

WAQUOIT BAY TRENDS: WEATHER & WATER QUALITY

Highlights and trends in weather and water quality at Waquoit Bay since 2000



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>

2022 HIGHLIGHTS

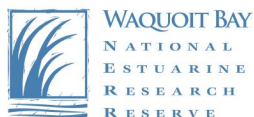
.....
It was hotter - average monthly water AND air temperatures were higher than the long-term historical averages for most of 2022.

.....
Three out of our four water quality sampling locations routinely experienced critically low oxygen conditions

.....
Algae growth increased across the whole bay since 2000, and in 2022 once-widespread eelgrass beds were not found.

.....
Turbidity (cloudiness) of the water in the bay was higher than the long-term average at every sampling station through most of the year.

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 2000 to 2022

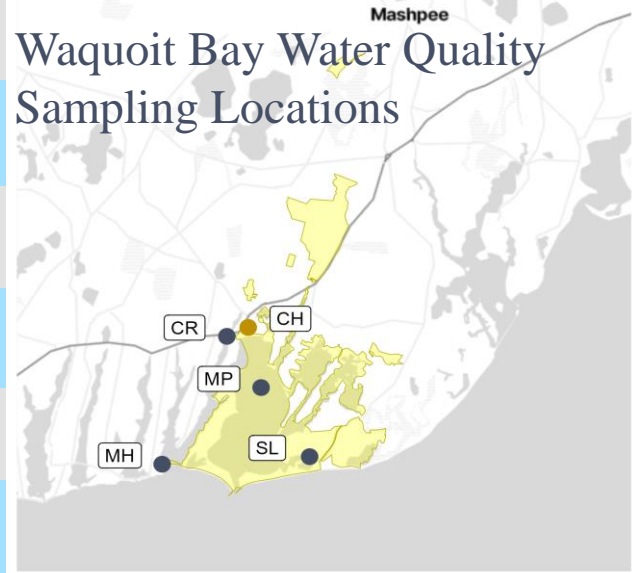
Air Temperature increased since observations started in 2002.

Water Temperature increased at all four locations.

Nitrogen in the form of ammonium concentrations decreased at all four locations.

Algae growth increased at all four locations.

Dissolved Oxygen decreased at one out of four locations.



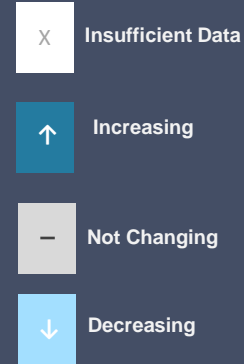
Trends in Weather & Water Quality*

*Based on data collected from 2000-2022

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

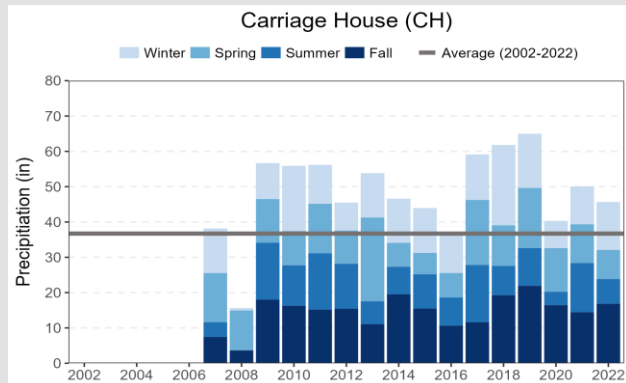
Location ID	Location Name	Water Temperature	Salinity	Dissolved Oxygen	pH	Turbidity
CR	Childs River	↑	↑	—	—	—
MH	Menauhant	↑	↑	—	↓	↑
MP	Metoxit Point	↑	↑	—	—	↑
SL	Sage Lot	↑	↑	↓	↓	↑

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

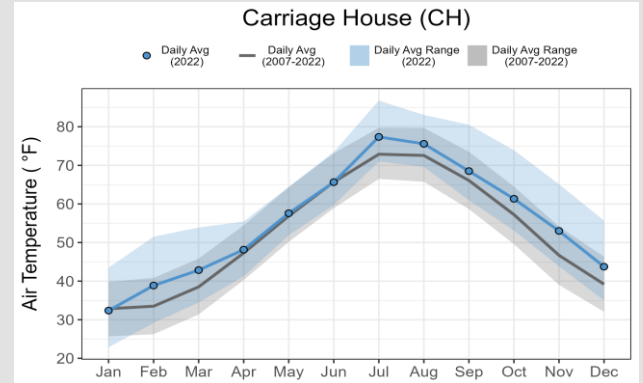


Weather Conditions Impact Water Quality

Precipitation & Air Temperature



Total precipitation in 2022 was ~8 inches more than the long-term historical average

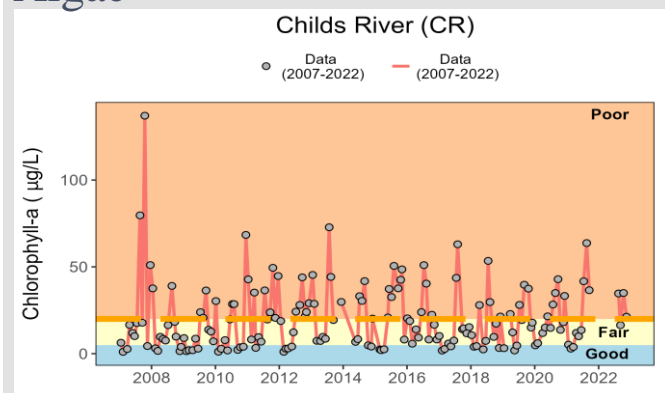


Average monthly air temperature was higher than the long-term historical average for nearly every month in 2022.

Do We Have Too Many Nutrients In The Water?

Algae are tiny, plant-like organisms living in and drifting through the water. They need sunlight and nutrients (nitrogen and phosphorus) to grow, and are critical to estuarine and ocean health. Some conditions (excess nutrients, high temperatures) can cause algal blooms, which use up the dissolved oxygen in the water that other life needs to survive. These events can negatively impact human health and close fishery harvest areas.

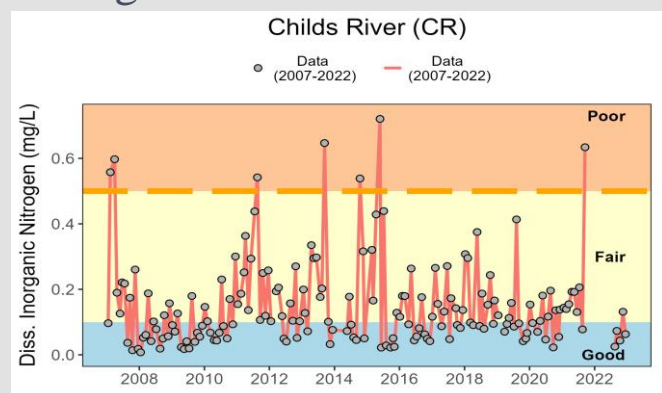
Algae



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

Algae growth is measured by chlorophyll-a concentrations. Data from Waquoit Bay show that chlorophyll-a levels increased between 2000-2022 at all sampling locations. Concentrations in samples collected at Childs River frequently exceed the critical threshold of 20 µg/L.

Nitrogen



Dissolved inorganic nitrogen (DIN) encompasses the types of nitrogen in the water that cause algae growth. In Waquoit Bay, data show that DIN concentrations decreased between 2002-2022 at all four locations, with all 2022 measurements from all stations in the "Fair" to "Good" range. However, this only tells us the DIN concentration at specific points in Waquoit Bay at specific times, not how much is entering the bay.

How is Oxygen Changing?

Dissolved oxygen concentrations decreased at Sage Lot between 2000-2022 and showed no significant change at the other three sites. Most of the measurements vary between the poor to good range at all locations, though concentrations at Metoxit Point, Childs River, and Sage Lot routinely drop into the poor "hypoxic" range at night during the summer.

Small Changes You Can Make To Help

- Limit use of fertilizers/pesticides and apply 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.

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 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.

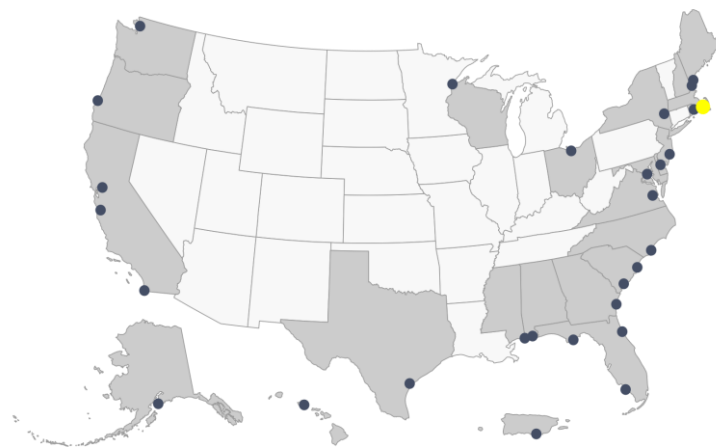
Habitat Diversity



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 29 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://coast.noaa.gov/swmp/>

For Scientists

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

Have Questions?

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WAQUOIT BAY
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RESERVE