MONITORING PLAN

SUMMARY

The Partnership is committed to comprehensively monitoring the condition of Long Island Sound and to tracking progress in implementing actions to better inform adaptive, ecosystem-based management. Long-term monitoring supports the program's ability to evaluate the effectiveness of management actions, track progress towards environmental goals, and establish baseline knowledge of ecosystem conditions to better plan for and respond to perturbations (e.g., storms, spills, and climate change). Long-term monitoring data is essential to many of the research projects and modeling tools supported by the Partnership.

ENVIRONMENTAL MONITORING

Across Long Island Sound, water quality is monitored by state, interstate, and local agencies, academic institutions, environmental nongovernment organizations, and local volunteers and community groups. Typically, governmental agencies and universities monitor the open Sound and the rivers draining to it. Community organizations often contribute information on local streams, bays, and harbors. For example, begun in 2016, the Unified Water Study now coordinates 29 community organizations that contribute monitoring data on 49 embayments and harbors using standardized operating procedures.

Monitoring consists of measuring and analyzing physical, chemical, and biological properties of coastal waters and the watershed, including sediments, habitats, and aquatic life. Physical measurements such as the temperature and salinity of water can be used to track water mass movements which, along with dissolved oxygen levels, can indicate how suitable a particular area is for aquatic life. Analyses of sediment and animal tissue can reveal the presence of toxic chemicals. Data collected from animal tissue such as fish are used to assess health risks to aquatic organisms and humans that consume them.

The Partnership first prepared a monitoring plan in support of the 1994 CCMP to measure the effectiveness of the management actions and programs implemented under the CCMP; provide essential information that can be used to redirect and refocus the CCMP during implementation; and inform and facilitate research and modeling efforts by providing a suite of baseline data on spatial and temporal variability of environmental conditions. The following characteristics are considered essential to a successful monitoring program:

- Have clear goals and objectives.
- Prioritize maintaining baseline monitoring, adding new elements as funding allows.
- Generate long-term commitments to monitoring.
- Deploy new technologies and methodologies as they become available.
- Comply with data management and quality assurance plans.
- Proactively consider key steps that come after data collection: data management, synthesis, analysis, integration, transformation, and accessibility.
- Develop and sustain a rich array of informational products that are carefully tailored to the special needs and interests of different constituencies.

The monitoring plan has been adapted, modified, and expanded over time. The Partnership has focused on financial support, coordination, synthesis, and communication to varying degrees for those components. A partial listing of the major elements of the monitoring program are described in Table 1. Information on the overall program with links to specific monitoring elements is available on the monitoring page of the Partnership's website. The program uses monitoring data to track environmental indicators of the status and trends in conditions, providing insight into the health of Long Island Sound and the factors driving those changes. These indicators are communicated on the website and through formal reports such as the biennial report to Congress on program performance.

KIMARIE YAP measures dissolved oxygen and other water quality indicators in Manhasset Bay for a 2023 coastal acidification study. At the time she was working for the Interstate Environmental Commission. Photo by Jade Rae Kaiser.

PROGRAMMATIC MONITORING
In addition to environmental monitoring, the Partnership will track and report the implementation of CCMP actions supporting plan objectives. This will include evaluation of multiple metrics such as dollars spent, pounds of pollution reduced, acres of habitat restored or protected, and number of people engaged. These metrics will quantify Partnership efforts that contribute to achieving plan objectives. Environmental and programmatic monitoring will be combined to assess and report on progress toward meeting the objectives. The information will be regularly reported so partners and the public are informed about program investments and activities, and the environmental progress made as a result.

Activity (Data Collected)	Lead/ Partners	Actions	Collection Frequency	Timeframe
Open Sound water quality monitoring, including temperature, salinity, dissolved nitrogen, nutrients, and dissolved oxygen	CT DEEP	CWHW 1-2	Monthly, Sept.-Jan.; Every two weeks, Feb.-Aug.	1991-ongoing
Narrows and Western LIS Basin water quality monitoring	IEC	CWHW 1-2	Monthly, Oct.-May; Every two weeks, June-Sept.	1991-ongoing
LIS Connecticut River and tributary nutrient monitoring, embayment monitoring	CT DEEP, USGS	CWHW 1-2	Discrete and continuous river monitoring year-round; Discrete and continuous embayment monitoring, 5 CT embayments for 2 years each	1975-ongoing, recently expanded
Embayment water quality monitoring Tier 1 monitoring measures — dissolved oxygen, water clarity, temperature, salinity, chlorophyll a, qualitative macrophytes. Tier 2 adds continuous dissolved oxygen, nitrogen, phosphorus, quantitative macrophytes	Unified Water Study of Save the Sound	CWHW 1-2	Tier 1: Every two weeks, May-Oct.; Tier 2 nutrients, every two weeks, May-Oct.	2017-ongoing
Embayments on the North Shore of Suffolk County — salinity, temperature, dissolved oxygen, pH, nutrients, chlorophyll, organic carbon	Suffolk County Department of Health Services	CWHW 1-2	Mostly bimonthly to quarterly, with some as needed	1976-ongoing
Buoy-based time-series monitoring of wave, weather, and water quality data	UConn, NERACOOS	CWHW 1-2	Continuous at several depths	2003-ongoing
Long-term water quality monitoring stations in southeastern CT	CT NERR	CWHW 1-2	n/a	New in 2024
Acidification monitoring	CT DEEP, UConn, USGS, IEC	CWHW 1-2	pH, TA, DIC-monthly in open Sound and embayments, sometimes more frequently in the Western Narrows; continuous pH, pCO_2, in open Sound from buoys	2022-ongoing
Harbor water quality survey (85 stations total) by NYCDEP provides data on fecal coliform and enterococcus pathogens in the Upper East River and Western Long Island Sound (26 stations) as well as water quality indicators such as dissolved oxygen levels and concentrations of microscopic plants and animals, nutrients, and organic carbon. NYSDEC does water quality testing of fecal coliforms in relation to shellfish harvesting and biotoxin monitoring every spring	NYCDEP, NYSDEC	CWHW 3-2	Weekly, May-Oct.; Monthly, Nov.-April	1909-ongoing
Embayments on the North Shore of Suffolk County — total coliform, fecal coliform	Suffolk County Department of Health Services	CWHW 3-2	Mostly bimonthly to quarterly, with some as needed	1976-ongoing

Activity (Data Collected)	Lead/ Partners	Actions	Collection Frequency	Timeframe
Watershed pathogen monitoring for fecal indicator bacteria, routine monitoring and track-down of problem areas, initially in five waterbodies with future increases	CT DEEP, Maritime Aquarium, IEC, Harbor Watch, CT NERR	CWHW 3-2	Initially every two weeks, increasing to weekly in future years	2023-2025
Beach closures	EPA BEACON 2.0	CWHW 3-2	Annual	2004-ongoing
National Coastal Condition Assessment (NCCA) of water quality, sediment quality, biota, habitat, and ecosystem integrity	EPA	CWHW 4-2	NCCA every five years; 2010, 2015, 2020; The first National Coastal Condition Report (NCCR 1), published in 2001, used data from 1990-1996	1990-ongoing
Pounds of debris collected per mile of coastline	Ocean Conservancy, Save the Sound, American Littoral Society	CWHW 5-1	Annual	2015-ongoing
Land cover	UConn CLEAR	CWHW 2-1, THAW 4-1	Every two years	1985-ongoing
Eelgrass	URI, USFWS, CT DEEP, NYSDEC, USGS, EPA	THAW 1-3	Aerial imagery every three years and satellite imagery annually	2002, 2006, 2009, 2012, 2017, 2024, and continuing
Shellfish beds	CT Dept. of Agriculture, NYSDEC	CWHW 3-2	Annual	2010-ongoing
Seafloor mapping	UConn, Stony Brook University, Columbia University, NOAA	THAW 2-2	Once initial seafloor mapping is complete, 10-year cycle to update each phase of mapping	2013-ongoing
Long Island Sound Trawl Survey	CTDEEP	THAW 2-1	Annual	1984-ongoing
Wildlife shorebirds	NYSDEC, CTDEEP	THAW 1-1	Annual	1990-ongoing
Wildlife horseshoe crab	NYSDEC, CTDEEP, Sacred Heart University	THAW 1-1	Annual	1976-ongoing
Migratory fish runs of CT	CT DEEP	THAW 3-2	Annual	1967-ongoing