Managing the water quality and natural resources of Sarasota Bay -

What has been done, and is it working?

SARASOTA BAY ESTUARY PROGRAM
RESTORING OUR BAYS

A healthy bay is important to our quality of life

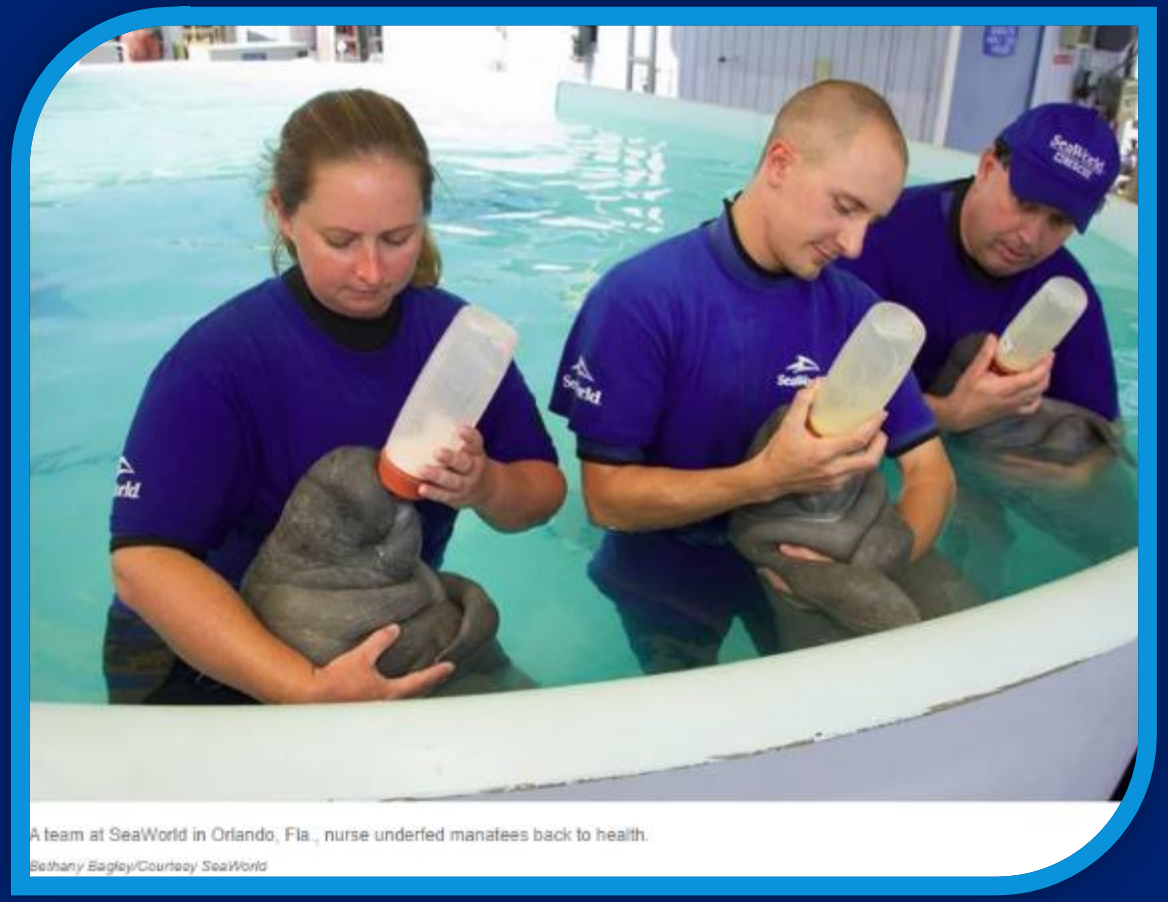
SARASOTA BAY ESTUARY PROGRAM

A healthy bay is important to our economy

Many bay habitats depend on good water quality

SARASOTA BAY ESTUARY PROGRAM

Much of our wildlife depends on habitats that require good water quality



A team at SeaWorld in Orlando, Fla., nurse underfed manatees back to health.

Bethany Bagley/Courtesy SeaWorld

Over 3,000 manatees have died over the last few years

An “unusual mortality event” driven mostly by starvation

Over 150 square miles of seagrass have been lost over the past 20 years

–

not just in the IRL

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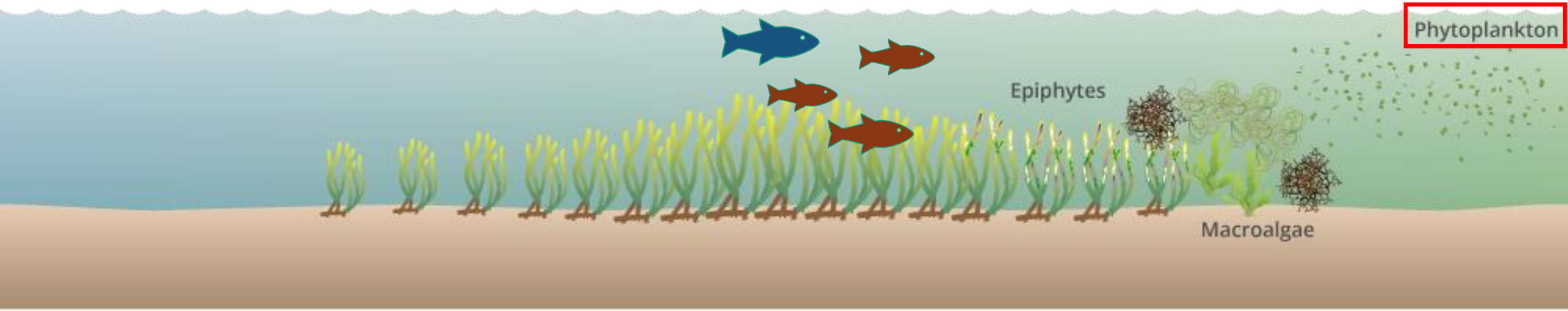
Managing Sarasota Bay Means Managing Nitrogen

The only thing you ***have to*** monitor is the water column



Conceptual diagram illustrating the effect of nutrients of aquatic primary producers

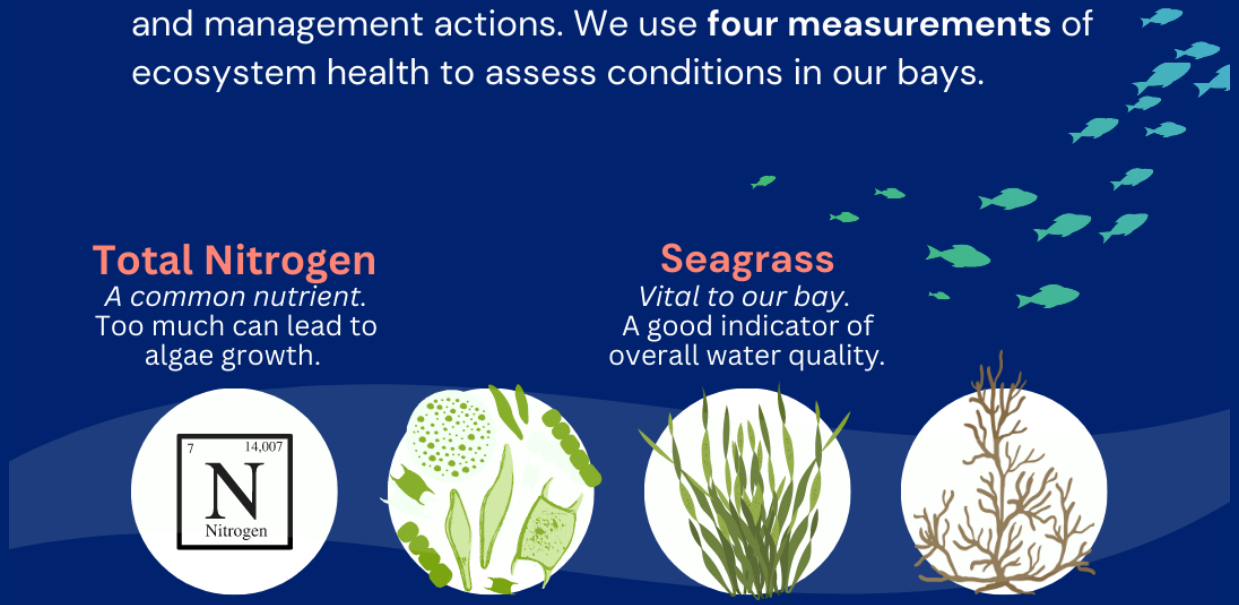
Diagram courtesy of the Integration and Application Network (ian.umces.edu), University of Maryland Center for Environmental Science. Source:

ian.umces.edu

SARASOTA BAY ESTUARY PROGRAM

WHAT IS THE BAY REPORT CARD?

Every year, we create an **Ecosystem Health Report Card** to track conditions in each of our five bay segments. The report card is intended to guide and prioritize monitoring and management actions. We use **four measurements** of ecosystem health to assess conditions in our bays.



Total Nitrogen
A common nutrient.
Too much can lead to algae growth.

Seagrass
Vital to our bay.
A good indicator of overall water quality.

Chlorophyll-a
Floating microscopic algae.
Too much can impact water clarity.

Macroalgae
Known as seaweeds.
Can be harmful to bay health when present in high quantities.

HOW DO WE SCORE?

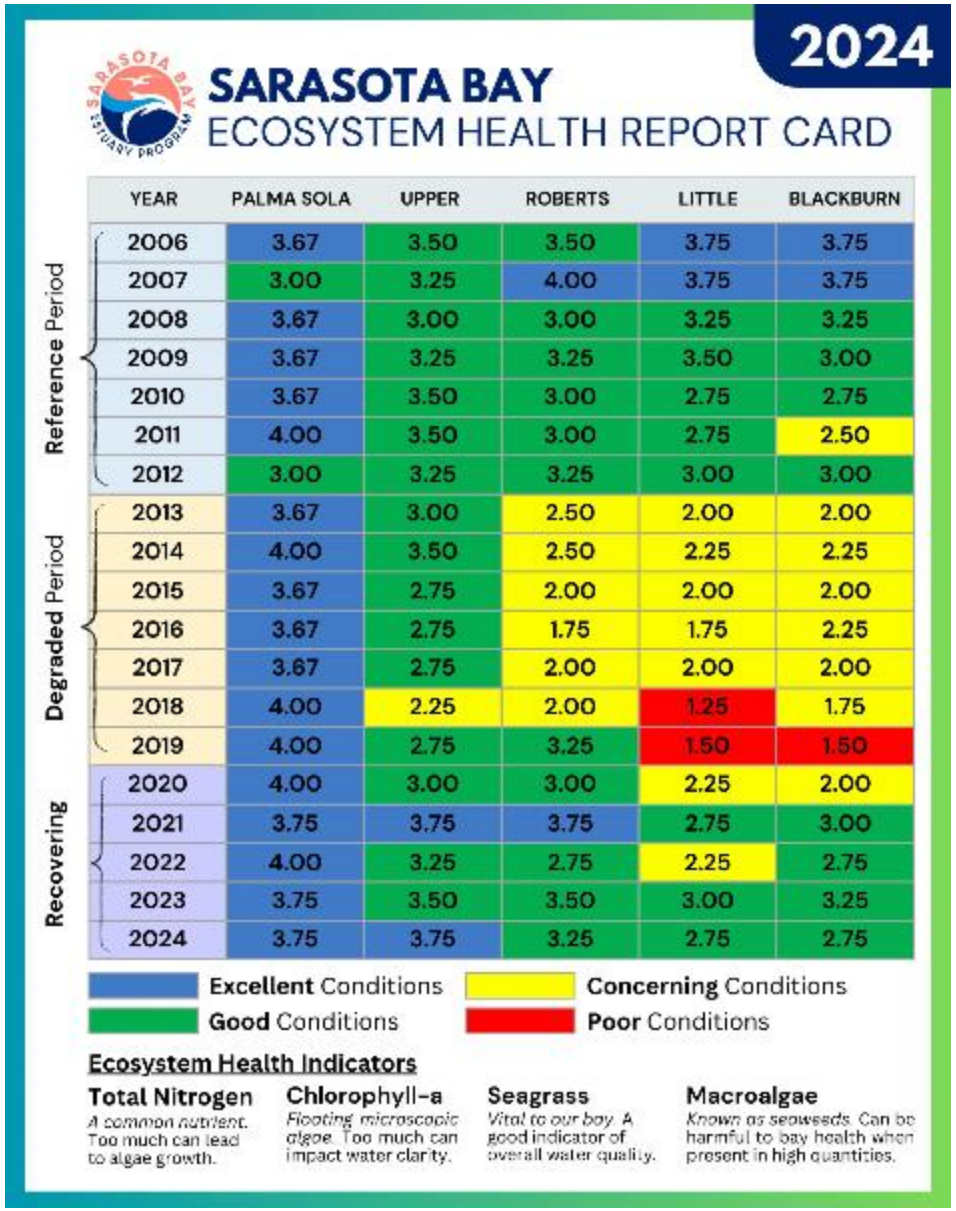
We assign each bay segment one of four scores for each year based on the status of that bay segment's ecosystem health indicators. We encourage continued monitoring in bay segments with good scores while bays with poorer scores require more attention.

One poor score may not indicate an ongoing problem, but a bay with several years of yellow or red scores almost certainly needs scrutiny and management action.

A	**All signs indicate healthy water quality; continue to monitor as usual**
B	**Most signs indicate healthy water quality; monitor carefully**
C	**One or more signs indicate concern; investigate stressors, check for compliance with wastewater and stormwater permits, and plan for management actions**
D	**All signs indicate water quality degradation; take management actions**

SARASOTA BAY ESTUARY PROGRAM

Bay segments used in our Ecosystem Health Report Card



2024

SARASOTA BAY
ECOSYSTEM HEALTH REPORT CARD

	YEAR	PALMA SOLA	UPPER	ROBERTS	LITTLE	BLACKBURN
Reference Period	2006	3.67	3.50	3.50	3.75	3.75
	2007	3.00	3.25	4.00	3.75	3.75
	2008	3.67	3.00	3.00	3.25	3.25
	2009	3.67	3.25	3.25	3.50	3.00
	2010	3.67	3.50	3.00	2.75	2.75
	2011	4.00	3.50	3.00	2.75	2.50
	2012	3.00	3.25	3.25	3.00	3.00
Degraded Period	2013	3.67	3.00	2.50	2.00	2.00
	2014	4.00	3.50	2.50	2.25	2.25
	2015	3.67	2.75	2.00	2.00	2.00
	2016	3.67	2.75	1.75	1.75	2.25
	2017	3.67	2.75	2.00	2.00	2.00
	2018	4.00	2.25	2.00	1.25	1.75
	2019	4.00	2.75	3.25	1.50	1.50
Recovering	2020	4.00	3.00	3.00	2.25	2.00
	2021	3.75	3.75	3.75	2.75	3.00
	2022	4.00	3.25	2.75	2.25	2.75
	2023	3.75	3.50	3.50	3.00	3.25
	2024	3.75	3.75	3.25	2.75	2.75

Excellent Conditions
Good Conditions
Concerning Conditions
Poor Conditions

Ecosystem Health Indicators

Total Nitrogen *A common nutrient. Too much can lead to algae growth.*

Chlorophyll-a *Floating microscopic algae. Too much can impact water clarity.*

Seagrass *Vital to our bay. A good indicator of overall water quality.*

Macroalgae *Known as seaweeds. Can be harmful to bay health when present in high quantities.*

Ecosystem Health Report Card

Reference period

Across the bay, healthier conditions during the **reference period**. Better water quality, less macroalgae, ca. 30% increase in seagrass

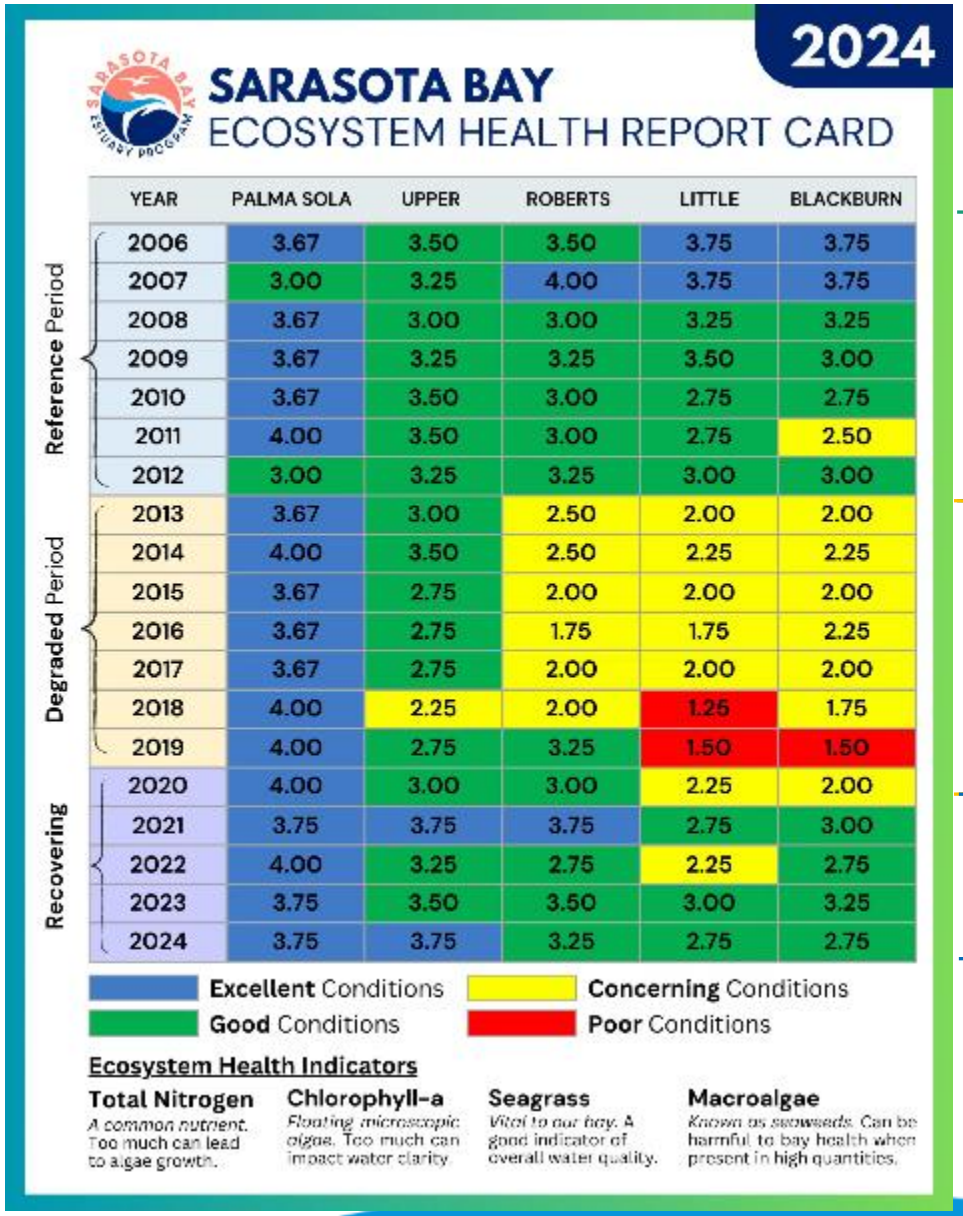
Degraded period

During the **degraded period**, worse water quality, more macroalgae, and ca. 30% seagrass loss

Improving trends

Despite Piney Point in 2021, Hurricane Ian and Tropical Storm Nicole in 2022, evidence of **improving conditions**

Why the likely decline in ecosystem health?



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	2011	4.00	3.50	3.00	2.75	2.50
	2012	3.00	3.25	3.25	3.00	3.00
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	2014	4.00	3.50	2.50	2.25	2.25
	2015	3.67	2.75	2.00	2.00	2.00
	2016	3.67	2.75	1.75	1.75	2.25
	2017	3.67	2.75	2.00	2.00	2.00
	2018	4.00	2.25	2.00	1.25	1.75
	2019	4.00	2.75	3.25	1.50	1.50
Recovering	2020	4.00	3.00	3.00	2.25	2.00
	2021	3.75	3.75	3.75	2.75	3.00
	2022	4.00	3.25	2.75	2.25	2.75
	2023	3.75	3.50	3.50	3.00	3.25
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Excellent Conditions
Good Conditions
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Poor Conditions

Ecosystem Health Indicators

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Reference period

Degraded period

Improving trends

During the degraded period, *dissolved inorganic nitrogen (DIN) loads were 20% higher* (nitrogen load reduction target; SBEP, 2021)

Why the focus on DIN loads?

- Total Nitrogen (TN) includes different fractions
  - Particulate nitrogen (>0.45 microns)
    - Not readily available until broken down and remineralized
  - Dissolved organic nitrogen
    - <0.45 microns, needs to be remineralized
      - Labile – available in hours to days
      - Refractory – available only after days to weeks – if then
  - Dissolved inorganic nitrogen
    - Immediately available for algal uptake

- Stormwater runoff – 30% DIN
  - 0.3 to 0.6 mg/L
- Wastewater – 80 to 90% DIN
  - 2 to 18 mg/L

Our management paradigm

- Regulatory guidance considers all sources of nitrogen loads equally important for management. However…
  - Organic nitrogen (ON) is not readily available for phytoplankton uptake (Seitzinger et al. 2002, Bronk et al. 2006, Urgun-Demirtas et al. 2008)
  - The residence time of estuaries can be less than the time required for remineralization of ON (Seitzinger et al. 2002)
- *SBEP operates on the belief that DIN loads are the most important (not sole) nitrogen loads to get under control*

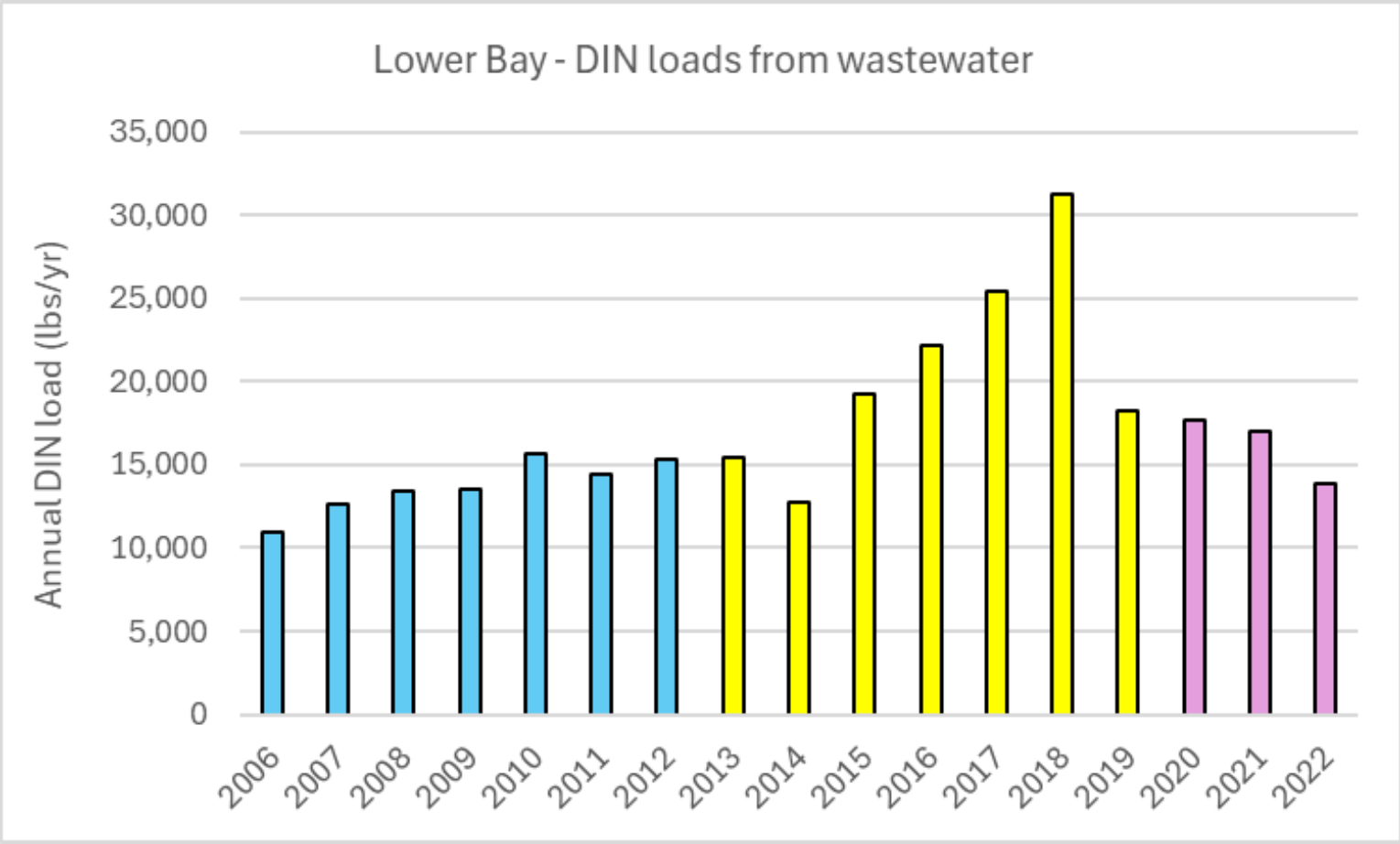
What about stormwater?

- A ton of nitrogen from stormwater runoff is likely more impactful than a ton from atmospheric deposition
- But…not likely as impactful as a ton from wastewater
- Does NOT mean ignore stormwater
  - ***But, retrofitting stormwater loads without addressing wastewater? Not likely to be successful***
- Also, wet detention ponds do a MUCH better job of reducing DIN loads than TN loads
  - 70% vs. 30% (Tomasko et al. 2013, and references within)
- Our focus is on reducing stormwater loads from older development, not changing rules for new development

Actions that can reduce DIN loads by 20% (12 tons)

- Reclaimed water - 20 tons/yr
- Wastewater spills and overflows – up to 15 tons/yr
- Stormwater (>100 tons/yr)
- It appears that the 20% load reduction target **(for DIN, not TN)** *has already been achieved*

Changes in DIN loads to lower bay



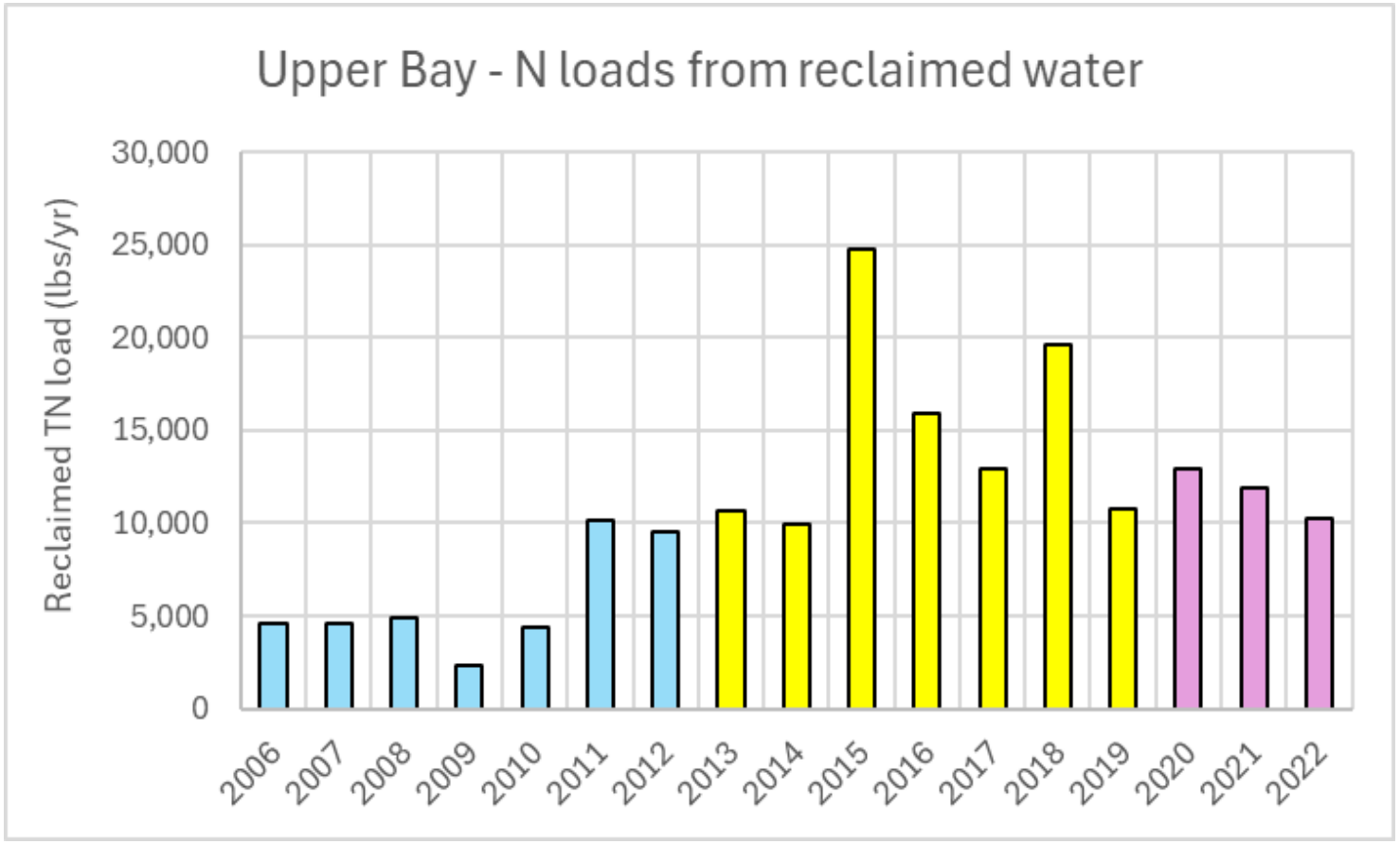
Wastewater DIN loads:

50% increase (on average) from reference to degraded periods

22% decrease (on average; so far) from degraded to recovering periods

Over 8 tons/ yr decline from 2018 to 2022

Changes in DIN loads to upper bay



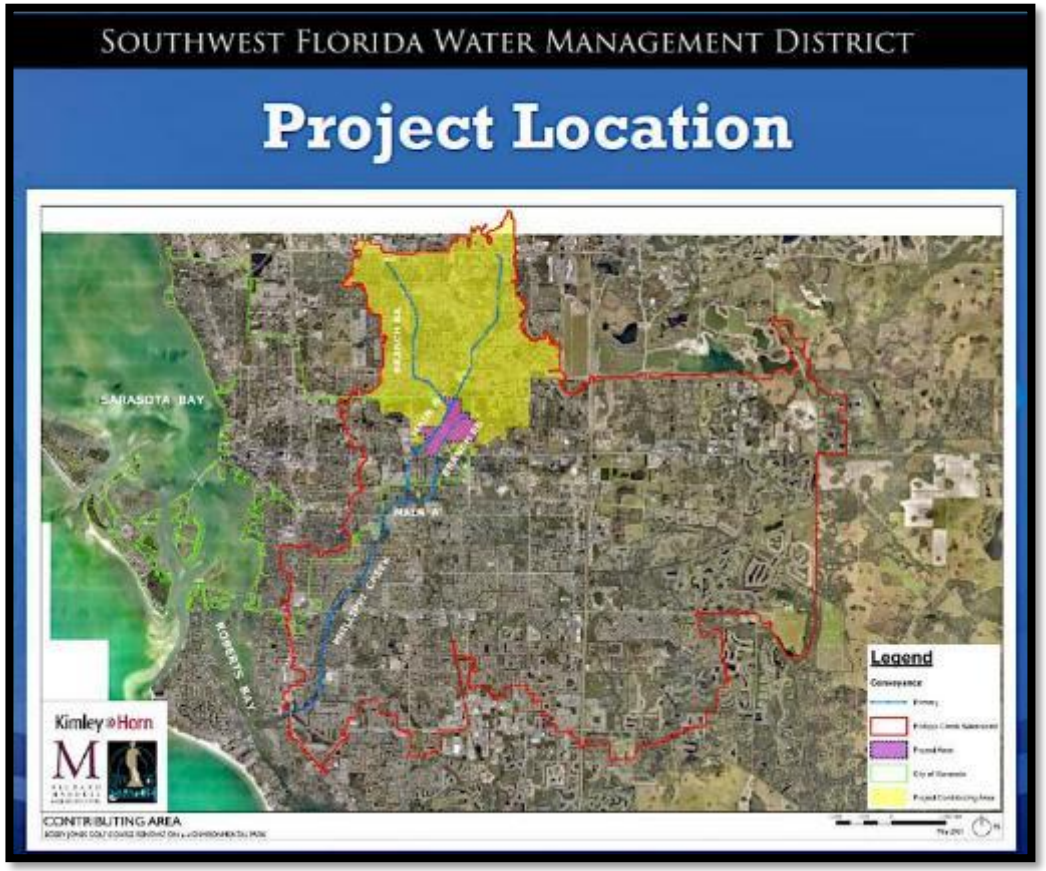
Reclaimed water DIN loads:

150 % increase (on average) from reference to degraded periods

Upgrade to Manatee County SW Treatment Plant completed in 2017 (from ca. 13 to ca. 7 mg TN/L)

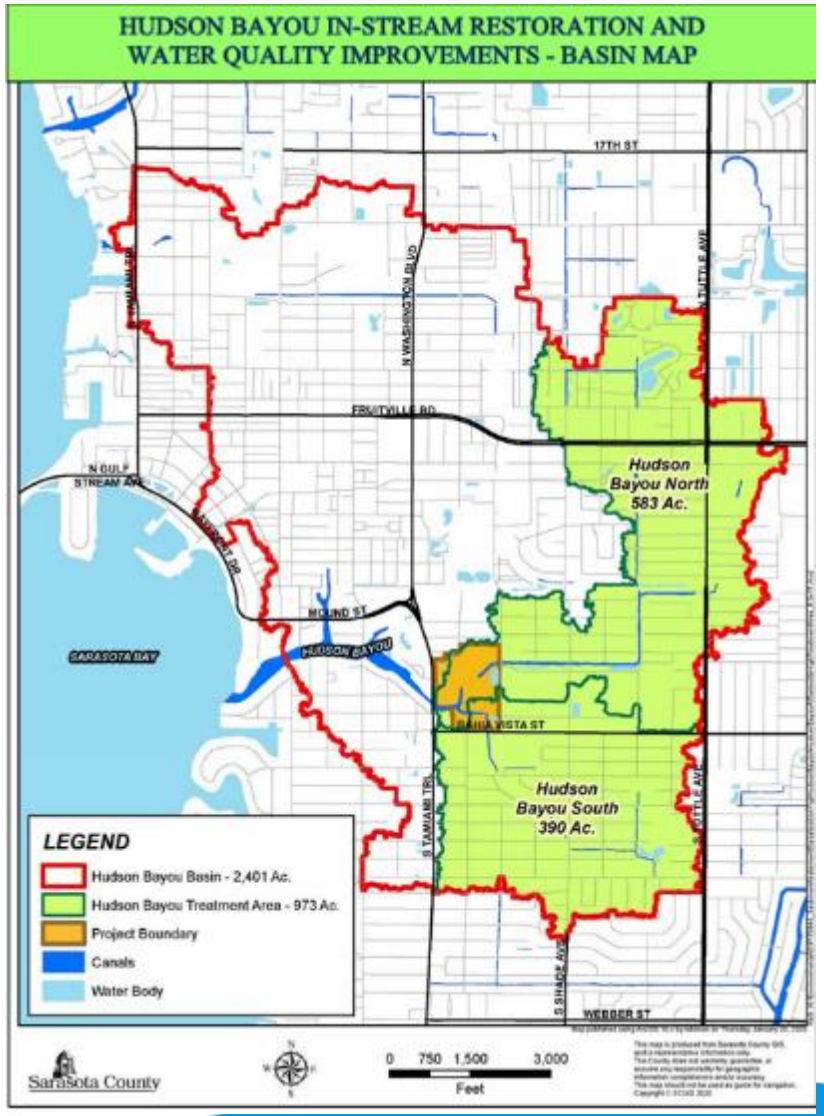
Approximate 10 tons/ yr decline from 2018 to 2022

Regional stormwater retrofit projects – Bobby Jones Golf Course

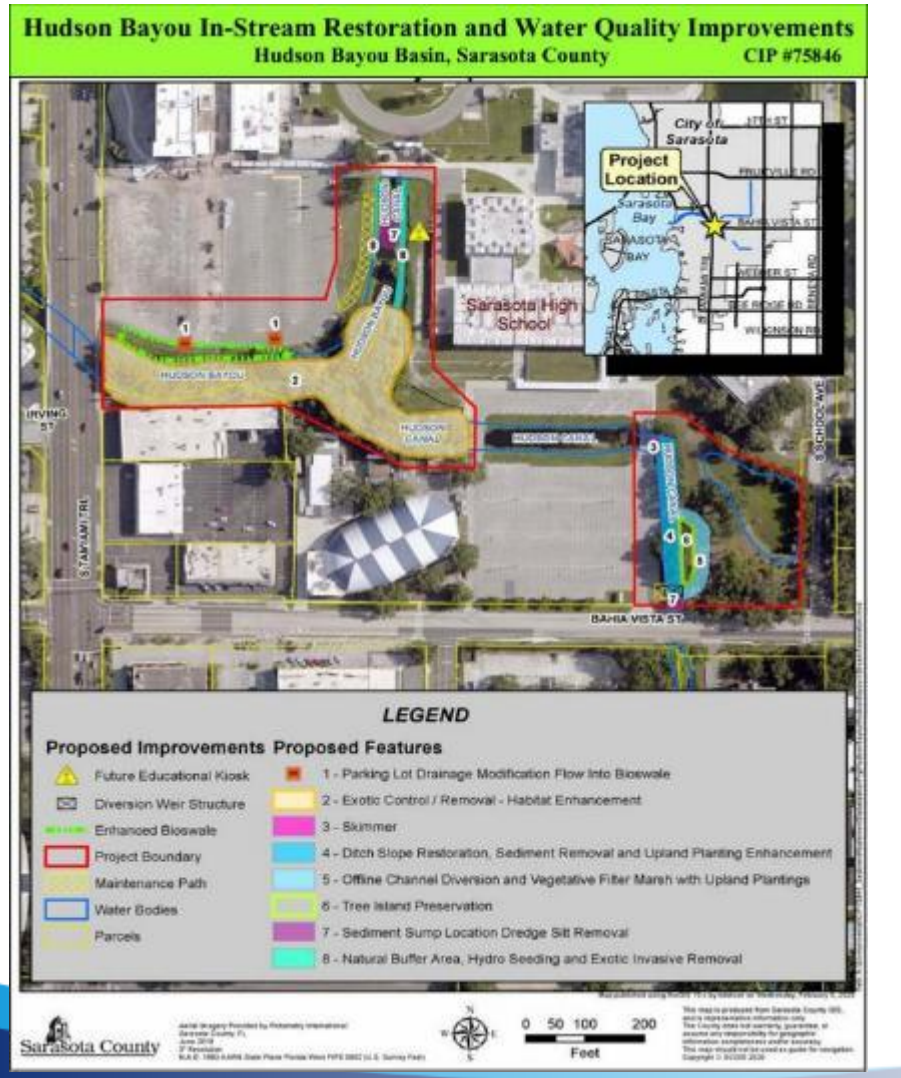


Treats 5,800-acre watershed
Estimated removal >900 lbs TN/yr

Hudson Bayou In-Stream Retrofit

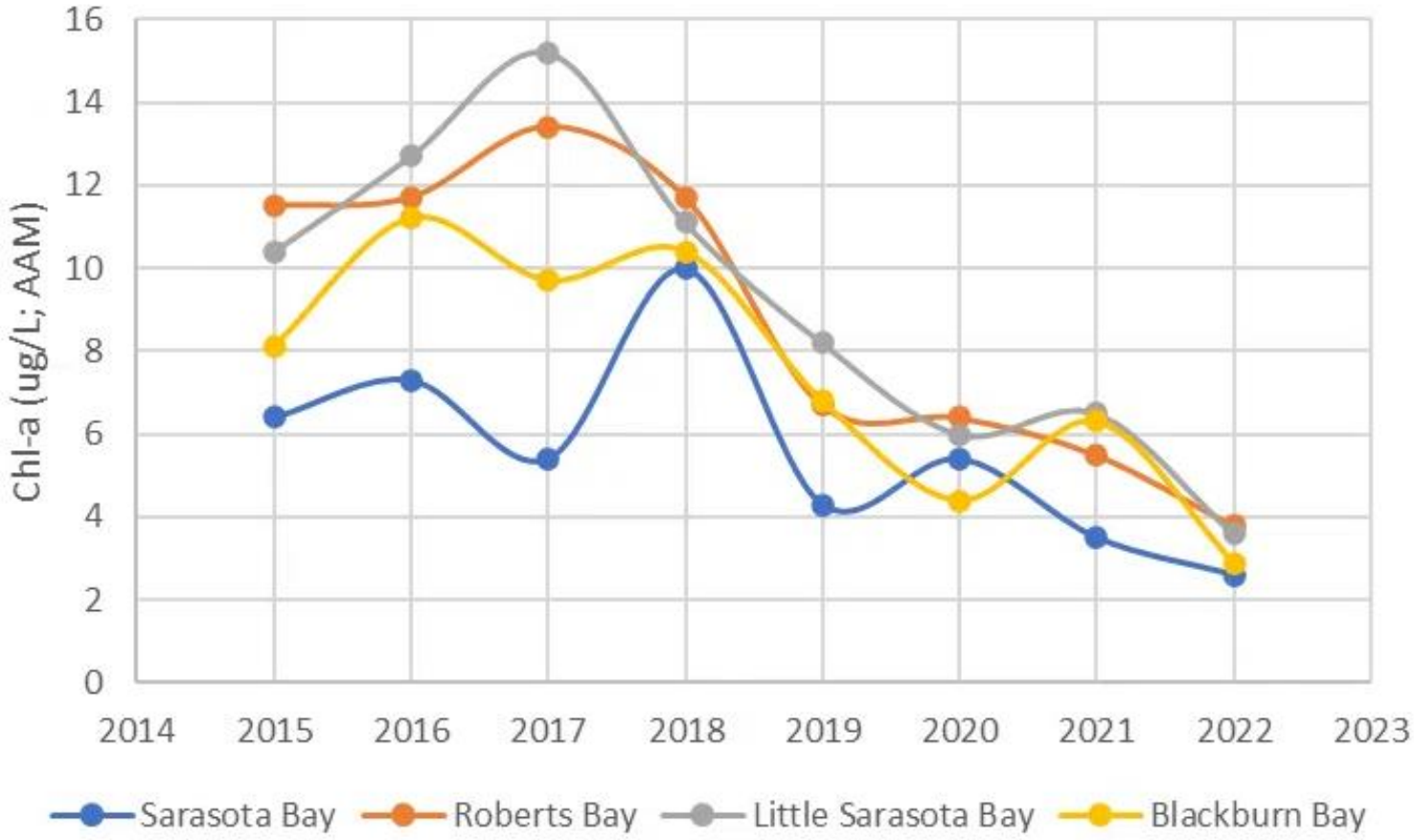


Treats 970-acre watershed
Estimated removal >150 lbs TN/yr

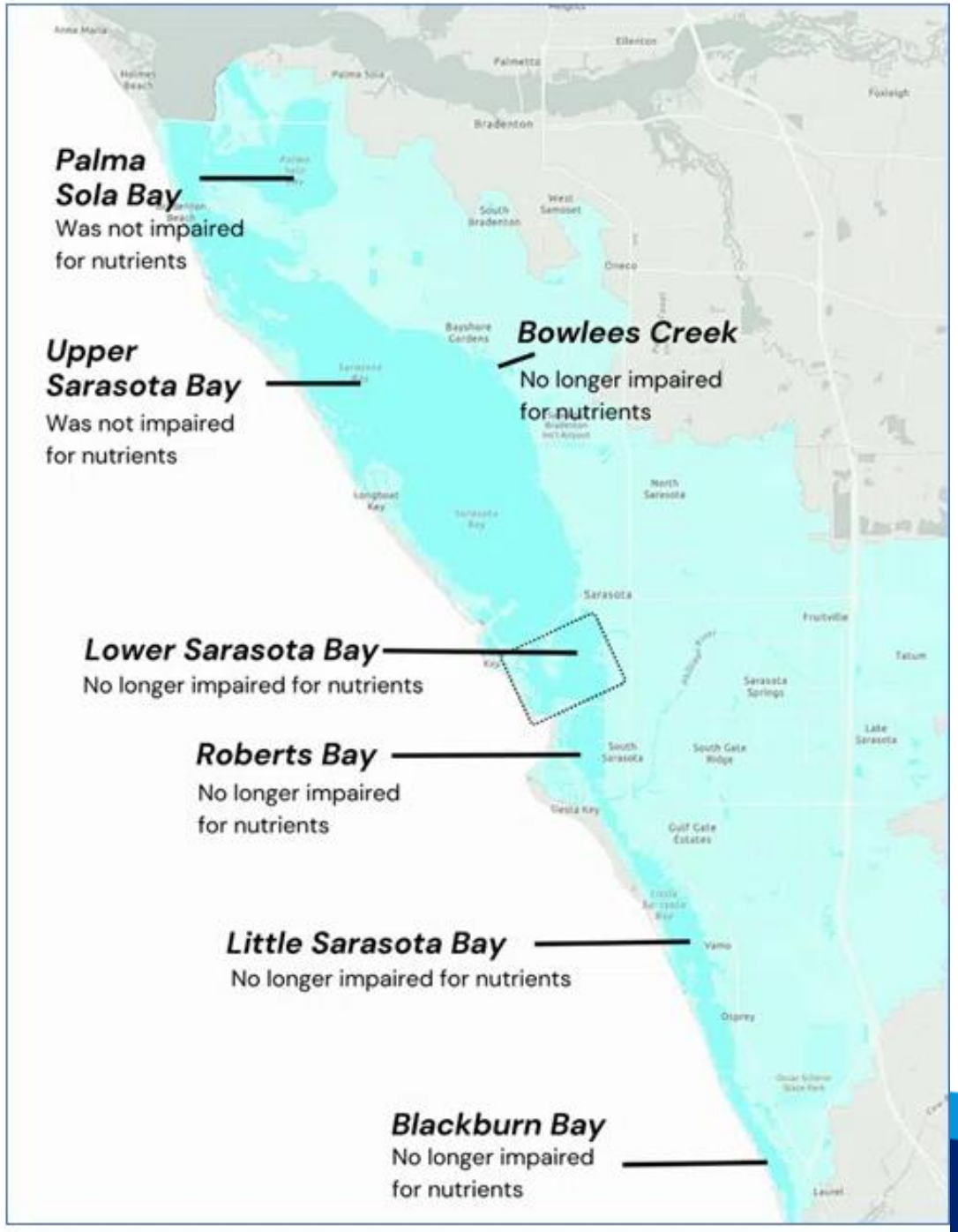


How did our bay respond?

Widespread improvements in water quality



>50% decline in Chl-a between 2015 and 2022



Sarasota Bay is no longer “impaired” for nutrients (FDEP, 2023)

These actions match up with recent improvements

- **$25 million** spent by Manatee County to upgrade SWRWRF
- **$1 million** spent by SWFWMD and Sarasota County on stormwater retrofit at Hudson Bayou (800 acres)
- **$250 million** by Sarasota County to expand and upgrade Bee Ridge WWTP
- **$3 million** by SWFWMD and City of Sarasota on Bobby Jones stormwater retrofit (5,700 acres)
- **$1.8 million** from EPA for FISH Preserve Phase IV, GT Bray, and restarting artificial reef program

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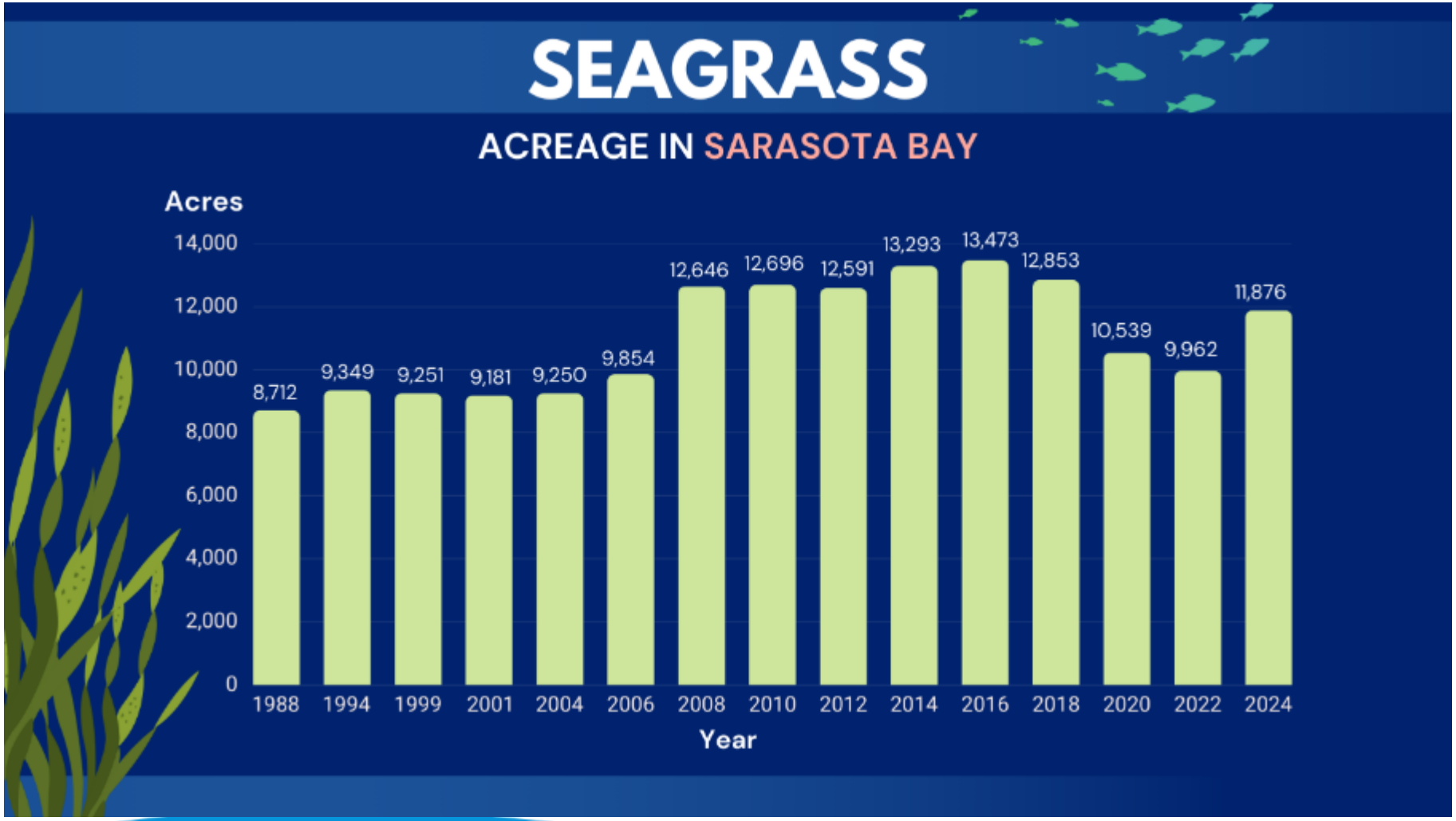
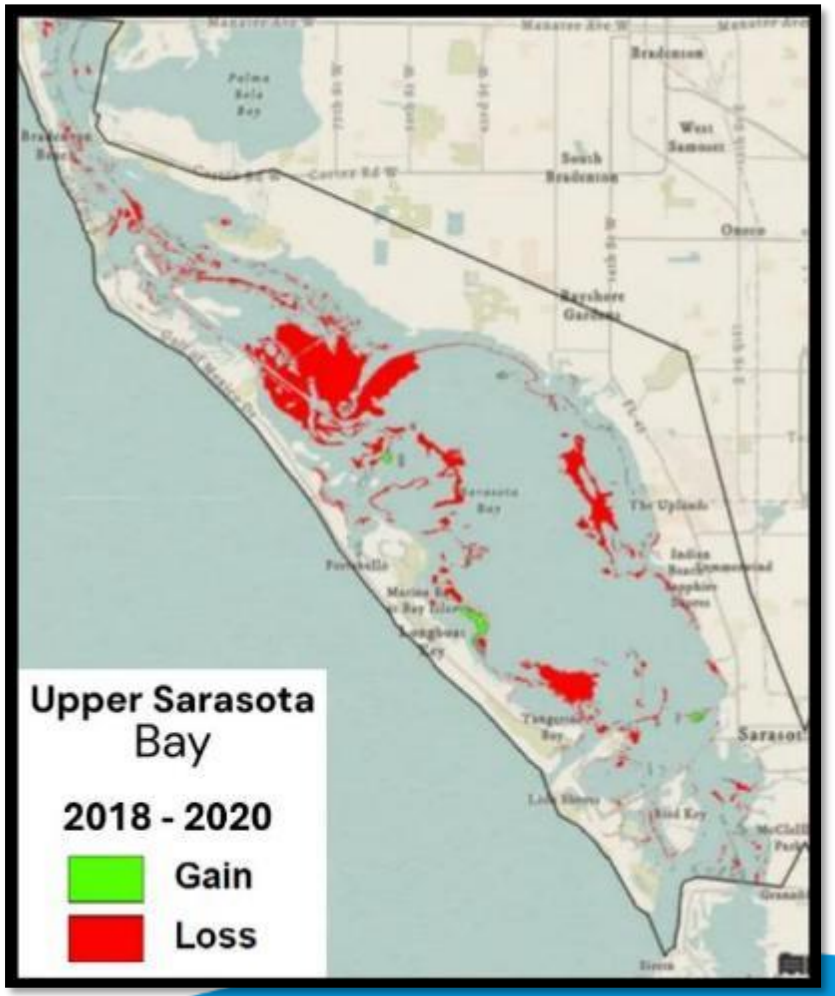
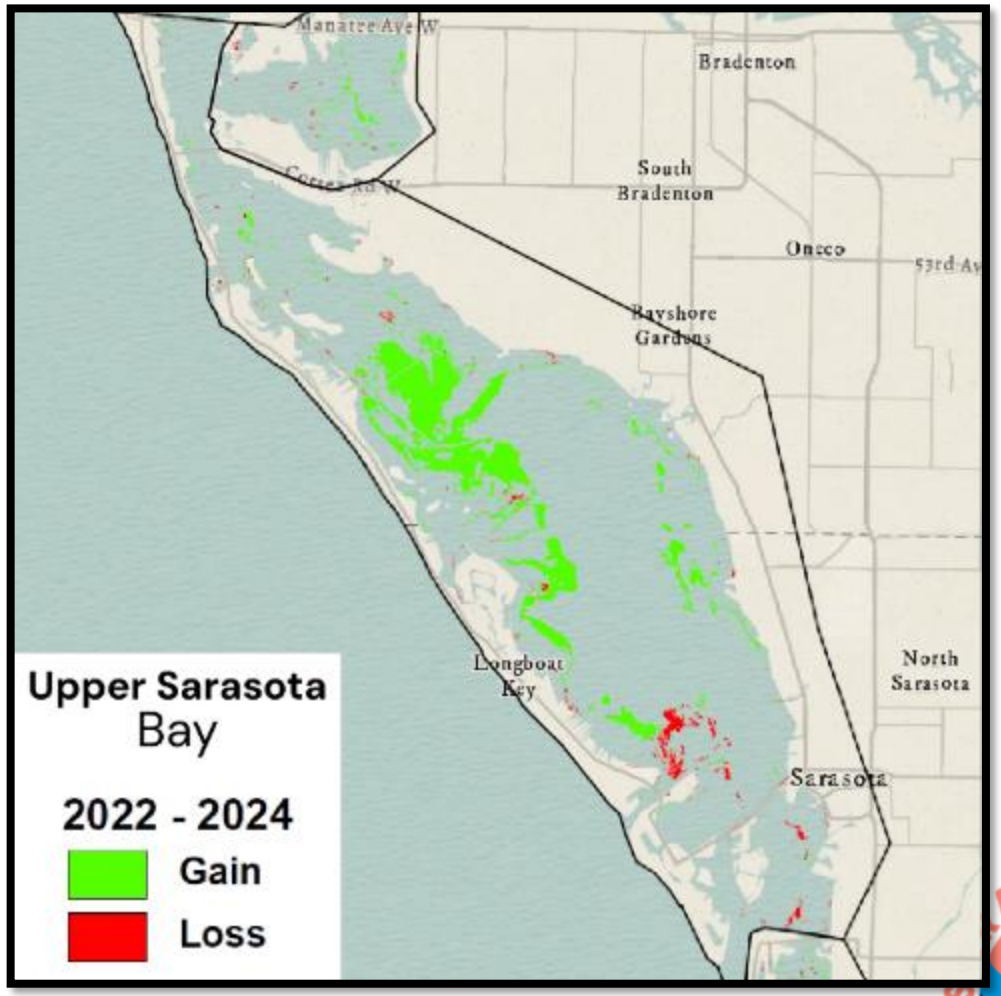
Second biggest increase in 30 years



Most of the increase is recovery from prior decreases





Wildlife benefits of substantial increase in seagrass acreage

Great news, but we must still be vigilant…

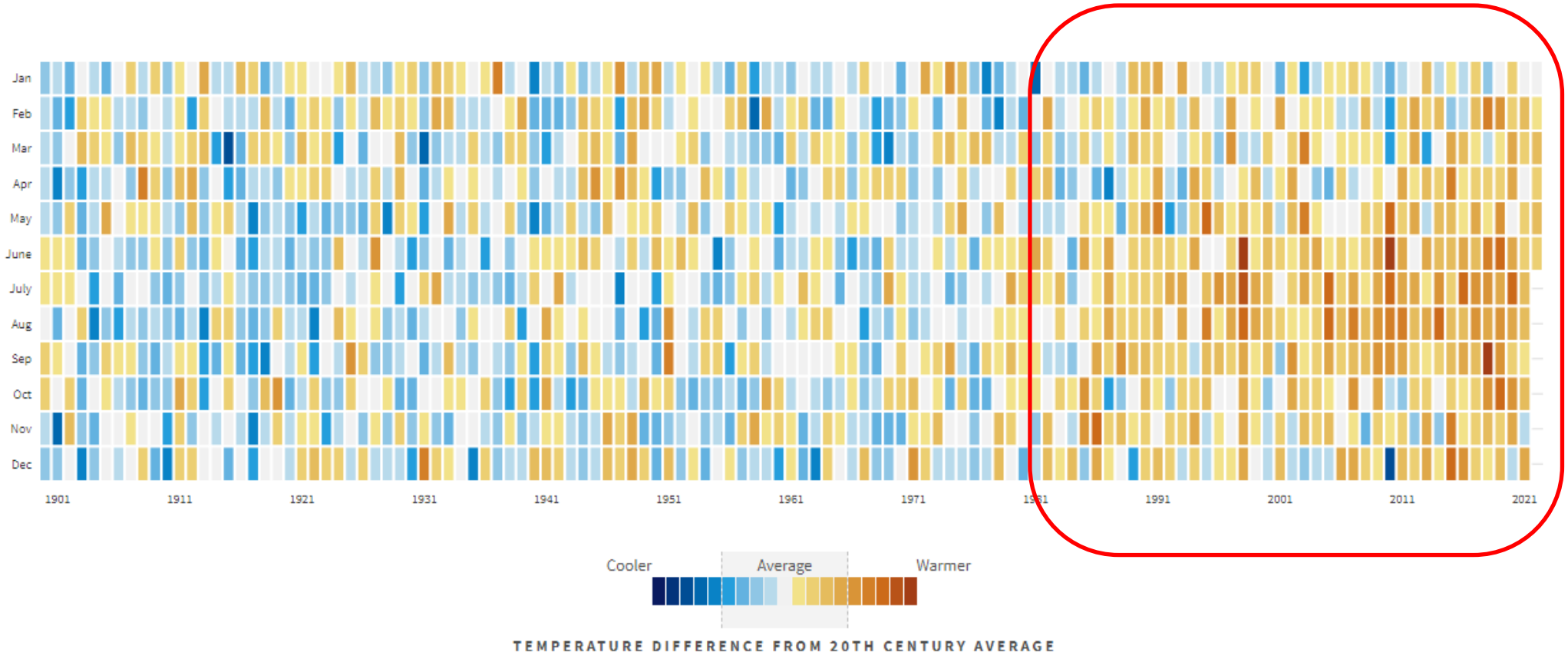
Our population will continue to grow across the watershed

- We have a “hold the line” strategy
- Focus on the next 30 years

Our climate is changing in ways that will complicate our efforts

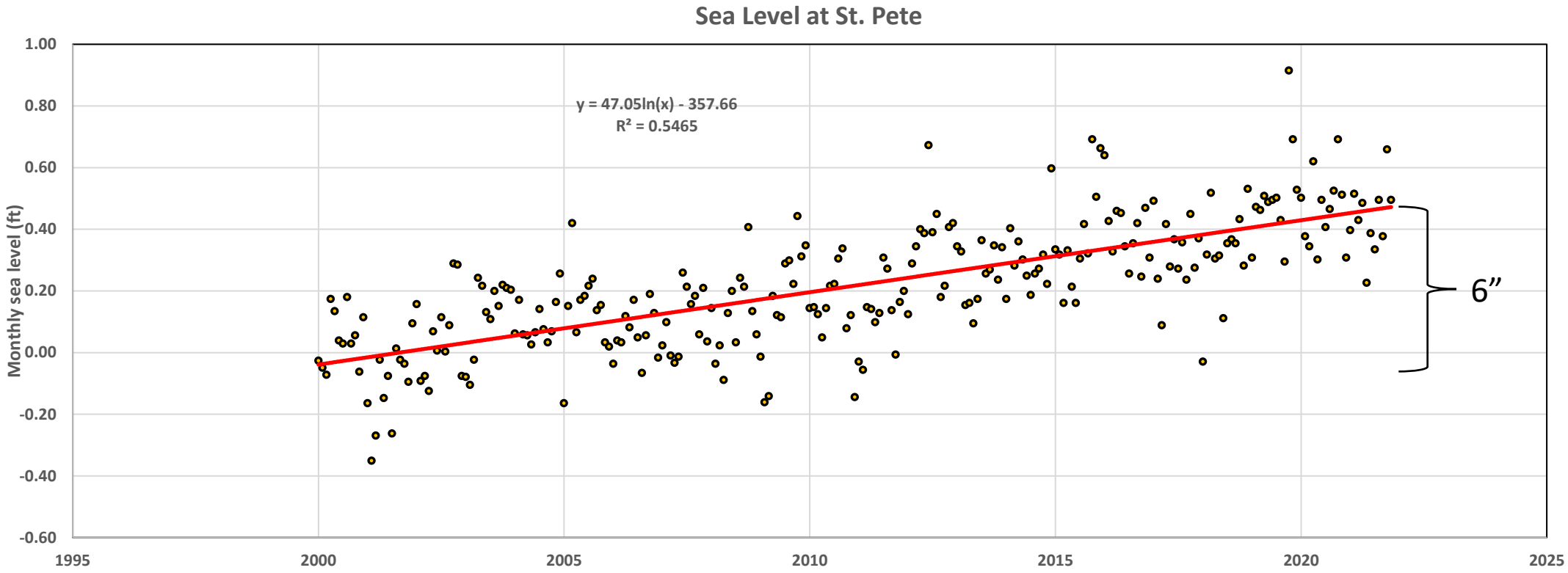
- Sea level
- Temperatures
- Tropical events

Overall trend of increased air temperatures across most of the year

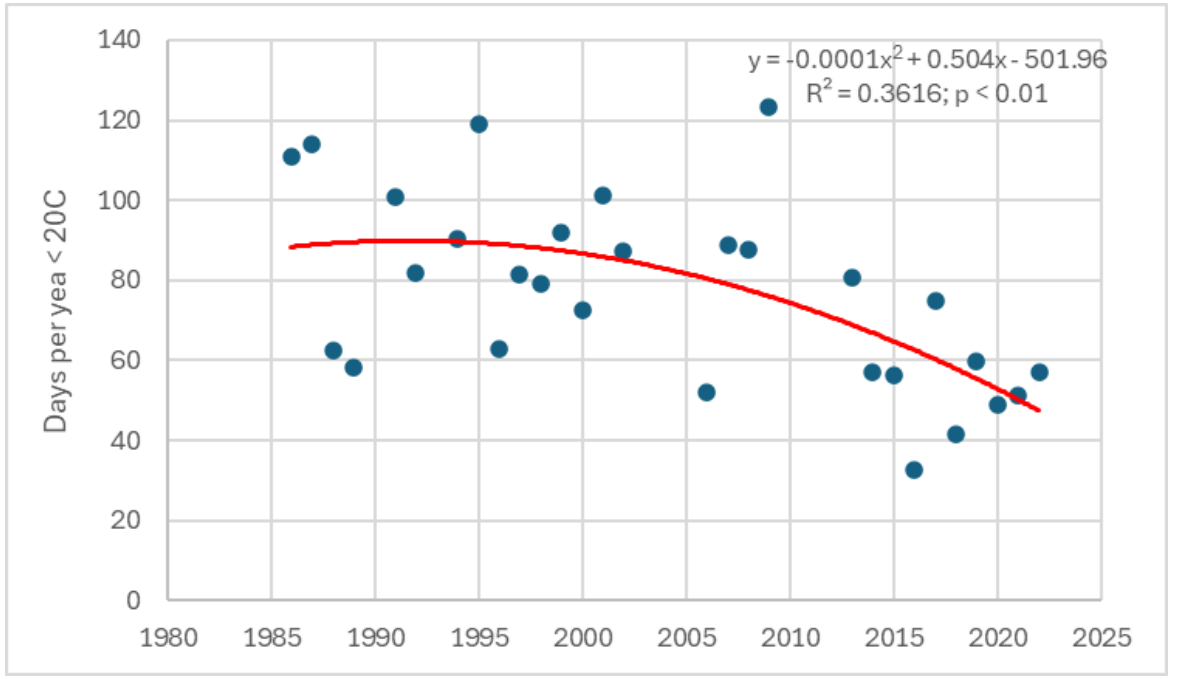


[Climate in Sarasota County, Florida |]

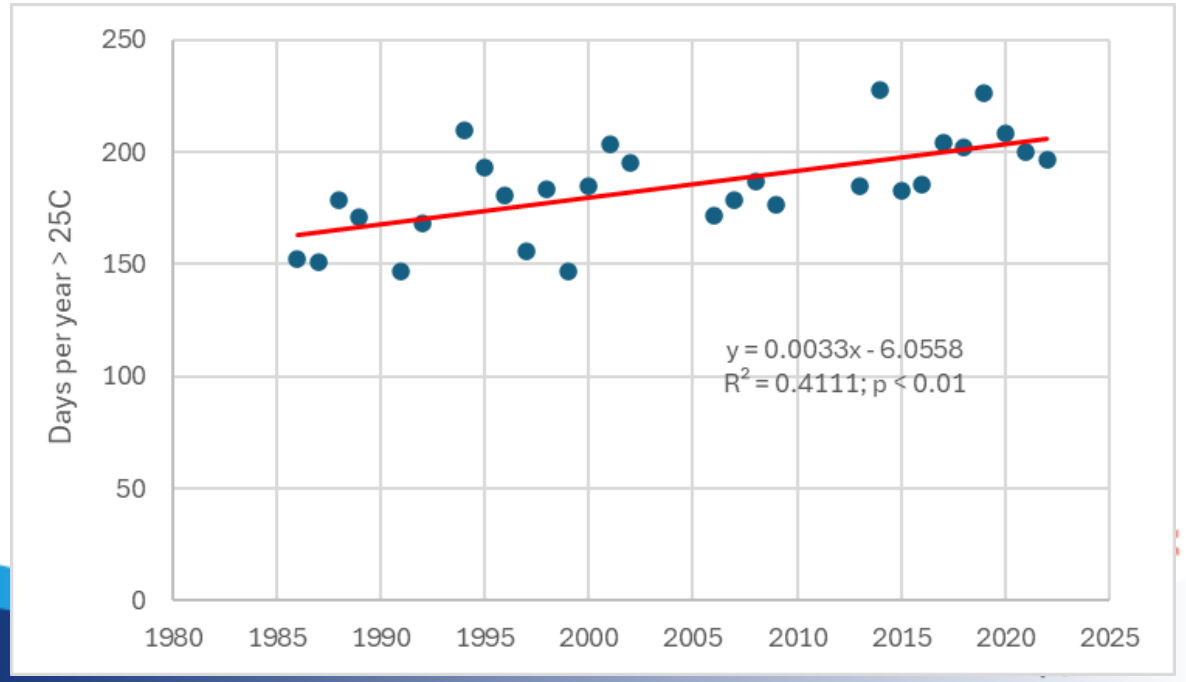
Sea Level Data Since 2000



- Water temperatures below 20^0 C (68^0 F)
  - Reduced growth rate for *Karenia brevis*
  - Mid to late 1980s – 3 months/yr “too cold”
  - Last 10 years - 1 1/2 months/yr “too cold”

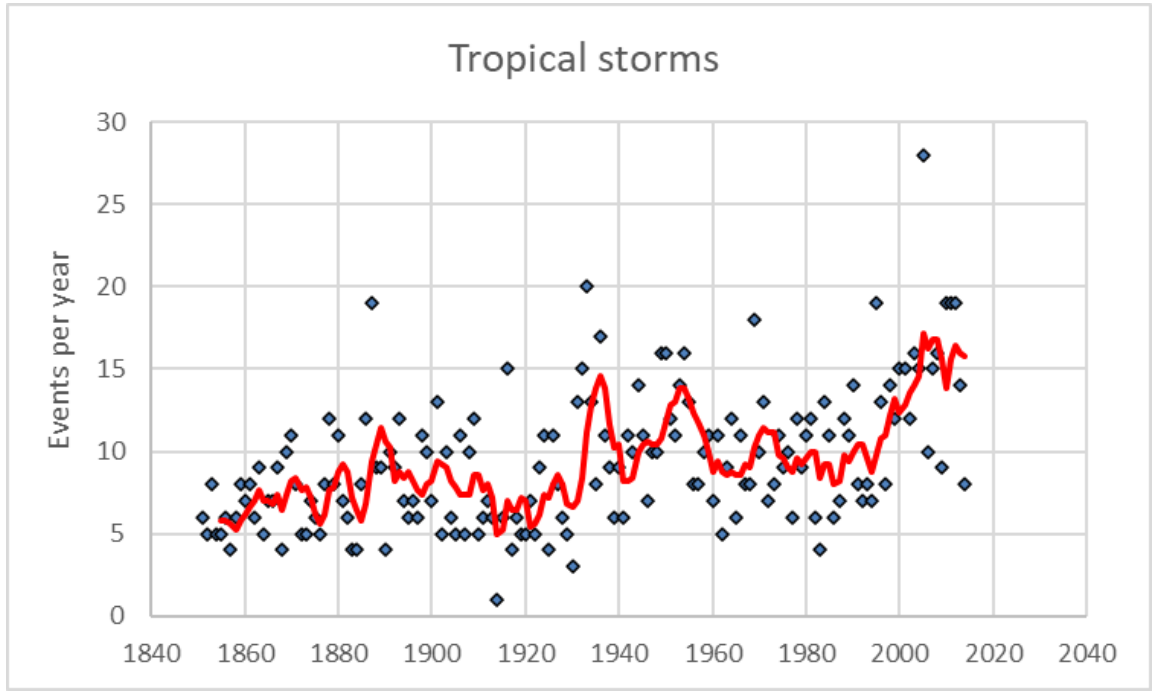


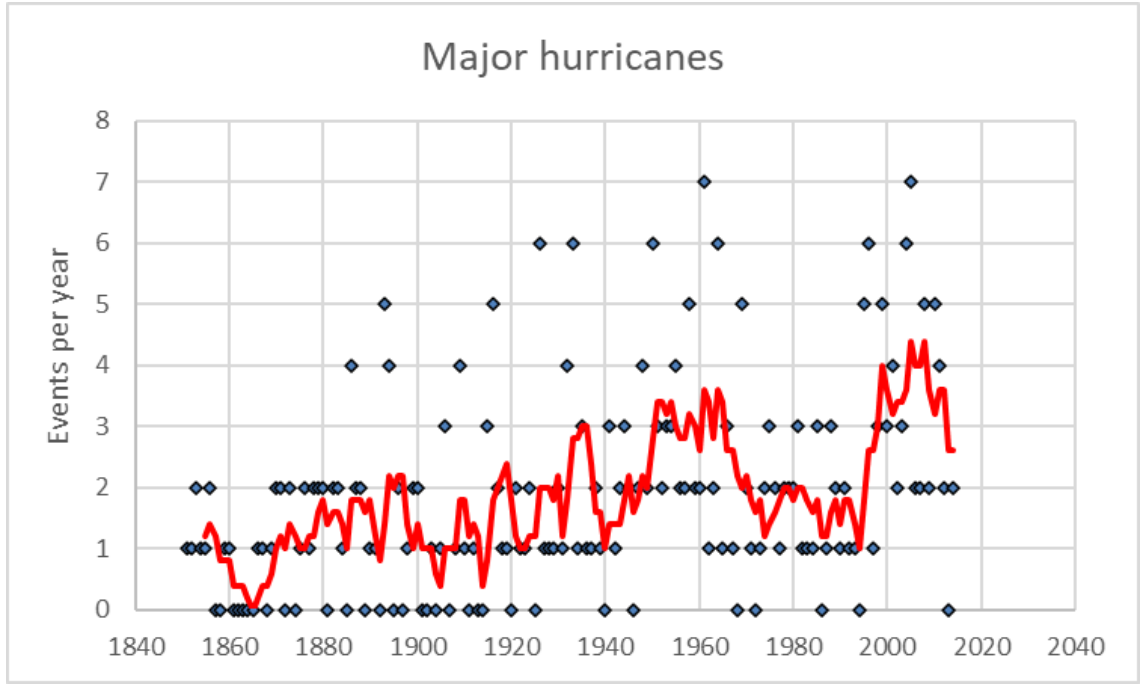
- Water temperatures above 25^0 C (77^0 F)
  - Higher growth rate for *Dapis pleousa*
  - Mid to late 1980s – 5-month growing season
  - Last 10 years – 6 ½ month growing season



NOAA Venice Buoy Data

Tropical storms and hurricanes are “heat engines”





National Hurricane Center - Atlantic Basin Count - https://www.nhc.noaa.gov/climo/

A lot of “once in a century” events lately…

- Ian (2022)
- Nicole (2022)
- Idalia (2023)
- Invest 90L (June 2024)
- Debby (August 2024)
- Helene (September 2024)
- Milton (October 2024)

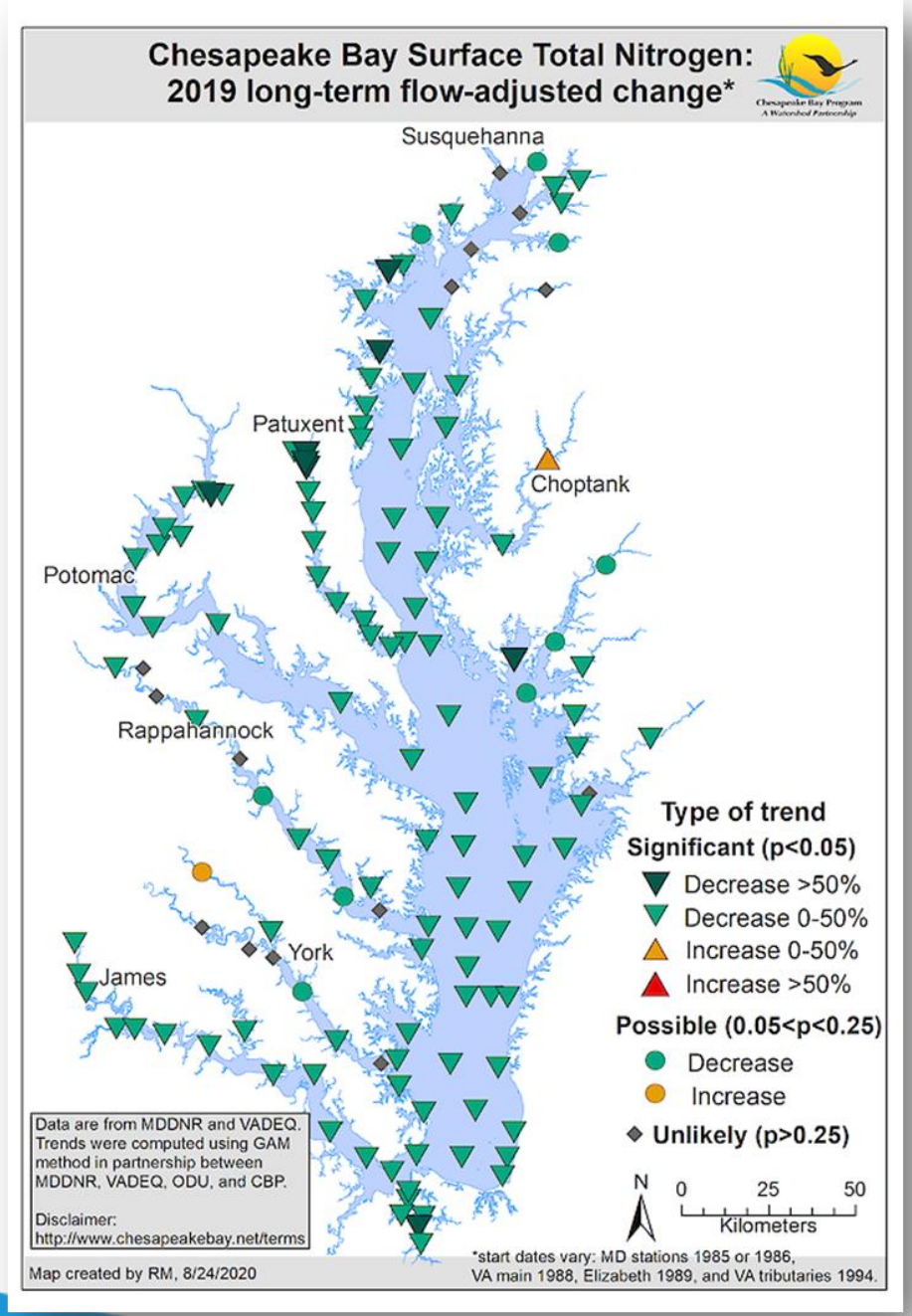
A cleaner bay is a more resilient bay.

That’s great, but…

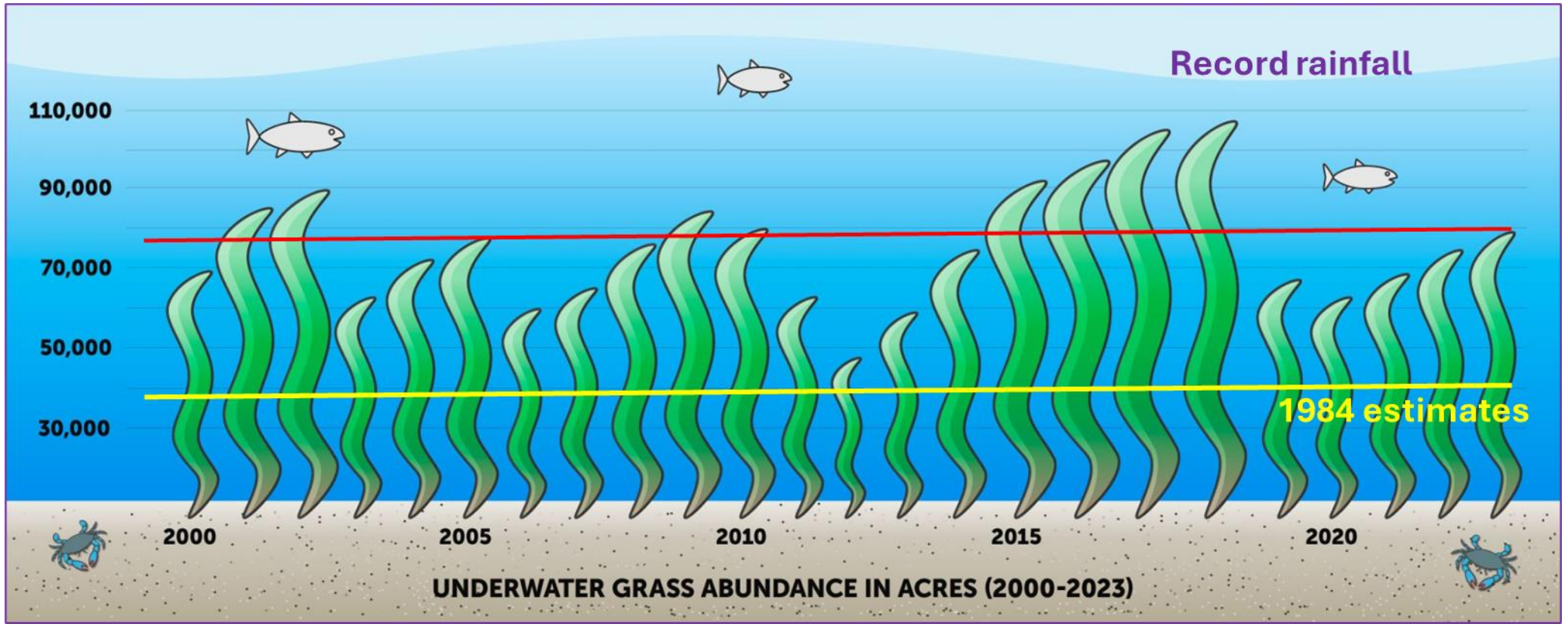
- Sarasota Bay is tiny, right?
- “My system” is so much larger and so much more complex
- Can we do large-scale ecosystem restoration?

Chesapeake Bay

- Model for collaborative management
- Open water - 4,480 square miles
  - 86 times > Sarasota Bay
  - 11 times > Tampa Bay
- Watershed – 64,000 square miles
  - 420 times > Sarasota Bay
  - 26 times > Tampa Bay
  - **97% as large as the State of Florida**
- And yet…

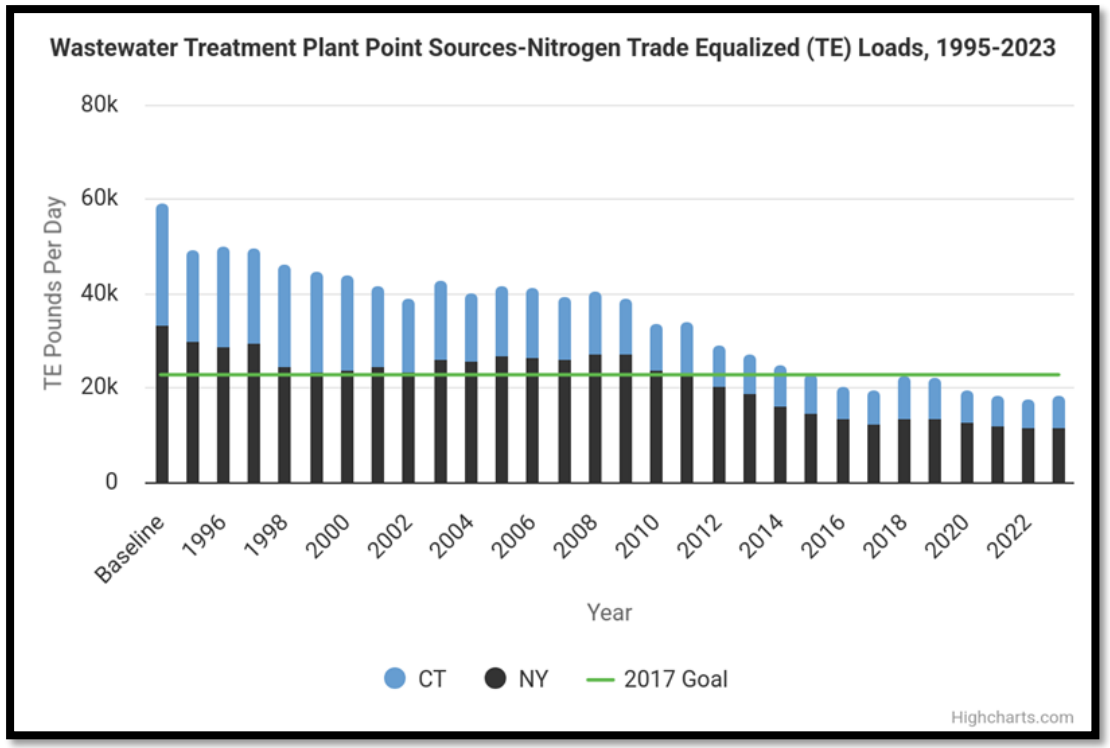


Chesapeake Bay Submerged Aquatic Vegetation

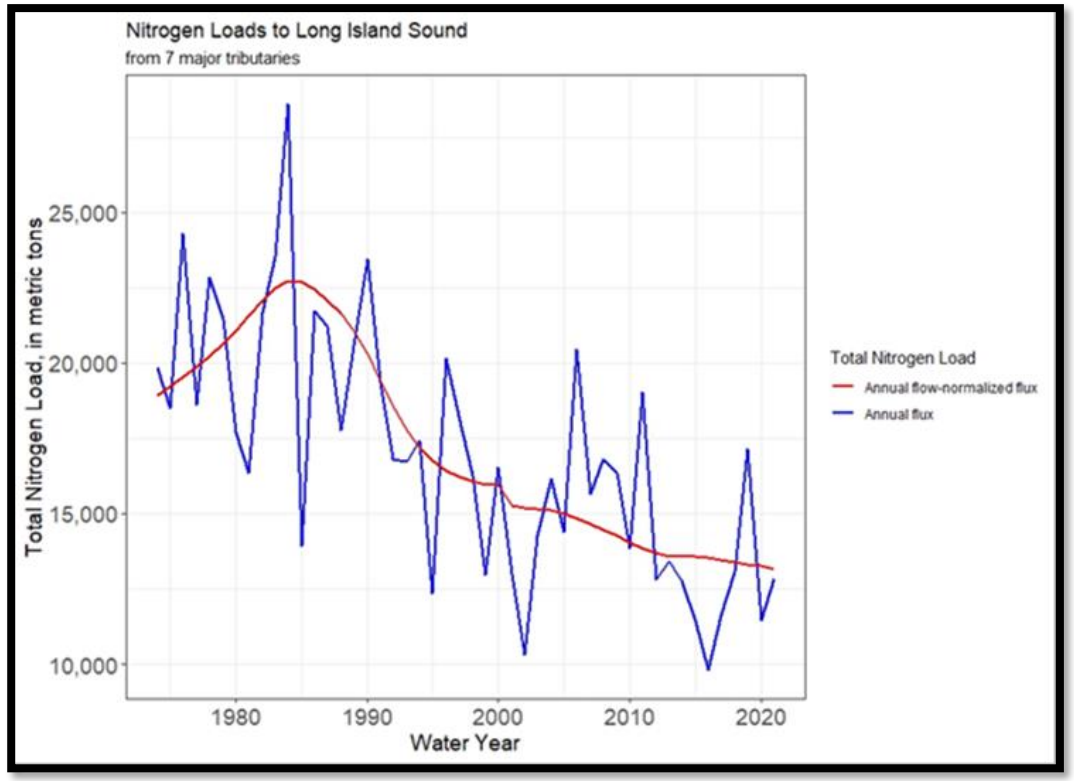


Graphic from Chesapeake Bay Program. Data from VIMS

Long Island Sound



Reductions in WWTP Nitrogen loads…



Helped achieve a substantial overall reduction in system-wide nitrogen loads

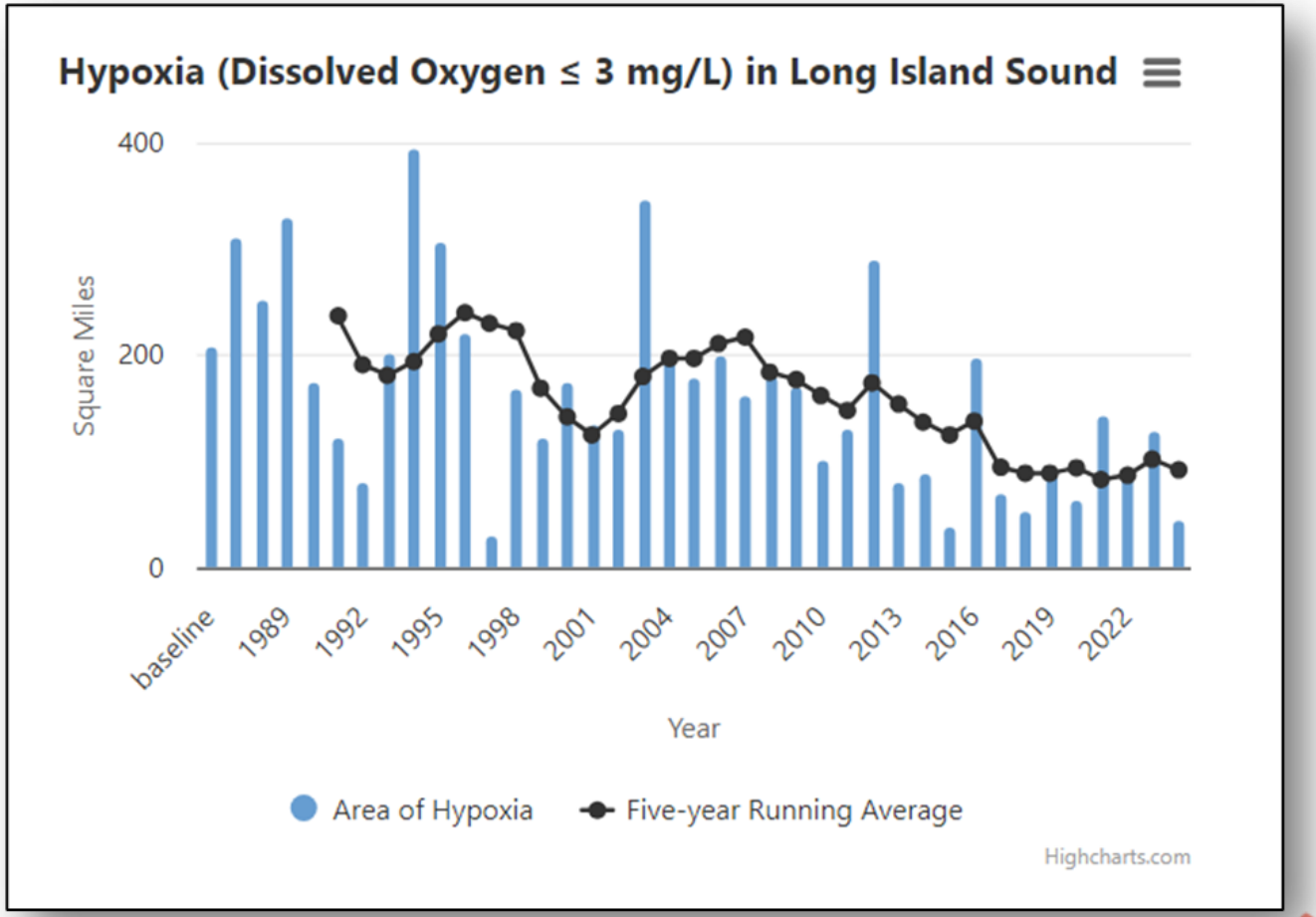
Figures from Long Island Sound Office – EPA

Long Island Sound

Target: measurably reduce the area of hypoxia in Long Island Sound from pre-2000 conditions

1987 to 1999 average - 208 square miles

2019 to 2023 average - 102 square miles



The public expects results

- Not just studies
- Not projects with little to no track record of success
- Not a bunch of projects too small to make a difference
- We need –
  - Projects big enough to address the scale of the problem
  - Enough big projects to make a difference
  - Enough funding to implement such projects
- *Otherwise…what are we doing?*

OUR PLAN

for a thriving estuary

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