

California MLPA Master Plan Science Advisory Team
Summary of SAT Water and Sediment Quality Evaluation of Round 2
NCRSG Draft MPA Proposals for the MLPA North Coast Study Region
Revised June 21, 2010

Overview of MPA Proposal Evaluations Regarding Water and Sediment Quality

While water quality is not subject to management under the Marine Life Protection Act (MLPA), it may be an important consideration in designing marine protected area (MPA) proposals. Where water quality is significantly compromised, living marine resources may be substantially affected, being subject to changes in key population parameters, such as abundance, growth, reproduction, and mortality, and community parameters such as energetics, diversity, structure and organization. Quality of water and sediment is a concern in the MLPA North Coast Study Region (NCSR) and should be considered during the MPA planning and design process. However, it is important to remember that water-quality evaluations are not mandated by the MLPA, and should therefore be considered secondary to other MPA design guidelines. Water quality considerations should be incorporated if other guidelines and criteria have been met. This document discusses evaluation considerations and compares results for existing MPAs (Proposal 0 [P0]) and for the MLPA North Coast Regional Stakeholder Group (NCRSG) draft MPA proposals (Ruby Draft MPA Proposal 1 [Ruby 1 or RU1], Ruby Draft MPA Proposal 2 [Ruby 2 or RU2], Sapphire Draft MPA Proposal 1 [Sapphire 1 or SA1], Sapphire Draft MPA Proposal 1 [Sapphire 2 or SA2]).

Evaluation Considerations

On May 20, 2010, the NCRSG finalized four Round 2 draft MPA proposals that were advanced for evaluation. All four draft proposals and Proposal 0 (existing state MPAs) were evaluated for water quality. This evaluation was based on the presence or absence of the following scoring categories:

- Urban stormwater runoff, and non-point source pollution (e.g. harbors)
- Municipal sewage or industrial wastewater outfalls
- Co-location with an area of special biological significance (ASBS, a subset of State Water Quality Protection Areas [SWQPAs])

This summary document focuses on comparisons among all five proposals described above and their scores based on the three scoring categories.

The SAT determined that the best way to evaluate MPAs with regard to water quality is to allocate scores based on a presence or absence scoring system. For open coast MPAs the scoring system gives a range of values, with 0.17 being the least desirable, and a range of 0.67 to 1.0 considered the most desirable. Specifically for open coast MPAs, the upper range is influenced by the co-location of MPAs with areas of special biological significance (ASBSs). For example, MPAs that are absent any areas of water quality concern and are completely within an ASBS would receive 1.0, the highest possible score. Open coast MPAs that are absent any areas of water quality concern and are *not* co-located with an ASBS would score a 0.67. This 0.67 score is the upper threshold that a score could get without the presence of an ASBS, or in other words, 0.67 is a very favorable score. Anything less than 0.67 indicates MPA co-location with an area having one or more water quality concerns. Methods for these

analyses are described in an associated document, *Draft SAT Methods Used to Evaluate Marine Protected Area Proposals in the North Coast Study Region* ("Evaluation Methods Document"). The scoring tables in the appendices can also be used as a reference if clarification is needed.

All proposals include enclosed bays, estuaries or lagoons, due to the important role these systems play in the marine ecosystem and because they include one or more of the many SAT-defined key habitats that should be included in MPA proposals. These embayments are productive and essential to the marine system as a whole largely because of their enclosed, protected nature at the mouths of coastal streams. Their productivity is related to natural nutrient deposition from coastal streams. However, the influence of developed watersheds adjacent to or upstream of some of these embayments can also make them vulnerable to pollution. Anthropogenic eutrophication and sedimentation from urban runoff, agriculture, and timber harvest can upset the natural nutrient balance in these embayments. Toxic pollutants, also derived from urban runoff, agricultural runoff, and from anthropogenic activities on the shoreline or in active harbors, adhere to the sediments in bays and estuaries. Therefore, the greater the number of bay and estuary MPAs included in a proposal that receive polluted stormwater runoff and other nonpoint source pollution, the greater the chance that the proposal's overall score will be reduced. However, not all bay and estuary MPAs in the MLPA North Coast Study Region (NCSR) are considered impacted enough to receive a reduced water quality score.

The SAT furthermore recognizes the 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 state water quality protection areas (SWQPAs) or 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.

Per unit of area, semi-enclosed bays and estuaries have shoreline lengths roughly double those of straight shorelines along the open coast. Therefore, shoreline lengths for bays and estuaries were not used and instead the area (square miles) of the bay or estuary was used to make the weighting more proportional to the actual MPA area. In addition, there are no ASBSs currently designated in enclosed bays and estuaries. For all these reasons, the SAT is providing separate evaluations of MPAs located in embayments and open coast MPAs. For embayment MPAs the scoring system gives a range of values, with 0.25 being the least desirable, and a score of 1.0 considered the most desirable.

Draft MPA Proposals Evaluated

All of the submitted proposals in Round 2 did very well in adhering to the MLPA Master Plan Science Advisory Team's (SAT) water quality guidelines with half of the submitted proposals receiving scores indicating an absence of water quality concerns. The differences among proposals with respect to water quality are minor relative to other criteria established by the

SAT, and should not be a substantive factor in choosing among them, though this information may be used to improve proposals in Round 3.

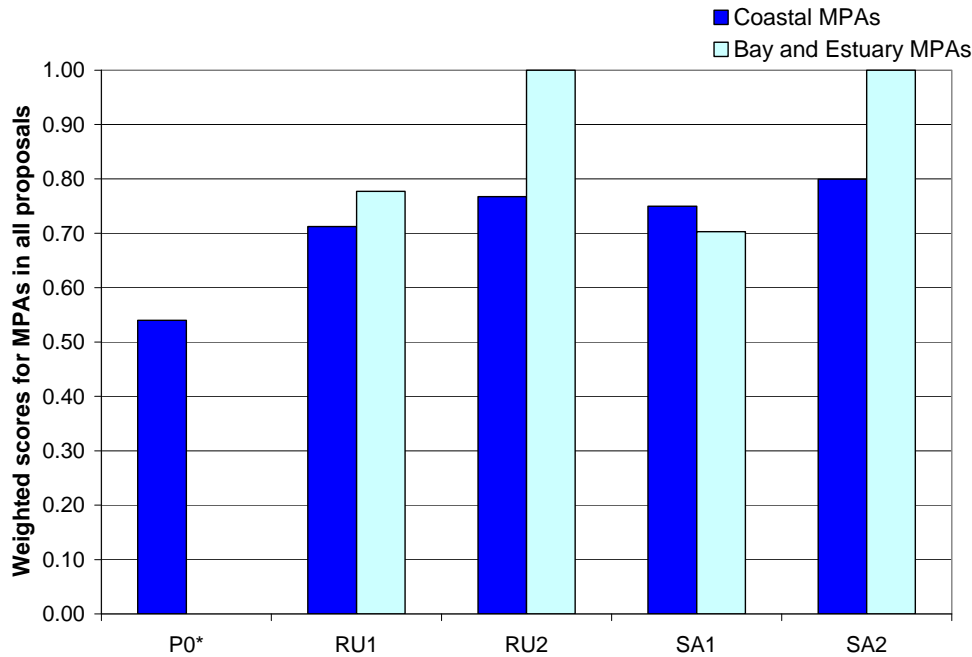
All proposals did a good job of avoiding harbors and marinas, which are known sources of non-point sources of pollution. Only two proposals included some MPAs that will be impacted by urban stormwater discharge. These MPAs were located in Humboldt Bay and the MacKerricher State Park. All proposals avoided major wastewater or industrial plant outfalls. However, two proposals had an MPA with an intermediate wastewater treatment plant outfall and buffer zone (quarter-mile) completely contained within it (North Humboldt Bay). It should be stressed that intermediate wastewater plant outfalls have a lower associated concern when compared to major wastewater plant outfalls, but may potentially have upsets that result in temporary increases in pollutants in effluent.

All of the proposals did an excellent job of co-located MPAs within ASBSs. Co-location of MPAs within ASBS ranged from a low of three MPAs in a proposal to a high of five MPAs in a proposal. Two of the four ASBSs in the NCSR were utilized (the two larger ASBSs – Redwood National and State Park ASBS and Kings Range National Conservation Area ASBS). There were some lost opportunities to utilize the other two smaller ASBSs in the study region; Jughandle Cove ASBS near Fort Bragg and Trinidad Head ASBS near Trinidad. Stakeholders should still consider these areas as water quality opportunities when proposing alternative MPAs for Round 3.

Coastal MPAs Summary

All submitted proposals scored very well for coastal MPAs, with proposal weighted scores greater than 0.67 (Figure 1). However, the difference between the highest and lowest scores was minimal. There was only one MPA (MacKerricher State Marine Conservation Area [SMCA]) that overlapped partially with an urban stormwater discharge area (Fort Bragg municipal separate storm sewer system [MS4]) draining into it. This MPA was found in both Ruby 1 (RU1) and Sapphire 1 (SA1) and the Fort Bragg MS4 drainage area reaches only the southern portion of both MPAs. Of the four proposals submitted for evaluation, Sapphire 2 (SA2) had the most favorable coastal MPAs scores (weighted score 0.80) followed by Ruby 2 (RU2) (weighted score 0.77), Sapphire 1 (weighted score 0.75) and Ruby 1 (weighted score 0.71). Scores were mostly influenced by the co-location with ASBSs and the number of MPAs proposed in a given proposal, rather than the co-location in areas of water quality concern. Interestingly, all of the submitted proposals scored better than Proposal 0, with a weighted score of 0.54.

Figure 1. Weighted scores for all water-quality evaluation categories in a given proposal

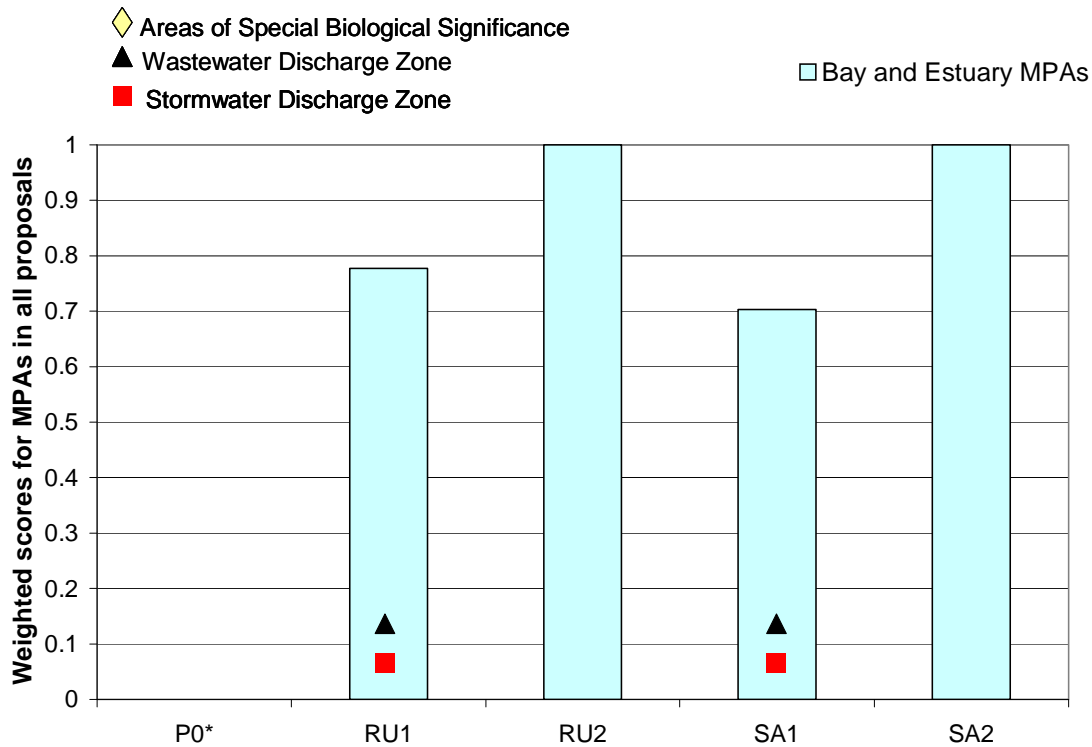


Notes: Proposal 0 did not have any bay or estuary MPAs. Scores between 0.67 and 1.0 indicate MPA placement without area of water quality concern. Scores less than 0.67 indicate placement of MPAs within areas of water quality concern.

Bay and Estuary MPAs Summary

Proposals Ruby 2 and Sapphire 2 scored very well (weighted scores 1.0) and neither proposal contained MPAs that were located in areas where available data indicated water quality concerns. Proposals Ruby 1 and Sapphire 1 scored lower (weighted scores 0.78 and 0.70 respectively) than the other two but still scored well. Both Ruby 1 and Sapphire 1 contain an MPA in North Humboldt Bay (North Humboldt Bay State Marine Recreational Management Area [SMRA]) which has water quality concerns. There is an intermediate wastewater discharge outfall operated by the city of Arcata in the northeast portion of the bay. In addition to this, the North Humboldt Bay State Marine Recreational Management Area (SMRMA) is adjacent to an urban stormwater discharge area (Arcata MS4). Both of these factors contribute to the decreased score for North Humboldt Bay SMRMA in both proposals Ruby 1 and Sapphire 1. All other bay and estuary MPAs in Ruby 1 and Sapphire 1 were free of water quality concern areas as defined by the SAT.

Figure 2. Weighted scores and the associated water quality concerns for all Round 2 proposals with bay and estuary MPAs



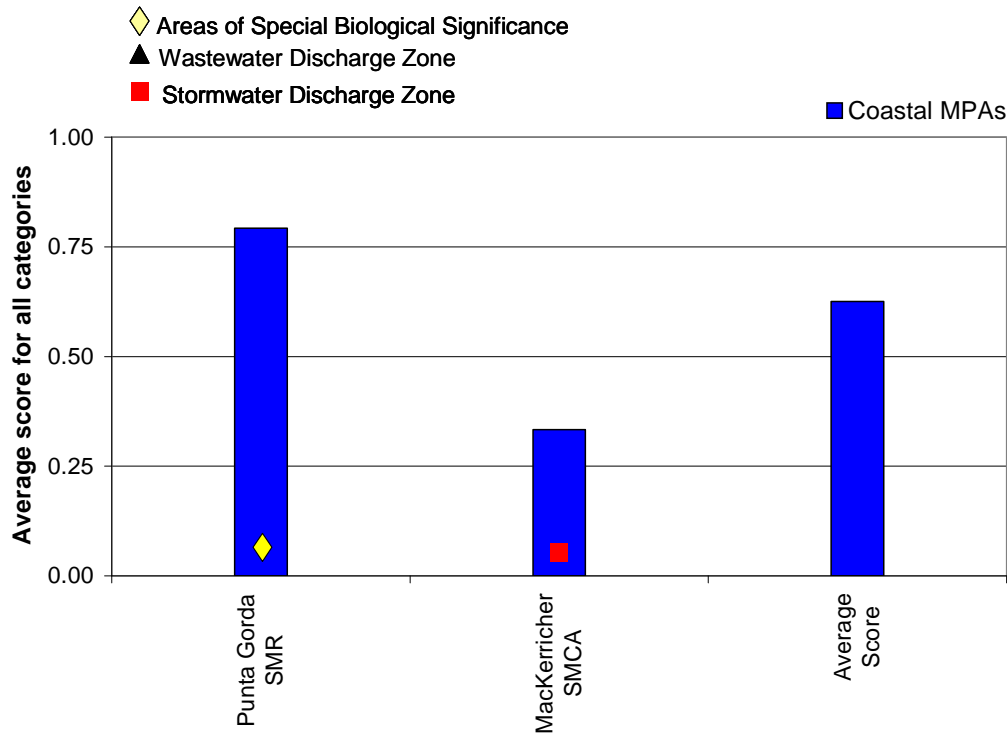
*Proposal 0 does not have any bay or estuary MPAs.

The following individual summaries focus on the specific co-location with areas of water quality concern and water quality opportunities (ASBSs). By reviewing the individual MPA proposal charts and appendices, it is possible to determine which, if any, MPAs could be adjusted to include areas without water quality concerns. Again, these considerations should be secondary and supplemental to other SAT guidelines, such as size, spacing, and habitat representation and replication.

Proposal 0: Individual Summary

Proposal 0 comprises the five existing MPAs. All five MPAs are located along the coast. The average score for existing coastal MPAs is 0.63 and the weighted score is 0.54 (Appendix A). Four of the five coastal MPAs (80%) scored 0.67 or higher. Also, one of existing MPAs is co-located within an ASBS (Figure 3). Only one out of five coastal MPAs scored lower than 0.67 (located within urban stormwater discharge drainage area (Fort Bragg MS4) near MacKerricher State Park) (Figure 3).

Figure 3. Proposal 0: Scores for coastal MPAs with water quality concerns and opportunities and the proposal's average score

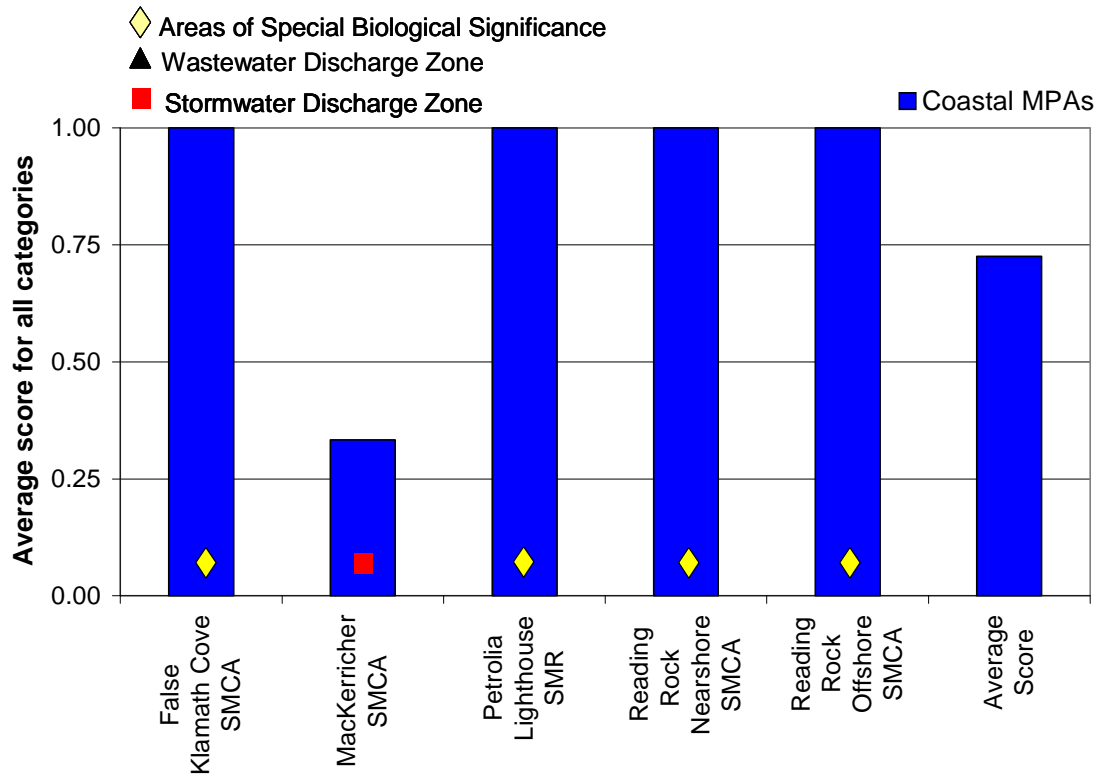


Ruby Draft MPA Proposal 1: Individual Summary

Nearly 83% of the Ruby 1 MPAs located in bays and estuaries scored well (1.00); only one of six MPAs located in bays and estuaries scored poorly. The Humboldt Bay SMRMA was co-located adjacent to Arcata’s urban stormwater discharge areas and scored a 0.25. Additionally, this MPA was also co-located with an intermediate wastewater discharge outfall operated by the city of Arcata in the northeast portion of the bay. There are also aquaculture activities nearby but outside the MPA, which should be considered.

The average score for Ruby 1 coastal MPAs is 0.73 and the weighted score is 0.73 (Appendix B). There were 16 of 17 (94%) coastal MPAs that scored 0.67 or higher. There were also 4 of 17 coastal MPAs that were entirely co-located within an ASBS (Figure 4). Three of these MPAs were co-located within Redwood National and State Park ASBS. The fourth MPA was co-located within the Kings Range National Conservation Area ASBS. Only one coastal MPA scored lower than 0.67 (MacKerricher SMCA). The MacKerricher SMCA was located within an urban stormwater discharge drainage area near MacKerricher State Park in Fort Bragg. A potential solution to improving the MacKerricher SMCA’s score would be to move the boundary north of the urban stormwater discharge drainage area.

Figure 4. Ruby Draft MPA Proposal 1: Scores for coastal MPAs with water quality concerns and opportunities and the proposal’s average score

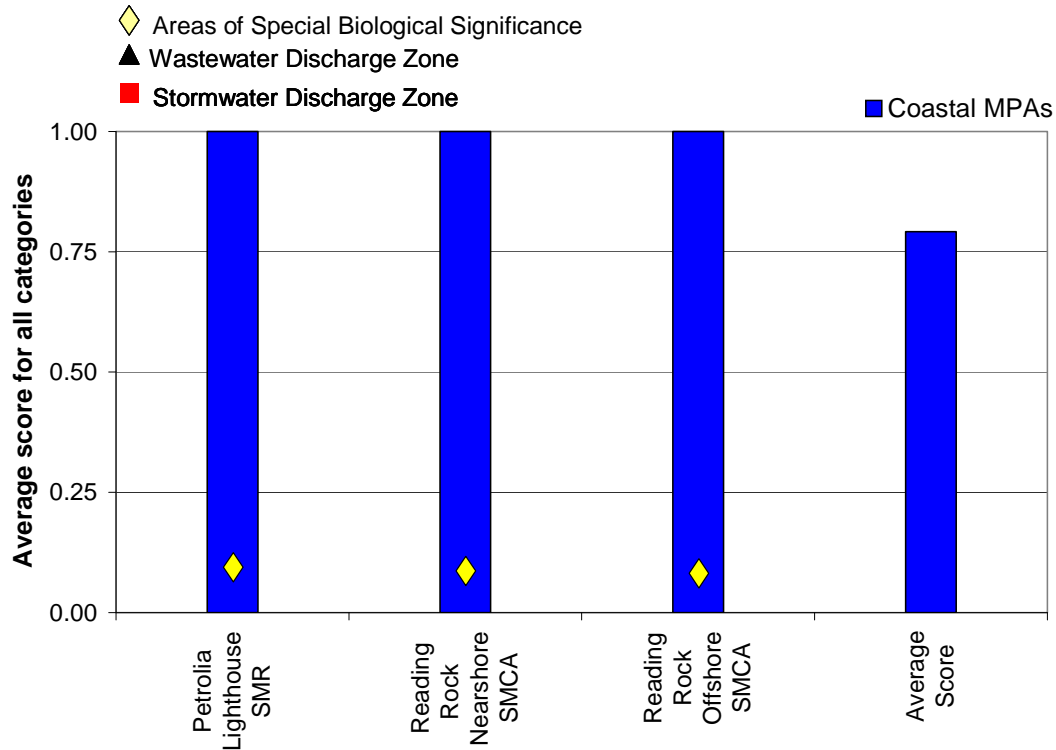


Ruby Draft MPA Proposal 2: Individual Summary

All four MPAs proposed in Ruby 2 located in bays and estuaries scored the highest score of 1.00. There were no MPAs located in areas that had SAT defined water quality concerns per SAT guidelines.

The average score for Ruby coastal MPAs is 0.79 and the weighted score is 0.77 (Appendix C). All eight coastal MPAs scored 0.67 or higher and did not have any water quality concerns associated with them. Furthermore, 3 of 8 (38%) coastal MPAs are entirely co-located within the boundaries of an ASBS and received the highest average score of 1.00 (Figure 5). Two of these MPAs were co-located within Redwood National and State Park ASBS. The third MPA was co-located within the Kings Range National Conservation Area ASBS. There were no coastal MPAs located in areas that had SAT defined water quality concerns per SAT guidelines.

Figure 5. Ruby Draft MPA Proposal 2: Scores for coastal MPAs with water quality concerns and opportunities and the proposal’s average score



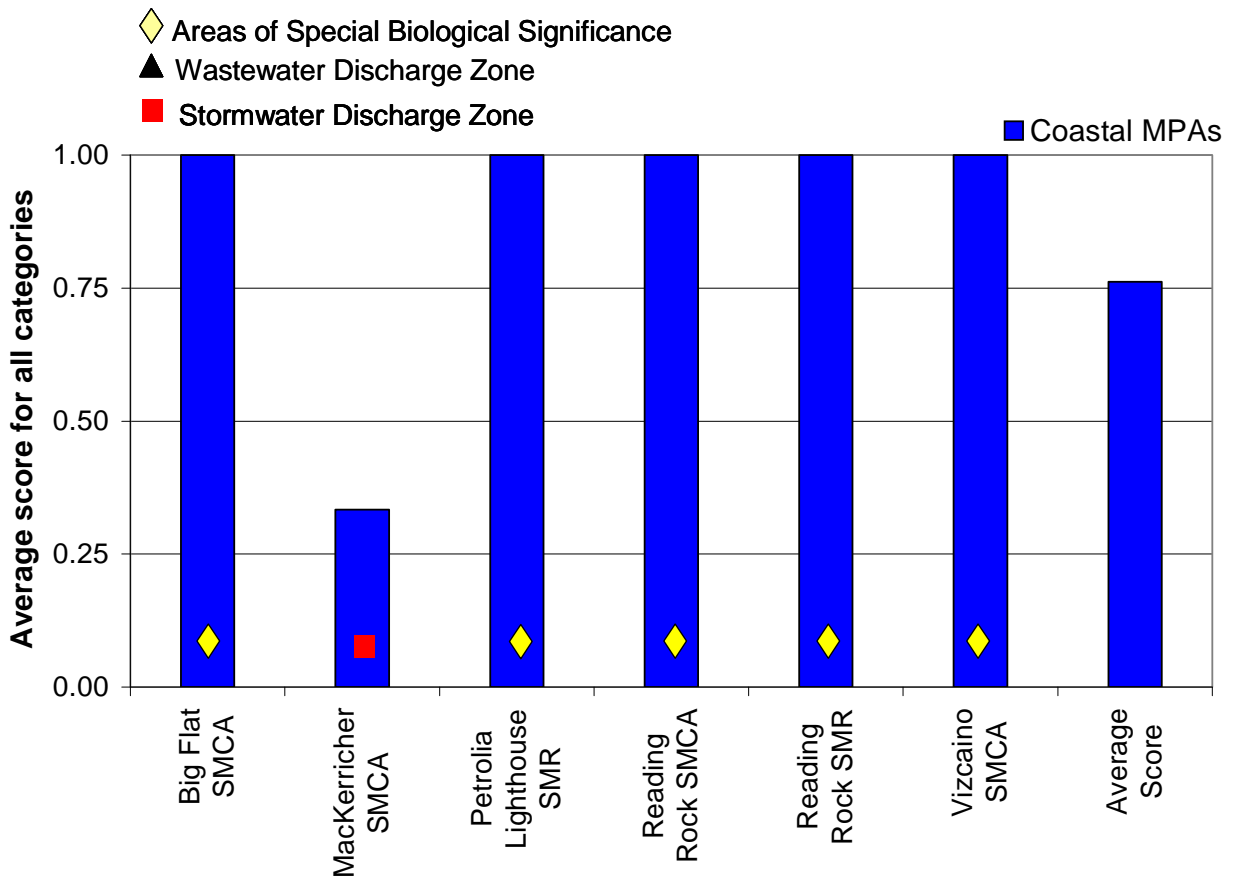
Sapphire Draft MPA Proposal 1: Individual Summary

Nearly 83% of Sapphire 1 MPAs located in bays and estuaries scored well (1.00); only one of six MPAs located in bays and estuaries scored poorly. The Humboldt Bay SMRMA was co-located adjacent to Arcata’s urban stormwater discharge areas and scored a 0.25. Additionally, this MPA was also co-located with an intermediate wastewater discharge outfall operated by the city of Arcata in the northeast portion of the bay. There are also aquaculture activities nearby but outside the MPA, which should be considered.

The average score for Sapphire 1 coastal MPAs is 0.76 and the weighted score is 0.75 (Appendix D). There were 13 of 14 (93%) coastal MPAs that scored 0.67 or higher. There were also 5 of 14 (36%) coastal MPAs that were entirely co-located within an ASBS (Figure 6). Three of these MPAs were co-located within Redwood National and State Park ASBS. The fourth and fifth MPA were co-located within the Kings Range National Conservation Area ASBS. Only one coastal MPA scored lower than 0.67 (MacKerricher SMCA). The MacKerricher SMCA was located within an urban stormwater discharge drainage area near MacKerricher State Park in Fort Bragg. A potential solution to improving the MacKerricher

SMCA's score would be to move the boundary north of the urban stormwater discharge drainage area.

Figure 6. Sapphire Draft MPA Proposal: Scores for coastal MPAs with water quality concerns and opportunities and the proposal's average score



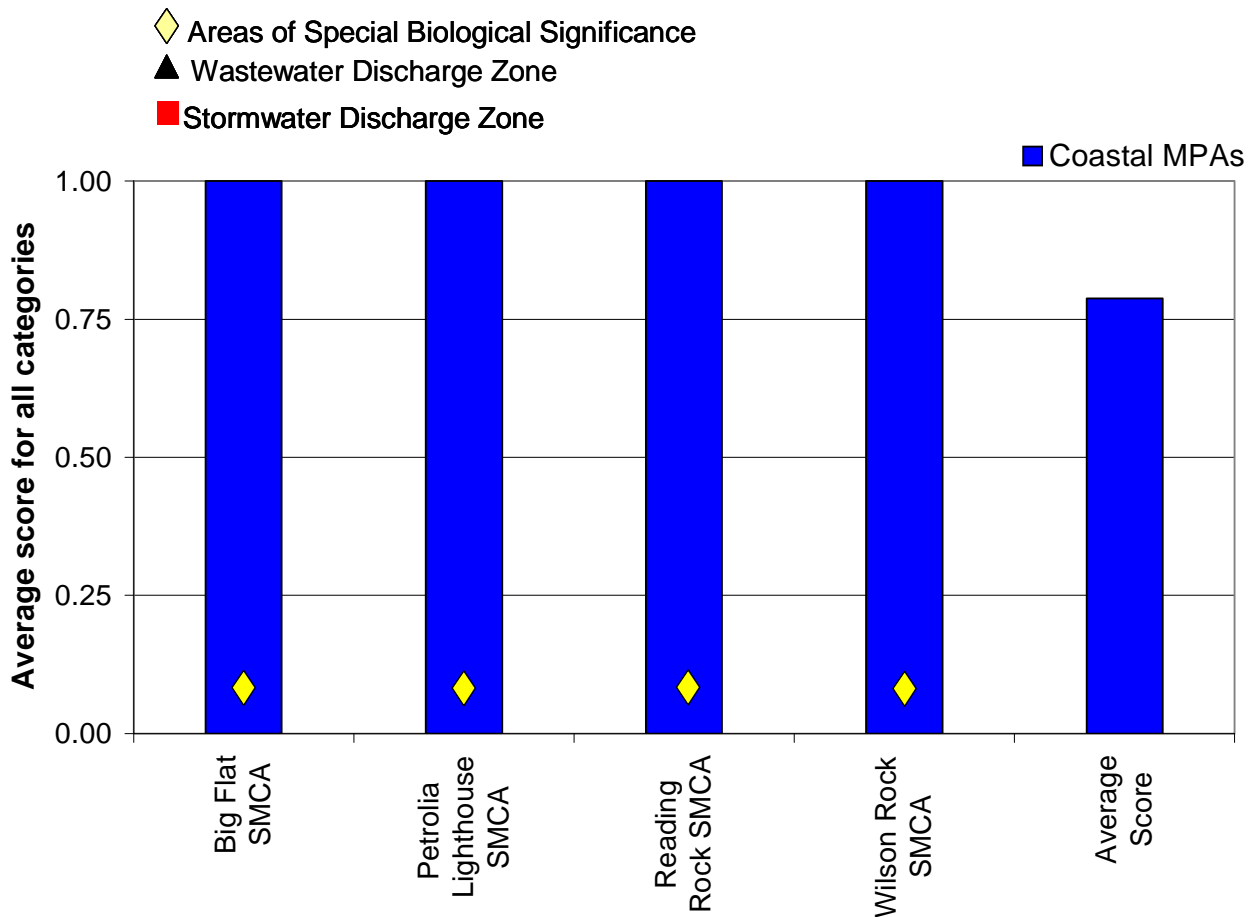
Sapphire Draft MPA Proposal 2: Individual Summary

All three MPAs proposed in Sapphire 2 located in bays and estuaries scored the highest score of 1.00. There were no MPAs located in areas that had SAT defined water quality concerns per SAT guidelines.

The average score for Sapphire 2 coastal MPAs is 0.79 and the weighted score is 0.80 (Appendix E). All 11 coastal MPAs scored 0.67 or higher and did not have any water quality concerns associated with them. Furthermore, 4 of 11 (36%) coastal MPAs are entirely co-located within the boundaries of an ASBS and received the highest average score of 1.00

(Figure 7). Two of these MPAs were co-located within Redwood National and State Park ASBS. The third and fourth MPAs were co-located within the Kings Range National Conservation Area ASBS. There were no coastal MPAs located in areas that had SAT defined water quality concerns per SAT guidelines.

Figure 7. Sapphire Draft MPA Proposal 2: Scores for coastal MPAs with water quality concerns and opportunities and the proposal's average score



Appendix A. Raw Scoring Table for Proposal 0 Based on SAT Water-Quality Evaluation Methods

MPA	MPA Shoreline Length (miles)	Stormwater and Other Nonpoint Source Discharge	Municipal/Industrial Discharge Zone	Co-Located with ASBS	Average Score	Weighted Score
Coastal MPAs						
Punta Gorda SMR	1.36	1.00	1.00	0.38	0.79	0.10
MacKerricher SMCA	4.28	0.00	1.00	0.00	0.33	0.14
Point Cabrillo SMCA	2.43	1.00	1.00	0.00	0.67	0.16
Russian Gulch SMCA	1.87	1.00	1.00	0.00	0.67	0.12
Van Damme SMCA	0.35	1.00	1.00	0.00	0.67	0.02
Average Score		0.80	1.00	0.08	0.63	0.54

Appendix B. Raw Scoring Table for Ruby Draft MPA Proposal 1 Based on SAT Water-Quality Evaluation Methods

MPA	MPA size ^a	Stormwater and Other Nonpoint Source Discharge	Municipal/ Industrial Discharge Zone	Co-located with ASBS	Average Score	Weighted Score
Coastal MPAs						
False Klamath Cove SMCA	2.73	1.00	1.00	1.00	1.00	0.05
MacKerricher SMCA	5.27	0.00	1.00	0.00	0.33	0.03
Mattole Canyon SMR	3.44	1.00	1.00	0.00	0.67	0.04
Petrolia Lighthouse SMR	3.63	1.00	1.00	1.00	1.00	0.06
Point Cabrillo SMCA	1.94	1.00	1.00	0.00	0.67	0.02
Point St. George Reef SMCA	4.85	1.00	1.00	0.00	0.67	0.05
Pyramid Point SMCA	2.32	1.00	1.00	0.00	0.67	0.03
Pyramid Point SMR	2.23	1.00	1.00	0.00	0.67	0.03
Reading Rock Nearshore SMCA	3.52	1.00	1.00	1.00	1.00	0.06
Reading Rock Offshore SMCA	3.45	1.00	1.00	1.00	1.00	0.06
Russian Gulch SMCA	2.08	1.00	1.00	0.00	0.67	0.02
Samoa SMCA	3.67	1.00	1.00	0.00	0.67	0.04
South Cape Mendocino SMR	1.68	1.00	1.00	0.00	0.67	0.02
Ten Mile SMCA	6.60	1.00	1.00	0.00	0.67	0.07
Ten Mile SMR	3.17	1.00	1.00	0.00	0.67	0.04
Van Damme SMCA	0.35	1.00	1.00	0.00	0.67	0.00
Vizcaino SMCA	8.06	1.00	1.00	0.00	0.67	0.09
Average Score		0.94	1.00	0.24	0.73	0.71
Bays/Estuary						
Big River Estuary SMP	0.30	1.00	1.00	N/A	1.00	0.05
Navarro River Estuary SMCA	0.20	1.00	1.00	N/A	1.00	0.03
North Humboldt Bay SMRMA	1.89	0.00	0.50	N/A	0.25	0.07
South Humboldt Bay SMRMA	2.83	1.00	1.00	N/A	1.00	0.44
Stone Lagoon SMRMA	0.95	1.00	1.00	N/A	1.00	0.15
Ten Mile Estuary SMCA	0.19	1.00	1.00	N/A	1.00	0.03
Average Score		0.83	0.92	N/A	0.88	0.78

a For coastal MPAs, size is the MPA's shoreline length. For bay/estuary MPAs, size is the MPA's area in square miles.

Appendix C. Raw Scoring Table for Ruby Draft MPA Proposal 2 Based on SAT Water-Quality Evaluation Methods

MPA	MPA size ^a	Stormwater and Other Nonpoint Source Discharge	Municipal/ Industrial Discharge Zone	Co-located with ASBS	Average Score	Weighted Score
Coastal MPAs						
Mattole Canyon SMR	3.44	1.00	1.00	0.00	0.67	0.08
Petrolia Lighthouse SMR	2.46	1.00	1.00	1.00	1.00	0.09
Pyramid Point SMCA	2.98	1.00	1.00	0.00	0.67	0.07
Pyramid Point SMR	2.87	1.00	1.00	0.00	0.67	0.07
Reading Rock Nearshore SMCA	2.93	1.00	1.00	1.00	1.00	0.11
Reading Rock Offshore SMCA	2.87	1.00	1.00	1.00	1.00	0.11
South Cape Mendocino SMR	1.68	1.00	1.00	0.00	0.67	0.04
Vizcaino SMCA	8.06	1.00	1.00	0.00	0.67	0.20
Average Score		1.00	1.00	0.38	0.79	0.77
Bays/Estuary						
Big River Estuary SMP	0.30	1.00	1.00	N/A	1.00	0.23
Navarro River Estuary SMCA	0.20	1.00	1.00	N/A	1.00	0.15
South Humboldt Bay SMRMA	0.65	1.00	1.00	N/A	1.00	0.49
Ten Mile Estuary SMCA	0.19	1.00	1.00	N/A	1.00	0.14
Average Score		1.00	1.00	N/A	1.00	1.00

a For coastal MPAs, size is the MPA's shoreline length. For bay/estuary MPAs, size is the MPA's area in square miles.

Appendix D. Raw Scoring Table for Sapphire Draft MPA Proposal 1 Based on SAT Water-Quality Evaluation Methods

MPA	MPA size ^a	Stormwater and Other Nonpoint Source Discharge	Municipal/ Industrial Discharge Zone	Co-located with ASBS	Average Score	Weighted Score
Coastal						
Big Flat SMCA	4.26	1.00	1.00	1.00	1.00	0.08
MacKerricher SMCA	4.57	0.00	1.00	0.00	0.33	0.03
Mattole Canyon Offshore SMR	3.45	1.00	1.00	0.00	0.67	0.04
Petrolia Lighthouse SMR	4.09	1.00	1.00	1.00	1.00	0.08
Point Cabrillo SMCA	2.74	1.00	1.00	0.00	0.67	0.04
Pyramid Point SMCA	3.69	1.00	1.00	0.00	0.67	0.05
Pyramid Point SMR	3.43	1.00	1.00	0.00	0.67	0.04
Reading Rock SMCA	2.92	1.00	1.00	1.00	1.00	0.06
Reading Rock SMR	2.86	1.00	1.00	1.00	1.00	0.06
South Cape Mendocino SMR	1.82	1.00	1.00	0.00	0.67	0.02
Ten Mile SMCA	3.91	1.00	1.00	0.00	0.67	0.05
Ten Mile SMR	2.30	1.00	1.00	0.00	0.67	0.03
Vizcaino SMCA	8.24	1.00	1.00	0.00	0.67	0.11
Wilson Rock SMCA	3.29	1.00	1.00	1.00	1.00	0.06
Average Score		0.93	1.00	0.36	0.76	0.75
Bays/Estuary						
Albion River Estuary SMCA	0.05	1.00	1.00	N/A	1.00	0.01
Big River Estuary SMP	0.16	1.00	1.00	N/A	1.00	0.03
Navarro River Estuary SMCA	0.09	1.00	1.00	N/A	1.00	0.02
North Humboldt Bay SMRMA	1.91	0.00	0.50	N/A	0.25	0.10
South Humboldt Bay SMRMA	2.44	1.00	1.00	N/A	1.00	0.50
Ten Mile Estuary SMCA	0.19	1.00	1.00	N/A	1.00	0.04
Average Score		0.83	0.92	N/A	0.88	0.70

a For coastal MPAs, size is the MPA's shoreline length. For bay/estuary MPAs, size is the MPA's area in square miles.

Appendix E. Raw Scoring Table for Sapphire Draft MPA Proposal 2 Based on SAT Water-Quality Evaluation Methods

MPA	MPA size ^a	Stormwater and Other Nonpoint Source Discharge	Municipal/ Industrial Discharge Zone	Co-located with ASBS	Average Score	Weighted Score
Coastal						
Big Flat SMCA	4.26	1.00	1.00	1.00	1.00	0.12
Mattole Canyon Offshore SMR	3.42	1.00	1.00	0.00	0.67	0.06
Petrolia Lighthouse SMCA	4.11	1.00	1.00	1.00	1.00	0.11
Point Cabrillo SMCA	2.74	1.00	1.00	0.00	0.67	0.05
Pyramid Point SMCA	3.68	1.00	1.00	0.00	0.67	0.07
Reading Rock SMCA	2.92	1.00	1.00	1.00	1.00	0.08
South Cape Mendocino SMR	1.83	1.00	1.00	0.00	0.67	0.03
Ten Mile SMCA	3.91	1.00	1.00	0.00	0.67	0.07
Ten Mile SMR	2.30	1.00	1.00	0.00	0.67	0.04
Vizcaino SMCA	4.06	1.00	1.00	0.00	0.67	0.07
Wilson Rock SMCA	3.29	1.00	1.00	1.00	1.00	0.09
Average Score		1.00	1.00	0.36	0.79	0.80
Bays/Estuary						
Big River Estuary SMP	0.16	1.00	1.00	N/A	1.00	0.16
South Humboldt Bay SMRMA	0.65	1.00	1.00	N/A	1.00	0.66
Ten Mile Estuary SMCA	0.19	1.00	1.00	N/A	1.00	0.19
Average Score		1.00	1.00	N/A	1.00	1.00

a For coastal MPAs, size is the MPA's shoreline length. For bay/estuary MPAs, size is the MPA's area in square miles.