

**California Marine Life Protection Act Initiative**

***Regional Profile of the  
North Coast Study Region***

***(California-Oregon Border to Alder Creek)***

***April 19, 2010***

This is the 3rd printed edition, dated April 19, 2010; it supersedes the editions of December 2009 and February 2010. The electronic version of this document can be found at <http://www.dfg.ca.gov/mlpa/ncprofile.asp>.

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## How to Use this Document

This is the third edition of the *Regional Profile of the North Coast Study Region (California-Oregon Border to Alder Creek)*, authored by the staff and advisors of the California Marine Life Protection Act Initiative. The purpose of this document is to provide an overview of the features and characteristics of the study region, to better inform the design of marine protected areas (MPAs) for the region.

### Acronyms and Abbreviations

In a document of this type, it is natural that a large number of abbreviations and acronyms will be used. In all cases where an acronym is used for the first time, the name or phrase it represents is spelled out. For reference, a complete list of acronyms and abbreviations has been placed inside the back cover, where it is easy to find. Note, though, that this list does not cover acronyms which are used only in references to other works. In those cases, the full name or phrase is spelled out in the References section at the end of the chapter.

### Maps and Geographical Aids

As a companion to this profile, two atlases are being published in a single, separate volume. That book, the *MLPA North Coast Study Region Atlas*, contains large-format maps in two thematic atlases: the *Coastal Management & Human Uses Atlas* and the *Habitat & Species Atlas*. This profile will make several reference to those atlases.

MLPA Initiative staff have compiled and developed spatial data layers and have conducted geographic information system (GIS) analyses to support the MPA planning process. The atlases that accompany this regional profile include maps of only selected spatial data layers. Additional spatial data layers for the study region are available through the online tool, MarineMap (<http://northcoast.marinemap.org/>). Data layers available at the date of printing are listed in Appendix A of this profile.

### How to Learn More

At the end of each chapter there is a list of references for that chapter. In all, over 400 works were consulted in the document's creation, and readers may want to consult these works. In the case of many academic papers, a trip to a good library is necessary. Increasingly, though, valuable documents are to be found online; we have supplied a URL in every case where we were able to identify an online source for a document. If you wish to follow the links to online sources, you may want to obtain an electronic copy of this profile, in which the URLs are highlighted in blue and are live, clickable links.



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## Executive Summary

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

A regional approach is being used to redesign MPAs in state waters along California's 1100-mile coast. Implementation of the MLPA is being undertaken in five study regions: the central coast, the north central coast, the south coast, the north coast, and San Francisco Bay. As part of the MLPA Initiative, a master plan was created to provide a framework to guide the planning process within individual study regions. The central coast study region (Pigeon Point in San Mateo County to Point Conception in Santa Barbara County) was the first study region for which the MPA planning process was completed; the California Fish and Game Commission adopted 29 central coast MPAs in April 2007. The north central coast study region (Alder Creek to Pigeon Point) was the second study region for which the MLPA planning process was completed, and the California Fish and Game Commission adopted 28 north central coast MPAs in August 2009. Planning has also concluded for the south coast study region (Point Conception to the California-Mexico border), and MPA proposals are under review with the California Fish and Game Commission. The north coast study region (California-Oregon border to Alder Creek near Point Arena in Mendocino County) is the fourth study region for which the MPA planning process has been started. After the north coast process, the MLPA Initiative will address the San Francisco Bay study region (from Golden Gate Bridge to the Carquinez Bridge).

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

### Overview of the MLPA North Coast Study Region

The MLPA North Coast Study Region spans a straight-line distance of approximately 225 statute miles of the California coastline (with about 517 statute miles of actual shoreline) from the California-Oregon border to Alder Creek near Point Arena in Mendocino County. Encompassing 1,027 square miles of coastal waters, the study region extends from the shoreline (mean high tide) to the boundary between state and federal waters, three nautical miles from shore. The study region's waters range in depth from the intertidal zone to a maximum of approximately 1,667 feet. The population, broad range of interests, sensitive marine ecosystem, and the unique conditions of the California Current Large Marine Ecosystem (LME) combine to create a complex setting. Some of the unique features of the study region include:

- a complex system of oceanographic currents and features that make up the California Current LME; one of only four temperate upwelling systems in the world

- diverse habitats ranging from rocky coasts and sandy beaches to soft- and hard-bottom deep habitat and some of the least developed coastal areas in the state
- kelp forests dominated by bull kelp and associated species assemblages of flora and fauna
- nearly 20 estuaries and lagoons that are greater than 0.5 mi<sup>2</sup> in size, and high biodiversity of fish, birds, invertebrates, and marine mammals
- the Smith River, the largest river system in California that flows freely along its entire course
- Castle Rock, an offshore rock supporting the largest population of Common Murres in California
- Humboldt Bay, the second largest estuary in California and home to approximately 40% of the known eelgrass in the state
- Cape Mendocino, location of the Mendocino Triple Junction and one of the most seismically active regions in the contiguous United States
- submarine canyons, such as Mendocino, Mattole, Delgada and Spanish canyons, that bring deepwater habitats and species into close proximity to the near-shore
- the Eel River, the third largest watershed in California with the highest recorded average sediment yield per drainage area of any river of its size or larger in the contiguous United States
- productive commercial fisheries, targeting a wide diversity of species that help support economies of coastal communities
- opportunities for consumptive recreational activities, including shore and vessel-based fishing, kayak angling, clamming, and abalone picking and diving, which is currently only allowed in California north of San Francisco Bay
- opportunities for a range of non-consumptive activities, such as diving, surfing, kayaking, beach-going, swimming, and shore and boat-based wildlife viewing

### **Ecological Setting**

The MLPA North Coast Study Region is characterized by high productivity, high biodiversity, diverse habitat types, and unique oceanographic conditions. Nearly all of the habitats listed in the MLPA or recommended by the MLPA Master Plan Science Advisory Team (SAT) for representation within MPAs, with the exception of seamounts (which do not occur within state waters) are found within the study region. For most of these habitats, there are mapped data available for use in the MPA planning process.

Key ecological considerations within the study region, including habitat types and ecologically distinctive areas, include:

- Most of the study region is relatively shallow (less than 100 meters), although some areas, including submarine canyons, are much deeper.
- Intertidal zones include sandy beaches, rocky shores, tidal flats, coastal marsh, and manmade structures.
- Estuaries, with associated open water, soft bottom, coastal marsh, tidal mud flats, and eelgrass beds, exist throughout the study region. Two types of estuaries are present in the north coast: those permanently or semi-permanently open to the ocean and those seasonally separated from the ocean by sand bars. While there are some large estuaries (Humboldt Bay and Eel River estuaries) in the study region, most are small and are periodically closed to tidal influence. Some of the species that depend on these estuaries seasonally or at some point in their life history include staghorn sculpin, surfperch, sharks, salmonids (Chinook salmon and steelhead), and several species of smelt.

- Native eelgrass beds (*Zostera sp*) are known to occur mostly in bays and estuaries throughout the north coast, most notably in Humboldt Bay. Eelgrass has been reported from other locations, including the Smith River estuary, Crescent City harbor, Eel River estuary, Ten Mile River estuary, Noyo River estuary, Big River estuary, and Albion River estuary; however, the extent and distribution of eelgrass in these areas is not as well mapped as eelgrass populations in Humboldt Bay. Mapped eelgrass beds in Humboldt Bay total 7.08 square miles. Surfgrass (*Phyllospadix sp.*) is also found in the study region and is associated with open ocean habitat.
- Bull kelp (*Nereocystis luetkeana*) dominates the study region with dense canopies that support diverse marine life. Kelp beds have been mapped at a fine-scale resolution in seven annual surveys (1989, 1999, 2002, 2003, 2004, 2005, and 2008) and are generally found off of rocky headlands in the southern portion of the study region.
- Hard-bottom habitats (rocky reefs) are less common than soft-bottom habitats in the study region at all depth zones based on available fine-scale mapping data. The species composition for hard substrate varies with depth zone. Kelp forests are associated with shallow rock bottoms, while deep-sea corals and sponges are found in deep rock habitat.
- Sandy and soft-bottom habitats are more common than hard-bottom habitats at all depth zones. These habitats do not have the relief or structural complexity of hard-bottom habitats, but do host a number of unique species adapted to the dynamic environment and low-relief physical characteristics. Invertebrates and bottom-dwelling fish are the most common species found in soft substrate.
- Underwater pinnacles are submerged rocky cones or outcrops that can be important areas where fish and other species aggregate. Underwater pinnacles probably exist in the north coast study region, but they are not well mapped.
- Four submarine canyons exist in state waters within the study region and are found along the Lost Coast between Cape Mendocino and Pt. Delgada. Canyons provide important habitat for deep-water communities and young rockfish, and provide foraging areas for seabirds and marine mammals.
- Numerous rocks and islets located within the north coast study region provide important foraging and nesting sites for marine birds and are used as haulout sites by pinnipeds. In addition, the north coast study region contains offshore reefs, isolated offshore rocks, and two larger nearshore islands.
- Oceanography in the study region is complex, with the southward-flowing California current and northward-flowing Davidson current dominating the flow of coastal waters. Upwelling plays a major role in the study region, especially during late spring and early summer, with a prominent center at Cape Mendocino. Additionally, freshwater inputs from large coastal rivers affect local ecosystems, especially in the northern portion of the study region.

The diverse habitats of the north coast study region host a wide array of species that may be considered in the MPA planning process. This document describes some of the species that have relevance to that process, including:

- Depressed or overfished species, which include species of abalone, salmon, steelhead, and rockfish
- Species targeted by commercial and/or recreational fisheries, which are an important component of the study region's economy
- Special-status species that are protected under either state or federal law, including a number of pinnipeds, cetaceans, seabirds, and fish.

## Land-Sea Interactions

Ecological linkages between the marine and terrestrial environments include:

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

Terrestrial activities can have significant impacts on coastal water quality and habitat condition. Some of the most important water quality issues to consider include:

- Point sources of pollution that empty into the coastal environment at specific locations and may cause localized impacts. Examples of point sources of pollution in the study region are wastewater treatment facilities, industrial discharge sites, and stormwater discharge.
- Nonpoint source pollution, which is the leading cause of degraded water quality and eutrophication in the study region, is difficult to identify because it is derived from diffuse locations. Major sources of nonpoint source pollution are agriculture, forestry operations, urban areas, hydromodification, and ports and associated vessels.
- Impaired rivers and waterbodies that have been identified under Section 303(d) of the federal Clean Water Act and have a total maximum daily load (TMDL) for pollutants
- Recognized water quality management areas including state water quality protection areas (SWQPAs), areas of special biological significance (ASBSs), and California critical coastal areas (CCAs)
- Coastal energy involves development, extraction, and transportation of energy-related resources in coastal waters, as well as offshore. Projects include coastal power plants and hydrokinetic energy.

## Socioeconomic Setting

The three counties of the MLPA North Coast Study Region are part of a unique economic setting that includes industries and economic sectors that are dependent on marine resources. Commercial and recreational fisheries, kelp and aquaculture leases, shellfish mariculture, as well as tourism and non-consumptive uses of marine resources all contribute to the coastal economies of Del Norte, Humboldt and Mendocino counties.

- Overall, the north coast study region has a smaller population than other MLPA study regions. Data on top industries, as well as specialized information on top ocean-related industries, are provided for each county in the study region. Population projections are also provided for each county.

- Native American coastal communities and associated resource uses are significant within the study region. Tribes that own land adjacent to the study region include the Smith River Rancheria, Trinidad Rancheria, Yurok Tribe, and Wiyot Tribe. In addition, the Tolowa, Yurok, Wiyot, Mattole, Sinkyone, coastal Yuki and Pomo Tribal people have ancestral territories bounding the coastline. Other Tribes and Tribal people with coastal interests include, but are not limited to, the Hupa, Karuk, Wintu, Bear River Band, Hopland Band of Pomo Indians, Cahto Tribe of Laytonville, Pomo Tribes of Lake County and many others. Historic and contemporary significance of consumptive and non-consumptive uses of the marine environment is further described and is important to consider in MPA planning.
- Significant commercial fisheries occur within the study region. Two port complexes (Eureka and Fort Bragg) include several ports that span the three counties of the study region. Ports of note within the north coast study region include Crescent City, Trinidad, Eureka, King Salmon, Fields Landing, Shelter Cove, Fort Bragg and Albion. Note that ports outside of the study region, for instance Point Arena and Brookings, may utilize resources within or adjacent to the study region and may have landings processed in the study region. Numbers of commercial fishermen and vessels for all three counties have declined from 1999 through 2008. Dungeness crab was the largest commercial fishery in the region by landings over the past decade, followed by urchin and Chinook salmon. The Dungeness crab fishery was also the commercial fishery with the highest ex-vessel value over the same period.
- Both harvest of kelp and aquaculture occur in the study region. Although none of the administrative kelp beds in the region are currently open to commercial take, harvest of edible seaweeds does occur. Harvest of algae occurs generally on a small scale and mechanical harvest of large quantities of kelp does not occur in the study region. Some harvested species include Sea Palm (*Postelsia palmaeformis*), which was harvested more than any other seaweed from 2002 to 2008, as well as *Laminaria* spp. and *Porphyra* spp. Mendocino county experienced the highest rate of harvest for all species of edible seaweeds during the same period. Shellfish mariculture activities occur in northern Humboldt Bay and are economically important to providing employment, lease fees and tax revenues. The California state legislature deemed Humboldt Bay the "Oyster Capital of California".
- Recreational fishing is important within the study region, and estimated annual recreational take is presented by species. Major recreational finfish fisheries in the region from 2005 - 2008 include black rockfish, redbelt surfperch, Chinook salmon and lingcod. A recreational fishery for red abalone occurs in the study region, and is unique to the area north of San Francisco Bay. The highest proportion of recreational catch is landed via private boat and commercial passenger fishing vessel (CPFV) for most recreational fisheries, with notable exclusions being the surfperch, smelt, greenling, and red abalone recreational fisheries. Various boat-based and shore-based fishing modes are described. Angling effort is summarized by mode, with the highest annual angler effort belonging to beach-and-bank-based modes.
- Coastal tourism is an important driver of local economies and Mendocino and Humboldt Counties lead the study region in travel spending. The most visited coastal state park in the region in 2007/2008 was Mendocino Headlands. The most visited public land adjacent to the coast managed by the U.S. Bureau of Land Management in 2008/2009 was the Samoa Dunes Recreation Area in Humboldt County.
- Non-consumptive uses of coastal environments, including beach-going, swimming, surfing, sailing, kayaking, diving, wildlife viewing, photography, and other activities that do not involve the take or extraction of marine resources, also occur in within the north coast study region and are further described in this document.

## **Marine Research, Public Outreach and Education**

There are several institutions conducting research and monitoring of north coast marine ecosystems and resources. These include educational institutions (such as Humboldt State University) as well as government agencies and non-governmental organizations. Information on ongoing scientific research in the region and associated institutions, organizations and agencies is presented, as are those involved in public outreach.

## **Jurisdiction and Management**

Federal, Tribal, state and local government bodies have various overlapping jurisdictions within the study region, which are herein discussed. Consideration of these managing agencies is important to consider in both MPA planning, as well as long-term management.

## **Existing MPAs and Other Protected and Managed Areas**

Several state marine protected areas, as well as a number of fishery closures and other coastal protected areas exist within the north coast study region:

- There are five existing MPAs in the north coast study region, located in the southern portion of the study region. Punta Gorda State Marine Reserve (SMR) in Humboldt County is the only state marine reserve on the north coast of California and is the largest MPA currently established in the study region at 2.07 square miles. Four state marine conservation areas (SMCAs) exist on the north coast, all of which are located in the southern portion of the study region: MacKerricher SMCA, Point Cabrillo SMCA, Russian Gulch SMCA and Van Damme SMCA.
- Other marine managed areas in the study region include the federally managed Redwood National Park (which has a boundary that extends a quarter mile offshore) as well as two types of fishery closures: rockfish conservations areas (RCAs) and essential fish habitat (EFH) areas.
- There are several terrestrial protected areas that occur in coastal watersheds of the north coast study region, which are further outlined and described.
- Marine protected areas in Oregon may provide the potential for connectivity with the California network of MPAs, and additional protection for some species.

## **Conclusion**

The MLPA North Coast Study Region's diverse marine habitats, communities and dynamic oceanographic setting create an assemblage of resources that is unique within the state. Bathymetric features, from submarine canyons to underwater pinnacles and offshore rocks, provide essential substrate for assemblages of organisms that contribute to the region's biodiversity. Abundant marine resources support recreational and commercial activities that are important to the various coastal communities in the three counties of the study region. Moreover, for Indigenous Peoples in the study region, marine resources also support customary uses, such as subsistence, ceremonial, and cultural activities that are essential to the various Tribes. Additionally, the coastal environment provides an exceptional background for the various academic and non-academic research and monitoring entities in Northern California. The unique nature of marine resources on the north coast has been a driving factor in the establishment of five existing marine protected areas within the region. This document summarizes key information relating to the study region in order that these state MPAs may be efficiently redesigned to better protect California's marine heritage in accordance with the Marine Life Protection Act.