

# ESTUARY TRENDS: WEATHER & WATER QUALITY

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



## Chesapeake Bay - Maryland National Estuarine Research Reserve (NERR)

The Chesapeake Bay is the largest estuary in the United States, and one of the most productive bodies of water in the world. The Chesapeake Bay Reserve is made up of three sites—Jug Bay, Otter Point Creek, and Monie Bay. These sites reflect the diversity of estuarine habitats found within the Maryland portion of the Bay. These tributaries are an important component of the overall health of the Chesapeake Bay ecosystem. For more information go to: <http://dnr.maryland.gov/waters/cbnerr/Pages/default.aspx>

## 2016 HIGHLIGHTS

.....  
It was **wetter** - **precipitation** was **above** average compared to the long-term historical average

.....  
It was **cooler** - **air temperatures** in spring were **lower** than the long-term historical average

.....  
The **highest** observed dissolved inorganic **nitrogen** (DIN) concentrations occurred in **winter** at Iron Pot Landing

.....  
**Algae blooms** were observed at all four sampling locations

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?

Precipitation is not changing

Air Temperature is not changing

Nutrients (nitrogen and phosphorus) vary across locations in terms of trends

Algae growth is increasing at one out of four locations

Dissolved Oxygen is decreasing at one out of four locations

## Chesapeake Bay Sampling Locations



## Trends in Weather & Water Quality\*

Location ID	Location Name	Air Temperature	Precipitation
JB	Jug Bay	—	—

Location ID	Location Name	Water Temperature	Salinity	Dissolved Oxygen	pH	Turbidity
IP	Iron Pot Landing	—	↑	—	↓	—
MC	Mataponi Creek	—	↑	—	—	↑
OC	Otter Point Creek	—	—	↓	↓	—
RR	Railroad	—	—	—	—	—

Location ID	Location Name	Ortho-phosphate	Ammonium	Nitrite	Nitrate	Chlorophyll-a
IP	Iron Pot Landing	↓	↑	—	↓	—
MC	Mataponi Creek	↑	↑	—	—	—
OC	Otter Point Creek	—	—	—	—	↑
RR	Railroad	↓	—	↓	↓	—

\*Based on data collected from 2007-2016

X Insufficient Data   ↑ Increasing   — Not Changing   ↓ Decreasing

## Weather & Climate – What is the Difference?

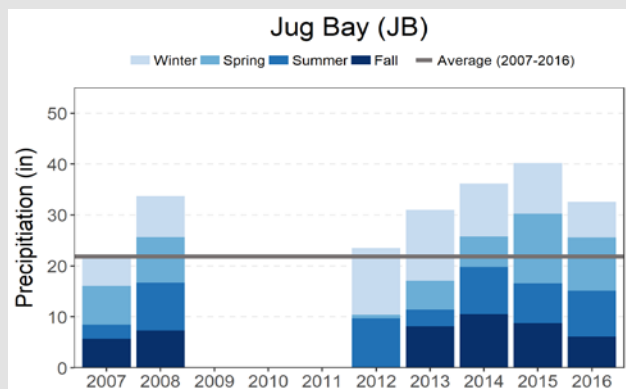
**WEATHER** is what you see outside on any particular day in terms of precipitation, temperature, humidity, cloudiness, visibility and wind.



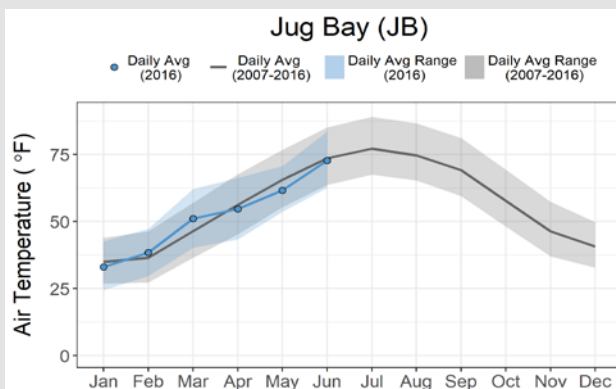
**CLIMATE** tells us the average daily weather for an extended period of time (years, decades, centuries) at a certain location.

## Weather Can Have A Major Impact On Water Quality

### Precipitation & Air Temperature



Precipitation was ~10 inches greater than the long-term historical average in 2016



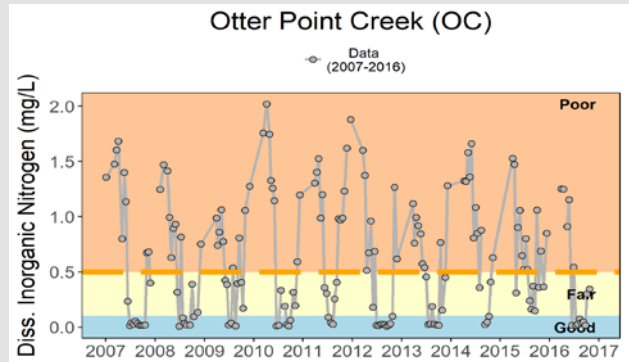
Air Temperature was cooler in April and May of 2016 compared to the long-term historical average

*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?

Phytoplankton (also called microalgae) are tiny, plant-like organisms that need nutrients (nitrogen and phosphorus) to grow. Phytoplankton are critical to estuarine and ocean health. However, some conditions, such as excess nutrients, can cause phytoplankton blooms. The blooms can decrease the dissolved oxygen underwater life needs to survive, negatively impact human health, and close fishery harvest areas.

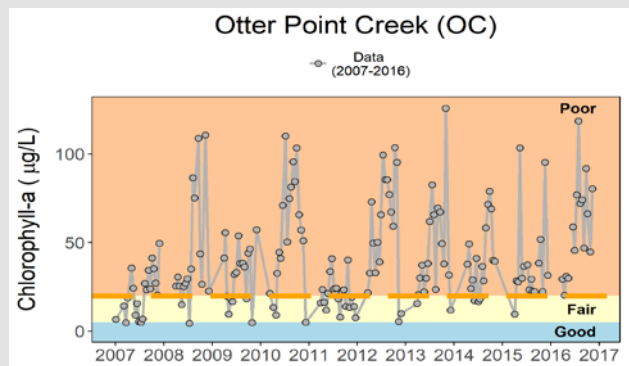
## Nitrogen



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

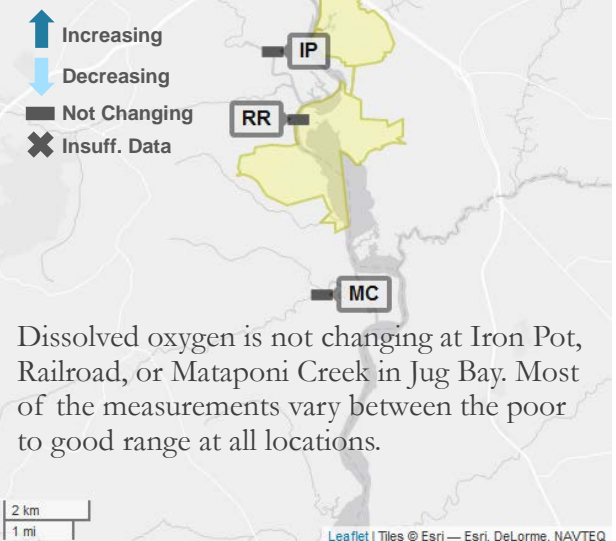
Dissolved inorganic nitrogen (DIN) is the type of nitrogen in the water phytoplankton need to grow. At CBM NERR, data show that DIN concentrations are not changing over the long-term at three locations and are decreasing at one location. Most of the measurements are in the fair to good range. The critical threshold of 0.5 mg/L is exceeded, at times, at all locations. Concentrations most often exceed the critical threshold at Otter Point Creek.

## Algae



Phytoplankton growth is measured by chlorophyll a concentrations. At CBM NERR, data show that chlorophyll a levels are not changing over the long-term at the three locations and are decreasing at one location. Most of the measurements are in the poor to good range. Concentrations exceed the critical threshold of 20 µg/L, at times, at all sampling locations. Concentrations most often exceed the critical threshold at Otter Point Creek.

## How is Oxygen Changing?



Dissolved oxygen is not changing at Iron Pot, Railroad, or Mataponi Creek in Jug Bay. Most of the measurements vary between the poor to good range at all locations.

## 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 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.

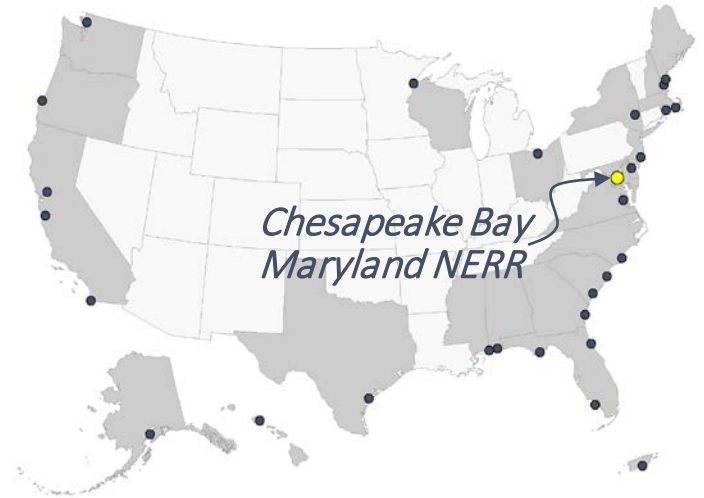
## Habitat Diversity



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.

## 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 NOAA  
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(555) 555-1212

Chesapeake Bay – Maryland NERR -  
providing the science needed  
for today and tomorrow

