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**

<table>
<thead>
<tr>
<th>Location ID</th>
<th>Location Name</th>
<th>Air Temperature</th>
<th>Precipitation</th>
<th>Maximum Wind Speed</th>
<th>Barometric Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC</td>
<td>Potters Cove</td>
<td></td>
<td></td>
<td></td>
<td>↑</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Location ID</th>
<th>Location Name</th>
<th>Water Temperature</th>
<th>Salinity</th>
<th>Dissolved Oxygen</th>
<th>pH</th>
<th>Turbidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC</td>
<td>Nag Creek</td>
<td>↑</td>
<td></td>
<td>↑</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>PC</td>
<td>Potters Cove</td>
<td>↑</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TB</td>
<td>T-Wharf Bottom</td>
<td>↑</td>
<td>↓</td>
<td>↓</td>
<td></td>
<td>↓</td>
</tr>
<tr>
<td>TS</td>
<td>T-Wharf Surface</td>
<td></td>
<td>↓</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Location ID</th>
<th>Location Name</th>
<th>Ortho-phosphate</th>
<th>Ammonium</th>
<th>Nitrite</th>
<th>Nitrate</th>
<th>Chlorophyll-a</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC</td>
<td>Nag Creek</td>
<td></td>
<td>↓</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

*Based on data collected from 2007-2019

- 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**
  - 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.

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

- 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.

**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**

- 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.

- 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

**Small Changes You Can Make To Help**
### Why Estuaries Matter

<table>
<thead>
<tr>
<th>Economic Impacts</th>
<th>Community Benefits</th>
<th>Healthy Ecosystems</th>
<th>Habitat Diversity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal shoreline counties provided 53 million jobs and contributed $7.4 trillion (nearly 44%) of the nation’s gross domestic product in 2012.</td>
<td>Estuaries protect coastal communities by reducing flooding and storm surge impacts, enhancing water quality, and providing commercial and recreational benefits.</td>
<td>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.</td>
<td>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.</td>
</tr>
</tbody>
</table>

### 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/](https://coast.noaa.gov/nerrs/)

### More Information...

**For Stakeholders**
- Access data at the System Wide Monitoring Program (SWMP) Graphing Application website: [https://coast.noaa.gov/swmp/](https://coast.noaa.gov/swmp/)

**For Scientists**

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

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