

WAQUOIT BAY TRENDS: WEATHER & WATER QUALITY

Resilient estuaries and coastal watersheds – where human and natural communities thrive.

Waquoit Bay National Estuarine Research Reserve (WBNERR)

As part of the National Estuarine Research Reserve System (NERRS), WBNERR participates in the NERRS System-Wide Monitoring Program (SWMP). The primary mission of SWMP is to measure short-term variability and long-term changes in the water quality, biological systems, and land-use/land-cover characteristics of estuaries

For more information go to:
<https://waquoitbayreserve.org>

2023 HIGHLIGHTS

.....
Waquoit Bay is warming. Water and air temperatures increased significantly over the 2002 - 2023 time period.

.....
Chlorophyll-a concentrations increased at three of four sampling sites, indicating an increase in algal growth in the bay.

.....
Dissolved oxygen concentrations are decreasing throughout Waquoit Bay.

.....
Fourteen out of the past seventeen years (including 2023) experienced more precipitation than the historical average.



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**.



Waquoit Bay Trends From 2002 to 2023

Air Temperature increased since observations started in 2002.

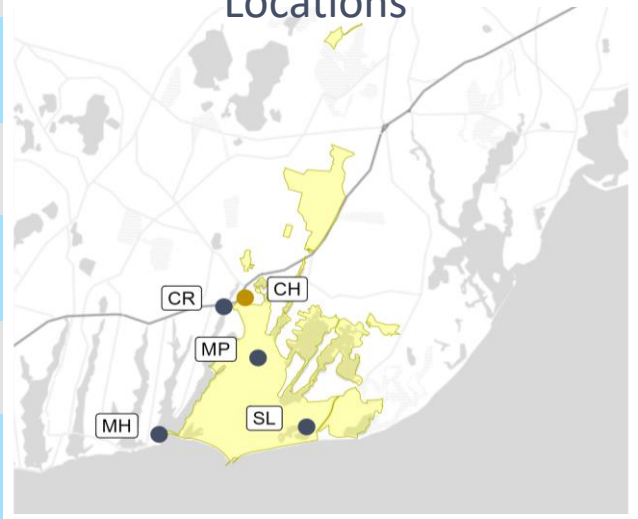
Water Temperature increased at all four locations.

Nitrogen in the form of ammonium decreased at all four sites.

Algae growth increased at three out of four sites.

Dissolved Oxygen decreased at three out of four sites.

Waquoit Bay Sampling Locations



Trends in Weather & Water Quality*

*Based on 2002-2023 data. Nutrient data from 2010 – 2013 omitted from analysis – did not pass quality control checks.

Location ID	Location Name	Air Temperature	Precipitation
CH	Carriage House	↑	—

Location ID	Location Name	Water Temperature	Salinity	Dissolved Oxygen	pH	Turbidity
CR	Childs River	↑	↑	—	—	—
MH	Menauhant	↑	↑	↓	↓	↑
MP	Metoxit Point	↑	↑	↓	↓	↑
SL	Sage Lot	↑	↑	↓	↓	↑

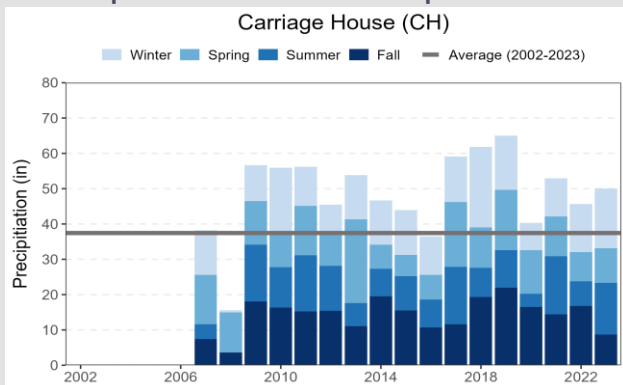
Location ID	Location Name	Ortho-phosphate	Ammonium	Chlorophyll-a
CR	Childs River	↓	↓	—
MH	Menauhant	↓	↓	↑
MP	Metoxit Point	↓	↓	↑
SL	Sage Lot	↓	↓	↑

- X Insufficient Data
- ↑ Increasing
- Not Changing
- ↓ Decreasing

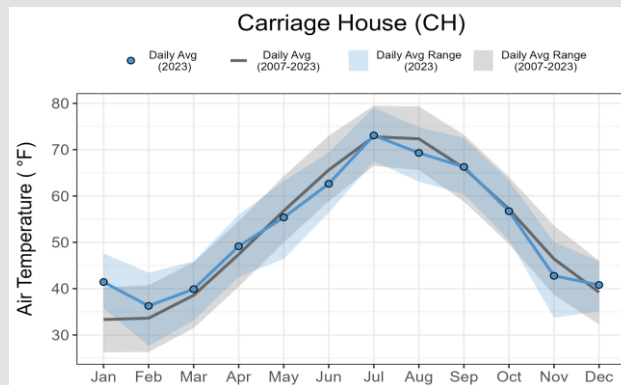
Table 1

Weather Conditions Can Impact Water Quality

Precipitation & Air Temperature



Total precipitation in 2023 was ~12 inches more than the long-term historical average.



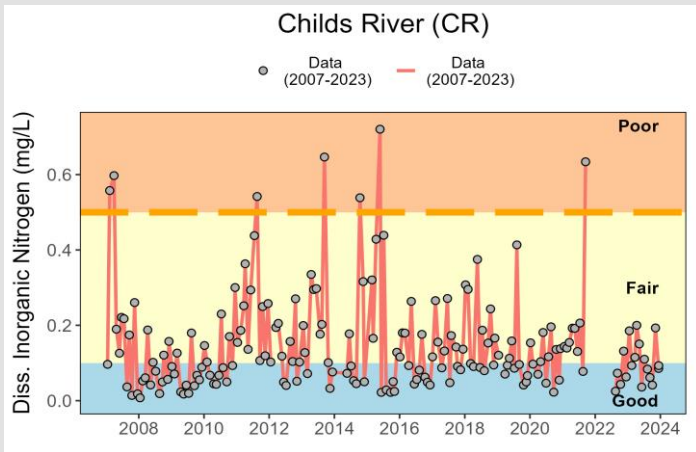
Winter temperatures in 2023 were warmer than the long-term historical average.

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

Do We Have Too Many Nutrients In The Water?

Microalgae (also called phytoplankton) are tiny, plant-like organisms that need nutrients (forms of nitrogen and phosphorus) to grow, and are critical to estuarine and ocean health. However, some conditions such as excess nutrients can trigger algal blooms which can close fisheries and negatively impact human health as well as eelgrass populations. When the blooms die, the decomposition process uses up the dissolved oxygen in the water that life needs to survive.

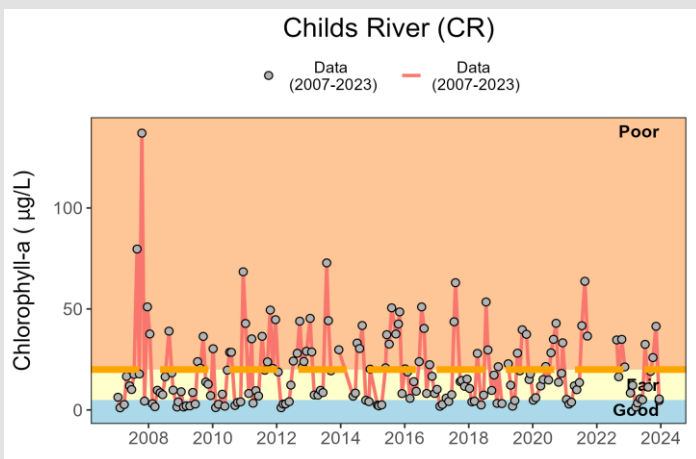
Nitrogen



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

Dissolved inorganic nitrogen (DIN) encompasses the types of nitrogen in the water that lead to phytoplankton growth. At the Childs River station, DIN concentrations in 2023 remained in the “Fair” (0.1–0.5 mg/L) or “Good” (0–0.1 mg/L) range, and in the past have only sporadically spiked into the “Poor” range (>0.5 mg/L).

Microalgae/Phytoplankton



Phytoplankton growth is determined by measuring chlorophyll a concentrations. Note that even though DIN concentrations (above) remain mostly in “Fair” to “Good” ranges, chlorophyll-a concentrations frequently exceed the critical threshold of 20 µg/L, indicating unhealthy amounts of phytoplankton.

How is Oxygen Changing?



Dissolved oxygen concentrations decreased at every site except for the Childs River between 2002 - 2023. Concentrations at Metoxit Point, Childs River, and Sage Lot routinely drop into the poor “hypoxic” range at nights during the summer. Hypoxic water conditions have so little oxygen (<2 mg/L) that it significantly stresses organisms living in the area.

Small Things You Can Do To Help

- Limit use of fertilizers and pesticides, and apply them responsibly.
- Use compost as fertilizer in gardens.
- Collect pet droppings.
- 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.
- Support public sewer initiatives and innovative septic system alternatives.

What happens on 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 54.6 million jobs and contributed \$9.6 trillion (nearly 45%) of the nation's gross domestic product in 2020.

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.

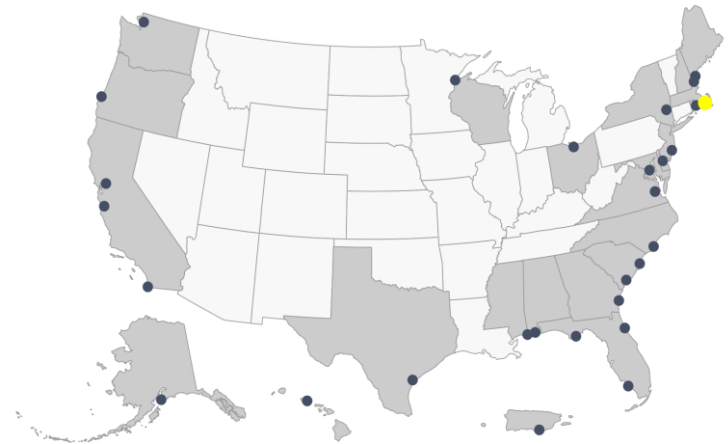
Habitat Diversity



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 30 coastal reserves established for long-term research, education and stewardship.

More Information...

For Stakeholders

Access data at the System Wide Monitoring Program (SWMP) Graphing Application website:

<https://cdmo.baruch.sc.edu/dges/>

For Scientists

Access data at the Central Data Management Office (CDMO) website:

<http://cdmo.baruch.sc.edu/>

Have Questions?

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