zone. CZMA, which is administered nationwide by NOAA, provides federal funding for the development and implementation of state Coastal Zone Management Programs. The state agency charged with developing and implementing a state coastal plan in accordance with CZMA is the California Coastal Commission. Significantly, CZMA grants the commission the authority to review federal activities in the coastal zone and ensure they comply with California's Coastal Zone Management Program.

Coastal Zone Management Act Reauthorization Amendments of 1990

The Coastal Nonpoint Pollution Control Program, established by the Coastal Zone Reauthorization Amendments of 1990 (CZARA), addresses the control of nonpoint source pollution, which is the number one cause of water contamination in the state. The impacts of nonpoint source pollution in coastal areas include beach closings and advisories, loss of habitat, closed or harvest-limited shellfish beds, declining fisheries, red tides and other harmful plankton blooms, reduction in tourism revenues and threats to the drinking water of coastal communities.

The State Water Resources Control Board and the California Coastal Commission have submitted to U.S. EPA and NOAA a Nonpoint Pollution Control Program Plan that is intended to control nonpoint source pollution in accordance with CZARA Section 6217 requirements. The plan lays out a general outline of nonpoint source pollution management measures that will be implemented over the next 15 years.

U.S. EPA and NOAA approved California's plan in July 2000. Additional requirements on the contents of the Plan imposed under state law (particularly with respect to enforcement) should be completed by February 2001.

Magnuson-Stevens Fishery Conservation and Management Act

As amended and reauthorized in 1996, the Magnuson-Stevens Fishery Conservation and Management Act includes substantial new provisions designed to protect habitats important to all federally managed species of anadromous and marine fish. The amended Act defines "essential fish habitat" (EFH) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity."

The act requires the eight regional fishery management councils around the country and the Secretary of Commerce to amend each regional fishery management plan to:

- Describe and identify EFH;
- Identify adverse impacts to EFH;
- Minimize, to the extent practicable, adverse impacts from fishing to EFH; and
- Develop suggested measures to conserve and enhance EFH.

Before a federal agency may proceed with an activity that may adversely affect a designated EFH, the agency must consult with NOAA Fisheries with regard to measures that avoid or minimize adverse impacts on the EFH.

The Pacific Fishery Management Council has defined groundfish EFH as waters of the entire Pacific Coast, and described the types of measures needed to protect the habitat from fishing and non-fishing impacts. However, the Council, like other councils nationwide, has required almost no protection for EFH from fishing itself, despite growing evidence that fishing often poses a significant threat to EFH.

Oil Pollution Act of 1990

The Oil Pollution Act (OPA) of 1990 streamlined and strengthened EPA's ability to prevent and respond to catastrophic oil spills. A trust fund financed by a tax on oil is available to clean up spills when the reponsible party is incapable or unwilling to do so. The OPA requires oil storage facilities and vessels to submit plans to the Federal government detailing how they will repond to large discharges. EPA has published regulations for above ground storage facilites; the Coast Guard has done so for oil tankers. The OPA also requires the development of Area Contingency Plans to prepare and plan for oil spill response on a regional scale.

State

California Environmental Quality Act

Like NEPA, the California Environmental Quality Act requires the state to take a hard look at the environmental impacts of projects that require state or local government approval. Unlike NEPA, CEQA also requires appropriate mitigation of projects that contain significant environmental impacts. Specifically, CEQA states that agencies must adopt feasible mitigation measures in order to substantially lessen or avoid the otherwise significant environmental impacts of a proposed project. A "significant" impact is a "substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, [and] fauna…"

CEQA also mandates that the responsible agencies consider a reasonable range of project alternatives that offer substantial environmental advantages over the project proposal. CEQA adds that the agency responsible for the project's approval must deny approval if there would be "significant adverse effects" when feasible alternatives or feasible mitigation measures could substantially lessen such effects.

Porter-Cologne Water Quality Control Act

Under California's Porter-Cologne Water Quality Control Act "any person discharging waste, or proposing to discharge waste, within any region that could affect the quality of the waters of the state" must file a report of the discharge with the appropriate Regional Water Quality Control Board. Pursuant to the act, the regional board may then prescribe "waste discharge requirements" (WDRs) that add conditions related to control of the discharge. Porter-Cologne defines "waste" broadly, and the term has been applied to a diverse array of materials, including nonpoint source pollution.

When regulating discharges that are included in the federal Clean Water Act, the state essentially treats WDRs and NPDES as a single permitting vehicle. Where Porter-Cologne is more stringent than the Clean Water Act, such as for discharges of nonpoint source pollution, WDRs alone must be applied to or waived for such discharges. This requirement, however, is not implemented as it should be, and indeed is simply ignored in a number of cases, particularly with respect to nonpoint source pollution. A bill passed in 1999 now requires the state and regional boards to review existing waivers of WDRs in an effort to ensure that needed regulatory controls are properly imposed.

California Endangered Species Act

The California Endangered Species Act (CESA) generally parallels the main provisions of the Federal Endangered Species Act and is administered by the California Department of Fish and Game. Under CESA, the term "endangered species" is defined as a species of plant, fish, or wildlife that is in serious danger of becoming extinct throughout all, or a significant portion of its range and is limited to species or subspecies native to California. CESA states that it is the "policy of the state" that state agencies should not approve projects as proposed which would "jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat essential to the continued existence of those species," if there are "reasonable and prudent alternatives available consistent with conserving the species or its habitat which would prevent jeopardy." However, CESA goes on to add that, in the event "specific economic, social, or other conditions make infeasible" such alternatives, individual projects may be approved if "appropriate" mitigation and enhancement measures are provided.

McAteer-Petris Act

Under the McAteer-Petris Act of 1965, the Bay Conservation and Development Commission (BCDC) has authority to plan and regulate activities and development in and around San Francisco Bay through policies developed in the San Francisco Bay Plan. This is essentially the San Francisco Bay counterpart to the California Coastal Act.

California Coastal Act

The California Coastal Act of 1976 granted state authority to the California Coastal Commission, in conjunction with local governments, to manage the conservation and orderly development of coastal resources through a comprehensive planning and regulatory program for the coast (excluding areas covered by the McAteer-Petris Act). The state's management program for the 1,100-mile Pacific Coast program was approved in 1977 by NOAA as consistent with the requirements for planning in the federal Coastal Zone Management Act. NOAA's approval was made pursuant to an agreement between the Coastal Commission and the Bay Conservation and Development Commission to develop mechanisms to integrate their two programs.

The Coastal Act contains specific policies relating to management of coastal development activities that affect the marine environment and coastal land resources. These policies are the standards used in the commission's planning and regulatory programs to ensure that the commission meets the act's mandate that the state "[p]rotect, maintain, and, where feasible, enhance and restore the overall quality of the coastal environment and its natural and manmade resources." The act also delegates planning and permitting authority to local governments through the Local Coastal Plan process.

Oil Spill Prevention and Response Act of 1990

The state's Office of Spill Prevention and Response (OSPR) was created in the aftermath of the Exxon-Valdez oil spill and the American Trader oil spill at Huntington Beach. The Lempert-Keene-Seastrand Oil Spill Prevention and Response Act of 1990 created OSPR within the Department of Fish and Game. The bill provided funding for OSPR's work by levying a tax on oil brought into the state and another on oil transported across the state by rail, truck, or pipeline. OSPR's mandate is to work with other DFG units, interested public, other agencies, clean-up companies, and oil companies to prevent oil spills, to develop response plans, and to implement those plans when spills occur.

The U.S. Coast Guard is OSPR's federal counterpart and response partner for these efforts. In addition, OSPR has responsibility for determining injuries to living natural resources and seeking compensation and restoration through civil litigation. More recently, OSPR's role has expanded from a focus on oil spills to a broader focus on spills of any material deleterious to living natural resources, and has expanded from marine waters to spills that may happen anywhere in California.

In addition, the act makes the State Lands Commission responsible for ensuring that all marine terminals and other oil and gas facilities within their jurisdiction use the best achievable methods to prevent accidents and resulting oil spills. The State Lands Commission has jurisdiction over all of California's tidal and submerged lands. Management responsibilities extend to activities within submerged lands and those within three nautical miles of shore.

Regional

Numerous regional and local initiatives have been launched to protect marine resources and wildlife. A few of the more significant initiatives are highlighted below.

CALFED

The San Francisco Bay-Delta Estuary is a significant habitat for numerous coastal and marine species and directly impacts the viability of many of the state's coastal watersheds and resources. However, years of mismanagement of this invaluable resouce has left its health seriously threatened. State-federal cooperation to restore the estu-

ary was formalized in June 1994 with the signing of a framework agreement by the state and federal agencies with management and regulatory responsibility in the Bay-Delta Estuary. These "CALFED" agencies include the state Resources Agency, the California Environmental Protection Agency, the Department of the Interior, the Environmental Protection Agency, the Department of Commerce, the U.S. Army Corps of Engineers, and the Department of Agriculture. The framework agreement pledged that the state and federal agencies would work together on implementation of water quality standards, coordination of State Water Project and Central Valley Project operations with regulatory requirements, and development of long-term solutions to problems in the Bay-Delta Estuary.

The long-term goal of CALFED is to develop a comprehensive and balanced plan that addresses all of the resource problems in the estuary. A group of more than 30 citizen-advisors selected from California's agriculture, environmental, urban, business, fishing, and other interests with a stake in finding long-term solutions for the problems of the Bay-Delta Estuary has been chartered to advise the CALFED program on its mission and objectives, the problems to be addressed and proposed actions.

The program is following a three-phase process to achieve broad agreement on long-term solutions. First, a clear definition of the problems to be addressed and a range of solution alternatives were developed. Second, environmental impact reports are being prepared to identify impacts associated with the various alternatives. The program's final EIS was released in June 2000, proposing more reliable water deliveries to the Estuary to protect habitats, water quality and wildlife. Environmental impact reports will be prepared for each element of the selected solution. Implementation of the final CALFED Bay-Delta Estuary solution is expected to take 30 years.

Monterey Bay National Marine Sanctuary Water Quality Protection Program

The proximity of the Monterey Bay National Marine Sanctuary to the coast and its sheer size make the sanctuary vulnerable to numerous pollution problems in the eleven watersheds that drain into it. The quality of the water in the sanctuary is directly linked to the quality of the rainwater runoff and irrigation water from mountains, valleys, rivers, streams, and wetlands on the adjacent coastline. Key problems identified in the sanctuary and its watersheds include sedimentation, toxic pollutants in sediments, fish and shellfish, high fecal coliform levels, fish population declines, low flows in rivers and streams, wetlands alteration, and habitat degradation.

Recognizing that water quality is a key to ensuring protection for all sanctuary resources, a memorandum of agreement (MOA) was signed by eight federal, state, and local agencies in 1992, committing the agencies to working together to develop a Water Quality Protection Plan for the sanctuary. Led by sanctuary staff, over two dozen federal, state, local agencies and public and private groups have developed much of the planned comprehensive Water Quality Protection Program, addressing urban runoff, marina and boating pollution, monitoring, and runoff from agricultural activities and rural lands, in order to enhance and protect the sanctuary's physical, chemical and biological conditions. Implementation has begun on many of the action items in the plans.

Local

Implementation of CEQA and NEPA

One of the more common ways that coastal and marine resources are protected on a local level is through implementation of environmental review requirements under CEQA and NEPA. Projects requiring local, state or federal approval are generally subject to the review requirements in these statutes. Local and state projects also are subject to required mitigation under CEQA.

Coordinated Resource Management Planning

Coordinated Resource Management and Planning (CRMP) is a community-based program established by the federal Natural Resource Conservation Service. It uses a watershed-based approach to manage upstream lands in order to improve downstream water quality. CRMP emphasizes direct participation by everyone concerned with natural resource management in a given planning area. The concept underlying CRMP is that coordinating resource management strategies will result in improved resource management and minimized conflicts among land users, landowners, governmental agencies, and interest groups. The goals of CRMP are to protect, improve and maintain natural resources by addressing resource problems based on resource boundaries and through those who live, work and recreate on a given piece of land, and by avoiding artificial constraints by individual, agency or political boundaries.

CRMPs work with University of California Cooperative Extension program and the Resource Conservation Districts, who are signatories to the CRMP Memorandum of Understanding and who support this process through technical and other assistance to the local CRMP groups.

Marine Protected Areas

Marine Protected Areas (MPAs) are special ocean areas that are protected in some way above other marine areas in order to minimize disturbance. Depending on the level of use of such areas, benefits include biodiversity conservation, ecosystem protection,

improved fisheries, enhanced recreation, improved water quality and expanded knowledge and understanding of marine systems.

As a tool for enhancing ocean resources and wildlife, MPAs are becoming increasingly popular. In 1999, the legislature passed the Marine Life Protection Act, which sets up a system for evaluating and coordinating MPAs in the state. In May 2000, President Clinton issued an executive order supporting MPAs and further defining their purpose.

Regulatory Gaps

California has lagged in implementing federal and state laws designed to protect the health of the state's waters. Years of budget cuts and bond act failures have left California's water quality protection programs underfunded and poorly implemented. Until the recent passage of Propositions 12 and 13, of the $2.9 billion in water bonds approved by California voters since 1970, only $10 million had been earmarked for nonpoint source pollution, the number one source of water pollution in the state. In addition, acquisition funding for protection of the state's lands, which helps prevent increasing pollution from urban and other runoff sources declined 80-90 percent over the last 10 years.

As a result, use of the vast majority of the state's surveyed tidal wetlands, bays, harbors, and estuaries is impaired or threatened in some way by water pollution. Examples of uses that are being impaired or threatened by pollution include drinking, fish consumption, aquatic life support, swimming, and aquaculture. The primary source of pollution in these waters is nonpoint source pollution. The state's lack of a detailed, comprehensive approach for addressing nonpoint source pollution is a major stumbling block in our efforts to stem the continuing degradation of these water bodies.

These water-use impairment figures are even more alarming in light of the fact that many of the state's waterways are monitored only infrequently or not at all. California does not yet have a system to comprehensively monitor water quality in the inland watershed, enclosed waters, or nearshore ocean zones, and the vast majority of California's waterways and small estuarine systems are not monitored by the state on a regular basis. Because of these deficiencies, it is difficult to comprehensively determine the health of these water bodies. In other words, the number of impaired water bodies that we know about is the minimum number of polluted water bodies in the state.

Federal water quality control programs that are not being implemented fully include the Clean Water Act's stormwater permitting program; the Clean Water Act's Section 303(d) program; and the state and federal antidegradation programs, which are designed to prevent cleaner waters from sliding down towards contamination.

With respect to the storm-water permit program, the state has allocated far fewer staff and other resources than needed to ensure full compliance with federal requirements. For example, at the current rate of facility inspections, the Los Angeles Regional Water Quality Control Board will not be able to make even one full round of inspections of regulated industries in its jurisdiction in 100 years. Moreover, the regional board has not moved forward with more than a handful of enforcement actions against non-filing facilities, even though there are between 12,000 and 17,000 facilities in the Los Angeles region that have not filed permit applications as required by law. For this reason, several environmental groups recently petitioned U.S. EPA to take away the state's authority to conduct the storm-water permit program in that region.

The state has identified over 500 water bodies as impaired under section 303(d) of the Clean Water Act. The limited monitoring information available indicates that the number of impaired waters is likely to be much higher. However, the state has completed only a scattering of plans for reducing pollution into these impaired waters, with the pace of production of new plans extremely slow and implementation uncertain.

With respect to antidegradation, the state has paid virtually no attention to protecting its cleaner waters, choosing instead to spend much of its limited time and funds on already impaired waters. Protecting the state's waters from increased pollution is not only beneficial to the health of those waters and the people who depend on them, it is also more cost-effective than cleaning up contaminated waters. Regulations implementing the federal Clean Water Act as well as State Water Board Resolution 68-16, call on the state and regional water boards to consider and address the impacts of their decisions on the overall health of the waters affected. However, this mandate has not been implemented fully, particularly with respect to nonpoint source discharges, leaving cleaner waters and associated habitats vulnerable to pollution.

Other state programs that are not being implemented fully include the state water board's Bay Protection and Toxic Cleanup Program (BPTCP) and its program of issuing waste discharge requirements for nonpoint source pollution under the Porter-Cologne Water Quality Control Act, as well as the Department of Fish and Game's program for addressing pollution under Fish and Game Code Section 5650.

The Bay Protection and Toxic Cleanup Program required monitoring for toxic pollution, identification of cleanup priorities, and development of standards for toxics in sedi-

ment, plans for cleaning up the toxics, and a funding mechanism to ensure that the dischargers that created the problem will pay for the cleanup. Much of the BPTCP's goal of identifying "hot spots" of toxic coastal contamination has been completed, leading to significant new knowledge about threats to marine wildlife. However, the original goal of actually cleaning up these hot spots remains unmet, and is unlikely to be met in the foreseeable future.

With respect to Porter-Cologne, the state has the authority to issue waste discharge requirements for both point and nonpoint source discharges. However, the full extent of this authority has never been used, particularly with respect to nonpoint source discharges, where such requirements are routinely waived. Increased permitting would increase the number of conditions on discharges, which would reduce this significant source of pollution in coastal and marine habitats.

Finally, implementation of Fish and Game Code Section 5650 has been weakened through recent statutory amendments and a lack of allocated funding. This section stated broadly that "it is unlawful to deposit in, permit to pass into, or place where it can pass into the waters of this state…[a]ny substance or material deleterious to fish, plant life, or bird life." This language gave the department wide latitude to protect marine habitats from problem discharges. However, the program was amended recently to exempt dischargers who hold state or regional water board discharge permits, on the assumption that those discharges are already being controlled. But, as noted above, the regional water boards are behind on fulfilling state and federal permit mandates. As a result, there is no assurance that permitted discharges will not be "deleterious" to fish, plants and birds.

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