Table 8.3. Stressor Metrics and Monitoring Program Details.

Indicator	Monitoring Metric / Parameter	Monitoring Data Program / Responsible Party	Frequency
Land Cover Change Index	Projected land cover change	General plan and zoning maps	Opportunistic research
Sedimentation	Change in sediment deposition	No current programs	No current programs
	Stream flow alteration	SMC data on channel modification	No current programs
Water Quality Index	Median stream summer conductivity	SMC / City and County water action plan reporting / EWMPs / SWRCB data; conservation maps and plans	Unknown
	Nitrate concentrations and turbidity	SMC / City and County water action plan reporting / EWMPs / SWRCB data; conservation maps and plans	Unknown
	pH	SMC / City and County water action plan reporting / EWMPs / SWRCB data; conservation maps and plans	Unknown
Anthropogenic Watershed Condition (Disturbance)	Percent artificial drainage area	USEPA StreamCat database, SWAMP databases, SPoT data, EWMPs	Unknown
	Dam storage ratio	USEPA StreamCat database, SWAMP databases, SPoT data, EWMPs	Unknown
	Longitudinal connectivity	USEPA StreamCat database, SWAMP databases, SPoT data, EWMPs	Unknown
	Index of watershed integrity / index of catchment integrity	USEPA StreamCat database	Unknown
Stream Quality Index (SQI)	Stressor condition index	Four stream sites in SM Bay, data reported by SCCWRP (see Beck et al. 2019b)	Opportunistic surveys / research

Table 8.4. Climate Vulnerability Metrics and Monitoring Program Details.

Indicator	Monitoring Metric / Parameter	Monitoring Data Program / Responsible Party	Frequency
Water Temperature Change	Water temperature (min, max, mean)	SMC / City and County water action plan reporting / EWMPs / SWRCB data; conservation maps and plans	Unknown
		RCDSMM (eight sites in Topanga Creek; Arroyo and Malibu Creeks historical data)	RCDSMM Topanga: April – Oct annually; Arroyo and Malibu opportunistic
	Ambient air temperature (as proxy for water)	National Weather Service stations throughout SM Bay	Daily; downloaded opportunistically
	Species invasion or distribution changes	Some data captured in RCDSMM snorkel surveys (Topanga Creek)	Monthly snorkel surveys when funding available
Water Flow and Alteration	Projected change in precipitation	UCLA / SW Climate Science Center	Unknown
	Snowpack	UCLA / SW Climate Science Center	Unknown
	Baseflow and surface runoff	UCLA / SW Climate Science Center; LA County (stream gauges on Ballona, Malibu, and Topanga Creeks)	Unknown
	Suitability models for key aquatic species	SCCWRP has flow ecology models that could be used to estimate habitat suitability	Opportunistic surveys / research
	Predicted stream flows	New model under California Environmental Flows Framework Project (three sites in SM Bay)	Unknown
Fire Vulnerability Index	Projected change in wildfire severity and fire regime condition class	CalFire risk mapping / forest disease areas mapping	Unknown
	Fire history, area, and overlap	CalFire history data (geospatial); TBF has preliminary research study	Opportunistic surveys / research

Data Sharing and Reporting

Freshwater aquatic and riparian habitat 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 California Rapid Assessment Method database or other similar public data sharing portals.

Data Gaps and Future Studies

While the freshwater and aquatic riparian habitat indicators have the highest number of developed indices and standardized metrics (e.g., CIAWH indices summarized in Cadmus Group 2013, CRAM, CSCI, etc.), there is a lack of consistent monitoring data available, especially across multiple years. Several of the indices also incorporate many variables. For example, the USEPA StreamCAT database includes variables to estimate an index of watershed integrity and an index of catchment integrity (Johnson et al. 2018, Kuhn et al. 2018), and the SCAPE model is currently being expanded.

Former data gaps identified for freshwater and riparian habitats by the 2015 SotB Report were substantial, predominantly relating to the frequency of available data and a lack of developed indicators or indices. Several new metrics associated with the new "climate change vulnerability" category are also identified in the tables above as priority data gaps (e.g., water temperature change and water flow and alteration; see Taylor et al. 2019), though there are some data from gauges in Malibu and Topanga Creeks. There was also some overlap between indicators that have not yet been fully developed (e.g., sedimentation, stream connectivity, and several of the climate indicators). These need to be further developed to make sure each indicator is covering unique aspects of the habitat assessment framework.

Because the habitat extent indicator was substantially updated since the 2015 SotB Report, there is a basic priority need for habitat extent maps to assess change over time. Some habitat mapping for steelhead trout in Arroyo, Malibu, and Topanga Creeks was provided in Dagit et al 2019, based on CDFW protocols. While this habitat has a higher number of standardized monitoring assessments and well developed indices as indicators, there is a gap in long-term collection of relevant data and a lack of consistent monitoring across a broad geographic area. Table 8.5 summarizes priority data gaps identified for the freshwater 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 9.7 of Chapter 9).

Next steps for this habitat type include continuing to prioritize and fill data gaps listed above and in Tables 8.2-8.5, especially repeated collection of data using the standardized metrics, categories that are "no current programs" or "unknowns" and require more information, as well as additional new studies that could further support the refinement of indicators for this habitat. Note that portions of Tables 8.2-8.4 may look complete, but still may have spatial or metric data gaps. New studies that are recommended include habitat extent assessments, development of habitat provisioning models and predictions (which could build from known occupancy areas and develop a site suitability model), using species specific flow ecology models (SCCWRP) that could be used to estimate suitability for key aquatic species, combining habitat provisioning metrics into an index, developing the stream connectivity indicator, filling geographic gaps, and acquiring consistent data across years and sites.

Table 8.5. Freshwater / Riparian Habitat – Summary of Data Gaps and Potential Funding Sources.

Indicator Category	Freshwater / Riparian Habitat Data Gaps	Data Gap Type	Potential Funding Source(s)
Habitat Extent	Habitat extent map and assessment (both present and historical)	Special study (existing data, new data acquisition)	Prop. 50
Ecological Condition	Geographic gaps and long-term monitoring of all existing indicators/indices (ASCI, CSCI, CRAM and IPI)	Index component; Single metric	SCCWRP, RCDSMM, NPS, USGS, SMC, CDFW, TNC, LA County SEA
	Habitat provisioning models and predictions	Index development; Special study (existing data)	SCCWRP, RCDSMM, NPS, USGS, SMC, CDFW, TNC, LA County SEA
	Stream connectivity	Single metric, Index development	SCCWRP, RCDSMM, NPS, USGS, SMC, CDFW, TNC, LA County SEA
Stressor	Geographic gaps and long-term monitoring of all existing indicators including those that are components of existing indices (ASCI, CSCI, CRAM and IPI)	Single metric	SMC, City and County, SWRCB, USEPA
	Land cover change index	Index development	Unknown
	Sedimentation indicator	Single metric	Unknown
Climate Vulnerability	Water temperature change	Single metric	Sea Grant, OPC, SCC, LA County, cities, others (2019 CCMP Finance Plan Action #36)
	Water flow and alteration	Single metric; Special study (new data acquisition)	Sea Grant, OPC, SCC, UCLA, others (2019 CCMP Finance Plan Action #36)
	Fire vulnerability index	Index development	Sea Grant, OPC, SCC, UCLA, others (2019 CCMP Finance Plan Action #36)

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