

California MLPA North Central Coast Project
Initial External Proposal D
October 4, 2007

MPA PROPOSAL NAME: *Initial External Proposal D: Oceana*

PROPOSAL CONTRIBUTORS: *Oceana*

FORMAT IN WHICH PROPOSED MPA BOUNDARIES WERE SUBMITTED:

_____ MPA ARRAY IN DORIS _____ HARDCOPY MAP TO STAFF X GIS FORMAT

NUMBER AND TYPE OF MPAS IN INITIAL MPA PROPOSAL:

 13 SMR 0 SMP 5 SMCA 18+ Total # MPAs

NARRATIVE RATIONALE:

The October 4, 2007 deadline for initial ideas on MPAs provides an opportunity to ensure all areas identified as important are properly included in the discussion and evaluation process. Note that these should not be seen as proposal as there is considerable information and data yet to be made available to the RSG. We have also submitted additional information on the approach we have used to generate these initial ideas in a document titled "California North-Central Coast: Marine Life Protection Act MPA Ideas and Rationale" (submitted to MLPA comments on October 10, 2007).

Initial MPA Proposal
October 4, 2007

Proposal Name: INITIAL EXTERNAL PROPOSAL D

Provide ALL the information listed below for each individual MPA included in the initial proposal.

MPA Name	Type (SMCA, SMP, SMR)	GIS ID #	General MPA Boundaries	Allowed or Disallowed Uses	Goals/Objective s/ Design Criteria this MPA Contributes Toward	Comments, Questions or Important Information
Point Arena SMR	SMR	15	SMR encompassing rocky habitat from West Arena Cove area out to roughly 50 fm line.	No take in inshore SMR	1.1 to 1.5 2.1-2.3 3.1-3.3 4.2 5.2-5.3 6.1-6.2	
Point Arena SMCA	SMCA	16	SMCA beyond SMR west to state line, and north to study region boundary. Manchester State Beach left open.	Offshore SMCA to allow crab and salmon	1.1 to 1.5 2.1-2.3 3.1-3.3 4.2 5.2-5.3 6.1-6.2	
Fish Rocks SMR	SMR	4	¼ mile around Fish Rocks	No take, no disturbance	1.4-1.5 2.2	
Gualala Point Island SMR	SMR	5	¼ mile around Gualala Point Island	No take, no disturbance	1.4-1.5 2.2	
Black Point to Salt Point SMR	SMR	10	MPA from Black Point west to state line to Salt Point West to state line. SMR out to 50m, SMCA outside to state line	SMR – To Take	1.1-1.5 2.1-2.3 3.1-3.3 4.2	

MPA Name	Type (SMCA, SMP, SMR)	GIS ID #	General MPA Boundaries	Allowed or Disallowed Uses	Goals/Objective s/ Design Criteria this MPA Contributes Toward	Comments, Questions or Important Information
					5.2-5.3 6.1-6.2	
Black Point to Salt Point SMCA	SMCA	11	MPA from Black Point west to state line to Salt Point West to state line. SMR out to 50m, SMCA outside to state line	SMCA - Allows crab, salmon, halibut	1.1-1.5 2.1-2.3 3.1-3.3 4.2 5.2-5.3 6.1-6.2	
Fort Ross SMR	SMR	17	¼ mile around Fish Rocks	No take, no disturbance	1.4-1.5 2.2	
Russian River SMR	SMR	6	SMR encompassing RR Rocks, Gull Rock, Arched Rock (all to ¼ mile) and Russian River Mouth	No take, no disturbance	1.4-1.5 2.1-2.2	
Bodega Head SMR	SMR	7	MPA west from Salmon Creek Estuary to state line, and south and then west from Bodega Head to encompass reef. SMR to encompass reef (roughly 50m contour), rest SMCA	No take	1.1 to 1.5 2.1-2.3 3.1-3.3 4.2 5.2-5.3 6.1-6.2	
Bodega Head SMCA	SMCA	8	MPA west from Salmon Creek Estuary to state line, and south and then west from Bodega Head to encompass reef. SMR to encompass reef (roughly 50m contour), rest SMCA	Salmon and crab in SMCA	1.1 to 1.5 2.1-2.3 3.1-3.3 4.2 5.2-5.3 6.1-6.2	
Tomales Bay SMP	SMP	20	Existing MPA boundaries	Take of all living marine resources is prohibited except the recreational hook and		Retain existing MPA boundaries and

MPA Name	Type (SMCA, SMP, SMR)	GIS ID #	General MPA Boundaries	Allowed or Disallowed Uses	Goals/Objective s/ Design Criteria this MPA Contributes Toward	Comments, Questions or Important Information
				line take of species other than marine aquatic plants. Only lightweight, hand-carried boats may be launched or operated within the Park.		regulations.
Tomales Bluff/Bird Rock SMR	SMR	12	¼ mile around Bird Rock	No take, no disturbance	1.4-1.5 2.2	
Point Reyes SMR	SMR	2	SMR around headland with surrounding SMCA encompassing west Drake's Bay	No take	1.1 to 1.5 2.1-2.3 3.1-3.3 4.2 5.2-5.3 6.1-6.2	
Point Reyes Offshore SMCA	SMCA	9	SMR around headland with surrounding SMCA encompassing west Drake's Bay	No squid fishing in SMCA	1.1 to 1.5 2.1-2.3 3.1-3.3 4.2 5.2-5.3 6.1-6.2	
Drakes Estero and Limantour SMR	SMR	1	Entire Estero	No take (except oyster mariculture until 2012)	1.1, 1.3-1.5 2.2-2.3 3.1-3.3 4.1 5.2	

MPA Name	Type (SMCA, SMP, SMR)	GIS ID #	General MPA Boundaries	Allowed or Disallowed Uses	Goals/Objective s/ Design Criteria this MPA Contributes Toward	Comments, Questions or Important Information
Point San Pedro SMR	SMR	13	¼ mile around Point San Pedro	No take, no disturbance	1.4-1.5 2.2	
Devil's Sliide SMR	SMR	14	¼ mile around Devils Slide Rock	No take, no disturbance	1.4-1.5 2.2	
Fitzgerald I SMCA	SMCA	18	SMCA 1 directly north of SMR to Point San Pedro.	SMCA1 - no squid fishing	1.1 to 1.5 2.1-2.3 3.1-3.3 4.2 5.2-5.3 6.1-6.2	
Fitzgerald SMR	SMR	3	SMR from Pillar Point north to just north of Montara and out to capture reef habitat.	SMR – No take	1.1 to 1.5 2.1-2.3 3.1-3.3 4.2 5.2-5.3 6.1-6.2	
Fitzgerald II SMCA	SMCA	19	SMCA 2 outside SMR and SMCA1 to state line.	SMCA 2 - Allow squid, crab, salmon	1.1 to 1.5 2.1-2.3 3.1-3.3 4.2 5.2-5.3 6.1-6.2	

Consideration of Existing State MPAs

Proposal Name: INITIAL EXTERNAL PROPOSAL D

Please indicate how each of the following existing MLPA North Central Coast MPAs is considered within your initial MPA proposal.

Existing MPA	Included Without Changes (proposed to be retained)	Included with Boundary or Regulation Change (proposed to be modified)	Not Included (proposed for elimination)
Manchester and Arena Rock SMCA			Not included
Del Mar Landing SMP			Not included
Salt Point SMCA		Currently not included in Black Salt SMR/SMCA	
Gerstle Cove SMCA			Not included
Fort Ross SMCA		May be modified by Fort Ross concept	
Tomales Bay SMP	Included without changes		
Point Reyes SMCA		Modified by Point Reyes concept.	
Estero de Limantour SMCA		Modified by Drakes Estero concept	
Duxbury Reef SMCA	TBD		
Sonoma Coast SMCA		Modified by Bodega Head concept	
Bodega SMR		Modified by Bodega Head concept	
Fitzgerald SMP		Modified by Fitzgerald concept.	
Farallon Islands SMCA	TBD		

October 10, 2007

Ken Wiseman
Marine Life Protection Act Initiative
c/o California Resources Agency
1416 Ninth Street, Suite 1311
Sacramento, CA 95814

Dear Mr Wiseman

Oceana submitted a preliminary proposal to the North-Central Coast MLPA process on October 4 last week. This supplementary document provides more detailed information and the rationale behind that proposal. We hope it will provide useful context for all stakeholders as we continue to work towards a comprehensive and systematic network of MPAs designed to meet the goals of the MLPA.

Our goal in this process is to protect the health of the marine ecosystems of the North-Central California Coast. Our approach is to identify and protect Important Ecological Areas (IEAs) and the overall health of the ecosystem using a comprehensive and systematic network of MPAs including reserves and other appropriate designations (e.g. marine parks, conservation areas, refuges, etc.) that protect biodiversity, productivity, resilience, functioning, and structure of the ecosystem and provide for research, monitoring, public participation, and adaptive management.

We recognize that not all pertinent information is currently available to stakeholders, so both our October 4 submission and this document will need modifying as the process continues. For example, at this time as there are outstanding data on seabirds and mammals as well as commercial, recreational and non-consumptive uses. In addition, Science Advisory Team (SAT) guidance on several important issues including evaluation is not yet complete. For these reasons, we have taken the October 4 deadline as an opportunity to share ideas not yet fully discussed and considered in the stakeholder groups rather than the final deadline for fully fledged proposals.

The ideas in this document represent over five years of data collection, scientific research, and conservation efforts that we have conducted throughout the California Current Large Marine Ecosystem. We look forward to continuing this work through the MLPA process, and welcome additional information and ideas from MLPAI staff, the SAT, and particularly other stakeholders and the public.

Sincerely,



Jim Ayers
Vice President

California North-Central Coast Marine Life Protection Act MPA Ideas and Rationale

Oceana - October 10, 2007

1. Introduction and Context

The MLPA provides the opportunity to establish models and procedures to implement in-the-water protections for the nearshore area. This must be coupled with management actions that protect habitat and marine life in federal waters in order to lead us to the goal of a healthy, biodiverse California Current Large Marine Ecosystem.

The California State Legislature passed the Marine Life Protection Act in 1999, in part in recognition of the fact that the existing patchwork of marine protected areas in state waters did not live up to its potential. The legislature specifically recognized that marine reserves are an essential element to a marine protected area system, and thus established a process to review and modify the existing set of marine protected areas to include a marine reserve component as well as a coherent rationale for management and conservation measures. The marine reserves in each bioregion shall encompass a representative variety of marine habitat types and communities, across a range of depths and environmental conditions.

The North-Central California review process of the MLPA applies to 763.5 square miles of the California Current Large Marine Ecosystem, including all state waters between Alder creek and Pigeon Point and those around the Farallon Islands.

Oceana's overall goals for participation in the North North-Central Coast MLPA Initiative are to maintain, protect, and restore the health of California's marine ecosystems on the North-Central Coast while building a model for ecosystem-based management on a larger scale.

The California Current Large Marine Ecosystem

One of the ten major Large Marine Ecosystems of the United States, the California Current Large Marine Ecosystem (LME) is one of the most productive and biodiverse ocean ecosystems on the planet. Nutrient rich upwellings fuel phytoplankton blooms and in turn, zooplankton and euphausiids, which create a solid foundation for a food web that supports marine mammals including humpback whales and elephant seals; millions of seabirds; endangered sea turtles; slow growing fragile deep sea corals; and species such as salmon, halibut, and crab that are important for commercial, recreational, and subsistence harvest.

The California Current LME extends from the northern end of Vancouver Island to Baja California, and includes the Pacific waters off Washington, Oregon, and California from shore to the 200 mile Exclusive Economic Zone; and is integral to the economy, culture, and wellbeing of California as well as the American way of life. These waters provide opportunities for millions of Americans, and Californians specifically, for recreational activities, commercial fishing, critical commerce supply links, subsistence and personal use, and a variety of economic activities including tourism.

North-Central California as an integral unit of the North Pacific

The California Current LME is considered globally important for its high productivity and the large numbers of species it supports (NCC Regional Profile; WWF 2000). It is one of only four temperate upwelling zones in the world where deep nutrient-rich waters are pulled to the surface by seasonal offshore winds (NCC Regional Profile). According to the Census of Marine Life, it has among the highest numbers of species of fish, seabirds and marine mammals of all the 11 LMEs in the North Pacific Ocean. It has the third largest number of species of bottom dwelling fish anywhere in the North Pacific, and is second only to the Kuroshio/Oyashio Current Zone in biodiversity of pelagic fish (non-reef), seabirds and possibly mammals (**Table 1**; Perry and McKinnell, 2005).

Table 1: Total number of species of (non-reef) demersal and pelagic finfish, seabirds (excluding shorebirds), and marine mammals, by LME or ocean region (Perry and McKinnell, 2005). Blank cells indicate no data available from the cited reference. The NCC region is at the northern end of California Current (south) in the table below.

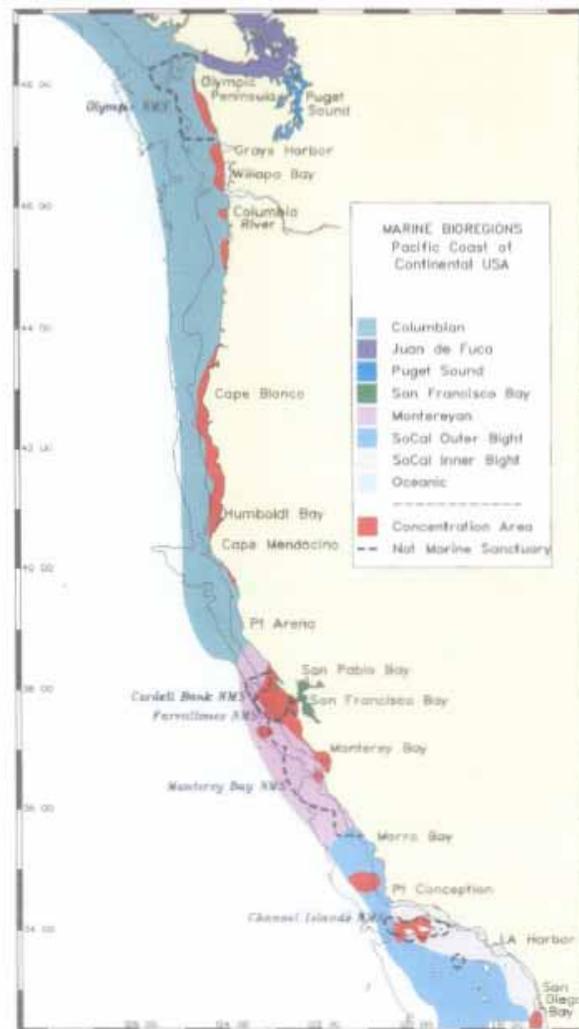
Region	Number of Species	
	Seabirds	Marine mammals
Kuroshio/Oyashio	54-61	
California Current (north)	52	16
California Current (south)	49	30
Sea of Okhotsk	42	19
Gulf of Alaska (offshore)	24-30	18
Gulf of Alaska (coastal)	38	
Central Transition Zone	35-40	27 (west)
Eastern Bering Sea shelf	37	22
East China Sea	25-36	14
Western Subarctic Gyre	31	14
Kamchatka and Kuril Islands	19	
Western Subarctic Gyre		14
Central Transition Zone (east)		27

North Pacific LME	Total Number of Finfish Species	
	Demersal	Pelagic
Yellow Sea	570	244
East China Sea	487	258
California Current	406	308
Japan/East Sea	339	91
Sea of Okhotsk	271	67
Kuroshio	232	351
Gulf of Alaska	223	73
Western Bering Sea	215	54
Gulf of California	186	94
Eastern Bering Sea	161	24
Oyashio	18	18

Within the CCLME, the entire region from Monterey Bay up through the Gulf of the Farallones is in the top 10% of aggregated abundance of seabirds, mammals and fish (**Figure 1**; Ford and Bonnell 1996,). This area coincides roughly with the North-Central Coast region, which encompasses all of the state waters of the Gulf of the Farallones National Marine Sanctuary. The NCC Regional Profile describes the area in some detail, but several important or unique features are:

- One of the broadest sections of continental shelf on the West Coast, mostly sandy and muddy and relatively shallow (<120m)
- Entire area is influenced by coastal upwelling and the San Francisco tidal plume
- One of the world’s largest congregations of white sharks, attracted by the sizable colonies of marine mammals at the Farallones, Point Ano Nuevo and Ano Nuevo Island
- Gray, humpback and blue whales feed in the area
- Farallon Islands are home to 12 species of breeding seabirds, the largest concentration in the lower 48 states
- One of the richest assemblages of seals and sea lions (5 species)
- Roughly 163 species of marine, coastal and estuarine birds and 36 species of marine mammals use the area for breeding or migration
- California’s largest population of harbor seals
- Unique shallow water eelgrass beds and wetlands in large and small estuaries are important nursery ground for fish and invertebrates and support numerous migrating waterfowl and shorebird species

Figure 1: Marine Bioregions of the US portion of the CCLME. Areas in red are the top 10% of aggregated abundance of seabirds, mammals and fish



2. Important Ecological Areas – A comprehensive and systematic approach to MPAs

Goal: Protect the health of the marine ecosystems of the North-Central California Coast.

Objective: Identify and protect Important Ecological Areas (IEAs) and overall health of the ecosystem using a comprehensive and systematic network of MPAs including reserves and other appropriate designations (e.g. marine parks, conservation areas, refuges, etc.) that protect biodiversity, productivity, resilience, functioning, and structure of the ecosystem and provide for research, monitoring, public participation, and adaptive management.

Phase I. Identification

1. Identify ecological features based on criteria such as ecological significance, biological diversity, rarity, and sensitivity.
2. Synthesize available information including local knowledge, on ecological features, economic and social uses, and map all spatial data.
3. Identify IEAs based on ecological features that result in the area contributing disproportionately to the health of the marine ecosystem.
4. Identify threats to IEAs and the ecosystem.
5. Identify network objectives for protecting ecosystem health (e.g. connectivity).

Phase II. Protection

6. Identify management objectives for each IEA by constructing a matrix of ecological features and threats and by considering ecosystem protection goals.
7. Work with stakeholders to propose and implement a network of MPAs including reserves and other appropriate designations (e.g. marine parks, conservation areas, refuges, etc.) to meet the objectives for each IEA and for the network.

Phase III. Monitoring, Evaluation, Research and Adaptive Management

8. Ensure development of a monitoring and evaluation plan for all IEAs that would include local observations and input, and use the results for adaptive management.
9. Encourage research including assessments of current and historical biodiversity across management regimes in order to improve our understanding of marine ecosystems and inform adaptive management.
10. Make information on the management, monitoring and research of all identified areas and ecosystem condition widely available to the public.

2.1. Key ecological features, information and datasets

Based on the goals of the MLPA, the Master Plan Framework, the North-Central Coast Regional Profile, and the Goals, Objectives, and Design Considerations Package from the NCCRSR, we identified 8 ecological features (listed below) as a starting point for identifying Important Ecological Areas on the North-Central Coast. Many of these criteria are listed directly in Section 3.3 of the Regional Profile (May 7, 2007 Draft) as “areas of biodiversity significance.”

Next, we conducted a comprehensive search of existing information available from the MLPA Initiative and elsewhere. The information used to develop our preliminary proposal relies most

heavily on the datasets provided by DFG from the IMS database, as well as some datasets developed by NOAA for the Pacific Region Essential Fish Habitat (EFH) process. We recognize that some of these are currently being updated and shall update this document when the new data become available.

- Hard substrate / rocky reefs (Preliminary Predicted Substrate NCCSR and Coarse Scale Hard and Soft Bottom Habitats for the Farallons and Federal waters)
- Habitat for overfished groundfish (EFH EIS highest 20% Habitat Suitability Indices for NMFS declared overfished groundfish)
- Nearshore FMP species and abalone habitat (habitat requirements listed in Nearshore FMP and Abalone Recovery Plan)
- Marine mammal rookeries/haulouts (known elephant seal colonies and marine mammal rookeries and haulout layers from IMS site)
- Seabird colonies and foraging areas (major seabird colonies data layer from IMS site and upwelling centers as a proxy for foraging areas)
- Estuaries / coastal marsh (Estuaries and coastal marsh data layers from IMS site)
- Kelp forests (Kelp records from IMS site including persistent kelp and available individual years 1989, 1999, 2002-2005)
- Top fish and bird diversity areas (Highest 20% fish and bird density and diversity data layer from IMS site)

In addition to these datasets, we have been fortunate enough to have access to local knowledge and expertise both from stakeholders and from the Science Advisory Team. Such ‘groundtruthing’ is an important component of our analysis. The following section summarizes and supplements the extensive description of ecological features in the North-Central Coast Regional Profile, providing rationale for why these features warrant additional protection.

Hard Substrates

Appendix F of the Master Plan framework states that proposals will be evaluated based on the extent that they “emphasize hard bottom as opposed to soft bottom, because fishing activities within state waters have had the greatest impact on fishes associated with hard bottom, and because soft bottom habitat is interspersed within areas containing rocky habitat” (p.32). Hard substrates, which include rocky ridges and rocky slopes, are one of the least abundant benthic habitats, yet they are among the most important habitats for fishes (Hixon et al. 1991, Pacific EFH DEIS 2005). Hard substrates are also the seafloor substrate type most sensitive to bottom disturbance and take the longest to recover (NAS 2002, Pacific EFH PDEIS 2005).

The EFH DEIS published by the National Marine Fisheries Service states: Many managed species are dependent on hard bottom habitat during some portion of their life cycle. Typically, deeper water hard bottom habitats are inhabited by large, mobile, nekto-benthic fishes such as rockfish, sablefish, Pacific hake, spotted ratfish, and spiny dogfish (MMS 2002). Cross and Allen (1993) estimated that about 30% of the fish species and 40% of the families occur over hard substrates. Many managed groundfish species use hard bottom habitats during one or more life stages including aurora rockfish, bank rockfish, black rockfish, black-and-yellow rockfish, blackgill rockfish, blue rockfish, bocaccio, bronzespotted rockfish, brown rockfish,

cabezon, calico rockfish, California scorpionfish, canary rockfish, chilipepper, China rockfish, copper rockfish, cowcod, dusky rockfish, flag rockfish, gopher rockfish, grass rockfish, greenblotched rockfish, greenspotted rockfish, greenstriped rockfish, harlequin rockfish, honeycomb rockfish, kelp greenling, kelp rockfish, leopard shark, lingcod, Mexican rockfish, olive rockfish, Pacific cod, Pacific ocean perch, pink rockfish, quillback rockfish, redstripe rockfish, rosethorn rockfish, rosy rockfish, rougheye rockfish, sharpchin rockfish, shortbelly rockfish, shortraker rockfish, silvergray rockfish, speckled rockfish, spotted ratfish, squarespot rockfish, starry rockfish, stripetail rockfish, tiger rockfish, treefish, vermilion rockfish, widow rockfish, yelloweye rockfish, yellowmouth rockfish, and yellowtail rockfish (Ch.3, p.3-7).

Managed species known to use hard bottom habitat in the coastal zone include black rockfish, black-and-yellow rockfish, brown rockfish, cabezon, calico rockfish, California scorpionfish, chilipepper, copper rockfish, gopher rockfish, kelp greenling, leopard shark, lingcod, olive rockfish, quillback rockfish, redstripe rockfish, rosethorn rockfish, shortbelly rockfish, silvergray rockfish, and spotted ratfish (Ch 3. p.3-5).

Habitat for overfished groundfish

Several major groundfish species have been designated as overfished and are currently being fished pursuant to rebuilding plans. Most of these species have been documented to use complex structural habitat. Protecting habitats specifically for these species will aid in their recovery, and thus should allow increased harvests to resume after a shorter time period. Habitat suitability modeling performed in the Habitat Comprehensive Risk Assessment (NMFS 2005) identified areas of the highest suitability for overfished groundfish species. These areas occur in the North-Central Coast study region at several locations.

Kelp Forests

California's kelp forests are not only globally significant, but are also some of the most productive areas in the ocean, providing the primary structure for diverse assemblages of marine species. All species in the Nearshore FMP are associated with kelp during at least one life stage. By focusing protections on kelp forests, along representative areas along the California coast, a high diversity of marine life will be protected. Kelp in the North-Central Coast study region is primarily bull kelp. The presence of kelp in the North-Central Coast provides habitat and nursery areas for many species of fishes as well as invertebrates (Foster et al. 1985). Kelp is a variable habitat, and distribution and abundance of kelp beds can be affected by climatic and oceanographic changes, as well as certain types of fisheries (Tegner et al 1997; Tegner and Dayton 2000). With regard to giant kelp, researchers in central California found that harvesting of kelp forests affected the distribution of fishes associated with kelp forests, especially juvenile rockfishes (Miller and Giebel 1973, Houk and McCleneghan 1993). Sea otters, which have an important structuring role in kelp forest communities, occur in the southern part of the study region and are increasingly sighted as far north as Point Reyes (North-Central Coast Regional Profile).

Estuaries and Coastal Marsh

Estuaries and coastal marshes support high levels of productivity and provide habitat for many species. Estuaries play a key role in the coastal ecosystem as nursery habitat for coastal invertebrates and fish. Although San Francisco Bay itself is not in the study region, this biggest of Californian estuaries plays a large part in defining the ecology of the region. In addition, the North-Central Coast study region includes the relatively large, permanent estuaries of Tomales Bay, Bodega Bay, and Bolinas Lagoon, as well as several smaller estuaries or coastal marsh lands at the mouths of coastal rivers. Estuarine areas host many species during migration, including salmonids and lampreys. Steelhead in the North-Central Coast also spend a significant part of their juvenile phase in coastal estuaries. Since estuaries and surrounding habitat areas are important habitat linkages between marine, aquatic and terrestrial habitats, their condition is closely tied to the condition of the surrounding watershed. Estuaries provide critical ecosystem services such as filtering sediments and nutrients from the watershed, stabilizing shorelines, and providing flood and storm protection (North-Central Coast Regional Profile).

Seabirds and Marine Mammals

Marine mammals and seabirds abound in the study region, with the Gulf of the Farallones area a globally important breeding and foraging area for many species. These and other apex predators such as white sharks play an important role in the North-Central Coast ecosystem. As predators, marine mammals are integral parts of the marine food chain, impacting species distribution of many smaller species of plants and animals. Seabirds similarly feed on the many species of small fishes and invertebrates along the coast, as well as juvenile age classes of larger fish.

Some fish, marine mammals and seabirds in the North-Central Coast region, whose populations have declined, receive special protections under the Endangered Species Act. In addition, marine mammals are protected under the Marine Mammal Protection Act and migratory seabirds and shorebirds in the study region are protected under the Migratory Bird Treaty Act. Protection of rookery sites, juvenile habitat, and important foraging areas within MPAs can help provide additional protections, increase public awareness, and support monitoring and enforcement efforts.

Top 20% Fish and Bird Diversity and Density

Density and diversity of marine life populations are key criteria directly pursuant to the goals of the MLPA. We used the DFG dataset developed for the MLPA process on the IMS site showing areas that contain the highest 20% diversity and density of fish and birds, which is a compilation of trawl surveys and bird survey data.

2.2. Potential threats to IEAs

Many human activities have an impact on the rest of the ecosystem. It is precisely to buffer marine ecosystems from the impacts of climate change and a burgeoning population that IEAs need to be protected through a comprehensive and systematic network of MPAs. The activities below reflect those that can be addressed directly by the DFG and California Fish and Game Commission. Other issues, such as water quality, are no less important and can affect the performance of MPAs, and so need to be addressed through discussions between the DFG and state and local agencies.

Entanglement

Entanglement with fishing gear can result in injury or mortality of marine mammals. Cetaceans are particularly vulnerable to fishing gear entanglement when utilizing coastal habitat that overlaps fishing grounds (Reeves et al. 2003). The most frequent gear type involved in whale entanglements are pot gear and gillnets. Pot gear and gillnet gear were implicated in 89% of entanglements of right whales and humpback whales in the western North Atlantic (Johnson et al. 2005). Fishing gears that suspend through the water column (i.e. a stationary pot attached by line to a buoy floating at the surface or a gillnet that hangs in the water column) can interfere with whales feeding, movement, and behavior and can cause death if entanglement is severe.

Fishing

Fishing can be a large enough disturbance in and of itself to change both the resilience and the structure of an ecosystem (Worm et al. 2006). For example, cod fishing on Georges Bank may have driven cod numbers so low that they were replaced by skates and dogfish (Fogarty and Murawski 1998). Similarly, Levin et al. (2006) reported that overfishing of Pacific rockfishes likely caused a shift from large to small species and from rockfish to flatfish domination. Field et al. (2006) showed that fishing over the past 40 years has altered the Northern California Current food web.

Localized declines of abundance and diversity can have major impacts to local processes and be an indicator of ecosystem wide impacts. Further, fisheries reduce the age structure of populations, simply because the likelihood of being caught increases the amount of time a fish is exposed to the fishery (i.e. with age) (Berkeley et al. 2004). Fisheries can also cause size selectivity in fish populations, causing fish to mature earlier and grow to a smaller size to ensure reproduction prior to capture by the fishery. Many larger and older fishes in species or species groups like rockfish, have greater reproductive value in terms of both the number and fitness of offspring (Berkeley et al. 2004).

Seafloor contact

Seafloor and biogenic structures create complex habitats for a multitude of species. Damage to biogenic structures is among the most detrimental human impact to the resilience of marine populations. Trawling and dredging are the most destructive commercial fishing gear types to habitat (NRC 2002), but bottom longlines, pots, gillnets, and other gears can also take a toll (Chuenpagdee et al. 2003). Biogenic structures include benthic invertebrates (i.e. corals, sponges, tunicates, bryozoans) and marine algae (i.e. giant kelp, bull kelp, seagrass). Protecting the biodiversity, functional diversity, and abundances of marine life requires large areas of intact seafloor and biogenic habitat.

Forage and Apex Predators

Apex predators are animals near or at the top of the food web and subject to little predation. Apex predators often play a crucial role in determining the dynamics and structure of the ecosystem. Some apex predators are also keystone predators in that they control the composition and abundance of prey species in the system (Power et al. 1996). Fisheries can compete with apex predators by targeting prey species, or have direct impacts through targeted or incidental fishing mortality. In the North Pacific, declines of Steller sea lions have been linked to decreased temporal and spatial prey abundance due to commercial fisheries removals.

Spatial protections that limit such fishing activities on the forage base of top predators could feasibly enhance populations that depend on such habitat and food sources. Examples of the forage base include squid, schooling fish, and krill. Even if overall populations of forage species are abundant, localized depletion of forage species in the vicinity of bird colonies, marine mammal haulouts and rookeries, and key foraging sites (e.g. upwelling centers) may adversely affect populations and behavior of top predators. Therefore, large areas where the forage base is protected in the vicinity of such sites could prevent localized depletion and maintain an abundant food source for top predators.

Disturbance

McChesney (USFWS, pers. comm. 2006) observed seabird nesting failure resulting from nearshore vessels approaching rookeries in close proximity. Nesting seabirds and marine mammal rookeries are particularly vulnerable to disturbance by fishing vessels, human incursion, and habitat alteration. An adequate buffer from vessel traffic when these animals are present could serve to maintain and improve their reproductive success. Various management measures such as no-transit zones around key marine mammal and seabird rookeries have already been established based on this mechanism (i.e. no-transit zones in the Farallon Islands to protect seabirds and in areas of the North Pacific to protect Steller sea lions). Protection of spawning or mating aggregations at specific times of year is a measure that could also be used to protect migratory species such as tuna and sea turtles.

2.3. Objectives

Management objectives are assigned based on the potential threats to ecological features for each IEA. Each objective meets several NCCRSR objectives.

Objective 1: Protect benthic invertebrates and groundfish

This objective is meant to protect populations of species likely to benefit from a network of MPAs based on adult movement. Protections in these areas should serve to restore or maintain the size and age structure of these populations, a factor shown to be particularly important in some rockfish species (Berkeley et al 2004). The areas with this objective were selected because they contain habitat for abalone, urchin, nearshore FMP species, and overfished groundfish species. Achieving this objective contributes to objectives 1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 3.1, 3.2, 3.4, 5.2, and 5.3 of the NCCRSR Goals and Objectives Package. **Figure 3** shows the network of areas with this objective.

Objective 2: Protect seafloor and biogenic habitat

This objective serves to protect the components of the marine ecosystem that harbor the highest diversity of marine life. Seafloor and biogenic structures provide the only structures and niches that create complex habitats for a multitude of species. Biogenic structures include benthic invertebrates (i.e. corals, sponges, tunicates, bryozoans) and marine algae (i.e. giant kelp, bull kelp, seagrass). Protecting the biodiversity, functional diversity, and abundances of marine life requires large areas of intact seafloor and biogenic habitat. This objective includes improving habitat for anadromous fish. Achieving this objective will serve to contribute to objectives 1.1, 1.2, 1.5, 2.1, 2.3, 3.1, 3.2, 3.3, 4.1, 4.2, 5.2, 5.3 of the NCCRSR Goals and Objectives Package. **Figure 4** shows areas with this objective.

Objective 3: Protect forage base for top predators

Top predators can be keystone species in marine ecosystems that play a critical role in structuring food webs. Marine mammals, birds, and large fish and sharks are the top predators in the North-Central Coast study region. Examples of the forage base include squid, schooling fish, and krill. Even if overall populations of forage species are abundant, localized depletion of forage species in the vicinity of bird colonies, marine mammal haulouts and rookeries, and key foraging sites (e.g. upwelling centers) may adversely affect populations and behavior of top predators. Therefore, sub-areas with this objective were selected to prevent localized depletion in the vicinity of such sites. Achieving this objective will contribute to objectives: 1.4, 1.5, 2.1, 2.3, 3.2, 4.1, 5.2, and 5.3 of the NCCRSR Goals and Objectives Package. **Figure 5** shows areas with this objective

Objective 4: Protect seabird/mammal colonies from anthropogenic disturbance

Nesting seabirds and marine mammal rookeries are particularly vulnerable to disturbance by fishing vessels, human incursion, and habitat alteration. This objective serves to protect major nesting sites and rookeries from this type of disturbance to ensure that these federally protected top predators maintain and improve their reproductive success. Achieving this objective will contribute to objectives: 1.1, 1.4, 1.5, 2.1, 3.1, 3.4, 4.2, 5.2, and 5.3 of the CCRSR Goals and Objectives Package. There is no figure to show these areas because they are typically very small, on the order of ¼ mile around important colonies, and so difficult to show on a map of the region.

Objective 5: Improve water quality

While outside the direct jurisdiction of DFG, water quality is an essential component of marine ecosystems--affecting fish, invertebrates, biogenic habitats, birds, and mammals. There are several "impaired" rivers and water bodies designated by the State Water Resources Control Board as a result of sedimentation, pathogens, and various contaminants. Some of these have Total Maximum Daily Loads (TMDLs) with accompanying programs to improve the water quality of rivers flowing into the North-Central Coast study region. Areas that receive inputs from these "impaired" water bodies have this objective. To meet this objective, DFG must work with other state and local agencies to improve the water quality of waters flowing into the MPAs designated through the MLPA process. Achieving this objective will contribute to objectives 1.5 and 5.3 of the NCCRSR Goals and Objectives Package, as well as a transition to ecosystem-based management on the Central Coast. **Figure 6** shows areas with this objective.

2.4 Synthesis of features, threats, and objectives

A summary of important ecological features, threats, and consequent management objectives for each IEA can be found in the matrices in Section 3 of this document. The matrices also contain information on possible MPAs that could meet the objectives for each IEA while minimizing adverse social or economic impact, based on stakeholder discussions, guidance from the SAT (e.g. size, spacing, buffer distance for no disturbance zones), and considering existing 'permanent' management measures (e.g. regulations prohibiting bottom trawling or drift gillnetting in the NCC region). Other configurations of MPAs are entirely possible of course, and we look forward to continued discussion with stakeholders in this process to ensure the optimal network of MPAs designed to meet the goals of the MLPA is ultimately implemented.

Further work will be needed to ensure each MPA and the MPA network in its entirety is meeting its objectives. In addition, to truly meet the broad goals of the MLPA, further research designed to help us all to better understand the ecosystem we are trying to protect should be undertaken. In this respect we suggest the following:

- Ensure development of a monitoring and evaluation plan for all IEAs that would include local observations and input, and use the results for adaptive management.
- Encourage research including assessments of current and historical biodiversity across management regimes in order to improve our understanding of marine ecosystems and inform adaptive management.
- Make information on the management, monitoring and research of all identified areas and ecosystem condition widely available to the public.

3. Matrices of Important Ecological Features, Threats and Management Objectives for 30 Important Ecological Areas of the North -Central California Coast, including MPA ideas

Notes:

1. * denotes feature identified from data available through the NCC MLPA database (IMS) and other sources.
2. Seabird and mammal species diversity and density indices based on NOAA 2003.
3. Kelp forest based on aerial surveys: “persistent” kelp was present 3 of 4 of the years 89, 99, 02, 03

Pt Arena to Fort Ross Region

The major persistent upwelling area at Pt Arena combines with seasonal upwelling all along the Sonoma Coast to fuel highly productive and biodiverse marine ecosystems over much of the entire NCC. This region is characterized by open, exposed rocky coast that submerges as nearshore rocky substrate with sandy substrate offshore. Bull kelp is found all along the coast, with heavy concentrations just south of Point Arena and annual persistence mainly south of Del Mar to the Fort Ross area. Several areas are important for seabirds and mammals (including threatened or endangered species like Steller sea lion and marbled murrelet), including Pt Arena, Fish Rocks, Gualala Point Island, and Fort Ross. The Garcia and Gualala Rivers flow into this region, and are habitat to runs of steelhead, coho, and Chinook (steelhead only at Garcia).

IEA	Key ecological features Interpreted from IMS database (*), SAT and Regional Profile	Potentially vulnerable to	Major objectives <i>(minor in italics)</i>	MPA idea
Pt Arena to Saunders Reef: IEAs 1 and 2	<p>* Major upwelling zone on California Coast *</p> <p>Rocky intertidal and subtidal habitat * Rocky reef at Saunders * Kelp forest (not persistent) *</p> <p>Overfished groundfish habitat * Abalone habitat *</p> <p>Minor seabird and mammal colonies * Heavy seasonal use by gray whales</p> <p><u>SAT/Regional Profile</u> -- Pt Arena headland fairly unique in containing both sandy areas and rocky habitat – high diversity of habitats. Pt Arena important for marbled murrelets. Pt Arena rookery for CSL, HS.</p>	<p>Fishing</p> <p>Kelp harvest</p> <p>Seafloor contact</p> <p>Whale entanglement</p> <p>Depletion of forage base</p> <p>Disturbance</p>	<p>Protect benthic fish and invertebrates</p> <p>Protect seafloor and other biogenic habitat</p> <p>Protect forage base</p> <p>Protect seabirds and mammals from disturbance</p>	<p>SMR encompassing rocky habitat from West Arena Cove area out to roughly 50 fm line.</p> <p>SMCA beyond SMR west to state line, and north to study region boundary. Manchester State Beach left open. SMCA allows crab and salmon.</p> <p>Generally leaves areas south of Arena Cove open to rockfish fishing, urchin</p>

IEA	Key ecological features Interpreted from IMS database (*), SAT and Regional Profile	Potentially vulnerable to	Major objectives (<i>minor in italics</i>)	MPA idea
				and abalone harvest. If preferred size not met at Pt Arena, supplement with MPA south.
Haven's Neck, Fish Rocks, Gualala, Del Mar: IEA 3	<p>* Kelp forest (not persistent) * Overfished groundfish habitat * Abalone habitat * Rocky intertidal and subtidal * Rocky reef at Robinson * High diversity seabird colonies (Fish Rocks) * Occasional large California sea lion colony * Steller sea lion colony * Heavy seasonal use by gray whales</p> <p><u>SAT/Regional Profile</u> -- Fish Rocks (Leach's Storm Petrel, Brandt's Cormorant, Pelagic Cormorant, Western Gull, Pigeon Guillemot, Cassin's Auklet, Rhinoceros Auklet, Tufted Puffin) and, Gualala Point Island (Brandt's Cormorant, Western Gull, Pigeon Guillemot), are major colonies for multiple species. Gualala River Mouth important for marbled murrelets. Pelagic Cormorant and Pigeon Guillemot at many sites. Fish Rocks and Gualala rookeries for CSL, HS. Fish Rocks minor rookery for SSL.</p>	<p>Fishing</p> <p>Kelp harvest</p> <p>Seafloor contact</p> <p>Whale entanglement</p> <p>Depletion of forage base</p> <p>Disturbance</p>	<p>Protect forage base</p> <p>Protect seabirds and mammals from disturbance</p> <p><i>Protect benthic fish and invertebrates</i></p> <p><i>Protect seafloor and other biogenic habitat</i></p>	<p>SMR ¼ mile around Fish Rocks: No take, no disturbance</p> <p>SMR ¼ mile around Gualala Point Island: No take, no disturbance</p> <p>There is no wetfish/squid fishing in this region.</p> <p>Habitat/Groundfish protection objectives for region to be met by MPAs in the IEAs north and south of this IEA, in addition to prohibition on bottom trawling in NCC</p>
Del Mar, Black Point, Sea Ranch, Salt Point, Fort Ross: IEAs 4 and 5	<p>* Persistent kelp forest * Overfished groundfish habitat * Abalone habitat * Rocky substrate * Multiple seabird and mammal colonies</p> <p><u>SAT</u> -- Continuous rocky intertidal and nearshore habitat. Bodega Canyon outside state waters but highly diverse, unknown connectedness. Arched Rock (Brandt's Cormorant, Western Gull), Russian River Rocks (Double-Crested Cormorant, Brandt's Cormorant, Pelagic Cormorant, Western Gull), Russian Gulch (Pelagic Cormorant, Western Gull, Pigeon Guillemot), Gull Rock (Leach's</p>	<p>Fishing</p> <p>Kelp harvest</p> <p>Seafloor contact</p> <p>Depletion of forage base</p> <p>Disturbance</p>	<p>Protect benthic fish and invertebrates</p> <p>Protect seafloor and other biogenic habitat</p> <p>Protect forage base</p> <p>Protect seabirds and mammals from disturbance</p>	<p>MPA from Black Point west to state line to Salt Point West to state line: SMR out to 50m, SMCA outside to state line: crab and halibut ok</p> <p>SMR ¼ mile around Fish Rocks and Fort Ross: No take, no disturbance</p>

IEA	Key ecological features Interpreted from IMS database (*), SAT and Regional Profile	Potentially vulnerable to	Major objectives <i>(minor in italics)</i>	MPA idea
	Storm Petrel, Pelagic Cormorant, Western Gull). Colonies north and south of the Russian River Mouth for marbled murrelets. Many scattered small colonies, foraging around river mouths. Marine Mammal Rookeries at Northwest Cape Rocks/Fort Ross (Steller sea lion), Major harbor seal colony at Salt Point.			

Russian River Mouth Area

The Russian River is one of the major rivers on the North Central Coast, draining a very large Sonoma and Mendocino watershed at Jenner. The freshwater plume extends from the coast during the wet season, dropping sediment to the north in winter and flowing south in summer. At other times, a coastal lagoon forms behind a sandbar at the mouth of the river, temporarily blocking threatened runs of steelhead, coho and Chinook. Twenty-four species of fish, eight species of crab, and five species of shrimp are found in the Russian River Estuary. The river is considered impaired in terms of temperature, sediment, and pathogens, issues that should be dealt with through the DFG working with appropriate state and federal authorities.

IEA	Key ecological features Interpreted from IMS database (*), SAT and Regional Profile	Potentially vulnerable to	Major objectives <i>(minor in italics)</i>	MPA idea
Jenner: IEA 6	* Moderate diversity seabird colonies <u>SAT/Regional Profile</u> -- Colonies north and south of Russian River mouth, important for marbled murrelets. Russian River important for marine mammals. Gray whales often seen near the Russian River Mouth.	Depletion of forage base Disturbance Pollution/sedimentation	Protect forage base Protect seabirds and mammals from disturbance Improve water quality	SMR encompassing Russian River Rocks, Gull Rock, Arched Rock (all to ¼ mile) and Russian River Mouth There is no wetfish/squid fishing in this area.

Bodega Head to West Point Reyes Region

The region from south of the Russian River to Point Reyes is characterized by a transition in substratum from granitic rock to the north to sedimentary in the south (Point Reyes is granitic, West Point Reyes is high relief sedimentary rock). Combined with differences in oceanography, these changes correspond roughly with a change in intertidal assemblages at Point Reyes. Bodega Head is a granitic peninsula which extends out to the state line. West Point Reyes including Tomales Bluff is a mosaic of different substrate types, including both hard and sandy habitat. The region also has several large bays and estuaries, including Bodega Bay, Tomales Bay, Estero Americano, Estero San Antonio, Drake's Estero and Estero de Limantour, and Bolinas Lagoon. These estuarine areas support numerous migrating waterfowl and shorebird species. Tomales Bay and Bodega are important low-inflow estuaries, each offering distinct and rare oceanographic habitats. Estuarine habitat like the eelgrass found in Bodega Bay, Estero Americano and Tomales Bay is important as nursery habitat for many invertebrates and fish. Tomales Bay is one of only 4 RAMSAR-listed 'Wetlands of International Importance' in California and only 22 such sites in the entire US.

IEA	Key ecological features Interpreted from IMS database (*), SAT and Regional Profile	Potentially vulnerable to	Major objectives (<i>minor in italics</i>)	MPA ideas
Bodega Head: IEAs 7 and 8	<p>* Hard rock peninsula * Overfished groundfish habitat * Larval retention area * Moderate density and diversity seabird colony * Occasional high density California sea lion colony * Steller sea lion rookery</p> <p><u>SAT/Regional Profile</u> -- Bodega Head rocky intertidal with connections to subtidal habitats. Bodega Head important for Brandt's cormorant and mammal foraging. Bodega Rock home to four species of marine mammals, including SSL rookery.</p>	<p>Fishing</p> <p>Kelp harvest</p> <p>Seafloor contact</p> <p>Depletion of forage base</p> <p>Disturbance</p>	<p>Protect benthic fish and invertebrates</p> <p>Protect seafloor and other biogenic habitat</p> <p>Protect forage base</p> <p>Protect seabirds and mammals from disturbance</p>	<p>MPA west from Salmon Creek Estuary to state line, and south and then west from Bodega Head to encompass reef. SMR to encompass reef (roughly 50m contour), rest SMCA allowing salmon and crab.</p> <p>SMR ¼ mile around Bodega Rock: no take, no disturbance</p>
Tomales Bluff: IEAs 9 and 10	<p>* Multiple large rocky reefs * Overfished groundfish habitat * Highly diverse seabird colony * High density harbor seal haulout</p> <p><u>SAT/Regional Profile</u> -- Bird Rock (Tomales Point) key area for wintering shorebirds and several species of seabirds: Ashy Storm Petrel, Western Gull, Pigeon Guillemot, Rhinoceros Auklet, Tufted Puffin. HS and CSL common to</p>	<p>Fishing</p> <p>Seafloor contact</p> <p>Depletion of forage base</p> <p>Disturbance</p>	<p>Protect benthic fish and invertebrates</p> <p>Protect seafloor and other biogenic habitat</p> <p>Protect forage base</p> <p>Protect seabirds and</p>	<p>SMR ¼ mile around Bird Rock: no take, no disturbance</p> <p>MPA at Bodega Head to meet groundfish/habitat goals for region</p>

IEA	Key ecological features Interpreted from IMS database (*), SAT and Regional Profile	Potentially vulnerable to	Major objectives <i>(minor in italics)</i>	MPA ideas
	Bird Rock (Tomales Point). Brandt's cormorant winter in Tomales Bay. White sharks frequent area.		mammals from disturbance	
West Point Reyes: IEAs 11 and 12	* Mosaic of rocky and sandy habitats <u>SAT/Regional Profile</u> -- High relief sandstone substrate.	Fishing Seafloor contact	Protect benthic fish and invertebrates Protect seafloor and other biogenic habitat	MPA at Bodega Head used to meet groundfish/habitat goals
Bodega Bay: IEA 13	* Invertebrate habitat * Fish and invertebrate nursery <u>SAT/Regional Profile</u> -- Key area for wintering shorebirds. Bodega harbor contains eelgrass and mudflats, important nursery habitat. Porpoises use Bodega Bay.	Fishing Seafloor contact Depletion of forage base Disturbance Pollution/sedimentation	Protect benthic fish and invertebrates Protect seafloor and other biogenic habitat Protect forage base Protect seabirds and mammals from disturbance Improve water quality	TBD
Estero Americano: IEA 14	<u>SAT/Regional Profile</u> -- mudflats, seasonal brackish and freshwater marsh, eelgrass, supporting a rich diversity of species including 71 species of water/marsh birds, 44 species of marine and freshwater fish, over 70 species of benthic invertebrates, and 30 species of epibenthic invertebrates as well as several special status species such as the northwestern pond turtle, steelhead, and the tidewater goby. Documented water quality problems.	Fishing Seafloor contact Pollution/sedimentation	Protect benthic fish and invertebrates Protect seafloor and other biogenic habitat Improve water quality	TBD
Estero San Antonio: IEA 15	<u>SAT/Regional Profile</u> – shallow coastal marsh, rocky shore and mudflats. The tidewater goby breeds in the shallow waters of this estuary and Dungeness crabs use the estuary's eelgrass beds as a nursery area.	Fishing Seafloor contact Pollution/sedimentation	Protect benthic fish and invertebrates Protect seafloor and other biogenic habitat Improve water quality	TBD

IEA	Key ecological features Interpreted from IMS database (*), SAT and Regional Profile	Potentially vulnerable to	Major objectives <i>(minor in italics)</i>	MPA ideas
Tomales Bay: IEA 16	<p>* Eelgrass beds * Fish and invertebrate nursery * Invertebrate habitat</p> <p><u>SAT/Regional Profile</u> -- Very rich nursery ground with eelgrass beds. Key area for wintering shorebirds. Hog Island important for double crested cormorants.</p>	<p>Fishing</p> <p>Seafloor contact</p> <p>Depletion of forage base</p> <p>Disturbance</p> <p>Mariculture</p> <p>Pollution/sedimentation</p>	<p>Protect benthic fish and invertebrates</p> <p>Protect seafloor and other biogenic habitat</p> <p>Protect forage base</p> <p>Protect seabirds and mammals from disturbance</p> <p>Improve water quality</p>	TBD

Point Reyes to Bolinas Region

This region is part of the northern land boundary of the Gulf of the Farallones, one of the broadest areas of continental shelf on the West Coast of the US. The majority of the shelf is relatively shallow and primarily sand/mud substrate that provides important habitat and forage area for many species of fish, seabirds, and mammals. Point Reyes headland is colonized by 14 species of seabirds and four species of pinniped, including breeding colonies of Steller sea lions and elephant seals. Grey whales pass close by the headland on their migrations, and critically endangered leatherback sea turtles can be found foraging on jellyfish here in the fall. Humpback whales and porpoises are found in Drake's Bay, an area also used for minke whale calving. The estuarine waters of Drake's Estero and Estero de Limantour are rich grounds for eelgrass and the many species that use it as nursery habitat. The esteros are home to the largest colony of shorebirds in Marin County, and a large harbor seal haulout. Important seabird colonies are also found at Double Point, Miller's Point, and Point Resistance, and Double Point also hosts one of the largest harbor seal haulouts in the state. In the vicinity of Double Point, and therefore still important for foraging, is Duxbury Reef, the only large area of rocky substrate between West Point Reyes and Half Moon Bay Area. Bolinas Lagoon is important estuarine habitat and home to a large colony of harbor seals. Bolinas Lagoon is one of only 4 RAMSAR-listed 'Wetlands of International Importance' in California and only 22 such sites in the entire US.

IEA	Key ecological features Interpreted from IMS database (*), SAT and Regional Profile	Potentially vulnerable to	Major objectives (<i>minor in italics</i>)	MPA idea
Point Reyes to Double Point: IEA 17	* Rocky substrate * Overfished groundfish habitat * Top 20% fish density in region * Large larval retention area * Highest density and diversity seabird colony at Pt Reyes headland, moderate density and diversity seabird colonies at Double Point * Multiple marine mammal haulouts * One of only two northern elephant seal rookeries in study region	Fishing Seafloor contact Depletion of forage base Disturbance Entanglement	Protect forage base Protect seabirds and mammals from disturbance <i>Protect benthic fish and invertebrates</i> <i>Protect seafloor and other biogenic habitat</i>	SMR around headland with surrounding SMCA encompassing west Drake's Bay: no squid/wetfish fishing
Drake's Estero and Limantour: IEA 18	* Seagrass beds * Estuary * Fish and invertebrate nursery * Invertebrate habitat * Harbor seal haulout <u>SAT</u> -- Drake's Estero largest colony shorebirds in Marin County, important for Brandt's cormorant.	Fishing Seafloor contact Depletion of forage base Disturbance Pollution/sedimentation	Protect benthic fish and invertebrates Protect seafloor and other biogenic habitat Protect forage base Protect seabirds and	SMR Entire Estero: no take (except oyster mariculture until 2012)

IEA	Key ecological features Interpreted from IMS database (*), SAT and Regional Profile	Potentially vulnerable to	Major objectives <i>(minor in italics)</i>	MPA idea
			mammals from disturbance Improve water quality	
Duxbury Reef: IEA 19	* Rocky substrate * Overfished groundfish habitat <u>SAT/Regional Profile</u> -- Duxbury Reef has rocky intertidal habitat used by shorebirds. Small HS haul out.	Fishing Seafloor contact	Protect benthic fish and invertebrates Protect seafloor and other biogenic habitat	Duxbury Reef is an area that needs more deliberation with respect to specific MPAs. It is important both ecologically and socio-economically. Whatever protections are put in place, both a monitoring and evaluation plan, plus a more extensive research plan is needed to ensure objectives are being met and to better understand the importance of the area to the wider ecosystem. The objectives of protective measures here are to ensure a healthy local ecosystem, including trophic and population structure. Thus protection of groundfish, benthic invertebrates, habitat, the forage base and no disturbance areas are needed.
Bolinás Lagoon: IEA 20	* Estuary * Fish and invertebrate nursery * Invertebrate habitat * High density harbor seal rookery <u>SAT/Regional Profile</u> -- Migratory shorebirds and wintering waterfowl.	Fishing Seafloor contact Depletion of forage base	Protect benthic fish and invertebrates Protect seafloor and other biogenic habitat	TBD

IEA	Key ecological features Interpreted from IMS database (*), SAT and Regional Profile	Potentially vulnerable to	Major objectives <i>(minor in italics)</i>	MPA idea
		Disturbance Pollution/sedimentation	Protect forage base Protect seabirds and mammals from disturbance Improve water quality	

San Francisco Bay Plume Region

San Francisco Bay is the largest of all of California's estuaries. While the bay itself is not in the MLPA NCC study region, all of this freshwater is a major contributor to the productivity and biodiversity of the Gulf of the Farallones. The current moves north to Bolinas under most conditions, and north to Point Reyes during heavy water input and weaker northerly winds. During the upwelling season, the plume flows south and moves offshore. The plume acts as an oceanographic barrier to connectivity and so is a northern boundary for many species (e.g. kelp rockfish). The mouth of the bay is a key foraging area for many species of seabirds and marine mammals, including minke whales and harbor porpoises. Leatherback sea turtles also forage in the area during the fall. Point Bonita has pelagic cormorants and pigeon guillemots, while Sea Rocks is home to Brandt's cormorants, a brown pelican breeding colony, and is a Steller sea lion and California sea lion haulout.

IEA	Key ecological features Interpreted from IMS database (*), SAT and Regional Profile	Potentially vulnerable to	Major objectives <i>(minor in italics)</i>	MPA idea
Mouth of San Francisco Bay: IEA 21	* Some rocky subtidal * Major freshwater influence * Seabird and mammal colonies	Depletion of forage base Disturbance	Protect forage base Protect seabirds and mammals from disturbance	Pirates Cove in the coastal Marin Headlands to Ocean Beach/San Francisco Zoo and 3 miles out. SMCA no wetfish/squid fishing No disturbance zone around Point Bonita and Seal Rocks may not be most appropriate management measure, due to heavy vessel traffic, more disturbance from land than from the sea, and safety issues of pushing smaller vessels further into mouth. Education and awareness program may be more effective.

Point San Pedro to Pigeon Point Region

The southernmost end of the NCC region has a mix of hard and soft-bottom habitat, with a particularly broad rocky substrate to the west and south of Half Moon Bay. Upwelling is again important, particularly at Pigeon Point but also at Pillar Point on a smaller scale. The whole region from Point San Pedro to Pescadero Point is important foraging ground for many species of seabird including common murres, pigeon guillemots, pelagic cormorants, though there are few nesting sites. Humpback whales also forage in the region, and sea otters are present here north to Point San Pedro (and sometimes further north). While there are marine mammal haulouts, there are no breeding colonies in this region.

IEA	Key ecological features Interpreted from IMS database (*), SAT and Regional Profile	Potentially vulnerable to	Major objectives (<i>minor in italics</i>)	MPA idea
Devil's Slide Area: IEA 22	<p>* Rocky intertidal * Rocky substrate * Overfished groundfish habitat * Moderate diversity seabird colony</p> <p><u>SAT</u> -- Area between Devil's slide and Point San Pedro is important for murres and pigeon guillemot and a nesting site. Point San Pedro important for marbled murrelets and foraging for many species. Seabird colonies at Devil's Slide Rock (Common Murre, Pigeon Guillemot, Pelagic Cormorant, Western Gull), and San Pedro Rock (Pigeon Guillemot)</p>	<p>Disturbance</p> <p>Depletion of forage base</p>	<p>Protect forage base</p> <p>Protect seabirds and mammals from disturbance</p>	<p>SMR from Pillar Point north to just north of Montara and out to capture reef habitat.</p> <p>SMCA 1 directly north of SMR to Point San Pedro: No squid fishing, no disturbance ¼ mile around Devil's Slide</p> <p>SMCA 2 outside SMR and SMCA1 to state line: Allow squid, salmon, crab</p>
Half Moon Bay Reef complex: IEA 23	<p>* Rocky intertidal * Rocky substrate * Overfished groundfish habitat * Moderate density harbor seal haulout</p> <p><u>SAT</u> -- Pillar Point important for marbled murrelets and foraging for many species. Martin's Beach cliff is an important forage area for seabirds. Patchy kelp predominantly off Fitzgerald. Sea otters present from Point San Pedro to southern boundary of study region.</p>	<p>Fishing</p> <p>Seafloor contact</p> <p>Depletion of forage base</p> <p>Disturbance</p>	<p>Protect benthic fish and invertebrates</p> <p>Protect seafloor and other biogenic habitat</p> <p>Protect forage base</p> <p>Protect seabirds and mammals from disturbance</p>	
Martins Beach Area: IEA 24	<p><u>SAT</u> -- Martin's Beach cliff is an important forage area for seabirds. Pigeon guillemot and pelagic cormorant colonies.</p>	<p>Depletion of forage base</p>	<p>Protect forage base</p>	<p>Forage base protections met with Fitzgerald MPA</p>
San Gregorio to	<p>* Rocky intertidal * Rocky substrate * Overfished</p>	<p>Fishing</p>	<p>Protect benthic fish and</p>	<p>Groundfish/habitat</p>

IEA	Key ecological features Interpreted from IMS database (*), SAT and Regional Profile	Potentially vulnerable to	Major objectives <i>(minor in italics)</i>	MPA idea
Pescadero Area: IEA 25 and 26	groundfish habitat * Top 20% fish diversity <u>SAT</u> -- Pescadero Point important for marbled murrelets and foraging for many species. Pescadero Marsh habitat for steelhead and stocked coho, and other special status species, including brackish water snails, red-legged frogs, the San Francisco garter snake, black and clapper rails, and tidewater gobies.	Seafloor contact Depletion of forage base Disturbance	invertebrates Protect seafloor and other biogenic habitat Protect forage base Protect seabirds and mammals from disturbance	protection goals met with preferred size MPA at Fitzgerald. SMR Pescadero Marsh

Farallon Islands

The Farallon Islands comprises the third of three biologically distinct regions recognized by the NCC SAT. The intertidal and subtidal habitats and water above are considered unique in the study region. The four Farallon Islands (Southeast Farallon, West End, Middle Farallon, and North Farallon) sit on the continental shelf close to the shelf break on the western side (in federal waters). The incredible productivity of the region is reflected in the diversity and abundance of top predators. Eleven different species of seabirds nest here, including Brandt's, pelagic and double crested cormorants, common murre, Cassin's and rhinoceros auklets, tufted puffins, pigeon guillemots, Western gulls, ash storm-petrels, and Leach's storm-petrels. Together, these colonies comprise more than 350,000 birds, the largest breeding colony in the contiguous United States. Most breeding occurs in spring and fall, but common murre, western gulls, and cormorants also visit breeding sites during the fall and winter. Half the world's population of the ash storm-petrel, a state species of concern, nests here. Steller sea lions, Northern fur seals, California sea lions, and harbor seals breed on the islands during the summer, while Northern elephant seals breed there during the winter. Blue whales, Pacific white sided dolphins, Dall's porpoise, Risso's dolphin, humpback whales and gray whales all forage in the area. In all, the waters around the Farallones host at least 36 species of marine mammals. The area is also important as a foraging area of other species, including critically endangered leatherback sea turtles. The area also hosts one of the world's largest congregations of white sharks during the fall and winter, when they migrate into the area to forage on immature elephant seals.

IEA	Key ecological features Interpreted from IMS database (*), SAT and Regional Profile	Potentially vulnerable to	Major objectives <i>(minor in italics)</i>	MPA idea
Farallon Islands: IEAs 27 to 30		Fishing	Protect benthic fish and invertebrates	The Farallon Islands is an area that needs more deliberation with respect to specific MPAs. It is extremely important both ecologically and socio-economically. Whatever protections are put in place, both a monitoring and evaluation plan, plus a more extensive research plan is needed to ensure objective are being met
South Farallon Island Area	* Rocky substrate * Overfished groundfish habitat * Highest density and diversity seabird colony * Top 20% seabird density and diversity * Highest density California sea lion haulout and only rookery in study region * One of only two northern elephant seal rookeries in study region * Only northern fur seal rookery in study region * Only Steller sea lion rookery in region * Moderate/high seasonal use by gray whales, humpback whales, Dall's porpoise, Pacific white sided dolphin	Seafloor contact Depletion of forage base Disturbance	Protect seafloor and other biogenic habitat Protect forage base Protect seabirds and mammals from disturbance	

IEA	Key ecological features Interpreted from IMS database (*), SAT and Regional Profile	Potentially vulnerable to	Major objectives <i>(minor in italics)</i>	MPA idea
North Farallon Island	<ul style="list-style-type: none"> * Rocky substrate * Overfished groundfish habitat * High density/ moderate diversity seabird colony (primarily murre) * Top 20% seabird density and diversity * California sea lion haulout and Steller sea lion rookery * Moderate/high seasonal use by gray whales, humpback whales, Dall's porpoise, Pacific white sided dolphin 			<p>and to better understand the importance of the area to the wider ecosystem.</p> <p>The objectives of protective measures here are to ensure a healthy local ecosystem, including trophic and population structure. Thus protection of groundfish, benthic invertebrates, habitat, the forage base and no disturbance areas are needed.</p> <p>Protective measure needed include reserves, no disturbance areas, and a prohibition on wetfish/squid fishing.</p>

Figure 2: Current NCC MPAs

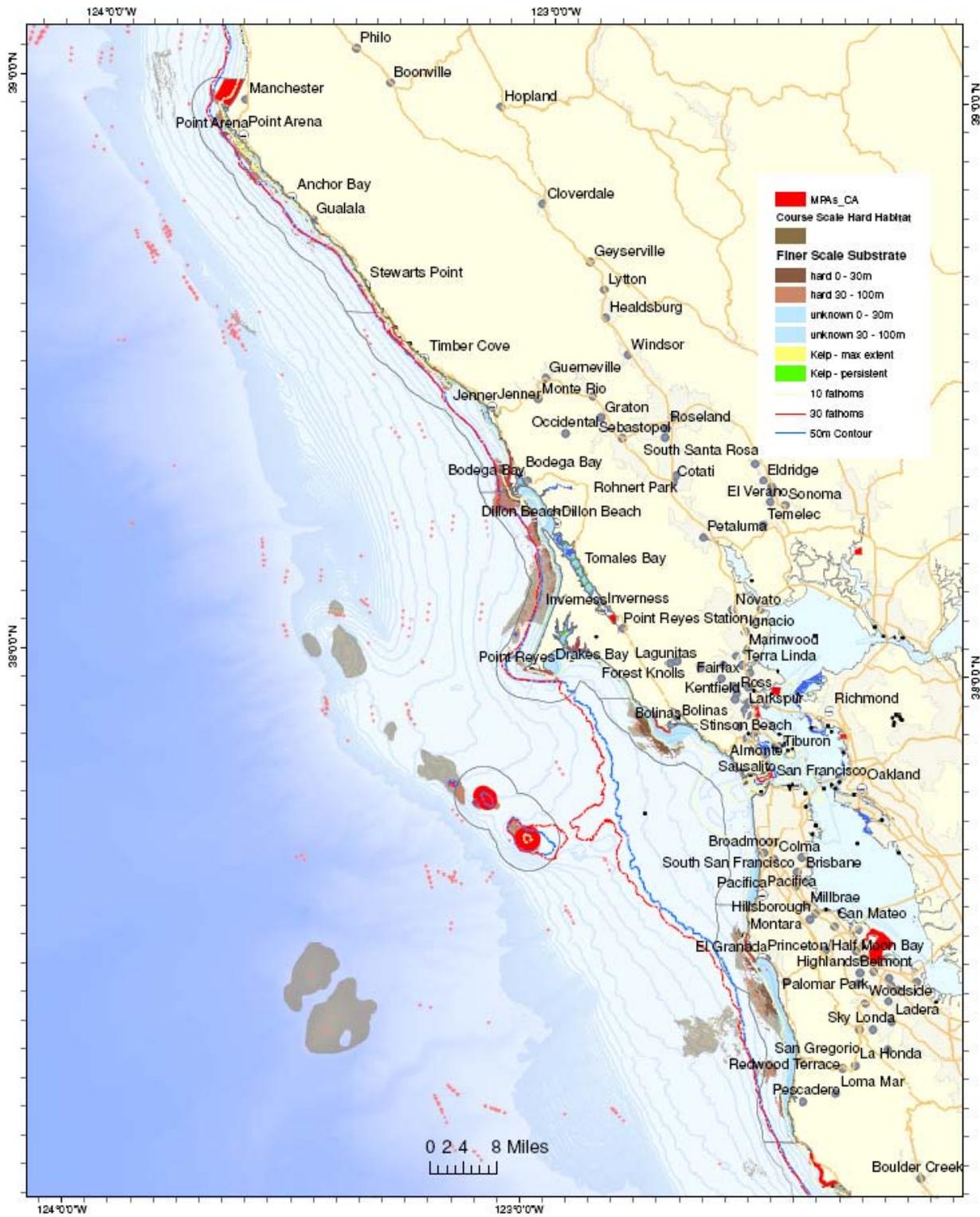


Figure 3: IEAs with an Objective to Protect Groundfish and Benthic Invertebrates

NOTE: THESE ARE NOT MPAs

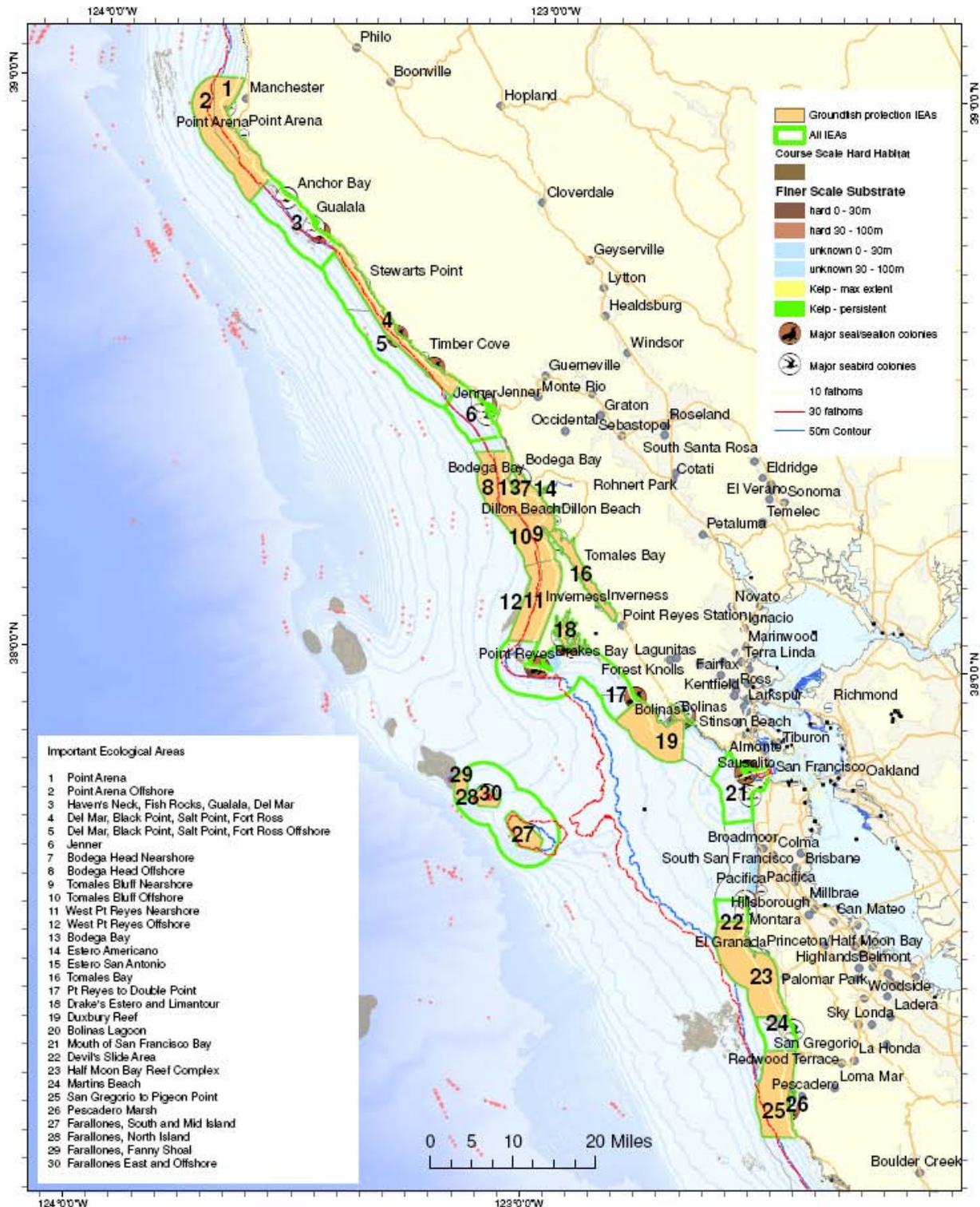


Figure 4: IEAs with an Objective to Protect Habitat

NOTE: THESE ARE NOT MPAs

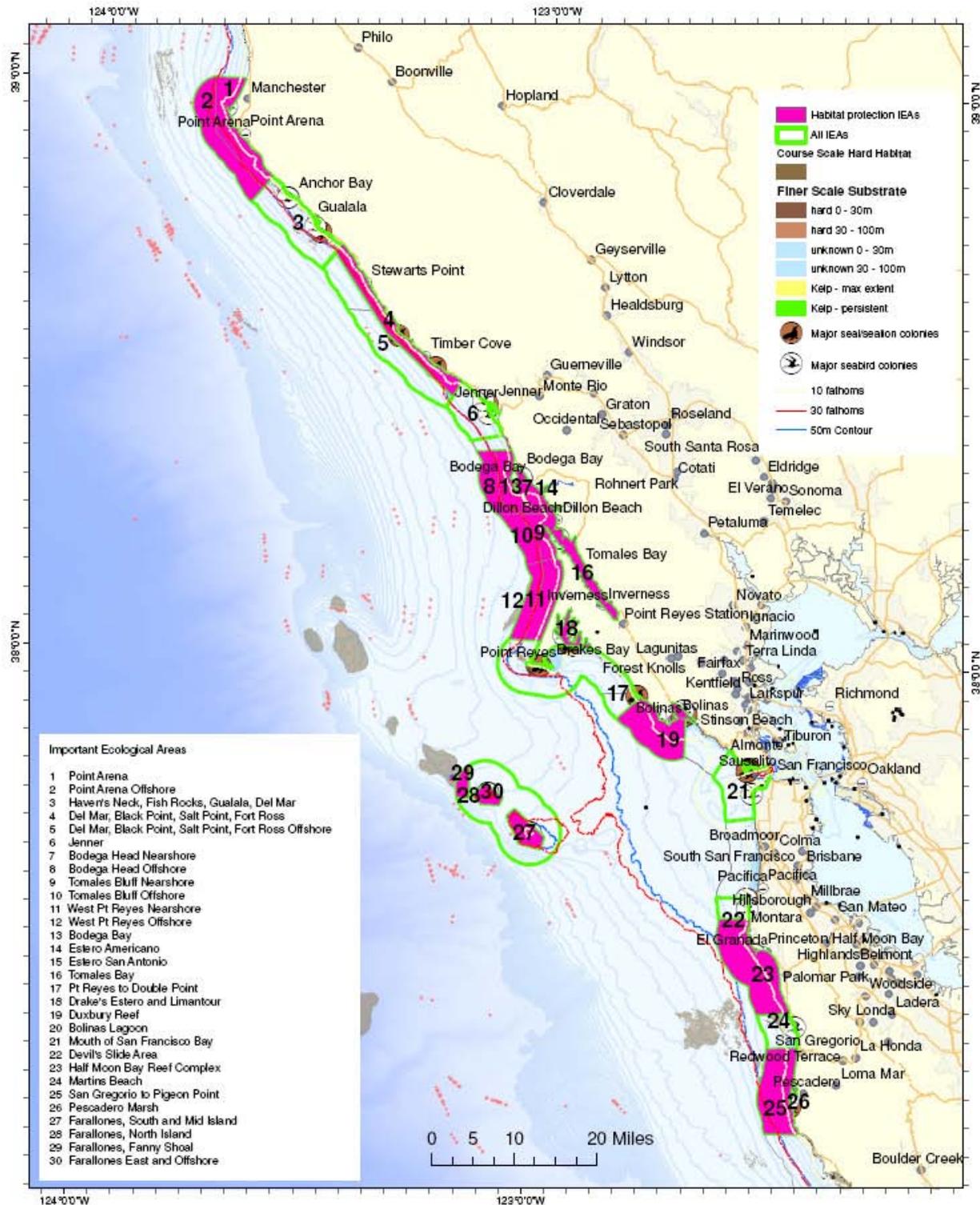


Figure 5: IEAs with an Objective to Protect the Forage Base

NOTE: THESE ARE NOT MPAs

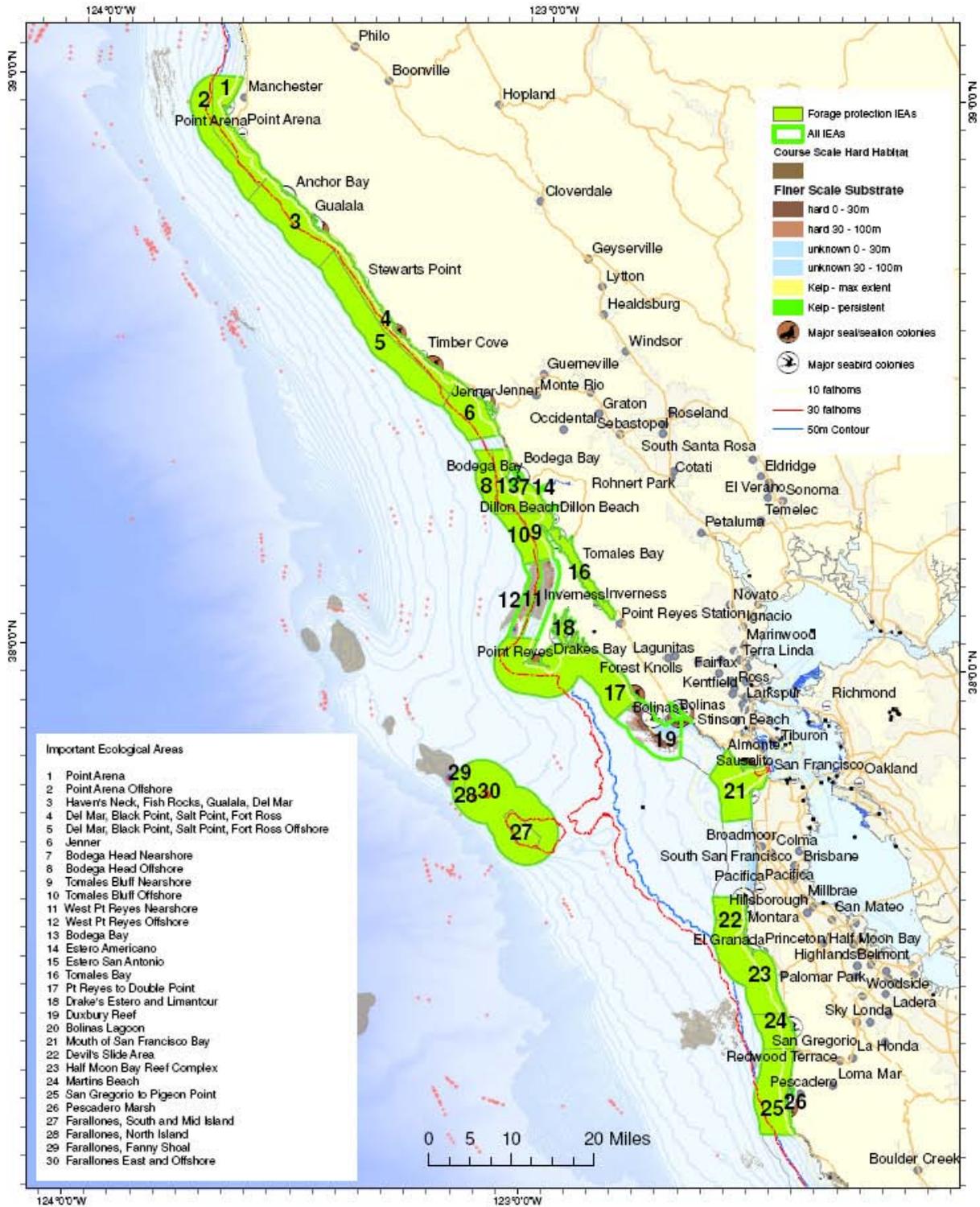


Figure 6: IEAs with an Objective to Improve Water Quality.

NOTE: THESE ARE NOT MPAs

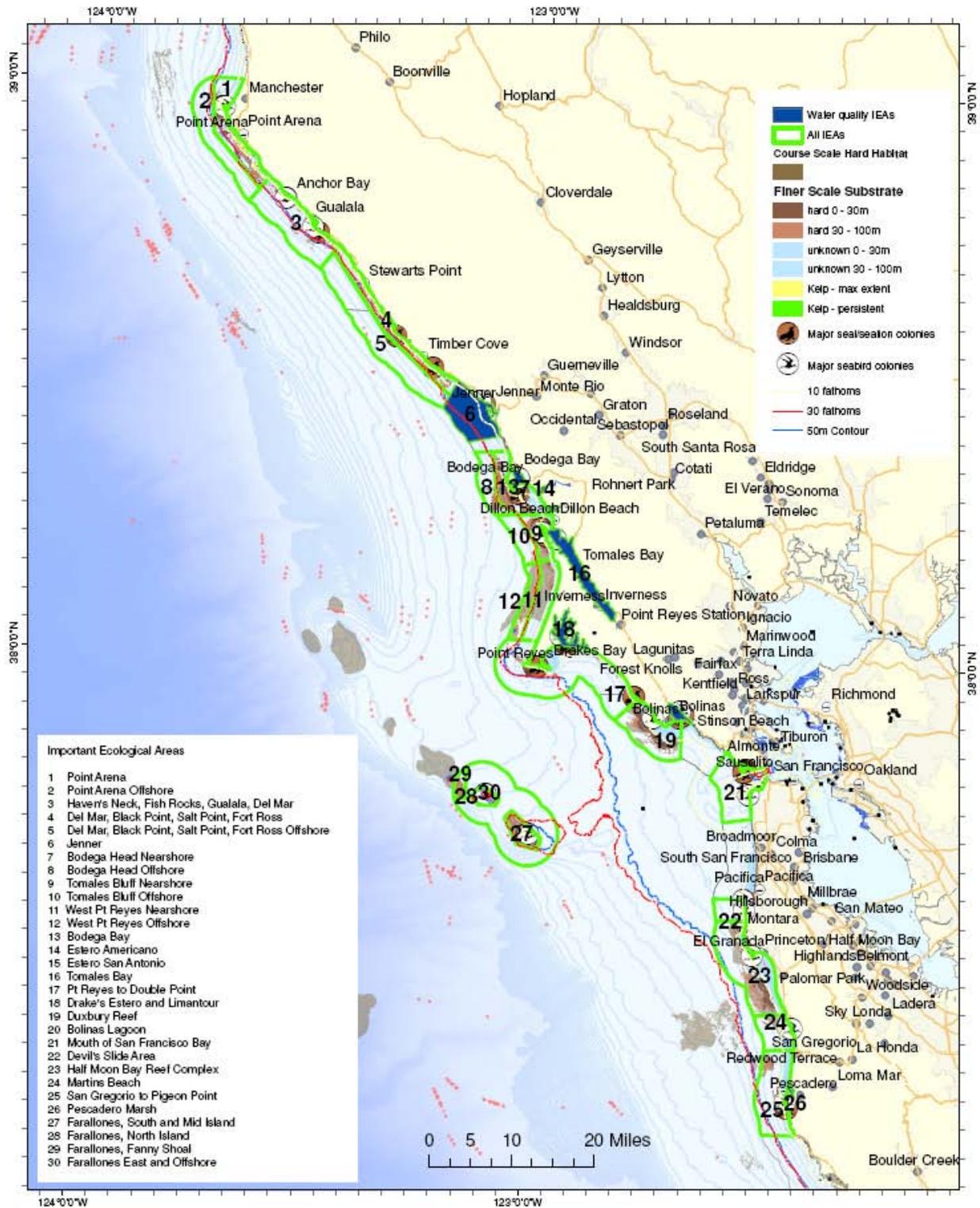


Figure 7: All IEAs

NOTE: THESE ARE NOT MPAs

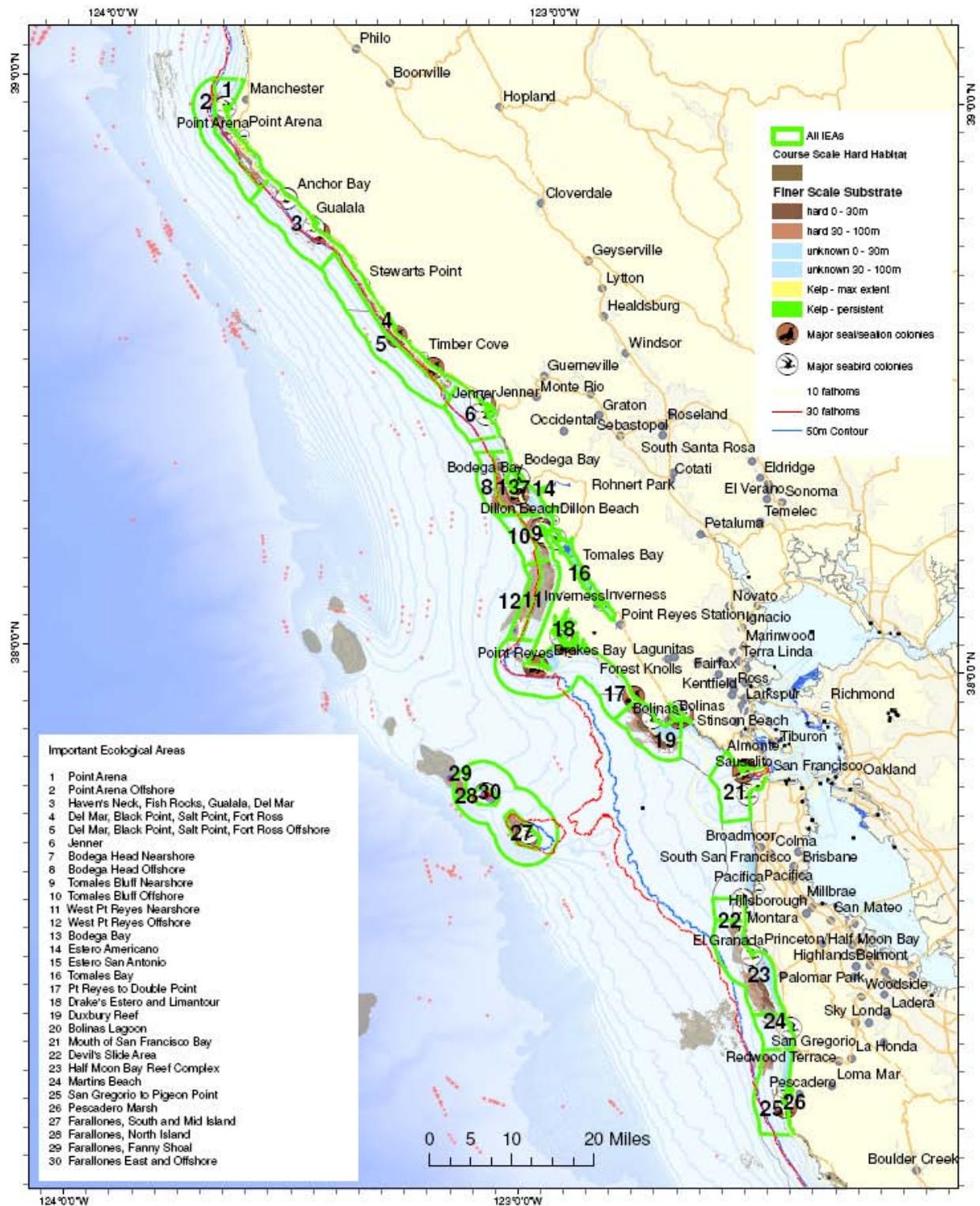


Figure 8: Point Arena to Saunders Reef IEAs and possible MPAs: Groundfish, benthic invertebrate and habitat protection.

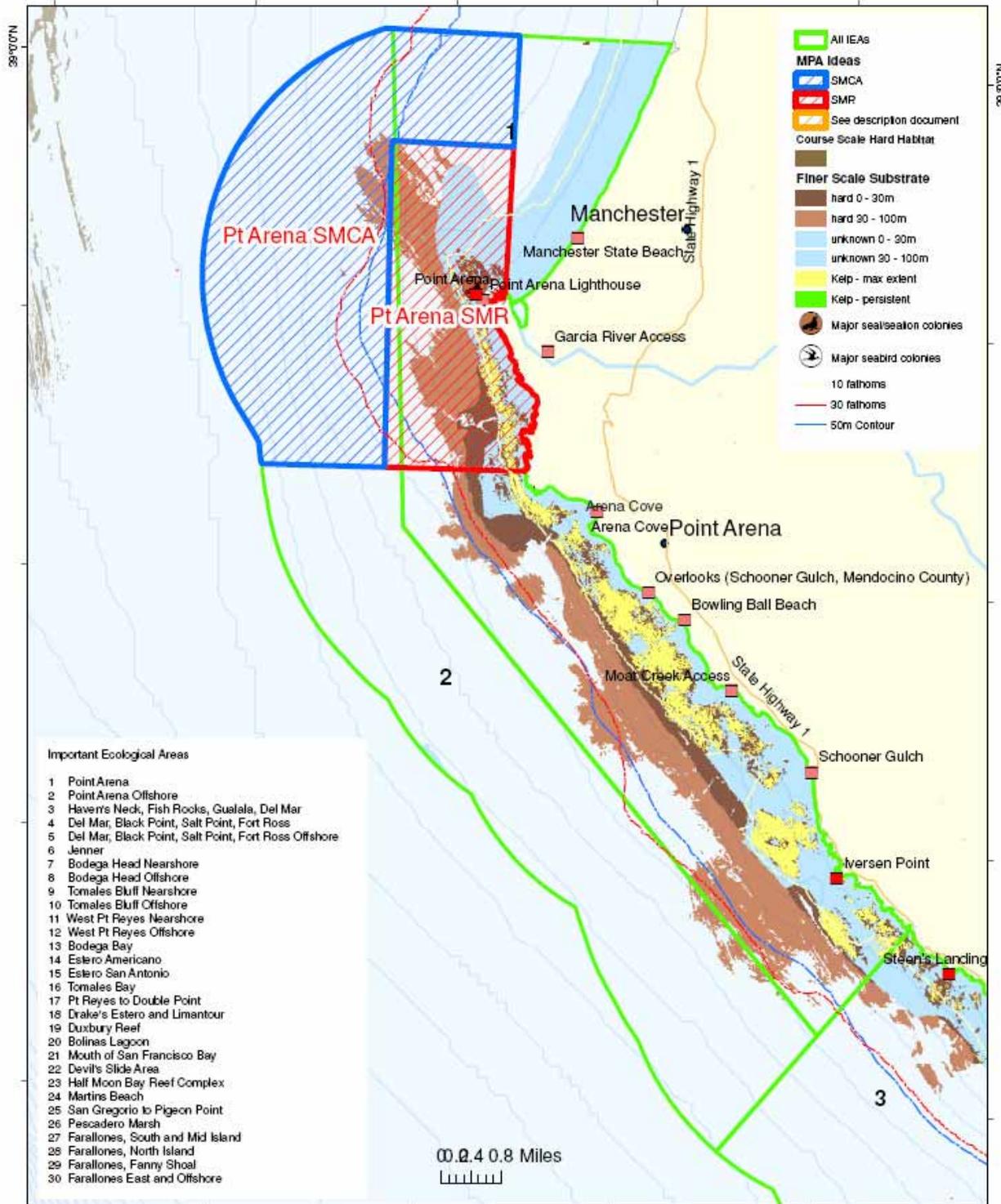


Figure 9: Haven's Neck, Fish Rocks, Gualala, Del Mar IEA and possible MPAs: Forage protection and no disturbance.

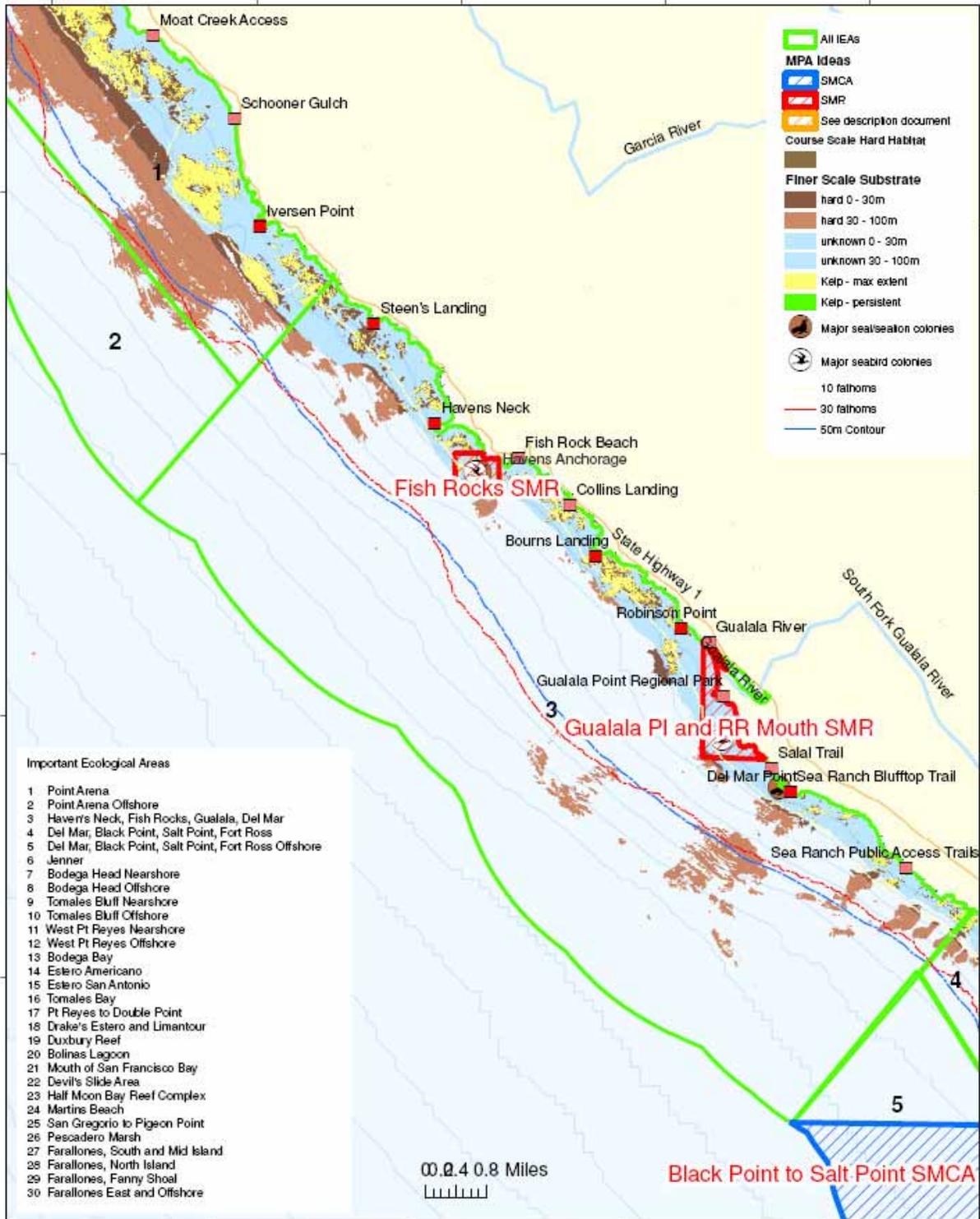


Figure 10: Del Mar, Black Point, Salt Point, Fort Ross IEAs and possible MPAs: Groundfish, benthic invertebrate and habitat protection

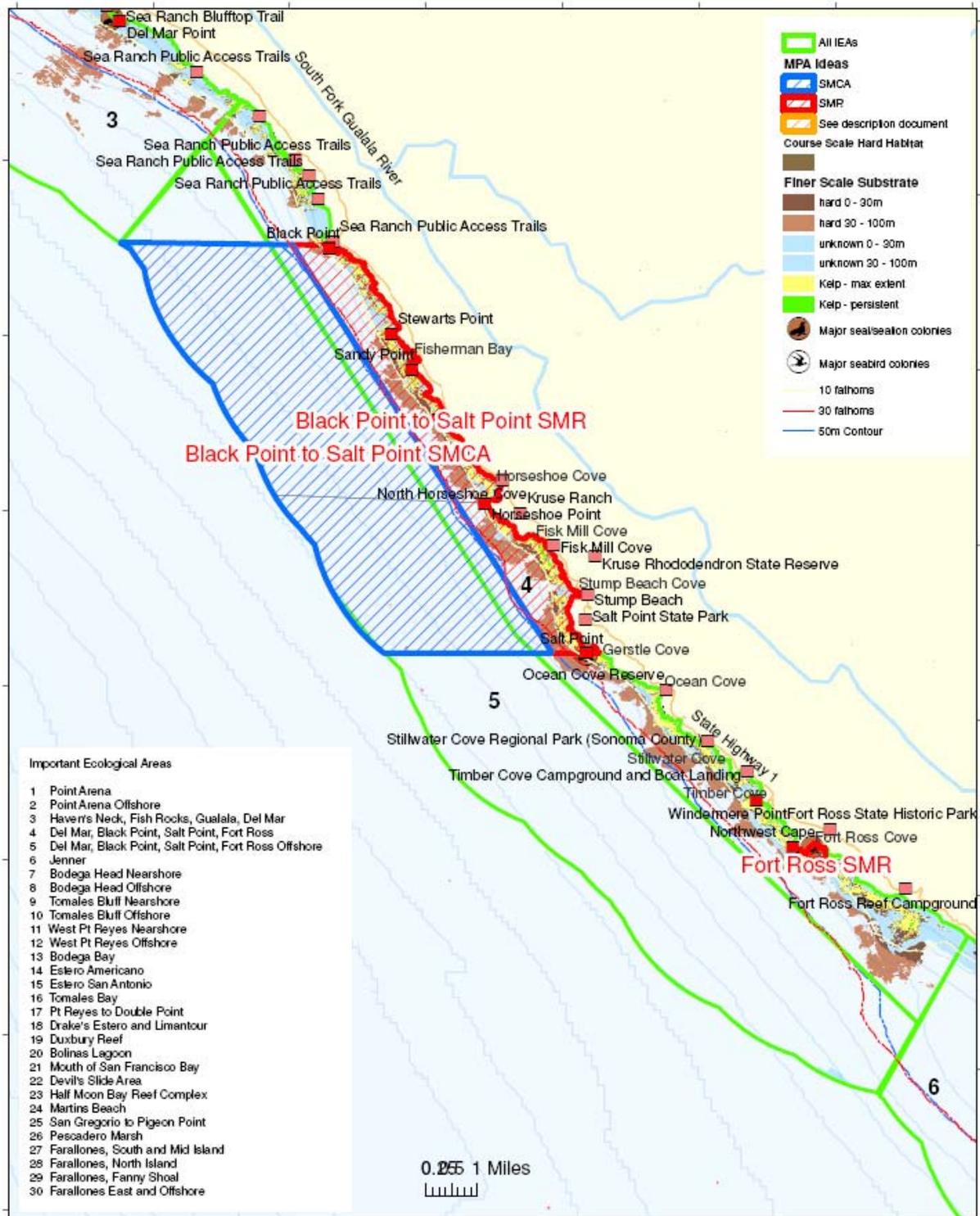


Figure 11: Jenner IEA and possible MPA: Forage protection, no disturbance and improve water quality.

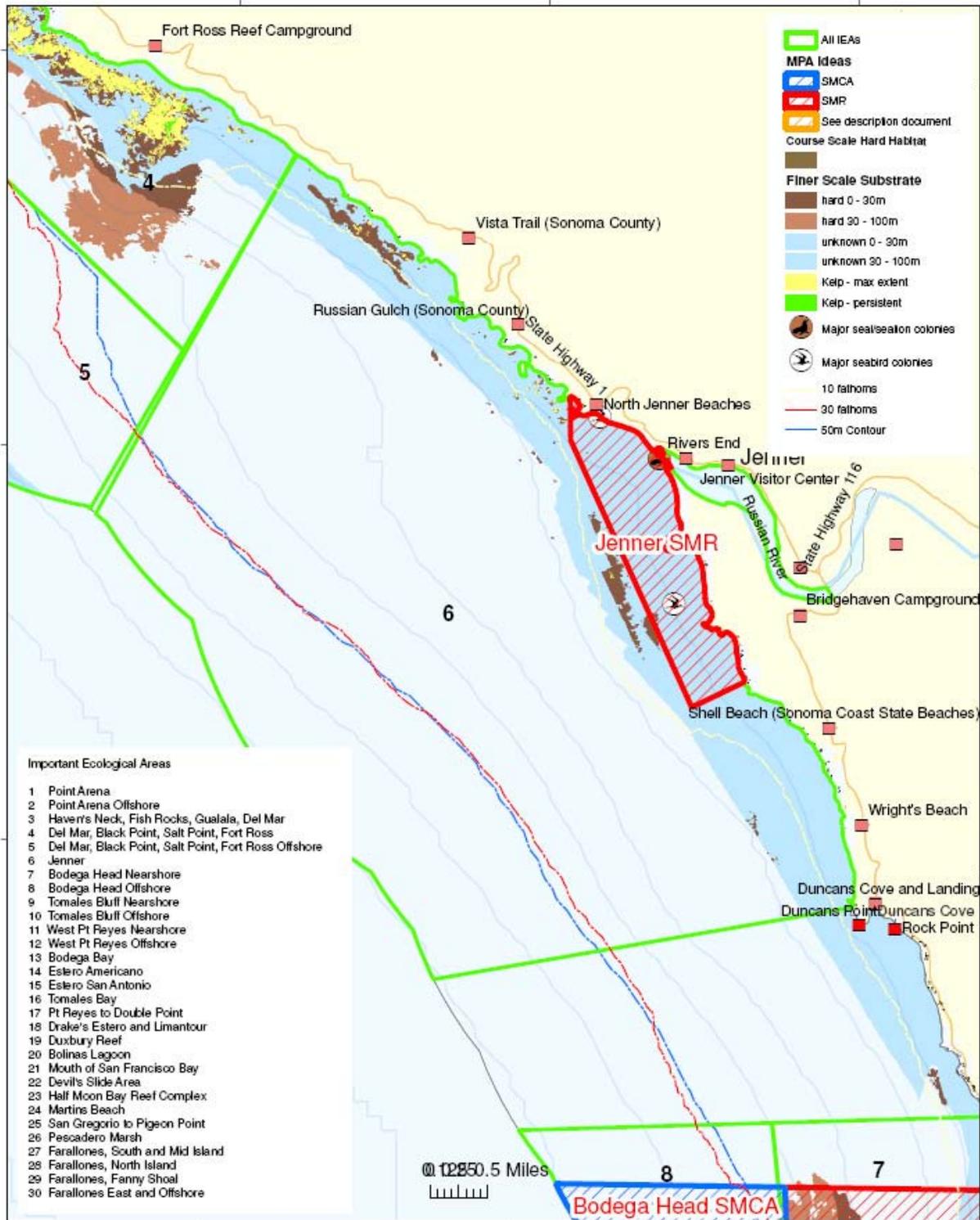


Figure 12: Bodega Head and Tomales Bluff IEAs and possible MPAs: Groundfish, benthic invertebrate, habitat and forage protection and no disturbance; West Pt Reyes IEAs: Groundfish, benthic invertebrate and habitat protection; Bodega and Tomales Bay, Estero Americano and San Antonio IEAs: Groundfish, habitat protection and improve water quality

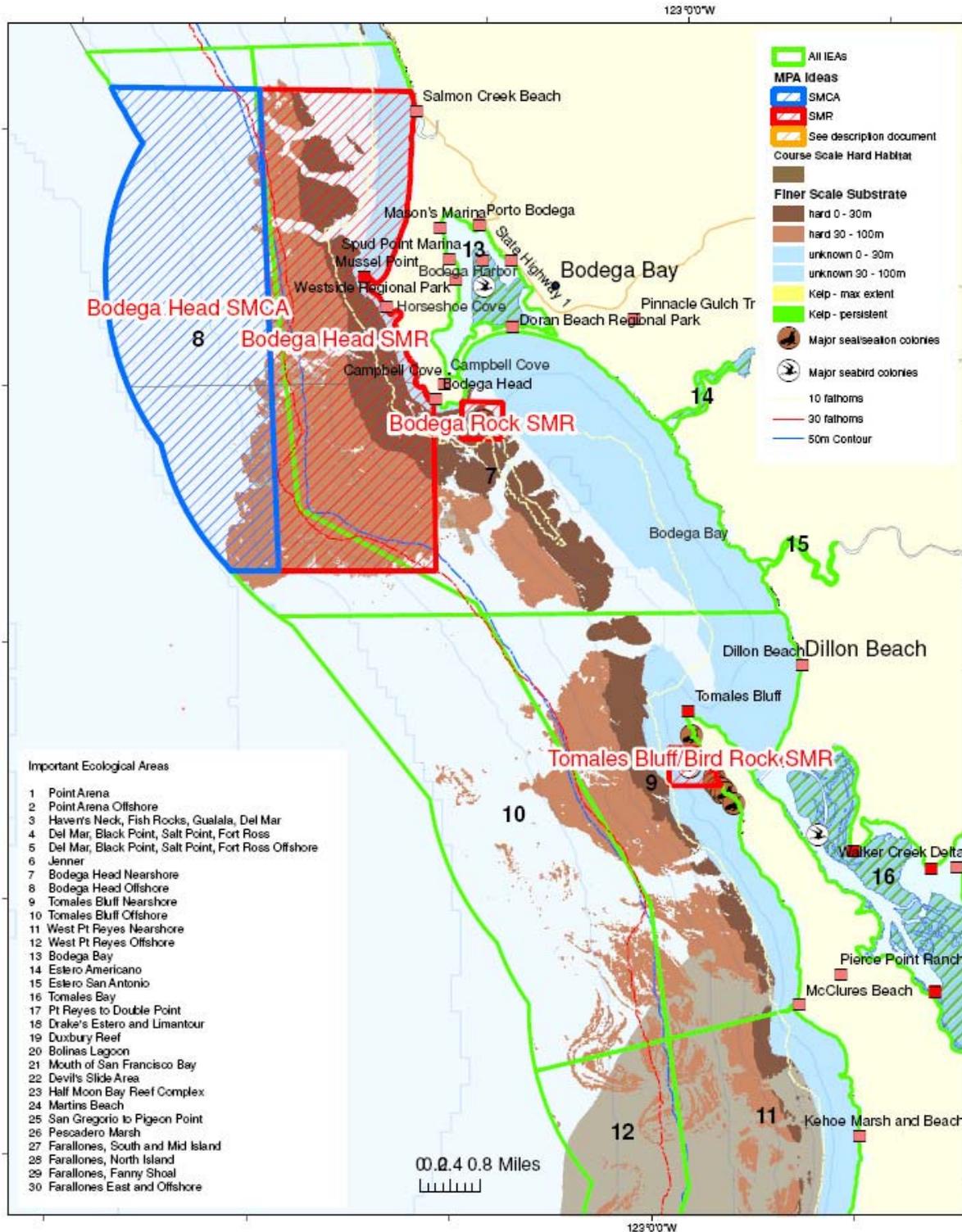


Figure 13: Point Reyes, Drakes Bay and Double Point IEAs and possible MPAs: Forage protection and no disturbance; Drakes Bay and Limantour IEA, Groundfish, benthic invertebrate, habitat and forage protection.

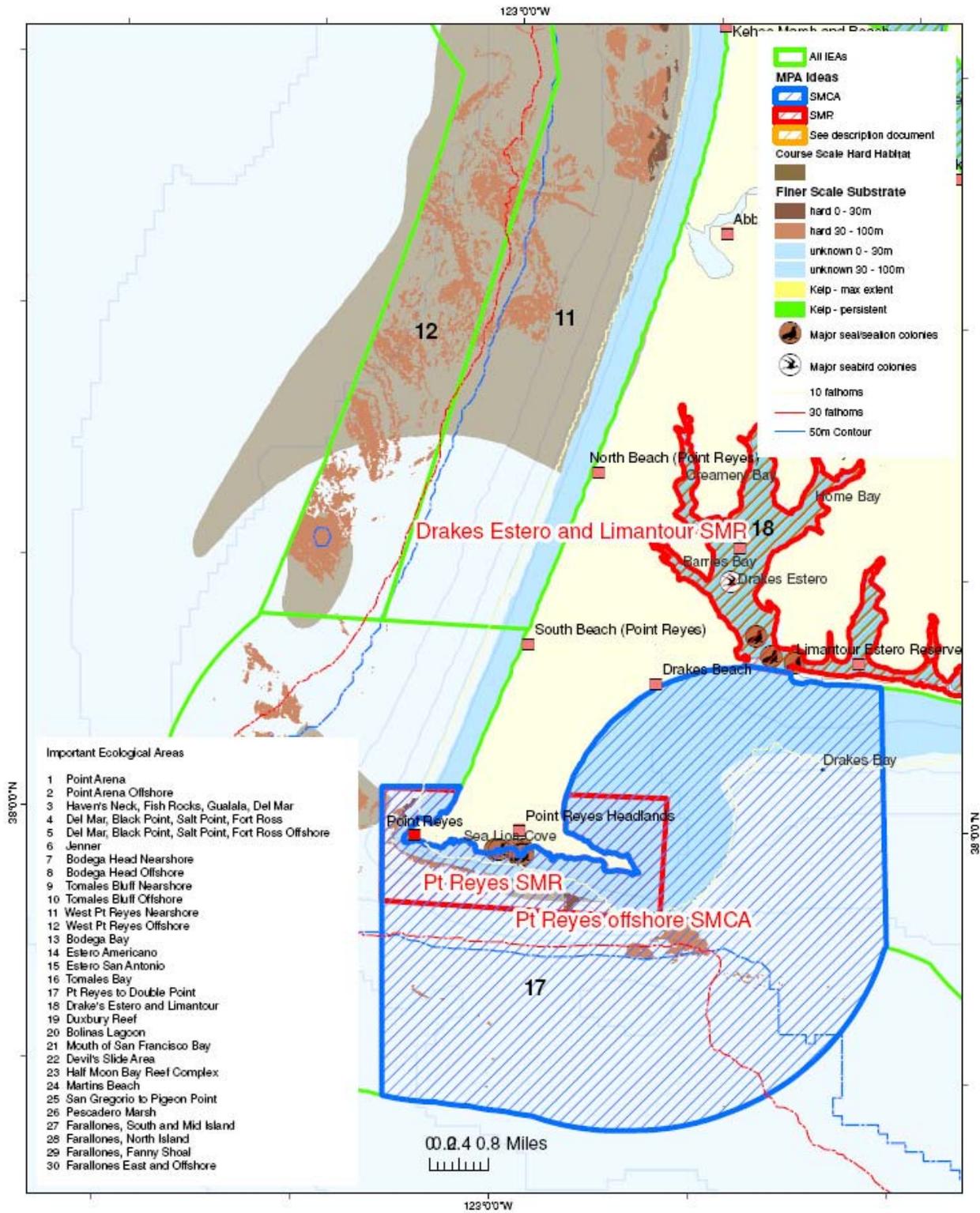


Figure 14: Duxbury IEA: Groundfish, benthic invertebrate and habitat protection; Bolinas Lagoon IEA: groundfish and habitat protection and improve water quality

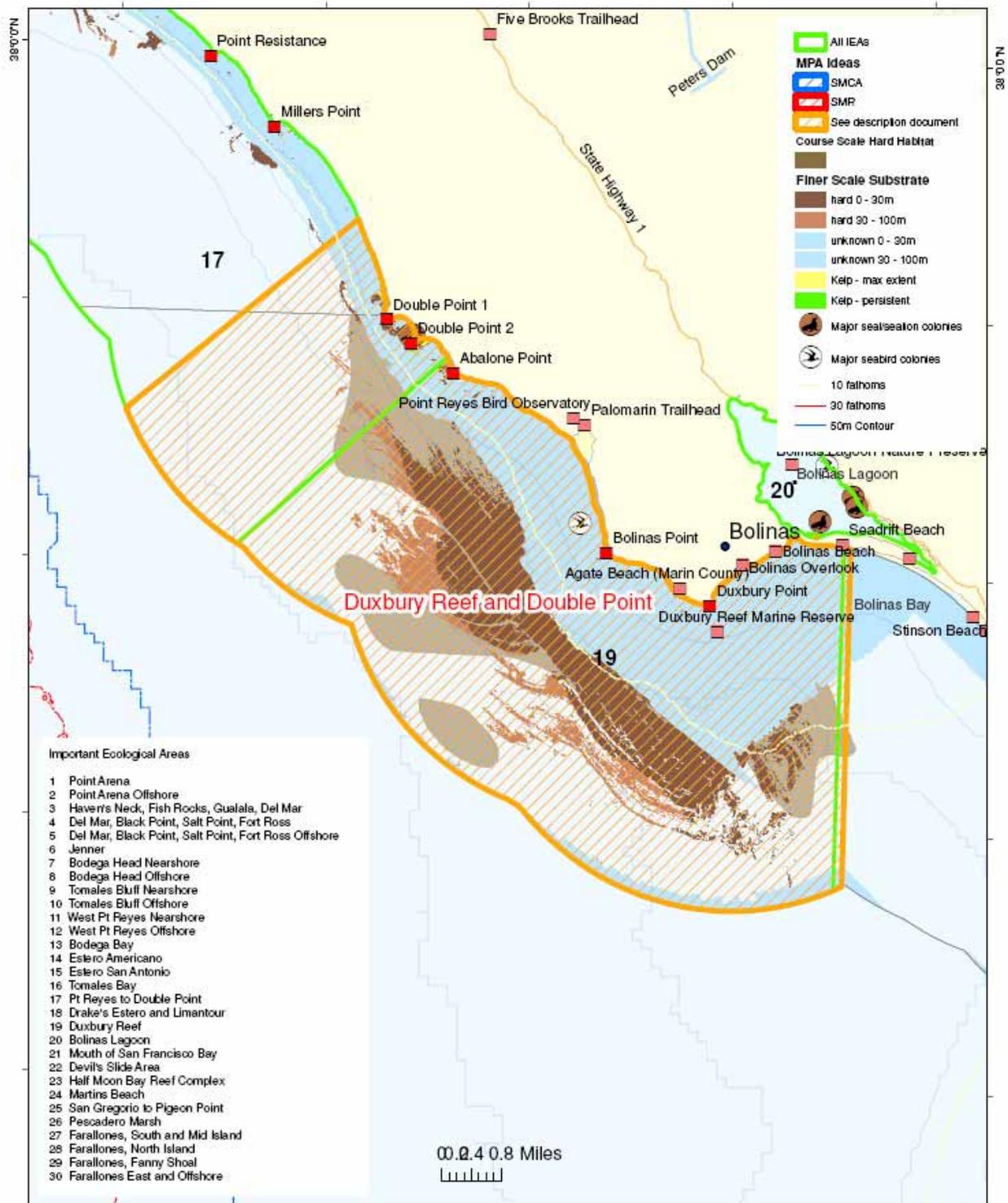


Figure 15: San Francisco Bay Mouth IEA: Forage protection and no disturbance.

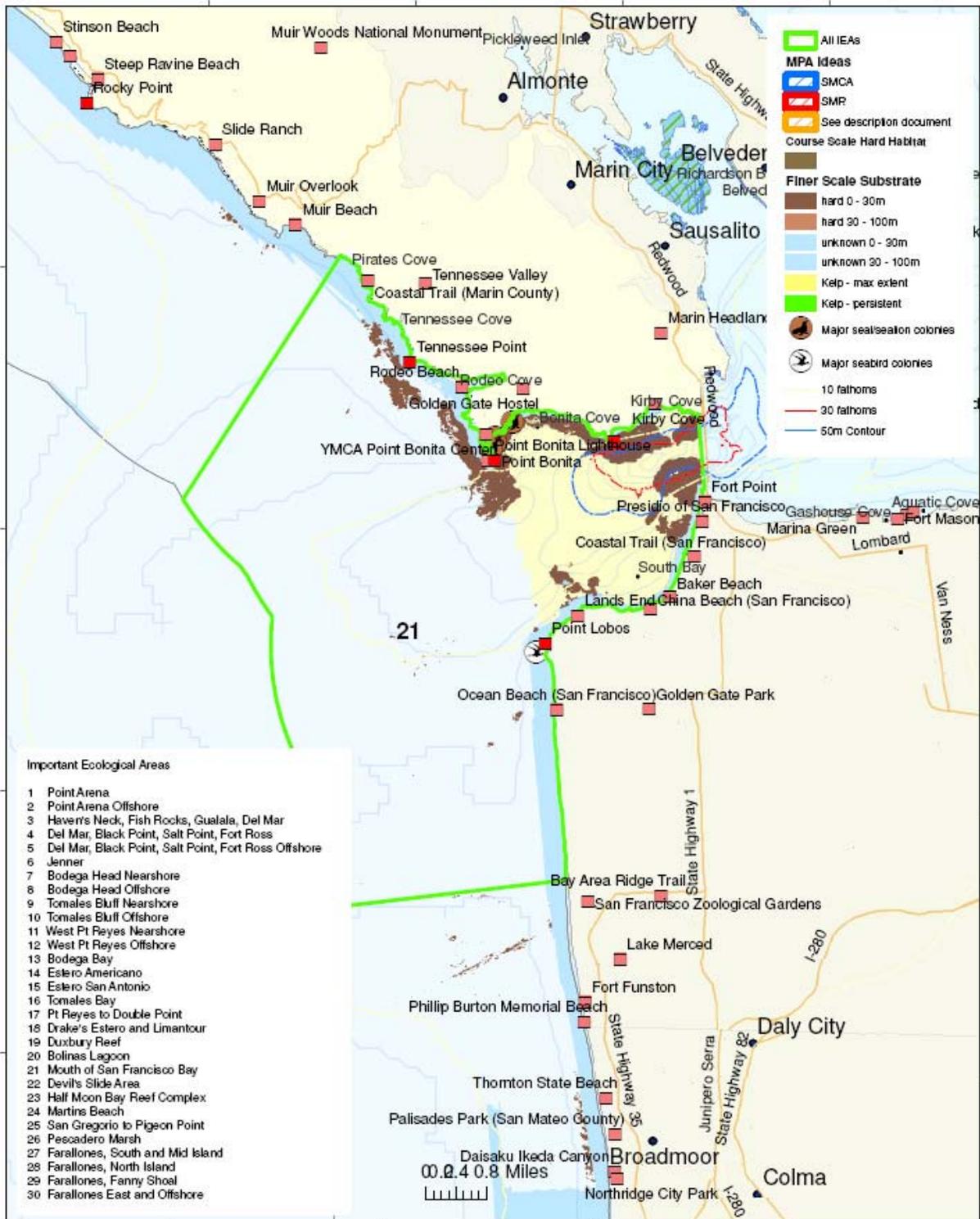


Figure 16: Devil's Slide IEA and possible MPAs: Forage protection and no disturbance; Half Moon Bay Reef complex IEA and possible MPAs: groundfish, invertebrate and habitat protection; Martin's Beach IEA: Forage protection; San Gregorio to Pescadero IEA: Groundfish, benthic invertebrate, habitat, and forage protection and no disturbance.

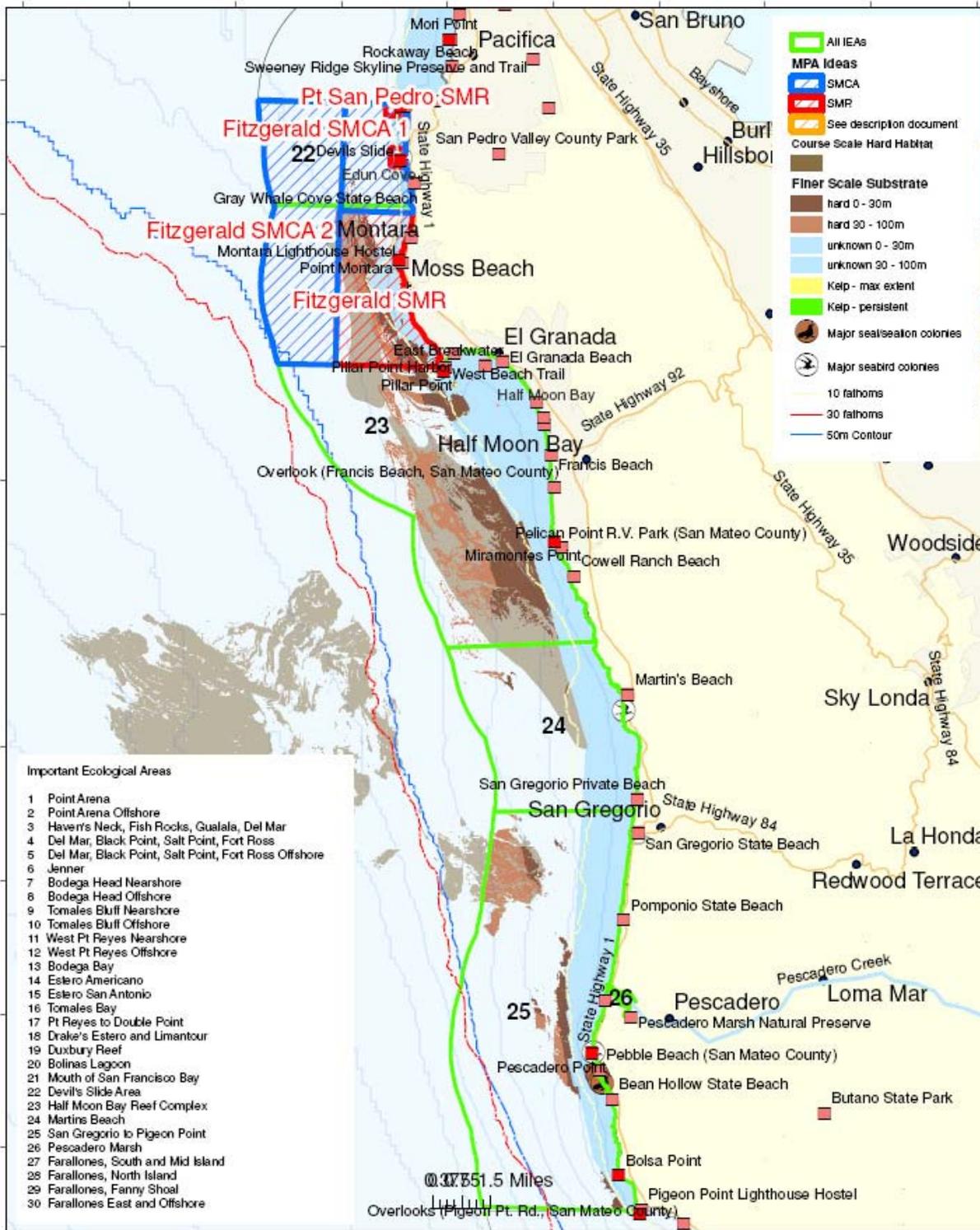
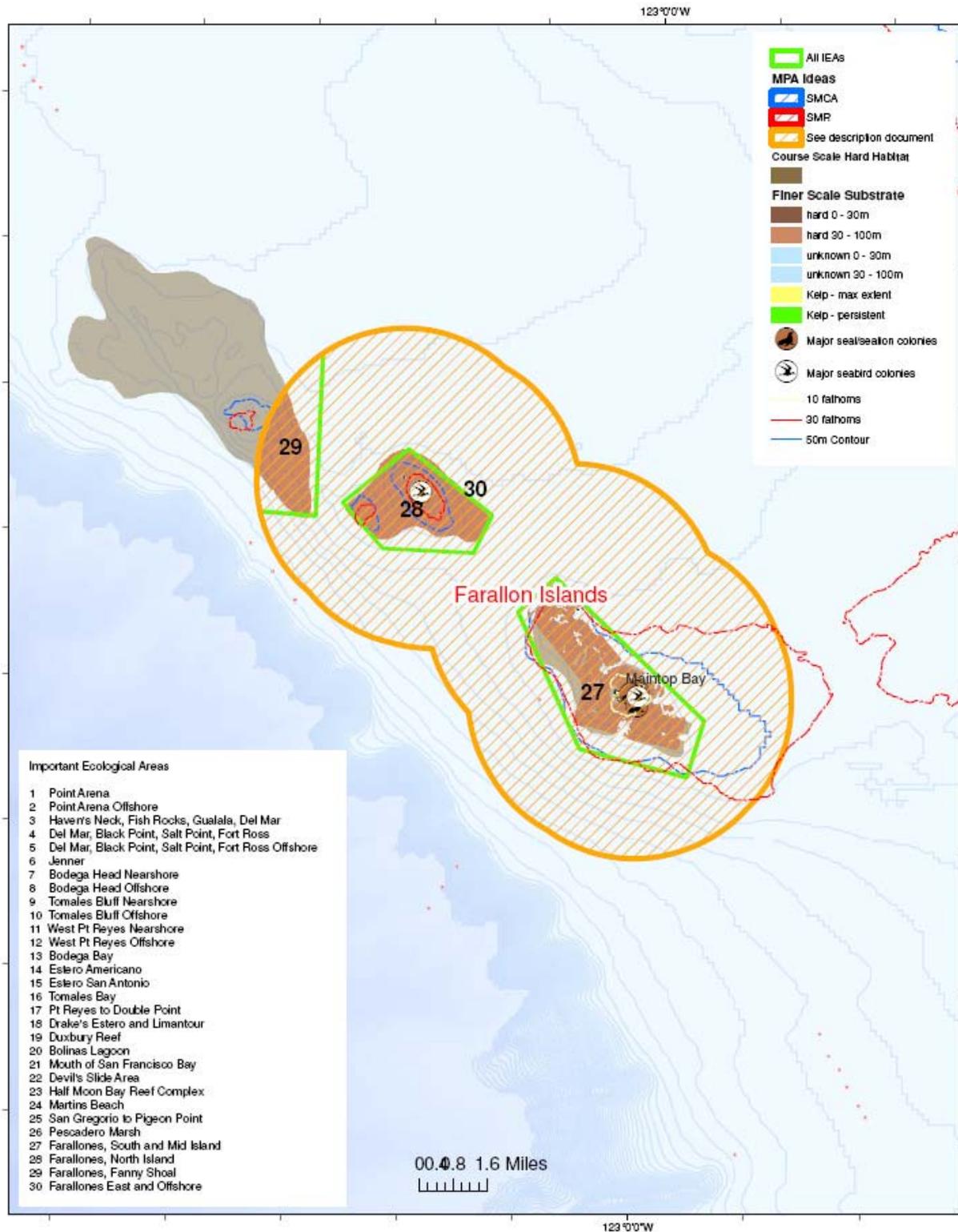


Figure 17: Farallon Islands IEAs: Groundfish, benthic invertebrate, habitat and forage protection and no disturbance



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