

Table 5.3. Stressor Metrics and Monitoring Program Details.

Indicator	Monitoring Metric / Parameter	Monitoring Data Program / Responsible Party	Frequency
Invasive Species	Diversity and percentage of intertidal area covered by non-native species	Some inclusion of invasive species information in MARINE surveys, but not comprehensive for this metric	Annually
Human Activities	Intensity of use and activity measured by the number of people in count per unit area (e.g., shore-based fishing, ocean-based fishing)	MPA Watch program data on human activities led by Heal the Bay and LA Waterkeeper (trained community science program)	Opportunistic surveys
Sediment Deposition Events	Proximity to areas with high landslide potential or frequency	No current programs	No current programs
Presence of Disease	Percent of diseased individuals per species per site	Diseased sea stars (and possibly purple urchins) are quantified as part of MARINE surveys	Annually

Table 5.4. Climate Vulnerability Metrics and Monitoring Program Details.

Indicator	Monitoring Metric / Parameter	Monitoring Data Program / Responsible Party	Frequency
Habitat Change due to Sea Level Rise	Projected habitat area loss	Could develop and apply existing models to rocky intertidal habitats as a research project (not completed)	Opportunistic research (could complete once and then as models are updated)
Temperature Change (Water and Air)	Surface water temperature	Remote sensing data (satellite); NOAA buoys; National Weather Service data; water temperature collected at three MARINE sites; SCCOOS Santa Monica Pier Station	Satellite data multiple times monthly (when clear); NOAA/NWS data daily or more frequent; MARINE sites annually; SCCOOS data averaged daily
	Air temperature	Weather station data	Multiple times daily
	Dissolved oxygen	No current programs	No current programs
Increased Storminess	Wave height frequency	NOAA/CDIP Scripps buoys	Daily
	Impacts to organisms	Indicator needs development	No current programs
Dissolution of Carbonate Structures (Organismal)	Indicator not developed	No current programs	No current programs

Data Sharing and Reporting

Rocky intertidal monitoring data will be compiled and analyzed approximately every five years associated with production of the SMBNEP SotB Report and led by the NEP's Technical Advisory Committee. The SotB Report will be made publicly available via website. Data will be consolidated and used to develop the SotB condition and trend graphics and will be represented visually when possible. Detailed information on data quality control, quality assurance, database management, and analysis will be available in the next update of SMBNEP's Quality Assurance Program Plan, scheduled for review in 2021. Data will be stored on TBF's servers with summaries available to the public upon request. When possible, data will be incorporated into public databases like the MARINE database or other similar public data sharing portals.

Data Gaps and Future Studies

Major data gaps identified in the 2015 SotB Report included some indicators that had no data but were identified as priorities such as surfgrass presence and cover, sediment deposition events, presence of disease, and response to human disturbance or long-term monitoring of human activities in general. The extent of surfgrasses may be difficult to survey or quantify due to the depth of surfgrass habitat. While data were available for the development of the SotB Report, much of it came from published research as opposed to being generated by long-term monitoring programs. Additional recommendations included broadening the timing and spatial distribution of existing long-term biological monitoring sites by adding additional MARINE geographic locations and collecting data at MARINE stations on a wider variety of indicators.

New data gaps identified as part of the CMP development included recommendations for new habitat extent categorizations with finer resolution, including typically understudied categories such as coastal armoring, rocky / sandy habitat areas that shift seasonally or over time, and deeper rocky intertidal or lower intertidal zones. Additionally, all climate vulnerability indicators are identified as existing data gaps, and some indicators need to be further developed (e.g., increased storminess, dissolution of organism carbonate structures, projected habitat area loss). Additional gaps in indicators may be filled by emerging technologies such as drone surveys, modeling, or remote sensing data, which should be explored for their potential to help fill more than one data gap. These are all priorities for future monitoring programs. Table 5.5 summarizes priority data gaps identified for the rocky intertidal habitat; types of data gaps; potential sources of funding at the federal, state, and local levels for filling these data gaps; and cross-references to relevant actions and potential funding sources identified in the 2019 CCMP Finance Plan (also provided in Table 9.4 of Chapter 9).

Next steps for this habitat type include continuing to prioritize and fill data gaps listed above and in Tables 5.2-5.5, especially the categories that are “no current programs” and

require more information, as well as additional new studies that could further support the evaluation of the key indices for this habitat. Note that Tables 5.2-5.4 may look complete, but still may have spatial or metric data gaps. New studies that are recommended include building on observational data for extreme tide events, adding monitoring stations or targeted research for many of the indicators above (e.g., percent cover of small, fast-growing opportunistic algae, abundance of upper shore rockweed, etc.), higher resolution / better geospatial coverage for invertebrate taxa data, more detailed spatial / frequency information on human use data such as through drones, in situ chemical and physical data from the rocky intertidal, and incorporation of new modeling efforts.

Many additional opportunities were identified for future studies and research across multiple indicators for this habitat. Drone or other remote survey methods may be used for aerial imagery to fill gaps across multiple indicators but would also require in situ data collection to calibrate or inform the metrics. Water quality and nutrient monitoring are also data gaps, and opportunities exist to develop nutrient input and response models or to collect additional information from storm drain outfall water quality data. For the biological indicators, bird activity and eDNA surveys may provide additional data supporting several indicators. Surveys utilizing eDNA may be especially useful for invasive species tracking and other biological indicators not covered by the MARINE program. A pilot study is recommended to evaluate the potential effectiveness of this survey type. Lastly, studies relating to marine organism physiology or stress responses may provide deeper insight into the stressor evaluation and climate vulnerability.

Table 5.5. Rocky Intertidal Habitat – Summary of Data Gaps and Potential Funding Sources.

Indicator Category	Rocky Intertidal Habitat Data Gaps	Data Gap Type	Potential Funding Source(s)
Habitat Extent	Finer habitat categorization incorporating interspersed or buried rocks under sand, artificial beach armoring structures, jetties, etc.	Special study (new data acquisition, new methods/tools development)	Prop. 50, others (2019 CCMP Finance Plan Action #38)
	Characterization of seasonal or multi-year beach transition between sandy and rocky conditions	Special study (new data acquisition, new methods/tools development)	Prop. 50, others (2019 CCMP Finance Plan Action #38)
Ecological Condition	Expansion (timing and spatial distribution) of existing MARINE monitoring sites	Index component	OPC, CCC, others (2019 CCMP Finance Plan Action #38)
	Nutrient levels in discharges onto rocky intertidal sites	Single metric; Special study (new data acquisition)	Prop. 50, others
	Biodiversity Survey	Special study (new data acquisition)	OPC, CCC, others (2019 CCMP Finance Plan Action #38)
	Surveys of birds activity	Single metric; Special study (new data acquisition)	Unknown
Stressor	Diversity and percentage of intertidal area covered by non-native species	Single metric; Special study (new methods/tools development)	OPC, CCC, others (2019 CCMP Finance Plan Action #38)
	Intensity of use measured by the number of people in count per unit area	Single metric	Unknown
	Proximity to areas with high landslide potential or frequency	Single metric	Unknown
	Percent of diseased individuals per species per site	Single metric	Unknown

Indicator Category	Rocky Intertidal Habitat Data Gaps	Data Gap Type	Potential Funding Source(s)
Climate Vulnerability	Projected area of habitat loss	Special study (existing data, new data acquisition, new methods/tools development)	Unknown
	Surface and air temperature	Single metric; Special study (new data acquisition)	Sea Grant, OPC, SCC, others (2019 CCMP Finance Plan Action #36)
	Increased storminess and extreme tide events	Single metric; Special study (new data acquisition)	Sea Grant, OPC, SCC, others (2019 CCMP Finance Plan Action #36)
	Dissolution of Carbonate Structures (Organismal)	Single metric; special study (new data acquisition)	Sea Grant, OPC, SCC, others (2019 CCMP Finance Plan Action #36)

Literature Cited

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