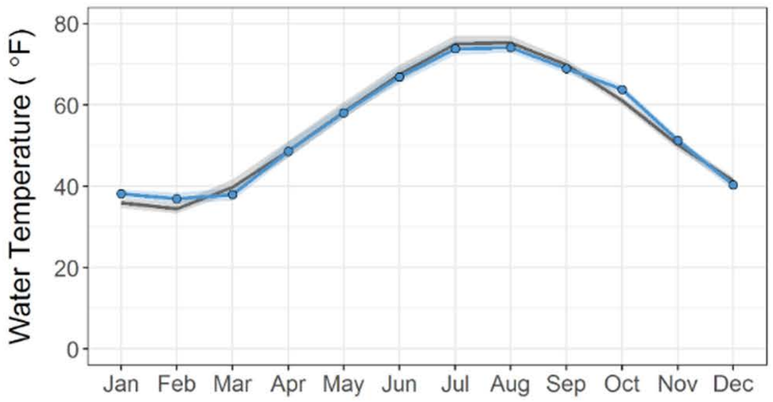
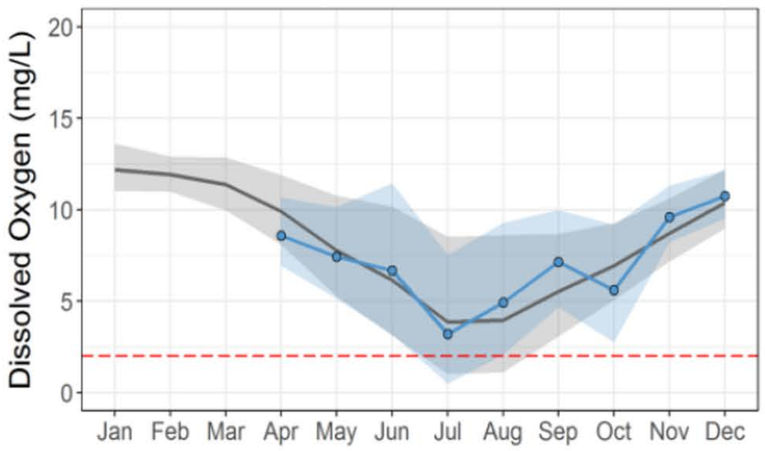
Weather's Impact on Water Quality

Weather plays a significant role in driving seasonal water quality patterns. Because oxygen is less soluble in warmer water, dissolved oxygen (DO) decreases with increasing temperature. In addition, reduced wind speeds during the summer months can limit circulation in the water column causing deeper water to remain low in oxygen. Temperature also drives algae production, represented here as chlorophyll-a concentration (the pigment required for photosynthesis). The bacterial respiration involved in the decomposition of algae results in a corresponding drawdown in DO following algae blooms. The combined effect can be dangerously low DO levels for oxygen-breathing organisms, such as fin-and shellfish (see red dashed line) in the summertime.

Data Taken From Menauhant



Data Taken From Child's River



What is an Estuary?

An estuary is a place where a freshwater river or stream meets salty ocean water. Estuaries host a wide range of habitats which promotes high biodiversity.

Estuary systems are fragile and can be easily affected by changes in the watershed. A watershed is the area of land which drains into an estuary.

Why Estuaries Matter

Economic Impacts
Coastal shoreline countries 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.

ESTUARY TRENDS

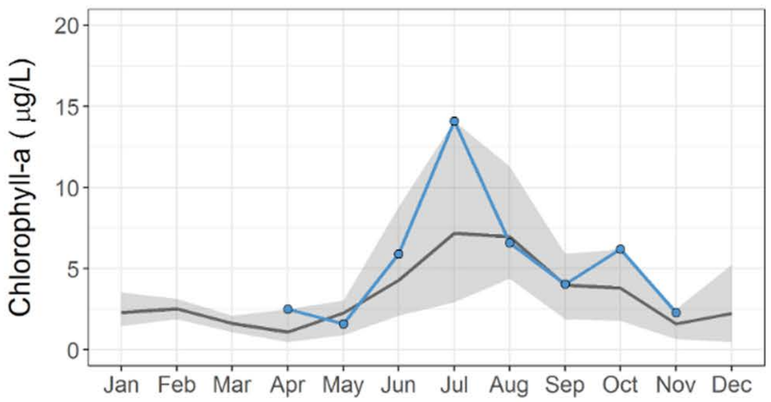
Climate Impacts on Water Quality

Waquoit Bay National Estuarine Research Reserve

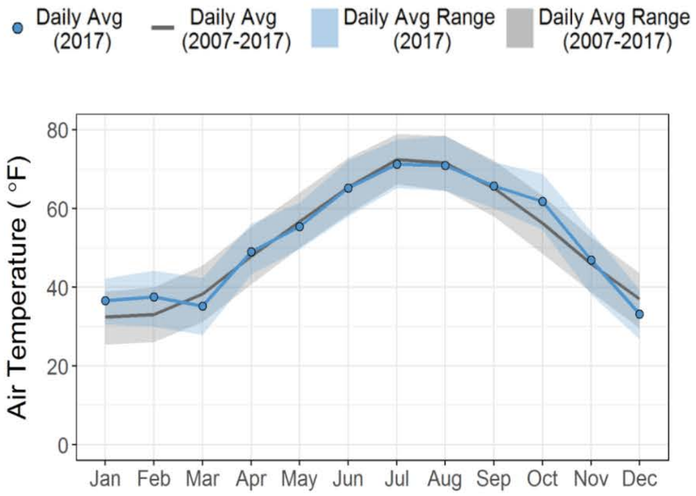
NOAA

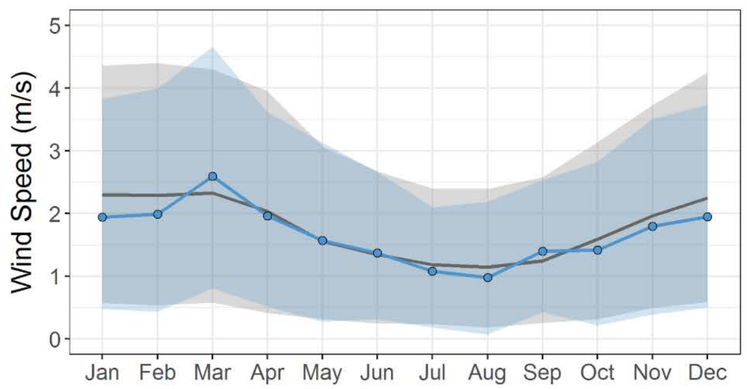
dcr Massachusetts

Data Taken From Metoxit Point



Data Taken From the WBNERR Carriage House





Note

µg, or microgram, is equal to one-millionth of a gram.

DO is an abbreviation for Dissolved Oxygen.

Analysis

As you can see, slight annual deviations from the historical average temperature and wind are reflected in deviations in the water quality patterns as well. March was unusually cold and October unusually warm in 2017. The above-average temperatures in October also resulted in lower DO and higher chlorophyll-a than normal. Consequently, long-term changes in climate are likely to have a profound impact on our future estuarine environment. See table below for long-term weather and water quality trends we've already detected.

Trends from 2007-2018

ID	Location Name	Air Temperature	Precipitation	Wind Speed	Max Wind Speed
CH	Carriage House	↑	X	↓	↓

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

X Insufficient Data

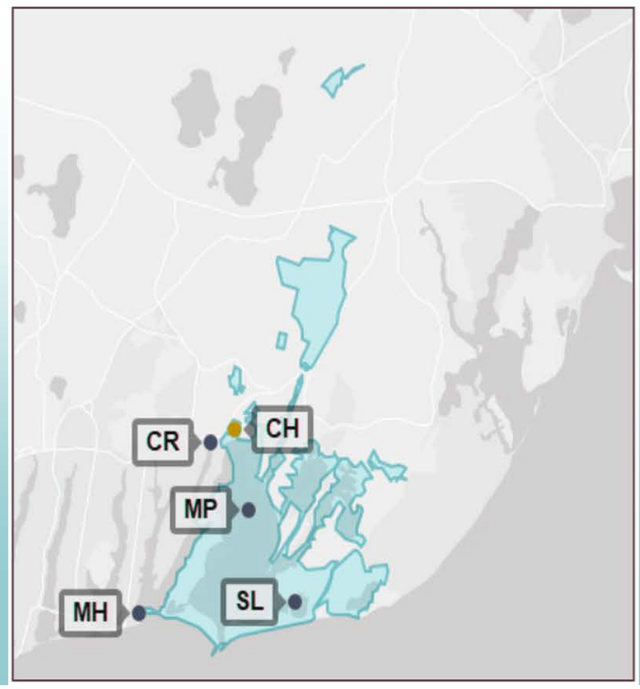
↑ Increasing ($p = 0.05$)

↑ Increasing ($p = 0.06$)

— Not Changing

↓ Decreasing ($p = 0.05$)

Waquoit Bay Sampling Locations



WAQUOIT BAY

National Estuarine Research Reserve (NERR)

This Reserve is located on the south shore of Cape Cod, Massachusetts and contains open waters, salt and fresh marshes, barrier beaches, sand dunes, rivers, mixed pine and oak forests, and sandplain grasslands. Waquoit Bay, approximately 825 acres, is the dominant water feature and once supported one of the most diverse estuarine fish communities in the state. It is still important to commercial and recreational shellfish and finfish fisheries.

Please visit us at: **http://www.waquoitbayreserve.org/**

Brochure designed by Emma Hsiao (2020)

More Information

To access data, visit the NERRS Central Data Management Office (CDMO) website:
https://www.nerrsdata.org/

To learn more about the National Estuarine Research Reserve System, visit:
https://coast.noaa.gov/nerrs/

Have Questions?

Contact Waquoit Bay NERR Research Coordinator

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