

ESTUARY TRENDS: WEATHER & WATER QUALITY

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



Photo Credit: Julie Drevenkar

Rookery Bay National Estuarine Research Reserve (NERR)

This Florida reserve is a prime example of a nearly pristine subtropical, mangrove forested estuary. Located south of Naples on the Florida Gulf coast, the total estimated surface area of open waters within the boundary is 70,000 acres--64 percent of the reserve. The remaining 40,000 acres are primarily mangroves, fresh to brackish water marshes, and upland habitats. A myriad of wildlife thrive in this estuarine environment and surrounding uplands. For more information go to:

<https://rookerybay.org/>

2024 HIGHLIGHTS

.....

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

.....

It was **warmer** –**air temperatures** were warmer compared to long-term historical average

.....

Dissolved inorganic **nitrogen** (DIN) concentrations were low for most of the year at all locations

.....

All **algal** readings were in the good to fair range for the year at all 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?

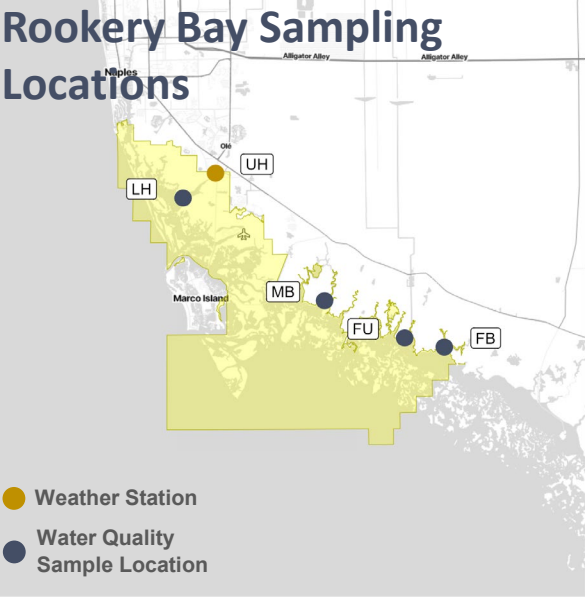
Precipitation is increasing

Air Temperature is increasing

Phosphorus (ortho-phosphate) is increasing at two out of four locations

Algae growth is not changing

Dissolved Oxygen is decreasing at three out of four locations



Trends in Weather & Water Quality*

Location ID	Location Name	Air Temperature	Precipitation
UH	Upper Henderson Creek	↑	↑

Location ID	Location Name	Water Temperature	Salinity	Dissolved Oxygen	pH	Turbidity
FB	Fakahatchee Bay	↑	↓	↓	—	↓
FU	Faka Union Bay	↑	↓	↓	—	↓
LH	Lower Henderson Creek	↑	↓	—	—	↓
MB	Middle Blackwater River	↑	↓	↓	↓	↓

Location ID	Location Name	Ortho-phosphate	Ammonium	Nitrite	Nitrate	Algae
FB	Fakahatchee Bay	—	—	—	—	—
FU	Faka Union Bay	—	—	—	—	—
LH	Lower Henderson Creek	↑	↓	↓	—	—
MB	Middle Blackwater River	—	↓	↓	↓	—

*Based on data collected from 2000-2024

X Insufficient Data ↑ Increasing — Not Changing ↓ Decreasing

Weather & Climate – What is the Difference?

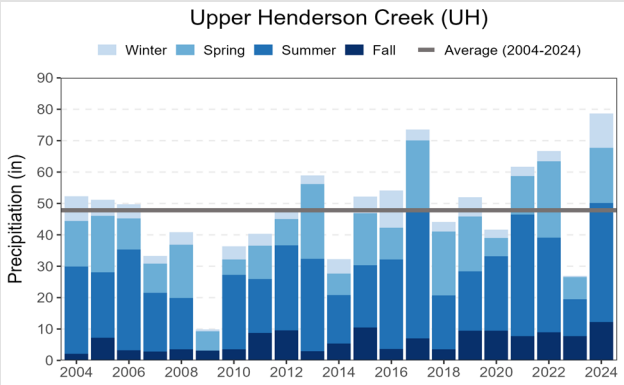
WEATHER is what you see outside on any particular day in terms of precipitation, temperature, humidity, cloudiness, visibility and wind.



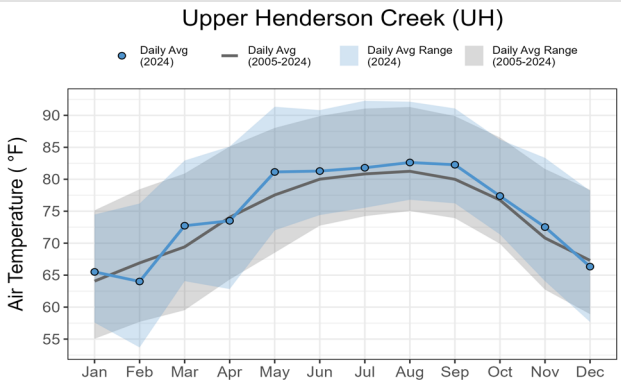
CLIMATE tells us the average daily weather for an extended period of time (years, decades, centuries) at a certain location.

Weather Can Have A Major Impact On Water Quality

Precipitation & Air Temperature



Rainfall was ~30 inches greater than the long-term historical average in 2024.



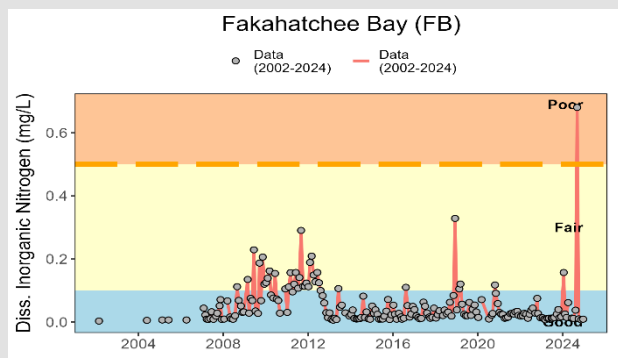
Air Temperature in 2024 was above average most of the year.

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.

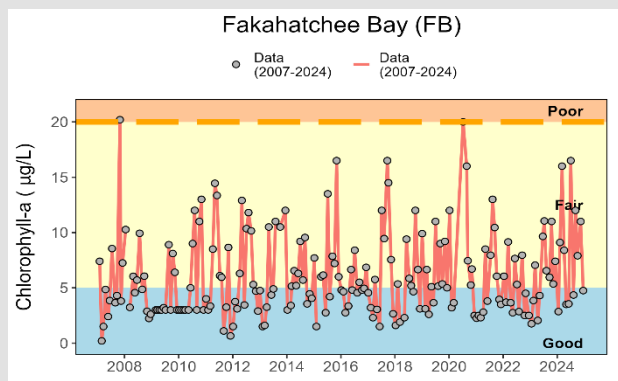
Nitrogen



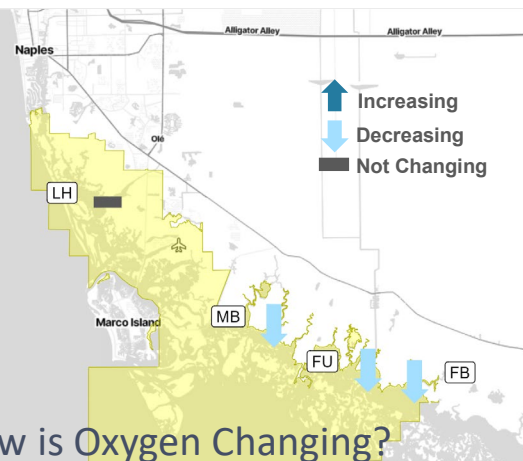
A critical threshold value is used to determine if a water quality measurement is at a level where negative impacts may occur.

Dissolved inorganic nitrogen (DIN) is the type of nitrogen in the water phytoplankton need to grow. At Rookery Bay NERR, data show that DIN concentrations are not changing over the long-term. Measurements are in the fair to good range. The critical threshold of 0.5 mg/L (Poor) was exceeded at all 4 of the Rookery Bay sampling locations in 2024.

Algae



Phytoplankton growth is measured by chlorophyll a concentrations. At Rookery Bay NERR, data show that chlorophyll a levels are slightly increasing in 2 stations over the long-term. Most of the measurements are in the fair to good range.



How is Oxygen Changing?

Dissolved oxygen decreased at 3 sites. 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

Photo Credit: Julie Drevencar

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.

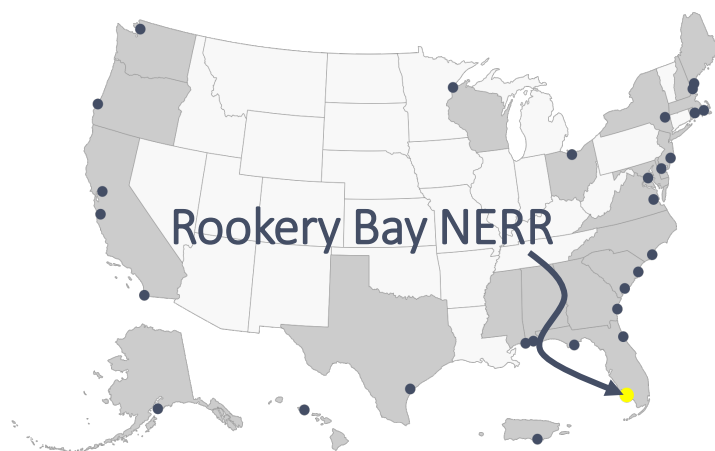
Habitat Diversity



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 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://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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Rookery Bay NERR - providing the science needed for today and tomorrow



NATIONAL
ESTUARINE
RESEARCH
RESERVE
SYSTEM

