

**California Marine Life Protection Act Initiative**  
**Draft Summary of Methods Used to**  
**Evaluate MPA Proposals in the MLPA South Coast Study Region**  
*Revised December 12~~14~~, 2008*

The MLPA Master Plan Science Advisory Team (SAT) and MLPA Initiative staff evaluate draft marine protected area (MPA) proposals relative to the science guidelines found in the *California Marine Life Protection Act Master Plan for Marine Protected Areas* (Master Plan) and Marine Life Protection Act (MLPA) goals (goals 1, 2, 3, 4 and 6).

The SAT developed methods to evaluate the potential of the draft proposals to fulfill the scientific and ecologically-oriented goals of the MLPA (i.e., goals 1, 2, 4 and 6). MLPA Initiative staff developed methods used to evaluate the MLPA goal pertaining to improved recreational, educational, and study opportunities (i.e., goal 3). The criteria established by CDFG for its feasibility evaluation are contained in a separate document. All evaluations and analyses are forwarded to the MLPA Blue Ribbon Task Force (BRTF) and the California Department of Fish and Game for their consideration in providing policy guidance to the regional stakeholders.

This summary provides an overview of the elements of the SAT's and MLPA Initiative staff's evaluations relative to the MLPA goals (Table 1).

**Table 1. MLPA goals and the evaluation elements relating to each goal**

<b>MLPA Goal</b>	<b>SAT Evaluation of Scientific Elements</b>
1. To protect the natural diversity and abundance of marine life, and the structure, function, and integrity of marine ecosystems.	Habitat representation and protection levels
2. To help sustain, conserve, and protect marine life populations, including those of economic value, and rebuild those that are depleted.	Size and spacing guidelines; protection levels; and protection to forage, breeding, and rearing areas
3. To improve recreational, educational, and study opportunities provided by marine ecosystems that are subjected to minimal human disturbance, and to manage these uses in a manner consistent with protecting biodiversity.	Habitat replication (MPA and habitat size); accessibility;
4. To protect marine natural heritage, including protection of representative and unique marine life habitats in California waters for their intrinsic value.	Habitat representation, replication, and protection levels
5. To ensure that California's MPAs have clearly defined objectives, effective management measures, and adequate enforcement and are based on sound scientific guidelines.	No SAT evaluation specific to goal 5
6. To ensure that the state's MPAs are designed and managed, to the extent possible, as a network.	Size and spacing guidelines, (MPA and habitat size)

## Evaluations Conducted by the Science Advisory Team

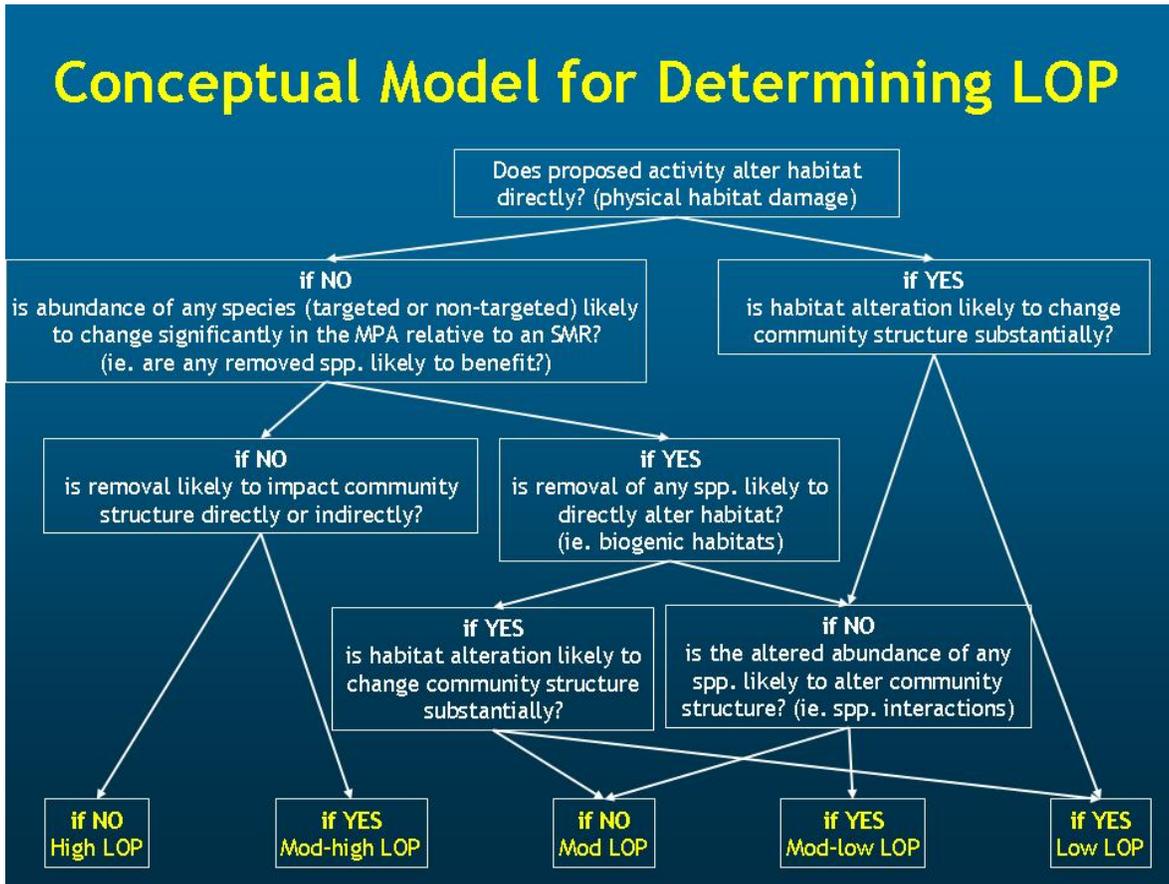
### **Levels of Protection (Goals 1, 2, 4 and 6)**

There is great variation in the type of activities that may be permitted within the three types of marine protected areas ~~identified by the MLPA~~ (state marine conservation area, state marine park, and state marine reserve). To facilitate comparison across proposals, the SAT assigns a “level of protection” to each MPA based on the uses allowed within its boundaries.

Levels of protection are based upon the likely impacts of proposed activities to the ecosystems within the MPA. Conceptually, the SAT seeks to answer the following question in assigning levels of protection: “How much will an ecosystem differ from an unfished ecosystem if one or more proposed activities are allowed?”

State marine reserves (SMRs) are, by definition, unfished ecosystems, therefore they receive the highest protection level, “very high”. MPAs that allow extractive activities receive levels of protection ranging from “high” for low impact activities, to “low” for activities that alter habitat and thus are likely to have a large impact on the ecosystem. Both direct impacts (those resulting directly from the gear used or removal of target or non-target species) and indirect impacts (ecosystem-level effects of species removal) are considered in the levels of protection analysis. Figure 1 presents the decision flow for determining the level of protection.

**Figure 1. Conceptual model for determining the level of protection in an MPA that allows extractive activities.**



In applying the conceptual model presented in Figure 1, the SAT makes three important assumptions:

1. Any extractive activity can occur at high intensity,
2. For the purpose of comparison, an unfished system is a marine reserve that is successful in protecting that ecosystem from all effects of fishing within the MPA, and
3. The proposed activity is occurring in isolation (i.e., without cumulative effects of multiple allowed activities).

The MPA types, and activities associated with each protection level, are presented in Table 2. The SAT assigns to each MPA one of six protection levels, from low to high, depending on the allowed activities proposed.

**Table 2. Levels of protection and the activities associated with levels of protection in the MLPA North Central Coast Study Region with proposed additions for the MLPA South Coast Study Region**

Level of Protection	MPA Types	Activities associated with this protection level
Very high	SMR	No take

High	SMCA	In water depth > 50m: pelagic finfish <sup>1</sup> <u>and bonito</u> by hook and line (salmon by troll only); coastal pelagic finfish <sup>2</sup> by seine
Moderate-high	SMCA	In water depth < 50m: pelagic finfish <sup>1</sup> <u>and bonito</u> by hook and line (salmon by troll only); coastal pelagic finfish <sup>2</sup> by seine; Dungeness crab (traps/pots), squid (pelagic seine)
Moderate	SMCA SMP	salmon (non-troll H&L); abalone (diving); halibut, white seabass, shore-based finfish, croaker, and flatfishes (H&L); smelt (H&L and hand/dip nets); clams (hand harvest); giant kelp (hand harvest); <u>spot prawn (trap); sea cucumber (diving); grunion (hand take)</u>
Moderate-low	SMCA SMP	Urchin (diving); lingcod, cabezon, greenling, rockfish, <u>kelp bass, barred sand bass, sheephead</u> and other reef fish (H&L, <u>spear, trap</u> ); surfperches (H&L); <u>spotted sand bass (H&amp;L); lobster (trap, hoop net, diving); rock scallop (diving)</u>
Low	SMCA SMP	bull kelp and mussels (any method); all trawling; giant kelp (mechanical harvest); mariculture (existing methods)

The level of protection assigned to an MPA that allows multiple uses is the lowest level of protection designated for any of the uses. SAT protection level analysis does not currently account for the cumulative impacts of multiple activities within a single MPA, but the SAT is working to address this problem.

The levels of protection assigned by the SAT are used in all subsequent SAT analyses. Only MPAs that received moderate-high, high, or very high protection contribute toward replication or are considered as part of the size and spacing analysis (see below).

In addition to this existing level of protection framework, the SAT is working to assess levels of protection with a quantitative model. This model would consider how both direct and indirect impacts of extractive activities alter ecosystems and communities by assessing the probable change in abundance of individual species or suites of species. The multi-dimensional distance between the resultant community and an unfished ecosystem (marine reserve) would inform the level of protection designation. This method would consider cumulative impacts of multiple activities and create a more continuous gradient in protection level instead of the discrete categories (e.g. “high”, moderate-high”) conveyed by the current approach.

### **Habitat Representation Analysis (Goals 1 and 4)**

<sup>1</sup> Pelagic finfish: northern anchovy (*Engraulis mordax*), barracudas (*Sphyraena* spp.), billfishes\* (family Istiophoridae), dolphinfish (*Coryphaena hippurus*), Pacific herring (*Clupea pallasii*), jack mackerel (*Trachurus symmetricus*), Pacific mackerel (*Scomber japonicus*), salmon (*Oncorhynchus* spp.), Pacific sardine (*Sardinops sagax*), blue shark (*Prionace glauca*), salmon shark (*Lamna ditropis*), shortfin mako shark (*Isurus oxyrinchus*), thresher sharks (*Alopias* spp.), swordfish (*Xiphias gladius*), tunas (family Scombridae), and yellowtail (*Seriola lalandi*). \*Marlin is not allowed for commercial take.

<sup>2</sup> Coastal pelagic finfish: northern anchovy (*Engraulis mordax*), Pacific herring (*Clupea pallasii*), jack mackerel (*Trachurus symmetricus*), Pacific mackerel (*Scomber japonicus*), and Pacific sardine (*Sardinops sagax*).

California’s key marine habitats are categorized by the MLPA and have been further subdivided by the SAT based on depth categories of 0-30 meters, 30-100 meters, 100-200 meters, and greater than 200 meters. This yields a total of 16 key habitats for which habitat representation is assessed: rocky shore, sandy beach, surfgrass, coastal marsh, tidal flats, estuarine waters, eelgrass, kelp, and hard and soft substrates in the four depth zones named above.

In evaluating habitat representation the SAT considers:

- The availability of habitats across the entire study region
- The availability of habitats within the biogeographically relevant subregions
- The percentage of available habitat protected in MPAs across all six levels of protection
- The distribution of habitat protection across the biogeographically relevant subregions

Because of their limited distribution, the representation of unique habitats has not been analyzed by the SAT in past study regions.

***Habitat Replication (Goals 1, 3 and 4)***

Habitat replication within broad biogeographic regions is required by the MLPA Master Plan (three to five replicates of each habitat). The Master Plan identifies just two biogeographic regions in California: 1) Point Conception north to the Oregon border and 2) Point Conception south to the California border with Mexico. In consideration of the strong physical and biological gradients across the MLPA South Coast Study Region, the SAT has additionally recommended that at least one replicate of each habitat be included in each of the five [biogeographically relevant subregions](#) of the MLPA South Coast Study Region.

To count as a replicate of any given habitat, an MPA must contain enough habitat to encompass 90% of the biodiversity associated with that habitat. This area varies by habitat and is determined from biological surveys.

Biodiversity-area relationships should will be revisited with data from the study region where possible.

**Table 3. The amount of habitat in an MPA necessary to encompass 90% of local biodiversity. Square and linear miles are measured as statute miles.**

Habitat	Representation needed to encompass 90% of biodiversity	Data Source
Rocky intertidal	~0.5 linear miles	PISCO Biodiversity (CCSR)
Shallow rocky reefs/kelp forests (0-30 m)	~1 linear miles	PISCO Subtidal (CCSR)

Rocky reefs (30-100 m)	~0.3 square miles	Love surveys (SCSR)
Rocky reefs (100-200 m)	~0.28 square miles	Love surveys (SCSR)
Rocky reefs (>200 m)	not yet assessed	
Sandy beaches	~1 linear mile	no data
Soft bottom (0-30 m)	~1 linear miles	Based on shallow rocky reefs
Soft bottom (30-100 m)	~10 square miles	NMFS triennial trawl surveys 1977-2007 (NCCSR)
Soft bottom (100-200 m)	not yet assessed	
Soft bottom (>200 m)	not yet assessed	
Estuary	~0.12 square miles	SONGS mitigation team surveys (SCSR)

To evaluate replication, the SAT considers whether there is a minimum amount of habitat present within an MPA, and whether the MPA meets the minimum size threshold, as described below. Habitat replication is used as an analytical tool in two different sets of analyses and the evaluation of habitat replication is done in two ways:

- In the habitat replication analyses (goals 1 and 4), habitat replication is expressed *within the biogeographical region (Point Conception to the California/Mexico border)* relative to the MLPA Master Plan guidelines of three to five replicates per biogeographic region. Proposals that follow the size and spacing guidelines (see below) automatically result in some habitat replication within the study region.
- In the analysis of recreational, educational, and study opportunities (goal 3), habitat replication *within the study region* is summarized. The analysis also provides information on the potential for MPAs to contribute to regional monitoring efforts.

~~The SAT is currently assessing the spacing guidelines for the Channel Islands. Pending this assessment and subsequent guidance, habitat replication guidance and analysis for the islands may or may not differ from the mainland.~~

The California Fish and Game Commission has requested that the MLPA South Coast Regional Stakeholder Group (SCRSG) not consider changes to the boundaries and regulations of the existing northern Channel Islands and Santa Barbara Island MPAs, but that these existing MPAs (using current boundaries, regulations and classifications) be included within, and evaluated by the SAT, as part of, the alternative MPA proposals developed for the MLPA South Coast Study Region.

## **Size and Spacing Analyses (Goals 2 and 6)**

Size and spacing guidelines were developed to provide for the persistence of important benthic-associated fish and invertebrate groups within MPAs and their dispersal among MPAs and to promote connectivity in the network (goals 2 and 6).

In evaluating the size of MPAs, the SAT considers the area of individual MPAs and clusters of contiguous MPAs. The size guidelines in the master plan specify that MPAs should cover an alongshore span of at least three to six statute miles (preferably six to twelve statute miles) and extend from the coast to deep waters offshore. Because state waters extend only three nautical miles offshore, the SAT considers an MPA or cluster of MPAs that extend to the offshore limit of state waters to meet the offshore guideline.

The SAT combines and simplifies alongshore and offshore guidelines from the master plan by using a minimum size threshold of nine square statute miles (three miles alongshore and three miles offshore) while recognizing that the state waters extend three nautical miles offshore. (No MPA that is smaller than nine square miles could meet both the alongshore and onshore-offshore size guidelines mentioned above.) Thus, for the purpose of SAT analyses, MPA clusters with areas nine to eighteen square miles are considered to fall within the minimum size range, and those eighteen to thirty-six square miles fall within the preferred size range.

In evaluating the size of MPAs, the SAT:

- Combines contiguous MPAs at or above a given level of protection into clusters. Size analyses are conducted at three different LOPs: mod-high, high, and very-high.
- Tabulates the number of MPA clusters in each size range (below minimum, minimum size range, preferred size range).

In evaluating the spacing of MPAs, the SAT:

- Considers whether an MPA has sufficient habitat present (see Table 3), is of sufficient size (minimum cluster size of nine square miles), and has at least moderate-high protection level to count toward the spacing analysis.
- Combines adjacent MPAs together as a "cluster" as long as they are each at least of moderate-high protection and are intended by stakeholders to contribute toward population and network goals (goals 2 and 6).
- Determines whether replicates of habitats within MPAs are spaced within 31-62 miles of one another, as recommended in the master plan science guidelines. The SAT has made operational this guidance by considering the distance between MPAs that contain each of the key habitats. Each habitat is analyzed separately for the spacing analysis.

The spacing analysis is conducted separately for each habitat and with a focus on MPAs at three different levels of protection: at least "moderate-high" protection; at least "high" protection; and, finally, only MPAs with "very high" levels of protection. For example, in the

"high" level of protection spacing analysis, only MPAs with a "high" or "very high" level of protection are considered.

Based on a model of oceanographic circulation and connectivity through larval dispersal, the SAT ~~concluded~~may conclude that larval dispersal between island and mainland MPAs is not sufficiently large or bidirectional to warrant inclusion of island MPAs in the standard spacing analysis.

### ***Protection of Foraging, Breeding and Rearing Areas (Goal 2)***

MPAs can protect marine birds and mammals by protecting their forage base and by reducing human disturbance to roosting and haul-outs sites, breeding colonies or rookeries. To evaluate the protection afforded by proposed MPAs to birds and mammals the SAT:

- Identifies proposed MPAs or special closures that might contribute to protecting birds and mammals
- Identifies focal species likely to benefit from MPAs and for which data are available
- Analyzes the proportion (of total numbers of individuals) of breeding bird/mammals at colonies and rookeries potentially benefiting by proposed MPAs
- Analyzes the proportion of nearby foraging areas protected by MPAs, defined by evaluating protection of 'hot spots' and buffered areas around colonies.

### ***Water and Sediment Quality***

While water and sediment quality are not subject to management under the MLPA, these factors may be important in designing MPA proposals. Where water quality or sediment quality is significantly compromised, marine life may be affected. Effects can be on bioaccumulation, as well as population rate parameters (growth, reproduction, and mortality), influencing population levels and also the ecological community composition through a variety of interactions (e.g., decreased diversity, loss of sensitive species and abundance of tolerant species). Thus, it is recognized that habitat is altered where water quality or sediment quality is degraded.

In the design of MPA proposals for previous study regions, there was no organized attempt to assess water quality or sediment quality concerns and these factors were not directly included in the evaluations of MPA proposals. However, the SAT has expressed interest in developing an informative evaluation for MPA proposals concerning water and sediment quality. The SAT is currently reviewing a series of informative maps which highlight areas of water quality concern as well as areas of special biological significance (ASBS). These maps provide additional information for MPA design but also provide a spatial foundation from which an evaluation of MPA proposals with regard to water quality may be developed.

Since water quality evaluations are not mandated by the MLPA, this evaluation will be used to supplement, and is not intended to carry greater weight than, other evaluations. Details on the evaluation of MPA proposals for water quality will be updated pending SAT discussion and recommendations.

## Evaluations Conducted by Staff or Contractors:

### **Recreational, Education and Study Opportunities (Goal 3)**

MLPA Initiative staff evaluates the potential recreational, educational, and study opportunities provided by each MPA proposal in terms of the MPAs' overall accessibility, proximity to educational institutions, inclusion of existing monitoring sites, and consideration of replication in design.

In evaluating the draft proposals Initiative staff considers:

- Access points within and near MPAs, including proximity to boat launches and ports. Proximity to MPAs that allow many uses versus MPAs that allow few uses may have different effects on different users.
- Inclusion of existing monitoring sites and close proximity to research institutions, which may increase study opportunities.
- Replication of habitats within MPAs, which may contribute to increasing research opportunities.

### **Recreational and Commercial Fishery Impacts**

While fishery impacts are not the focus of the MLPA, they may be considered in designing MPA networks. The evaluation of maximum potential recreational and commercial fishery impacts utilizes region-specific data collected by MLPA contractor Ecotrust on areas of importance.

To evaluate the potential recreational and commercial fishery impacts, MLPA Initiative staff and contractors:

- Conduct local knowledge interviews with recreational and commercial fishermen, using an interactive, custom computer interface, to collect geo-referenced information about the extent and relative importance of study region commercial and recreational fisheries.
- Organize impact analyses by port, fishery and/or user group.
- Evaluate and summarize the maximum potential impacts on commercial and recreational fishing grounds both in terms of total area and value affected. Results are summarized for both study region fishing grounds and total fishing grounds.<sup>3</sup>
- Conduct a socioeconomic impact analysis for commercial fisheries.
- Consider or identify “outliers” (i.e. fishermen likely to experience disproportional impacts).
- Assess the effect of existing fishery management area closures and other constraints on fishing grounds.

---

<sup>3</sup> Impact analyses represent a “worst case” scenario where fisherman cannot fish in a different location.