California MLPA Master Plan Science Advisory Team
Round 1 Outputs from Bioeconomic Model Evaluations: Deletion Analysis
April 9, 2010 DRAFT

Table 3. Deletion Analysis for External Proposed MPA Arrays. This table shows the biomass increase and biomass increase per area for each MPA proposed in external MPA arrays for the Marine Life Protection Act Initiative North Coast Study Region (NCSR). Results are derived from the UC Santa Barbara (UCSB) and UC Davis (UCD) bioeconomic models. To explore a range of assumptions, the UCSB model runs this analysis assuming maximum-sustainable yield (MSY)-type management outside of the MPAs, while the UCD model assumes unsuccessful management outside of the MPAs. Because of this, deletion values for the UCD model are typically higher than for the UCSB model, reflecting the more important contributions of MPAs when fish populations outside of MPAs are being depleted. The ***biomass increase*** is the contribution of an individual proposed MPA to the overall biomass in the external MPA array, expressed as a percentage of the equilibrium biomass with the full proposed MPA array. A biomass increase of 1 indicates that the MPA is contributing 1% to the overall biomass in the study region (for example, allowing fishing within that MPA would reduce biomass by 1%). ***Biomass increase per area*** is the contribution of an individual proposed MPA to the overall biomass in the external MPA array, accounting for the area of the MPA. This is calculated as the percent increase in biomass per square kilometer of habitat protected. For both metrics, negative numbers indicate that the MPA is reducing equilibrium biomass. Negative numbers are rare but can occur when opening an MPA draws fishing effort away from other, more productive, locations. For round 1 evaluations, the Master Plan Science Advisory Team (SAT) modeled populations of four species: Black rockfish, cabezon, redtail surfperch, and red sea urchin. Biomass increase and biomass increase per area are averaged across these four species. In subsequent evaluations, three additional species will be modeled, including red abalone, brown rockfish and Dungeness crab. Due to limitations of the SAT's current evaluation methods, for round 1, proposed MPAs in external MPA array A were considered static rather than mobile. Traditional tribal uses were not integrated into round 1 evaluations of external MPA arrays due to the limited information about tribal uses. NA indicates an MPA that contained an insufficient amount of suitable habitat for any of the modeled species to be included in the analysis.

External Proposed MPA Array	MPA Name	Biomass increase (UCSB)	Biomass increase per area (UCSB)	Biomass increase (UCD)	Biomass increase per area (UCD)
ExA	Albion Mobile SMCA	1.3894	0.51079	4.9313	2.4018
ExA	Point Arena Mobile SMCA	0.86492	0.52102	0.1864	0.1747
ExA	Noyo Mobile SMCA	1.7711	0.48702	6.222	1.8471
ExA	Punta Gorda (FS) SMCA	3.7956	0.70246	8.5588	1.5903
ExA	Pyramid Point (FS) SMCA	2.2608	0.29275	8.8049	0.665
ExA	Crescent City Mobile SMCA	0.71659	0.10831	2.2359	0.8715
ExA	Ten Mile Estuary SMR	-3.25×10^{-04}	-0.02391	0	NA
ExA	Navarro River Estuary SMR	6.01×10^{-04}	0.20522	0	NA
ExA	Point Cabrillo (FS) SMR	0.35703	0.54739	2.5356	2.6286
ExA	Ten Mile (FS) SMR	1.8404	0.57419	2.8462	0.7276
ExA	Eureka Mobile SMCA	0.048822	0.052992	0.2637	0.6522
ExA	Trinidad Mobile SMCA	1.1698	0.33968	2.5774	0.3487

External Proposed MPA Array	MPA Name	Biomass increase (UCSB)	Biomass increase per area (UCSB)	Biomass increase (UCD)	Biomass increase per area (UCD)
ExA	Reading Rock (FS) SMCA	0.90839	0.038357	2.9303	0.4451
ExA	Shelter Cove Mobile SMCA	0.47484	0.33191	0.2213	0.0995
ExB	Ten Mile Estuary SMR	3.64×10^{-04}	0.026709	0	NA
ExB	Navarro River Estuary SMR	6.93×10^{-04}	0.23679	0	NA
ExB	Point Cabrillo SMR	0.34088	0.51101	1.4939	2.2095
ExB	Point Cabrillo SMCA	0.18234	0.50574	0.9818	2.5115
ExB	Ten Mile SMR	0.86188	0.58571	1.4601	0.5831
ExB	Punta Gorda SMR	3.6911	0.71504	13.5015	2.4133
ExB	Ten Mile Beach SMCA	0.072638	0.028058	0.1981	0.4818
ExB	Pyramid Point SMR	2.2397	0.28321	10.247	0.7739
ExB	Reading Rock SMCA	0.98876	0.039108	3.6006	0.5723
ExB	Reading Rock SMR	7.59×10^{-03}	0.007838	-0.4936	-0.5628
ExC	Reading Rock SMCA	0.69576	0.4509	-0.6424	-0.4144
ExC	Reading Rock Coastline SMCA	1.0268	0.16693	3.6057	0.4801
ExC	Punta Gorda SMCA	4.734	0.71077	16.5983	1.9609
ExC	Vizcaino SMCA	1.4379	0.45227	2.4056	0.8016
ExC	Ten Mile SMCA	1.8187	0.56874	2.759	0.7054
ExC	Point Cabrillo SMCA	0.60934	0.54306	0.8894	0.833
ExC	Russian Gulch SMCA	0.12799	0.46407	1.9565	1.6419
ExC	Ten Mile Estuary SMCA	0	0	0	NA
ExC	Navarro River Estuary SMCA	1.09×10^{-03}	0.3714	0	NA
ExC	False Klamath Cove SMCA	0.68556	0.26576	3.2661	0.6386
ExC	Pyramid Point SMCA	2.2715	0.28622	9.0441	0.6831
ExD	Patrick's Point SMCA	1.4693	0.86858	3.8772	0.438
ExD	False Klamath SMCA	1.076	0.26144	4.0677	0.5775
ExD	Point Cabrillo Offshore SMCA	0.11154	0.31174	-1.483	-8.2892
ExD	Usal SMR	2.0815	0.47106	3.5111	0.5556
ExD	Pyramid Point SMR	2.239	0.28605	7.4203	0.5604
ExD	Big Flat SMCA	0.739	0.45667	5.1327	1.2273
ExD	Gorda SMR	4.7037	0.69628	15.3054	1.9135
ExD	Reading Rock SMR	0.46066	0.46863	-1.2022	-0.7131
ExD	Reading Rock SMCA	0.98916	0.039123	2.5018	0.3976
ExD	Navarro River Estuary SMR	-8.67×10^{-04}	-0.29604	0	NA
ExD	Ten Mile River Estuary SMR	2.23×10^{-04}	0.016357	0	NA
ExD	Point Cabrillo SMR	1.3281	0.50334	4.42	1.6167
ExE	Russian Gulch SMCA	0.45185	0.56018	1.3643	1.3293
ExE	Vizcaino SMCA	2.5811	0.44838	4.1079	0.6546
ExE	Reading Rock SMCA	0.98539	0.038974	2.9736	0.4726
ExE	Reading Rock SMR	0.45045	0.45814	-1.105	-0.6555

External Proposed MPA Array	MPA Name	Biomass increase (UCSB)	Biomass increase per area (UCSB)	Biomass increase (UCD)	Biomass increase per area (UCD)
ExE	Point Cabrillo SMR	0.60295	0.53772	0.4466	0.3906
ExE	Pyramid Point SMR	2.2618	0.28871	8.2631	0.6318
ExE	Pyramid Point SMCA	-8.12×10^{-04}	-0.01784	0	NA
ExE	Punta Gorda SMR	5.6826	0.70225	18.5128	1.9505
ExE	False Cape SMCA	0.38031	0.45099	-1.8821	-1.2088
ExE	S.E.A. Ten Mile Estuary SMR	-4.13×10^{-04}	-0.03035	0	NA
ExE	S.E.A. Ten Mile SMR	1.7963	0.56383	3.7004	0.8801
ExE	False Klamath SMCA	1.602	0.28624	6.5102	0.732
ExF	Point Cabrillo SMCA	0.18112	0.49492	0.9818	2.5115
ExF	Point Cabrillo SMR	0.3374	0.50341	1.4939	2.2095
ExF	Navarro River Estuary SMR	6.01×10^{-04}	0.20521	0	NA
ExF	Ten Mile SMR	0.85849	0.58294	1.4601	0.5831
ExF	Ten Mile Estuary SMR	-1.91×10^{-04}	-0.01406	0	NA
ExF	Ten Mile Beach SMCA	0.072299	0.027928	0.1981	0.4818
ExF	Pyramid Point SMCA	-1.14×10^{-04}	-0.01627	0	NA
ExF	Pyramid Point SMR	2.2394	0.28311	10.247	0.7739
ExF	Reading Rock SMCA	0.98841	0.039094	3.6006	0.5723
ExF	Reading Rock SMR	0.40628	0.43719	-0.4936	-0.5628
ExF	Punta Gorda SMR	3.6485	0.72427	13.5015	2.4133
ExG	Reading Rock SMR	0.40628	0.43719	-0.4936	-0.5628
ExG	Punta Gorda SMR	3.6485	0.72427	13.5015	2.4133
ExG	Navarro River Estuary SMR	6.01×10^{-04}	0.20521	0	NA
ExG	Point Cabrillo SMR	0.3374	0.50341	1.4939	2.2095
ExG	Point Cabrillo SMCA	0.18112	0.49492	0.9818	2.5115
ExG	Ten Mile Estuary SMR	-1.91×10^{-04}	-0.01406	0	NA
ExG	Ten Mile SMR	0.85849	0.58294	1.4601	0.5831
ExG	Ten Mile Beach SMCA	0.072299	0.027928	0.1981	0.4818
ExG	Pyramid Point SMCA	-1.14×10^{-04}	-0.01627	0	NA
ExG	Pyramid Point SMR	2.2394	0.28311	10.247	0.7739
ExG	Reading Rock SMCA	0.98841	0.039094	3.6006	0.5723
ExH	Ten Mile Estuary SMR	-1.20×10^{-04}	-0.00881	0	NA
ExH	Ten Mile Beach SMCA	0.072699	0.028082	0.2005	0.4876
ExH	Reading Rock SMCA	0.98867	0.039104	3.6462	0.5795
ExH	Reading Rock SMR	0.40418	0.43493	-0.4904	-0.5592
ExH	Punta Gorda SMR	3.6463	0.72403	13.5511	2.4221
ExH	Point Cabrillo SMR	0.33772	0.50533	1.9633	2.0352
ExH	Pyramid Point SMR	2.2301	0.2857	10.0619	0.7693
ExH	Ten Mile SMR	0.85747	0.58221	1.48	0.591