

California Marine Life Protection Act (MLPA) Initiative

**Evaluation of Existing Central Coast
Marine Protected Areas**

DRAFT, v. 2.0

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EXECUTIVE SUMMARY

The Marine Life Protection Act (MLPA) requires the evaluation of existing Marine Protected Areas (MPAs) to assess the need for modification of those MPAs or the addition of new MPAs in the region to meet the requirements of the Act. This draft evaluation of existing MPAs in the Central Coast study region (Pigeon Point to Point Conception) provides information to assist the Central Coast Regional Stakeholder Group in developing recommendations for changes to existing MPAs and developing proposals for new MPAs. The Central Coast study region has 12 existing state MPAs and 1 existing state Special Closure area, all of which together encompass 3.8% of the total area of the study region. Five of these MPAs are state marine reserves, which encompass 0.66% of the total area in the study region. Only the state marine reserves provide protection for finfish populations, all other areas allow take of finfish species.

This draft evaluation of existing MPAs is based on readily available information and includes:

- A narrative description of each existing MPA and special closure. There are 5 state marine reserves, 7 state marine conservation areas, 1 special closure, and no state marine parks in the study region (Section 2.0).
- An evaluation of the amount of representative habitats of the Central Coast in existing MPAs and the extent to which existing MPAs meet the Central Coast regional goals, objectives, and design considerations are provided in an evaluation matrix (Appendix I).
- A gap analysis of levels of protection of representative and unique habitat types in different types of MPAs (Section 3.0 and Appendix II).
- A preliminary assessment of other types of closure areas that limit fishing activity or are closed to public access, such as selected fishery closures and powerplant and military security zones, that may offer habitat and species protections that are similar to MPAs (Section 4.0 and Appendix III).
- A summary evaluation of existing MPAs and other types of closures (Section 5.0).

The 12 existing MPAs and one Special Closure in the Central Coast study region encompass approximately 43.0 mi² (32.5 km²) of water surface area. While they are spread along much of the study region's coastline, there are notable gaps between Morro Bay and Big Creek in the south and between Elkhorn Slough and Pigeon Point in the north (with the exception of the special closure at Año Nuevo). A wide array of habitats is included to varying extents, though deeper water habitats are generally not represented (especially deeper than 100m) and many habitats are poorly represented. The following summarizes the results of the gap analysis evaluating the amount of each habitat in the study region and the amount represented in existing MPAs:

- **Intertidal Zone:** The intertidal zone includes sandy beaches, rocky intertidal, coastal marsh, and tidal flats mapped as linear segments along the coast. In many places more than one intertidal shoreline type is present, therefore total amount of all shoreline types may add up to more than 100% of the Central Coast study region coastline.
 - **Sandy beaches** compose 52.3% of the shoreline length of the study region (224 mi or 195 km of coastline) and are represented at 11% of their total length in existing MPAs, with only about 2% of the total in state marine reserves.

- **Rocky intertidal shores and cliffs** compose 48.9% of the shoreline length of the study region (209 mi or 182 nm of coastline) and are represented in existing MPAs at 15% of their total amount, with 8% in state marine reserves.
- **Coastal marsh and tidal flats:** These habitats compose 8.5% and 5.5% of the shoreline length of the study region (37 mi or 32 nm and 23 mi or 20 nm of coastline), respectively. Elkhorn Slough SMR is the only estuarine MPA and it captures 27% (linear measure) and 43% (areal measure) of the coastal marsh and 42% (linear measure) of the tidal flats in the region.
- **Estuaries:** There are 2 large and several small estuaries along the Central Coast. In terms of total area, approximately 7.9 mi² of estuarine environment has been mapped based on information from the National Wetlands Inventory, California Natural Diversity Database, and USGS topographic maps. Only 0.59 mi² of that area, or 7% occurs in an existing MPA (Elkhorn Slough SMR).
- **Seagrasses:** Eelgrass makes up only 0.1% of the area in the study region (1 mi² or 0.8 nm²), while surfgrass covers 37.7% of the study region's coastline (161 mi or 140 nm). Only about 1% of the region's eelgrass beds are in the existing estuarine MPA (Elkhorn Slough SMR). Twenty-two percent of mapped surfgrass beds present along the coastline in the shallow subtidal zone are found in existing MPAs, with 12.6% in state marine reserves.
- **Soft and hard bottom habitats:** Based on coarse scale data (which overestimates the amount of soft substrata), most of the study region (90.8%) is covered by soft bottom habitats (1034 mi² or 783 nm²), with 25.8% of the total area covered in the 0-30 m range (294 mi² or 223 nm²), 50.6% in 30-100 m range (576 mi² or 436 nm²), 5.1% in the 100-200 m range (58 mi² or 44 nm²), and 9.3% covered in the greater than 200 m range (106 mi² or 80 nm²). Hard bottom covers only 9.1% of the region (104 mi² or 79 nm²), with 4.1% in the 0-30 m range (47 mi² or 36 nm²), 2.4% in the 30-100 m range (27 mi² or 20 nm²), 1.2% in the 100-200 m range (14 mi² or 11 nm²), and 1.4% in the greater than 200 m range (16 mi² or 12 nm²). The coarse scale data shows that about 7% of the region's soft bottom habitat in the 0-30m range, 3% of the 30-100m range, and none of the deeper soft bottom habitat is in existing MPAs. Based on the more accurate but geographically limited fine-scale data, 5% of the *mapped* soft bottom habitat at 0-30m and <2% at 30-100m is in existing SMRs or SCMAs, and none of the deeper soft bottom habitat is within MPAs. For rocky bottom habitats, based on coarse-scale data, less than 5% of the 0-30m range, 2% of the 30-100m range, and none of the deeper rocky habitat is protected in existing MPAs. Based on the more accurate but geographically limited fine-scale data, 2-5% of the *mapped* hard bottom habitat at 0-30m and <2% at 30-100m is in existing SMRs or SCMAs, and none of the deeper rocky bottom habitat is within MPAs.
- **Kelp forests:** Giant and bull kelp abundance varies annually. Depending on the survey year, kelp beds make up 0.2% to 1.6% of the total regional area (2.5 mi² or 1.9 nm² to 18 mi² or 13.5 nm²). Kelp beds are represented inside existing MPAs at 7.7 -17% of the total amount.. In state marine reserves, the representation of kelp beds varies from 3.6 to 9% of the total. Approximately 13% of persistent kelp beds (present in 3 of 4 years) is

represented in existing MPAs; 3 state marine reserves have 6% of the total amount of persistent kelp beds (Hopkins SMR, Point Lobos SMR, and Big Creek SMR).

- **Pinnacles and submarine canyons:** Pinnacles were identified based on bathymetry for a portion of the study region; Big Creek SMR, Point Lobos SMR, and Carmel Bay SMCA all have pinnacles in the 0-30 and 30-100m depth zones. Submarine canyons make up 4.8% of the region's area (54 mi² or 41 nm²), covering 0.1% of the total regional area in the 0-30 m range (0.6 mi² or 0.5 nm²), 0.4% in the 30-100m range (4 mi² or 3 nm²), 0.5% in the 100-200 m range (6 mi² or 5 nm²), and 3.8% in the greater than 200 m range (43 mi² or 33 nm²). Most existing MPAs do not extend deep enough to include submarine canyon habitats (exceptions include Carmel Bay SMCA and Julia Pfeiffer Burns SMCA). Almost 33% of shallow (0-30m) canyon habitat and less than 2% of 30-100m canyon habitat are captured in these MPAs. Minimal amounts (<1%) of deep canyon habitat (>100m) are represented in existing MPAs.
- **Oceanographic habitats:** Oceanographic habitats have not been mapped. Relative to existing MPAs and based on qualitative information, freshwater plumes may occur at Elkhorn Slough SMR (Elkhorn Slough and nearby Salinas River), Carmel Bay SMCA (Carmel River), Big Creek SMR (Big Creek) and Pismo-Oceano SMCA (Santa Maria River). A larval retention area may occur in Carmel Bay SMCA, based on coastal geographic and current patterns. A few existing MPAs *may* overlap with upwelling features; these *may* include Año Nuevo Special Closure, Pacific Grove SMCA, Carmel Bay SMCA, Point Lobos SMR, Julia Pfeiffer Burns SMCA, Big Creek SMR, and Vandenberg SMR. However, since most of the existing MPAs do not extend far offshore or include deep water habitats, upwelling features in deep waters are not represented in existing MPAs.

Other types of spatial closure areas in the region were also evaluated. Within the Central Coast study region, the extent of the Rockfish Conservation Area (RCA) that is currently protected year-round from fishing activities that may impact overfished groundfish is approximately 45.0 mi² (34nm²); that is 2.0 mi² (1.5nm²) greater than the total area of all the MPAs in the Study Region. The portion of the RCA which restricts all types of fishing year-round lies between 587 and 886 feet (180 m and 270 m or 100 and 150 fathoms) of depth protecting groundfish species throughout much of the continental shelf/slope break. Though detailed habitat information is unavailable for most of this area, by definition the RCA includes all habitats within this depth range.

Diablo Canyon nuclear power plant security zone is small (1.85 mi² or 1.4nm²), but protects intertidal and nearshore rocky and soft habitats and some kelp forests from human access. The Vandenberg Air Force Base security zone is large (137 mi² or 104 nm²) but only Security Zone 4 offers year-round habitat protection as vessels are not permitted to stop (trolling is allowed); the other security zones (1-3 and 5-9) offer more limited habitat protections by limiting access for only short periods during military activities. Vandenberg Security Zone 4 is 31.87 mi² and protects intertidal and nearshore rocky and soft substrata and some kelp forests.

The evaluation of the extent to which each existing MPA contributes toward regional goals, objectives and design considerations shows that some MPAs are contributing more than others (Appendix I). While each of the MPAs contributes something toward meeting regional objectives, overall the existing MPAs display the lack of coherent planning and purpose that inspired the legislature to pass the MLPA. Of the areas with specific objectives noted for their establishment, most were designed to protect single species or groups of species. Though three MPAs were established with the intent of fostering scientific research and study in areas with little human impact (Hopkins SMR, Big Creek SMR, and Vandenberg SMR) all three are smaller than the minimum shoreline length recommended by the Science Advisory Team based on the ability of an area to be self sustaining. The Central Coast MPAs were established over a period of more than 30 years with no coordination among areas or long-term monitoring plan to evaluate their success. In addition, these MPAs lack effective management measures and thus the current array “creates the illusion of protection while falling far short of its potential to protect and conserve living marine life and habitat” (F&G Code Section 2851).

The existing array of MPAs along the Central Coast does not include representation of all habitat types within the region, provides ecosystem protection for only some nearshore habitats, and lacks coherent management. In addition, representative habitat types are not replicated within marine reserves as required by the MLPA. Based on the habitat gap analysis, improvements to this array are clearly possible. The overall goals and objectives of the region should be taken into consideration so that the combination of MPAs, other management, and non-MPA restrictions meet the requirements of the MLPA.

1.0 INTRODUCTION

The Marine Life Protection Act (MLPA) requires an analysis of the region's existing state marine protected areas (MPAs) to assess the need for changing boundaries or management of existing MPAs or the creation of new MPAs to fulfill the requirements of the Act. An MPA, according to California State law, is a discrete geographic area that has been designated by law, administrative action, or voter initiative to protect or conserve marine habitat and life. This evaluation focuses on the Central Coast study region (Central Coast, or region), extending from Pigeon Point to Point Conception in state waters. The Central Coast study region has 12 existing state MPAs and 1 existing state Special Closure area that together encompass 3.8% of the total area of the study region (Table 1, Map 1). For the purpose of this analysis, the Special Closure will be treated as an MPA. There are 5 state marine reserves, 7 state marine conservation areas, 1 special closure, and no state marine parks in the study region. Only the state marine reserves, which encompass 0.66% of the total area in the study region, provide protection for finfish populations, all other areas allow take of finfish species.

Preliminary site characterizations and evaluations of existing MPAs in the region were conducted by the California Department of Fish and Game (Department) in early 2005 (CDFG 2005a) and included as an appendix to the Central Coast Regional Profile (MLPA Initiative 2005). Those preliminary evaluations were refined, and included in Section 2.0 of this document. In addition, the extent to which existing MPAs meet the Central Coast regional goals, objectives, and design considerations; and the guidelines in the MLPA and Master Plan Framework (CDFG 2005b) were assessed. Results of the evaluation of each existing MPA are provided in an evaluation matrix included as Appendix I. While there has not been focused monitoring of the state's MPAs in the study region, some existing monitoring programs do have sites inside Central Coast MPAs (Table 2).

A gap analysis is an evaluation of the amount of each habitat type in protected areas relative to the total amount in a region, and helps to identify habitats that are underrepresented in protected areas (National Gap Analysis Program, 1994). A gap analysis was conducted to determine the extent to which existing MPAs capture representative and less common habitats of the Central Coast study region; results are provided in Appendix II and described in Section 3.0.

In addition, this evaluation provides a preliminary assessment of other types of closure areas that limit fishing activity or are closed to public access, such as selected fishery closures and powerplant and military security zones, that may offer habitat and species protections that are similar to that afforded by MPAs (Section 4.0). An analysis of the amount of each habitat type in these other types of closure areas was conducted (Appendix III); further evaluation of the contribution of these other closure areas toward regional goals, objectives, and design considerations is still underway.

Based on the evaluation of existing MPAs and the gap analysis, a summary evaluation of the effectiveness of existing Central Coast MPAs and their contribution toward regional goals and objectives, and design considerations, is provided (Section 5.0). From this summary evaluation,

recommendations for modifications to existing Central Coast MPAs will be made based on input from the Central Coast Regional Stakeholder Group (CCRSG).

Both the evaluation of existing MPAs and the gap analysis relied on readily available data, including Geographic Information System (GIS) mapped data, published and unpublished reports, and personal communication with some individuals familiar with these sites.

It is important to note that existing spatial data for habitats are of variable quality, resolution, and spatial extent depending on the habitat type and portion of the region. For example, accurate seafloor mapping to identify fine-scale substrata types (rocky or soft-bottom) has only been conducted in about 25% of the region and for some existing MPAs; coarse-scale substrata data are available for most of the region, but this dataset under-represents the amount of rocky habitat. Caveats on data quality are provided as notes, where possible.

Table 1: Shoreline Length and Area of Existing State MPAs in the Central Coast Study Region

MPA NAME	Level of Protection	Shoreline Length (mi)	Area (mi²)	Percentage of Total Study Region Area
Special Closure: Año Nuevo Invertebrate Area	Seasonal invertebrate closure	5.52	2.20	0.19%
Elkhorn Slough State Marine Reserve	No-take estuarine area	3.16	1.35	0.12%
Hopkins State Marine Reserve	No-take marine area	0.52	0.16	0.01%
Pacific Grove State Marine Conservation Area	Invertebrate closure	3.45	1.53	0.13%
Carmel Bay State Marine Conservation Area	Invertebrate and commercial finfish closure	3.11	2.79	0.24%
Point Lobos State Marine Reserve	No-take marine area	1.96	1.19	0.10%
Julia Pfeiffer Burns State Marine Conservation Area	Limited invertebrate closure	2.07	2.65	0.23%
Big Creek State Marine Reserve	No-take marine area	2.19	2.26	0.20%
Atascadero Beach State Marine Conservation Area	Pismo clam closure	1.61	6.32	0.55%
Morro Beach State Marine Conservation Area	Pismo clam closure	1.96	6.81	0.59%
Pismo State Marine Conservation Area	Invertebrate closure	0.38	0.08	0.01%
Pismo-Oceano Beach State Marine Conservation Area	Pismo clam closure	3.80	13.28	1.16%
Vandenberg State Marine Reserve	No-take marine area	3.68	2.47	0.22%
Total for State Marine Reserves		11.50	7.43	0.65%
Total for State Marine Parks		0.00	0.00	0%
Total for State Marine Conservation Areas		16.33	33.46	2.91%
Total for all State MPAs in Central Coast		33.35	43.09	3.76%
Total for Central Coast Study Region		approximately 427 mi	1148.46	

Table 2: Monitoring Sites in Existing MPAs

Monitoring Category	Año Nuevo Special Closure	Elkhorn Slough SMR	Hopkins SMR	Pacific Grove SMCA	Carmel Bay SMCA	Point Lobos SMR	Julia Pfeiffer Burns SMCA	Big Creek SMR	Atascadero Beach SMCA	Morro Beach SMCA	Pismo SMCA	Pismo-Oceano SMCA	Vandenberg SMR
Intertidal Monitoring			PISCO		PISCO	PISCO	PISCO						DFG
Subtidal Monitoring	PSRF	PSRF	PISCO/DFG		PISCO	PISCO	PISCO	PISCO/DFG					
Other Monitoring	PRBO	ESNERR											

2.0 EVALUATION OF EXISTING MPAs

The purpose of the evaluation of existing MPAs is to assess the overall effectiveness and the extent to which Central Coast MPAs contribute to regional goals, objectives, design considerations, and habitat protection requirements of the MLPA. This evaluation of existing MPAs includes (1) a narrative description of each MPA (a refinement of CDFG 2005a) and (2) a matrix characterizing each MPA by amount of habitats present; size, depth range, and spacing; and the extent to which it contributes to each of the regional goals, objectives and design considerations developed by the CCRSG (see Appendix I). Information from spatial data sources, unpublished and published reports, and personal communication with local experts was compiled for each existing MPA. A list of published and unpublished documents related to the existing MPAs is provided in the reference list.

2.1 Año Nuevo Special Closure

Year established: 1976

Approximate area: 2.20 mi² (1.66nm²) (GIS)

Approximate depth range: 0 - 33 ft (0-10 m) (GIS)

Approximate shoreline length: 7.00 mi (6.09 nm)

Approximate alongshore span: 5.52 mi (4.80 nm) (Nautical Chart)

Habitat types: Sandy and rocky intertidal, tidal flats, surfgrass, bull kelp forest, as well as soft and hard bottom to approximately 10 m of depth. Intertidal geologic formations include sandstone, siltstone and mudstone of the Vaqueros formation, the Monterey formation, Santa Cruz mudstone, and the Purisma formation (Intertidal SWAT team, 2005). Tube worm (*Dodecaceria fewkes*) reefs present. Tidal flats in the lee of Año Nuevo Island have species similar to Elkhorn Slough. Major upwelling location, especially on south side of island (John Pearse pers. comm.).

Surrounding habitat types: Franklin Point to Pigeon Point is comparable to Año Nuevo. More bull kelp occurs between Año Nuevo and Scott Creek.

Summary of existing regulations: Take of invertebrates is not allowed within the boundaries of Año Nuevo State Reserve between the high tide mark and 100 feet beyond the low tide mark between November 30 and April 30 (California Code of Regulations, Title 14, Section 632(b)(27)(A)1). Overlapping regulations include: Monterey Bay National Marine Sanctuary,

Restricted Overflight Area, Prohibited Shark Attraction Area, and Año Nuevo Point and Island Areas of Special Biological Significance (Brown 2001).

Primary objectives: Prevent seasonal take of invertebrate species along boundary of Año Nuevo State Reserve. Protect Elephant Seals from human disturbance.

Existing enforcement: Adjacent to Año Nuevo State Reserve. Regulations are enforced by on-site State Park rangers. Park rangers give tickets to individuals who are caught violating regulations. Park volunteer naturalists (docents) are trained to report any violations to park rangers. In addition, park rangers may call Department wardens for assistance with violations occurring offshore. The offshore boundary for this MPA is defined by distance from shore which is not the preferred boundary description, though may be appropriate if intertidal invertebrate protection is the only desired objective.

Important species present: Elephant seals (haulout, roosting, foraging), bull kelp, tube worm (*Dodecaceria fewkes*), black oystercatchers, red and black abalone, (CCRSG), harbor seals, marbled murrelets, fat innkeeper worms (John Pearse pers. comm.).

Human Use patterns: Tourists come to see elephant seals. Historic abalone diving until take was prohibited in all waters south of San Francisco, historic clamming location. Not much diving due to murky water and presence of great white sharks. Popular sport-fishing location (John Pearse pers. comm.).

Baseline and ongoing monitoring and research studies: From the 1970's to the 1990's, species richness has increased (though less than other locations) (John Pearse pers. comm.). Monitoring for birds, marine mammals, forage studies (PRBO) and shark studies/tagging have been done in the area by PSRF.

Public Access: Access to Año Nuevo Island is prohibited. Access limited on beaches where seals are present. Allowed to access area by boat. Restrooms, water, and picnic tables available. Located 23 miles (20 nm) from Santa Cruz, the closest significant population center.

Basic Evaluation: Some modification to Año Nuevo may be needed to better align it to the goals of the MLPA. The special closure protects some species within a very unique habitat in the Central Coast. However, the existing closure does not meet the Science Advisory Team guidelines with regard to size and offshore extent, limits protection to invertebrates, and does not provide year-round protection.

2.2 Elkhorn Slough State Marine Reserve

Year established: 1980

Approximate area: 1.35 mi² (1.02 nm²) (GIS)

Approximate depth range: 0 to 20 ft (0-3 m) (GIS)

Approximate shoreline length: 19.22 mi (16.71 nm)

Approximate alongshore span: 3.16 mi (2.75 nm) (Nautical Chart)

Habitat types: Coastal marsh, tidal flats, eelgrass, surfgrass, open water estuarine, and subtidal soft bottom habitats. One of two large estuaries in the study region.

Surrounding habitat types: The SMR is located within the larger Elkhorn Slough which contains newly-formed clay soils derived from a mostly agricultural watershed. The main channel extends 6.2 miles (10km) inland from the bay and ranges from 5 to 25 feet (1.5 to 7.5 m) depth (Caffrey 2002).

Summary of existing regulations: No take is allowed both through State regulations and designation as a Federal National Estuarine Research Reserve. The SMR is located within the larger National Estuarine Research Reserve (NERR).

Primary objectives: This area was originally designated as an ecological reserve. Fish and Game Code Section 1580 (ecological reserves) states that "the policy of the state is to protect threatened or endangered native plants, wildlife, or aquatic organisms or specialized habitat types, both terrestrial and non-marine aquatic, or large heterogeneous natural gene pools for the future use of mankind through the establishment of ecological reserves." Although the language does not specifically refer to ecological reserves in marine areas, the Fish and Game Commission has extended this policy to those areas. The Elkhorn Slough Ecological Reserve was established to protect sensitive salt marsh, mudflat, and open water habitats, and to provide a quality, undisturbed estuarine site for education, restoration, research and monitoring.

Existing enforcement: Some of the SMR is well enforced because it is easily-observed and has a Department of Fish and Game facility on site. Enforcement is less feasible on more remote parts of the NERR, and low levels of fishing occur especially from areas off the railroad tracks. Nearby protected areas with limited access include wetlands owned by The Nature Conservancy (Azevedo Ponds, Porter Marsh, northwestern marshes), Elkhorn Slough Foundation (Moro Cojo), and California State Parks (North Moss Landing / Jetty Road) (Wasson pers. comm.). A docent program for the SMR exists.

Important species present: Salt marsh is present in the NERR, but much of what was historically present in this area was lost due to subsidence during periods of diking where marsh was converted to agricultural uses. The NERR harbors some of the largest remaining ghost shrimp aggregations and native oyster beds in the estuary. Its shallow warm waters are used by several species of sharks and rays, some of which give birth here. The mudflats of South Marsh are used by moderate numbers of shorebirds at low tide; the North marsh lagoon is an important refuge and foraging site for shorebirds and other water birds at high tide, because it remains shallow. Brown pelicans frequent the channels and lagoons. Sea otters forage in the area and harbor seals haul out and pup on its mudflats (Wasson pers. comm.). Eelgrass can be found within the state marine reserve, though its abundance throughout the entire estuary has declined by more than 95% since the 1920s.

A great number of other species are represented in the entire Elkhorn Slough. The estuary has 559 species of invertebrates (Caffrey 2002) including the fat innkeeper worm (80% of subtidal biomass), horseshoe worms (*Phoronopsis viridis*) which are in danger of local extinction), gaper clam (*Tresus nuttallii*), bent-nosed clam (*Macoma nasuta*), moon snail (*Polinices lewisii*), sea hare (*Aplysia californica*), ghost shrimp (*Callinassa californiensis*), shore crabs (*Pachygrapsus crassipes* and *Hemigrapsus oregonis*), pea crabs (Pinnotheridae), amphipods, tannids, and polychaetes. There are at least 102 species of fish, including 16 species that use the slough as a spawning or nursery ground (e.g. northern anchovy, Pacific herring, cabezon, and 6 species of flatfish such as California halibut, English sole, Pacific sanddab, and others). Other fish include staghorn sculpin, black surfperch, bay pipefish, five species of gobies, topsmelt, jacksmelt, shiner surfperch, white surfperch, leopard shark, bat ray, American shad, mosquitofish, prickly sculpin, threestripe stickleback, striped bass speckled sanddab, leopard shark, and starry flounder (Yoklavich et al 2002). The American Bird Conservatory ranks Elkhorn Slough as a "Globally Important Bird Area" and 255 bird species have been recorded there. Sea lions, harbor porpoises, and juvenile gray whales use the estuary on an infrequent basis (Caffrey 2002).

Human use patterns: Within the NERR, approximately 60,000 visitors/year utilize interpretation facilities and shore access trails (including 10,000 students on school trips). Outside the NERR, approximately 300,000 visitors/year visit the beach at the Slough's mouth. Visitors travel the main channel daily on pontoon rides (Elkhorn Slough Safari) or by kayaks (about 50-150 rentals/summer day in Moss Landing). Recreational fishermen mostly use the Kirby Park dock (though also unauthorized sites in the NERR (Wasson pers. comm.)) and commonly catch: rubberlip surfperch, pile surfperch, black surfperch, jacksmelt, sand sole, staghorn sculpin, starry flounder, walleye surfperch, cabezon, bat ray, leopard shark, and round stingray in the slough area outside of the Elkhorn SMR. Harvesting of benthic invertebrates outside of the NERR and SMR targets the following species: gaper, Washington, littleneck clams, oysters, piddocks, and fat innkeeper worms and ghost shrimp (in mudflats near the Slough mouth) (Caffrey 2002).

Baseline and ongoing monitoring and research studies: ESNERR coordinates dozens of long-term monitoring programs. Most of these include many sites outside the MPA, to encompass the whole estuarine ecosystem. Water quality is monitored at 24 sites monthly and at 4 stations in situ every 30 min. Habitat change is monitoring using remote sensing and GIS analyses. Biological indicators that are monitored include macroinvertebrates, threatened amphibians, and shorebirds and waterbirds. ESNERR scientists also conduct short-term applied studies; current projects include an investigation of the threatened marsh-upland ecotone, of habitat differences in invertebrate invasion rates, and of estuarine assemblages responses to restrictions of tidal flow. Researchers from nearby universities (Moss Landing Marine Laboratories, University of California Santa Cruz, Stanford University) also regularly carry out projects at Elkhorn Slough. The Monterey Bay National Marine Sanctuary's Integrated Monitoring Program is currently funding a team of MLML researchers to monitor benthic and planktonic assemblage changes in Elkhorn Slough. ESNERR maintains a reference library and Endnote bibliography of all Slough research (Wasson pers. comm.). Numerous studies of the spatial and seasonal abundance of fish and shorebirds have also been conducted (Barry et al 1996, Yoklavich et al 1992, Yoklavich et al 1991, and Ramer et al 1991).

Public access: Numerous trails with access to estuarine habitats start at the ESNERR Visitor Center. Boat ramps are available outside of the NERR at the harbor and in Kirby Park. Kirby park has free parking for 50 vehicles and a portable restroom for the disabled (Linda McIntyre pers. comm.). Nearest population centers include Monterey 16.1 mi (14 nm) and Santa Cruz 21.9 mi (19nm).

Basic evaluation: With on-site presence of Department of Fish and Game as well as NOAA-funded staff, and with a history of baseline monitoring and research studies, the SMR functions well as one of the few protected estuarine areas in the state. The SMR itself is small, however, and does not encompass the entire estuary. The SMR represents some of the most degraded estuarine habitats in Elkhorn Slough, since most of them lie on the landward side of the berm constructed in the late 1800s for the still-active railroad line, providing an opportunity for landowners to fully remove these areas from tidal flow and claim them for agricultural purposes. Major restoration efforts are still needed within the SMR. Other portions of Elkhorn Slough that were never diked provide better representation of salt marshes, eelgrass, and intertidal mudflats that are rich with invertebrates and important for shorebirds at lowtide (Wasson pers comm.).

Other considerations: Elkhorn Slough wetlands have been dramatically altered and face continuing threats from hydrological alterations, including decreases in tidal influence due to diking and increases in tidal energy in undiked areas due to the creation and maintenance of an artificially deep, wide, and permanent mouth in line with the main channel and the Monterey

Canyon, required to accommodate Moss Landing Harbor. Elkhorn Slough also faces intense pollution, mostly from adjacent agricultural lands. Extremely high nutrient-loading has been regularly documented, as well as high pesticide levels. The invertebrate communities of Elkhorn Slough are heavily invaded; about 60 non-native invertebrates have been documented, and some of them are amongst the most common species encountered (Wasson pers comm.). Duke Energy's natural gas-fired power plant is located near the mouth of slough, and planktonic organisms are entrained into the cooling system (the intake is in Moss Landing Harbor). Tidal scouring in Elkhorn Slough has become a concern since Moss Landing Harbor was built in 1946, exposing the estuary to tidal flushing (Caffrey 2002).

2.3 Hopkins State Marine Reserve

Year established: 1984

Approximate area: 0.16 mi² (0.12 nm²) (GIS)

Approximate depth range: 0 to 60 ft (18.3 m) (GIS)

Approximate shoreline length: 0.79 mi (.69 nm)

Approximate alongshore span: 0.52 mi (.45 nm) (Nautical Chart)

Habitat types: Sandy and rocky intertidal. Mostly granite reef with smaller portions of sand, especially on outside edge. Subtidal habitats include low and medium boulders and sand (CDFG 2005a). Many rock outcrops, ledges, and crevices with sand filling gaps between the rocks, especially below 3.3 ft (10 meters) (Pearse and Lowry 1974). Dominated by foliose red algae species. Giant kelp forest, surfgrass, and pinnacles present.

Surrounding Habitat types: Similar.

Summary of existing regulations: No take is allowed. Scientific collecting is allowed with a permit. Overlapping regulations include: Monterey Bay National Marine Sanctuary, Prohibited Shark Attraction Area, and Hopkins ASBS (Brown 2001).

Primary objectives: The primary purpose is to allow for research in an area that is free of disturbance due to exploitation.

Existing enforcement: The area is easily-observed from shore, well-known, marked on the seaward boundary by buoys, and faculty, staff, and students from the Hopkins Marine Station (HMS) are on site every day. Bay Net volunteers stationed nearby. The offshore boundary is defined by a depth contour which is not preferred by enforcement officials.

Important species present: Dominated by giant kelp, though bull kelp was more abundant in the 1970's, prior to the arrival of the sea otter (Pearse and Lowry 1974). Nearshore rockfish (gopher rockfish, black and yellow rockfish, kelp rockfish, and copper rockfish) were determined to be significantly larger (length) inside the reserve than outside the reserve. Other species include red and black abalone, China, black, blue, vermilion, and olive rockfish, sheephead, china, lincod, cabezon, and kelp greenling. Average fish density was 0.68 fish per 10m² in a study conducted from 1994-1996 (Estes and Paddock 2002). Many species of crabs and nudibranchs are present (Shargel pers. comm.). PISCO studies indicate that igneous, high relief habitats tend to have communities defined by rockfish and surfperch (PISCO 2003).

Human use patterns: Kayakers and non-extractive divers. Utilized by students and scientists from Hopkins Marine Station. Shoreline access is closed to the general public.

Baseline and ongoing monitoring and research studies: Numerous studies of algae, invertebrates, and fish have taken place. Long-term monitoring of the intertidal zone dates back to the 1930s, starting with the Hewitt Transect, a 1933 baseline study in the rocky intertidal

(CCRSG meeting 9/8/05). The Department carried out relatively intensive fish counts, and some re-monitoring of those counts has taken place. A recent study was completed comparing counts and sizes of benthic fishes in and adjacent to the MPA. REEF volunteers have done some surveys within this MPA. In addition, the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) has had permanent intertidal and subtidal monitoring sites here for several years.

Public access: Shoreline closed to the public by Hopkins Marine Station. Divers can access by boat (anchored outside the reserve).

Basic evaluation: The area contains one of the oldest fully-protected marine research sites in the state and contains a variety of shallow habitat types within a relatively small area. It is a classic example of how a small but fully protected MPA can function well by providing a multitude of research opportunities with populations of marine organisms occurring at natural densities and size frequencies. While it is relatively small, studies have documented significantly greater biomass and size frequencies of nearshore fishes compared with adjacent fished areas. The effectiveness of this MPA is demonstrated in a study by Estes and Paddock (2002), in which Hopkins SMR had significantly longer rockfish than similar sites outside of the reserve and a trend (not significantly significant) toward greater fish density. The modest differences between areas inside and outside of the reserve can be attributed to the reserve's small size, recent establishment, and light fishing pressure (Starr et al 2002). Pollard (1990) determined that red abalone densities are higher within the reserve than outside of it, even with the presence of sea otters.

2.4 Pacific Grove State Marine Conservation Area

Year established: 1984

Approximate area: 1.54 mi² (1.16 nm²) (GIS)

Approximate depth range: 0 to 60 ft (18.3 m) (GIS)

Approximate shoreline length: 4.47 mi (3.89 nm)

Approximate alongshore span: 3.45 mi (3.00 nm) (Nautical Chart)

Habitat types: Sandy and rocky intertidal. Mostly granite reef with smaller portions of sand, especially on outside edge. Rock reefs in deeper water outside of the MPA have been surveyed by researchers in submersibles. Giant and bull kelp forest, surfgrass, and pinnacles (one from 60ft to 30 ft) present.

Surrounding habitat types: Similar, except higher proportion of sand bottom offshore. Similar to Carmel Point (CCRSG).

Summary of existing regulations: Only the following species may be taken recreationally: finfish, and invertebrates other than mollusks or crustaceans. Only the following species may be taken commercially by ring net, lampara net, or bait net: sardines, mackerel, anchovies, squid, and herring. Scientific collecting prohibited south of Point Piños within the MPA. Overlapping regulations include Monterey Bay National Marine Sanctuary, Prohibited Shark Attraction Area, Asilomar State Beach, and Pacific Grove Area of Special Biological Significance (Brown 2001).

Primary objectives: Established by legislative action, the primary objective is to provide protection from exploitation for certain fishes and invertebrates.

Existing enforcement: The area is easily-observed from shore by law enforcement personnel as well as private citizens. The site is well-known, and benefits from an increased community

awareness of the need to protect marine resources. During daylight hours thousands of people pass by or visit the area on a daily basis. Pacific Grove is located in an urban area where the public can easily observe activities in the water from shore. Bay Net volunteers are stationed nearby (Gaffney and Shimek, pers. comm.). The offshore boundary for this MPA is defined by a depth contour which is not preferred by enforcement officials.

Important species present: An Acoel flatworm, *Polychoerus carmelensis* (which is endemic to the Monterey Peninsula and considered threatened/endangered (Pearse pers. comm.)), red and black abalone, sponges, sea cucumbers, moon snails, chitons, sea stars, large bull and giant kelp, cabezon, grass rockfish, California sheephead, kelp bass, kelp greenling, treefish (rare), vermilion rockfish, California halibut, pile surfperch, rubberlip surfperch, and juvenile canary rockfish are present within this MPA (CCRSO). PISCO studies indicate that igneous, high relief habitats tend to have communities defined by rockfish and surfperch (PISCO 2003). Kelp studies conducted between 1999 and 2002 revealed that kelp forests off the Monterey Peninsula consisted of approximately 87% giant kelp and 13% bull kelp, though abundances varied widely (PISCO 2004).

Human use patterns: Adjacent offshore area popular for charter dive boats. MPA area used by non-consumptive scuba divers for calm and rough water diving (also for dive training), tidepoolers, kelp harvesters, recreational shore, skiff, and spear fishermen, and occasional commercial fishermen for pelagic species.

Baseline and ongoing monitoring and research studies: Many researchers from the Department and several academic institutions have conducted life-history studies, recruitment studies, and tagging studies in this region. Tenera Environmental completed a study in 2003 which investigated the effects of visitor use on the intertidal area and established baseline levels for the more common intertidal species (Tenera 2003). Submersible studies of deeper-water fishes have also been carried out offshore of this site. Many REEF surveys have been conducted at this site.

Public access: Accessible tidepools with adjacent parking, easy access for beach diving. Located adjacent to the urban center of Monterey.

Basic evaluation: The area presently offers some resource protection since regulations prohibit commercial finfishing (except for pelagic species) and allow the harvest of only certain invertebrates. The presence of sea otters precludes the harvest of most species of invertebrates permitted for take (e.g. sea urchin). This MPA does not meet the SAT guidelines for offshore extent. However, the area does function well as an MPA by providing recreational opportunities, allowing a low but sustainable level of kelp and recreational finfish harvest, and providing a safe and local site for scientific collecting for research and public education. This area contains extensive intertidal and subtidal reef habitat and provides easy access to intertidal areas from shore. It also provides a source of kelp for local aquaculture businesses.

2.5: Carmel Bay State Marine Conservation Area

Year established: 1976

Approximate area: 2.79 mi² (2.11 nm²) (GIS)

Approximate depth range: 0 to 203 ft (61.9 m) (GIS)

Approximate shoreline length: 5.73 mi (5.0 nm)

Approximate alongshore span: 3.11 mi (2.70 nm) (Nautical Chart)

Habitat types: Granite reef along rocky and sandy shores; extensive areas of sand offshore; granite pinnacles present; head of Carmel submarine canyon. Surfgrass and giant and bull kelp forest present.

Surrounding habitat types: Similar, except for the submarine canyon, which has greater depths than in the MPA.

Summary of existing regulations: Take of all living marine resources is prohibited except the recreational take of finfish by hook-and-line or spear and the commercial take of kelp under specific conditions. Overlapping regulations include: Monterey Bay National Marine Sanctuary, Restricted Overflight Area, Prohibited Shark Attraction Area, Carmel River State Beach, California Sea Otter Game Refuge, Carmel Bay Area of Special Biological Significance. Adjacent to Carmel River State Beach. Carmel Bay SMCA also partially overlaps with a portion of the year-round, all gear rockfish conservation area (RCA).

Primary objectives: This area was originally designated as an ecological reserve. Fish and Game Code Section 1580 (ecological reserves) states that "the policy of the state is to protect threatened or endangered native plants, wildlife, or aquatic organisms or specialized habitat types, both terrestrial and non-marine aquatic, or large heterogeneous natural gene pools for the future use of mankind through the establishment of ecological reserves." Although the language does not specifically refer to ecological reserves in marine areas, the Fish and Game Commission has extended this policy to those areas.

Existing enforcement: The area is adjacent to a population center, and is therefore easily observed from shore. Pleasure boats, dive boats, and party boats frequent the area. Department provides enforcement presence on the water as well as from land. Carmel Bay also has State Park ranger presence (Gaffney and Shimek pers. comm.).

Important species present: Many black abalone (John Pearse pers. comm.). Type locality for the flatworm, *Polychoerus carmelensis*, and the slime sponge, *Oscarella carmela* (Pearse pers. comm.). Other species include a large giant and bull kelp canopy, red and black abalone, sponges, giant Pacific octopus, scallops, sea stars, sea otter, harbor seal, lingcod, cabezon, vermilion rockfish, China rockfish, kelp greenling, white surfperch, rainbow surfperch, striped surfperch, cabezon, California sheephead, California halibut, pile surfperch, opal-eye, flat abalone, kelp bass, rubberlip surfperch, hydrocorals (*Stylaster and Allopورا*) (off Butterfly house and at inner and outer pinnacles), leopard shark in Stillwater Cove, and spot prawn (CCRSG). Spiny Lobster, though outside its normal range, has been observed there (CCRSG). PISCO studies indicate that igneous, high relief habitats tend to have communities defined by rockfish and surfperch (PISCO 2003).

Human use patterns: Accessible deep diving, popular charter and private boat diving (especially at Monastery Beach), divers from skiff and shore, preferred dive spot for experienced divers. No commercial fishing, but recreational fishing is allowed. From 0-50 ft, the area is used mostly by recreational fishermen, and from 0-100 ft the area is used by non-consumptive divers. Not many users far from shore. Scientific collecting allowed with permit. Important for recreational spearfishing (CCRSG).

Baseline and ongoing monitoring and research studies: The areas near Pescadero Point, Stillwater Cove, and Arrowhead Point are the focus of a number of marine ecological studies, mostly through Moss Landing Marine Lab. San Francisco State University has conducted life-history and recruitment studies of fish in this area. A high school class carries out an ongoing monitoring program. There have also been submersible studies in the surrounding area. Many REEF surveys have been conducted at this site. In addition, the Partnership for Interdisciplinary

Studies of Coastal Oceans (PISCO) has had permanent intertidal and subtidal monitoring sites here for several years.

Public access: Parking limited primarily to Monastery Beach area and Carmel River State Beach area, which makes the area difficult to access. For boats, this site is difficult to get to unless weather conditions allow access around Point Piños. There are boat launches at Stillwater Cove and Whaler's Cove in Pt. Lobos State Marine Reserve. Cannot carry a spear if launching from Pt. Lobos (CCRSG). Adjacent to the population center of Carmel.

Basic evaluation: This area contains reef and sand habitat, a kelp bed, and includes the head of a submarine canyon. It provides opportunities for recreational angling and diving as well as limited commercial kelp harvest and is adjacent to the fully-protected area at Point Lobos. The previous kelp harvester, ISP Alginates, no longer operates in this area. The existing degree of protection is probably consistent with its uses, and the site appears to function well as an MPA with limited harvest. The Department has documented its long term use as a fishing area for recreational anglers on Commercial Passenger Fishing Vessels and in skiffs, as well as from extractive free divers (CenCal competitive free-diving competitions). This level of use appears to be sustainable in the absence of commercial fishing for finfish and invertebrates (CDFG 2005a). The presence of the submarine canyon head provides a source of spot prawn recruitment to the commercial trap fishery in the adjacent area. Schlining (in progress) showed a higher catch per unit effort (kg per trap) within the reserve than outside of the reserve for spot prawn, as well as a higher male to female sex ratio and a difference in mean carapace length.

2.6 Point Lobos State Marine Reserve

Year established: 1973 (invertebrates protected since 1963)

Approximate area: 1.19 mi² (0.90 nm²) (GIS)

Approximate depth range: 0 to 233 ft (71 m) (GIS)

Approximate shoreline length: 6.19 mi (5.38 nm)

Approximate alongshore span: 1.96 mi (1.70 nm) (Nautical Chart)

Habitat types: Sandy and rocky intertidal. Mostly granitic reef habitat with many crevices and pinnacles, dropping from shore to sand bottom. Sedimentary substrata are also present. Extensive giant kelp forest, bull kelp beds, and surfgrass. Sand, cobble, medium boulders, and pinnacles make up most of subtidal area. Abundant articulated corallines, encrusting corallines, and foliose red algae in subtidal area (Estes and Paddock 2002).

Surrounding habitat types: Carmel submarine canyon is nearby. Extensive hard bottom offshore, as determined from submersible studies.

Summary of existing regulations: No take is allowed. Boating and kayaking are allowed with limited shore access. Diving allowed, but limited to 15 teams of 2-3 divers per day with restricted shore entry points and dive locations. No fishing implements or collection tools are allowed within the reserve. Overlapping regulations include: Monterey Bay National Marine Sanctuary, Restricted Overflight Area, Prohibited Shark Attraction Area, California Sea Otter Game Refuge, Point Lobos Ecological Reserve Area of Special Biological Significance (Brown 2001). Point Lobos SMR also partially overlaps with a portion of the year-round, all gear rockfish conservation area (RCA).

Primary objectives: This area was originally designated as an ecological reserve. Fish and Game Code Section 1580 (ecological reserves) states that "the policy of the state is to protect threatened or endangered native plants, wildlife, or aquatic organisms or specialized habitat

types, both terrestrial and non-marine aquatic, or large heterogeneous natural gene pools for the future use of mankind through the establishment of ecological reserves." Although the language does not specifically refer to ecological reserves in marine areas, the Fish and Game Commission has extended this policy to those areas.

Existing enforcement: On-site State Park rangers within the adjacent terrestrial reserve monitor access from shore, and monitor approaches by boats, ticketing regulation violators. The presence of visitors every day of the year in the adjacent terrestrial reserve provides an additional deterrent to potential violators of regulations. Point Lobos also has a docent program. Department wardens are called when assistance is needed (Brown 2001).

Important species present: This MPA contains both bull and giant kelp. Nearshore species (defined by the Nearshore Fishery Management Plan) include: California sheephead, China, blue, copper, black-and-yellow, grass, gopher, and kelp rockfishes, cabezon, and kelp greenling. Average fish density was 0.85 fish per 10 m² when surveyed between 1994 and 1996 (Estes and Paddock 2002). Other species include red and black abalone, bocaccio, olive, widow, yellowtail, vermilion and canary rockfish, lingcod, cabezon, kelp greenling, lingcod, rockfish, kelp bass, leopard shark, longfin and buffalo sculpins, striped, kelp, pile, and rubberlip surfperches, scallops, large sponges, hydrocoral, Pacific octopus, harbor seal, sea otter, occasionally Risso's dolphin, and rarely orca. Hydrocoral are common off Granite Point, mysid shrimp swarms occur in Whalers cove, and leopard sharks are also common there (CCRSG). PISCO studies indicate that soft sedimentary habitats tend to have communities defined by surfperch and greenlings, while igneous, high relief habitats have communities defined by rockfish and surfperch; Point Lobos has both habitats (PISCO 2003).

Human use patterns: Popular dive location (recreational and technical non-consumptive divers), for boat and beach diving as well as accessible deep diving, though diving is limited by a headcount and a no-go area and divers are turned away almost every weekend once the daily maximum is reached. This is a safe area for recreational water access (CCRSG).

Baseline and ongoing monitoring and research studies: UC Santa Cruz students found slightly greater abundances of benthic fish in the MPA than in adjacent areas (CDFG 2005A). The Department has conducted habitat-based surveys of fish abundance within the MPA. Submersible surveys have been carried out offshore of the MPA. In addition, the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) has had permanent intertidal and subtidal monitoring sites here for several years. Many REEF surveys have been taken within this MPA.

Public access: Only 15 teams of 2-3 divers per day are allowed in this MPA. They are restricted in areas where they may dive and they must pay to enter the state park (\$6). Reservations must often be made to ensure access on weekends and holidays (\$8) (combined \$15). Point Lobos has one of the few accessible boat launch ramps south of the Monterey Bay peninsula in central coast (there are 2 boat ramps, one in Whalers Cove and one to the west). Located 5.8 mi (5 nm) from the population center of Monterey.

Basic evaluation: This site contains a complex variety of habitats, primarily hard bottom, and contains high densities of large, adult bottom fishes such as rockfishes and lingcod. Although relatively small (this MPA does not meet the SAT guidelines for alongshore span), the MPA functions well as a fully protected area because of its high species diversity and variety of habitat, and it is effectively enforced. Studies by the Department and others have documented high population densities and large sizes of economically important nearshore and other fish species, in particular rockfishes, lingcod, cabezon, and kelp greenling, with population densities and size frequencies significantly greater than in adjacent and more distant fished areas. In addition, the site is a prime destination for non-extractive scuba divers, and use is limited by

local policy. The effectiveness of this MPA is demonstrated in a study by Estes and Paddock (2002), in which Point Lobos SMR had significantly longer rockfish than similar sites outside of the reserve and a trend (not significantly significant) toward greater fish density. The modest differences between areas inside and outside of the reserve can be attributed to the reserve's small size, recent establishment, and light fishing pressure (Starr et al 2002). Pollard (1990) determined that red abalone densities are higher within the reserve than outside of it, even with the presence of sea otters. According to Brown (2001) "enforcement of park regulations within the reserve appears to be very effective. There is low incidence of poaching in the reserve and human impacts on natural resources appear to be low."

2.7 Julia Pfeiffer Burns State Marine Conservation Area

Year established: 1970

Approximate area: 2.65 mi² (2.0 nm²) (GIS)

Approximate depth range: 0 to 358 ft (109 m) for MPA boundary (GIS), which extends 6000 feet (1829 m) offshore, but site-specific regulations apply to the harvest of invertebrates only within 1000 feet (305 m) from shore, which is approximately 60 feet (18.3 m) deep.

Approximate shoreline length: 3.46 mi (3.00 nm)

Approximate alongshore span: 2.07 mi (1.80 nm) (Nautical Chart)

Habitat types: Hard and soft bottom. Giant kelp beds, pinnacles, underwater cliffs, Diopatra (tube worm) beds, unstable gravel and boulder fields, and surge channels present. Some pinnacles have up to 75 ft of vertical relief in over 50 ft horizontally. Surfgrass and submarine canyon also present (CDFG 2005a).

Surrounding habitat types: Similar habitats are found to south. To the north, Partington Canyon extends close to shore. Offshore is a mixture of hard and soft bottom, with some depths exceeding 300 fathoms (1,800 ft) within 3 miles of shore (CDFG 2005a).

Summary of existing regulations: Only the following species may be taken recreationally: finfish, chiones, clams, cockles, rock scallops, native oysters, crabs, lobsters, ghost shrimp, sea urchins, mussels and marine worms (except that no worms may be taken in any mussel bed unless taken incidentally to the take of mussels). Only the following species may be taken commercially: finfish, crabs, ghost shrimp, jackknife clams, sea urchins, squid, kelp and worms (except that no worms may be taken in any mussel bed, nor may any person pick up, remove, detach from the substrata any other organisms, or break up, move or destroy any rocks or other substrata or surfaces to which organisms are attached). Overlapping regulations include Monterey Bay National Marine Sanctuary, Restricted Overflight Area, Prohibited Shark Attraction Area, California Sea Otter Game Refuge, Julia Pfeiffer Burns Area of Special Biological Significance. This MPA has some overlap with the year-round, all gear rockfish conservation area (RCA).

Primary objectives: This site was established to protect unique habitat primarily due to prevalence of outstanding wall and pinnacle communities. It contains the most extensive series of pinnacles and underwater cliffs along the Big Sur Coast (CDFG 2005a).

Existing enforcement: Enforcement is aided by the lack of access to the intertidal and subtidal area from shore (although fishing from shore occurs at Partington Point) due to park requirements to stay on trails. Department of Parks and Recreation staff provide on-site presence. The Department provides on-water presence. Commercial and recreational harvest

restrictions pertain to invertebrates only, and for those which might be taken illegally, access is difficult at best.

Important species present: Giant kelp, red and black abalone, diopatra worms (CCRSG), sea otter. PISCO studies indicate that soft sedimentary habitats tend to have communities defined by surfperch and greenlings, while igneous, high relief habitats have communities defined by rockfish and surfperch; Julia Pfeiffer Burns has both habitats (PISCO 2003).

Human use patterns: Very small number of divers. Permit is required to dive from Partington Cove (CCRSG). A few locals fish from shore (for finfish), but there are few consumptive users. Used to be used for recreational abalone harvesting. Interpretive center at the bottom of the road at Partington Cove provides some information on the area (Phil Sammet pers. comm.).

Baseline and ongoing monitoring and research studies: Moss Landing Marine Laboratory - extensive diving surveys from 1987 to 1989 with some follow-up in mid 1990's, related to impacts of the massive landslide and subsequent manipulations by Caltrans in 1983-84. Extensive qualitative surveys of plant, invertebrate, and fish communities by sub-habitat types have been completed (John Oliver, MLML, and Jim Barry, Department of Parks and Recreation). Side-scan sonar maps and data from surveys conducted by Rick Kvitek (CSUMB) in 1994, 1995, 1997, and 1998. In addition, the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) has intertidal and subtidal monitoring sites here.

Public access: Difficult to access, remote. Shoreline is inaccessible from adjacent terrestrial state park (CCRSG). For diving, there are limited entry points. One is Partington Cove, but access here is difficult, especially since the dirt access road has been closed and divers need to hike to get there. Access rules are determined by the local ranger (Phil Sammet pers. comm.). The nearest population center is Monterey (35 mi or 30 nm).

Basic evaluation: The area presently offers little in the way of resource protection since only certain invertebrates are protected from harvest. Among the allowable species, the presence of the sea otter precludes harvest by man for some of these (e.g. crab, urchin). Also, this MPA does not meet the SAT guidelines for alongshore span. However, the area does function well by providing recreational opportunities. The Department of Parks and Recreation has a long-term database here, including information on habitat, fishes, invertebrates, and algae. At present, except for Big Creek State Marine Reserve, there are not any no-take areas between Pt. Lobos State Marine Reserve, and Vandenberg State Marine Reserve. The northern boundary of Big Creek State Marine Reserve is about 5 miles from the southern boundary of Julia Pfeiffer Burns State Marine Conservation Area.

2.8 Big Creek State Marine Reserve

Year established: 1994

Approximate area: 2.26 mi² (1.71 nm²) (GIS)

Approximate depth range: 0 to 300 ft (0-91 m) (GIS)

Approximate shoreline length: 3.05 mi (2.65 nm)

Approximate alongshore span: 2.19 mi (1.90 nm) (Nautical Chart)

Habitat types: Sandy and rocky (sandstone and granite) intertidal; soft bottom and hard bottom subtidal; giant and bull kelp and surfgrass beds; many wash rocks and pinnacles. Shoreline is composed of a series of boulder fields separated by sand and cobble beaches. Includes exposures of greenstone, a soft crumbly rock that appears in only a few other areas along the central Californian coast (Ferguson 1984). Subtidal area has a combination of sand, flat rock,

low- and medium-relief boulders, and pinnacles. Encrusting corallines and turf brown algae are abundant (Estes and Paddock 2002, Yoklavich 2002). Much of the seafloor habitat at Big Creek SMR has been mapped. A 10-20 km (6-12 mi or 6.8-13.8 nm) wide current, extending from the surface to a depth of 656 ft (200 m) and flowing north at 0.3–0.5 ft/sec (8-15 cm/sec), passes through Big Creek SMR (Yoklavich et al 1997).

Surrounding habitat types: To the north and south a mixture of hard and soft bottom with scattered kelp beds. Several heads of submarine canyons are adjacent to the MPA on seaward side and to the south. A survey of 24.6 km² (9.5 mi² or 8.2 nm²) of continental shelf from 98-656 ft (30-200 m) in and outside of the reserve determined that 8% of this area can be characterized as complex rock bottom with high relief. Upwelling and significant offshore transport occur off Point Sur and Lopez point according to temperature, salinity, and current data (Yoklavich et al 1997).

Summary of existing regulations: No take is allowed. No disturbance of the bottom; no boats, diving or other use (boat transit only); public entry restricted. Overlapping regulations include: Monterey Bay National Marine Sanctuary, Restricted Overflight Area, Prohibited Shark Attraction Area, California Sea Otter Game Refuge (Brown 2001). Entire watershed is protected, including portions of the Los Padres national forest (Merg pers. comm.). This MPA overlaps with the year-round, all gear rockfish conservation area (RCA).

Primary objectives: To satisfy requirements of the Marine Resources Protection Act of 1990 the Fish and Game Commission was required to establish four ecological reserves along the mainland coast. The Big Creek State Marine Reserve (originally named the Big Creek Marine Resources Protection Act Ecological Reserve) was one of the reserves established pursuant to the Act. The Act specified that the specific purpose of these reserves was "to provide for scientific research related to the management and enhancement of marine resources".

Existing enforcement: Full-time reserve manager provides on-site presence. Local users of adjacent areas (skiff fishermen), who are allowed access through the MPA, assist in insuring compliance with regulations and provide catch data. This system of cooperative management with fishermen has provided low-cost, high quality data on rockfish since 1991 and facilitates better communication between fishers, managers, and researchers (Pomeroy and Beck 1998). The Department provides on-water enforcement presence. The MPA is contiguous with the University of California Landels-Hill Big Creek Reserve, which protects about 16 km² (6 mi²) of coastal terrestrial habitats (CDFG 2005A). The offshore boundary is defined by a depth contour which is not preferred by enforcement officials.

Important species present: The most abundant (> 0.1% total) rockfishes include: halfbanded, blue, pygmy, olive, and gopher. Relatively abundant (< 0.1% total) rockfishes include: bocaccio and shortbelly, copper, and rosy. Relatively abundant non-rockfish include: speckled and Pacific sanddabs, blackeye goby, and painted greenling (Yoklavich 2002). Many other nearshore rockfishes are present including China, copper, grass, widow, yelloweye, gopher, black-and-yellow, black, canary, copper, kelp, and vermilion rockfish, in addition to California Sheephead, lingcod, cabezon, and kelp greenling, but significant size and length differences between areas inside and outside of reserve were not apparent in a study conducted between 1994 and 1996. Average fish density was 0.80 fish per 10m² in this study (Estes and Paddock 2002). Ninety-three percent of the 25,159 fish observed within the reserve during submersible dives were rockfish representing at least 20 species (Yoklavich 2002). Other species present include: rubberlip, pile and striped surfperches, chinook salmon, starry, yellowtail, and grass rockfishes, California halibut, harbor seal, sea otter, bull and giant kelp (Reilly pers. comm.). In the past, this area has supported one of the few undisturbed mainland populations of owl

limpets (*Lottia gigantea*) (Ferguson 1984). Big Creek is also an important feeding area for sea otters. Red and Black abalone are present, but black abalone populations may be threatened by “withering syndrome” which reached the area in 2001. By 2003, some decline in black abalone populations had occurred. Black abalone populations north of Big Creek remain healthy, while many south of Big Creek have crashed (PISCO 2005).

Human use patterns: Live fish fishermen use the area just outside the reserve. They help to enforce regulations and are allowed to launch their boats from the Big Creek beach in exchange for their catch data (Merg pers. comm). Students and scientists use the area for research and for technical diver training courses in association with Landels-Hill Big Creek Reserve (Merg pers. comm.). Other access to the Landels-Hill Big Creek Reserve is restricted.

Baseline and ongoing monitoring and research studies: Benthic habitat mapping and characterization and baseline information for entire reserve (Yoklavich, VenTresca). Ongoing mapping of ocean currents and related hydrographic studies (C. Collins, F. Schwing). Benthic fish surveys and baseline research for deep habitats (Yoklavich) and general subtidal areas (VenTresca, Paddock). Some baseline surveys of intertidal invertebrates (Pearse) and subtidal benthic invertebrates (Mira Parks). Socioeconomic aspects of local fisheries (Pomeroy, Smiley). In addition, the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) has a subtidal monitoring site here (Mark Carr pers. comm.).

Public access: Relatively remote. Access restricted by Big Creek Reserve manager. No recreational diving or kayaking allowed. The area outside of the reserve is difficult to access for fishermen as the closest easy access points are in Morro bay. Small beach launch sites are located nearby, but dangerous in all but the calmest conditions. To use this area, fishermen must transit up the coast and hope that the weather remains favorable (Merg pers. comm.). The nearest population center is Monterey 43.7 mi (38 nm).

Basic evaluation: This site contains a variety of habitats with hard and soft substrata, including kelp beds, and is one of the few existing MPAs which extends to a depth of 50 fathoms, though it does not meet the SAT guidelines for alongshore span. This site functions well as a completely protected area while allowing research, particularly the documentation of population densities of nearshore and offshore fishes. Studies by the Department, National Marine Fisheries Service, and others have quantified density and size frequency of populations of rockfishes, lingcod, cabezon, and other economically important finfishes within and outside the MPA boundaries, and have found significant numbers of large, reproductively mature fishes within, as well as adjacent to this site. Populations of fishes in adjacent areas are of higher density than within fished areas closer to ports, primarily due to the remoteness of the areas and their difficult access from shore (CDFG 2005A). Ferguson (1984) describes the intertidal community at Big Creek as “less complex” than other regions in the central coast and attributes this difference to the presence of a crumbly substrate (greenstone) and heavy wave impact that might favor opportunistic colonizing species. A 1998 study (VenTresca et al) suggests that the mean count of rockfish is greater within the reserve than outside of the reserve and that the mean length of gopher rockfish is significantly greater within the reserve. However, a 2002 study by Estes and Paddock found no significant difference between rockfish sizes within and outside of the reserve, which Starr. et al (2002) attributes to the small size of the reserve, its relatively recent establishment, and overall light fishing pressure in the area. If fishing pressure increases in the future in adjacent areas, the MPA will continue to serve as a baseline for indices of natural populations. The MPA benefits from the presence of an on-site manager and has excellent enforcement. In the past few years, the incidence of poaching in the reserve has declined significantly. Most of the initial poaching incidents were unintentional because

fishermen were unfamiliar with the reserves boundaries. The decrease in poaching over the last few years is probably due to increased awareness of the reserve boundaries and increased local enforcement of regulations (Brown 2001). To further facilitate compliance with reserve regulations, the boundaries should be placed at more easily recognized points than is now the case. For example, the northern boundary could be made contiguous with the Landels-Hill Big Creek Reserve (a terrestrial protected area adjacent) boundary and the southern boundary extended to Gamboa Point to make it clearly recognizable from sea (Yoklavich 2002).

2.9 Atascadero Beach State Marine Conservation Area

Year established: 1985

Approximate area: 6.33 mi² (4.78 nm²) (GIS)

Approximate depth range: 0 to 236 ft (72 m) (GIS)

Approximate shoreline length: 2.07 mi (1.8 nm)

Approximate alongshore span: 1.61 mi (1.40 nm) (Nautical Chart)

Habitat types: Rocky and sandy intertidal, mostly sandy bottom offshore.

Surrounding habitat types: Similar.

Summary of existing regulations: Take of clams is prohibited. Take of other living marine resources is allowed.

Primary objectives: Help to sustain the harvest of legal-sized Pismo clams in adjacent areas.

Existing enforcement: The Department provides enforcement from shore. The primary purpose of enforcement would be to prevent harvest of sub-legal size clams. The offshore boundary is defined by distance from shore (3.45 mi, 3 nm).

Important species present: Diopatra beds, ten species of surf perches, rays, and Pismo clams (CCRSG).

Human Use patterns: Fishers, surfers, and beachgoers (CCRSG). Adjacent area used for hiking and other outdoor activities. A survey of recreational user trends (not of total usage) at nearby Morro Strand State Beach recorded 2,377 users over a four month period, the majority of which were walkers. Thirty-three fishermen were also observed over this period, which constituted approximately 1.5% of the users (Vince Cicero pers. comm.).

Baseline and ongoing monitoring and research studies: Transects sampled in winter by the Department to monitor recruitment of young clams.

Public access: Area is accessible from Atascadero State Beach and from nearby Morro Bay.

Basic evaluation: Between 1990 and 1994, sea otters re-established themselves within the area containing the three Pismo clam state marine conservation areas (SMCA) in San Luis Obispo County (Atascadero Beach SMCA, Morro Beach SMCA, and Pismo-Oceano SMCA). They had previously occupied the area in the mid- to late 1980s, but are believed to have moved offshore for several years. Foraging on the larger clams by otters reduced the availability of legal-sized clams (minimum 4.5 inches greatest shell diameter) to recreational harvesters. Department clam transects and interviews of recreational clam harvesters, conducted annually in the Pismo Beach to Morro Bay area, documented this event. For example, in 1990, 32 of 224 clammers were interviewed on Pismo Beach; those 32 clammers harvested 204 legal-sized clams (6.4 per person). In 1994 and subsequent years, Department transects have yielded virtually no clams over 3 inches in diameter. For these reasons, the three state marine conservation areas designed to help sustain the harvest of legal-sized Pismo clams no longer meet their original objective. It should be noted that these three MPAs do not

currently protect any species other than clams (Paul Reilly pers. comm.). In addition, this MPA does not meet the SAT guidelines for alongshore extent.

Other considerations: Outflow from Duke energy plant in Morro Bay. Sewer outfall from Morro Bay (CCRSG).

2.10 Morro Beach State Marine Conservation Area

Year established: 1985

Approximate area: 6.82 mi² (5.15 nm²) (GIS)

Approximate depth range: 0 to 243 ft (74 m) (GIS)

Approximate shoreline length: 2.09 mi (1.81 nm)

Approximate alongshore span: 1.96 mi (1.70 nm) (Nautical Chart)

Habitat types: Rocky and sandy intertidal, mostly sandy bottom offshore. Minimal kelp forest (bull kelp). Sand spits and dunes, shale rocky reef from 30-100 meters. Adjacent to Morro Creek outlet.

Surrounding habitat types: Similar.

Summary of existing regulations: Take of clams is prohibited. Take of other living marine resources is allowed. The offshore boundary is defined by distance from shore (3.45 mi, 3 nm).

Primary objectives: Help to sustain the harvest of legal-sized Pismo clams in adjacent areas.

Existing enforcement: The Department provides enforcement from shore. The primary purpose of enforcement would be to prevent harvest of sub-legal size clams. This MPA shares its north border with Montana de Oro State Park.

Important species present: Pismo Clam, Diopatra beds, sand dollar beds, feeding area for sea otters, bull kelp, important breeding area for Western Snowy Plover on beach.

Human use patterns: Fishers, surfers, and beachgoers. No drive up access, so fewer people use it than Atascadero Beach SMCA (CCRSG). A survey of recreational user trends (not of total usage) at the nearby Morro Bay Sandspit recorded 599 users over a two month period, the majority of which were stationary beachgoers and walkers. Three fishermen were observed during this period, which constituted 0.5% of the users. A separate, but similar survey recorded 364 kayakers over a three month period, an average of 12 per day observed, in the same area (Vince Cicero pers. comm.).

Baseline and ongoing monitoring and research studies: Clam transects sampled in winter by the Department to monitor recruitment of young.

Public access: Moderately difficult.

Basic evaluation: Between 1990 and 1994, sea otters re-established themselves within the area containing the three Pismo clam state marine conservation areas (SMCA) in San Luis Obispo County (Atascadero Beach SMCA, Morro Beach SMCA, and Pismo-Oceano SMCA). They had previously occupied the area in the mid- to late 1980s, but are believed to have moved offshore for several years. Foraging on the larger clams by otters reduced the availability of legal-sized clams (minimum 4.5 inches greatest shell diameter) to recreational harvesters. Department clam transects and interviews of recreational clam harvesters, conducted annually in the Pismo Beach to Morro Bay area, documented this event. For example, in 1990, 32 of 224 clammers were interviewed on Pismo Beach; those 32 clammers harvested 204 legal-sized clams (6.4 per person). In 1994 and subsequent years, Department transects have yielded virtually no clams over 3 inches in diameter. For these reasons, the three state marine conservation areas designed to help sustain the harvest of legal-sized Pismo

clams no longer meet their original objective. It should be noted that, these three MPAs do not currently protect any species other than clams (Paul Reilly pers. comm.). In addition, this MPA does not meet the SAT guidelines for alongshore extent.

2.11 Pismo State Marine Conservation Area

Year established: 1977

Approximate area: 0.08 mi² (0.06 nm²) (GIS)

Approximate depth range: 0 to 10 ft (3 m) (GIS)

Approximate shoreline length: 0.38 mi (.33 nm)

Approximate alongshore span: 0.38 mi (.33 nm) (Nautical Chart)

Habitat types: All soft bottom.

Surrounding habitat types: Similar.

Summary of existing regulations: Take of all invertebrates and marine aquatic plants is prohibited except the commercial take of algae other than giant kelp and bull kelp. Take of finfish is allowed.

Primary objectives: To establish baseline for assessing sea otter impact to clam population.

Existing enforcement: The Department provides enforcement from shore. The primary purpose of enforcement would be to prevent harvest of sub-legal size clams.

Important species present: Pismo Clam.

Human use patterns: Used by surfers and beachgoers (CCRSG).

Baseline and ongoing monitoring and research studies: Transects sampled by the Department in winter to monitor recruitment of young clams.

Public access: Nearby road access.

Basic evaluation: Between 1990 and 1994, sea otters re-established themselves within the area containing the three Pismo clam state marine conservation areas (SMCA) in San Luis Obispo County (Atascadero Beach SMCA, Morro Beach SMCA, and Pismo-Oceano SMCA). They had previously occupied the area in the mid- to late 1980s, but are believed to have moved offshore for several years. Foraging on the larger clams by otters reduced the availability of legal-sized clams (minimum 4.5 inches greatest shell diameter) to recreational harvesters. Department clam transects and interviews of recreational clam harvesters, conducted annually in the Pismo Beach to Morro Bay area, documented this event. For example, in 1990, 32 of 224 clammers were interviewed on Pismo Beach; those 32 clammers harvested 204 legal-sized clams (6.4 per person). In 1994 and subsequent years, Department transects have yielded virtually no clams over 3 inches in diameter. For these reasons, the three state marine conservation areas designed to help sustain the harvest of legal-sized Pismo clams in adjacent areas no longer meet their original objective. The primary purpose of this invertebrate conservation area was to establish a baseline for assessing sea otter impact on clam populations; a secondary objective was to provide protection from human harvest to all invertebrates (Paul Reilly pers. comm.). It might be useful to retain this small MPA as a long-term reference area for continuing to assess relative abundance and size frequency of Pismo clams in the absence of human harvest, but within the established range of the sea otter. This MPA does not meet the SAT guidelines for alongshore extent or depth range.

2.12 Pismo-Oceano State Marine Conservation Area

Year established: 1985

Approximate area: 13.30 mi² (10.04 nm²) (GIS)

Approximate depth range: 0 to 135 ft (0-41.2 m) (GIS)

Approximate shoreline length: 3.95 mi (3.43 nm)

Approximate alongshore span: 3.80 mi (3.30 nm) (Nautical Chart)

Habitat types: All soft bottom.

Surrounding habitat types: Similar.

Summary of existing regulations: Take of clams is prohibited. Commercial take of giant kelp and bull kelp is prohibited. Take of other living marine resources is allowed. The offshore boundary is defined by distance from shore (3.45 mi, 3 nm).

Primary objectives: Help to sustain the harvest of legal-sized Pismo clams in adjacent areas.

Existing enforcement: The Department provides enforcement from shore. The primary purpose of enforcement would be to prevent harvest of sub-legal size clams.

Important species present: Pismo Clam

Human use patterns: Used by fishers, surfers, and beachgoers (CCRSG).

Baseline and ongoing monitoring and research studies: Transects sampled in winter by the Department to monitor recruitment of young clams.

Public access: Relatively difficult access. Located 9.2 mi (8 nm) from Pismo Beach population center.

Basic evaluation: Between 1990 and 1994, sea otters re-established themselves within the area containing the three Pismo clam state marine conservation areas (SMCA) in San Luis Obispo County (Atascadero Beach SMCA, Morro Beach SMCA, and Pismo-Oceano SMCA). They had previously occupied the area in the mid- to late 1980s, but are believed to have moved offshore for several years. Foraging on the larger clams by otters reduced the availability of legal-sized clams (minimum 4.5 inches greatest shell diameter) to recreational harvesters. Department clam transects and interviews of recreational clam harvesters, conducted annually in the Pismo Beach to Morro Bay area, documented this event. For example, in 1990, 32 of 224 clammers were interviewed on Pismo Beach; those 32 clammers harvested 204 legal-sized clams (6.4 per person). In 1994 and subsequent years, Department transects have yielded virtually no clams over 3 inches in diameter. For these reasons, the three state marine conservation areas designed to help sustain the harvest of legal-sized Pismo clams no longer meet their original objective. It should be noted that, these three MPAs do not currently protect any species other than clams (Paul Reilly pers. comm.).

2.13 Vandenberg State Marine Reserve

Year established: 1994

Approximate area: 2.48 mi² (1.87 nm²) (GIS)

Approximate depth range (feet): 0 to 60 (18 m) (GIS)

Approximate shoreline length: 6.66 mi (5.8 nm)

Approximate alongshore span: 3.68 mi (3.20 nm) (Nautical Chart)

Habitat types: This MPA contains a mixture of hard and soft bottom, and rocky and sandy intertidal areas, and a small amount of giant kelp. The rocky intertidal is primarily Monterey shale (SWAT). This is a high energy area that is likely heavily scoured by violent wave action.

Oil from natural seeps was observed on shore in four small patches (largest was 185 mm by 90 mm) in the north part of reserve in 1998.

Surrounding habitat types: Fairly similar to the north, south, and offshore, although a higher percentage of soft bottom to the north.

Summary of existing regulations: No take is allowed. No disturbance of bottom; no boats, diving or other use (boat transit only); public entry restricted. In offshore area outside boundaries, a recent ban on gill nets was enacted legislatively.

Primary objectives: To satisfy requirements of the Marine Resources Protection Act of 1990 the Fish and Game Commission was required to establish four ecological reserves along the mainland coast. The Vandenberg State Marine Reserve (originally named the Vandenberg Marine Resources Protection Act Ecological Reserve) was one of the reserves established pursuant to the Act. The Act specified that the specific purpose of these reserves was “to provide for scientific research related to the management and enhancement of marine resources”.

Existing enforcement: Access from land is restricted via Vandenberg Air Force Base security restrictions. This is a very remote location that is publicly inaccessible from land and sea. Surrounded by Vandenberg Air Force Base terrestrial wildlife closure. The offshore boundary is defined by a depth contour which is not preferred by enforcement officials.

Important species present: Black abalone (abundant populations have been subject to decline from withering syndrome), red abalone, black, blue, brown, copper, olive, and vermilion rockfish, lingcod, sea lions, sea otters, halibut, white sea bass, and a small amount of giant kelp (CCRSO). PISCO studies indicate that soft sedimentary habitats tend to have communities defined by surfperch and greenlings (PISCO 2003).

Human use patterns: Rarely used, though some military personnel do access the area and fish in adjacent areas. The Vandenberg Dive Club dives near this area.

Baseline and ongoing monitoring and research studies:

Benthic habitat mapping (Cochrane, USGS). Mapping ocean currents and related hydrographic studies (Russ Vetter, NMFS). Eggs and larval fish surveys and research (Vetter, NMFS). Abalone enhancement, growth studies (Friedman, Haaker). Intertidal invertebrate surveys (PISCO-Pete Raimondi, UCSC; Steve Murray, UC). Evaluation of effects of oil spill on intertidal (Pete Raimondi, UCSC; Andy Lisner, MMS). Some baseline data on fish abundance in the adjacent Purisima Point area exists from a Department research cruise in 1998.

Public access: Very limited due to Vandenberg AFB access restrictions. Shallow rocky subtidal makes boat access difficult. Coastal cliff makes water access difficult/impossible. Nearest population centers are Pismo Beach (46 mi, 40 nm) and Santa Barbara (58 mi, 50 nm).

Basic evaluation: This site contains primarily shallow soft-bottom substrata, but includes some low-relief subtidal reef. It does not meet the SAT guidelines for depth range. Based on Department surveys in the late 1990s, the site and the immediately adjacent area appear to function well in protecting high population densities of black abalone. The adjacent area, while not within an MPA, benefits from military-imposed restricted access (Safety Zone 4) is enforced as a no-stopping area by the Air Force. No other sites along the southern-central California mainland contain high densities of black abalone.

3.0 GAP ANALYSIS

A marine habitat gap analysis was conducted for the Central Coast study region using the best readily available information to determine the current level of representation of habitats in different types of MPAs. All habitats identified in the MLPA or the Master Plan Framework (MPF, CDFG 2005b) were included in the evaluation. The results of the gap analysis are presented in Appendix II and summarized below.

The best available spatial GIS data were used to estimate the amount of each habitat in state marine reserves, state marine conservation areas, and the special closure area (Ano Nuevo). It is important to note that the quality of data varies by habitat and by portion of the region. This analysis is quantitative and fairly accurate for those habitats with good spatial data (eg. kelp, intertidal habitats, and soft and hard bottom substrata *where accurately mapped with fine-scale data*). This analysis is qualitative and approximate for those habitats with poor or minimal spatial data (eg. rocky reefs in the southern part of the region where fine-scale habitat mapping has not been conducted, pinnacles, and oceanographic features such as upwelling zones throughout the region).

A summary of the gap analysis results is provided in Figure 1a and 1b and Table 3. This shows the total amount of the study region that each habitat covers as a red line on the graph and the percentage of that habitat type included in State Marine Reserves, State Marine Conservation Areas, and Special Closures in a stacked bar chart. For hard and soft bottom habitats, this summary includes only coarse-scale data from Greene et al 2004 which underestimates amount of rocky habitat in nearshore waters. Habitats mapped as polygonal features (most nearshore and offshore habitats) are shown in Figure 1a while habitats mapped as linear features (shoreline types and surfgrass) are included in Figure 1b.

Figure 1a: Habitats captured in existing MPAs (area)

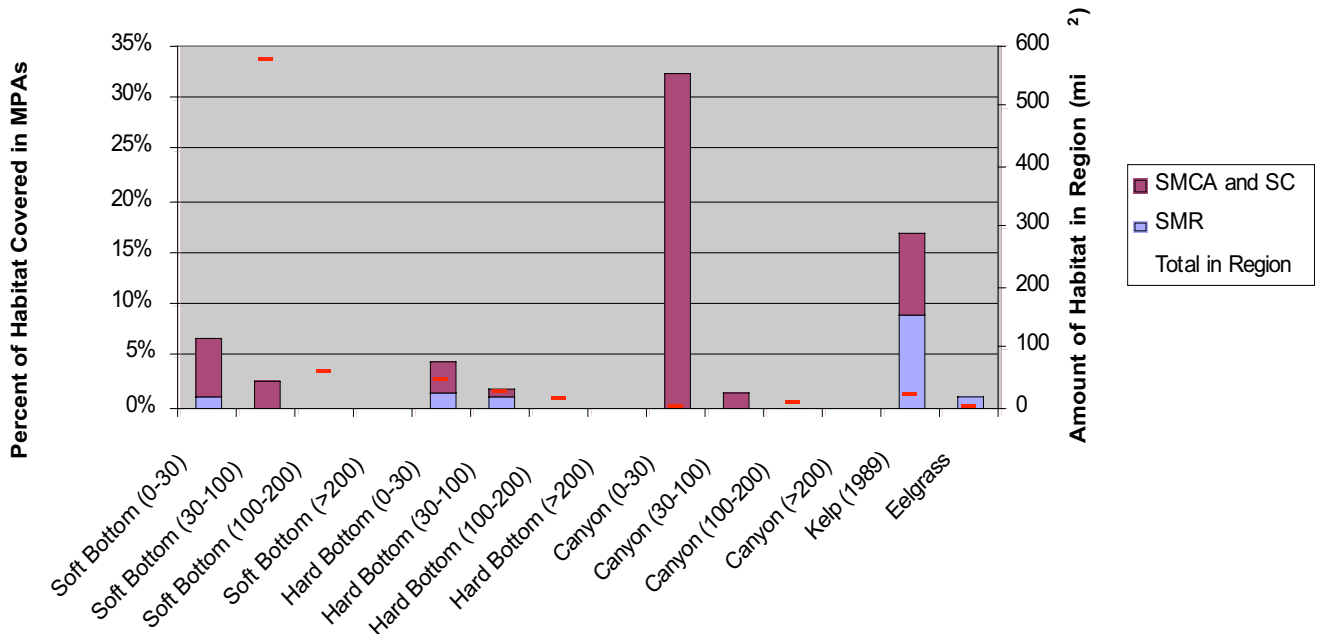


Figure 1b: Habitats captured in existing MPAs (linear)

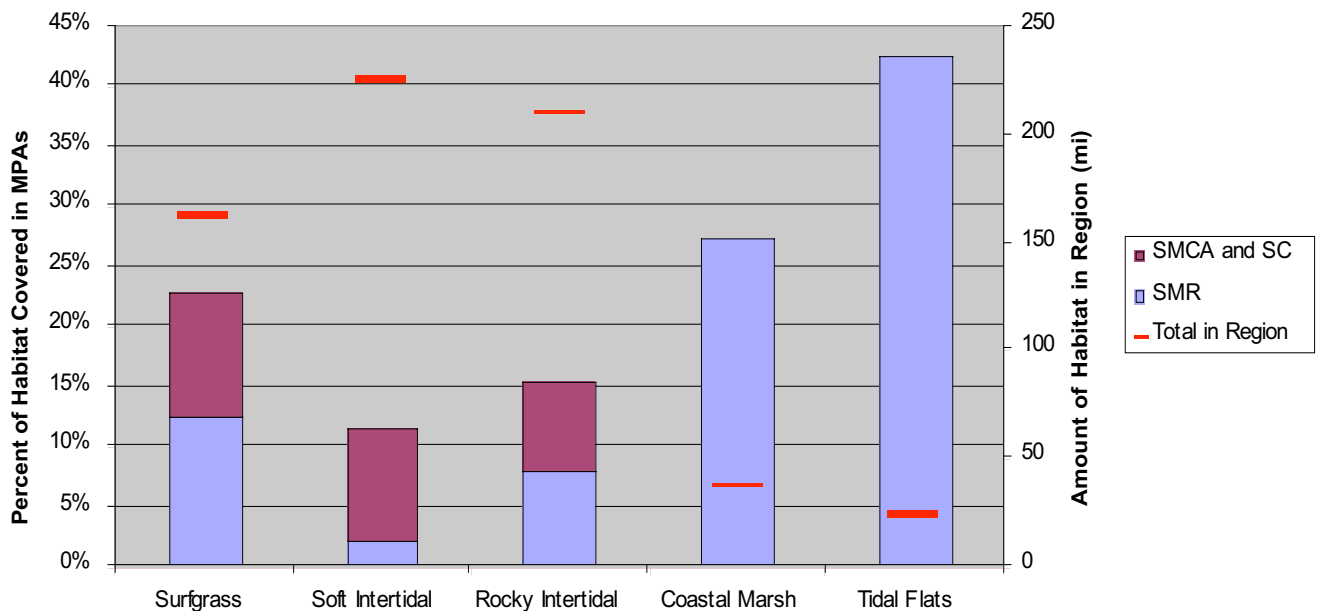


Table 3: Habitats Captured in Existing MPAs

Habitat	Total amount of habitat in Study Region	Units	Study Region Area	Percent of study region area (all habitats)	Percent of habitat in SMRs	Percent of habitat in SMCAs and Special Closures	Percent of habitat in existing MPAs
Soft Bottom (0-30)	294.14	mi ²	1145.00	25.8%	1.1%	5.9%	6.97%
Soft Bottom (30-100)	575.78	mi ²	1145.00	50.6%	0.2%	2.6%	2.87%
Soft Bottom (100-200)	58.46	mi ²	1145.00	5.1%	0.0%	0.0%	0.04%
Soft Bottom (>200)	105.52	mi ²	1145.00	9.3%	0.0%	0.0%	0.00%
Hard Bottom (0-30)	46.66	mi ²	1145.00	4.1%	1.6%	2.9%	4.52%
Hard Bottom (30-100)	26.78	mi ²	1145.00	2.4%	1.1%	0.9%	2.01%
Hard Bottom (100-200)	13.91	mi ²	1145.00	1.2%	0.0%	0.0%	0.00%
Hard Bottom (>200)	16.16	mi ²	1145.00	1.4%	0.0%	0.0%	0.00%
Canyon (0-30)	0.56	mi ²	1145.00	0.1%	0.0%	32.6%	32.82%
Canyon (30-100)	4.42	mi ²	1145.00	0.4%	0.0%	1.8%	1.80%
Canyon (100-200)	6.06	mi ²	1145.00	0.5%	0.0%	0.2%	0.22%
Canyon (>200)	42.77	mi ²	1145.00	3.8%	0.0%	0.0%	0.00%
Kelp (1989)	17.94	mi ²	1145.00	1.6%	9.1%	8.0%	17.12%
Eelgrass	1.07	mi ²	1145.00	0.1%	1.2%	0.0%	1.23%
Intertidal Zone:							
Surfgrass	161.09	Linear mi	427 along coastline	37.7%	12.58%	10.19%	22.77%
Soft Intertidal	223.66	Linear mi	427 along coastline	52.3%	2.32%	9.16%	11.47%
Rocky Intertidal	209.21	Linear mi	427 along coastline	48.9%	8.04%	7.45%	15.50%
Coastal Marsh	36.53	Linear mi	427 along coastline	8.5%	27.31%	0.00%	27.31%
Tidal Flats	23.48	Linear mi	427 along coastline	5.5%	42.49%	0.00%	42.50%

Percentage of habitats protected in MPAs relative to the total amount of habitat available is the main result of the gap analysis as described above. But percentages alone do not provide information on the relative rarity or abundance of each habitat type in the study region. In the absence of data on species distribution and abundance, habitat is often used as a surrogate for species diversity. Qualitative information on the relative number of species per unit area

expected to occur in each habitat type can also inform the results of the gap analysis since habitat is often used as a surrogate for species diversity.

Figure 2 and Table 4 categorize habitats by their abundance in the Central Coast study region and a relative ranking of the expected number of species per area based on professional judgment. This ranking has not yet been reviewed by the SAT. This graph shows that while soft bottom habitats are the most abundant in the study region, their relative contribution to regional species diversity is lower than less abundant but more diverse rocky intertidal, rocky reef, and kelp habitats. In general, habitats that are located in the lower-left portion of this graph are abundant in the study region and are expected to have low relative species diversity, while habitats in the upper-right portion of this graph are rare and are expected to have relatively high levels of species diversity.

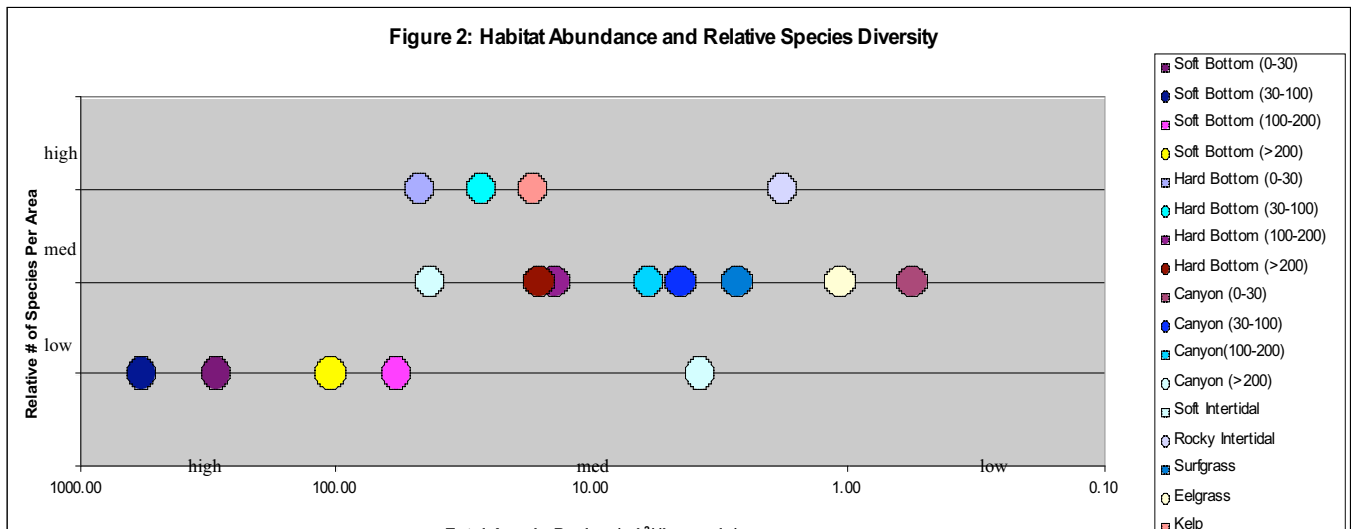


Table 4: Habitat Abundance and Relative Species Diversity

	area (mi ²)	Relative # species/area	area (mi ²)	Relative # species/area	area (mi ²)	Relative # species/area	area (mi ²)	Relative # species/area
Soft Bottom	294.00	1	575.00	1	58.00	1	105.00	1
Hard Bottom	47.00	3	27.00	3	14.00	2	16.00	2
Kelp	17.00	3	n/a	n/a	n/a	n/a	n/a	n/a
Canyon	0.56	2	4.50	2	6.00	2	43.00	2
Surfgrass	2.70	2	n/a	n/a	n/a	n/a	n/a	n/a
Eelgrass	1.07	2	n/a	n/a	n/a	n/a	n/a	n/a
Rocky Intertidal	1.80	3	n/a	n/a	n/a	n/a	n/a	n/a
Soft Intertidal	3.80	1	n/a	n/a	n/a	n/a	n/a	n/a

Note: The "relative # of species/area" for each habitat refers to how many species of interest occur in these habitats and is a qualitative ranking based on professional judgement. For this category: 1 = low, 2 = medium, and 3 = high.

3.1 Intertidal Habitats

Within the Central Coast Study Region, sandy beaches compose 52.3% of the shoreline in the study region (224 mi or 195 nm of coastline). Rocky intertidal shores and cliffs, on the other hand, compose 48.9% of the shoreline in the study region (209 mi or 182 nm of coastline). Coastal marsh and tidal flats make up a smaller portion of the region's coastline, composing

8.5% and 5.5% of the study region (37 mi or 32 nm and 23 mi or 20 nm of coastline), respectively.

Sandy beaches are represented at 11% of their total length (as measured by NOAA-Environmental Sensitivity Index, 2002) in existing MPAs; only about 2% of the total is in state marine reserves.

Rocky intertidal shores and cliffs are represented in existing MPAs at 15% of their total amount in the study region, with 8% in state marine reserves.

Elkhorn Slough SMR captures 27% of the coastal marsh, as mapped as a linear feature in the NOAA-ESI dataset. Coastal marsh is not just a linear feature of shorelines, but can be extensive in intertidal areas. Coastal marsh, mapped as polygonal features from a variety of datasets (National Wetlands Inventory and California Natural Diversity Database) totals 2.0 mi² (1.5 nm²), with 0.86 mi² (0.65 nm²) or 43% included in Elkhorn Slough SMR; most of the remaining coastal marsh in the region is in Morro Bay and is not included in an MPA.

Elkhorn Slough SMR includes 42% of the tidal flats in the study region, as mapped as linear features in the NOAA-ESI (2002) dataset. However, it should be noted that there are also extensive tidal flats in Morro Bay that are not mapped and included in these totals.

3.2. Estuaries

There are 2 large and several small estuaries along the Central Coast. In terms of total area, approximately 7.9 mi² of estuarine environment has been mapped based on information from the National Wetlands Inventory, California Natural Diversity Database, and USGS topographic maps. Only (0.59 mi²) 0.51 nm² of that area (or 7%) occurs in an existing MPA (Elkhorn Slough SMR).

3.3 Seagrasses

Eelgrass makes up only 0.1% of the area in the study region (1 mi² or 0.8 nm²), while surfgrass covers 37.7% of the study region's coastline (161 mi or 140 nm). Eelgrass beds are present in Elkhorn Slough and Morro Bay; only about 1% of the region's eelgrass beds are in the existing estuarine MPA (Elkhorn Slough SMR). Surfgrass beds are present along the coastline in the shallow subtidal zone. Twenty-two percent of mapped surfgrass beds are present in existing MPAs, with 12.6% in state marine reserves.

3.4 Soft and Hard Substrata

Calculations on amount of hard (rocky) and soft substrata in existing MPAs were made using fine-scale multi-beam and sonar data (Kvitek et al. 2005), where available; these data provide the most accurate assessment of hard and soft substrata but are limited in geographic extent. Only about 25% of the study region has been accurately mapped and classified to rocky or soft bottom habitat type; most of the seafloor mapping work to date has been conducted in the

northern half of the study region and some of it has focused on existing MPAs. Coarse-scale substrata data (Greene et al. 2004) are available for most of the region, but are not very accurate and underestimate the amount of hard substrata. Amount of both fine-scale and coarse-scale hard and soft substrata in existing MPAs are presented separately in Appendix II.

Soft bottom habitat is more common than rocky bottom habitat in the region. Based on coarse scale data (which overestimates the amount of soft substrata; Greene et al. 2004), most of the study region (90.8%) is covered by soft bottom habitats (1034 mi² or 783 nm²), with 25.8% of the total area covered in the 0-30 m range (294 mi² or 223 nm²), 50.6% in 30-100 m range (576 mi² or 436 nm²), 5.1% in the 100-200 m range (58 mi² or 44 nm²), and 9.3% covered in the greater than 200 m range (106 mi² or 80 nm²). The coarse-scale data indicates that about 7% of the region's soft bottom habitat in the 0-30m range, 3% of the 30-100m range, and none of the deeper soft bottom habitat is in existing MPAs. Based on the more accurate but geographically limited fine-scale data (Kvitek et al 2005), 5% of the *mapped* soft bottom habitat at 0-30m and <2% at 30-100m is in existing SMRs or SCMAs, with none of the deeper depth ranges protected.

Rocky bottom habitats, based on coarse-scale data, compose 9.1% of the region (104 mi² or 79 nm²), with 4.1 % in the 0-30 m range (47 mi² or 36 nm²), 2.4% in the 30-100 m range (27 mi² or 20 nm²), 1.2% in the 100-200 m range (14 mi² or 11 nm²), and 1.4% in the greater than 200 m range (16 mi² or 12 nm²). The coarse scale data indicates that less than 5% of the 0-30m range, 2% of the 30-100m range, and none of the deeper rocky habitat is protected in existing MPAs. Based on the more accurate but geographically limited fine-scale data (Kvitek et al. 2005), 2-5% of the *mapped* hard bottom habitat at 0-30m and <2% at 30-100m is in existing SMRs or SCMAs, with none of the deeper depth ranges protected.

3.5 Kelp Forests

Kelp forest total abundance varies from year to year (from a low of 2.5 mi² (1.9 nm²) to 17.9 mi² (13.5 nm²)) in the four years surveyed by the Department. Correspondingly, the amount of kelp inside existing MPAs varies from 7.7 -17% of the total amount in the study region. In state marine reserves, the representation of kelp varies from 3.6 to 9% of the total, depending on survey year. In state marine conservation areas, kelp is represented at 4-8% of the total amount.

Due to the inter-annual variability in kelp, it is useful to assess the persistence of kelp over time and determine whether persistent patches of kelp are found inside existing MPAs. Only 4 years of data on kelp coverage are available, and these survey years do not span the range of oceanographic conditions (El Niño – La Niña) that affect kelp abundance. However, using the data available (1989, 1999, 2002, and 2003) kelp was classified as persistent if it was present in 3 of the 4 survey years. Persistent kelp covered a small area (3.2 mi², 2.4 nm²) of the study region; 13% of that amount is represented in existing MPAs. There are 3 state marine reserves with 6% of the total amount of persistent kelp (Hopkins SMR, Point Lobos SMR, and Big Creek SMR).

3.6 Pinnacles and Submarine Canyons

Pinnacles have not been mapped for the region, but using changes in bathymetry (>10m variation in elevation within a grid cell) as a surrogate, pinnacles have tentatively been identified for some portions of the region. In addition, pinnacles at the 3m scale were mapped in Big Creek SMR (Yoklavich 1997). Big Creek SMR, Point Lobos SMR, and Carmel Bay SMCA all have pinnacles in the 0-30 and 30-100m depth zones. Pinnacles have also been identified from dive surveys by Dept. Parks and Recreation in Julia Pfeiffer Burns SMCA.

In state waters, submarine canyons are only found in the part of the study region north of Big Creek SMR. They make up 4.8% of the region's area (54 mi² or 41 nm²), covering 0.1% of the total regional area in the 0-30 m range (0.6 mi² or 0.5 nm²), 0.4% in the 30-100m range (4 mi² or 3 nm²), 0.5% in the 100-200 m range (6 mi² or 5 nm²), and 3.8% in the greater than 200 m range (43 mi² or 33 nm²). Most of the existing MPAs do not extend deep enough to capture submarine canyon habitat. A couple of exceptions include Carmel Bay SMCA and Julia Pfeiffer Burns SMCA, which include submarine canyon habitat. Almost 33% of shallow (0-30m) canyon habitat and less than 2% of 30-100m canyon habitat are captured in these MPAs. Minimal amounts (<1%) of deep canyon habitat (>100m) are represented in existing MPAs.

3.7 Oceanographic Habitats

Oceanographic habitats, including freshwater plumes, retention areas, and upwelling zones, have not been mapped for the region. But based on an evaluation of surrogates (presence of major rivers, presence of headlands, and sea surface temperature data compiled by the Pacific Fisheries Environmental Laboratory), the presence of these features was qualitatively assessed for each existing MPA.

Freshwater plumes are expected to occur where a major river meets the sea, or where coastal hydrology has created estuarine environments (such as Elkhorn Slough and Morro Bay). The existing MPAs expected to experience significant freshwater plumes at certain times of the year include Elkhorn Slough SMR (estuarine, with inputs from Elkhorn Slough and close proximity to Salinas River), Carmel Bay SMCA (with inputs from Carmel River), and Big Creek SMR (with inputs from Big Creek). Pismo-Oceano SMCA potentially has freshwater inputs from the Santa Maria River just to the south. In addition to the Salinas and Santa Maria Rivers (the largest in the region), there are several other medium to large rivers, including the Pajaro, Big Sur, and Santa Ynez which likely create freshwater plumes, but they are not located in close proximity to existing MPAs.

There has been little mapping of retention areas or upwelling zones in the study region. One retention zone has been identified in northern Monterey Bay (just below Santa Cruz; Paduan and Rosenfeld 1996); however, there is not an existing MPA there. Larval retention areas are expected to be found in the upwelling shadow or lee of large headlands. Based on geographic features, Carmel Bay SMCA may occur in or near a retention area.

Upwelling features can be very large and extend for many miles offshore. Upwelled water as mapped by PFEL or the presence of large headlands were used to identify existing MPAs that

may experience significant upwelling. In the Central Coast study region, there is likely to be seasonal upwelling at Año Nuevo, Point Sur, along the Big Sur coast, Point Arguello, and Point Conception. Therefore, quite a few existing MPAs *may* overlap with upwelling features; these *may* include Año Nuevo Special Closure, Pacific Grove SMCA, Carmel Bay SMCA, Point Lobos SMR, Julia Pfeiffer Burns SMCA, Big Creek SMR, and Vandenberg SMR. However, since most of the existing MPAs do not extend far offshore or include deep water habitats, upwelling features in deep waters are not represented in existing MPAs.

3.8 Size, spacing and depth of MPAs

Existing MPAs averaged 3.3 mi² (2.5 nm²) in size, and ranged from 0.08 mi² (0.06 nm²) (Pismo SCMA) to 13.28 mi² (10.04 nm²) (Pismo-Oceano SMCA). Alongshore span of existing MPAs averaged 2.5 mi (2.2 nm), which is less than the guidelines of 2.9-12.7 mi (2.5-11 nm) suggested in the MPF (CDFG 2005b); however 6 of the 13 MPAs met the minimum guideline.

In terms of spacing, many existing MPAs are clustered closer together than the MPF spacing guidelines of 31-62 miles (27-54 nm) distance between MPAs. The spacing of existing MPAs leaves large parts of the coastline without MPAs; there are no MPAs between Big Creek SMR and Atascadero SMCA, for example, a distance of 61 miles (53 nm). In the Monterey-Pacific Grove area, several MPAs are within 4.6 mi (4nm) of each other. On the Big Sur coast, Julia Pfeiffer Burns SCMC and Big Creek SMR are 5.8 mi (5nm) apart. In the southern part of the region, Atascadero SMCA and Morro Beach SMCA are close together; similarly Pismo and Pismo-Oceano SCMA are within 5.8 mi (5nm) of each other.

The existing MPAs can also be compared in terms of distance between similar habitats and levels of protection. Using these criteria, several gaps in spacing become apparent. North of Hopkins SMR, a similar habitat and level of protection does not occur for 85 mi (74 nm). Big Creek and Vandenberg, the only two rocky intertidal SMRs in the southern portion of the region, are separated by a distance of 121 mi (105 nm). Finally, Elkhorn Slough SMR is the only estuary included within the existing MPAs in the Central Coast, with the nearest similar protect habitats existing outside of the study region to the north and south.

The existing MPAs do not span the depth range present in the study region (0-1400m). The average depth of existing MPAs is 19m. Only Julia Pfeiffer Burns SMCA extends beyond 100m. Therefore few habitats in the 100-200m range are represented and no habitats in the greater than 200m depth range are represented in existing MPAs.

4.0 OTHER TYPES OF SPATIAL CLOSURES IN THE REGION

When considering proposals for developing new MPAs, the Master Plan Framework (CDFG 2005b) calls for consideration of other management programs that may contribute to achieving regional goals and objectives and the goals of the Marine Life Protection Act. In addition to existing state MPAs, this assessment provides basic habitat representation data for three other types of spatial closures in the region (Appendix III). Included in this evaluation are (1) the Rockfish Conservation Area (RCA), (2) Vandenberg Air Force Base security zone 4, (3) Diablo

Canyon nuclear powerplant security zone, and (4) the Monterey Bay National Marine Sanctuary. See Section 5.1.2 below for further description of these areas.

The Rockfish Conservation Area includes an area of 44.9 mi² (34nm²) that has year-round protection from certain fishing activities. The RCA is offshore and therefore does not include intertidal or near-shore habitats (sandy and rocky shores, estuary, seagrasses, and kelp forests). Unlike existing MPAs, the RCA includes deep water rocky and soft bottom habitat and (based on coarse-scale data from Greene et al 2004 which under-represents the amount of rocky substrata), the RCA includes 8% of the soft bottom and 13% of the hard bottom habitat in the 100-200m depth range and 4% of the soft bottom and 42% of the hard bottom habitat in the >200m depth range in state waters in the study region (these percentages should be considered approximate).

The Vandenberg Air Force Base security zone is large (137 mi², 104 nm²), but only Security Zone 4 offers year-round habitat protection as vessels are not permitted to stop (trolling is allowed); the other security zones (1-3, 5-9) offer more limited habitat protections by limiting access for only short periods during military activities. Vandenberg Security Zone 4 is 31.87 mi² (24.1 nm²) and protects sandy and rocky shores, kelp, soft and hard bottom, and a small estuary near the northern boundary.

The Diablo Canyon nuclear power plant security zone is 1.88 mi² (1.42 nm²) in size. The habitats present include sandy and rocky intertidal shores and kelp forests. Based on coarse-scale data, shallow soft bottom habitats are present. The presence of at least some shallow hard bottom habitats can be inferred by the presence of kelp which requires hard surfaces for attachment. There have been extensive and long-term studies on the impacts of the powerplant's seawater intake and warm water outfalls on intertidal and nearshore biota.

The Monterey Bay National Marine Sanctuary covers 763.35 mi² (577.2 nm²) or 67% of the Central Coast study region in state waters, while also extending well offshore and north of the study region. The MBNMS includes many habitats within its boundaries but the designation of marine sanctuary status does not confer habitat protection nor does it restrict take of living resources. A habitat evaluation of the MBNMS was not conducted.

5.0 SUMMARY EVALUATION AND RECOMMENDATIONS FOR EXISTING MPAS

A summary evaluation of the extent to which existing MPAs contribute to regional goals, objectives, and design considerations will provide the basis for the Central Coast Regional Stakeholder Group to make recommendations for modifications to existing MPAs.

5.1 Summary Evaluation of Existing MPAs, Management Measures and Restrictions

5.1.1 Existing MPAs (including Año Nuevo Special Closure)

The 12 existing MPAs and one special closure in the Central Coast Study Region encompass approximately 43 mi² (32.5 nm²) of water surface area. While they are spread along most of the study region's coastline, there are notable gaps between Morro Bay and Big Creek in the south

and between Elkhorn Slough and Pigeon Point in the north (with the exception of the special closure at Año Nuevo). A larger gap in entirely-marine MPAs (again with the exception of the special closure at Año Nuevo) occurs between Hopkins SMR and James V. Fitzgerald SMP in San Mateo County (north of the study region). Within the study region, a wide array of habitats is included to varying extents, though deeper water habitats are rarely included and many habitats are represented at low levels.

The central coast region contains five of the State's 11 mainland no-take state marine reserves. Similar to the rest of the mainland MPAs, these SMRs are small, encompassing only 7.4 mi² (5.6 km²). The remaining 7 MPAs and one special closure allow the take of all finfish species and, with two exceptions (Pismo SMCA and Carmel Bay SMCA), allow the take of most common invertebrate species. In these areas no consideration of ecosystem benefits or interactions between fished and unfished species has been made.

Overall, the existing MPAs display the lack of coherent planning and purpose that inspired the legislature to pass the MLPA. Of the areas with specific objectives noted for their establishment, most were designed to protect single species or types of species. Though three MPAs were established with the intent of fostering scientific research and study in areas with little human impact (Hopkins SMR, Big Creek SMR, and Vandenberg SMR) all three are smaller than current scientific recommendations based on the ability of an area to be self sustaining (Starr et al 2002). The MPAs were established over a period of more than 30 years with no specific plan to coordinate among areas or for long-term monitoring of their success.

Habitats deeper than 100 ft (30.5 m) are almost absent from existing MPAs, though significant protection for bottom habitats between 590 ft and 886 ft (180-270 m) is provided through other management measures (see Section 5.1.2). Shallower than 100 ft (30.5 m), only a small portion of the existing MPA area includes hard bottom habitats.

There are only two major estuarine areas in the central coast region; Elkhorn Slough and Morro Bay. A portion of Elkhorn Slough is within both a State no-take MPA and a National Estuarine Research Reserve. Part of the outer area of this estuary is impacted by cooling water intake and outfall from a coastal power plant.

Surface canopy and subtidal beds of giant kelp (*Macrocystis pyrifera*) and bull kelp (*Nereocystis luetkeana*) are found throughout the central coast study region. In most areas, these beds fluctuate seasonally and annually in their overall extent and many areas do not persistently support kelp. Within both persistent beds and less persistent areas very little of this critical habitat is contained in MPAs.

An evaluation of the effectiveness of three of the state marine reserves in the study region was conducted previously by some members of the Science Advisory Team and others (Starr et al 2002). This evaluation concluded 1) marine reserves need to be extended into deeper waters and 2) the existing marine reserves in Central California need to be expanded because they do not cover area large enough to achieve the goal of conserving biodiversity or habitats of the region (Starr et al 2002).

Overall, the existing array of MPAs along the Central Coast does not include representation of all habitat types and provides little in the way of ecosystem protection or coherent management. Based on the habitat gap analysis, improvements to this array are clearly possible. When recommending improvements, thought should be given not only to the impact of other existing measures and restrictions (see Section 5.1.2), but to the coherence and management of the system as a whole. In particular, the overall goals and objectives of the region should be taken into consideration so that the combination of MPAs, other management, and non-MPA restrictions meet the requirements of the MLPA.

5.1.2 Other existing management measures and restrictions

Fisheries in California are constrained by a host of other management measures and restrictions. Within the Central Coast Study Region many restrictions are in place that may help meet the goals and objectives of the region and the MLPA. It is notable that protection for certain groundfish species has increased dramatically since the passage of the MLPA in 1999. This increased protection may meet some of the goals of the MLPA, in particular helping to sustain economically valuable species and rebuild those that are depleted.

The single largest change in management since 1999 is the establishment of the Rockfish Conservation Areas (RCAs) which stretch along the entire California coast. The RCAs are large area closures intended to protect a complex of species, especially shelf rockfish species designated by the Pacific Fishery Management Council (PFMC) as over-fished. The RCAs differ between gear types (e.g., trawl, non-trawl, and recreational), vary throughout the year and between years in their total extent, and allow for certain types of fishing within their boundaries. The RCA restrictions are adopted by the PFMC but are incorporated into State regulation as well.

Within the central coast study region, the area of the RCAs that is currently protected year-round from fishing activities (commercial and recreational) that may impact over-fished groundfish is approximately 45 mi² (34nm²), which is 2.0 mi² (1.5 nm) greater than the area within MPAs. This area lies between 590 ft and 886 ft (100 and 150 fathoms, 180 and 270 meters) of depth protecting much of the continental shelf/slope break. Though detailed habitat information is unavailable for most of this area, it is fair to assume that the area includes representatives of all habitats within this depth range. At various times of the year more area is included depending on the gear type and user group, affording additional stock rebuilding potential.

Several State fishery restrictions also provide protection for certain species. Trawl nets (4½ inch or greater mesh) are prohibited within 3 miles of shore; only within Monterey Bay are there state waters greater than 3 miles from shore in which certain types of trawling are allowed. Gill nets (3½ inch or greater mesh) are generally prohibited in waters shallower than 110 m (60 fathoms) in the region. Exceptions to the gill net restrictions include set and drift nets (4½ or greater mesh) used in the central coast region to fish for rockfish and lingcod, which are generally allowed in waters deeper than 73 m (40 fathoms). All abalone species are prohibited from take within the central coast region. Many fisheries are subject to restricted access programs (limiting the total number of participants), quotas, trip limits, and gear restrictions. All

of the above regulations are designed to help promote sustainable fisheries, though their contribution to habitat protection and ecosystem management is not measurable.

The Monterey Bay National Marine Sanctuary (Sanctuary) has regulations and programs which help achieve some objectives of the MLPA. In particular, the Sanctuary has prohibitions on discharge into Sanctuary waters that help increase the overall water quality protection of the region. The Sanctuary also supports and participates in monitoring and research activities. Sanctuary participation in long-term monitoring will likely reduce the cost to the State and is one reason the central coast was selected as the first MLPA study region. The Sanctuary also provides outreach programs and educational opportunities that can be folded into a long-term strategy for MPA education.

A few areas along the central coast have access restrictions which, while not being designated to protect or enhance living resources, provide some additional protection. The one mile radius safety zone around the Diablo Canyon Power Plant provides complete protection from fishing activities. This area could be considered as a part of a potential new MPA by the central coast regional stakeholder group. It should be noted that heated water outflow from the plant has significant impacts on a portion of the security closure, and that the intake does not entrain larval organisms.

Similarly, the Safety Zone 4 around Vandenberg Air Force Base prohibits stopping within the area. This effectively creates an area where only trolling is allowed as fishing vessels cannot stop to fish bottom type gear. A representative from Vandenberg is on the CCRSG and can provide input on whether it is appropriate to establish formal limited-take or no-take MPAs in this area.

Finally, submarine cables are present in a variety of locations within the central coast. Cables that are not fully buried tend to limit the ability of trawl and some other bottom contact gears to be used. These areas would primarily impact trawl fisheries that are not allowed due to other regulations, but should be considered as potential areas where additional habitat protection may have smaller impacts on existing activities. As with the Diablo Canyon area, the impact of the cables themselves on natural habitats should be taken into consideration.

5.2 Recommendations for Modifications to Existing Central Coast MPAs

Recommendations for modifications to existing Central Coast MPAs will be included as part of the alternative packages of MPA proposals that the CCRSG develops over the next 2 months. This document will be provided as supporting rationale for recommendations in those MPA packages.

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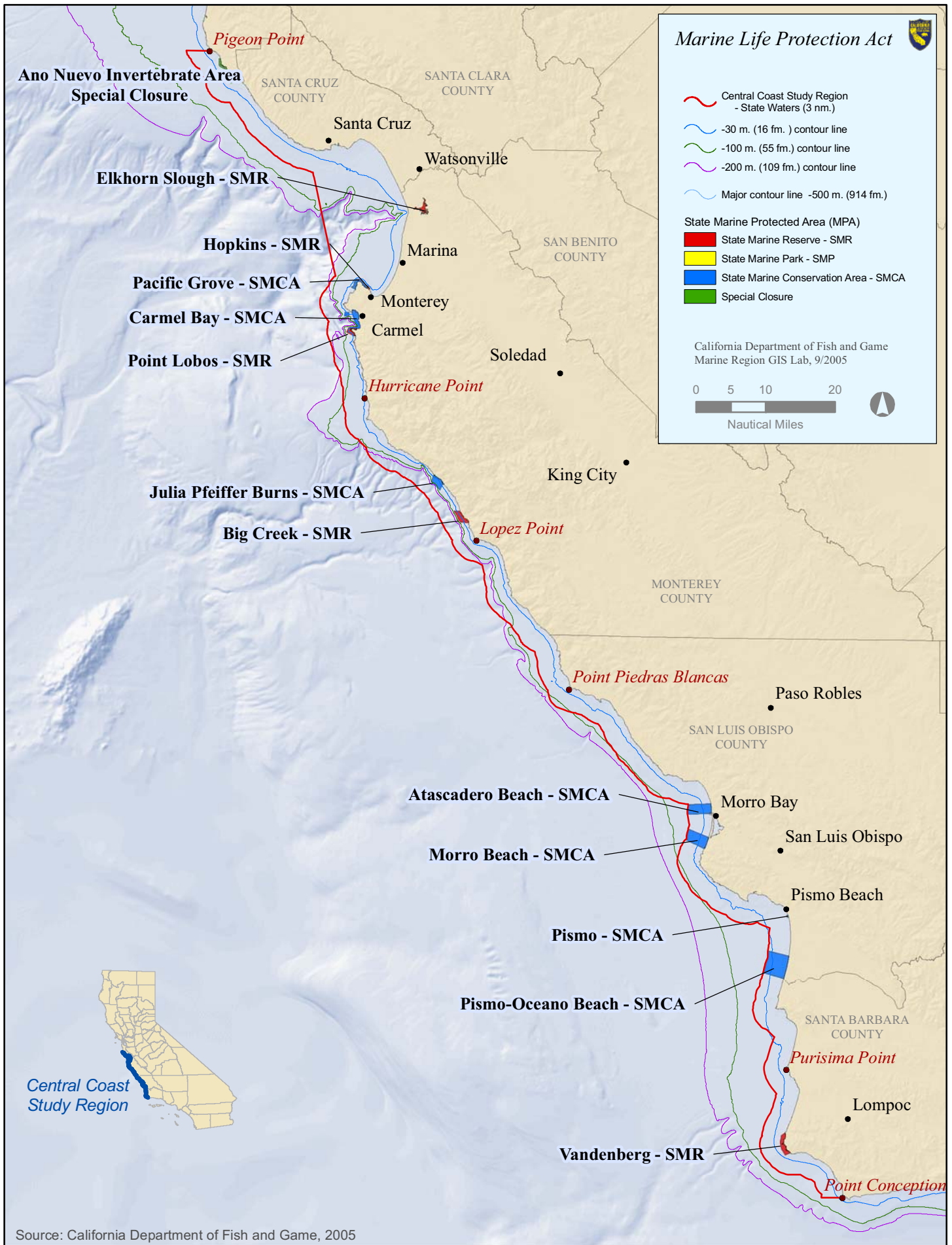
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Map 1. Central Coast Study Region and Existing State Marine Protected Areas

APPENDIX I

**DRAFT EVALUATION MATRIX
FOR EXISTING CENTRAL COAST MARINE PROTECTED AREAS**

APPENDIX I: DRAFT EVALUATION MATRIX FOR EXISTING CENTRAL COAST MARINE PROTECTED AREAS

Overall Evaluation	How measured?	Proposed Benchmark / Metric	Total amount in Region	Año Nuevo Special Closure	Elkhorn Slough SMR	Hopkins SMR	Pacific Grove SMCA	Carmel Bay SMCA	Point Lobos SMR	Julia Pfeiffer Burns SMCA	Data Sources	Comments
OVERALL EVALUATION	Green = Effective; Yellow = Effective with some modification; Red = Ineffective											
REPRESENTATIVE HABITATS												
Intertidal												
Dominant intertidal geologic substrate				sandstone, siltstone, mudstone (Tp)	Newly formed silt substrate	granite (Kgr)	granite (Kgr)	granite (Kgr)	sandstone/ conglomerate and granite	translucent, silty, calcareous and massive sandstone with shale (K/J) and siltstone	Intertidal SWNT team Coastal Biodiversity Survey, SAT	
Sandy or gravel beaches	Linear (mi)	Amount in MPA/Region Total	223.66	6.06	0.00*	0.32	2.73	3.64	1.01	0.37	NOAA-ESI 2002	
Rocky intertidal and cliff	Linear (mi)	Amount in MPA/Region Total	209.21	2.73	0.23	0.70	4.99	3.32	8.63	3.71	NOAA-ESI 2002	
Coastal marsh	Linear (mi)	Amount in MPA/Region Total	36.53	0.00	9.97	0.00	0.00	0.00*	0.00	0.00	NOAA-ESI 2002	
Tidal flats	Linear (mi)	Amount in MPA/Region Total	23.48	0.00**	9.97	0.00	0.00	0.00*	0.00	0.00	NOAA-ESI 2002	
Estuary	Area (mi ²)	Amount in MPA/Region Total	7.94	0.00	0.59	0.00	0.00	0.00	0.00	0.00	GIS Analysis	
Seagrass beds (0-30m): Surfgrass	Linear (mi)	Amount in MPA/Region Total	161.09	4.60	4.60	0.77	4.32	4.06	5.93	3.44	Minerals Management Service/Femera Inc.	
Seagrass beds (0-30m): Eelgrass	Area (mi ²)	Amount in MPA/Region Total	1.07	0.00	0.01	0.00*	0.00*	0.00*	0.00*	0.00	Elkhorn Slough Foundation and Morro Bay National Estuary Program	
Soft bottom (Fine Scale)												
0-30 meters	Area (mi ²)	Amount in MPA/Region Total	24.21	ND**	ND**	0.08	0.35	0.93	0.19	ND**	Kivitek et al	Total amount is only that which has been reported to date.
30-100 meters	Area (mi ²)	Amount in MPA/Region Total	93.72	N/A	N/A	N/A	N/A	0.08	0.19	1.13	Kivitek et al	Total amount is only that which has been reported to date.
100-200 meters	Area (mi ²)	Amount in MPA/Region Total	1.93	N/A	N/A	N/A	N/A	N/A	N/A	ND**	Kivitek et al	Total amount is only that which has been reported to date.
>200 meters	Area (mi ²)	Amount in MPA/Region Total	0.29	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Kivitek et al	Total amount is only that which has been reported to date.
Soft bottom (Coarse Scale)												
0-30 meters	Area (mi ²)	Amount in MPA/Region Total	294.14	1.86	0.00**	0.08	0.33	1.01	0.18	0.57	Greene et al 2004	Greene et al data underestimates the amount of hard substrate.
30-100 meters	Area (mi ²)	Amount in MPA/Region Total	575.76	N/A	N/A	N/A	N/A	0.22	0.19	2.05	Greene et al 2005	Greene et al data underestimates the amount of hard substrate.
100-200 meters	Area (mi ²)	Amount in MPA/Region Total	58.46	N/A	N/A	N/A	N/A	N/A	N/A	0.02	Greene et al 2006	Greene et al data underestimates the amount of hard substrate.
>200 meters	Area (mi ²)	Amount in MPA/Region Total	105.52	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Greene et al 2007	Greene et al data underestimates the amount of hard substrate.
Rocky reef; hard bottom (Fine Scale)												
0-30 meters	Area (mi ²)	Amount in MPA/Region Total	20.16	ND**	ND	0.03	0.54	0.63	0.27	ND*	Kivitek et al	Total amount is only that which has been reported to date.
30-100 meters	Area (mi ²)	Amount in MPA/Region Total	20.59	N/A	N/A	N/A	N/A	0.34	0.22	0.01	Kivitek et al	Total amount is only that which has been reported to date.
100-200 meters	Area (mi ²)	Amount in MPA/Region Total	0.40	N/A	N/A	N/A	N/A	N/A	N/A	ND	Kivitek et al	Total amount is only that which has been reported to date.
>200 meters	Area (mi ²)	Amount in MPA/Region Total	0.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Kivitek et al	Total amount is only that which has been reported to date.
Rocky reef; hard bottom (Coarse Scale)												
0-30 meters	Area (mi ²)	Amount in MPA/Region Total	46.66	0.31	0.00	0.03	0.46	0.58	0.27	0.00*	Greene et al 2004	Greene et al data underestimates the amount of hard substrate.
30-100 meters	Area (mi ²)	Amount in MPA/Region Total	26.78	N/A	N/A	N/A	N/A	0.23	0.22	0.00	Greene et al 2005	Greene et al data underestimates the amount of hard substrate.
100-200 meters	Area (mi ²)	Amount in MPA/Region Total	13.91	N/A	N/A	N/A	N/A	N/A	N/A	0.00	Greene et al 2006	Greene et al data underestimates the amount of hard substrate.
>200 meters	Area (mi ²)	Amount in MPA/Region Total	16.16	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Greene et al 2007	Greene et al data underestimates the amount of hard substrate.
Undetermined Habitat - For use with fine scale data												
0-30 meters	Area (mi ²)	Amount in MPA/Region Total	303.92	2.20 / 2.20	ND	0.040 / 0.146	0.67 / 1.50	0.74 / 2.31	0.32 / 0.78	0.58 / 0.58	See Notes	
30-100 meters	Area (mi ²)	Amount in MPA/Region Total	489.13	N/A	N/A	N/A	N/A	0.04 / 0.45	0.01 / 0.41	0.90 / 2.05	See Notes	
100-200 meters	Area (mi ²)	Amount in MPA/Region Total	70.03	N/A	N/A	N/A	N/A	N/A	N/A	0.03 / 0.03	See Notes	
Undetermined Habitat - For use with coarse scale data												
0-30 meters	Area (mi ²)	Amount in MPA/Region Total	303.92	0.00	0.00	0.00	0.05	0.06	0.04	0.00	See Notes	
30-100 meters	Area (mi ²)	Amount in MPA/Region Total	489.13	N/A	0.00	N/A	N/A	0.00	0.01	0.00	See Notes	
100-200 meters	Area (mi ²)	Amount in MPA/Region Total	70.03	N/A	0.00	N/A	N/A	N/A	N/A	0.00	See Notes	
Kelp forest (0-30m)												

	How measured?	Proposed Benchmark / Metric	Total amount in Region	Año Nuevo Special Closure	Elkhorn Slough SMR	Hopkins SMR	Pacific Grove SMCA	Carmel Bay SMCA	Point Lobos SMR	Julia Pfeiffer Burns SMCA	Data Sources	Comments
1989 Kelp Data	Area (mi ²)	MPA/Region Total Amount in MPA/Region Total	17.94	0.01	0.00	0.45	0.45	0.62	0.82	0.36	CDFG Kelp 1989 aerial survey	
1998 Kelp Data	Area (mi ²)	MPA/Region Total Amount in MPA/Region Total	2.56	0.00	0.00	<0.01	0.07	0.01	0.03	0.03	CDFG Kelp 1998 aerial survey	
2002 Kelp Data	Area (mi ²)	MPA/Region Total Amount in MPA/Region Total	12.55	0.00	0.00	0.05	0.32	0.62	0.20	0.11	CDFG Kelp 2002 aerial survey	
2003 Kelp Data	Area (mi ²)	MPA/Region Total Amount in MPA/Region Total	9.53	0.00	0.00	0.04	0.23	0.24	0.19	0.09	CDFG Kelp 2003 aerial survey	
Persistent Kelp	Area (mi ²)	MPA/Region Total Amount in MPA/Region Total	3.18	0.00	0.00	0.02	0.07	0.13	0.10	0.01	Present in 3 of 4 CDFG aerial survey datasets	
Bull Kelp (<i>Nereocystis</i>) presence	Presence			P**		P**	P**	P**	P**	P**	SAT	
Giant Kelp (<i>Macrocystis</i>) presence	Presence			P**		P**	P**	P**	P**	P**	SAT	
Pinnacles	Count	Amount in MPA/Region Total	0	0	0	0**	0**	100	23	0*	Bathymetry data	
30-100 meters	Count	Amount in MPA/Region Total	N/A	N/A	N/A	N/A	N/A	26	22	0*	Bathymetry data	
100-200 meters	Count	Amount in MPA/Region Total	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	Bathymetry data	
>200 meters	Count	Amount in MPA/Region Total	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Bathymetry data	
Submarine canyon	Area (mi ²)	Amount in MPA/Region Total	0.56	0.00	0.00	0.00	0.00	0.18	0.00*	0.00	Coarse-scale substrata (Greene et al 2004)	
0-30 meters	Area (mi ²)	Amount in MPA/Region Total	4.42	N/A	N/A	N/A	N/A	0.01	0.00*	0.06	Coarse-scale substrata (Greene et al 2004)	
30-100 meters	Area (mi ²)	Amount in MPA/Region Total	6.06	N/A	N/A	N/A	N/A	N/A	N/A	0.01	Coarse-scale substrata (Greene et al 2004)	
100-200 meters	Area (mi ²)	Amount in MPA/Region Total	42.77	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Coarse-scale substrata (Greene et al 2004)	
>200 meters	Area (mi ²)	Amount in MPA/Region Total	Need to fill in	A	P	A	A	P	A	A	NHD hydrography dataset	Very qualitative assessment
Freshwater plume	Presence/Absence	Presence of major river	unknown	A?	A?	A?	A?	P?	A?	A?	PFEL sea surface temperature, term water, presence of headland	Very qualitative assessment
Retention area	Presence/Absence	Presence of warm water or headland	3 major ones at Poverport, Sur, and Point Lobos; smaller amount in Big Sur Coastland	P	A	A	P	P	P	P	PFEL sea surface temperature, tide water, presence of headland	Very qualitative assessment
Upwelling cell	Presence/Absence	Presence of cold water or headland										
SIZE AND SPACING GUIDELINES												
Area	Area (mi ²)	N/A	N/A	2.20	1.35	0.16	1.54	2.79	1.19	2.65	GIS analysis	
Alongshore Span	Straight length (mi)	at least 2.88 to 6.21 mi, preferably 6.21 to 12.85 mi	N/A	5.52	app. 3.16	0.52	3.45	3.11	1.96	2.07	Nautical Chart	
Shoreline Length	Linear distance following baseline (mi)	N/A	N/A	7.00	19.22	0.79	4.47	5.73	6.19	3.46	GIS analysis	
Distance Between	Straight distance (mi) to nearest comparable blit and protection (th and south)	within 31 to 62 mi	N/A	24.2 N (Fitzgerald SMP), 15.5 S (Hopkins SMP), 65.5 S (Point Lobos SMR)	nearest protected area outside of the region to the north and south	85 N (Fitzgerald SMP), 11.7 S (Point Lobos SMR)	0 N (Hopkins SMR), 4.6 N (PG SMCA), 5.8 S (Point Lobos SMR)	11.7 N (Hopkins SMR), 34.4 S (Big Creek SMR)	11.7 N (Hopkins SMR), 34.4 S (Big Creek SMR)	26.5 N (Point Lobos SMR), 5.8 S (Big Creek SMR)	GIS analysis	
Shore to deep water	Depth range (ft) (average)	N/A	N/A	0-33 (11.5)	0-10	0-60 (19)	0-60 (19)	0-203 (49)	0-233 (94)	0-357.5 (149)	Legal boundary; GIS analysis; Bathymetry	
Offshore extent	Maximum linear distance offshore (mi)	N/A	N/A	100 feet	0 (Estuarine)	0.29	0.46	1.15 (offshore portion)	0.86	1.32	Legal boundary; Nautical Chart	
CCRSR DESIGN CONSIDERATIONS												
1. In evaluating the siting of MPAs, considerations should include the needs and interests of all users.	Not measurable for existing areas											
2. Recognize relevant portions of existing state and federal fishery management areas. To the extent possible, when designating new MPAs or expanding existing ones, consider how MPAs to prevent fishing effort shifts that would result in serial loss.	Compare MPA extent to other management measures	Overlap with year-round all gear RCA and recreational fir-round area)	45.36 mi ² (519.97 mi ²)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.50) finish lake allowed	0.00 (0.23)	0.00 (0.13) finish lake allowed	GIS Analysis	
3. To the extent possible, site MPAs adjacent to residential, state, county, or city parks, laboratories, or other "eyes on the water" to facilitate management, enforcement, and	Not measurable for existing areas											
4. When crafting MPA proposals, include considerations for design found in the Nearshore Fishery Management Plan and the draft Abalone Fishery and Management Plan	# of the 19 nearshore FMP species protected by the plan and present in the area? (Are all abalone present?)		19 / 2	0 (finish lake allowed) / 1 (black only)	0 (species not present) / 0 (species not present)	19 (all protected) / 2	0 (finish lake allowed) / 2	0 (finish lake allowed) / 2	0 (finish lake allowed) / 2	0 (finish lake allowed) / 2	Title 14, CCR	
5. In developing MPA proposals, consider how existing state and federal programs address the needs and objectives of the MLPA and the central region as well as how these proposals may	Not measurable for existing areas											
6. To the extent possible, site MPAs adjacent to residential, state, county, or city parks, laboratories, or other "eyes on the water" to facilitate management, enforcement, and	Compare MPA locations to terrestrial protected areas, search institutions, etc	Assess coastal protection and potential partners	N/A	Año Nuevo State Reserve	National Estuarine Research Reserve	Hopkins Marine Station	Some riparian presence, adjacent to urban area	Carmel River State Beach - danger presence	Point Lobos State Reserve	Julia Pfeiffer Burns State Park	GIS	
7. To the extent possible, site MPAs to facilitate the use of volunteers to assist in monitoring and management.	Compare MPA locations to existing program areas	Assess presence of existing volunteer programs		Docent program	Docent program	Volunteers stationed nearby, many divers, HMS nearby, 7/31/1996 survey	Bay Net volunteers stationed nearby, many divers, HMS nearby, 7/31/1996 survey	many divers, HMS nearby, 264/1396 REEF surveys	Docent program, many divers, HMS nearby, 128/1396 REEF surveys		K. Garfney, S. Shimek	

	How measured?	Proposed Benchmark / Metric	Total amount in Region	Año Nuevo Special Closure	Elkhorn Slough SMR	Hopkins SMR	Pacific Grove SMCA	Carmel Bay SMCA	Point Lobos SMR	Julia Pfeiffer Burns SMCA	Data Sources	Comments
8. To the extent possible, site MPAs to take advantage of existing long-term monitoring programs.	Compare MPA locations to existing program areas	Assess presence of existing monitoring programs	N/A	None reported for birds, marine mammals (PRBO) and shark studies (Shark Tagging) have been done in the area by offshore boundary delineation (distance from shore)	ESNERR (water quality and ecology), The Pacific Shark Research Foundation	2 PISCO, Old DFG Permanent Transect,	2 DFG Old Permanent Transects	2 PISCO, Cooperative Fish Trapping Society, Coastal DFG monitoring	2 PISCO	2 PISCO	DFG staff	
9. To the extent possible, design MPA boundaries that facilitate ease of public recognition and ease of enforcement.	Query enforcement: are existing boundaries cognizable	Report on enforcement concerns	N/A		prefer straight line for depth contour	prefer straight line for depth contour	prefer straight line for depth contour		prefer straight line for depth contour		DFG Staff	
REGIONAL GOALS AND PROVISIONAL OBJECTIVES.												
Goal 1. To protect the natural diversity and abundance of marine life, and the structure, function, and integrity of marine ecosystems.												
Obj1. Protect areas of high species diversity and abundance of marine life, and the structure, function, and integrity of marine ecosystems.	Amount (area) of each habitat and presence of areas of biodiversity significance; list of habitats	Assessment of presence of areas of biodiversity significance; list of habitats										
Obj2. Protect areas with diverse habitat types in close proximity to each other.	habitats present	habitats from above present	26 habitats	6	7 - red & black abalone, black-and-yellow, blue, copper, silver, kelp, and olive rockfish, hogcod, gon, kelp stalling.	6	2 - red abalone, black abalone	10	8	9	GIS Analysis	Proximity of habitats can be evaluated using mapped habitat information
Obj3. Protect natural size and age structure and genetic diversity of populations in representative habitats.	Assume take affects natural size and age structure, go by take regulations; list of species protected	Initial Review: number of "key" species from SAT list detected.	13 (Note: List getting revised, this is Aug 30 version)	2 - red abalone, black abalone	0 (species not present)	Yes	No	No	Yes	No	Title 14, CCR, SAT key species list, SAT species by depth	Direct size and age structure comparative information is generally lacking and this is a concern. We are unsure as to what the protection from take is for these characteristics. See written information for limited information on ecosystem health (eg. species)
Obj4. Protect natural trophic structure and food web in representative habitats.	Assume take affects natural size and age structure. Assume "key" protects entire food web	Initial Review: is the area no take?	N/A	No	Yes	Yes	No	No	Yes	No	Title 14, CCR, SAT key species list, SAT species by depth	See written evaluation for limited information on indicators of ecosystem health (eg. species size, density)
Obj5. Protect ecosystem structure, function, integrity and ecological processes to facilitate recovery of natural communities from effects of natural and human induced.	Act states that no-take reserves do this	Is the area no take?	N/A	No	Yes	Yes	No	No	Yes	No	MPA Designation	See written evaluation for limited information on indicators of ecosystem health (eg. species size, density)
Goal 2. To help sustain, conserve, and protect marine life populations, including those of high value, and rebuild those that are												
Obj1. Help protect or rebuild populations of rare, threatened, endangered, depleted, or overfished species, where identified, and the habitats and ecosystem functions upon which they rely.	Presence and protection of rare, threatened, endangered, depleted, or overfished species	Number of "key" species present										See written evaluation for limited information on indicators of ecosystem health (eg. species size, density)
Obj2. Protect larval sources and enhance genetic diversity of species that likely to fit from MPAs through retention of larvae, individuals.	Assume take affects natural size and age structure, go by take regulations; list of species protected	Number of "key" species present	13 (Note: List being revised, this is Aug 30 version)	2 - red abalone, black abalone	0 (species not present)	Yes	No	No	Yes	No	Title 14, CCR, SAT key species list, SAT species by depth	See written evaluation for limited information on indicators of ecosystem health (eg. species size, density)
Obj3. 3. Protect selected species and the habitats upon which they depend while allowing the harvest of fishery, highly mobile, or other species where feasible through the use of State Marine Region Areas and State Marine Parks.	Does the MPA meet objective? / summarize regulations	List species which are protected, if not protected	N/A	No, certain invertebrate species are protected only seasonally	Objective not met, all species are protected.	Objective not met, all species are protected.	Yes, certain species (mollusks and crustaceans) are protected while other finfish take is allowed	Yes, invertebrates are protected while recreational finfish take is allowed	Objective not met, all species are protected.	Yes, protects some invertebrate species	Title 14, CCR, SAT key species list, SAT species by depth	

How measured?	Proposed Benchmark / Metric	Total amount in Region	Año Nuevo Special Closure	Elkhorn Slough SMR	Hopkins SMR	Pacific Grove SMCA	Carmel Bay SMCA	Point Lobos SMR	Julia Pfeiffer Burns SMCA	Data Sources	Comments
Goal 3. To improve recreational, educational, and study opportunities provided by marine resources, and to manage these uses in a consistent with protecting											
Obj1. Ensure some MPAs are close to population centers and research and education institutions include areas of traditional nonconsumptive use and are accessible for formal, educational, and study opportunities.	Distance to Pop centers: Año Cruz, Monterey, Moss Landing, Big Sur, Point Pinos, Distant research values such as entry fees, etc. available.	N/A	20 nm to Santa Cruz. Some facilities available	Adjacent to Moss Landing Marine Laboratory, 14 nm to Monterey, 9 nm to Santa Cruz, facilities available	Adjacent to Monterey and Hopkins Marine Station, research facilities on site, non-impulsive site	Adjacent to Monterey, near Hopkins Marine Station, public facilities and kay access, non-impulsive site, pooling	Adjacent to Carmel, Public access to most areas from here, non-impulsive site	5 nm to Monterey, Public access through State Park, diving limited on daily basis, non-impulsive site	30 nm to Monterey, Public access through State Park	Nautical chart	See written evaluation for description of nonconsumptive use patterns
Obj2. To enhance the likelihood of scientifically sound studies, replicate appropriate MPA designs, habitats or control areas (including open to fishing) to the extent possible.	Number of habitats that are replicated; entity which are	26 total Habitats	Coastal Marsh; Tidal Flats; Soft Bottom >200; Rocky 30-100 (3 areas only); Rocky 100-200; >200; Submarine Canyons (all depths)						Rocky	GIS Analysis	
Obj3. Develop collaborative scientific monitoring and research projects evaluating MPAs that link classroom science curricula, volunteer dive sites, and fishermen of all ages, and identify	Do any of these MPAs have these programs? (PISCO, CRANE, etc)	N/A	None	ESNERR (water quality and ecology), The Pelagic Shark Research Foundation	2 PISCO, Old DFG Permanent Transect	2 DFG Old Permanent Transects	2 PISCO Cooperative Fish Trapping Surveys, CenCal DFG monitoring	2 PISCO, docent programs	2 PISCO	Monitoring Program data compiled for Regional Profile	
Obj4. Protect or enhance recreational experiences by ensuring natural size and age structure of line populations.	Consumptive - Short term: Document most popular recreational activities. List species subject to consumption. Non-impulsive - Short term: List most species subject to consumption.										
Goal 4. To protect marine natural heritage, including projects evaluating MPAs that link classroom science curricula, volunteer dive sites, and fishermen of all ages, and identify											
Obj1. Include within MPAs the following habitat types: estuaries, heads of submarine canyons, and submarine	Habitat amounts or presence		None	Estuary	None	None	Pinnacles, canyon	Pinnacles	Pinnacles, canyon		
Obj2. Protect, and replicate to the extent possible, representatives of all marine habitats identified in LPA or the MPF across a range of depths.	Habitat amounts or presence, and replication										
Goal 5. To ensure that central California's MPAs have clearly defined objectives, effective management measures, and adequate funding, and are based on sound scientific guidelines.											
Obj1. Minimize negative socio-economic impacts on the region, and ensure that MPAs are consistent with the California Coastal Act and its goals	Not measurable for existing areas										
Obj2. For all MPAs in the region, develop and implement a long-term monitoring plan that includes monitoring of biological resources, socioeconomic conditions, and a management plan that is consistent with the California Coastal Act and its goals	Not measurable for existing areas										
Obj3. To the extent possible, effectively use scientific guidelines in the Master Plan Framework.	Report out on span and spacing	N/A	Span - moderate Spacing - Yes	Span - Moderate Spacing - Moderate	Span - no Spacing - yes	Span - moderate Spacing - Yes	Span - moderate Spacing - Yes	Span - no Spacing - yes	Span - no Spacing - yes	Nautical Chart, GIS	
Goal 6. To ensure that the central coast's MPAs are designed and managed, to the extent possible, as a component of a statewide network.											
Obj1. Develop a process for regional review and evaluation of implementation effectiveness that includes stakeholder involvement to determine if MPAs are an effective component of a statewide network	Not measurable for existing areas										
Obj2. Develop a mechanism to coordinate with other MLPA Regional Stakeholder Groups in other counties to develop a statewide MPA network to the goals of the MLPA.	Not measurable for existing areas										
Species of Interest											
Sea Otter	Presence		P*	P*	P*	P*	P*	P*	P*	CCRSG and SAT	
Harbor Seals	Presence		P**	P**	P**	P**	P**	P**	P**	CCRSG and SAT	
Elephant Seals	Presence		P*	P*	P*	P*	P*	P*	P*	CCRSG and SAT	
Snowy Plovers	Presence		P*	P*	P*	P*	P*	P*	P*	CCRSG and SAT	
Other birds	Presence		P*	P*	P*	P*	P*	P*	P*	CCRSG and SAT	
White Sea Bass	Presence		P**	P**	P**	P**	P**	P**	P**	CCRSG and SAT	
Halibut	Presence		P**	P**	P**	P**	P**	P**	P**	CCRSG and SAT	
Assorted Flat Fish	Presence		P**	P**	P**	P**	P**	P**	P**	CCRSG and SAT	
Surf Perch	Presence		P**	P**	P**	P**	P**	P**	P**	CCRSG and SAT	
pile perch	Presence		P**	P**	P**	P**	P**	P**	P**	CCRSG and SAT	
rubberlip perch	Presence		P**	P**	P**	P**	P**	P**	P**	CCRSG and SAT	

	How measured?	Proposed Benchmark / Metric	Total amount in Region	Año Nuevo Special Closure	Elkhorn Slough SMR	Hopkins SMR	Pacific Grove SMCA	Carmel Bay SMCA	Point Lobos SMR	Julia Pfeiffer Burns SMCA	Data Sources	Comments
kelp bass	Presence						P*	P**	P*		CCRSG and SAT	
leopard seal	Presence						P*	P*			CCRSG and SAT	
kelp crinoid	Presence					P**	P*	P*			CCRSG and SAT	
california sheepshead	Presence					P**	P*	P*			CCRSG and SAT	
Cabezon	Presence				P**	P*	P*	P*			CCRSG and SAT	
longfin sculpin	Presence										CCRSG and SAT	
Salmon	Presence										CCRSG and SAT	
Steelhead	Presence										CCRSG and SAT	
Brown Rockfish	Presence					P**	P*	P*			CCRSG and SAT	
vermillion rockfish	Presence					P**	P*	P*			CCRSG and SAT	
grass rockfish	Presence					P**	P*	P*			CCRSG and SAT	
gopher rockfish	Presence					P**	P*	P*			CCRSG and SAT	
black rockfish	Presence					P**	P*	P*			CCRSG and SAT	
starry rockfish	Presence					P**	P*	P*			CCRSG and SAT	
yellowtail rockfish	Presence					P**	P*	P*			CCRSG and SAT	
China Rockfish	Presence			P**		P**	P*	P*			CCRSG and SAT	
sharks	Presence				P**						CCRSG and SAT	
skates/rays	Presence				P*						CCRSG and SAT	
Sand Crabs	Presence										CCRSG and SAT	
giant pacific octopus	Presence						P*	P*			CCRSG and SAT	
spot prawn	Presence						P*	P*			CCRSG and SAT	
lobster	Presence						P*	P*			CCRSG and SAT	
Clams	Presence										CCRSG and SAT	
scallops	Presence										CCRSG and SAT	
sea urchins	Presence										CCRSG and SAT	
hydrozoal	Presence						P*	P**			CCRSG and SAT	
bull kelp	Presence			P*		P**	P*	P**		P**	CCRSG and SAT	
giant kelp	Presence					P**	P*	P**		P**	CCRSG and SAT	
Use Data	Presence											
Not heavily used	Presence			P*				P*			CCRSG and SAT	
Heavily used	Presence			P*				P*			CCRSG and SAT	
fishing	Presence										CCRSG and SAT	
surfing	Presence										CCRSG and SAT	
horseback riding, hiking, ATVs, etc	Presence										CCRSG and SAT	
beachgoers	Presence										CCRSG and SAT	
intertidal visitors/ birders/ wildlife viewing	Presence			P*		P*		P*			CCRSG and SAT	
kayaking	Presence			P*		P*		P*			CCRSG and SAT	
boating	Presence					P*		P*			CCRSG and SAT	
researchers/school groups	Presence					P*		P*			CCRSG and SAT	

NOTES

Key to colored boxes: Red, yellow, and green color-coding of boxes is a simplified way to sum up how well each reserve fulfills the criterion in that row, this reflects the evaluation of the MPA Staff and the RSG members who took part in the respective work groups. For example, in our coding of Goal 1 Objective 3, Point Lobos

Objective, Hopkins marginally meets the goal/objective, and Año Nuevo, Pacific Grove, Carmel Bay, and Julia Pfeiffer Burns do not meet the goal/objective. (In this category, Elkhorn Slough has not been fully evaluated).

Blue boxes denote areas that need further information and evaluation.

ND: Text colored blue in the left-hand column means that this criterion is not relevant or can not be measured for the evaluation of existing MPAs.

N/A: This code indicates that no data for this habitat were available for GIS analysis.

Starred P's (P*): P's with stars denote the presence of the characteristic listed in the left-hand column; P* means that it has been listed by at least one CCRSG member and P** means that it has been listed by at least one SAT member.

Starred zeros (0.00*): Zeros with stars signify that none of the specified habitat type was found for this MPA by GIS analysis, but that at least one CCRSG or SAT member indicated the presence of this habitat type.

One star (0.00*): Zeros with stars signify that none of the specified habitat type was found for this MPA by GIS analysis, but that at least one CCRSG member and two stars (0.00**) means that it has been listed by at least one SAT member.

Starred ND (ND*): This indicates that no data for this habitat were available for GIS analysis, but that at least one CCRSG or SAT member indicated the presence of this habitat type.

One star (ND*) means that it has been listed by at least one CCRSG member and two stars (ND**) means that it has been listed by at least one SAT member.

Underlined: This indicates that the data for this habitat type were not available for GIS analysis. For the GIS analysis, portions of the study region could not be recognized as either soil or hard bottom. For the coarse scale data, this amount of undetermined habitat is given as a whole number.

During the GIS analysis, portions of the study region could not be recognized as either soil or hard bottom. For the coarse scale data, this amount of undetermined habitat is given as a whole number.

For the fine scale data, this amount of undetermined habitat is given as a fraction of the total amount of fine scale data in that MPA and depth zone.

APPENDIX I. DRAFT EVALUATION MATRIX FOR EXISTING CENTRAL COAST MARINE PROTECTED AREAS

OVERALL EVALUATION	How measured?	Proposed Benchmark Metric	Total amount in region	Big Creek SMR	Atascadero Beach SMCRA	Morro Beach SMCRA	Pismo SMCRA	Pismo-Oceano SMCRA	Vandenberg SMR	Data Sources	Comments
Intertidal				Green/Yellow (RSG)	Yellow/Red (RSG)	Green/Yellow (RSG)	Red (RSG)	Yellow (RSG)	Yellow (RSG)		
REPRESENTATIVE HABITATS											
Dominant intertidal geologic substrate				Franciscan complex; Diataceous and massive sandstone in shale (K-J) and tile	sand/soft substrate	sand/soft substrate	sand/soft substrate	sand/soft substrate	Monterey Shale (TM)	Intertidal SWAT team Coastal Biodiversity survey, SAT	
Sandy or gravel beaches	Linear (m)	Amount in MPA/Region Total	223.66	1.17	1.61	1.75	0.39	3.95	2.68	NOAA-ESI 2002	
Rocky intertidal and cliff	Linear (m)	Amount in MPA/Region Total	209.21	1.91	0.48	0.37	0.00	0.00	5.35	NOAA-ESI 2002	
Coastal marsh	Linear (m)	Amount in MPA/Region Total	36.53	0.00	0.00	0.00	0.00	0.00	0.00	NOAA-ESI 2002	
Tidal flats	Linear (m)	Amount in MPA/Region Total	23.48	0.00	0.00	0.00	0.00	0.00	0.00	NOAA-ESI 2002	
Estuary	Area (nm²)	Amount in MPA/Region Total	7.94	0.00	0.00	0.00	0.00	0.00	0.00	GIS Analysis	
Seagrass beds (0-30m): Surfgrass	Linear (m)	Amount in MPA/Region Total	161.09	3.04	0.00	0.00	0.00	0.00	5.93	Minerals Management Services/General Inc.	
Seagrass beds (0-30m): Eelgrass	Area (m ²)	Amount in MPA/Region Total	1.07	0.00	0.00	0.00	0.00	0.00	0.00	Eikhorn Slough Foundation and Morro Bay National Estuary Program	
Soft bottom (Fine Scale)											
0-30 meters	Area (m ²)	Amount in MPA/Region Total	24.21	0.24	ND**	ND**	ND**	ND**	0.89	Kvilek et al	Total amount is only that which has been reported to date.
30-100 meters	Area (m ²)	Amount in MPA/Region Total	93.72	1.13	ND**	ND**	N/A	ND**	N/A	Kvilek et al	Total amount is only that which has been reported to date.
100-200 meters	Area (m ²)	Amount in MPA/Region Total	1.93	N/A	N/A	N/A	N/A	N/A	N/A	Kvilek et al	Total amount is only that which has been reported to date.
>200 meters	Area (m ²)	Amount in MPA/Region Total	0.29	N/A	N/A	N/A	N/A	N/A	N/A	Kvilek et al	Total amount is only that which has been reported to date.
Soft bottom (Coarse Scale)											
0-30 meters	Area (m ²)	Amount in MPA/Region Total	294.14	0.49	2.30	2.19	0.08	8.94	2.46	See above	
30-100 meters	Area (m ²)	Amount in MPA/Region Total	575.78	1.11	4.02	4.62	N/A	4.35	N/A	See above	
100-200 meters	Area (m ²)	Amount in MPA/Region Total	58.46	N/A	N/A	N/A	N/A	N/A	N/A	See above	
>200 meters	Area (m ²)	Amount in MPA/Region Total	105.52	N/A	N/A	N/A	N/A	N/A	N/A	See above	
Rocky reef; hard bottom (Fine Scale)											
0-30 meters	Area (m ²); Type if known	Amount in MPA/Region Total	20.16	0.16	ND*	ND*	ND	ND	0.03	Kvilek et al multibeam sidescan sonar; amount is only that which has been reported to date.	Total amount is only that which has been reported to date.
30-100 meters	Area (m ²); Type if known	Amount in MPA/Region Total	20.59	0.06	ND	ND*	N/A	ND	N/A	Kvilek et al	Total amount is only that which has been reported to date.
100-200 meters	Area (m ²); Type if known	Amount in MPA/Region Total	0.40	N/A	N/A	N/A	N/A	N/A	N/A	Kvilek et al	Total amount is only that which has been reported to date.
>200 meters	Area (m ²); Type if known	Amount in MPA/Region Total	0.01	N/A	N/A	N/A	N/A	N/A	N/A	Kvilek et al	Total amount is only that which has been reported to date.
Rocky reef; hard bottom (Coarse Scale)											
0-30 meters	Area (m ²); Type if known	Amount in MPA/Region Total	46.66	0.46	0.00*	0.00*	0.00	0.00	0.01	See above	
30-100 meters	Area (m ²); Type if known	Amount in MPA/Region Total	26.78	0.09	0.00	0.00*	N/A	0.00	N/A	See above	
100-200 meters	Area (m ²); Type if known	Amount in MPA/Region Total	13.91	N/A	N/A	N/A	N/A	N/A	N/A	See above	
>200 meters	Area (m ²); Type if known	Amount in MPA/Region Total	16.16	N/A	N/A	N/A	N/A	N/A	N/A	See above	
Undetermined Habitat - For use with fine scale											

	How measured?	Proposed Benchmark / Metric	Total amount in Region	Big Creek SMR	Atascadero Beach SMCA	Marco Beach SMCA	Pismo SMCA	Pismo-Oceano SMCA	Vandenberg SMR	Data Sources	Comments
0-30 meters		Amount in MPA/Region Total	303.92	0.68 / 1.07	2.31 / 2.31	2.20 / 2.20	0.08 / 0.08	8.95 / 8.95	1.55 / 2.48	See Notes	
30-100 meters		Amount in MPA/Region Total	489.13	0 / 1.19	4.03 / 4.03	4.63 / 4.63	N/A	4.35 / 4.35	N/A	See Notes	
100-200 meters		Amount in MPA/Region Total	70.03	N/A	N/A	N/A	N/A	N/A	N/A	See Notes	
Undetermined Habitat - For use with coarse scale											
0-30 meters		Amount in MPA/Region Total	303.92	0.00	0.00	0.00	0.00	0.00	0.00	See Notes	
30-100 meters		Amount in MPA/Region Total	489.13	0.00	0.00	0.00	N/A	0.00	N/A	See Notes	
100-200 meters		Amount in MPA/Region Total	70.03	N/A	N/A	N/A	N/A	N/A	N/A	See Notes	
Kelp forest (0-30m)											
1989 Kelp Data	Area (m ²); Type	Amount in MPA/Region Total	17.94	0.36	0.00	0.00	0.00	0.00	0.00	CDFG Kelp 1989 aerial survey	
1999 Kelp Data	Area (m ²); Type	Amount in MPA/Region Total	2.56	0.07	0.00	0.00	0.00	0.00	0.00	CDFG Kelp 1999 aerial survey	
2002 Kelp Data	Area (m ²); Type	Amount in MPA/Region Total	12.55	0.28	0.00	0.00	0.00	0.00	0.00	CDFG Kelp 2002 aerial survey	
2003 Kelp Data	Area (m ²); Type	Amount in MPA/Region Total	9.53	0.17	0.00	0.01	0.00	0.00	< 0.01	CDFG Kelp 2003 aerial survey	
Persistent Kelp	Area (m ²)	Amount in MPA/Region Total	3.18	0.08	0.00	0.00	0.00	0.00	0.00	Present in 3 of 4 PDG aerial survey	
Bull Kelp (Macrocystis) presence	Presence		P**							SAT	
Giant Kelp (Macrocystis) presence	Presence		P**							SAT	
Pinnacles											
0-30 meters	Count	Amount in MPA/Region Total	1	0	0	0	0	0	0	Bathymetry data	
30-100 meters	Count	Amount in MPA/Region Total	7	0	0	0	N/A	0	N/A	Bathymetry data	
100-200 meters	Count	Amount in MPA/Region Total	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Bathymetry data	
>200 meters	Count	Amount in MPA/Region Total	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Bathymetry data	
Submarine canyon											
0-30 meters	Area (m ²)	Amount in MPA/Region Total	0.56	0.00	0.00	0.00	0.00	0.00	0.00	Coarse-scale bathymetry (Greene et al 2004)	
30-100 meters	Area (m ²)	Amount in MPA/Region Total	4.42	0.00	0.00	0.00	N/A	0.00	N/A	Coarse-scale bathymetry (Greene et al 2004)	
100-200 meters	Area (m ²)	Amount in MPA/Region Total	6.06	N/A	N/A	N/A	N/A	N/A	N/A	Coarse-scale bathymetry (Greene et al 2004)	
>200 meters	Area (m ²)	Amount in MPA/Region Total	42.77	N/A	N/A	N/A	N/A	N/A	N/A	Coarse-scale bathymetry (Greene et al 2004)	
Freshwater plume	Presence/Absence	Presence of major river	Need to fill in	P	A	A	A	P?	A	NHD hydrography dataset	
Retention area	Presence/Absence	Presence of warm water or headland	unknown	A?	A?	A?	A?	A?	A?	PFEL sea surface temperature, warm water, presence of headland	
Upwelling cell	Presence/Absence	Presence of cold water or headland	3 major ones at Davenport, Sur, Conception; smaller point on Big Coastland	P	A	A	A	A	P	PFEL sea surface temperature, cold water, presence of headland	
SIZE AND SPACING GUIDELINES											
Area		N/A	N/A	2.26	6.33	6.82	0.08	13.30	2.48	GIS analysis	
Along Shore Span	Straight length (mi) offshore	at least 2.88 to 6.21 mi, preferably 6.21 to 12.65 mi	N/A	2.19	1.61	1.96	0.38	3.80	3.68	Nautical Chart	
Shoreline Length	Linear distance following coastline (mi)	N/A	N/A	3.05	2.07	2.09	0.38	3.95	6.66	GIS analysis	
Distance Between	Straight distance (mi) to next area of comparable habitat protection (north and south)	within 31 to 62 mi	N/A	34.4 N (Point Lobos SMR), 4.6 S (Vandenberg SMR)	61 N (Big Creek SMR), 4.6 S (Marco Beach SMCA)	4.6 N (Atascadero SMCA), 5.8 S (Pismo Beach SMCA)	17.3 N (Morro Beach SMCA), 5.8 S (Pismo SMCA), 25.3 S (Vandenberg Rock SMR)	5.8 N (Pismo SMCA), 25.3 S (Vandenberg Rock SMR)	121.2 N (Big Creek SMR), 31 S (Vandenberg Rock SMR)	GIS analysis	
Shore to deep water	Depth range (ft) (average)	N/A	N/A	0-298 (95.8)	0-236 (130.2)	0-243 (128)	0-10 (4.9)	0-134.5 (78.4)	0-59 (40.7)	Legal boundary; GIS analysis; Bathymetry	
Offshore extent	Maximum linear distance offshore (mi)	N/A	N/A	1.15	3.45	3.45	1,000 feet	3.45	0.86	Legal boundary; Nautical Chart	
CCRS&G DESIGN CONSIDERATIONS											
		Not measurable for existing areas									
1. In evaluating the siting of MPAs, considerations all include the needs and interests of all users.											

	How measured?	Proposed Benchmark / Metric	Total amount In Region	Big Creek SMR	Atascadero Beach SMCA	Marco Beach SMCA	Pismo SMCA	Pismo-Oceano SMCA	Vandenberg SMR	Data Sources	Comments
2. Recognize relevant portions of existing state and federal fishery management areas, to the extent possible, when designing new MPAs or modifying ones.	Compare MPA extent to other management measures	Overlap with year-round all gear RCA and recreational in-round area	45.36 mi ² (519.87 mi ²)	0.00 (0.79)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)		
3. To the extent possible, site MPAs to prevent fishing activities that would result in serial depletion.	Not measurable for existing areas										
4. When crafting MPA proposals, include provisions for design food in the Nearshore Marine Plan and the Grant/Abalone Entry and Management Plan	Are Nearshore FMP species protected by regulations and management measures? Do red and black abalones present?	# of the 19 nearshore finfish protected / Assess presence of 2 species	19 / 2	19 (all protected) / 2	0 (finfish take allowed) / 0	0 (finfish take allowed) / 0	0 (finfish take allowed) / 0	0 (finfish take allowed) / 0	19 (all protected) / 2	Title 14, CCR	
5. In developing MPA proposals, consider how existing state and federal programs address the goals and objectives of the MLPA and the central coast region as well as how these proposals may coordinate with other	Not measurable for existing areas										
6. To the extent possible, site MPAs adjacent to forested federal, state, county, or city parks, marine reserves, or other "eyes on the water" to facilitate enforcement, and monitoring.	Compare MPA locations to terrestrial protected areas, research institutions, etc	Assess coastal protection and potential partners	N/A	Landels-Hill Big Creek Reserve (on site manager)	Atascadero State Beach	Montana de Oro State Park			Vandenberg AFB - Access Restricted	GIS	
7. To the extent possible, site MPAs to facilitate use of volunteers to assist in monitoring and management.	Compare MPA locations to existing program areas	Assess presence of existing volunteer programs		Voluntary monitoring by commercial fishermen coordinated with reserve manager	Monitoring of recreational user trends at state beach	Monitoring of recreational user trends at state beach					
8. To the extent possible, site MPAs to take advantage of existing long-term monitoring studies.	Compare MPA locations to existing program areas	Assess presence of existing monitoring studies	N/A	1 PISCO, 3 or more DFG Old Permanent Transects	DFG Interstitial Transects (Historical)	DFG Interstitial Transects (Historical)	DFG Interstitial Transects (Historical)	DFG Interstitial Transects (Historical)	DFG Abalone Interstitial Transects	DFG staff	
9. To the extent possible, design MPA boundaries that facilitate ease of public recognition and ease of enforcement.	Query enforcement: are existing boundaries cognizable	Report on enforcement concerns	N/A	prefer straight line offshore as opposed to depth contour	prefer straight line offshore as opposed to distance	prefer straight line offshore as opposed to distance	prefer straight line offshore as opposed to distance	prefer straight line offshore as opposed to distance	prefer straight line offshore as opposed to depth contour	DFG Staff	
REGIONAL GOALS AND PROVISIONAL OBJECTIVES											
Goal 1. To protect the natural diversity and abundance of marine life, and the structure, function, and integrity of marine ecosystems.											
Obj1. Protect areas of high species diversity and high species abundance, consistent with natural fluctuations, of populations in native habitats	Amount (area) of each habitat type and percentage of biodiversity (Section 3.3 file)	Qualitative assessment of presence of areas of high biodiversity influence - list of each habitat									
Obj2. Protect areas with diverse habitat types in close proximity to each other.	habitats present	#habitats from above present	26 habitats	8	4	5	2	3	5	GIS Analysis	Proximity of these habitats to one another is included in the report and being information for each MPA above.
Obj3. Protect natural size and age structure and genetic diversity of populations in representative habitats.	Assume take affects natural size and age structure. go by regulations; list of species protected	Initial Review: Number of "key" species from SAT list detected.	13 (Note: List getting revised, this is version)	12 - red & black abalone, black, black-and-yellow, blue, black, yellow, blue, yellow, green grass, kelp, live, vermillion, and yelloweye fish, lingcod, razor, kelp, starfishes	0	0.00	0.00	0.00	7 - red & black abalone, black, blue, brown, paper, olive, and vermillion fish, lingcod	Title 14, CCR, SAT Key species list, SAT species by depth	Direct size and age structure comparison is included in the report and being information from take protects these species. See written evaluation for information on indicators of health (eg. species size, density).
Obj4. Protect natural trophic structure and food webs in representative habitats.	Assume take affects natural size and age structure. assume "no-take" protects the food web	Initial Review: Is the area no take?	N/A	Yes	No	No	No	No	Yes	Title 14, CCR, SAT Key species list, SAT species by depth	See written evaluation for limited information on indicators of ecosystem health (eg. species size, density)
Obj5. Protect ecosystem structure, function, integrity ecological processes to facilitate recovery of communities from disturbances both natural and human induced.	Act states that no-take reserves do this	Is the area no take?	N/A	Yes	No	No	No	No	Yes	MPA Designation	See written evaluation for limited information on indicators of ecosystem health (eg. species size, density)
Goal 2. To help sustain, conserve, and protect marine life populations, including those of intrinsic value, and rebuild those that are											
Obj1. Help protect or rebuild populations of rare, threatened, endangered, depleted, or overfished species, and restore their natural functions upon which they rely.	Presence and protection of rare, threatened, endangered, depleted, or overfished species	Number of rare, threatened, endangered, depleted, or overfished species detected in the MPA / is the MPA productive.									

	How measured?	Proposed Benchmark / Metric	Total amount in Region	Big Creek SMR	Atascadero Beach SMCA	Marro Beach SMCA	Pismo SMCA	Pismo-Ocama SMCA	Vandenberg SMR	Data Sources	Comments
Obj2. Protect larval sources and enhance reproductive capacity of species most likely to benefit from MPAs in retention of large, mature individuals.	Assume take affects natural size and age structure. go by regulations; list of species protected	Number of "key" species present	13 (Note: List getting revised. This is the 30th version)	abalone, black, black-and-yellow, blue, bocaccio, canary, pepper grass, kelp, rockfish, sand yelloweye, sea urchin, spiny lobster, fish, lingcod, salmon, steelhead	0.00	0.00	0.00	0.00	7 red & black abalone, black, blue, brown, pepper, olive, and vermilion rockfish, lingcod	Title 14, CCR, SAT key species list, SAT species by depth	See written evaluation for limited information on indicators of ecosystem health (e.g. species size, density)
Obj3. 3. Protect selected species and the habitats on which they depend while allowing the harvest of fishery, highly mobile, or other species where there is no conflict with the use of State Marine Conservation Areas and State Marine Parks.	Does the MPA meet objective? / summarize regulations	List species which are protected, if not protected	N/A	Objective not met; all species are protected	Yes, certain species (Pismo clams) are protected.	Yes, certain species (Pismo clams) are protected.	Yes, certain species (Pismo clams) are protected.	Yes, certain species (Pismo clams) are protected.	Objective not met; all species are protected.	Title 14, CCR, SAT key species by depth	
Goal 3. To improve recreational, educational, and other opportunities provided by marine resources that are subject to minimal human pressures, and to manage these uses in a consistent with protecting biodiversity.											
Obj1. Ensure some MPAs are close to population centers and research and education institutions and provide areas of traditional nonconsumptive recreational use and are accessible for recreational, educational, and study opportunities.	Do any of these MPAs have these programs? (PISCO, RANNE, etc)	Do any of these MPAs have these programs? (PISCO, RANNE, etc)	N/A	38 nm to Monterey, Public Access prohibited, some public facilities for researchers	Adjacent to Morro Bay, Public beach access	Adjacent to Morro Bay, Public beach access	Adjacent to Pismo Beach, Public Beach Access	8 nm to Pismo Beach, Public Beach Access	40 nm to Pismo Beach, 50 nm to Santa Barbara, Public Beach Access, search access, limited basis	Nautical chart	See written evaluation for description of nonconsumptive use patterns
Obj2. To enhance the likelihood of scientifically valid data or control areas (including areas open to the public) to be used for research and education.	Number of each type of MPA and indication of habitat type	Identify which habitats are not protected in 3 or more MPAs	25 total Habitats	Coastal Marsh; Tidal Flats; Soft Bottom 100-200; Rocky 100-200; Rocky >200; Submarine Canyons (at depths)						GIS Analysis	
Obj3. Develop collaborative scientific monitoring and assessment programs, volunteer dive programs, citizen science curricula, volunteer dive programs, citizen science curricula, and identify participants.	Do any of these MPAs have these programs? (PISCO, RANNE, etc)	Assess programs present	N/A	1 PISCO, 3 or more DF-G Old Permanent Transects	None	None	None	None	DFG Abalone Interstitial Transects	GIS Analysis	
Obj4. Protect or enhance recreational experience by ensuring natural size and age structure of marine organisms.	Do any of these MPAs have these programs? (PISCO, RANNE, etc)	Assess programs present	N/A	1 PISCO, 3 or more DF-G Old Permanent Transects	None	None	None	None	DFG Abalone Interstitial Transects	GIS Analysis	
Obj5. Protect or enhance recreational experience by ensuring natural size and age structure of marine organisms.	Do any of these MPAs have these programs? (PISCO, RANNE, etc)	Assess programs present	N/A	1 PISCO, 3 or more DF-G Old Permanent Transects	None	None	None	None	DFG Abalone Interstitial Transects	GIS Analysis	
Goal 4. To protect marine natural heritage, including the marine life and the unique life habitats in central California waters.											
Obj1. Include within MPAs the following habitat types: seagrasses; heads of submarine canyons, and	Habitat amounts or presence	Presence of habitats		Pinnacles	None	None	None	None	None		
Obj2. Protect, and replicate to the extent possible, representatives of all marine habitats identified in the MPA or the MPF across a range of depths.	Habitat amounts or presence, and replication	Gap analysis of replication in MPA and adjacent to study								Included in Gap Analysis (Appx 2)	
Goal 5. To ensure that central California's MPAs have clearly defined objectives, effective management, and are based on sound scientific principles.											
Obj1. Minimize negative socio-economic impacts and maximize positive socio-economic impacts for all users, to the extent possible, and if consistent with the California Coastal Protection Act and its goals and guidelines.	Not measurable for existing years										
Obj2. For all MPAs in the region, develop objectives, a long-term monitoring plan that includes standardized biological and socioeconomic monitoring protocols, and apply for MPA evaluation, and ensure that each MPA is linked to one or more regional	Not measurable for existing years										
Obj3. To the extent possible, effectively use scientific principles in the MPA Framework.	Alongshore span and spacing	Report out on size and spacing	N/A	Span - No Spacing - Moderate	Span - No Spacing - Moderate	Span - No Spacing - Yes	Span - No Spacing - Yes	Span - Moderate Spacing - yes	Span - Moderate Spacing - yes	Nautical Chart GIS	
Goal 6. To ensure that the central coast's MPAs are designed and managed, to the extent possible, as components of a statewide network.											
Obj1. Develop a process for regional review and evaluation of implementation effectiveness that includes stakeholder involvement to determine if MPAs are an effective component of a network	N/A; future										
Obj2. Develop a mechanism to coordinate with future MPA Regional Stakeholder Groups in other regions to ensure that the statewide MPA network meets the needs of the MLPA.	N/A; future										
Species of Interest											
Sea Lions	Presence										
Sea Otters	Presence										
Harbor Seals	Presence										
Elephant Seals	Presence										

	How measured?	Proposed Benchmark / Metric	Total amount In Region	Big Creek SMR	Atascadero Beach SIMCA	Marco Beach SIMCA	Pismo SIMCA	Pismo-Oceano SIMCA	Vandenberg SMR	Data Sources	Comments
Snowy Plovers	Presence				P*	P*				CCRSG and SAT	
Other birds	Presence									CCRSG and SAT	
White Sea Bass	Presence									CCRSG and SAT	
Hallbut	Presence			P**	P*	P*		P*		CCRSG and SAT	
Assorted Flat Fish	Presence									CCRSG and SAT	
Surf Perch	Presence			P**	P*	P*		P*		CCRSG and SAT	
pile perch	Presence			P**						CCRSG and SAT	
rubberlip perch	Presence			P**						CCRSG and SAT	
kelp bass	Presence									CCRSG and SAT	
kelp greening	Presence			P**						CCRSG and SAT	
calico bass	Presence			P**						CCRSG and SAT	
california sheepshead	Presence			P**						CCRSG and SAT	
Cabezon	Presence			P**						CCRSG and SAT	
longfin sculpin	Presence									CCRSG and SAT	
Salmón	Presence			P**						CCRSG and SAT	
Steehead	Presence									CCRSG and SAT	
Brown Rockfish	Presence			P**					P*	CCRSG and SAT	
vermillion rockfish	Presence			P**					P**	CCRSG and SAT	
gopher rockfish	Presence			P**						CCRSG and SAT	
grass rockfish	Presence			P**						CCRSG and SAT	
cooper rockfish	Presence			P**						CCRSG and SAT	
black and yellow rockfish	Presence			P**						CCRSG and SAT	
starry rockfish	Presence			P**						CCRSG and SAT	
yellowtail rockfish	Presence			P**						CCRSG and SAT	
China Rockfish	Presence			P**						CCRSG and SAT	
sharks	Presence									CCRSG and SAT	
skates/rays	Presence									CCRSG and SAT	
Sand Crabs	Presence									CCRSG and SAT	
giant pacific octopus	Presence									CCRSG and SAT	
spot prawn	Presence									CCRSG and SAT	
lobster	Presence									CCRSG and SAT	
Clams	Presence									CCRSG and SAT	
scallops	Presence									CCRSG and SAT	
sponges	Presence									CCRSG and SAT	
hydrocoral	Presence									CCRSG and SAT	
bull kelp	Presence			P**						CCRSG and SAT	
giant kelp	Presence			P**						CCRSG and SAT	
Use Data											
Not heavily used	Presence			P*						CCRSG and SAT	
Heavily used	Presence									CCRSG and SAT	
fishing	Presence				P*					CCRSG and SAT	
surfing	Presence				P*					CCRSG and SAT	
horseback riding, hiking, ATVs, etc	Presence				P*					CCRSG and SAT	
beachpeeps	Presence				P*					CCRSG and SAT	
divers	Presence				P*					CCRSG and SAT	
intertidal visitors/ birdsers/ wildlife viewing	Presence				P*					CCRSG and SAT	
kayaking	Presence				P*					CCRSG and SAT	
boating	Presence				P*					CCRSG and SAT	
researchers/school groups	Presence				P*					CCRSG and SAT	

NOTES
 Color-coded boxes: Red, yellow, and green color-coding of boxes is a simplified way to sum up how well each reserve fulfills the criterion in that row, this reflects the evaluation of the MLPA Staff and the RSG members who took part in the respective work groups. For example, in our coding objective 3, Point Lobos meets the goal/objective, Hopkins marginally meets the goal/objective, and Ano Nuevo, Pacific Grove, Carmel Bay, and Julia Pfeiffer Burns do not meet the goal/objective (in this category, Elkhorn Slough has not been fully evaluated).
 Blue boxes denote areas that need further information and evaluation.
 Blue text: Text colored blue in the left-hand column means that this criterion is not relevant or can not be measured for the evaluation of existing MPAs.
 ND: This code indicates that no data for this habitat were available for GIS analysis.
 NA: This code indicates that this habitat was not applicable within this MPA.
 Starred P's (P*): P's with stars denote the presence of the characteristic listed in the left-hand column. P* means that it has been listed by at least one CCRSG member and P** means that it has been listed by at least one SAT member.
 Starred zeros (0.00*): Zeros with stars signify that none of the specified habitat type was found for this MPA by GIS analysis, but that, at least one CCRSG or SAT member indicated the presence of this habitat type.
 One star (0.00*): Zeros with stars signify that none of the specified habitat type was found for this MPA by GIS analysis, but that, at least one CCRSG or SAT member indicated the presence of this habitat type.
 Starred ND (ND*): This indicates that no data for this habitat were available for GIS analysis, but that, at least one CCRSG or SAT member indicated the presence of this habitat type.
 One star (ND*) means that it has been listed by at least one CCRSG member and two stars (ND**) means that it has been listed by at least one SAT member.
 Undetermined habitat: The "undetermined habitat" sections for fine and coarse scale data are to be used when evaluating the amount of hard and soft bottom present for these respective data layers.
 During the GIS analysis, portions of the study region could not be recognized as either soft or hard bottom. For the coarse scale data, this amount of undetermined habitat is given as a whole number.
 For the fine scale data, this amount of undetermined habitat is given as a fraction of the total amount of fine scale data in that MPA and depth zone.

APPENDIX II

DRAFT GAP ANALYSIS OF HABITAT REPRESENTATION IN EXISTING CENTRAL COAST MARINE PROTECTED AREAS

APPENDIX II: DRAFT GAP ANALYSIS OF HABITAT REPRESENTATION IN EXISTING CENTRAL COAST MARINE PROTECTED AREAS

MPA Abbreviations: AN: Año Nuevo, ES: Elkhorn Slough, H: Hopkins, PG: Pacific Grove, CB: Carmel Bay, PL: Point Lobos, JPB: Julia Pfeiffer Burns, BC: Big Creek, AB: Alascadero Beach, MB: Morro Beach, P: Pismo, PO: Pismo-Oceano, V: Vandenberg * Habitats identified as present by the stakeholder group, but not quantified with spatial data at this time.												
How measured?	Total amount in Region	Total percent of Region	MPA's with this habitat	Amount in State Marine Reserves	Percent of Total in State Marine Reserves	Amount in State Marine Conservation Areas	Percent of Total in State Marine Conservation Areas	Amount in Special Closure	Percent of Total in Special Closure	Amount in all existing MPAs in region	Percent of Total in existing MPAs	Spatial Data Source
HABITATS												
Intertidal												
Sandy or gravel beaches	223.66	52.3%	AN, ES*, H, PG, CB, PL, JPB, BC, AB, MB, P, PO, V	5.18	2.32%	14.43	6.45%	6.06	2.71%	25.66	11.47%	NOAA-ESI 2002
Rocky intertidal and cliff	209.21	48.9%	AN, ES, H, PG, CB, PL, JPB, BC, AB, MB, V	16.82	8.04%	12.86	6.15%	2.73	1.31%	32.42	15.50%	NOAA-ESI 2002
Coastal marsh	36.53	8.5%	ES, CB*	9.97	27.31%	0.00	0.00%	0.00	0.00%	9.98	27.31%	NOAA-ESI 2002
Tidal flats	23.48	5.5%	AN*, ES, CB*	9.97	42.49%	0.00	0.00%	0.00	0.00%	9.98	42.50%	NOAA-ESI 2002
Seagrass beds (0-30m): Surfgrass	161.09	37.7%	AN, ES*, H, PG, CB, PL, JPB, BC, V	20.27	12.58%	11.82	7.34%	4.60	2.86%	36.69	22.77%	Minerals Management Service / Tenerra Inc.
Seagrass beds (0-30m): Eelgrass	1.07	0.1%	ES, H*, PG*, CB*, PL*	0.01	1.23%	0.00	0.00%	0.00	0.00%	0.01	1.23%	Elkhorn Slough Foundation; Morro Bay National Estuary Program
Fine-scale Soft bottom												Fine-scale based on Kvittek et al multibeam and sidescan sonar, available for only about 25% of the region
0-30 meters	24.21	5.7%	AN, ES*, H, PG, CB, PL, JPB, BC, AB, MB, P, PO, V	1.40	5.79%	1.29	5.32%	0.00	0.00%	2.69	11.11%	Total amount is only that which has been mapped to date.
30-100 meters	93.72	21.9%	CB, PL, JPB, BC, AB, MB, PO	1.32	1.41%	1.21	1.29%	0.00	0.00%	2.53	2.70%	Total amount is only that which has been mapped to date.
100-200 meters	1.93	0.5%	CB*, PL*, JPB	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	Total amount is only that which has been mapped to date.
>200 meters	0.29	0.1%	AB*, MB*, V*	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	Total amount is only that which has been mapped to date.
Coarse-scale Soft bottom												Greene et al 2004, coarse scale data overestimates soft substrata
0-30 meters	294.14	25.8%	AN, ES*, H, PG, CB, PL, JPB, BC, AB, MB, P, PO, V	3.21	1.09%	15.43	5.25%	1.86	0.63%	20.51	6.97%	see above
30-100 meters	575.78	50.6%	CB, PL, JPB, BC, AB, MB, PO	1.29	0.22%	15.26	2.65%	0.00	0.00%	16.55	2.87%	see above
100-200 meters	58.46	5.1%	CB*, PL*, JPB	0.00	0.00%	0.02	0.04%	0.00	0.00%	0.02	0.04%	see above
>200 meters	105.52	9.3%	AB*, MB*, V*	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	see above
Fine-scale Rocky reef, hard bottom												Fine-scale based on Kvittek et al multibeam and sidescan sonar, available for only about 25% of the region
0-30 meters	20.16	4.7%	AN, H, PG, CB, PL, JPB*, BC, AB*, MB*, V*	0.49	2.43%	1.17	5.79%	0.00	0.00%	1.66	8.23%	Total amount is only that which has been mapped to date.
30-100 meters	20.59	4.8%	CB, PL, JPB*, BC, MB*	0.28	1.34%	0.35	1.70%	0.00	0.00%	0.63	3.04%	Total amount is only that which has been mapped to date.
100-200m	0.40	0.1%	CB*, PL*	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	Total amount is only that which has been mapped to date.

	How measured?	Total amount in Region	Total percent of Region	MPA's with this habitat	Amount in State Marine Reserves	Percent of Total in State Marine Reserves	Amount in State Marine Conservation Areas	Percent of Total in State Marine Conservation Areas	Amount in Special Closure	Percent of Total in Special Closure	Amount in all existing MPAs in region	Percent of Total in existing MPAs	Spatial Data Source
>200 meters	Area (mi ²)	0.01	< .01%	none	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	Total amount is only that which has been mapped to date.
Coarse-scale Rocky reef, hard bottom													
0-30 meters	Area (mi ²)	46.66	4.1%	AN, H, PG, CB, PL, JPB*, BC, AB*, MB*, V*	0.76	1.63%	1.04	2.23%	0.31	0.66%	2.11	4.52%	Greene et al 2004; coarse scale data underestimates hard substrata
30-100 meters	Area (mi ²)	26.78	2.4%	CB, PL, JPB*, BC, MB*	0.30	1.14%	0.23	0.87%	0.00	0.00%	0.54	2.01%	see above
100-200 meters	Area (mi ²)	13.91	1.2%	CB*, PL*	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	see above
>200 meters	Area (mi ²)	16.16	1.4%	none	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	see above
Kelp forest (0-30m)													
1989 Kelp	Area (mi ²)	17.94	1.6%	AN, H, PG, CB, PL, JPB, BC	1.63	9.08%	1.43	7.97%	0.01	0.07%	3.07	17.12%	1989 CDFG aerial survey
1999 Kelp	Area (mi ²)	2.56	0.2%	H, PG, CB, PL, JPB, BC	0.09	3.63%	0.11	4.15%	0.00	0.00%	0.20	7.77%	1999 CDFG aerial survey
2002 Kelp	Area (mi ²)	12.55	1.1%	H, PG, CB, PL, JPB, BC	0.53	4.22%	1.05	8.33%	0.00	0.00%	1.58	12.55%	2002 CDFG aerial survey
2003 Kelp	Area (mi ²)	9.53	0.8%	H, PG, CB, PL, JPB, BC, MB, V	0.40	4.17%	0.57	5.97%	0.00	0.00%	0.98	10.28%	2003 CDFG aerial survey
Persistent Kelp	Area (mi ²); present in 3 of 4 years	3.18	0.3%	BC, CB, H, JPB, PG, PL	0.20	6.30%	0.21	6.76%	0.00	0.00%	0.42	13.06%	Present in 3 of 4 CDFG aerial survey datasets
Pinnacles													
0-30 meters	Count			H* PG*, CB, PL, JPB*, BC*, V*	24		100		0		124		Bathymetry data
30-100 meters	Count			CB*, PL*, JPB*, BC*	29		26		0		55		
100-200 meters	Count			none	0		0		0		0		
>200 meters	Count			none	0		0		0		0		
Submarine canyon													
0-30 meters	Area (mi ²)	0.56	0.1%	CB, PL*	0.00	0.00%	0.18	32.62%	0.00	0.00%	0.19	32.82%	Coarse-scale substrata (Greene et al 2004)
30-100 meters	Area (mi ²)	4.42	0.4%	CB, PL*, JPB	0.00	0.00%	0.08	1.77%	0.00	0.00%	0.08	1.80%	Coarse-scale substrata (Greene et al 2004)
100-200 meters	Area (mi ²)	6.06	0.5%	CB*, JPB	0.00	0.00%	0.01	0.20%	0.00	0.00%	0.01	0.22%	Coarse-scale substrata (Greene et al 2004)
>200 meters	Area (mi ²)	42.77	3.8%	none	0.00	0.00%	0.00	0.00%	0.00	0.00%	0.00	0.00%	Coarse-scale substrata (Greene et al 2004)
Freshwater plume	Presence of major river	not mapped	not mapped	ES, CB, BC?, PO?	P				A		P		NHD hydrography dataset
Retention area	Presence of warm water/headland	not mapped	not mapped	CB?	A				A		P?		PFEL sea surface temperature, warm water; presence of headland
Upwelling zone	Presence of coldwater/headland	not mapped	not mapped	AN, PG, CB, PL, JPB, BC, V?	P				P		P		PFEL sea surface temperature, cold water; presence of headland

How measured?	MPP Guideline	MPA's meeting this guideline	SMPA's meeting this guideline	SMCAs meeting this guideline	SC meeting this guideline	Average (Range)	MPA's NOT meeting this guideline	Spatial Data Source
Area (mi ²)	N/A	N/A	N/A	N/A	N/A	3.32 average area (0.08-13.28)		GIS analysis
Straight length (mi) alongshore	2.88 to 12.65 mi	AN, ES, PG, CB, PO, V	ES, V	PG, CB, PO	AN	2.58 average length (0.38-5.52)	H, PL, JPB, BC, AB, MB, P	GIS analysis
Linear distance following coastline (mi)	N/A	N/A	N/A	N/A	N/A	5.00 average length (0.38 - 19.21)	N/A	GIS analysis
Straight distance (mi) to next area of comparable habitat and protection (north and south)	31 to 62 mi	AN, H, PG, CB, PL, JPB, BC, AB, MB, P, PO, V	H, PL, BC, V	PG, CB, JPB, AB, MB, P, PO	AN	29.2 average distance (excluding ES)	ES. The nearest protected estuary is outside of the study region. H, BC, AB, and V have distances to either the north or south that do not meet this guideline.	GIS analysis
Depth range (ft) (average)	N/A	7 (CB, PL, JPB, BC, AB, MB, PO) deeper than 98 feet, 1 (JPB) deeper than 328 feet				63 average depth	ES and P are only 0-10 ft. AN, H, PG, and V are all under 79 ft	Bathymetry data
Maximum linear distance offshore (mi)	N/A	AB, MB, and PO are furthest (3.45), JPB, BC, PL, CB, and V are next (.86-1.32), PG and H are next (.29-.46)				1.28 average offshore extent	P, AN, and ES are all less than 1000 ft	GIS analysis

APPENDIX III

**DRAFT ANALYSIS OF HABITATS
IN OTHER TYPES OF SPATIAL CLOSURE AREAS IN THE CENTRAL
COAST**

APPENDIX III: DRAFT ANALYSIS OF HABITATS IN OTHER TYPES OF SPATIAL CLOSURE AREAS IN THE CENTRAL COAST

	How measured?	Proposed Benchmark / Metric	Total amount in Region	Diablo Canyon Exclusion Zone	Vandenberg Safety Zone 4	Fixed RCA	PFMC No Trawl Zone	Data Sources
REPRESENTATIVE HABITATS								
Intertidal								
Dominant intertidal geologic substrate								
Sandy or gravel beaches	Linear (mi)	Amount in MPA/Region Total	223.66	2.00	8.29	0.00	10.63	NOAA-ESI 2002
Rocky intertidal and cliff	Linear (mi)	Amount in MPA/Region Total	209.21	4.06	3.49	0.00	35.25	NOAA-ESI 2003
Coastal marsh	Linear (mi)	Amount in MPA/Region Total	36.53	0.00	3.19	0.00	0.00	NOAA-ESI 2004
Tidal flats	Linear (mi)	Amount in MPA/Region Total	23.48	0.00	0.00	0.00	0.00	NOAA-ESI 2005
Seagrass beds (0-30m): Surfgrass	Linear (mi)	Amount in MPA/Region Total	161.09	0.00	0.00	0.00	0.00	Minerals Management Service / Tenera Inc
Seagrass beds (0-30m): Eelgrass	Area (mi ²)	Amount in MPA/Region Total	1.07	0.00	0.00	0.00	0.00	Elkhorn Slough Foundation; Morro Bay NEP
Estuaries	Area (mi ²)	Amount in MPA/Region Total	7.90	0.00	0.00	0.00	0.00	National Wetlands Inventory; CNDD; USGS
Soft bottom (Fine Scale)								
0-30 meters	Area (mi ²)	Amount in MPA/Region Total	24.21	ND	ND	ND	2.34	Kvitek et al; some mapping in Monterey Bay area
30-100 meters	Area (mi ²)	Amount in MPA/Region Total	93.72	ND	ND	ND	13.35	Kvitek et al; some mapping in Monterey Bay area
100-200 meters	Area (mi ²)	Amount in MPA/Region Total	1.93	ND	ND	ND	0.34	Kvitek et al; some mapping in Monterey Bay area
>200 meters	Area (mi ²)	Amount in MPA/Region Total	0.29	ND	ND	ND	0.00	
Soft bottom (Coarse Scale)								
0-30 meters	Area (mi ²)	Amount in MPA/Region Total	294.14	0.74	14.24	0.00	3.47	Greene et al 2004; overestimates soft substrata
30-100 meters	Area (mi ²)	Amount in MPA/Region Total	575.78	1.11	16.49	0.21	20.29	Greene et al 2004; overestimates soft substrata
100-200 meters	Area (mi ²)	Amount in MPA/Region Total	58.46	0.00	0.00	4.73	22.65	Greene et al 2004; overestimates soft substrata
>200 meters	Area (mi ²)	Amount in MPA/Region Total	105.52	0.00	0.00	31.81	41.13	Greene et al 2004; overestimates soft substrata
Rocky reef, hard bottom (Fine Scale)								
0-30 meters	Area (mi ²); Type if known	Amount in MPA/Region Total	20.16	ND	ND	ND	4.10	Kvitek et al; some mapping in Monterey Bay area
30-100 meters	Area (mi ²); Type if known	Amount in MPA/Region Total	20.59	ND	ND	ND	10.98	Kvitek et al; some mapping in Monterey Bay area
100-200 meters	Area (mi ²); Type if known	Amount in MPA/Region Total	0.40	ND	ND	ND	0.34	Kvitek et al; some mapping in Monterey Bay area
>200 meters	Area (mi ²); Type if known	Amount in MPA/Region Total	0.01	ND	ND	ND	0.01	Kvitek et al; some mapping in Monterey Bay area
Rocky reef, hard bottom (Coarse Scale)								
0-30 meters	Area (mi ²); Type if known	Amount in MPA/Region Total	46.66	P*	1.04	0.00	3.90	Greene et al 2004; overestimates soft substrata
30-100 meters	Area (mi ²); Type if known	Amount in MPA/Region Total	26.78	0.00	0.00	0.16	15.65	Greene et al 2004; overestimates soft substrata
100-200 meters	Area (mi ²); Type if known	Amount in MPA/Region Total	13.91	0.00	0.00	1.87	12.94	Greene et al 2004; overestimates soft substrata
>200 meters	Area (mi ²); Type if known	Amount in MPA/Region Total	16.16	0.00	0.00	6.73	15.07	Greene et al 2004; overestimates soft substrata
Kelp forest (0-30m)								
1989 Kelp Data	Area (mi ²); Type	Amount in MPA/Region Total	17.94	0.01	0.00	0.00	0.00	CDFG aerial survey 1989
1999 Kelp Data	Area (mi ²); Type	Amount in MPA/Region Total	2.56	0.04	0.00	0.00	0.00	CDFG aerial survey 1999
2002 Kelp Data	Area (mi ²); Type	Amount in MPA/Region Total	12.55	0.08	ND	0.00	0.00	CDFG aerial survey 2002
2003 Kelp Data	Area (mi ²); Type	Amount in MPA/Region Total	9.53	0.17	0.00	0.00	0.00	CDFG aerial survey 2003
Persistent Kelp	Area (mi ²)	Amount in MPA/Region Total	3.18	0.01	0.00	0.00	0.00	Present in 3 of 4 years of CDFG surveys
Nereocystis presence	Presence	Presence		ND	ND	NA	NA	
Macrocystis presence	Presence	Presence		ND	ND	NA	NA	
Pinnacles								
0-30 meters	Count	Amount in MPA/Region Total	NA	ND	ND	ND	154.00	Bathymetry data
30-100 meters	Count	Amount in MPA/Region Total	NA	ND	ND	ND	185.00	Bathymetry data
100-200 meters	Count	Amount in MPA/Region Total	NA	ND	ND	ND	26.00	Bathymetry data
>200 meters	Count	Amount in MPA/Region Total	NA	ND	ND	ND	4.00	Bathymetry data
Submarine canyon								
0-30 meters	Area (mi ²)	Amount in MPA/Region Total	0.56	0.00	0.00	0.00	0.22	Greene et al 2004
30-100 meters	Area (mi ²)	Amount in MPA/Region Total	4.42	0.00	0.00	0.11	0.60	Greene et al 2004
100-200 meters	Area (mi ²)	Amount in MPA/Region Total	6.06	0.00	0.00	1.43	1.79	Greene et al 2004
>200 meters	Area (mi ²)	Amount in MPA/Region Total	42.77	0.00	0.00	15.53	28.59	Greene et al 2004
SIZE AND SPACING GUIDELINES								
Area	Area (mi ²)	N/A	1150.00	1.89	32.80	45.5	138.024	
Along Shore Span	Straight length (mi) alongshore	at least 2.88 to 6.21 mi, preferably 6.21 to 12.65 mi	221 mi.	2.30	8.63	221.00	15.00	as the crow flies from southern to northern extent touching shore
Shoreline Length	Linear distance following coastline (mi)	N/A	363.00	4.62	9.80	0.00	4.27	For Study Region, 427 mi if including Estuaries, and large coastal rocks
Distance Between	Straight distance (mi) to next area of comparable habitat and protection (north and south)	within 31 to 62 mi	N/A	N/A	N/A	N/A	N/A	
Shore to deep water	Depth range (ft) (average)	N/A	0 - 4,800 ft.	0.9		14.3	5.4	value is for shore touching area
Offshore extent	Maximum linear distance offshore (mi)	N/A	3.45 mi. - Mont. Bay (14.08) mi.	1.15	3.00	14.30	14.00	value is from shore to furthest extent of area
Notes and Abbreviations: ND: no data; NA: not applicable; PFMC: Pacific Fisheries Management Council								