



Morro Bay Estuary Health For Water Year 2018

Date Range: Water Year 2018 (October 1, 2017 to September 30, 2018)

Analytes: Dissolved oxygen, *Enterococcus spp.*

Background

The Morro Bay National Estuary Program's Monitoring Program conducts monitoring in the Morro Bay estuary and watershed to track ambient water quality trends and to assess the impacts of specific implementation projects.

Monitoring data is collected by Estuary Program staff and volunteers, under the guidance of a Quality Assurance Project Plan (QAPP) which is reviewed and approved by EPA and the Central Coast Regional Water Quality Control Board (CCRWQCB). This document contains the monitoring locations, protocols, equipment specifications, and other details that allow users to assess the quality of the collected data. The full document is available upon request.

Bay Bacteria

The Estuary Program's goal is to assess the safety of the bay shoreline waters for recreational contact. Since 2005, program volunteers sample monthly at eight bay shoreline sites and analyze the samples for the indicator bacteria enterococcus. The samples are collected using sterile technique and analyzed by volunteers at the Morro Bay-Cayucos Wastewater Treatment Plant lab using the IDEXX method.

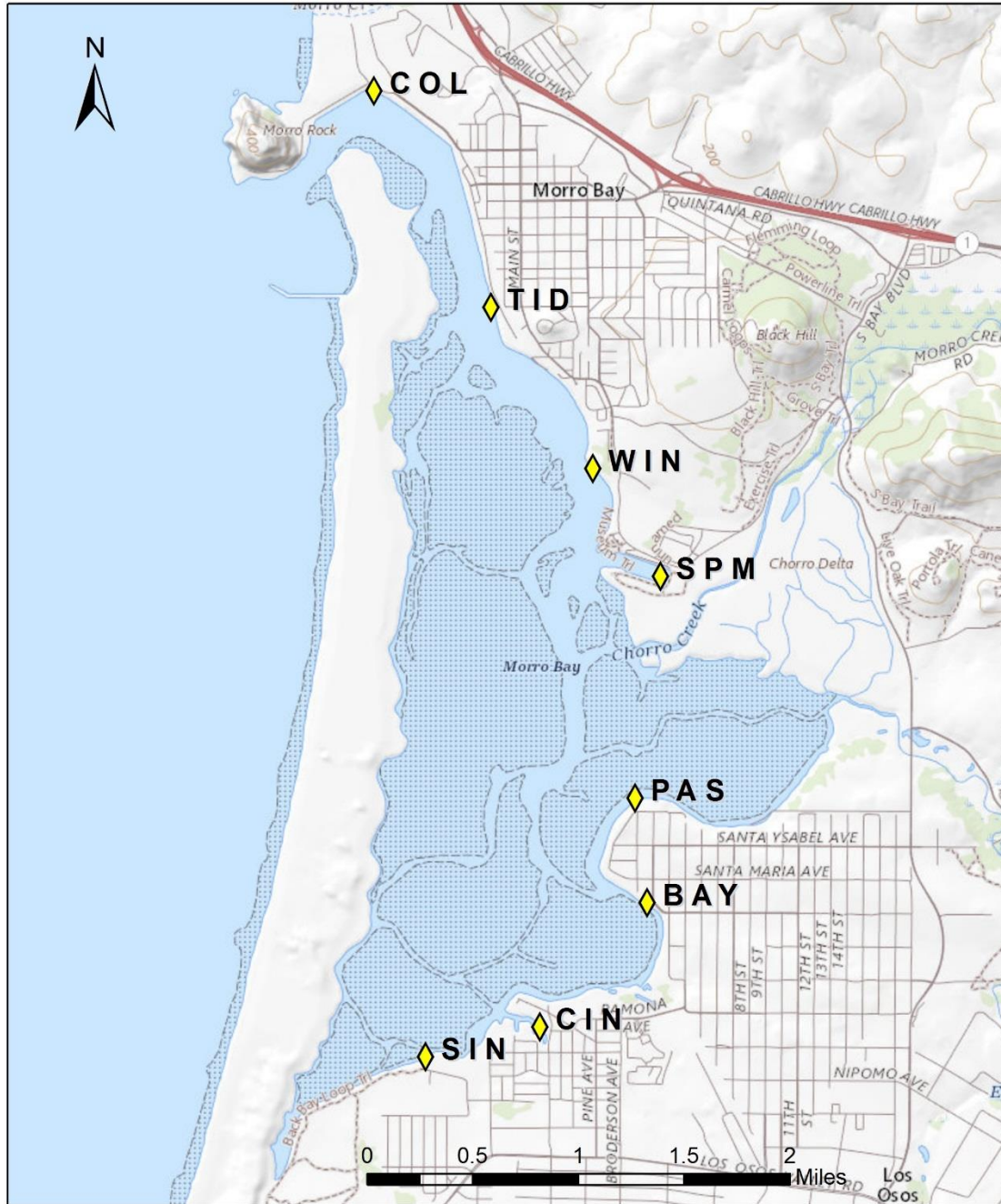
Enterococcus Monitoring Specifications

Specification	Value
Method	IDEXX Enterolert
Detection Range	10 to 24,190 MPN/100 mL
Hold Time	24 hours
Sample storage conditions	4°C in the dark

To ensure data quality, volunteers analyze blanks to check for sterility, split samples to check for precision, and certified reference materials to check for accuracy.

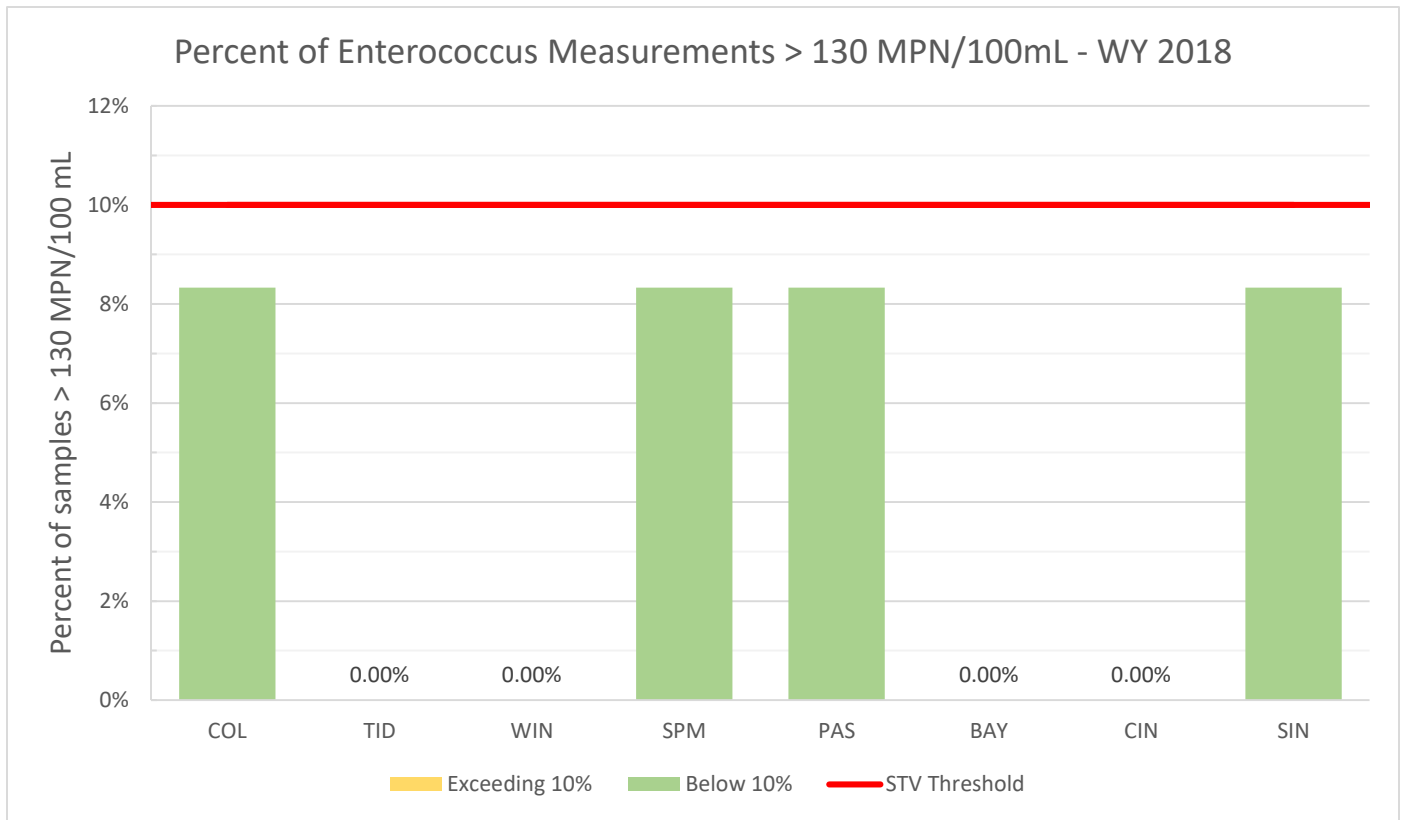
Monitoring Locations: The eight bay shoreline monitoring sites were selected because they represent the areas with the most recreational contact. The sites are (from north to south) Coleman Beach (site code COL), Tidelands Park (TID), Windy Cove (WIN), State Park Marina (SPM), Pasadena Point (PAS), Baywood Pier (BAY), Cuesta Inlet (CIN), and Sharks Inlet (SIN).

The following map indicates the monitoring locations.

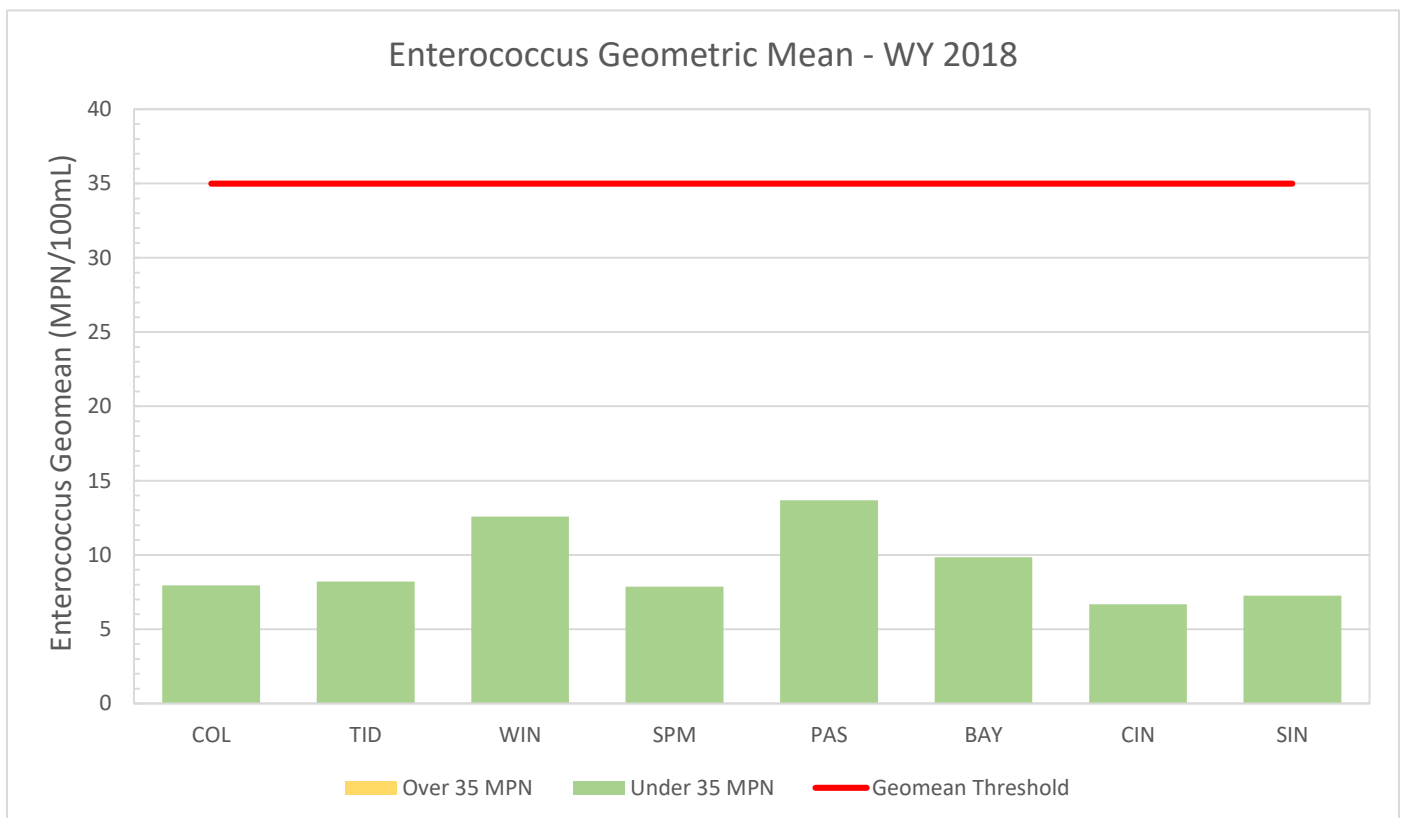


Results: Indicator bacteria data shows how often the waters in various locations along the bay shoreline have levels greater than those safe for recreational contact.

The following graph shows the percent of samples from Water Year 2018 (WY18) that exceeded the Statistical Threshold Value criteria. Ideally no more than 10% of samples exceed this value. This guiding value is from EPA's [2012 Recreational Water Quality Criteria](#).

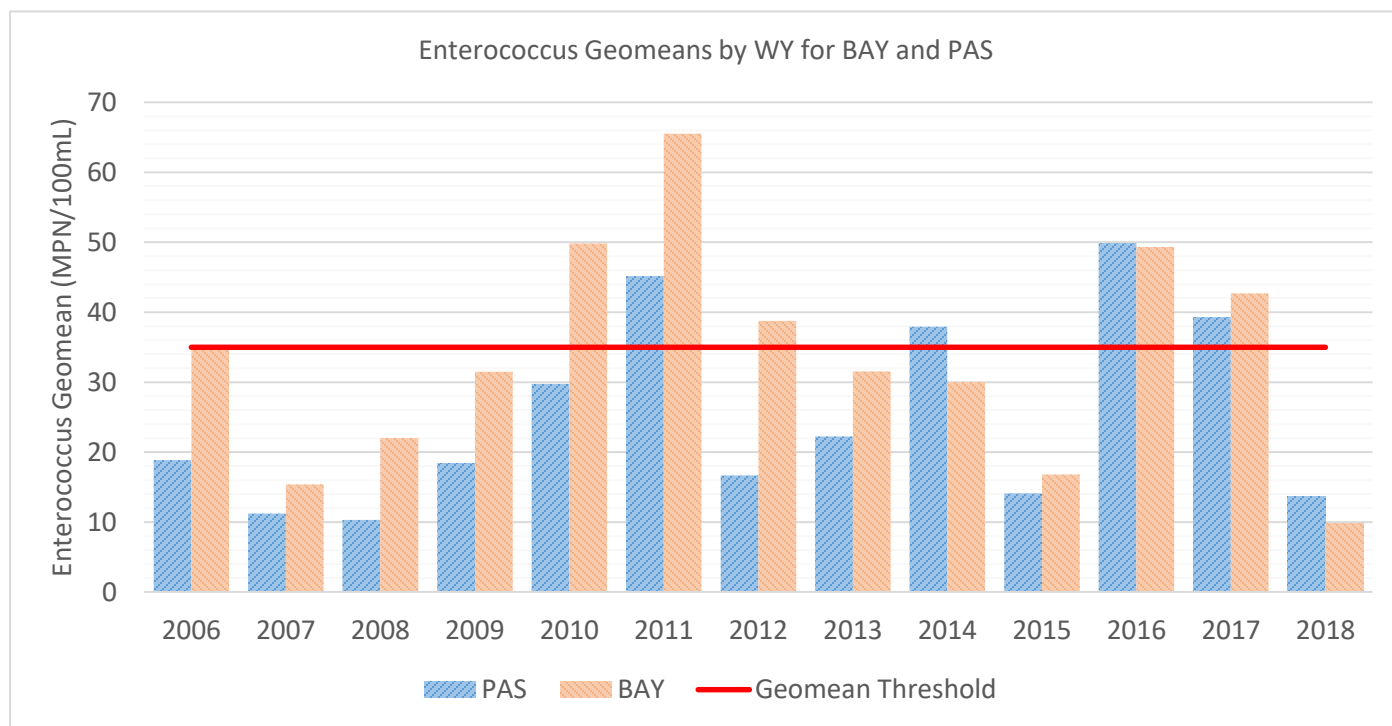


The following graph shows the geomean of all WY18 data for each site. Ideally the sample geomean remains below 35 MPN/100 mL. This guideline is from EPA's [2012 Recreational Water Quality Criteria](#).

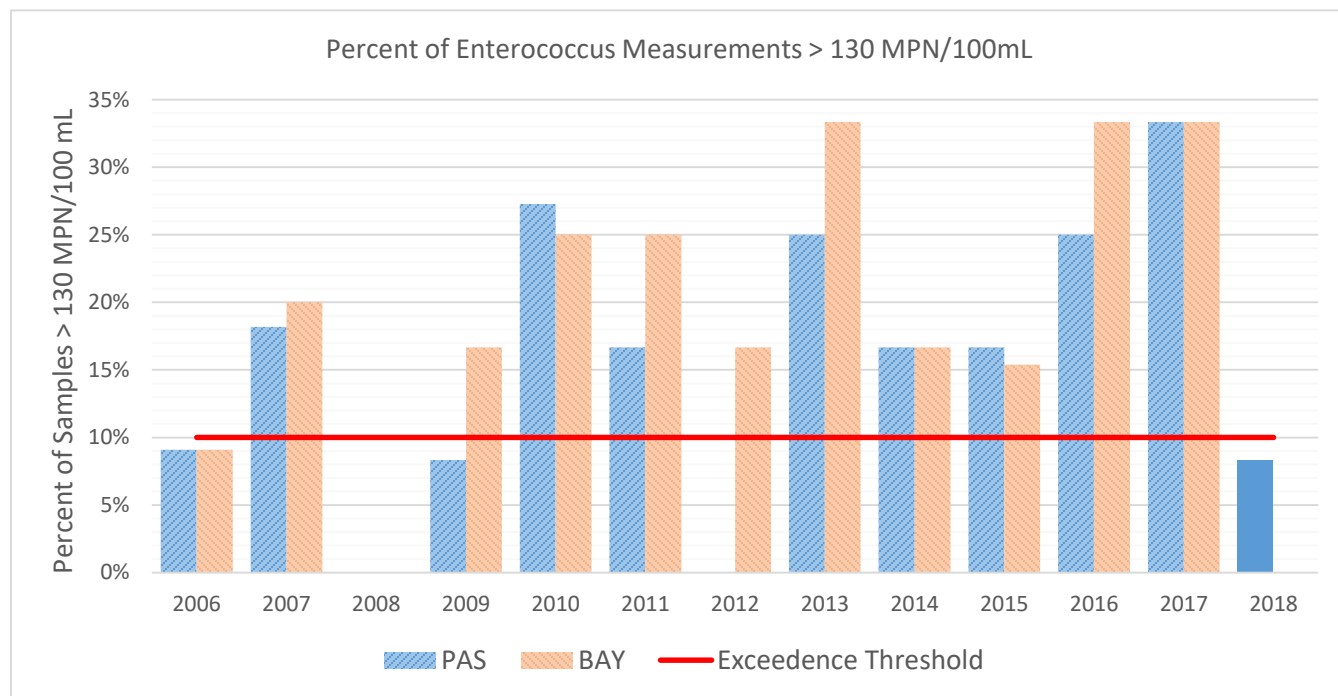


Discussion: Of the eight sites monitored, historical trends showed six sites typically had only rare exceedances of recreational contact standards. Two sites, Baywood Pier and Pasadena Point, had more frequent exceedances of the standard. These trends did not apply to WY2018 data. PAS had only one elevated result for the year, and BAY had none.

The following graph shows the percent exceedances of the recreational standard for 13 years. For PAS, eight of the 13 years had percent exceedances greater than 10%. For BAY, 10 of the 13 years had percent exceedances greater than 10%.



The following graph shows the geomean of results by Water Year. For PAS, four of 13 years exceeded the criteria, while for BAY, six of 13 years exceeded the Recreational Contact criteria.



The four sites toward the mouth of the bay (COL, TID, WIN, and SPM) are along the well-mixed channel and are thought to be primarily influenced by ocean water entering the bay with the incoming tide. These sites have very few elevated bacteria results. The two sites further back in the bay, Cuesta Inlet (CIN) and Sharks Inlet (SIN), have minimal exceedances of recreational standards. These sites may experience some water circulation issues, as the back bay is shallow and experiences minimal mixing with the incoming tides during certain times of year. BAY and PAS had elevated bacteria levels in approximately 30% of their samples during WY17. In WY18, PAS had only one reading that exceeded the safe swimming standards. All results from BAY were below the level unsafe for swimming, which has not occurred since 2008.

Potential sources of the bacteria could include runoff from land, contaminated groundwater, and wildlife. The California Department of Public Health (CDPH) monitoring of the freshwater seeps along the back bay indicated elevated levels of the fecal coliform indicator bacteria. Additional information on this seeps data set is available on the [Estuary Program website](#).

Bay Dissolved Oxygen

The Estuary Program wanted to assess the dissolved oxygen (DO) concentrations at the lowest levels in the diurnal cycle. Since 2002, program volunteers monitor monthly at seven bay sites and collect measurements for DO concentration, temperature, and salinity at the surface. The monitoring occurs in the early morning hours within two hours of sunrise on an adequate tide for safe access.

Equipment Specification: The Estuary Program uses a [YSI Pro 20](#) meter, which measures DO concentration, DO % saturation, temperature, specific conductance, and salinity. The equipment specifications for DO are as follows:

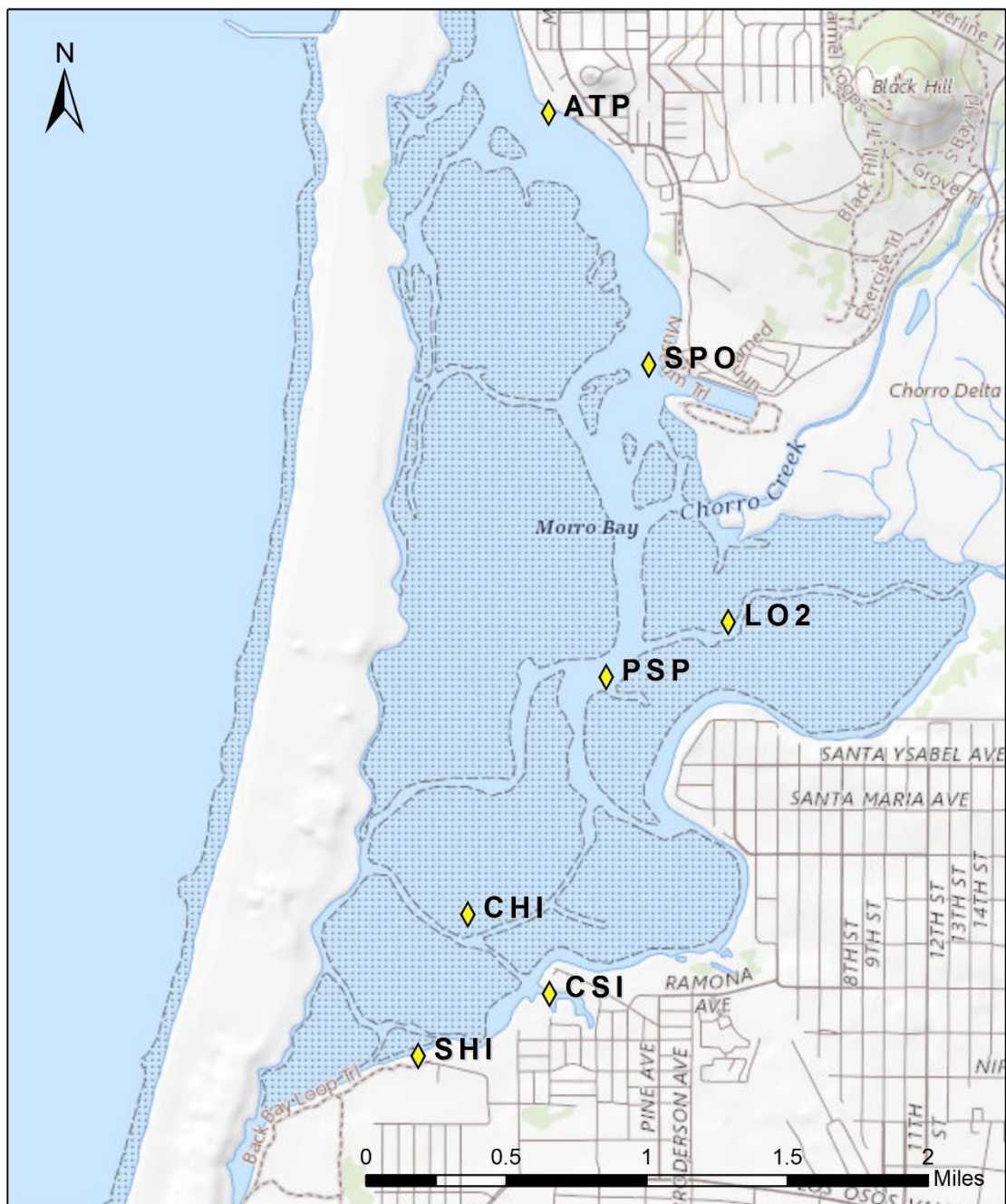
Dissolved Oxygen (DO) Concentration

Specification	Value
Sensor Type	Polarographic
Measurement Range	0 to 50 mg/L
Calibrated Range	0 to 20 mg/L; 0 to 35°C
Accuracy	±2% of reading for 0 to 20 mg/L; ±6% of reading for 20 to 50 mg/L
Resolution	0.01 mg/L

To ensure data quality, the Estuary Program calibrates the meters weekly for DO using an internal calibration. They are tested against a Winkler titration twice a month.

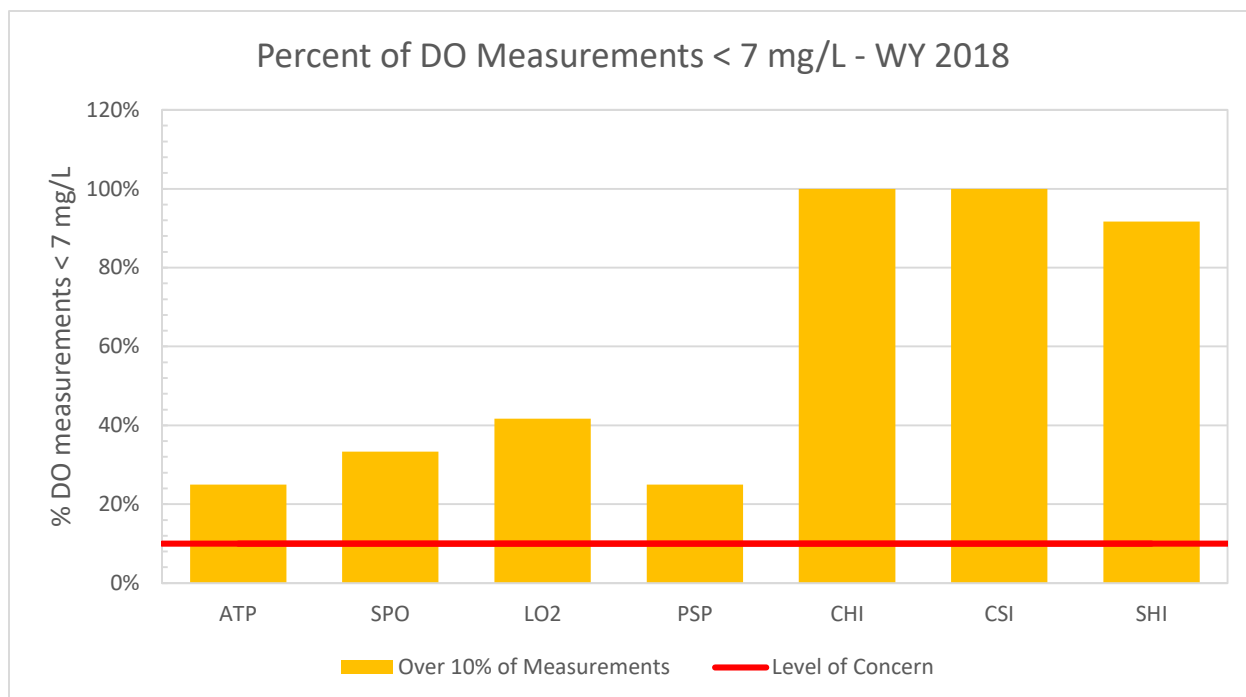
Monitoring Locations: The seven bay monitoring sites were selected to represent different regions of the bay. The sites are (from north to south) Tidelands (ATP), State Park Marina (SPO), Los Osos Channel (LO2), Pasadena Point (PSP), Cuesta Channel (CHI), Cuesta Inlet (CSI), and Sharks Inlet (SHI).

The following map shows the seven monitoring locations.

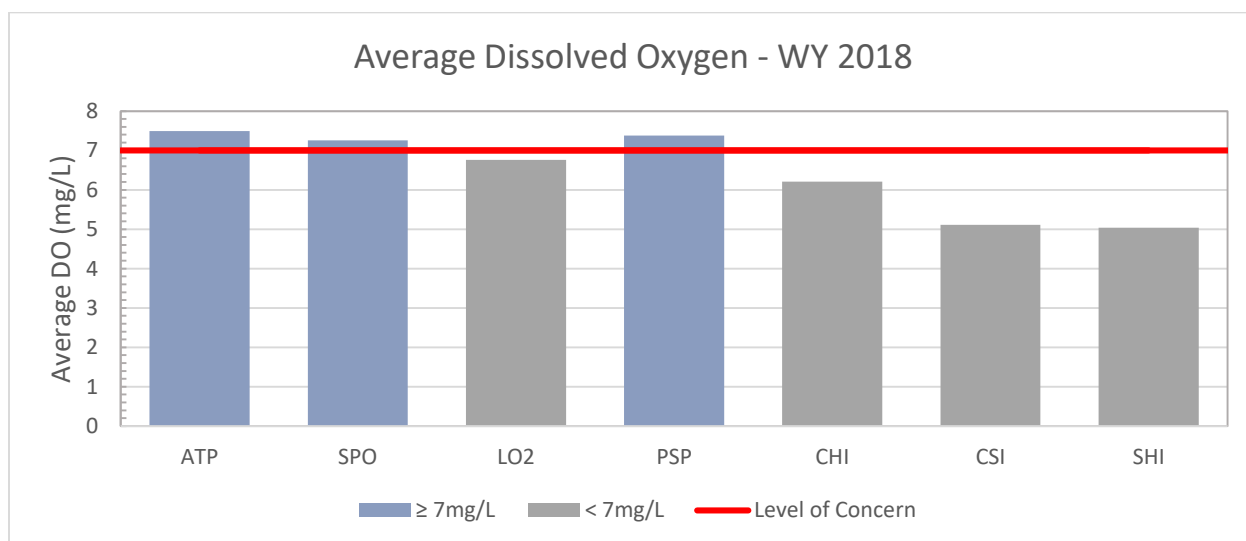


Results: Analysis gives an indication of DO levels relative to standards protective of aquatic life. The CCRWQCB designated the estuary as having the beneficial use of “Marine Habitat” and lists an objective that DO concentrations must not fall below 7 mg/L to be protective of aquatic life.

The following graphs show the DO concentration data for WY18 at each of the seven sites. The first graph shows the percent of DO concentration readings in WY18 that were less than 7 mg/L, which means they violated the numeric objective set by the CCRWQCB for marine waters. Ideally, only 10% or less of results would fall below the standard.



The next graph shows the average DO value of WY18 data. Ideally, all readings are greater than 7 mg/L to ensure adequate oxygen to be protective of aquatic life.



Discussion: The estuary waters frequently have DO levels below the [7 mg/L water quality objective](#) protective of the beneficial uses of the estuary. These trends also apply to data prior to WY18. At CHI and CSI, all results in WY18 were less than 7 mg/L. Sites located closer to well-mixed channels (ATP, SPO, LO2, and PSP) have fewer readings that fell below 7 mg/L, although all sites frequently violated the Basin Plan standard during WY18.

The depressed DO levels may be due in part to bay circulation. Waters in the back bay are shallower, meaning they heat up faster in the sun. Warmer water cannot hold onto as much DO as cooler water.

Sites toward the back of the bay seem to have lower DO concentrations on average than those located in the channel and towards the front of the bay. Macroalgae, which is typically more prevalent in the back bay than the front bay, could be contributing to the depressed DO levels as well.

Data Availability

The data is available from the California Environmental Data Exchange Network (CEDEN), a State Water Resources Control Board data portal. To retrieve data,

- Visit www.CEDEN.org.
- Click on Find Data.
- For Program, choose Morro Bay National Estuary Program.
- Bay Bacteria: For Stations, choose Morro Bay sites Coleman Beach shoreline, Tidelands Park shoreline, Windy Cove, State Park Marina shoreline, Pasadena Point shoreline, Baywood Pier shoreline, Cuesta Inlet shoreline, and Sharks Inlet shoreline.
- Bay DO: For Stations, choose Tidelands Park, State Park Marina bay, Sharks Inlet bay, Pasadena Point Bay, Near Cuesta Inlet, North of Cuesta Inlet Mouth, and Los Osos Creek Channel.
- Click on Retrieve Data.

For additional details, contact the Estuary Program at 805-772-3834 or staff@mbnep.org