

California Marine Life Protection Act Initiative
Draft Methods Used to Evaluate MPA Proposals in the
North Coast Study Region
Section 10.0 Water and Sediment Quality
Draft revised July 28, 2010

10. Water and Sediment Quality

Status of this chapter: Draft.

The SAT water quality work group has prepared the draft methods for evaluating water and sediment quality concerns within proposed marine protected areas (MPAs) in the MLPA North Coast Study Region (NCSR) for approval by the 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 parameters (e.g., energetic, diversity, structure and organization).

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 purposes, 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. The SAT determined that MPAs may be placed in or near areas of threatened water quality if there are other reasons (e.g. meeting the guidelines for 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 bioregions, habitat representation and replication, and MPA size and spacing, should be used as the primary mechanisms to drive the design of alternative MPA proposals consistent with the Master Plan. Water quality considerations should be incorporated if other guidelines and criteria have been met.

Areas of Water Quality Opportunities and Concern

The Marine Managed Areas Improvement Act (MMAIA; Stats. 2000, Chapter 385), which is complementary to the MLPA, does address water quality concerns with the establishment of state water quality protection areas (SWQPAs). Areas of special biological significance (ASBSs), which were established through the California Ocean Plan, are a subset of SWQPAs. SWQPAs, inclusive of ASBSs, must be designated by the State Water Resources Control Board. These areas are protected from waste being discharged into them, affording better and more natural water quality. MPAs proposed within ASBSs should have the potential to benefit from protection beyond that offered by standard waste discharge restrictions and other measures, due to the strict water quality protections in ASBSs (ASBSs in the NCSR are listed in Table 10-4). Where possible the SAT

recommends siting MPAs in ASBSs. The SAT recommends avoiding, where possible, water quality concern areas, including areas containing or impacted by:

1. Storm water runoff from developed urban or agricultural watersheds, ~~and~~ other non-point sources such as ports, harbors or marinas, and disturbances from dredge disposal activities.
2. Municipal sewage or industrial outfalls.

In the South Coast Study Region the SAT recommended avoiding cooling water intake sites for power plants. In the NCSR, there is only one major coastal power plant currently using once-through cooling, the Humboldt Bay Power Plant which is owned by Pacific Gas and Electric Company. However, the plant is completing a re-powering project in early 2010 to fully convert to closed cycle cooling by the end of 2010. There are therefore no cooling water intakes that should be avoided in the NCSR.

Both the SWQPAs and water quality concern areas have been identified on the water quality maps which accompany the guidance document titled “California MLPA Master Plan Science Advisory Team draft recommendations for considering water quality and marine protected areas in the MLPA North Coast Study Region”.

The SAT strongly recommends that the following sites are undesirable locations for MPA placement 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:

- Samoa Pulp Mill Outfall
- Crescent City Harbor
- Trinidad Harbor
- Eureka Harbor and other developed harbors in Humboldt Bay
- Shelter Cove Harbor
- Fort Bragg Noyo Bay Harbor

The SAT has also identified two areas where dredge disposal activities occur. The SAT recommends avoiding, when possible, placing an MPA adjacent to the Whaler Islands dredge disposal site and adjacent to the Crescent City Harbor and the Humboldt Open Ocean Disposal Site (HOODS) which is located three nautical miles off the mouth of Humboldt Bay. MPAs located adjacent to Whaler Island may experience periodical disturbances from sedimentation and turbidity caused by dredge disposal activities, which could disturb benthic communities. Additionally, MPAs may be minimally affected by dredge disposal activities if they were located adjacent to HOODS and for this reason it would be best to avoid this area, if possible, during the MPA planning process. For more detailed information and on these two sites please see Question # 9 in the document titled “California MLPA Master Plan Science Advisory Team Responses to Science Questions Posed during the June 29-30, 2010 MLPA Master Science Advisory Team Meeting” which was released during the July 29th and 30th NCRSG meeting.

Evaluation Methodology

Scoring for Open Coastal MPAs

The SAT determined that the best way to evaluate potential impacts of water quality on proposed MPA networks is to assign scores based on presence or absence of water quality concerns and opportunities. A matrix will be established based on whether or not a proposed MPA includes either of the two water quality concern areas listed above. SWQPAs also will 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 expert opinion that storm water and nonpoint source discharges will have a greater impact on MPA performance than wastewater discharges.

Urban and agricultural storm runoff is known to be toxic to larvae of marine fish and invertebrates; storm water plumes from developed areas may extend over an appreciable area following major rainstorms. Additionally, ports, harbors and marinas, may contain nonpoint source contaminants at levels unsuitable for MPA placements. Treated 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 may have elevated contaminant concentrations. There is only one major wastewater effluent discharge in the NCSR from the Samoa Pulp Mill, but there are several intermediate and small discharges. An impact zone of 0.5 mile radius should be given for major wastewater outfalls and 0.25 mile radius for intermediate wastewater outfalls, and it is advisable that small wastewater outfall points (impact “points”) should not be included in an MPA.

Co-location with urban or agricultural stormwater runoff or other nonpoint source discharge sites such as ports, harbors or marinas, and dredge disposal sites will reduce the score by 1.0. Co-location with an impact zone around a 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 SWQPA scores a maximum of 1.0. This score will be weighted based on the percentage of shoreline extent of the SWQPA that overlaps the proposed MPA. 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 SWQPA then it scores 0 for that category. Table 10-1 summarizes the scoring system for each category.

Table 10-1. Scoring table for evaluating water quality in coastal MPAs

Water Quality Concern Area	Scores: Co-located with Water Quality Concern Area	Scores: Not Co-located with Water Quality Concern Area
Stormwater/Nonpoint Source Discharge/ <u>Dredge Disposal</u>	-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 for coastal MPAs	
Final score for regional MPA proposal (coastal MPAs only)	Sum of the final score for each MPA within the proposal	

Maximum score for each category is 1.0.

The scores for the three water quality categories will be averaged to obtain a score for each proposed MPA. Individual MPA scores will be weighted by the ratio of the shoreline length of a proposed MPAs to the shoreline of the proposed MPAs in the NCSR. This will provide a water quality score for each coastal MPA in the proposal, which potentially ranges from a low of 0.17 for MPAs with high overlap with areas of water quality concern, to 1.0 for MPAs avoiding water quality concerns while having high overlap with areas of water quality opportunity.

Scoring for MPAs in Estuaries, Lagoons, and Bays

All MPA proposals likely will include estuaries, lagoons, and/or bays, due to the important role these play in marine ecosystems and because they include one or more of the many key habitats that should be included in MPA proposals as described in the *Master Plan*. Embayments are productive and essential to the marine ecosystem in part because of their enclosed, protected structure at the mouths of coastal streams. High productivity in embayments is related to natural nutrient deposition from coastal streams. However, the influence of development in watersheds and bays (such as urban development, agriculture, timber harvest, aquaculture and harbors) also makes them vulnerable to pollution. Anthropogenic eutrophication from developed watersheds can alter the natural nutrient balance in embayments. Toxic pollutants, also derived from watershed runoff and from anthropogenic activities in bays and on the shoreline, adhere to the sediments in bays and estuaries. Therefore, the greater the number of bay and estuary MPAs included in a proposal, the greater the chance that the proposal's overall score will be reduced. However, not all bay and estuary MPAs are considered impacted enough to receive a reduced water quality score.

The SAT recognizes differences between embayments (estuaries, lagoons, and bays) and open coastal MPAs in terms of water quality issues. Whereas water pollution enters open coastal waters from a nearshore discharge point and disperses toward the open ocean, discharges into enclosed bays and estuaries tend not to disperse quickly and can be retained through several tidal cycles. In addition, there are no SWQPA/ASBSs currently designated in enclosed bays and estuaries. Using the same scoring system would unequally weight scores for enclosed bays and estuaries relative to the open coast. For all these reasons, the SAT will provide, for each MPA proposal, separate evaluations of open coastal MPAs and MPAs located in bays and estuaries. Table 10-2 summarizes the scoring system for each water quality concern area for bays and estuaries.

Table 10-2. Scoring table for evaluating water quality concerns in embayment and estuarine MPAs

Water Quality Concern Area	Co-located with Water Quality Concern Area Scores	Not Co-located with Water Quality Concern Area Scores
Stormwater/Nonpoint Source Discharge	-1.0	1.0
Wastewater Discharge	-0.5	1.0
Final score for each embayment MPA	Average of scores for each category, weighted by multiplying by ratio of MPA area to total area of all proposed MPAs in embayments and estuaries.	
Final score for regional MPA proposal (coastal MPAs only)	Sum of the final score for each MPA within the proposal	

Maximum score for each category is 1.0

Each of the two water quality categories will be averaged to obtain a score for each individual MPA. These individual MPA scores will be combined by obtaining a weighted average based on the ratio of the area of a specific MPA to the sum of area for all the bay/estuary MPAs in the entire proposal. This will provide a water quality score for each bay/estuarine MPA in the proposal, which potentially ranges from a low of 0.25 for MPAs with high overlap with areas of water quality concern, to a high of 1.0 for MPAs without overlap with these areas of concern.

Scoring for MPAs Proposals

After a weighted average score has been determined for each of the individual coastal and embayment MPAs within a proposal, a weighted average score is then determined for the entire proposal. The weighted average is a single comprehensive score for water quality of the entire MPA proposal (average MPA score within a proposal) multiplied by (MPA size/total area or shoreline length in a proposal). This equation is done for each MPA and then summed across all MPAs to get the weighted average score, example provided below.

In the example proposal below (Table 10-3), MPAs One, Two and Three are coastal MPAs, and Four, Five and Six are embayment MPAs. For the coastal MPAs, MPA One was not placed in any areas of water quality concerns, such as stormwater/nonpoint source or wastewater discharges, therefore a score of 1 was placed under each of these two categories. Additionally, MPA One had a shoreline that was 100% co-located with an SWQPA/ASBS and followed the guidelines listed above for water quality protection area scoring. Therefore, a 1 was placed under that category. MPA One scored the highest possible score (1.0) across all categories. MPA Two did not score as well due to co-locating the MPA with a major or intermediate wastewater discharge. MPA Three did not score well due to co-locating with a stormwater/nonpoint source. MPAs Two and Three also did not receive any additional credit for being co-located with water quality protection areas.

Example MPA Four was not placed in any areas of water quality concerns, such as stormwater/nonpoint source or wastewater discharges, and therefore MPA Four scored the highest possible score for an embayment MPA across all categories. MPA Five did not score as well due to co-locating the MPA with a major or intermediate wastewater discharge. MPA Six scored even

worse due to co-locating with both a stormwater/nonpoint source and a wastewater discharge, and received the worst score of all MPAs in the proposal.

In summary for this hypothetical proposal, Example MPAs One and Four received the highest scores (1.0). Example MPAs Two, Three, Five and Six scored low and improvements could be made it is possible to adjust their locations to better meet the water quality guidelines.

Table 10-3. Example of water quality evaluations for a hypothetical proposal

	Shoreline Length (Mi)	Stormwater/ Nonpoint Source Discharge Zone/Dredge Diposal	Wastewater Discharge Zone	Co-Located with an SWQPA/AS BS	MPA Average Score	MPA Shoreline ratio	MPA Score Weighted Average
Coastal MPAs							
Example MPA One	5	1	1	1	1	0.42	0.42
Example MPA Two	3	1	0.5	0	0.5	0.25	0.13
Example MPA Three	4	0	1	0	0.33	0.33	0.11
Proposal Average Scores ^a	12	0.66	0.83	0.33	0.61		0.66
Bay/Estuarine MPAs							
Example MPA Four	10	1	1		1	0.3	0.3
Example MPA Five	15	1	0.5		0.75	0.45	0.34
Example MPA Six	8	0	0.5		0.25	0.24	0.06
Proposal Average Scores ^a	33	0.66	0.66		0.66		0.7

^a Shoreline length, MPA area, and final weighted score are summed and not averaged.

Table 10-4. Names and shoreline lengths of water quality protection areas in the NCSR

SWQPA	Area (mi ²)	Alongshore Span (miles)
Redwood National Park ASBS	97.88	35.9
Trinidad ASBS	0.46	2.0
King Range ASBS	39.15	33.0
Jughandle Cove ASBS	0.32	1.5