California Marine Life Protection Act Initiative

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To: **MLPA South Coast Regional Stakeholder Group and Other Interested Parties**

From: **MLPA Initiative Staff**

Subject: **Revised Chapters 9 and 10 in the *Draft Methods Used to Evaluate Marine Protected Area Proposals in the MLPA South Coast Study Region* (revised April 23, 2009)**

Date: **May 12, 2009**

Two chapters in the document entitled, *Draft Methods Used to Evaluate Marine Protected Area Proposals in the MLPA South Coast Study Region* (revised April 23, 2009), were recently updated and revised.

The two revised chapters, Chapter 9 (Protection of Birds and Mammals) and Chapter 10 (Water and Sediment Quality), are attached and should replace those chapters in the April 23 version of the evaluation document (provided in print form to the SCRSG on April 28, 2009 and posted to the MLPA website at http://www.dfg.ca.gov/mlpa/pdfs/agenda_042809a2.pdf).

9. Protection of Marine Birds and Mammals

Status of this chapter: The SAT has approved of the evaluation methods in this chapter.

Marine protected areas (MPAs) may benefit marine birds and mammals by 1) reducing bycatch, 2) protecting their forage base and 3) potentially reducing human disturbance at roosting/haul-out sites and breeding colonies/rookeries. To evaluate the protection afforded by proposed MPAs to birds and mammals the SAT does the following:

- identifies proposed MPAs or special closures[1] that contribute to protection of birds and mammals
- identifies focal species likely to benefit from MPAs and for which data are available
- estimates the proportion (of total numbers of individuals) of breeding bird/mammal at colonies and rookeries potentially benefiting by proposed MPAs
- estimates the proportion of available nearshore foraging areas protected by MPAs, defined by evaluating protection of buffered areas around colonies
- estimates the proportion of available neritic foraging 'hot spots' protected by MPAs, defined by at-sea densities of marine birds and mammals
- estimates the proportion of estuarine and coastal beach habitats protected by MPAs

This evaluation focuses on pinnipeds (seals and sea lions), nearshore delphinids (e.g. coastal bottlenose dolphin), sea otters and birds, including seabirds, shorebirds, and waterfowl[2]. Population, as used in this evaluation, refers to the number of animals that use a site for breeding or resting. Evaluations are focused on the five bioregions identified by the SAT. Evaluations include numbers of species (species diversity), numbers of individual birds or mammals, and percentages of bioregional populations breeding within individual proposed MPAs and within all proposed MPAs. Species evaluated are limited to those identified as likely to benefit from MPAs and special closures with an emphasis on species identified as most likely to benefit.

The SAT evaluation for marine birds and mammals focuses on:

[1] Special closures are not MPAs, but could restrict access to discrete areas to prevent human disturbance to colonies, rookeries, haul-outs, and roosts. Special closures may be included in future rounds of the marine birds and mammals evaluations if included in MPA proposals; they would be evaluated with regard to marine birds and mammals using similar methods as used for MPAs.

[2] Cetaceans are included only in foraging analyses (i.e., 3 and 4), because there is limited data about fine-scale use patterns for these species and it is unknown whether they would directly or measurably benefit from the size of MPAs being defined, given their relatively large-scale movements.

1. Protection of seabird breeding colonies and pinniped rookeries based on population size, location and species composition

This analysis examines whether MPAs and special closures proposals will benefit the species identified as likely to benefit. Evaluations are based on the numbers of animals in the MLPA South Coast Study Region, and the proportion within each bioregion, and within the proposed MPA or special closure area. For each colony within a proposed protection area, the SAT considers the likely effect of the specific protections or regulations identified (e.g. no-entry zones) that would reduce human disturbance, and whether the MPA or special closure area affects significant numbers of animals. Special closure areas will provide maximum benefit by minimizing disturbance caused by boats, irrespective of vessel type. MPAs that restrict fishing or other activities in waters surrounding colonies would provide less benefit than no-entry zones but likely would provide a benefit by reducing the numbers of boats approaching and lingering near colonies. Possible benefits of reduced disturbance include increased bird/mammal productivity, colony/population size, and species diversity (Carney & Sydeman 1999) (Rojek et al. 2007).

Data used for these assessments comes from the National Oceanic and Atmospheric Administration (NOAA)/U.S. Fish and Wildlife Service (USF&WS) bird colony database[3], from pinniped data compiled from Mark Lowry and Sharon Melin (NOAA Fisheries), and other sources. The SAT evaluates total numbers of seabirds and pinnipeds, and the proportion breeding by species for each bioregion, and for all species combined, within each proposed MPA or special closure. The sizes of special closures vary, but usually range between 300 and 1000 feet.

2. Marine bird and mammal resting (roost/haulout/raft) locations based on population size, location and species composition

Many marine birds and pinnipeds require areas close to foraging locations where they can safely come to shore to rest, sleep, dry (i.e., cormorants, pelicans), or molt (some pinnipeds). Frequent disturbance at resting sites results in high levels of energy expenditure that can lead to poor body condition and/or cause animals to abandon the area (Carney & Sydeman 1999) (Rojek et al. 2007).

The methods the SAT uses to assess roosting areas and haulout sites are similar to those used for colonies/rookeries. For seabirds, the SAT uses data on major Brown Pelican roosts, which also serve as a surrogate for other species. For pelicans, major roosts have been categorized as those typically containing: 1) 100-500 birds; 2) 500-1,000 birds; and 3) > 1,000 birds. For pinnipeds, total numbers and the proportion in each bioregion are calculated for each species and for all species combined, and sites used by each species are evaluated

[3] Original data is from Carter 1980 and Sowles 2000. These data were then updated in 2004 with information mostly in Baja California from Wolfe SG 2002 using the same format.

based on these proportions. For sea otters, their presence will be reported in this analysis when proposed MPAs include kelp beds known to be frequently used by otters within their boundaries. To accommodate for population movement and the potential for otters to expand their range in the MLPA South Coast Study Region the analysis will also report the proportion of available kelp habitat protected by proposed MPAs, regardless of current otter usage.

3. Marine bird and pinniped near-colony/rookery foraging concentrations based on population size, location, and species composition

As upper-trophic-level predators, seabirds and marine mammals require an abundance of resources for survival and reproduction. With long life expectancies (>20 years), low annual productivity, and high site fidelity, these animals are subject to population level impacts from reduced prey supplies or disturbance at foraging areas. High levels of disturbance at foraging areas can cause increased energy expenditure leading to poor body condition; this can be especially detrimental for species with long migration routes, which may not have sufficient energy reserves to complete migration. Thus, protection of important prey species and foraging areas could have benefits, especially to species with limited foraging distributions.

For breeding species, the SAT will focus on five seabird and one marine mammal species most likely to benefit based on limited foraging ranges. For birds, this analysis focuses on the Pelagic Cormorant, Brandt's Cormorant, Pigeon Guillemot, California Least Tern, and Bald Eagle. For pinnipeds, this analysis focuses on the harbor seal. These species mainly forage in nearshore waters within a few miles of colonies. However, other species are likely to benefit (e.g. Double-crested Cormorant, Forster’s Tern, Caspian Tern, Black Skimmer, Guadalupe fur seal, northern fur seal and coastal bottlenose dolphin).

Evaluations of benefits to marine birds and mammals near colonies are based on whether or not proposed regulations may benefit forage species (Table 9-1) or foraging habitats, how much foraging area will be protected near breeding areas, and how many animals stand to benefit. Zones extending three miles alongshore and to three miles offshore (the main foraging range of these species when breeding) from breeding colonies/rookeries are used to examine the numbers of birds/mammals utilizing the area within the proposed MPA.

4. Marine bird and mammal neritic foraging based on location, bird density, and species composition

There are many hydrographic features within the neritic zone of state waters that will concentrate the prey of many marine birds and mammals. Retention areas and thermal fronts adjacent to upwelling centers and river plumes are known to concentrate prey. These areas are often referred to as ‘hot spots’, or areas of high trophic transfer, as they provide essential foraging opportunities to upper trophic level predators. While the types of prey typically found at hot spots are highly mobile (e.g. anchovies, squid, and krill), they will benefit from MPAs protecting hot spots as they have a high probability of being concentrated in these areas. Any protection given to hot spots will ultimately translate into added marine bird and mammal

protection. A composite map of at-sea densities for the following 11 seabirds and 2 marine mammals will be plotted over proposed MPAs to determine the number of species and densities likely to benefit: Western Grebe, Sooty Shearwater, Brown Pelican, Brandt's Cormorant, Red Phalarope, Heermann's Gull, California Gull, Western Gull, Black-legged Kittiwake, Caspian Tern, Cassin's Auklet, coastal bottlenose dolphin, and California sea lion. At-sea seabird and sea lion distributions from Mason et al. (2007) and coastal bottlenose dolphin encounter rates collected by the Channel Islands National Marine Sanctuary will be used for these analyses (see Fig. 9.1 for composite map).

5. Estuarine and coastal beach protection for resident and migrant shorebirds and waterfowl

The SAT evaluates whether proposed MPAs provide protection to the inhabitants of estuarine areas. There are many human activities, including hunting, that take place within estuaries and have adverse effects on shorebird and waterfowl populations. Estuaries provide critical resting and foraging habitat for resident and migrant birds. However, with the loss of estuarine habitat in southern California over recent decades, coastal beach habitat has become increasingly important to displaced populations (J. Dugan pers. comm.). Protecting both estuarine and coastal beach habitat, even if limited to below mean high tide, will have direct benefit to these populations. For this analysis, four habitat types have been identified: estuary, tidal flat, coastal marsh, and coastal beach. The analysis will investigate the amount of available habitat protected within MPAs for each bioregion.

The focus of all analyses will be on special closures and state marine reserves (SMRs), with the recognition that special closures will provide greater protection than SMRs. However, the SAT recognizes some activities have greater impacts than others and state marine conservation areas (SMCAs) permitting certain activities should be considered independently during each analysis. Mills et al. (2005) provide summaries of fisheries activities with potential impacts to marine bird populations. Table 9.2 defines which activities an SMCA can allow and still be considered for a given analysis. For analyses of breeding and resting sites, the ultimate goal is to reduce all human activities within an area and only special closures and SMRs will be considered for these analyses. For the near-colony foraging analysis, SMCAs allowing activities that have potential for bycatch, compete for prey resources, or alter prey habitat will not be analyzed. For the neritic foraging 'hot spots' analysis, SMCAs allowing activities that have potential for bycatch will not be analyzed. And for the estuaries/coastal beach analysis, SMCAs allowing activities close to shore that have potential for bycatch, compete for prey resources, or alter prey habitat will not be analyzed. Finally, fisheries interactions with marine mammals have been less studied than those with seabirds. Given the lack of information on the impacts of specific activities, only special closures and SMRs will be included in the marine mammal analyses.

Table 9-1. Known Important Prey Items of Bald Eagle, Brandt's Cormorant, California Least Tern, Pelagic Cormorant, Pigeon Guillemot, Harbor Seal, California Sea Lion and Coastal Bottlenose Dolphin in Southern California.

Species	Prey	Preferred Foraging Habitat
Bald Eagle	**Fish** Rockfish *Sebastes* spp. Surfperch (Embiotocidae) Pile Perch *Damalichthys vacca* Cabezon *Scorpaenichthys marmoratus* Midshipman *Porichthys* spp. California sheephead *Semicossyphus pulcher* Pricklebacks (Stichaeidae) Bocaccio *Sebastes paucispinis* Halfmoon *Medialuna californiensis* White seabass *Atractoscion nobilis* Topsmelt *Atherinops affinis* **Invertebrates** California mussel *Mytilus californianus* Other bivalves, limpets Sea urchin *Strongylocentrotus* spp. **Marine birds** Eared Grebe *Podiceps nigicollis* Sooty Shearwater *Puffinus griseus* Cormorants *Phalacrocorax* spp. California Gull *Larus californicus* Common Murre *Uria aalge* Rhinoceros Auklet *Cerorhinca monocerata* Cassin's Auklet *Ptychoramphus aleuticus* Waterfowl (ducks, scoters, mergansers)	
Brandt's Cormorant	**Fish** Short-belly rockfish *Sebastes jordani* Yellowtail rockfish *Sebastes flavidus* Other rockfish *Sebastes* spp. Pacific sandlance *Ammodytes hexapterus* Plainfin midshipman *Porichthys notatus* Speckled sanddab *Citharichthys stigmaeus* White seaperch *Phanerodon furcatus* Northern anchovy *Engraulis mordax* Pacific herring *Clupea pallasi* Pacific staghorn sculpin *Leptocottus armatus* *Hemilepidotus* spp. (Cottidae) Other sculpins (Cottidae)	Soft bottom

Species	Prey	Preferred Foraging Habitat
	Pacific tomcod *Microgadus proximus* Northern Pacific hake *Merluccius productus* Shiner perch *Cymatogaster aggregata* Pacific tomcod *Microgadus proximus* Spotted cusk-eel *Chilara taylori* Butter sole Isopsetta isolepis Rex sole *Glyptocephalus zachirus* English sole *Parophrys vetulus* **Invertebrates** Market squid *Loligo opalescens*	
California Least Tern	**Fish** California killifish (*Fundulus parvipinnis*) Sculpins (Cottidae) Surfperch (Embiotocidae) Silverside smelt (Atherinidae) Anchovy (*Anchoa sp.*) Northern Anchovy (*Engraulis mordax*) Pacific Saury (*Cololabis saira*) – not in good years Cabezon (*Scorpaenichthys marmoratus*) Rockfish (*Sebastes sp.*)	Estuarine/lagoons and nearshore coastal
Pelagic Cormorant	**Fish** Short-belly rockfish *Sebastes jordani* Yellowtail rockfish *Sebastes flavidus* Other rockfish *Sebastes* spp. Sculpins (Cottidae) *Coryphopterus nicholsii* *Chilara taylori* **Invertebrates** Shrimp *Spirontocaris* sp.	Submerged reefs
Pigeon Guillemot	**Fish** Rockfish *Sebastes* spp. Pacific sanddab *Citharichthys sordidus* Blennies (Clinidae) Sculpins (Cottidae) Gunnels (Pholidae) Spotted cusk-eel *Chilara taylori* **Invertebrates** Red octopus *Octopus rufescens*	Submerged reefs
Harbor seal	**Fish**	

Species	Prey	Preferred Foraging Habitat
	Rockfish *Sebastes* spp. Pacific sandlance *Ammodytes hexapterus* Plainfin midshipman *Porichthys notatus* Speckled sanddab *Citharichthys stigmaeus* Northern anchovy *Engraulis mordax* Pacific herring *Clupea pallasi* Pacific staghorn sculpin *Leptocottus armatus* *Hemilepidotus* spp. (Cottidae) Other sculpins (Cottidae) Pacific tomcod *Microgadus proximus* Northern Pacific hake *Merluccius productus* Shiner perch *Cymatogaster aggregata* Spotted cusk-eel *Chilara taylori* Butter sole *Isopsetta isolepis* Rex sole *Glyptocephalus zachirus* English sole *Parophrys vetulus* Salmonid Lamprey Hagfish Walleye pollock Starry flounder, *Platichthys stellatus* Pile perch, *Rhacochilus (Damalilicthys) vacca* **Invertebrates** shrimp *Spirontocaris* spp. Market squid *Loligo opalescens* Octopoda spp. Crustacea Bivalve mollusk	

Species	Prey	Preferred Foraging Habitat
California sea lion	**Fish** Northern anchovy Pacific whiting Jack mackerel Rockfish spp. Pacific (chub) mackerel Blacksmith Senorita Plainfin midshipman **Invertebrates** Market squid Octopus spp. Squid spp. Pelagic red crab	
Coastal bottlenose dolphin	**Fish** Croaker spp., Family Sciaenidae Barracuda, *Sphyraena argentea* Jack mackerel, *Trachurus symmetricus* **Invertebrates** Market squid, *Loligo opalescens*	

Note: Most fish taken by seabirds are in the juvenile stage.

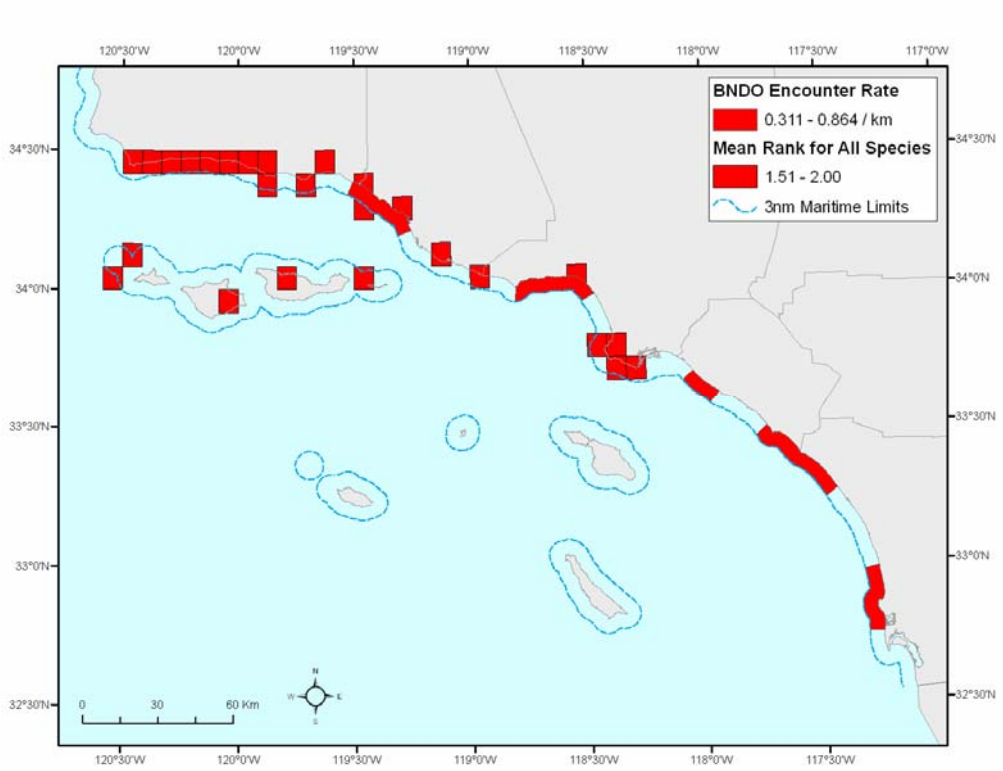
Sources for Table 9-1: Data on seabird prey items from Ainley, D.G., C.S. Strong, T.M. Penniman, and R.J. Boekelheide. 1990. The feeding ecology of Farallon seabirds. Pp. 51-127 in (D.G. Ainley and R.J. Boekelheide, eds.), Seabirds of the Farallon Islands: Ecology, Dynamics, and Structure of an Upwelling-system Community. Stanford University Press, Stanford, California. Data on Bald Eagle prey items, limited to marine prey items only, from Erlandson, J.M., T.C. Rick, P.W. Collins, and D.A. Guthrie. 2007. Archaeological implications of a bald eagle nesting site at Ferrelo Point, San Miguel Island, California. Journal of Archaeological Science 34: 255-271; and Sharpe, P.B. 2002. Restoration and Management of Bald Eagles on Santa Catalina Island, California, 2002. Report prepared for the U.S. Fish and Wildlife Service, Sacramento, Ca. November, 2002. Data on California Least Tern prey items from Robinette, D. 2003. Partitioning of food resources by four sympatric terns (Aves: Laridae) breeding in southern California. Master's Thesis. California State University, Long Beach; Robinette, D. and J. Howar. 2008. Monitoring and management of the California Least Tern colony at Purisima Point, Vandenberg Air Force Base, 2007. Unpublished Report, PRBO Conservation Science, Petaluma, CA. Data on harbor seal prey items from Harvey JT, Helm R, Morejohn G. (1995) Food habits of harbor seals inhabiting Elkhorn Slough, California. Calif. Fish and Game. 81:1-9; Antonelis, G.A. and C.H. Fiscus. 1980. The Pinnipeds of the California Current. CalCOFI Rep., Vol. XXI. Data on California sea lion prey items from Lowry MS, BS Stewart, CB Heath, PK Yochem, and JM Francis. 1991. Seasonal and annual variability in the diet of California sea lions Zalophus californianus at San Nicolas Island, California, 1981-1986. Fishery Bulletin, U.S. 89:331-336. Data on coastal bottlenose dolphin prey items from Schwartz, M. L., A. A. Hohn, H. J. Bernard, S.J. Chivers, and K. M. Peltier. 1992. Stomach contents of beach-cast cetaceans collected along the San Diego County coast of California, 1972-1991. NMFS-SWFSC- Administrative Report LJ-92-18. 33pp.

Table 9.2: Proposed Activities That Will Qualify (YES) or Disqualify (NO) an SMCA for Inclusion in Each Seabird Analysis.

Activity	Breeding Colony Analysis	Roost Analysis	Near-colony Foraging Analysis	Neritic Foraging Analysis	Estuary / Beach Analysis
Lobster (trap, hoop net)	NO	NO	NO	YES	YES
Lobster (scuba)	NO	NO	YES	YES	YES
Barred sand bass (H&L)	NO	NO	NO	NO	NO
Barred sand bass (spear)	NO	NO	NO	YES	YES
Kelp bass (H&L)	NO	NO	NO	NO	NO
Kelp bass (spear)	NO	NO	NO	YES	YES
Sheephead (H&L, trap)	NO	NO	NO	NO	NO
Sheephead (spear)	NO	NO	NO	YES	YES
Spotted sand bass (H&L)	NO	NO	NO	NO	NO
Spot prawn (trap)	NO	NO	NO	YES	NO
Sea cucumber (scuba/hookah)	NO	NO	YES	YES	YES
Grunion (hand take)	NO	NO	YES	YES	NO
Pelagic finfish, white seabass, and bonito (spear)	NO	NO	NO	YES	YES
Pelagic finfish, white seabass, and bonito (H&L) >50m depth	NO	NO	NO	NO	YES
Pelagic finfish, white seabass, and bonito (H&L) 50>30m depth using surface gear on mainland	NO	NO	NO	NO	YES
Pelagic finfish, white seabass, and bonito (H&L) <30m depth on mainland and <50m depth at islands	NO	NO	NO	NO	NO
Rock scallop (scuba)	NO	NO	NO	YES	YES
Urchin (scuba/hookah)	NO	NO	NO	YES	NO
Coastal pelagic finfish and bonito (seine, dip-net, crowder)	NO	NO	NO	NO	YES
Squid (seine, dip-net, crowder)	NO	NO	NO	NO	NO
Lingcod (H&L)	NO	NO	NO	NO	NO
Lingcod (spear)	NO	NO	NO	YES	YES
Rockfish (H&L)	NO	NO	NO	NO	NO

Activity	Breeding Colony Analysis	Roost Analysis	Near-colony Foraging Analysis	Neritic Foraging Analysis	Estuary / Beach Analysis
Rockfish (spear)	NO	NO	NO	YES	YES
Cabezon (H&L)	NO	NO	NO	NO	NO
Cabezon (spear)	NO	NO	NO	YES	YES
Halibut (H&L)	NO	NO	NO	NO	NO
Halibut (spear)	NO	NO	NO	YES	YES
Rock crab (trap)	NO	NO	NO	YES	NO
Mussels (hand harvest)	NO	NO	YES	YES	NO
Jumbo squid (squid jigs/ drift)	NO	NO	NO	NO	YES
Swordfish (harpoon)	NO	NO	YES	NO	YES
Kellet's whelk (trap)	NO	NO	NO	YES	NO
Giant kelp (hand harvest)	NO	NO	NO	YES	NO
Giant kelp (mechanical harvest)	NO	NO	NO	YES	NO
Clams (hand harvest)	NO	NO	YES	YES	NO
Catch and release (H&L barbless single hooks, and artificial lures only) in shallow <10m water or using surface gear	NO	NO	NO	NO	NO
Catch and release (H&L) in open coast environments >10m depth	NO	NO	NO	NO	YES
Shore-based finfish (H&L)	NO	NO	NO	NO	NO
Pier-based fishing (H&L, hoop net)	NO	NO	NO	NO	NO
Marine algae other than giant and bull kelp (hand harvest)	NO	NO	NO	YES	NO

Figure 9.1: Composite Map of Neritic Foraging 'Hot Spots' Within the MLPA South Coast Study Region.



Note: BNDO = Coastal bottlenose dolphin

Sources for Chapter 9

Carney, K.M. and W.J. Sydeman. 1999. A review of human disturbance effects on nesting colonial waterbirds. *Waterbirds* 22:68-79.

Mills, K. L., Sydeman, W.J. and Hodum, P. J. (Eds.), 2005. The California Current Marine Bird Conservation Plan, v. 1, PRBO Conservation Science, Stinson Beach, CA.

Rojek, N.A., M.W. Parker, H.R. Carter, and G.J. McChesney. 2007. Aircraft and vessel disturbances to Common Murres *Uria aalge* at breeding colonies in central California, 1997–1999. *Marine Ornithology* 35: 67–75.

10. Water and Sediment Quality

Status of this chapter: The SAT water quality work group has prepared the draft methods for evaluating water and sediment quality concerns within proposed marine protected areas (MPAs) for approval by the full SAT.

While water quality is not subject to management under the MLPA, it may be an important consideration in designing MPA proposals. Living marine resources may be substantially affected where water quality is significantly compromised, and may be subject to changes in key population (e.g., abundance, growth, reproduction, and mortality), and community (e.g., energetic, diversity, structure and organization) parameters.

Considering Water Quality in MPA Design

Water bodies that do not meet state water quality standards are placed on California's list of "impaired water bodies" according to Section 303(d) of the Clean Water Act. Water quality impairments are designated for a variety of beneficial uses, some of which do not directly affect marine life (e.g., human health due to contact recreation and seafood consumption) and are not a concern for the MLPA (e.g., Santa Monica Bay). The SAT determined that MPAs may be placed in or near areas of threatened water quality (see above) if there are other reasons (e.g. meeting the requirements of habitat representation and replication or MPA size and spacing) to place MPAs in such areas.

Water quality evaluations are not mandated by the MLPA, and should therefore be considered secondary to other MPA network design guidelines. Other established SAT guidance, including bioregion criteria, habitat representation and replication, and MPA size and spacing, should be used as the primary mechanisms to drive the design of alternative MPA proposals. Water quality considerations should be incorporated if other guidelines and criteria have been met.

Areas of Water Quality Opportunities and Concern

Where possible the SAT recommends siting MPAs in areas already designated as areas of special biological significance (ASBSs) when designing MPA network proposals; ASBSs are a type of state water quality protection area (SWQPA), and provide special protections for the maintenance of natural water quality through stringent limitations and prohibitions of waste discharges.

The SAT recommends avoiding, where possible, water quality concern areas, including areas containing or impacted by:

- Cooling water intake sites for power plants,
- Storm water plumes from larger watersheds, and
- Municipal sewage or industrial outfalls.

- Both the SWQPAs and water quality concern areas have been identified on Maps 1(a-c) through 4(a-c) at the end of this document.

Additionally, the SAT has identified the following three specific sites as undesirable locations for MPA placement in the SCSR because they contain water quality conditions that will most likely compromise MPA performance and potentially the ability of an MPA to meet the goals of the MLPA:

- San Onofre Nuclear Power Generating Station (SONGS) intake and discharge pipes (entrainment, impingement and thermal pollution concerns).
- Los Angeles and Long Beach Harbors (large industrial harbors, stormwater discharge concerns, wastewater treatment outfalls, sediment quality concerns, entrainment concerns).
- San Diego Harbor; in addition you might consider avoiding areas in the vicinity of South Bay Power Plant[1] (large industrial harbor, entrainment and sediment quality concerns).

Evaluation Methodology

The SAT determined that the best way to evaluate MPAs in regards to water quality is to allocate scores based on a presence or absence scoring system. A matrix will be established based on whether or not a proposed MPA includes any of the three water quality concern areas listed above. State water quality protection areas will also be included in this matrix, and will act as a positive influence on the score when co-located with MPAs. Final scores for each MPA and the MPA network proposal will be an average for each of the category scores. The scores for each water quality concern category are weighted according to the level of concern. Weights are based on the opinion that power plant intakes will have a greater impact on MPA performance than storm water discharges, which in turn have a greater impact than wastewater discharges (See *California MLPA Master Plan Science Advisory Team Draft Recommendations for Considering Water Quality and Marine Protected Areas in the MLPA South Coast Study Region*).

Intakes from power generating facilities are the greatest threat because they operate year round or over many months[2] and there is virtually complete mortality for any larvae entrained through the cooling water intake system. Storm runoff is known to be toxic to larvae, but is generally of lesser concern than power plants because their plume extends over an appreciable area only about a dozen or so days per year, following big rainstorms. Nineteen major watershed drainage plumes have been identified that present a noteworthy threat. Wastewater effluents are less of a concern because they are controlled through permits with effluent limitations; however, they still present a pollution threat if effluent limits are violated, and also because sediments in their immediate vicinity sometimes have elevated contaminant

[1] Note: South Bay Power Plant intake may be discontinued in the future due to lease status.

[2] Power plants may operate throughout the entire year, although operations may not occur on a continuous basis. For example, some power plants may only operate during peak usage times. Additionally, most if not all power plants periodically cease operating due to maintenance issues.

concentrations relative to background. An impact zone of 0.5 mile radius should be given for major wastewater outfalls and 0.25 mile radius for intermediate wastewater outfalls.

The score for an MPA that is co-located with an area strongly influenced by a power plant intake anywhere in its boundaries will be -1.5. Co-location with a major stormwater discharge plume will reduce the score by 1.0, and co-location with an impact zone around a major or intermediate wastewater discharge outfall will reduce the score by 0.5. MPAs that do not include water quality concern areas will receive a positive score of 1.

An MPA that is co-located with a state water quality protection area scores a maximum of 1.0. This score will be adjusted to match the percentage of shoreline coverage on an MPA from an SWQPA. For example, if 60% of the MPA's shoreline is within the boundaries of an SWQPA, then that MPA will receive a 0.6 score under the SWQPA category. If an MPA is not co-located with a state water quality protection area then it scores 0 for that category. Table 1 summarizes the scoring system for each category.

Table 1. Scoring table for evaluating MPAs by category. Maximum score for each category is 1.0.

Water Quality Concern Area	**Co-located with Water Quality Concern Area Scores**	**Not Co-located with Water Quality Concern Area Scores**
Power Plant Intake Zone	-1.5	1.0
Stormwater Discharge	-1.0	1.0
Wastewater Discharge	-0.5	1.0
Water Quality Protection Area	**Co-located with SWQPA**	**Not Co-located with SWQPA**
SWQPA/ASBS	Between 0 and 1, based on the % of shoreline coverage	0
Final score for each MPA	Average of scores for each category, weighted by multiplying by ratio of MPA shoreline to regional proposal total shoreline	
Final score for regional MPA proposal	Average of scores for each category across all MPAs	

Each of the four water quality categories will be averaged for each individual MPA to obtain a score for each MPA; these individual MPA scores will be combined by obtaining a weighted average based on the ratio of the coastal length of a specific MPA to the sum of coastal lengths for the entire proposal. The weighted average provides a final score for the entire MPA proposal (0.56 in the hypothetical proposal shown in Table 2).

In the example proposal below (Table 2), Example MPA One was not placed in any areas of water quality concerns, such as power plant intakes, stormwater discharge, or wastewater discharges, therefore a score of 1 was placed under each of these three categories.

Additionally, Example MPA One had a shoreline that was 100% co-located with an ASBS and followed the guidelines listed above for water quality protection area scoring. Therefore, a 1 was placed under that category. Example MPA One scored the highest possible score or a 1 across all categories. Conversely, Example MPA Two did not score as well due to co-locating the MPA with a power plant intake zone and with a major or intermediate wastewater discharge. Example MPA Two also did not receive any additional credit for being co-located with water quality protection areas along its shoreline. Therefore, Example MPA Two scored low and it may be prudent to revisit the MPA proposal to see if it is possible to adjust the location to better meet the water quality guidelines. In the proposal below, Example MPA One received the highest score (1.0) while Example MPA Six received the lowest score (0.0).

Table 2. Example evaluation for a hypothetical proposal. Values shown are resultant scores for each category and average score for each MPA and entire regional proposal.

		Score for Avoiding					
MPAs	**Shoreline Length**	**Power Plant Intake Zone**	**Stormwater Discharge Zone**	**Wastwater Discharge Zone**	**Co-Located with an SWQPA/ ASBS**	**MPA Average Score**	**MPA Score Weighted Average[1]**
Example MPA One	5	1.00	1.00	1.00	1.00	1.00	**.21**
Example MPA Two	3	-0.50	1.00	0.50	0.00	0.25	**.03**
Example MPA Three	4	1.00	0.00	1.00	0.00	0.50	**.08**
Example MPA Four	5	1.00	0.00	1.00	0.5	0.63	**.13**
Example MPA Five	3	1.00	1.00	0.50	1.00	0.88	**.11**
Example MPA Six	4	-0.50	0.00	0.50	0.00	0.00	**0.0**
Scores for Entire Proposal (avg.)	**24**	**0.50**	**0.50**	**0.75**	**0.42**	**0.54**	**.56**

[1] *The final weighted average score for the whole proposal is the sum of individual MPA scores, each multiplied by the ratio of the individual MPA shoreline length to the total shoreline length in the entire regional proposal.*

Appendix A. Names and shoreline lengths of water quality protection areas in the MLPA South Coast Study Region.

State Water Quality Protection Area/ASBS Name	Shoreline Coverage (Alongshore Span)
Santa Barbara Island and Anacapa Island ASBS	30.8
Magu Point to Latigo Point ASBS	24.0
San Clemente Island ASBS	58.5
San Miguel, Santa Rosa and Santa Cruz Islands ASBS	194.4
Santa Barbara Island and Anacapa Island ASBS	30.8
San Nicolas Island and Begg Rock ASBS	26.9
Northwest Santa Catalina Island ASBS	20.9
Western Santa Catalina Island ASBS	4.0
Irvine Coast ASBS	3.4
Robert E. Badham ASBS	0.7
Heisler Park ASBS	0.5
San Diego Scripps ASBS	0.6
La Jolla ASBS	1.7
Farnsworth Bank ASBS (offshore, no shore line)	0.0
Southeast Santa Catalina Island- ASBS	2.9