

Upper Mt Hope Bay Water Quality Monitoring through Narragansett Bay Fixed Site Monitoring Network (NBFSMN)

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ABSTRACT

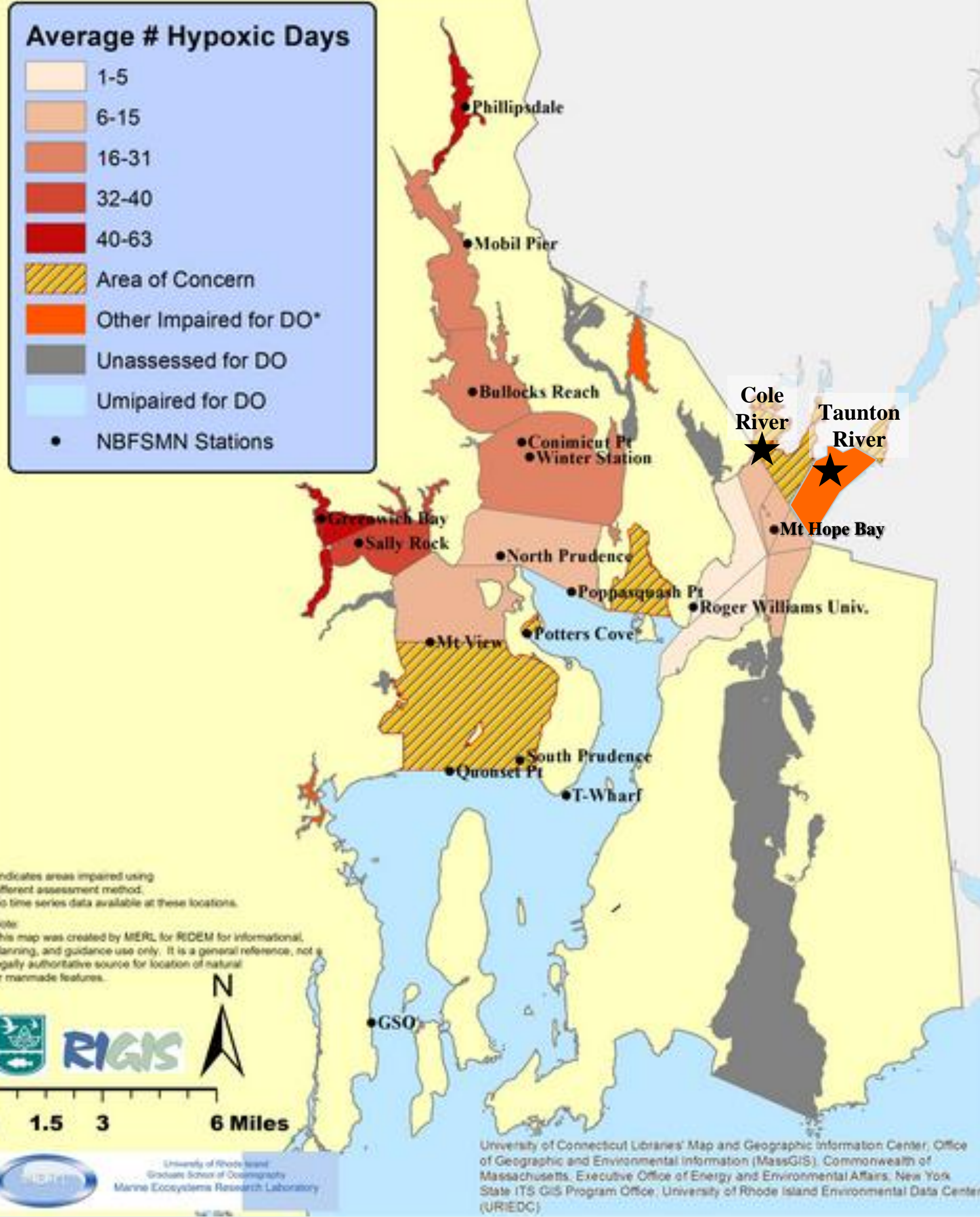
About 1/3 of Narragansett Bay is impaired for dissolved oxygen. Seasonal (June-September) intermittent low-oxygen (hypoxia) events have the potential to threaten ecological health. These events are documented in Narragansett Bay, RI using time-series records (2001-present) of temperature, salinity, and dissolved oxygen collected through the Narragansett Bay Fixed-Site Monitoring Network. This project focused on Upper Mt Hope Bay because it was critical data gap for managers. This data is currently used to help assess water quality in the Upper Mt Hope Bay area of Narragansett Bay.

MONITORING STATIONS

The Narragansett Bay Fixed-Site Monitoring Network (NBFSMN) was created to analyze the spatial and temporal distribution of hypoxia in Narragansett Bay. This goal is achieved through an interagency collaboration.

Narragansett Bay Fixed-Site Water Quality Monitoring Network Station Locations

Impaired Areas for Dissolved Oxygen in Narragansett Bay, RI



PICTURE. NBFSMN buoy with continuous, remote water quality monitoring equipment attached.

MAP. Narragansett Bay hypoxia map with NBFSMN station locations. Upper Mt Hope Bay stations (stars) are funded through SNEP grant.

(SNEPWG20-6-URI-MHB)

NBFSMN Partners: RIDEM-OWR, URI/GSO, Massachusetts Department of Environmental Protection (MassDEP), Narragansett Bay Commission (NBC), Narragansett Bay National Estuarine Research Reserve (NBNERR), and Narragansett Bay Estuary Program (NBEP).

For more information visit: www.dem.ri.gov/bart/stations.htm

METHODS



Buoy deployment

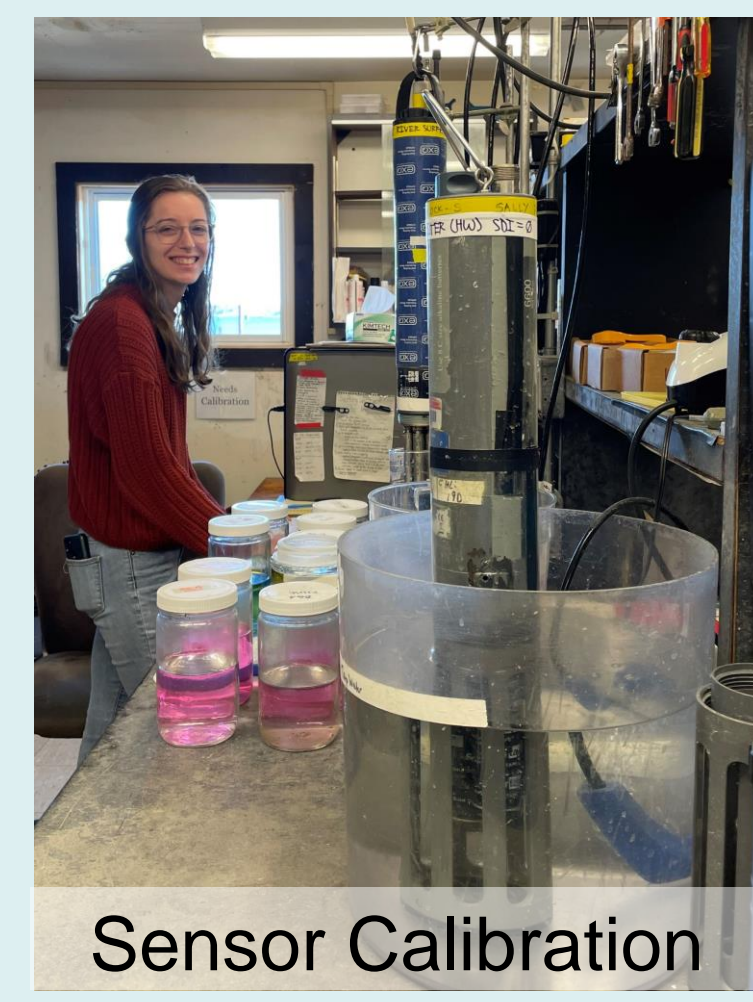


Measurements are made every 15-minutes at 0.5 meter above bottom and 1 meter below surface. Parameters measured are temperature, salinity, pH, dissolved oxygen and chlorophyll-a fluorescence. All data in results are considered preliminary.

FIELD AND LAB WORK



Nutrient Sampling



Sensor Calibration



Chlorophyll Sampling



Water Column Profiling



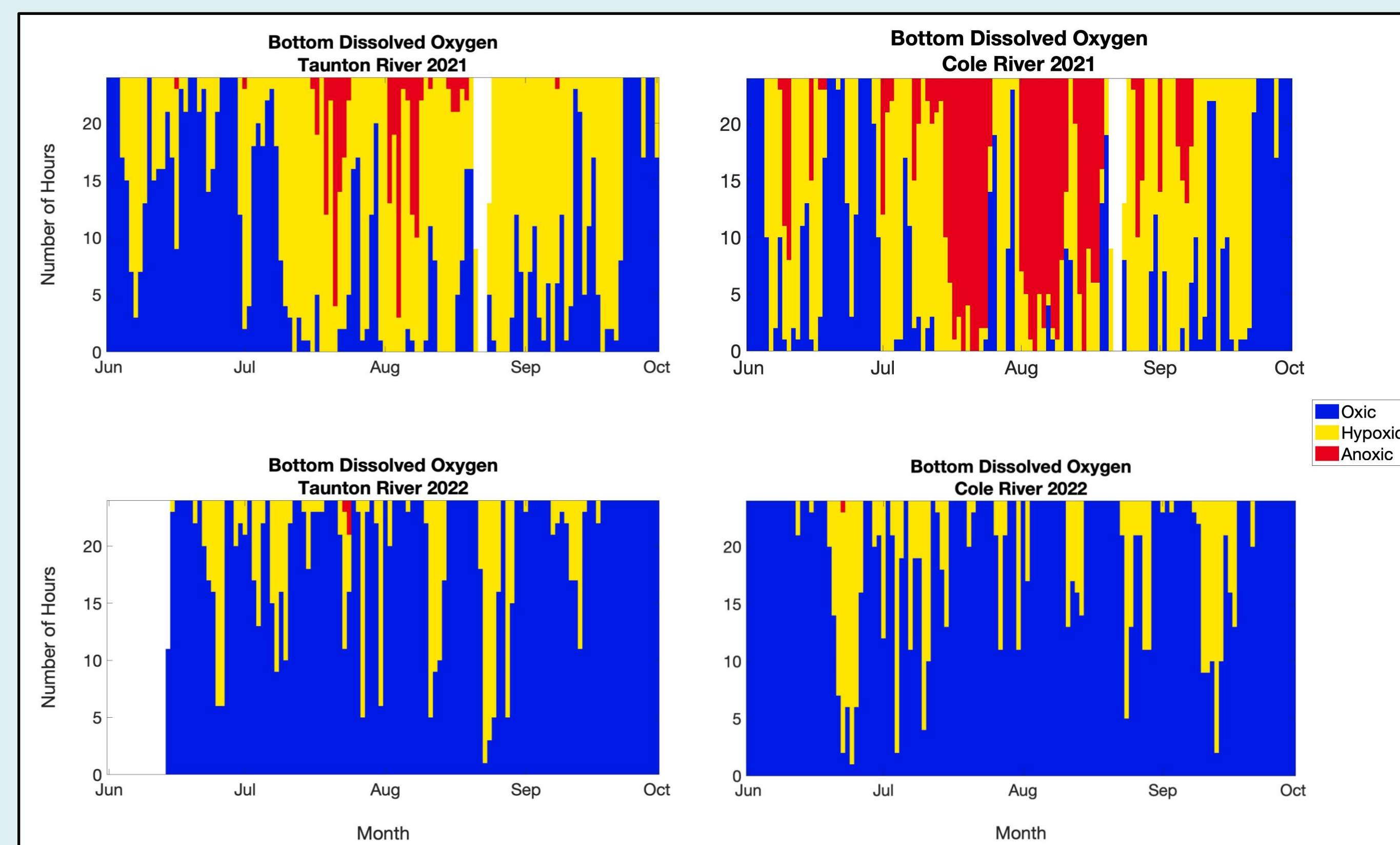
Sonde Swap



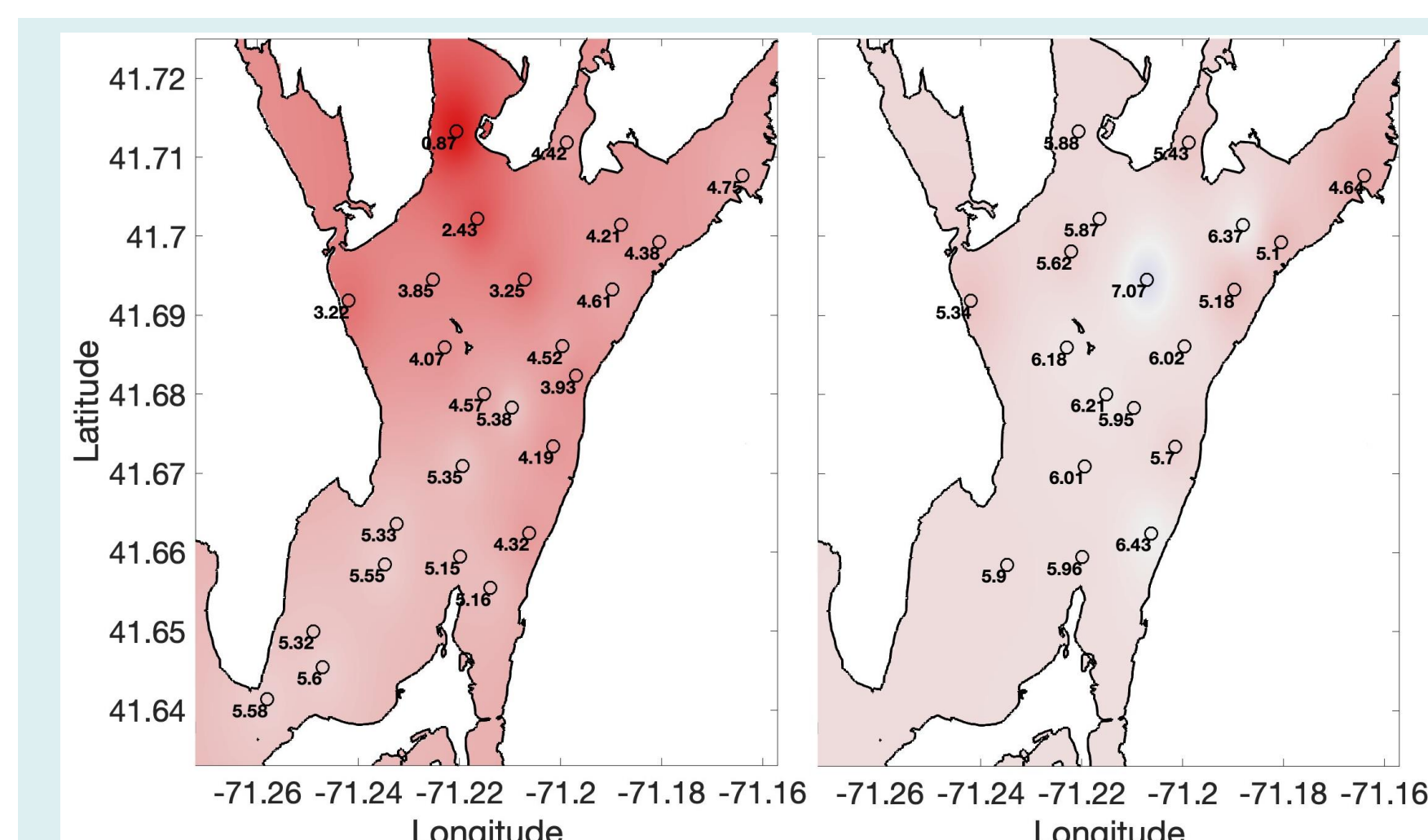
Spatial Surveys

HYPOXIA DESCRIPTION

Hypoxia refers low dissolved oxygen (DO) concentrations that adversely affect organisms. The states of Massachusetts and Rhode Island have DO criteria for Narragansett Bay designed to protect all life stages of aquatic life.

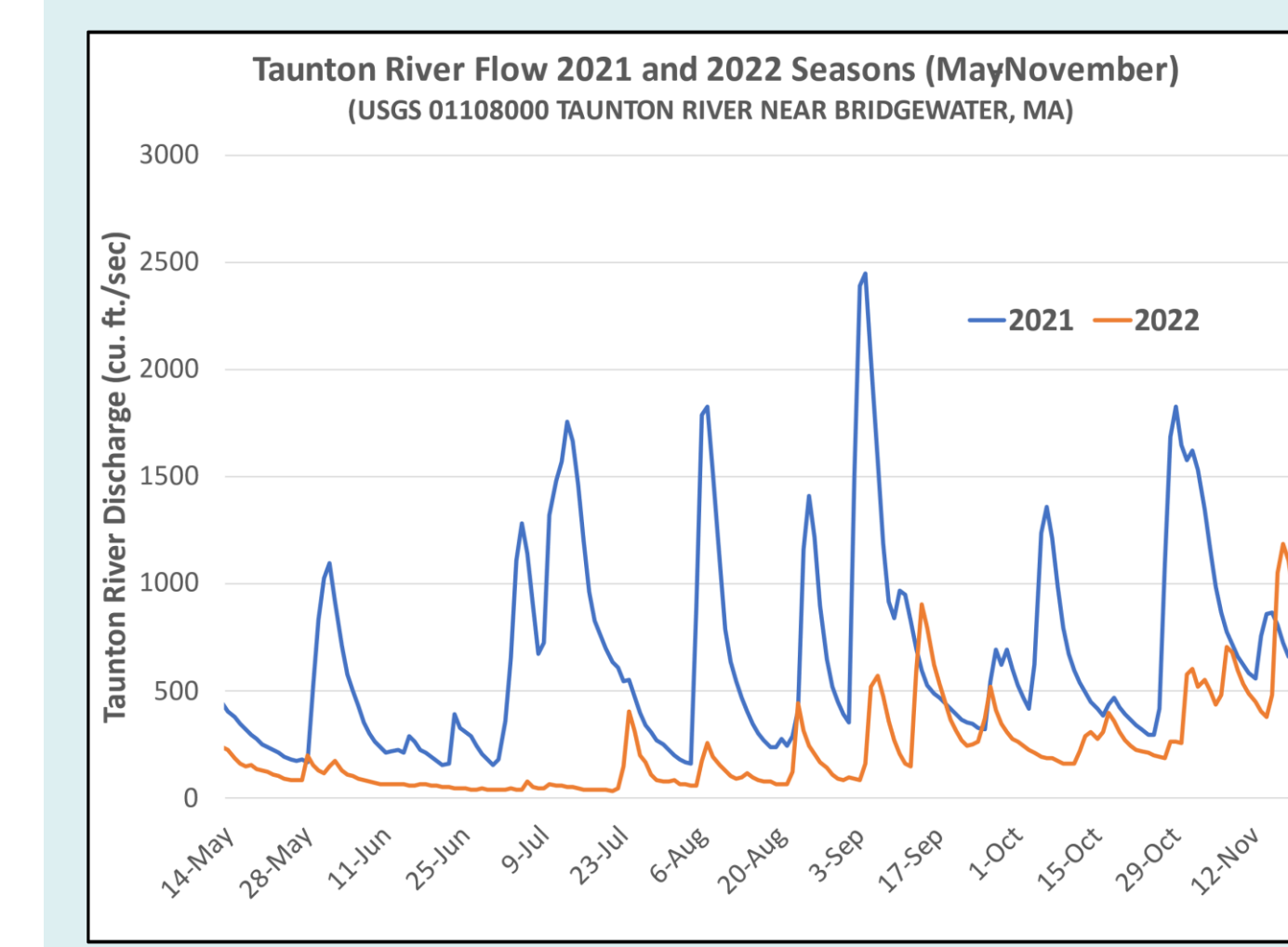


Hourly dissolved oxygen data from Taunton River and Cole River bottom in 2021 (top row) and 2022 (bottom row). Each vertical bar is a day between June and October. The amount of shaded blue, yellow and red areas note the number of hours of good oxia conditions (> 5 mg/L), hypoxia (between 2.9 mg/L and 5 mg/L) and severe hypoxia/anoxia (< 2.9 mg/L), respectively.

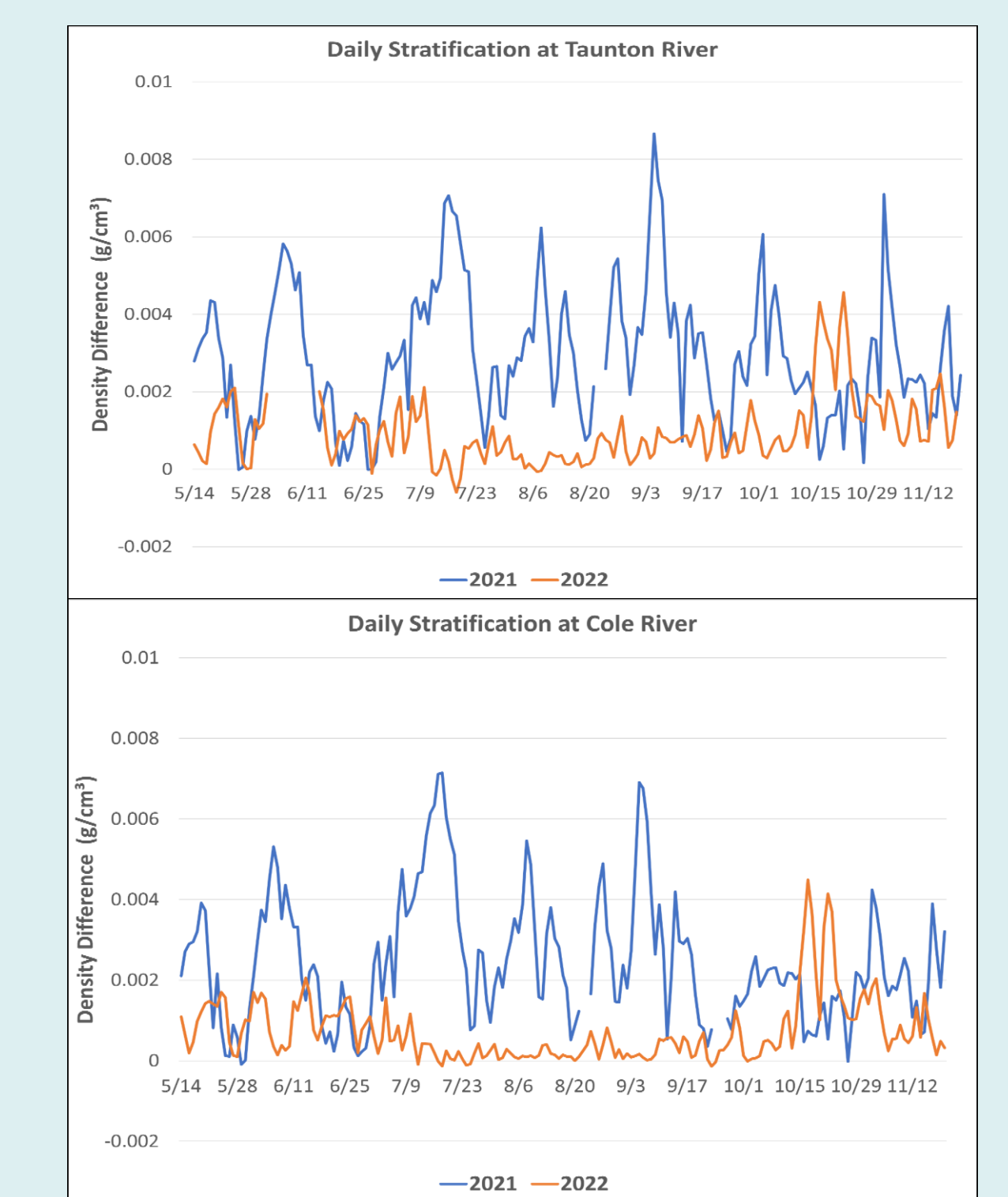


Bottom dissolved oxygen data collected from spatial surveys during July of 2021 (left) and 2022 (right).

FORCING FACTORS ON LOW OXYGEN 2021-2022

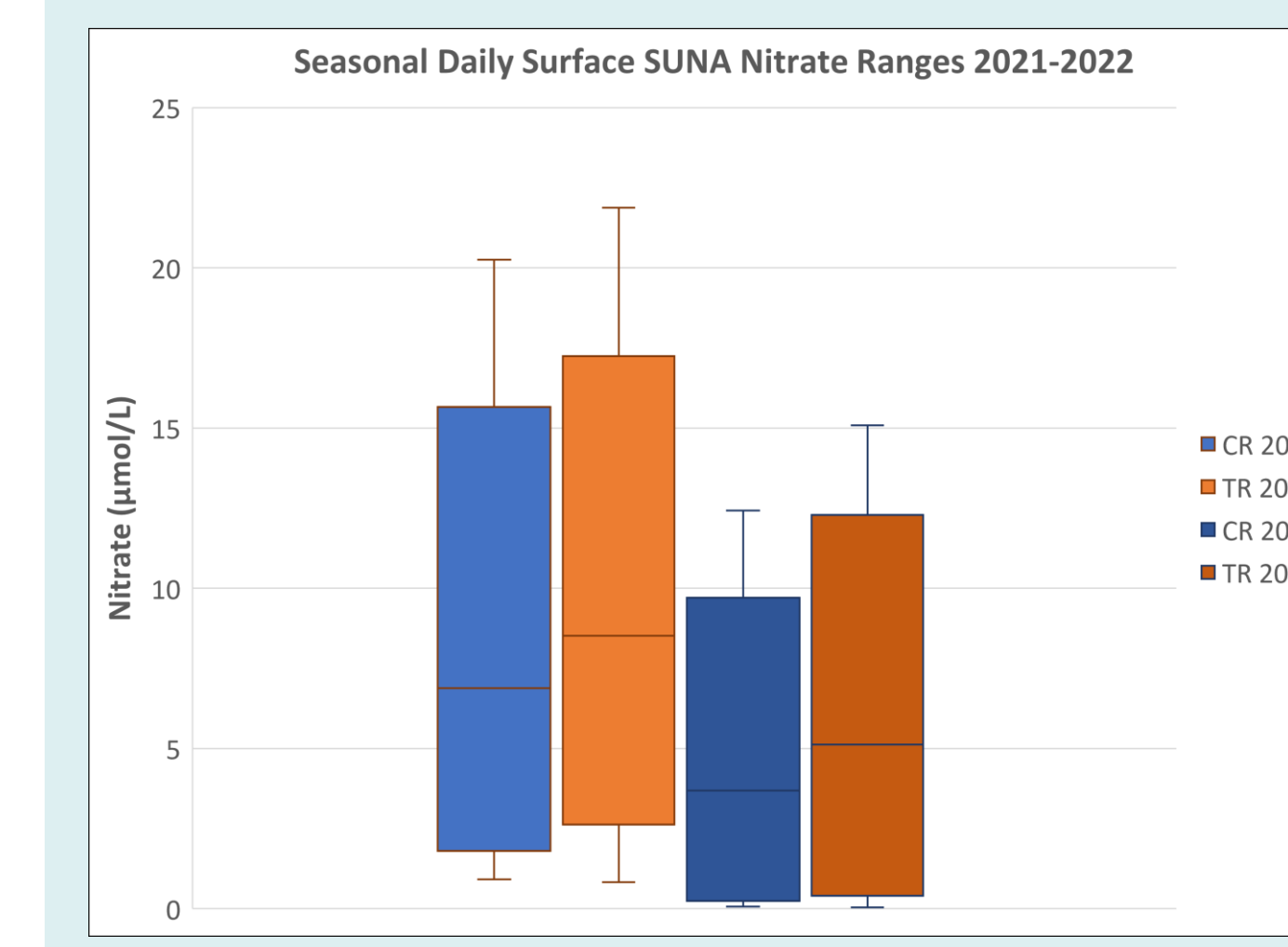


Hypoxic conditions are often caused by excess nutrients and salinity-driven stratification. Hypoxia is seasonally and event driven by river flow. Wet years see more hypoxia events and dry years see less. Wet summer seasons allow for stratification to build and block vertical mixing along with delivering larger amounts of nutrients from rivers.

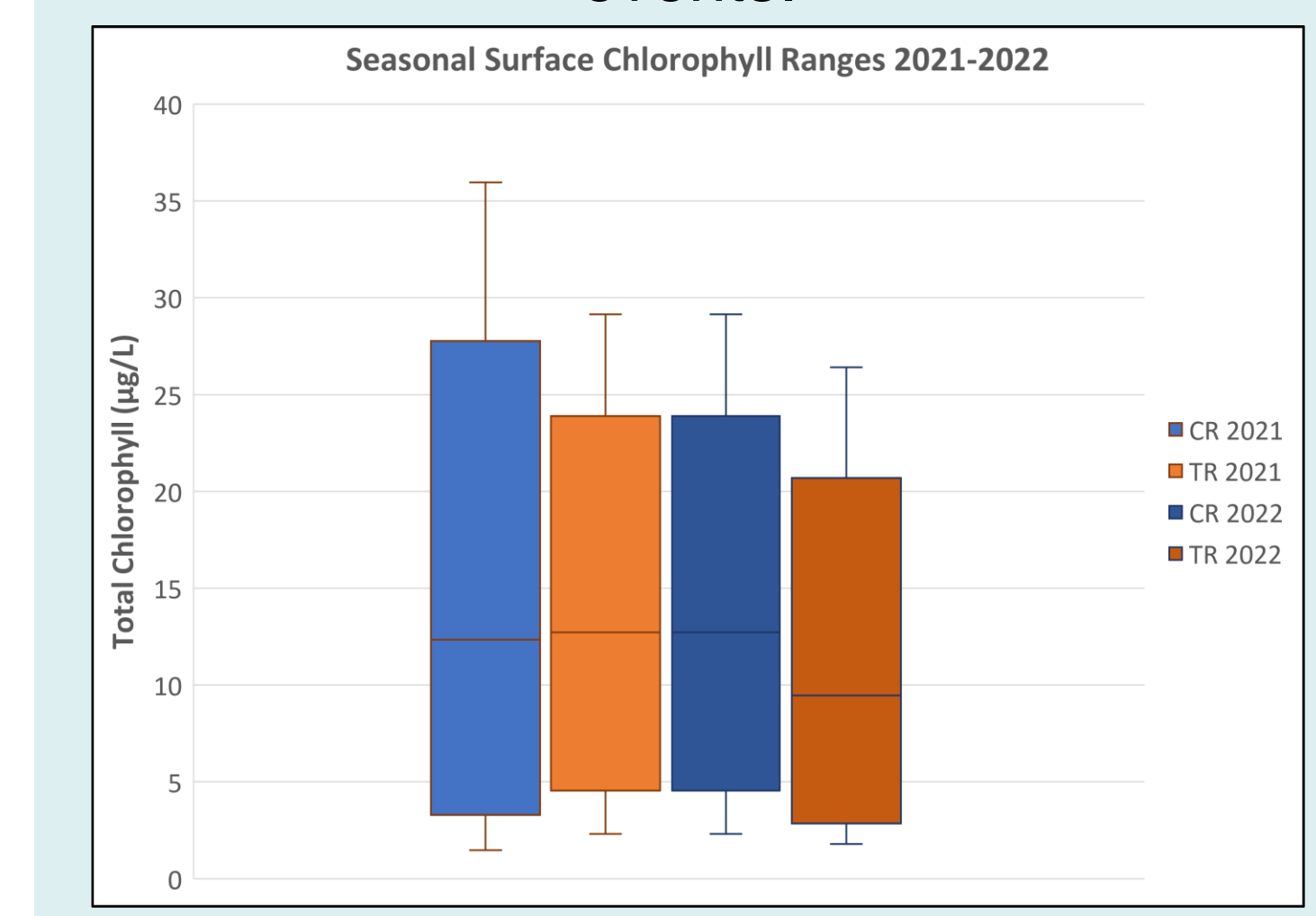


Stratification is more pronounced in 2021 vs 2022 and track event pulses based on river flow data. Taunton River has higher peaks in density differences than Cole River due to larger river discharge.

Nitrate levels were higher in 2021 vs 2022. More nutrients can be delivered to the estuary during wet summers via river flow and rainfall events.



As a result, Chlorophyll levels were also higher in 2021 vs 2022. More nutrients can be delivered to the estuary during wet summers via river flow and rainfall events. Chlorophyll levels tend to be higher at Cole River than Taunton River potentially contributing to more intense hypoxic events.



CONCLUSIONS & AGENCY DATA LINKS

Continued funding for monitoring is essential for public, managers and scientists. The spatial and temporally continuous monitoring can be used in conjunction to determine the full extent of a low oxygen event and allow management insight on focus areas.

The data from the monitoring network is gathered in real-time via cellular connections to give scientist and the public the most up to date data to assess the environmental conditions and response accordingly.

•MassDEP-Mt Hope Stations: <https://www.mass.gov/info-details/mount-hope-bay-marine-buoy-continuous-probe-data>

•ALL NBFSMN DATA SETS- weekly blog and yearly data: www.dem.ri.gov/bart

ACKNOWLEDGEMENTS

This project was funded through SNEP under SNEPWG20-6-URI-MHB with match from MassDEP. NBFSMN is funded by all participating partners (RIDEM-OWR, MassDEP, SNEP, NBC, NBNERR, and NERACOOS.) NBFSMN has also been funded in part by EPA Clean Water Act (sections 319 & 106) over the years. Thank you to all that contribute to NBFSMN.