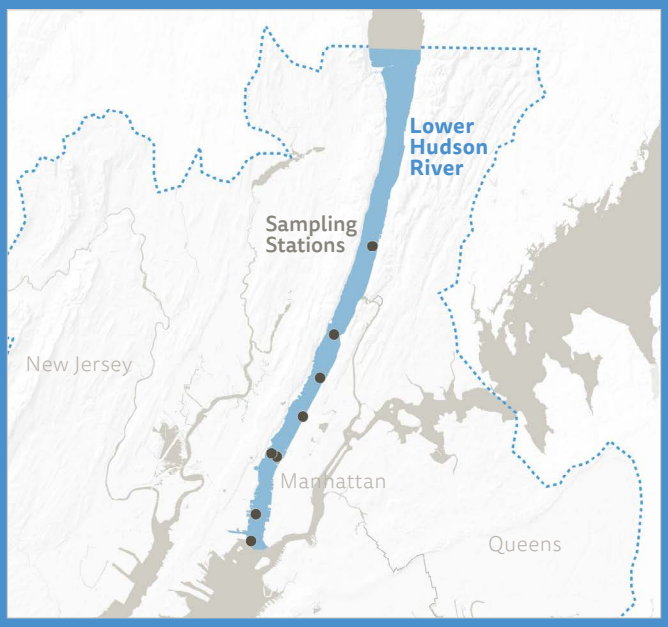
Regional Waterbody Summary
Lower Hudson River

Running from the Mario Cuomo Bridge to the Battery at the southern tip of Manhattan, the Lower Hudson River is made up of tidal urban waters shared between the states of New York and New Jersey. This region includes portions of Hudson and Bergen counties in New Jersey, parts of Westchester and Rockland Counties in New York, and the New York City boroughs of Manhattan and the Bronx. As a result of its location near the mouth of the Hudson River and its tidal nature, the Lower Hudson River played a key role in the Revolutionary War and continues to be a major transportation route. Much of its shoreline is accessible to the public, including the entire west side of Manhattan, the Hudson River Waterfront Walkway and adjoining parks in Hudson County, and Palisades Interstate Park.



With a long history of industrial pollution, including the discharge of large amounts of polychlorinated biphenyls (PCBs) from the electrical capacitor manufacturing at two General Electric Inc. facilities on the upper Hudson River from 1947-1977, has led to contaminated sediments that still impact the water quality of the river today. Major factors influencing water quality in this region include massive tidal exchange with the ocean, legacies of contaminated sediments, habitat alteration, power generation discharges, urban runoff, CSOs and municipal discharge/sewage.

The state reports to EPA through their 303(d) and 305(b) impairments to aquatic life, fish consumption, primary contact recreation, shellfish harvesting, and water supply, with most occurring south of the Bronx border. This region is impaired due to PCBs, Benzo[a] pyrene (PAHs), chlordane, DDT, dieldrin, dioxin (including 2,3,7,8-TCDD, hexachlorobenzene, and mercury. Secondary contact recreation, such as boating and fishing, is listed as in good condition throughout the region by both states while north of the Bronx border, primary contact recreation, such as bathing, is listed as in good condition by New York State. TMDLs are needed for all aforementioned causes of impairment.

Waterbody	**Water Class (NY)** 6 CRR-NY 703.3 & 6 CRR-NY 703.4	**Water Quality Criteria**	
		Pathogenic Bacteria (cfus/100mL)	**Dissolved Oxygen** (mg/L)
Hudson River	Class I: Fishing and Boating	Fecal Coliform: Monthly GM ≤ 200 from 5 or more samples	Never < 4.0
	Water Class (NJ) (NJAC 7:9B-1.14(d)(1))		
Hudson River	Class SE2: Fishing and Fish Propagation	Fecal Coliform: Monthly GM ≤ 770	Never < 4.0
	Class SE1: Shellfish and Bathing	Enterococcus: Monthly GM ≤ 35 or single sample max > 104	Never < 4.0 at any time, 24-hour average ≥ 5.0

Water Quality Monitoring in the Harbor Estuary

This regional waterbody summary, prepared by the New York-New Jersey Harbor and Estuary Program (HEP) and partners, provides a brief analysis of select water quality data to illustrate the progress toward achieving the fishable and swimmable goals of the Clean Water Act in the Lower Hudson River. It is a companion to HEP's 2021 *Harbor-Wide Water Quality Monitoring Report* (available at www.hudsonriver.org/harborwidewqreport-2021), which presents water quality data collected from 2010 to 2017 from both New York and New Jersey across all 10 different regions of the Harbor Estuary. The full report analyzes four water quality parameters against federal recreational water quality recommendations and guidance documents as well as state water quality standards and criteria, and discusses achievements to date and efforts still needed to achieve fishable and swimmable waters.

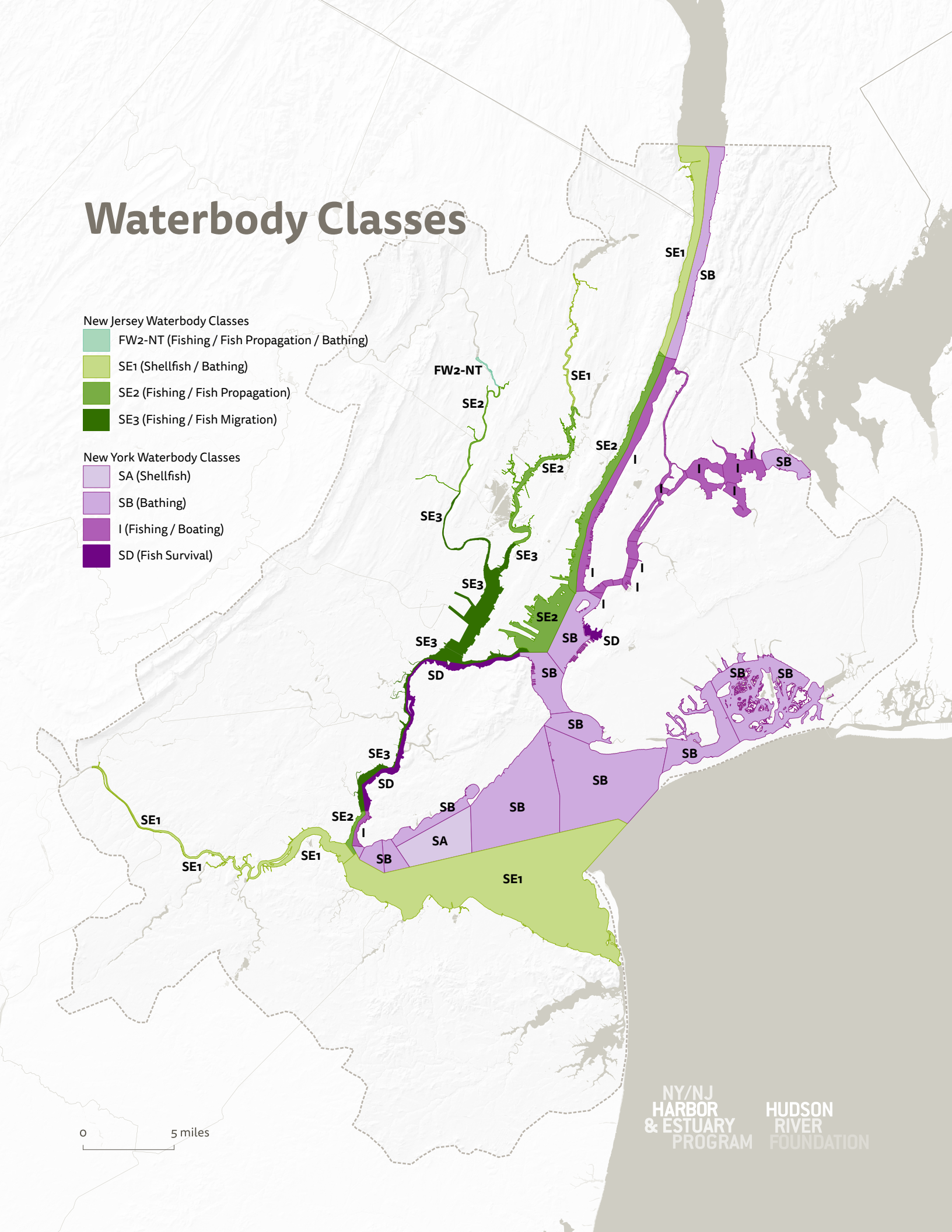
This regional waterbody summary describes water quality and key challenges and opportunities for improvement relative to New York's and/or New Jersey's state standards and criteria as of 2020 for pathogenic bacteria (e.g. fecal coliform, *Enterococci*, and *E. coli*) and dissolved oxygen. In the case where multiple water quality standards and criteria are used in a regional waterbody, the highest criteria that is supportive of primary or secondary contact is displayed as the threshold. For swimmable waters, pathogen levels must meet a state's criteria and designated use (i.e., supporting secondary or primary contact recreation). The potential future standard of *Enterococcus* is also discussed where applicable. For fishable waters, dissolved oxygen levels must meet and/or exceed the state's criteria and levels of total nitrogen and chlorophyll-*a* must show at least fair conditions to support aquatic life. Potential investments and opportunities for improvement are showcased, including the National Pollutant Discharge Elimination System (NPDES) and Long Terms Control Plan (LTCP) permits used by the states of New York and New Jersey to reduce pollution and ensure designated uses of each waterbody are met. Total Maximum Daily Loads (TMDLs) are another tool used by the states and EPA to determine the amount of a pollutant that a waterway can take in and still meet their designated uses and water quality criteria.

Data presented were collected primarily between June 1 and September 30, and compiled from two comparable harbor surveys conducted by the New York City Department of Environmental Protection (NYCDEP) and by the New Jersey Harbor Dischargers Group (NJHDG). As available, select secondary data sources were used to complement results from these two primary data sources. More information on data analysis methods can be found in the full report.

The full report and this regional waterbody summary does not serve to replace New York's or New Jersey's Integrated Water Quality Reports, nor are they meant to be used for compliance purposes. Proposed rulemaking to amend standards and/or criteria introduced by the states are also not explored in this report.

Photo: Rob Buchanan, Billion Oyster Project

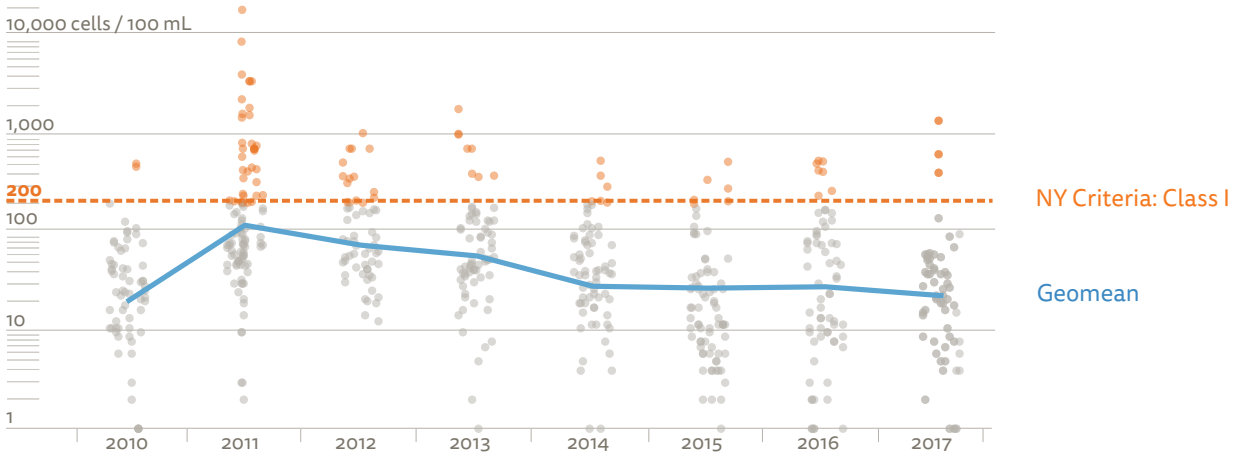
Waterbody Classes



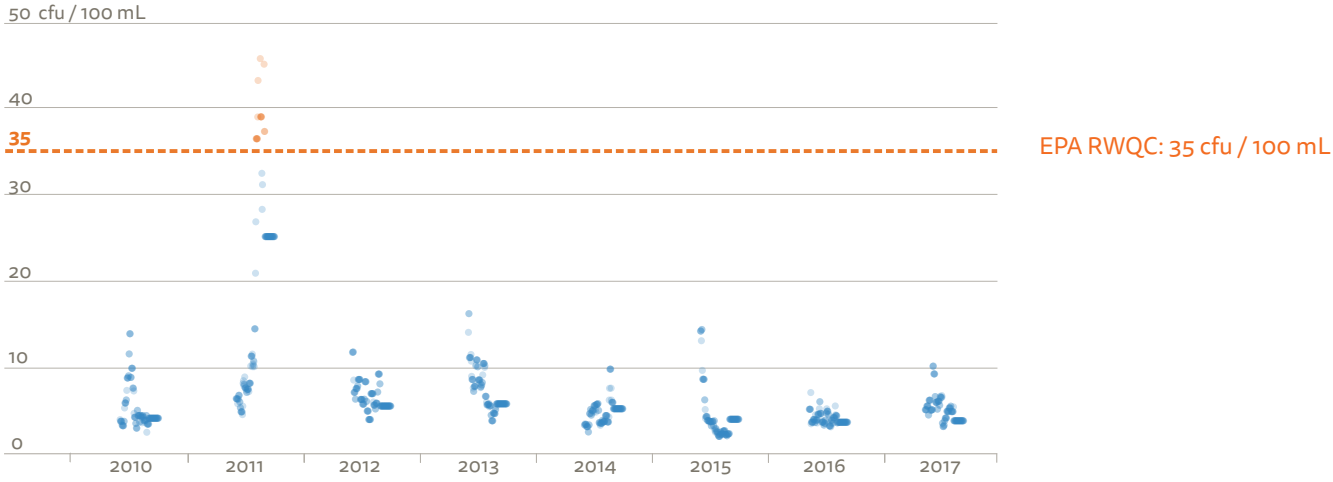
Pathogens

The presence of pathogenic bacteria can limit recreational use of these waterways. Sampling data show improvement over time. The geometric means of samples collected show compliance for fecal coliform in Class I in New York state waters and Class SE2 for New Jersey state waters, with only 2011 being out of compliance. The fecal coliform summer discrete measurements ranged from 1 cfu/100mL to 22,000 cfu/100mL over the eight-year period. With an average of 112 discrete samples per recreational season (June-September) per year, the average geomean for fecal coliform in this region is 55 cfu/100mL. While *Enterococcus* is not used by New York or New Jersey for this region, the geometric mean should not exceed 35 cfu/100mL to support primary contact recreational activities. *Enterococcus* summer geometric means ranged from 2.15 cfu/100mL to 61.5 cfu/100mL over the same periods. Out of over 1,000 samples, the average geomean of *Enterococcus* is 7.3 cfu/100mL, with 2011 being the only year out of compliance with over 20% of the moving 30-day geometric means greater than EPA's recommended 35 cfu/100mL and 12% greater than 130 cfu/100mL (above the recommended 10% of the STV).

Fecal Coliform, Summer Surface Bottom and Discrete Samples



Enterococcus, 30 Day Moving Geomean



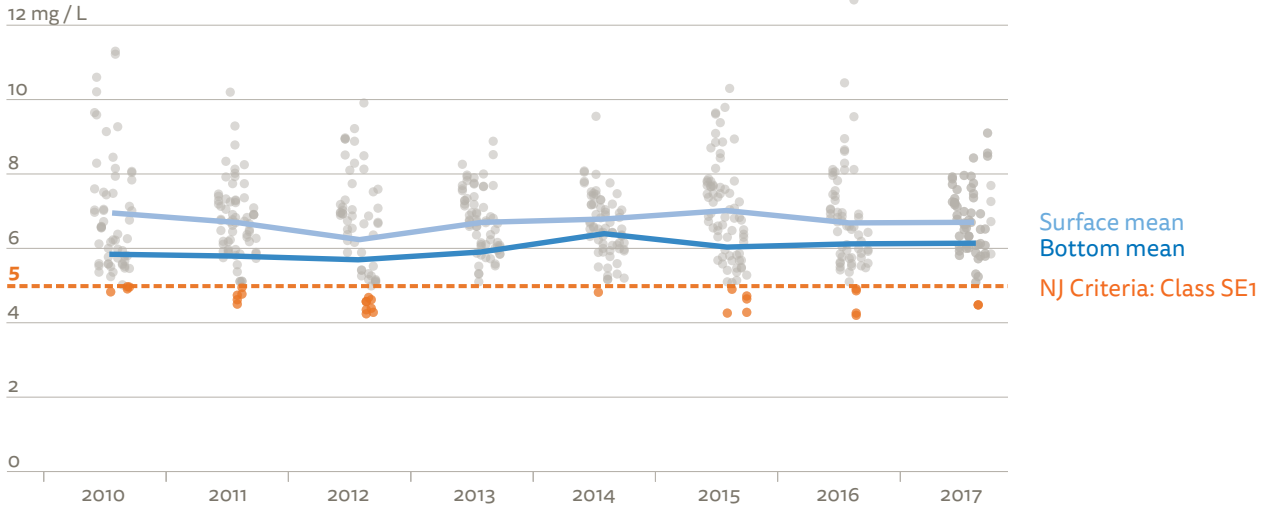
Dissolved Oxygen

Dissolved oxygen (DO) is a critical measure of habitat quality for fish and other wildlife. It is measured at the surface, where sunlight can penetrate to generate photosynthesis, as well as at the bottom, where sunlight is less available. In general, bottom DO concentrations are consistently lower than surface DO concentrations. Daily average concentrations are in compliance with the DO criteria throughout the years evaluated. In general, fish in this region are not stressed. The percent of time DO concentrations were less than 4 mg/L was between 0-4.6% for surface DO and between 0-11.2% for bottom DO. Although this region is doing well with respect to DO, minimum discrete sample concentrations of less than 4.0 mg/L are recorded in two of the eight years evaluated.

The data presented are from the New Jersey Long-term Ambient Water Quality Monitoring and the New York City Harbor Survey. The Hudson River Environmental Conditions Observing System (HRECOS) has a continuous monitoring station located at Pier 84 and at Castle Point that are operated and maintained by the Hudson River Park Trust and Stevens Institute of Technology, respectively. The HRECOS stations are located along the Hudson River in close proximity to the grab-sampling sites, station N4 monitored by NYCDEP and station 33 monitored by NJHDG, and collect data every 15-minutes year round. Samples from the two data sources do show similarities. For example, in 2016, the average bottom DO concentration from the grab samples were 6.7 and 6.1 mg/L, while the HRECOS stations for the same period were 5.7 and 6.3 mg/L respectively.

2016	Hudson River (near Pier 84)	HRECOS Pier 84	Hudson River (near Castle Point)	HRECOS Castle Pt
Average	6.7	5.7	6.1	6.3
% < 4.8	3.3	10.3	10	5.2
% < 2.3	0	0	0	0
Minimum	4.3	4.1	3.7	4.1

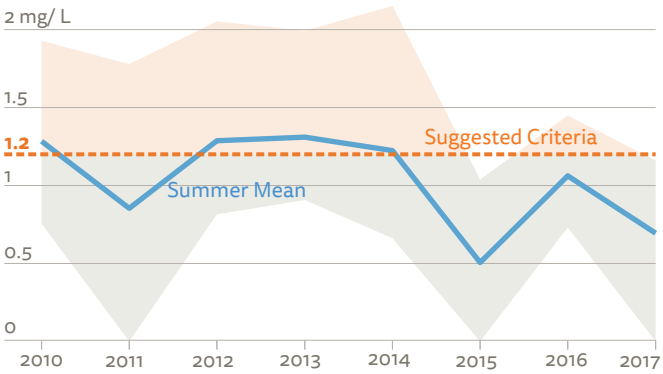
Dissolved Oxygen, Summer Mean, Surface and Bottom



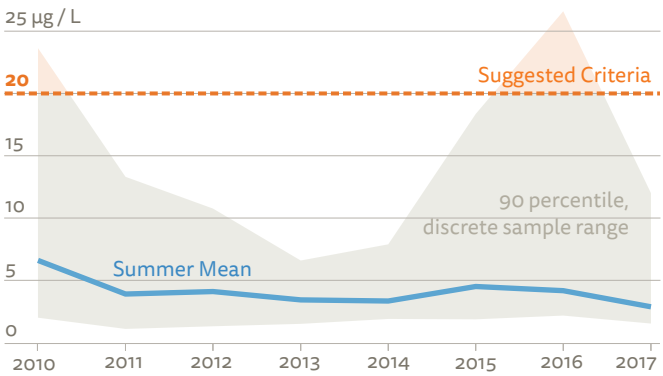
Other Water Quality Parameters

While pathogenic bacteria and dissolved oxygen are the primary criteria used to establish water quality standards in New Jersey and in New York, measurement of total nitrogen and chlorophyll-*a* provide additional information as to possible causes of low DO as well as the presence of photosynthetic algae and algal blooms. Between 2010 and 2017, the summer means for total nitrogen ranged between 0.51 and 1.31 mg/L with minimal daily fluctuation over time. Total nitrogen levels between 0.4 and 1.2 mg/L is indicative of fair conditions, and water quality would improve with nitrogen levels equal to or below 0.4 mg/L. Chlorophyll-*a* levels in this region show some variability, with higher levels in 2015 through 2016. Concentrations of 5 µg/L or below support healthier habitats for fish survival and propagation, while concentrations at or above 20 µg/L increase algal growth.

Total Nitrogen, Summer Mean



Chlorophyll-*a*, 90th percentile Surface



Investments and Opportunities for Improvement

EPA, New York, and New Jersey have identified CSOs as a key source of pathogenic bacteria (and other pollutants) that limit recreational use. Four of New Jersey's 25 CSO permit holders are located in this region, and each is responsible for producing a Long Term Control Plan (LTCP). These plans are intended to reduce the number of CSOs, therefore improving water quality through the management of pathogens. New Jersey LTCPs, submitted to the state in 2020, have a long term (20-40 year) implementation process. New Jersey municipalities' planned investments through the LTCPs range from $3.72 million to upwards of $859 million (NJDEP, 2020). Potential investments towards the implementation of chemical disinfection of discharge using Peracetic acid (PAA), storage tunnels or tanks, and green infrastructure should result in significant improvements to water quality in the region. In addition, this region is part of New York City's Citywide and East River/Open Water LTCP, submitted to the state in 2020. Preliminary reports on this plan suggest the optimization of CSO regulators, as well as the installation of a bending weir and CSO storage tunnels.

A considerable capital investment of $45 billion has been invested by New York City as well as additional investments by New Jersey municipalities and POTWs to achieve the goals of the Clean Water Act (NYCDEP, 2020). In addition, MS4 permits in the region will further address stormwater quality issues related to new development, redevelopment and existing development. With the implementation of the new LTCP in New York City and those LTCPs in New Jersey as well as preventing pollution through the MS4 permits, a reduction in pathogens is anticipated, specifically for fecal coliform and *Enterococci*, and for nutrients. LTCPs in New York City also require planning for the implementation of green infrastructure projects such as the conversion of impervious surface into rain gardens, which will potentially reduce levels of nutrient loading and total suspended solids. New Jersey CSO permittees are required to consider green infrastructure as a CSO alternative in their current planning phase before the submission of their LTCPs.