

Narragansett Bay Research Reserve

Collecting data to better understand our waters.



Data from the Reserve, together with efforts from other RI agencies, contributes to understanding the overall health of our estuary, Narragansett Bay.

Narragansett Bay National Estuarine Research Reserve (NBNERR)

The reserve is part of a network of 29 reserves under the National Estuarine Research Reserve System (NERRS). NERRS is a partnership program between NOAA and the coastal states to protect more than 1.3 million acres of estuarine land and water.

The Reserve is located on four islands in the geographic center of Narragansett Bay in Rhode Island: Prudence, Patience, Hope, and Dyer.

The health of every reserve is continuously monitored by collecting and analyzing water and weather data through the System Wide Monitoring Program (SWMP), a guidance program from NERRS.

For more information visit www.nbnerr.org

2019 HIGHLIGHTS

.....
More precipitation - precipitation was slightly above the long-term historical average.

.....
Warmer summer - air temperature was higher than the long-term historical 95th percentile.

.....
Colder winter - air temperature was lower than the long-term historical 5th percentile.

.....
Less nutrients - nitrite concentration decreased in three out of four sampling sites.

.....
Algal Bloom - no algal bloom was observed at any of the water quality data collection sites.

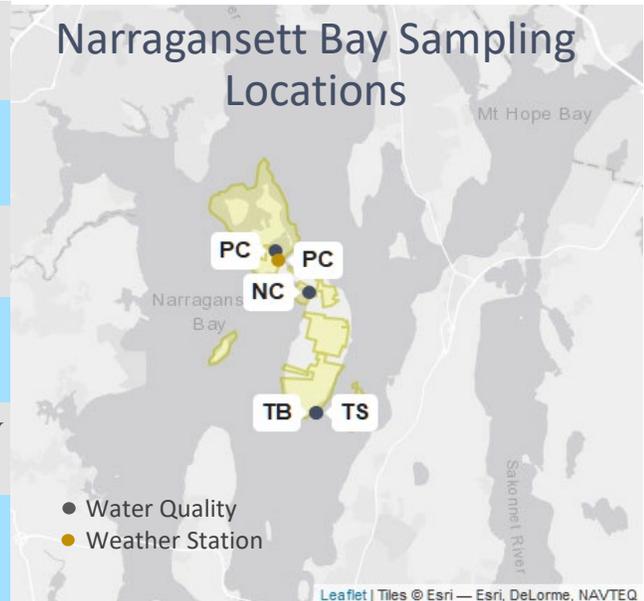


Water quality issues influence human and environmental health. The more we monitor our water, the better we will be able to recognize and prevent problems.



HOW IS OUR ESTUARY CHANGING IN TIME?

- **Precipitation** is not changing
- **Air Temperature** is not changing
- **Nitrite** is decreasing at three out of four locations
- **Algae** growth seem to be increasing at three shallow sampling locations
- **Dissolved Oxygen and pH** are decreasing at two out of four locations



Trends in Weather & Water Quality*

Location ID	Location Name	Air Temperature	Precipitation	Maximum Wind Speed	Barometric Pressure	
PC	Potters Cove	—	—	—	↑	
Location ID	Location Name	Water Temperature	Salinity	Dissolved Oxygen	pH	Turbidity
NC	Nag Creek	—	↑	—	↑	↓
PC	Potters Cove	—	—	—	—	—
TB	T-Wharf Bottom	—	↑	↓	↓	↓
TS	T-Wharf Surface	—	—	↓	↓	—
Location ID	Location Name	Ortho-phosphate	Ammonium	Nitrite	Nitrate	Chlorophyll-a
NC	Nag Creek	—	—	—	X	↑
PC	Potters Cove	—	—	↓	—	↑
TB	T-Wharf Bottom	—	—	↓	—	—
TS	T-Wharf Surface	—	—	↓	—	↑

*Based on data collected from 2007-2019

X Insufficient Data ↑ Increasing — Not Changing ↓ Decreasing

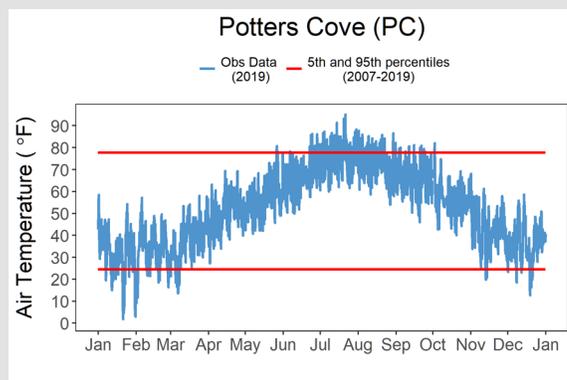
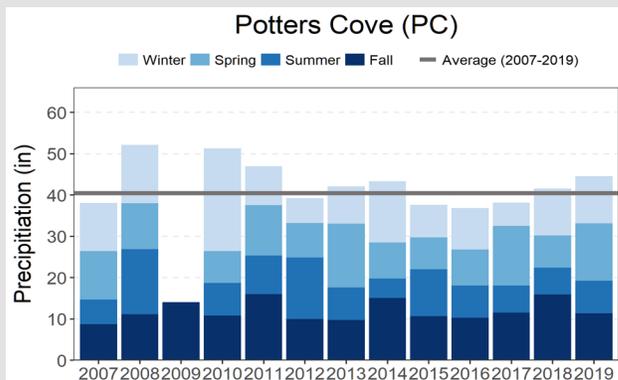
Weather & Climate – What is the Difference?

WEATHER is what you see outside on any particular day in terms of precipitation, temperature, humidity, cloudiness, visibility and wind.



CLIMATE tells us the average daily weather for an extended period of time (years, decades, centuries) at a certain location.

- Weather Can Have A Major Impact On Water Quality
- Precipitation & Air Temperature



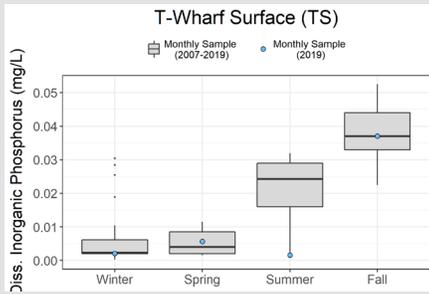
Weather data helps scientists and managers understand water circulation patterns, plant growth, shellfish and fish distribution, storm frequency and intensity and much more...

- Precipitation was ~4 inches more than the long-term historical average in 2019.
- Air temperature in 2019 was lower from Jan-Feb and higher from June-Sep when compared to the long-term historical 5th and 95th percentile, respectively.

Do We Have Too Many Nutrients In The Water?

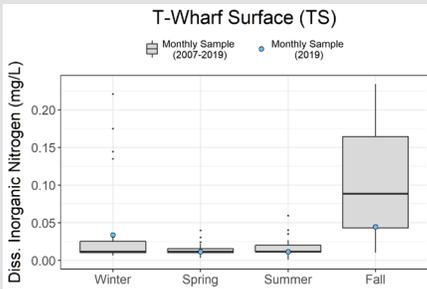
- Nitrogen and phosphorous are two fundamental nutrients to algal and plant production which are the base of the food chain that supports all other life in estuarine and ocean systems. An excess of these nutrients can cause phytoplankton blooms which, in turn, can decrease the dissolved oxygen underwater life needs to survive, negatively impact human health, and close fishery harvest areas.
- In 2019, the combination of necessary factors to trigger an algal bloom were not observed on waters around Prudence Island.

Inorganic phosphorous and nitrogen



A critical threshold value is used to determine if a water quality measurement is at a level where negative impacts may occur.

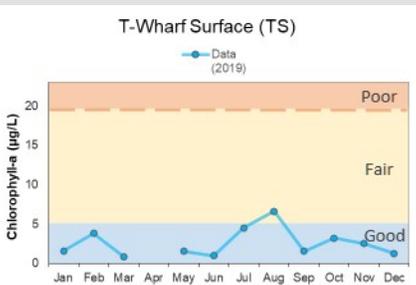
- During 2019, levels of dissolved inorganic phosphorus were low year-round (max. of 0.037 mg/L in fall) at the T-Wharf Surface site.
 - >0.03 mg/L phosphorus stimulates plant growth to exceed natural growth, (EPA, Campbell and Wildberger, 1992).



- Dissolved inorganic nitrogen concentrations were also considered low year-round (max. of 0.05 mg/L in fall).
 - <1 mg/L is considered a normal concentration in unpolluted waters (EPA, Campbell and Wildberger, 1992).

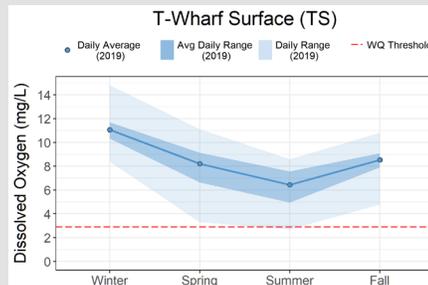
Algal Bloom

- Nutrient concentrations were low during 2019, hence, no algal bloom was observed.

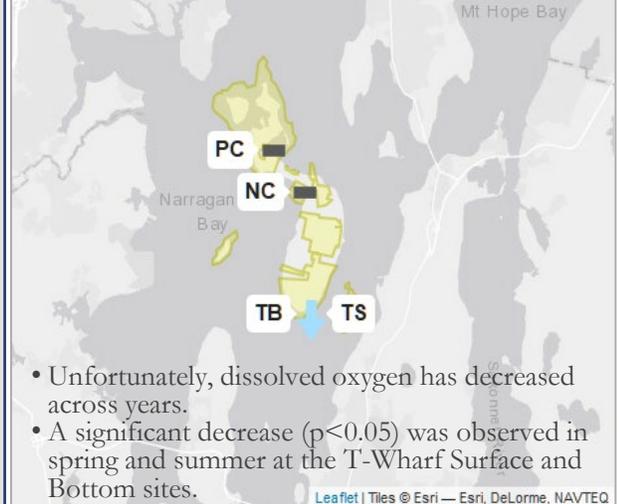


Dissolved Oxygen

- With no algal bloom, dissolved oxygen remained at a healthy level (>2.9 mg/L) for 2019.



How is Oxygen Changing in Time?



- Unfortunately, dissolved oxygen has decreased across years.
- A significant decrease ($p < 0.05$) was observed in spring and summer at the T-Wharf Surface and Bottom sites.

Small Changes You Can Make To Help

- Limit use of fertilizers/pesticides
- Use compost as fertilizer in gardens
- Collect pet droppings and dispose properly
- Plant trees and rain gardens
- Redirect downspouts away from impervious surfaces like driveways and sidewalks
- Wash cars and boats on lawn and not the driveway

Water Quality is a MAJOR Driver of Ecosystem Change

What happens on the land affects the quality of the water and the health of the plants and animals that live in the estuary.

Why Estuaries Matter

Economic Impacts



Coastal shoreline counties provided 53 million jobs and contributed \$7.4 trillion (nearly 44%) of the nation's gross domestic product in 2012.

Community Benefits



Estuaries protect coastal communities by reducing flooding and storm surge impacts, enhancing water quality, and providing commercial and recreational benefits.

Healthy Ecosystems



Up to two-thirds of the nation's commercial fish and shellfish spend some part of their life cycle in an estuary or depend on this resource for food.

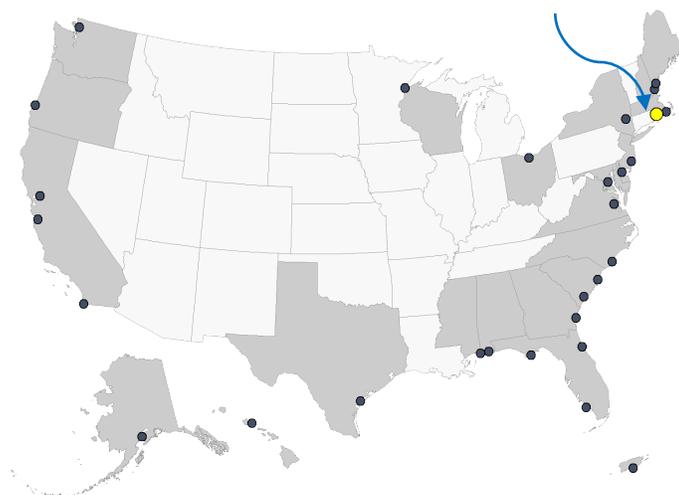
Habitat Diversity



Habitat types include shallow open waters, freshwater/salt marshes, swamps, sandy beaches, mud/sand flats, rocky shores, oyster reefs, mangrove forests, river deltas, tidal pools and seagrasses.

Tracking The Health of Our Estuaries 24/7

The **NERRS** is a partnership program between NOAA and the coastal states to manage designated reserves. More than 1.3 million acres of estuarine land and water are protected. Each reserve is managed on a daily basis by a lead state agency or university with input from local partners. The health of every reserve is continuously monitored by the **System Wide Monitoring Program (SWMP)**. SWMP is a **robust, long-term, and versatile** monitoring program that uses the NERRS network to intensively study estuarine reference sites for evaluating ecosystem function and change. Reserve-generated data and information are available to local citizens and decision makers. For more information, go to: <https://coast.noaa.gov/nerrs/>



NERRS is a network of 29 coastal reserves established for long-term **research, education and stewardship and training.**

More Information...

For Stakeholders

Access data at the System Wide Monitoring Program (SWMP) Graphing Application website: <https://coast.noaa.gov/swmp/>

For Scientists

Access data at the Central Data Management Office (CDMO) website: <http://www.nerrsdata.org/>

Have Questions?

- Contact Dr. Daisy Durant
- daisy.durant@dem.ri.gov
- (401) 683-7368

Narragansett Bay NERR- providing the science needed for today and tomorrow

