



THE HEALTH OF OUR ESTUARIES

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WHO WE ARE

- Formed in 1995 and one of only 28 Congressionally designated “estuaries of national significance” in the United States.
- Receive special funding and support from USEPA under the Clean Water Act to protect and restore water resources in the CHNEP area.



THE POWER OF PARTNERSHIP

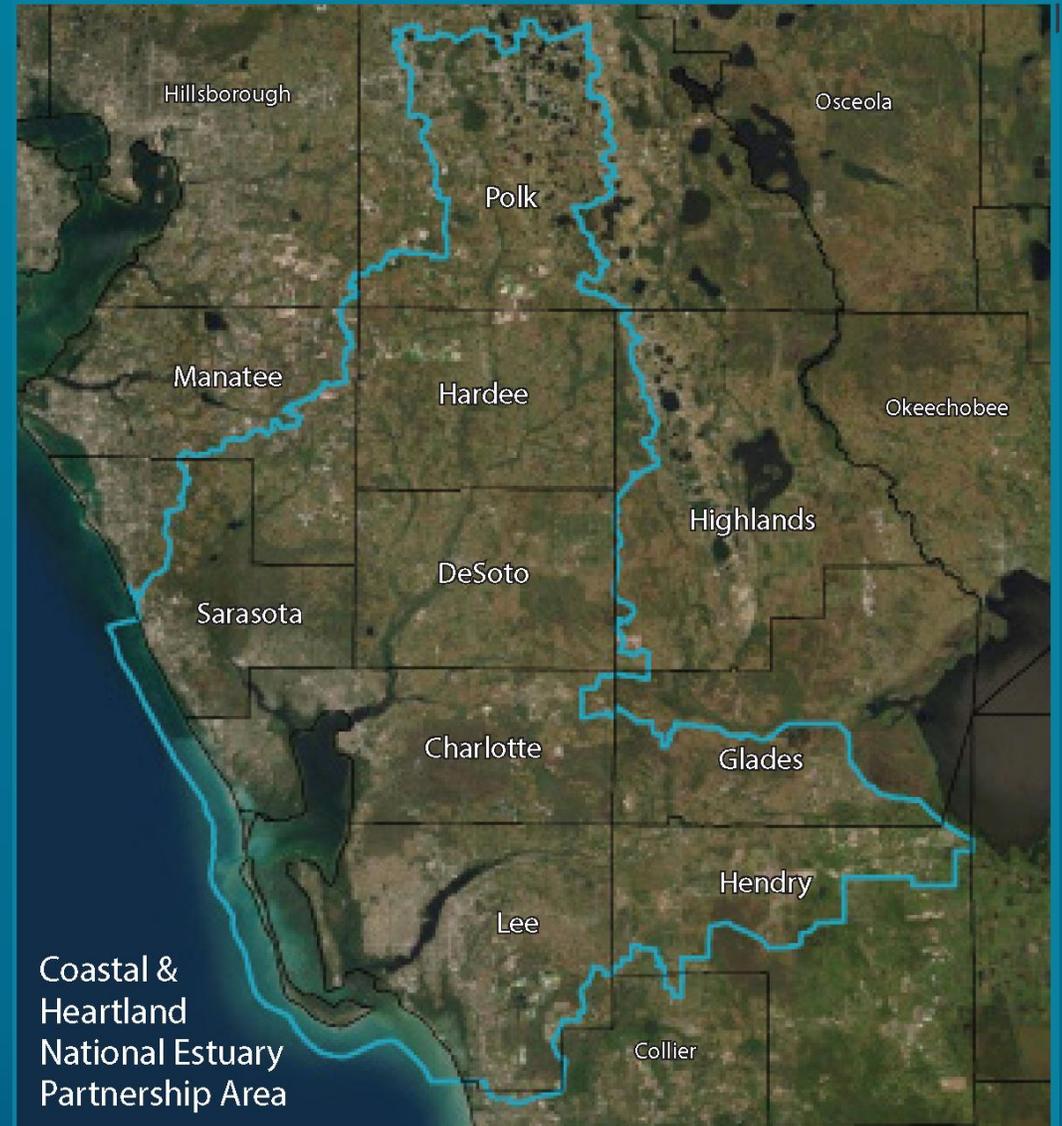
- CHNEP is:
 - Public-private partnership
 - Consensus-based
 - Non-regulatory
 - Science-based
 - Citizen-supported
- \$19 of restoration for every \$1 of federal funding!



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WHERE WE WORK

- CHNEP area 5,416 sq. miles
- Lemon Bay, Dona & Roberts Bay, Charlotte Harbor, Pine Island Sound, Caloosahatchee, San Carlos Bay and Estero Bay
- Rivers including Myakka, Peace, Caloosahatchee, and Estero
- Inland and coastal Communities 10 counties and 25 cities



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WHAT WE DO

Implement the Comprehensive Conservation Management Plan



**Water Quality
Improvement**



**Hydrological
Restoration**



**Fish, Wildlife &
Habitat Protection**



**Public
Engagement**



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ECONOMIC VALUE OF NATURAL RESOURCES



Primary economic driver: TOURISM.

NATURAL RESOURCES IN THE CHNEP AREA GENERATE:



\$13.6 Billion in Total Output



\$3.8 Billion in Regional Income



\$146 Million in Local & Tax Revenue



and Support Over 148,000 Jobs Annually



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FWC

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NUTRIENT POLLUTION

- Nutrient pollution is a common widespread problem in FL, accounting for 73% of all waterway 'impairments'
- Approx. 75% of assessed waterbodies in FL are impaired
- 363 waterbodies are impaired by Total Nitrogen
- 354 water bodies are impaired by Total Phosphorus

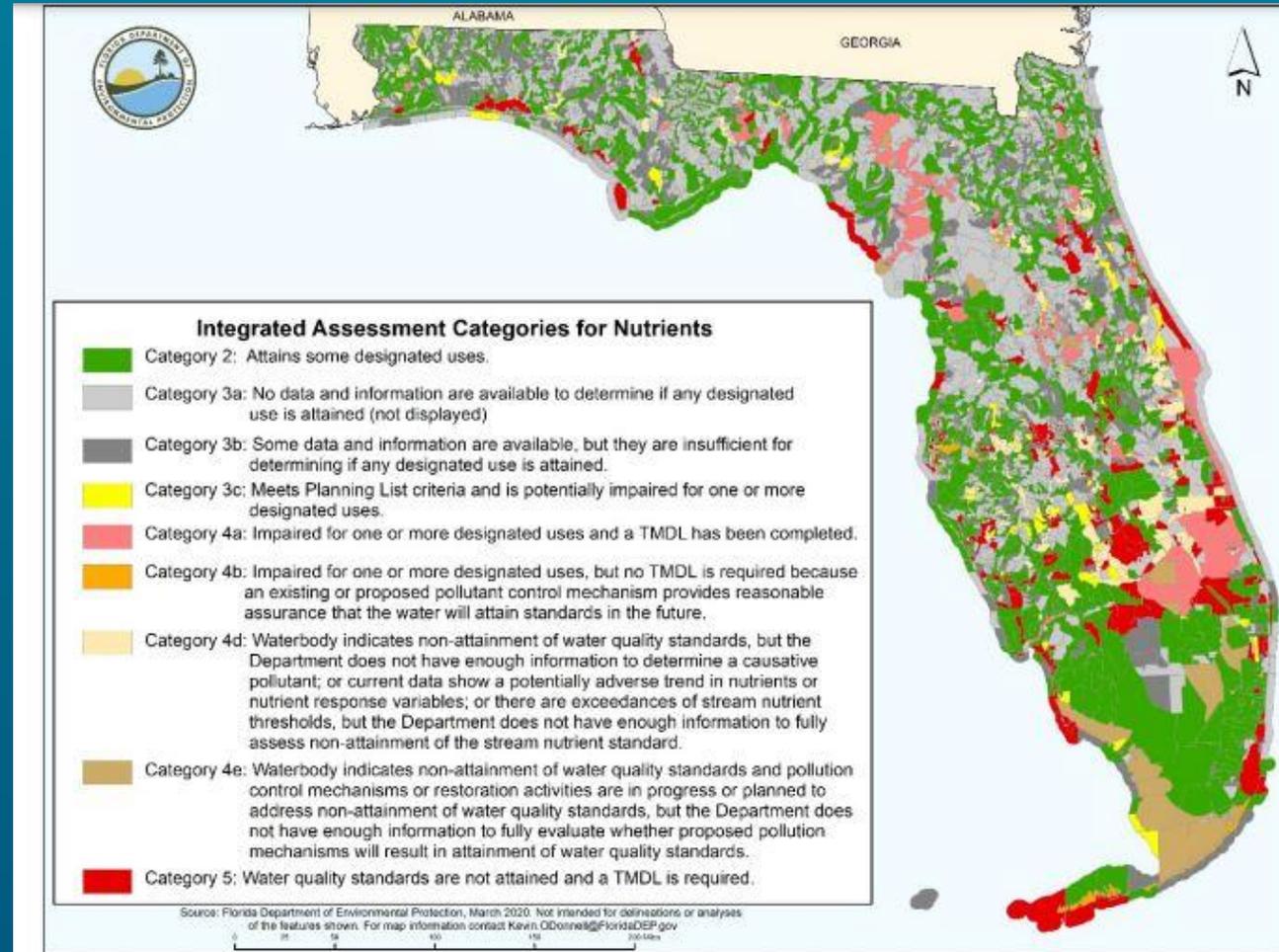


Figure 3.1b. Results of Florida's surface water quality assessment: EPA assessment categories for nutrients



NUTRIENT POLLUTION SOURCES

- Human-generated sources of Nitrogen and Phosphorus
- Sources include:
 - Agricultural, Industrial, Mining runoff
 - Urban Stormwater runoff
 - Wastewater discharges / failing septics
 - Atmospheric emissions
 - Development and loss of wetlands
 - Excess flow is considered a form of pollution- Ex: water coming from Lake Okeechobee into the Caloosahatchee at high volumes

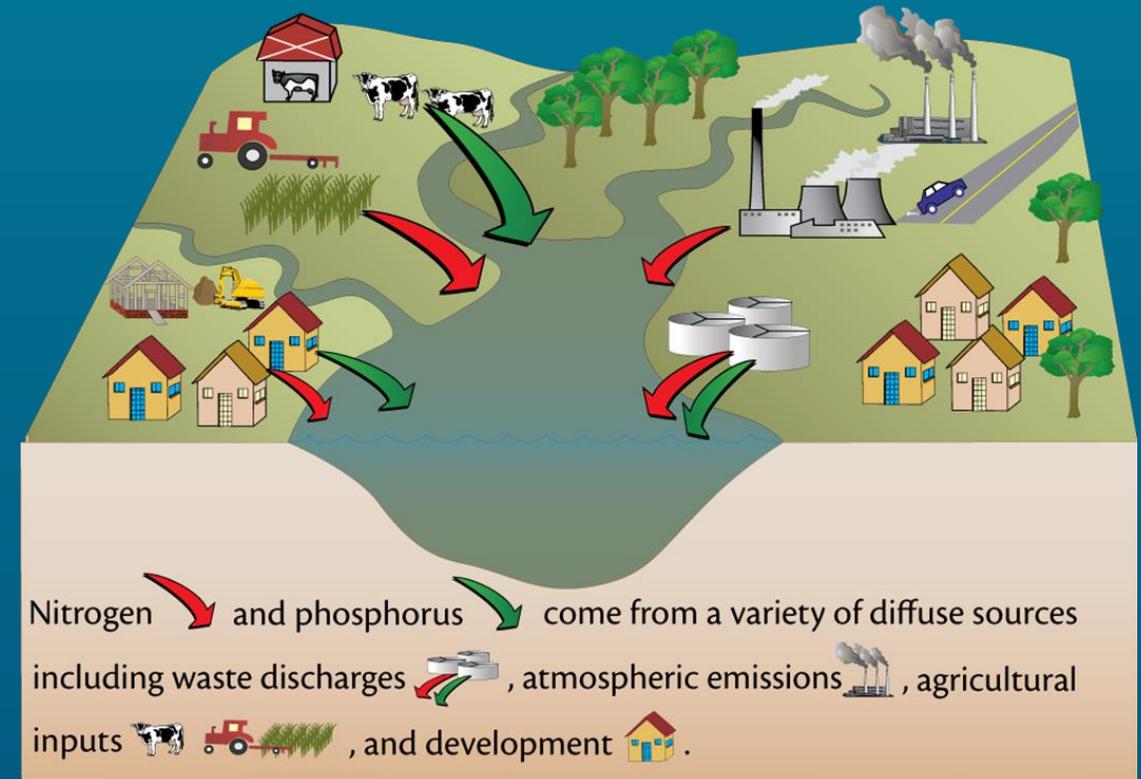
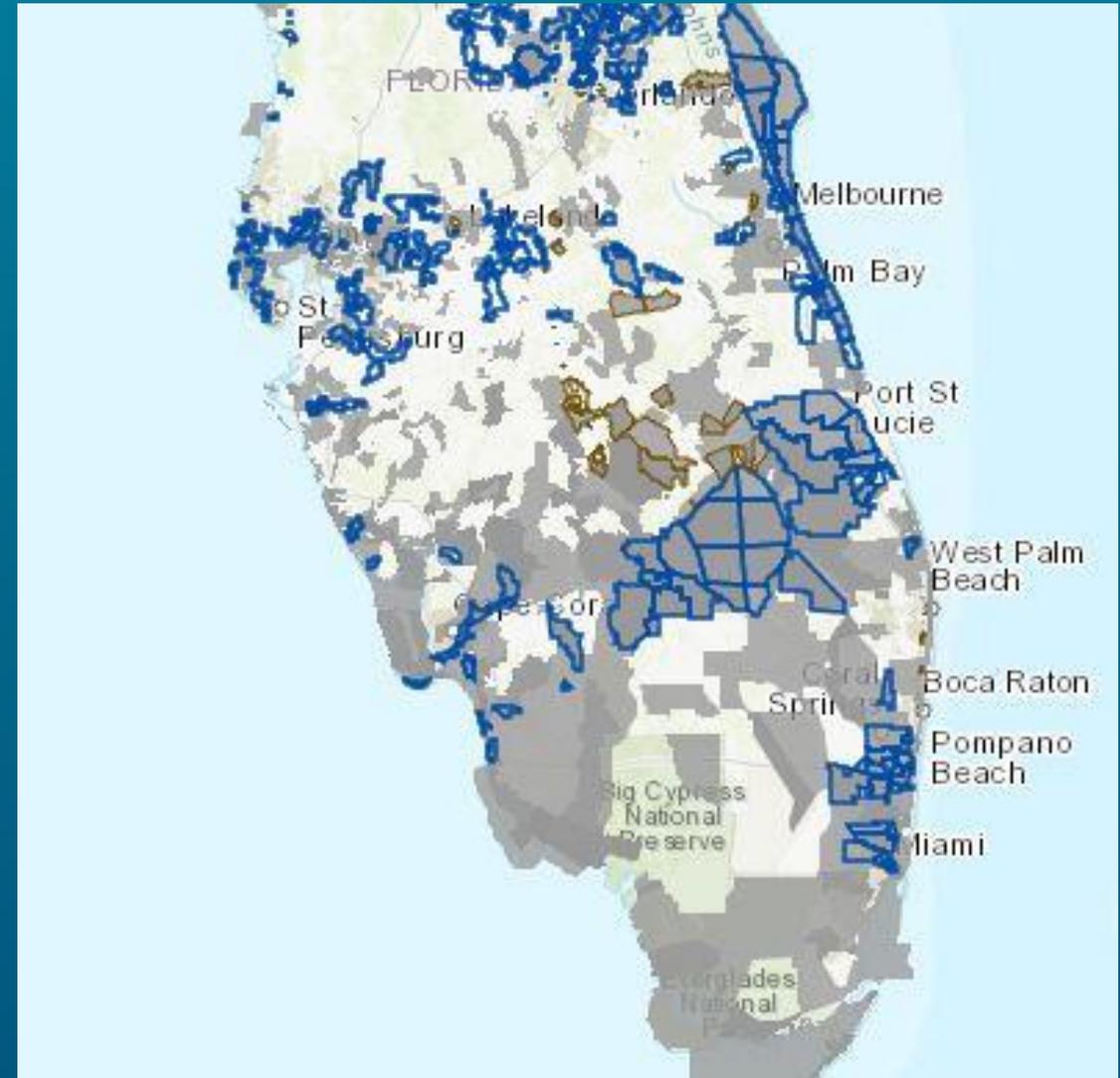


Diagram courtesy of the Integration and Application Network (ian.umces.edu), University of Maryland Center for Environmental Science. Source: Lane, H., J.L. Woerner, W.C. Dennison, C. Neill, C. Wilson, M. Elliott, M. Shively, J. Graine, and R. Jeavons. 2007. Defending our National Treasure: Department of Defense Chesapeake Bay Restoration Partnership 1998-2004. Integration and Application Network, University of Maryland Center for Environmental Science, Cambridge: MD.



NUTRIENT POLLUTION IN OUR AREA

- **Gray areas are waters not attaining standards set by the FDEP.**
- **Current areas that are impaired for nutrients:**
 - **Dona Bay (TN)**
 - **Roberts Bay (TN)**
 - **Lemon Bay (TN)**
 - **Matlacha Pass (TN)**
 - **Peace River (TN)**
 - **Caloosahatchee River (TN, TP)**
 - **Myakka River (TN)**



NUTRIENT POLLUTION IS PERVASIVE

- Calusa Waterkeeper analyzed metrics that define or contribute to water quality impairment to determine their overall rank on recent trends and worsening water quality.

1 rapid impairment - 9 less concerning impairment

County	Avg. Total Impairments ¹ 2018, 2019, 2020	% of Total ² WBIDs Impaired	% Net Change ³ Impairment	% Change ⁴ Developed	% Change ⁵ Impervious	% Area ⁶ Agriculture	Avg. Rank	Rank
Collier	7	7	2	2	2	8	4.67	4
Lee	5	3	1	4	3	7	3.83	2
Charlotte	4	5	4	7	6	4	5.00	5
Sarasota	3	6	6	5	5	6	5.17	6
Manatee	6	5	3	1	1	3	3.17	1
Hillsborough	1	4	9	3	4	5	4.33	3
Pinellas	2	6	5	9	9	9	6.67	9
Hendry	9	2	8	6	7	1	5.50	7
Glades	8	1	7	8	8	2	5.67	8

Source: Calusa Waterkeeper



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EFFECTS OF EXCESS NUTRIENTS & BACTERIA

- Increased algae growth → longer, more frequent algae blooms
- Decomposing algae lowers dissolved oxygen
- Multiple blooms of drift macroalgae in Florida estuaries have raised concerns → damage to seagrass habitats and water quality implications
- Harmful Algae Blooms (HABs) → adverse health effects in humans and other animal populations
- Existing monitoring shows increased macroalgae trends since 2012 → system that is under stress.
- Seagrass monitoring and monitoring the water column don't give complete picture → expand the type of data collected to better understand what is happening.



SEAGRASS & WATER QUALITY

- Submerged aquatic vegetation uptakes excess nutrients
- Seagrass however needs a certain amount nutrients, light to grow and thrive and thus is an indicator of clean clear water.
- Excess nutrients can produce chl-a (reflecting phytoplankton growth) which can limit light availability needed for growth.
- Seagrass thrive in systems with balanced nutrients algae likes lots of nutrients.
- In Charlotte Harbor and surrounding estuaries anecdotal data points to a shift from seagrass to algae indicating a high nutrient load- nutrients in algae rather than water column may not be captured in WQ data alone

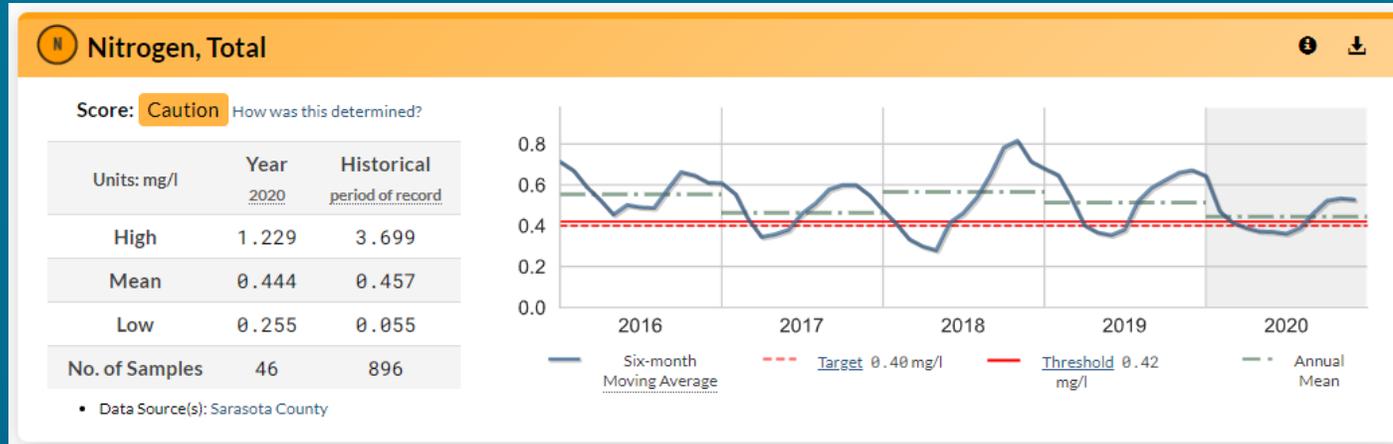


*Losing
Seagrass is a
WQ Double
Whammy!*

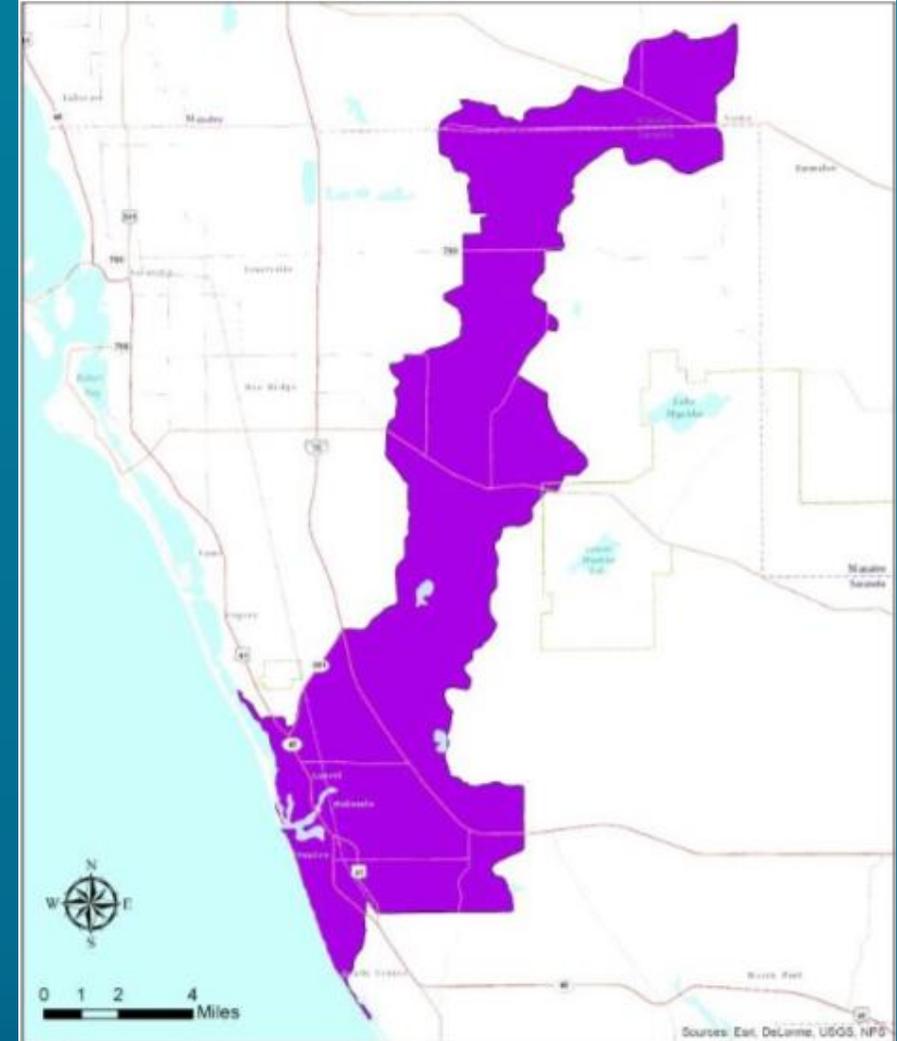


COASTAL VENICE ESTUARIES (DONA & ROBERTS BAYS)

- Impaired (FDEP IWR)
 - Nutrients(TN and Chl-a) and Mercury
- Water Quality Report Card Grade: C-
- Seagrass: Decreasing ↓
- Algae: Increasing ↑



Source: Conservancy of Southwest Florida

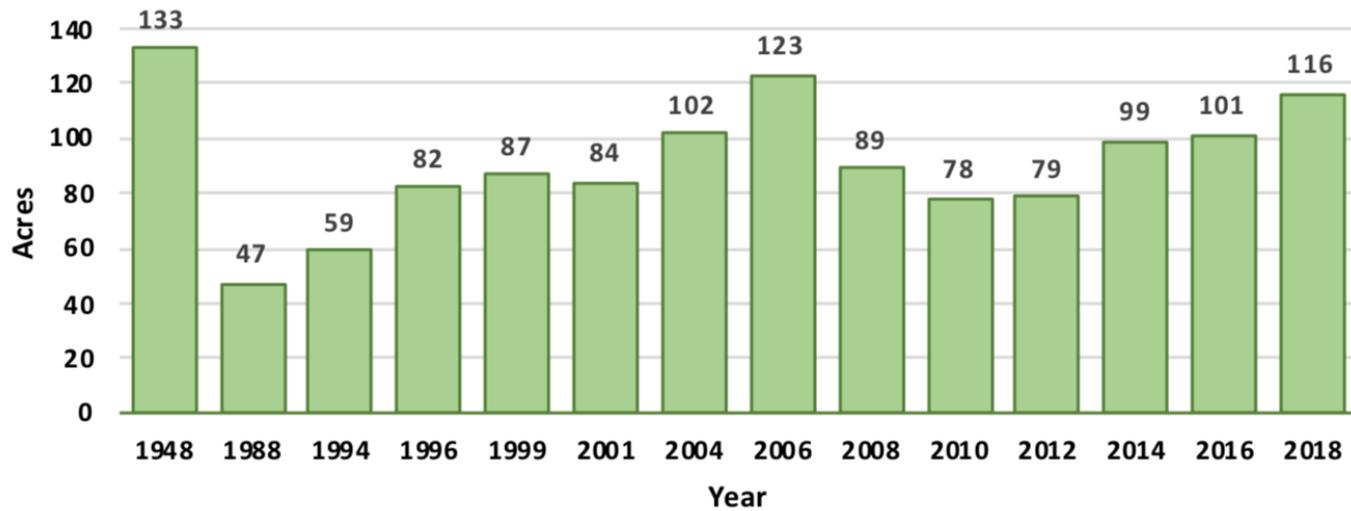


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COASTAL VENICE SEAGRASS

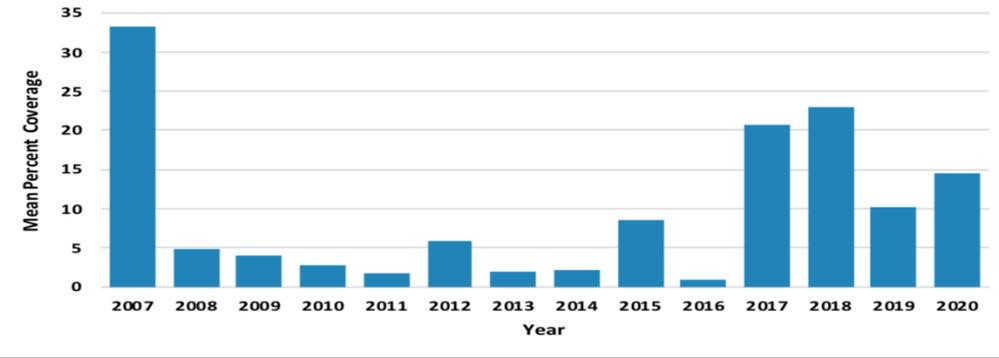
- In 2018, there was 15 acres in Dona Bay and 50 acres in Roberts Bay, almost 60% less than acreage targets set for this area

Seagrass Acreage within Dona & Roberts Bay

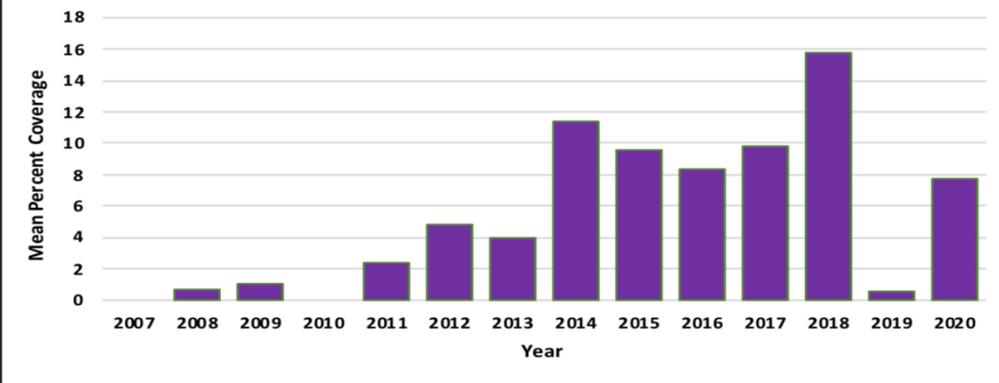


Source: Sarasota County and Source: Southwest Florida Water Management District

Dona & Roberts Bay - Thalassia



Dona & Roberts Bay - Syringodium



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COASTAL VENICE ALGAE

- Increased frequency and density of epiphytes and rooted algae

Sarasota County Seagrass Monitoring Scorecard 2021						
Seagrass Health	Sarasota Bay	Roberts Bay	Little Sarasota Bay	Blackburn Bay	Dona Roberts Bay	Lemon Bay
Seagrass Density Trend				↓	↓	↓
<i>Syringodium</i> Blade Height Trend	↓	↓	—	↓	↓	—
<i>Halodule</i> Blade Height Trend	↓	↓	↓	↓	↓	↓
Drift Algae Trend	—	—	—	—	—	—
Epiphyte Trend	↑	↑	↑	↑	↑	↑
<i>Caulerpa</i> Trend	↑	↑	↑	↑	↑	↑
Score	5	4	3	7	5	5

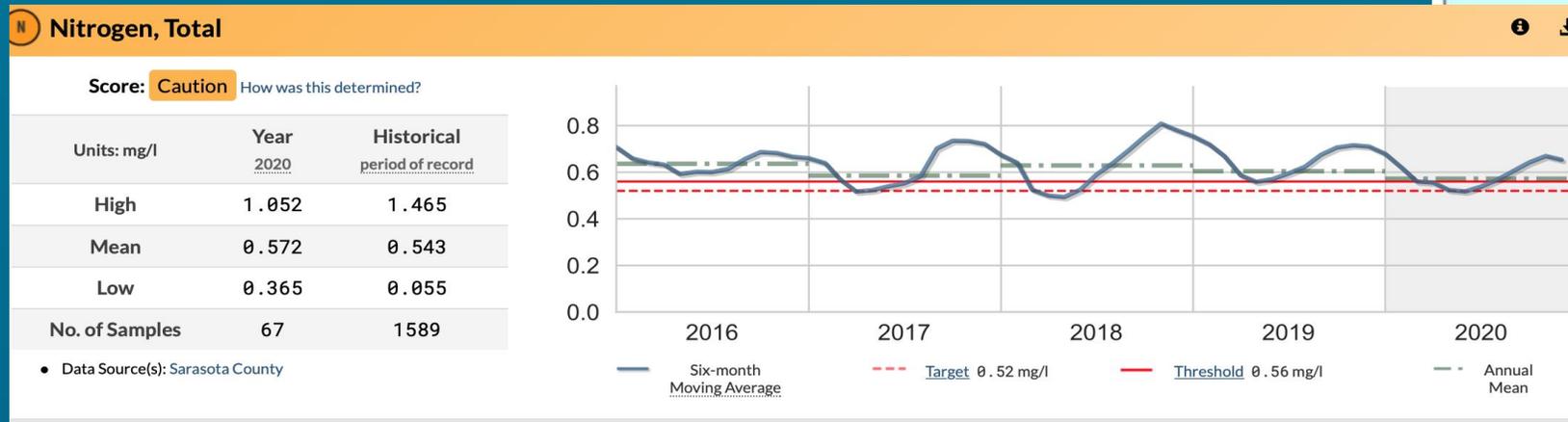
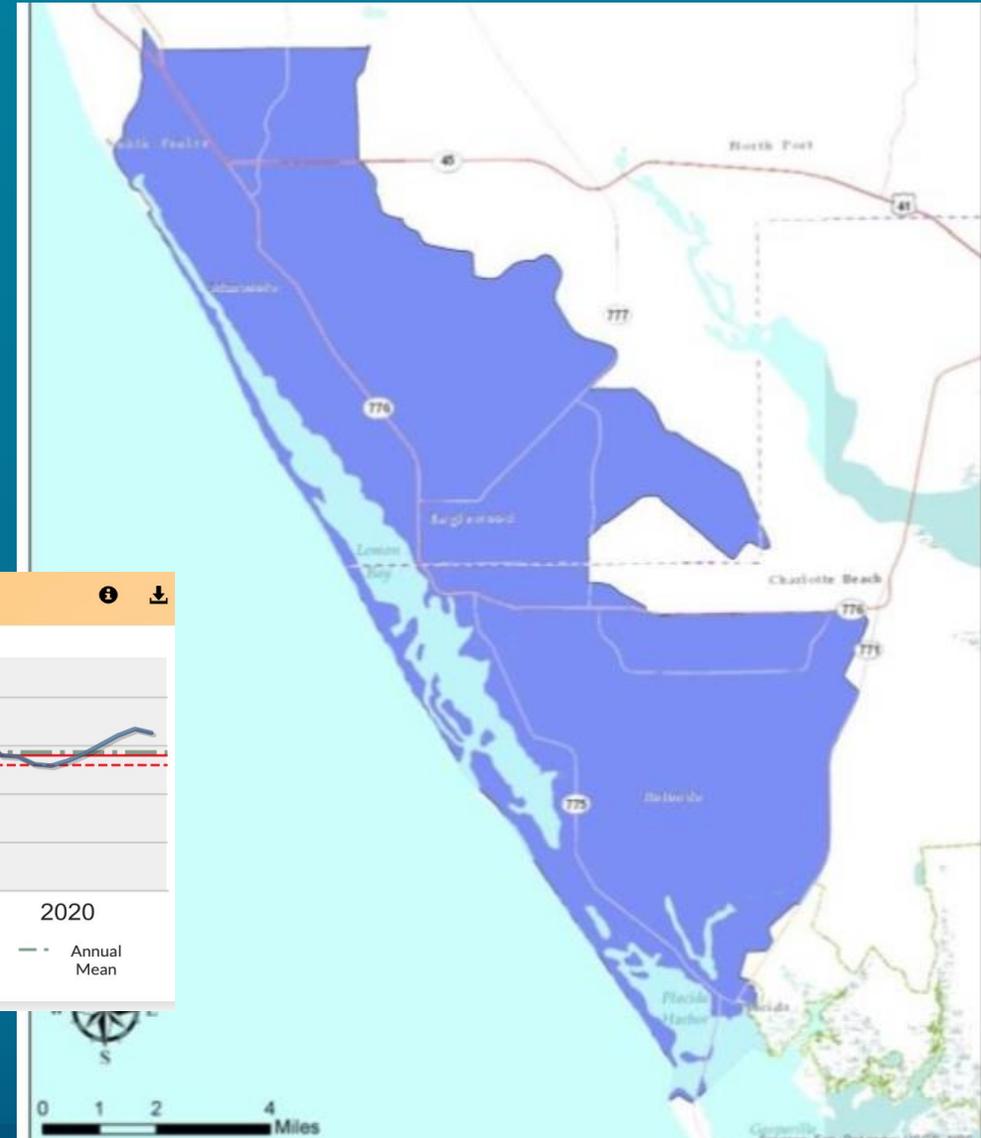
Sources: Charlotte Harbor Bay Aquatic Preserves, Sarasota County



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LEMON BAY ESTUARY

- Impaired (FDEP IWR)
 - Nutrients (TN and Chl-a), Fecal Coliform, Mercury
- Water Quality Report Card Grade: D-
- Seagrass: Decreasing ↓
- Algae: Increasing ↑



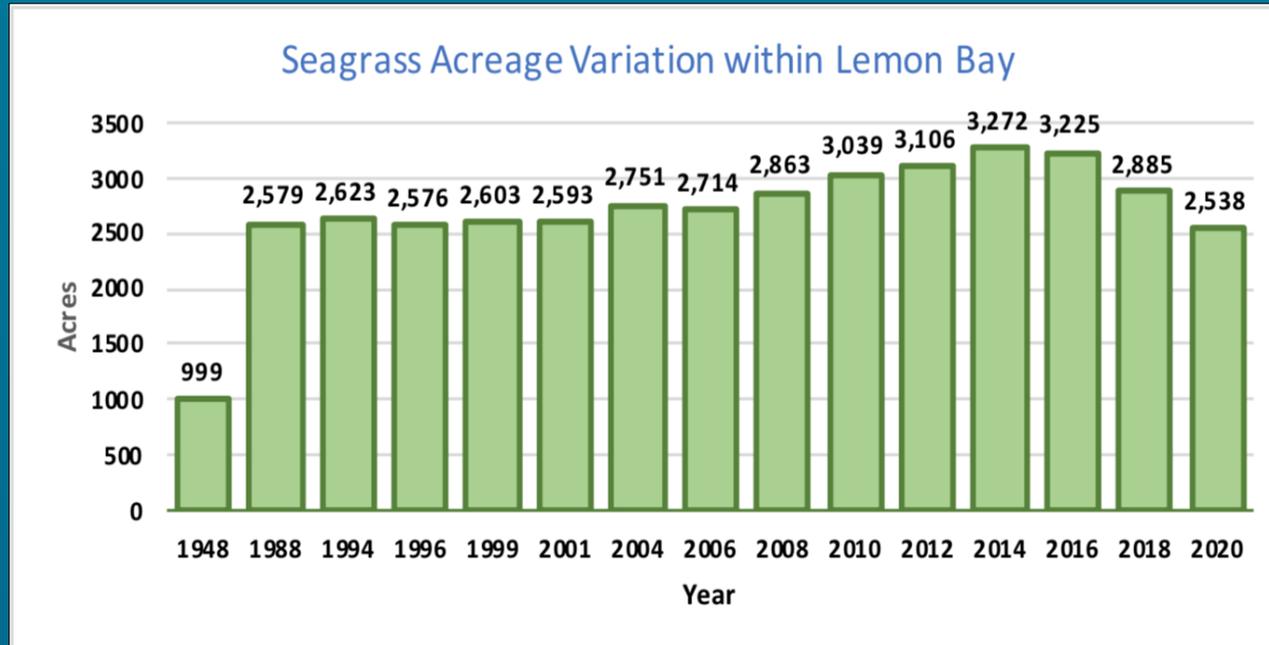
Source: Conservancy of Southwest Florida



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LEMON BAY SEAGRASS

- Between 2018-2020, lost 12% (-374 acres) of seagrass habitat



Source: Southwest Florida Water Management District

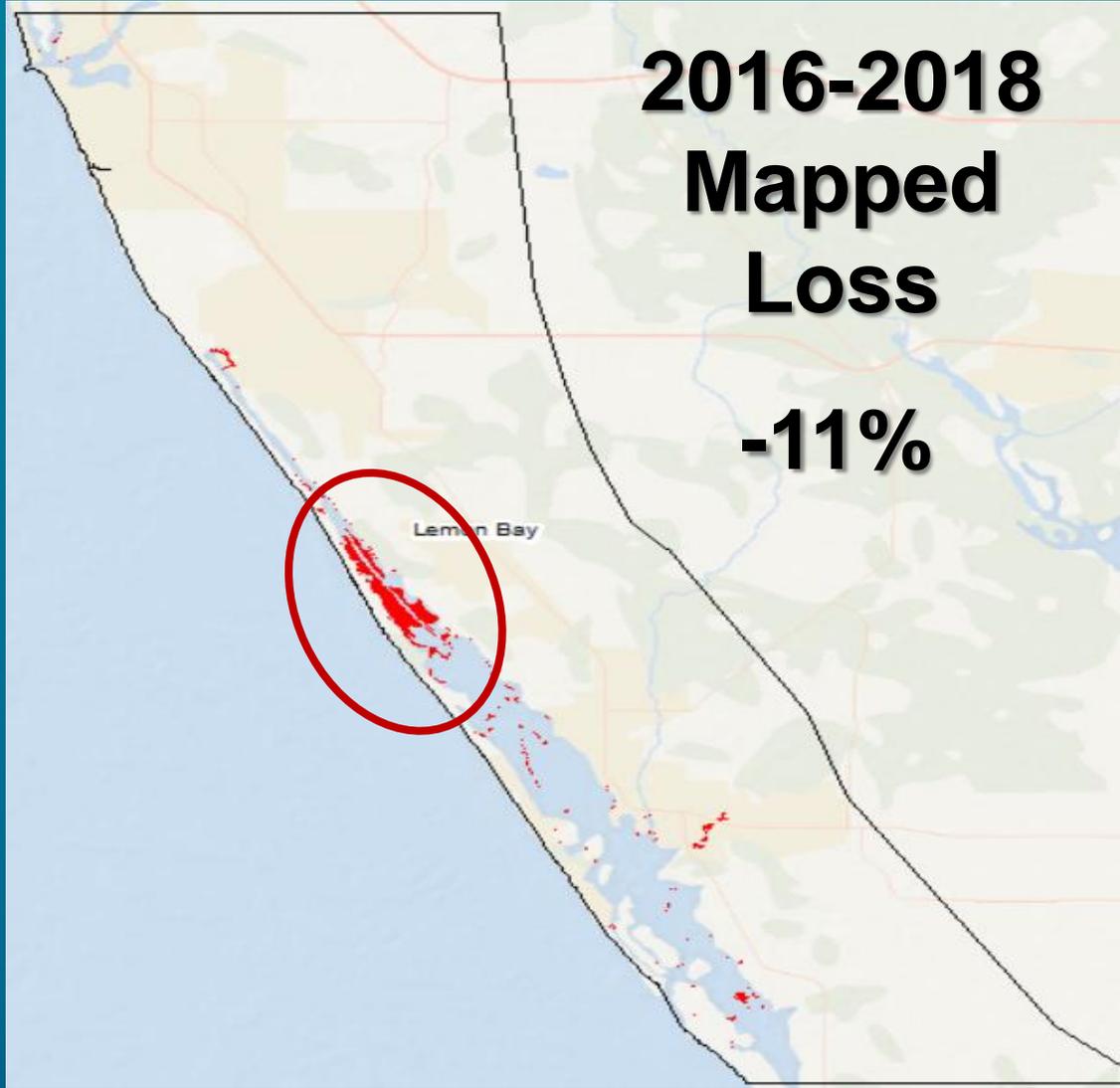


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LEMON BAY SEAGRASS LOSS

**2016-2018
Mapped
Loss**

-11%



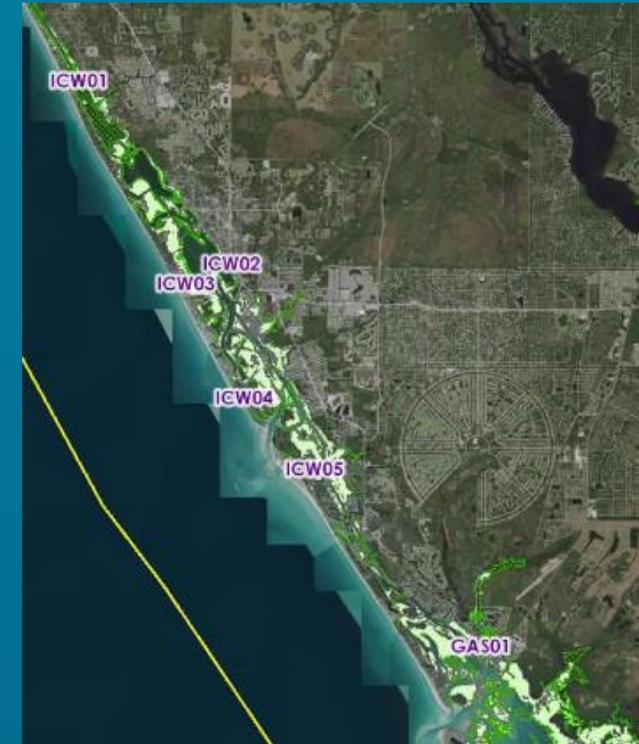
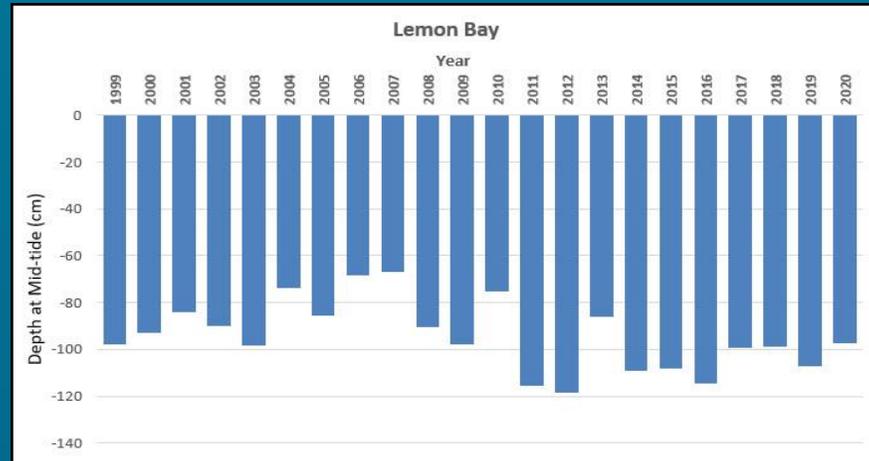
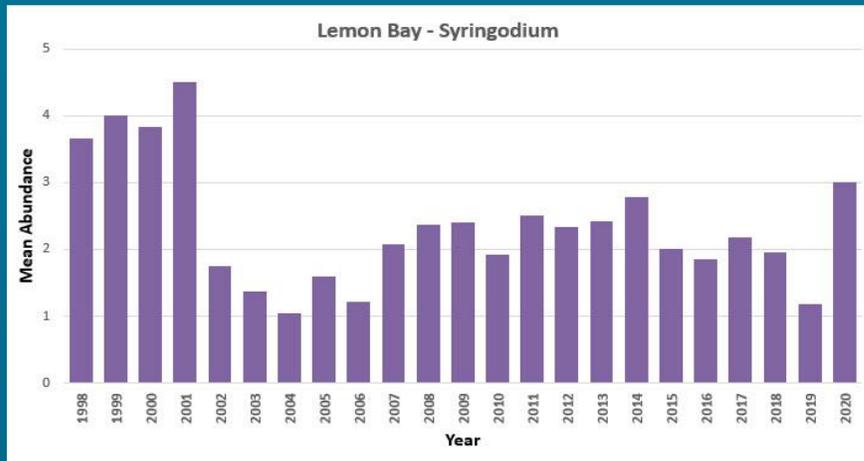
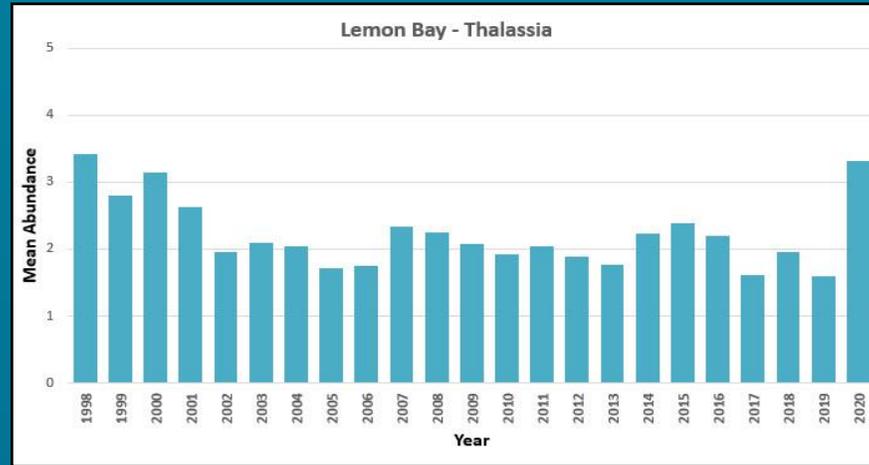
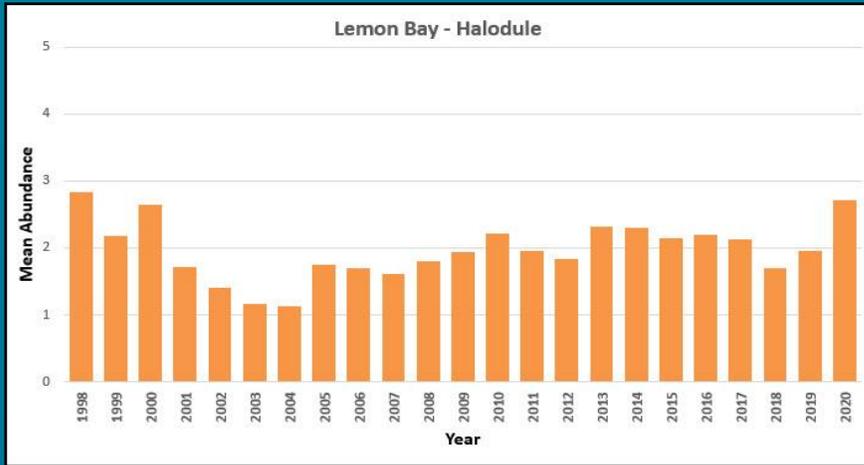
**2018-2020
Mapped
Loss**

-12%



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SEAGRASS DIVERSITY & HEALTH

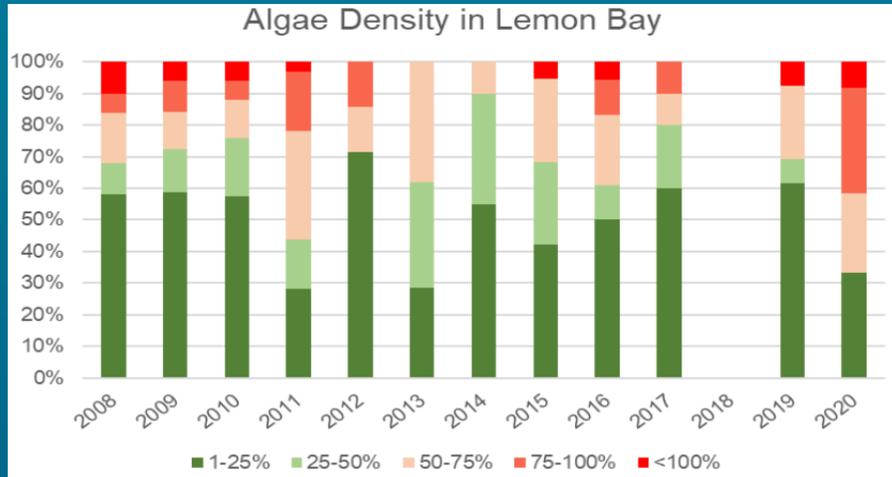


Source: Charlotte Harbor Aquatic Preserves, Florida Department of Environmental Protection.

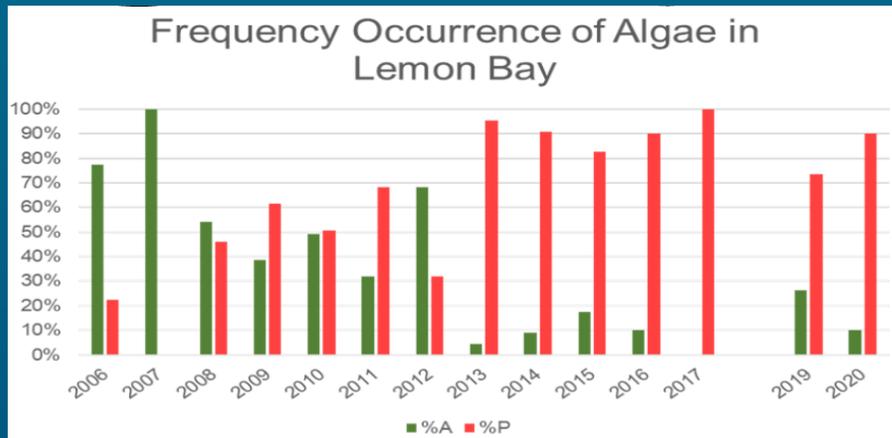


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LEMON BAY ALGAE



- Increased frequency and density of occurrence of drift algae and epiphytes in Lemon Bay.



Bays & Sub-Segments	Seagrass Coverage (average %)	Turtle Grass Coverage (average %)	Shoal Grass Coverage (average %)	Manatee Grass Coverage (average %)	Turtle Grass Height (average cm)	Shoal Grass Height (average cm)	Manatee Grass Height (average cm)	Epiphyte Intensity (average)	Drift Algae Intensity (average)	Seagrass Health
LEMON BAY	Red	Green	Green	Red	Green	Red	White	Red	Red	Green
LB-1	Green	White	Green	White	White	Red	White	Red	Green	Light Green
LB-2	Red	White	Green	White	White	Red	White	Red	Green	Red
LB-3	Red	White	Red	White	White	White	White	White	Green	Red
LB-4	Red	Red	Green	White	Red	Yellow	White	Red	Red	Red
LB-5	Red	Green	Yellow	Red	Red	Yellow	White	Red	Red	Red

Sources: Charlotte Harbor Bay Aquatic Preserves, Sarasota County

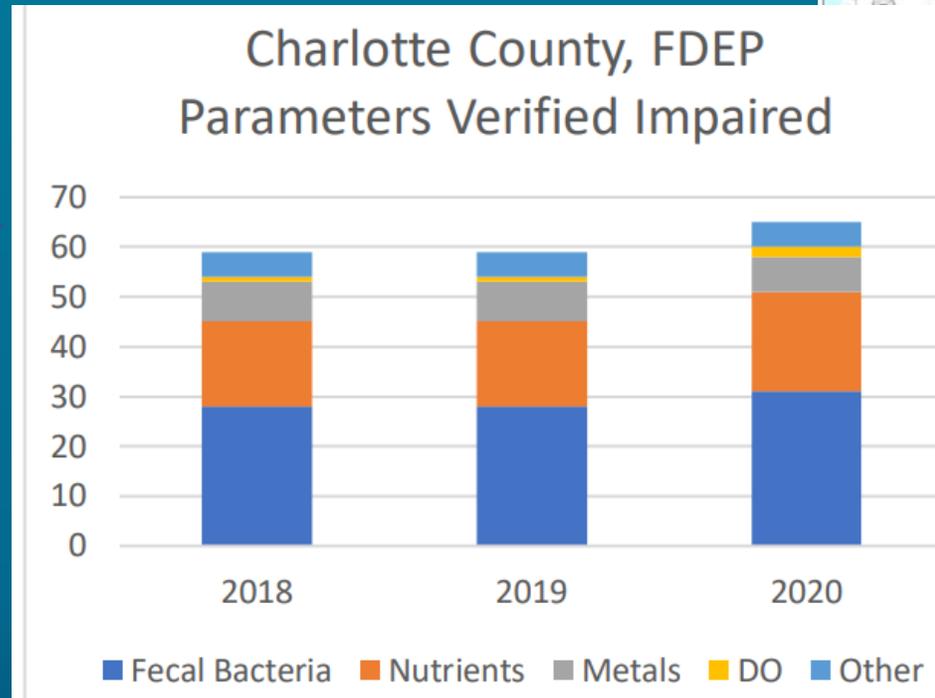
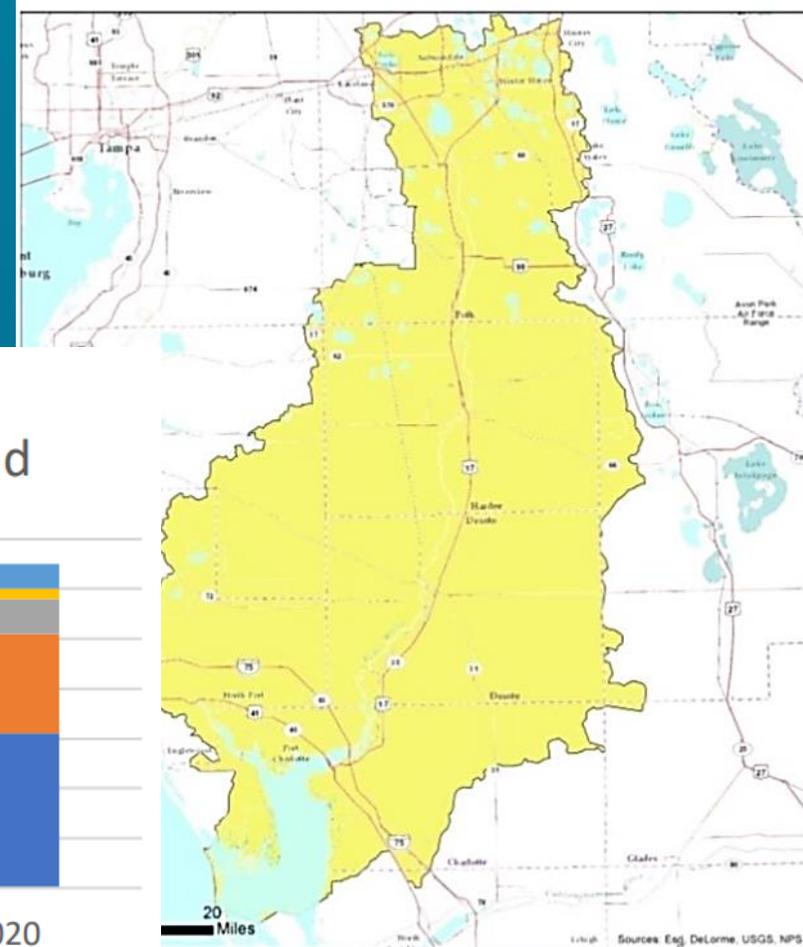


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CHARLOTTE HARBOR ESTUARY

- Peace River, Myakka River, and Charlotte Harbor Proper.
- Impaired (FDEP IWR)
 - Nutrients, Fecal Coliform, Iron, Mercury
- Water Quality Report Card Grade: C+
- Seagrass: Decreasing ↓
- Algae: Increasing ↑

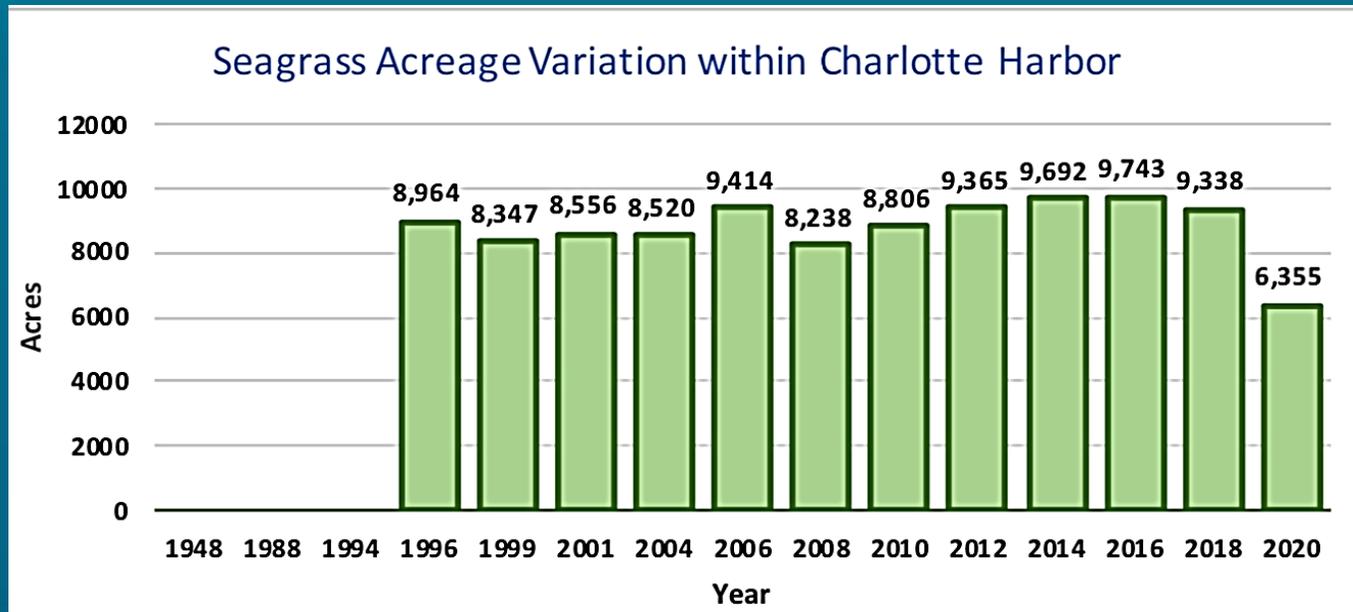
Source: Conservancy of Southwest Florida



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CHARLOTTE HARBOR SEAGRASS

- In the total Charlotte Harbor region, seagrass acreage has increased by 6,214 acres between 2008 and 2014
- 23% loss of seagrass between 2018-2020

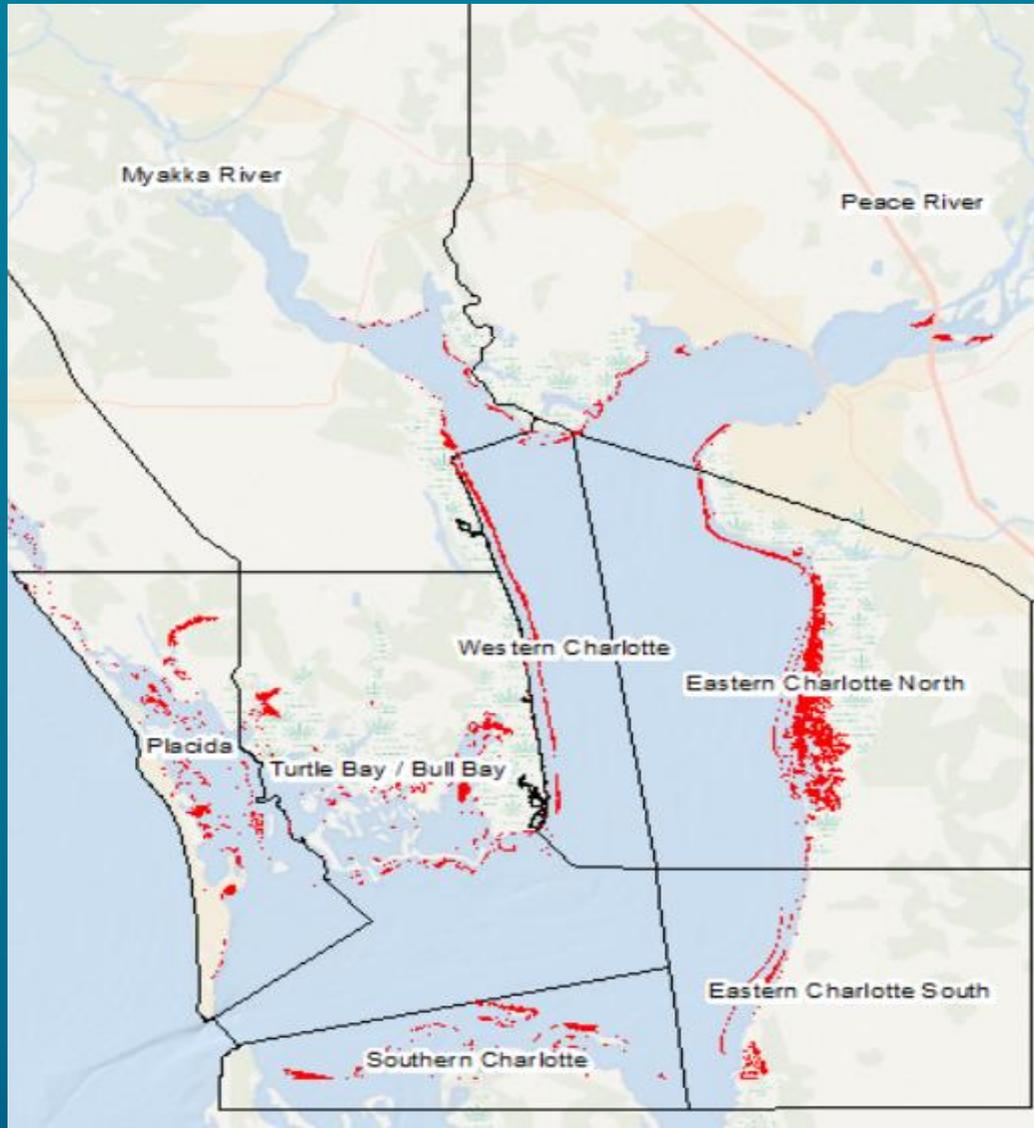


Source: Southwest Florida Water Management District



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CHARLOTTE HARBOR SEAGRASS LOSS

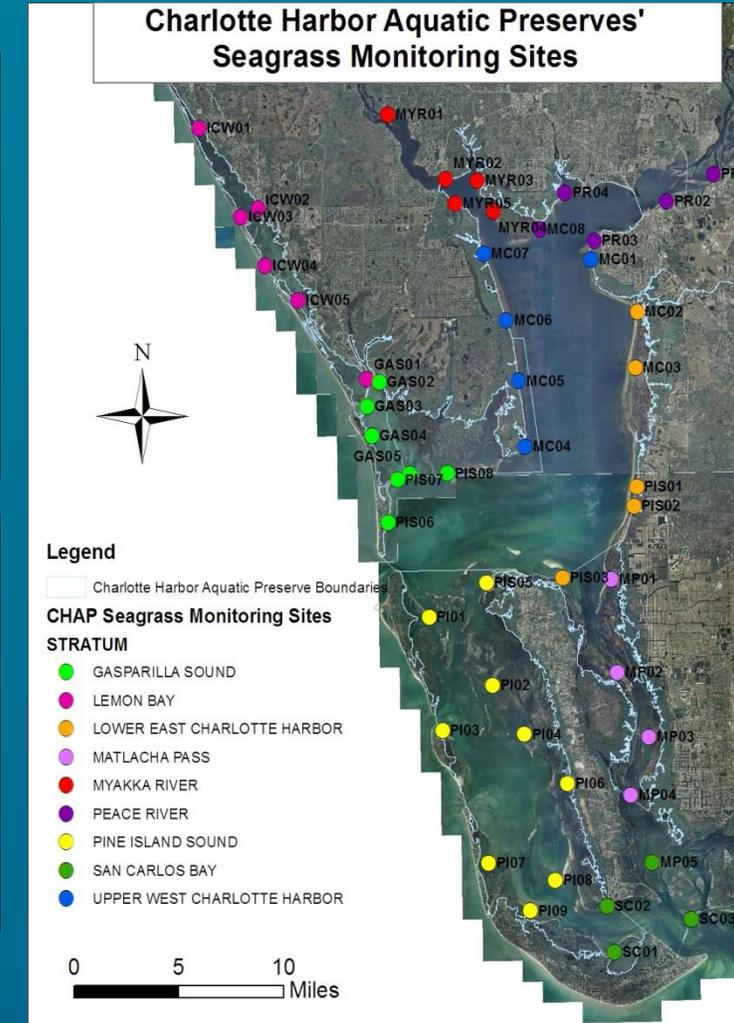
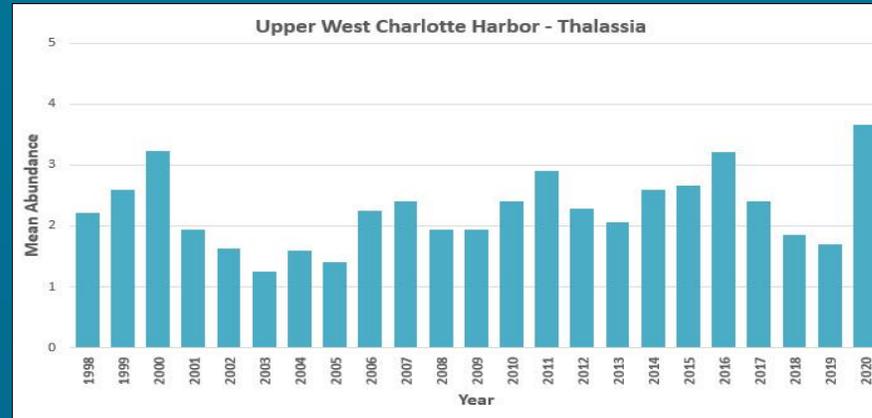
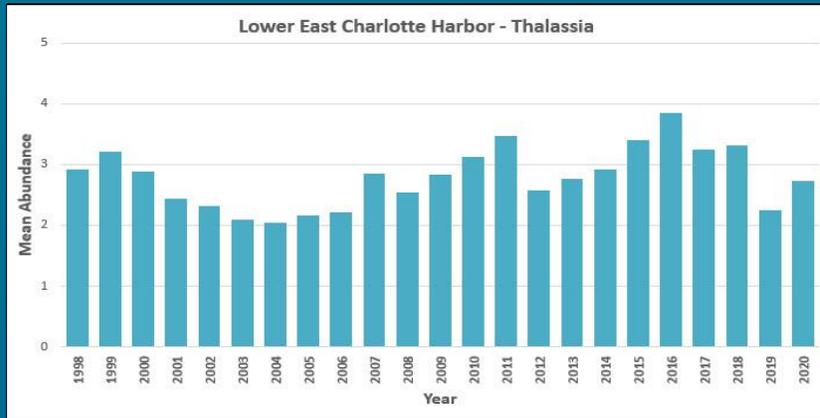
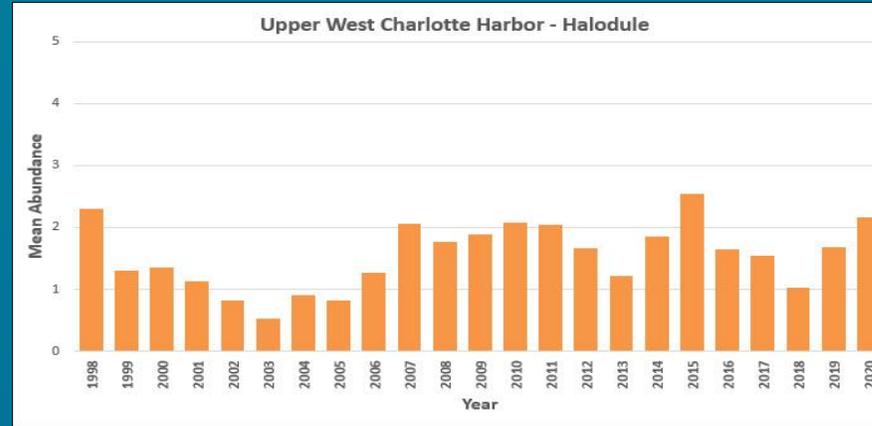
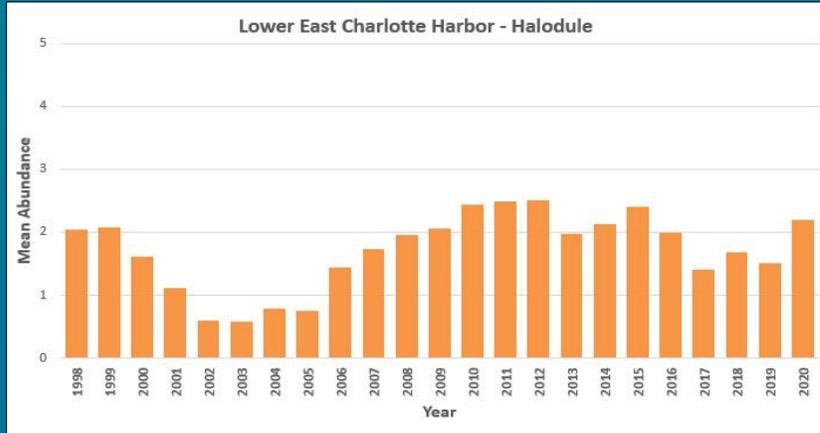


Segments	2018	2020	Δ Acres	% Change
Eastern Charlotte Harbor N	3,530	1,770	-1,760	-50%
Eastern Charlotte Harbor S	1,444	1,258	-186	-13%
Myakka River	351	189	-163	-46%
Peace River	602	349	-253	-42%
Placida	4,630	4,029	-602	-13%
Southern Charlotte	2,511	2,079	-440	-17%
Turtle Bay / Bull Bay	4,811	4,178	-634	-13%
Western Charlotte	1,835	1,421	-432	-23%
Charlotte Harbor Total	19,715	15,273	-4,615	-23%



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SEAGRASS DIVERSITY & HEALTH



Source: Charlotte Harbor Aquatic Preserves, Florida Department of Environmental Protection.



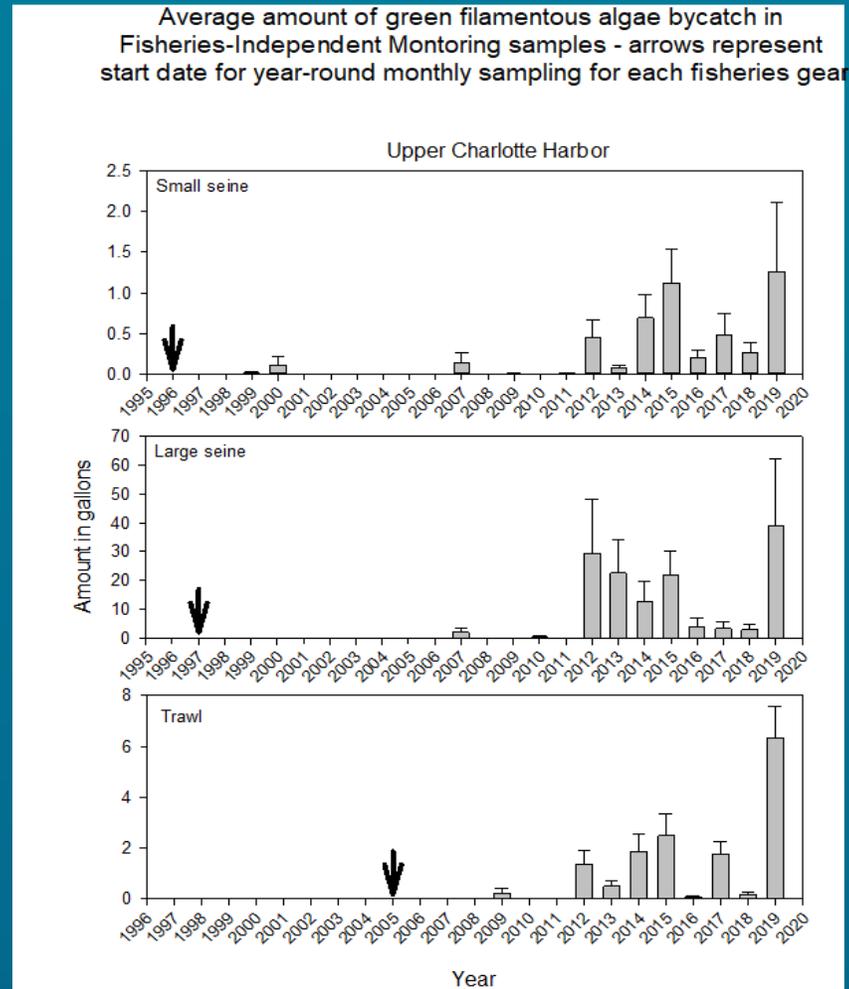
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CHARLOTTE HARBOR ALGAE

FWC-(FIM) scientists have documented 4 major green macro algae bloom 'hot spots' in recent years:

- 1) 2012/2015 Tidal Myakka
- 2) 2015 West Wall
- 3) 2019 Coral Creek
- 4) 2020 CH East Wall

The 2019-2020 bloom was also recorded By volunteers with UF/IFAS in Charlotte County during Seagrass Surveys.



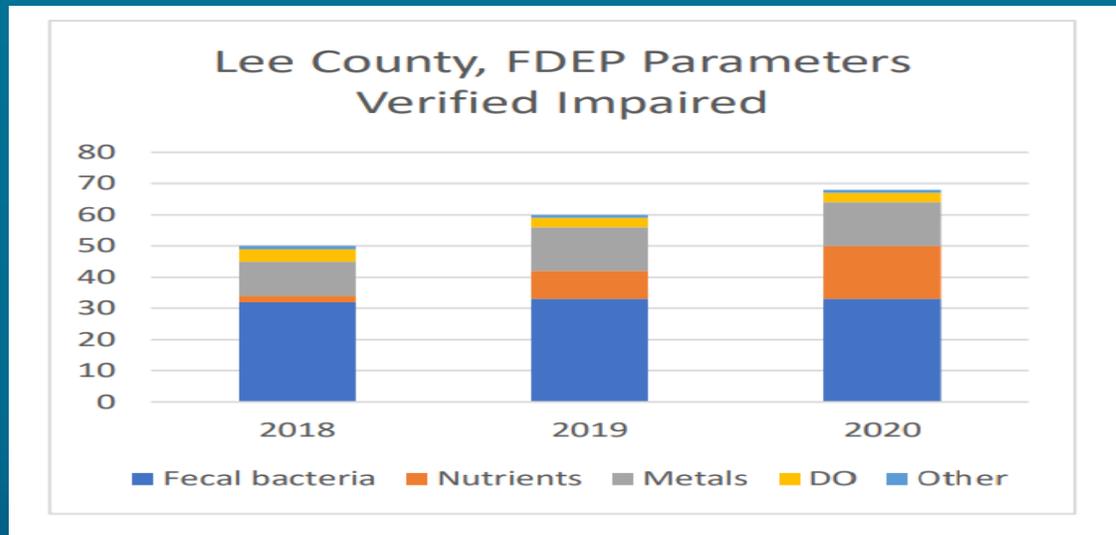
Sources: Florida Fish and Wildlife Conservation Commission, Fisheries-Independent Monitoring Program and Florida Sea Grant



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PINE ISLAND SOUND, MATLACHA PASS, SAN CARLOS BAY ESTUARIES

- Impaired (FDEP IWR)
 - Nutrients, Fecal Coliform, Mercury
- WQ Report Card Grade: D
- Seagrass: Decreasing ↓
- Algae: Increasing ↑

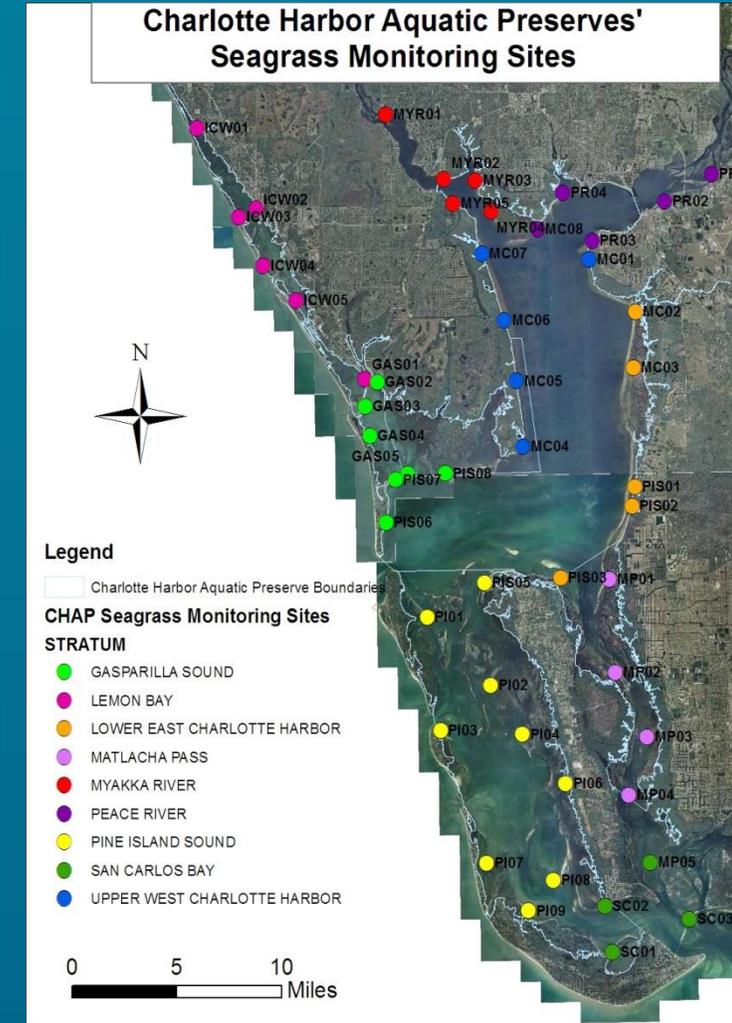
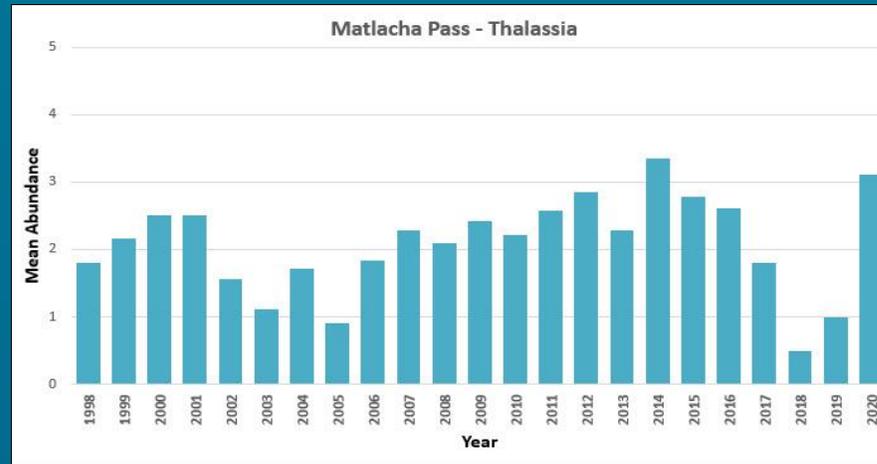
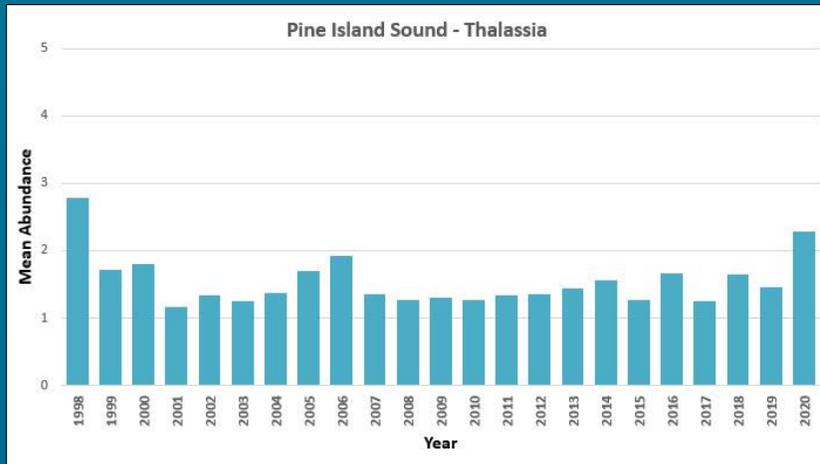
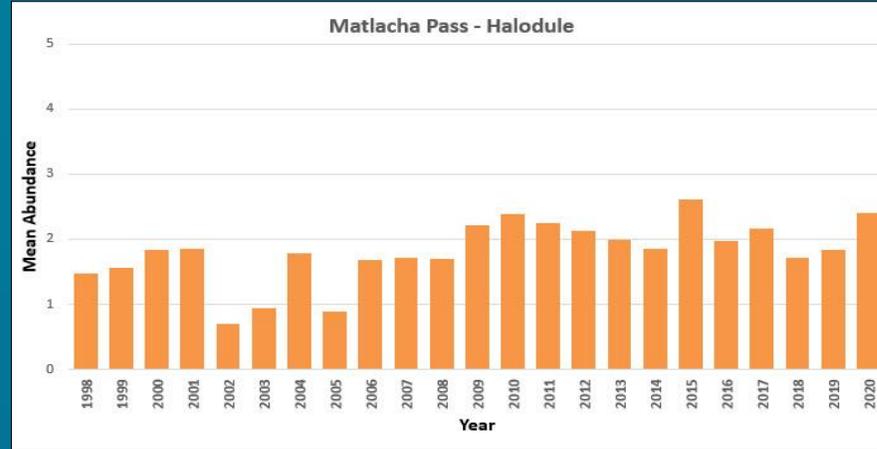
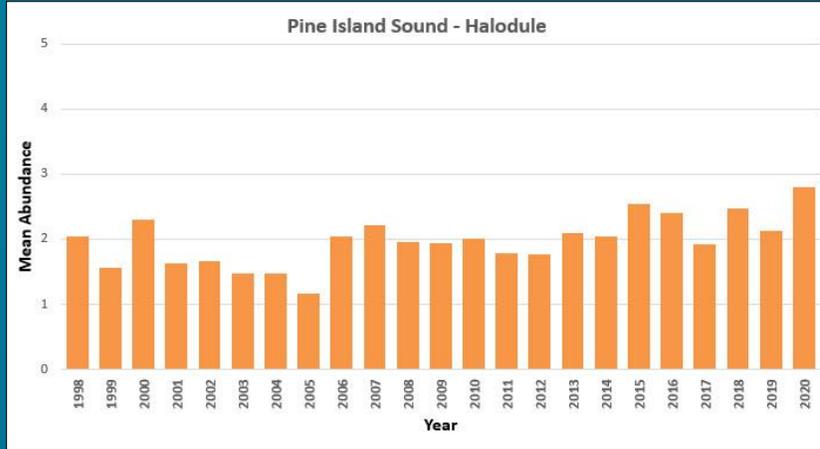


Source: Conservancy of Southwest Florida



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SEAGRASS DIVERSITY & HEALTH



Source: Charlotte Harbor Aquatic Preserves, Florida Department of Environmental Protection.



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PINE ISLAND SOUND, MATLACHA PASS, SAN CARLOS BAY ALGAE

Historical

- High densities of drift algae in winter for past 30+ years in N. Matlacha Pass

Recent

- Matlacha Pass: Increase in algae (North), *Gracilaria* bloom (North and South), green filamentous algae, loss of seagrass
- White sulfur bacteria bloom
- Pine Island: 2018-19 increased drift algae, increased macroalgae, loss of seagrass
- San Carlos: Red macroalgae beach strandings, more macroalgae than seagrass



Sources: Charlotte Harbor Aquatic Preserves, Florida Department of Environmental Protection, Sanibel Captiva Conservation Foundation

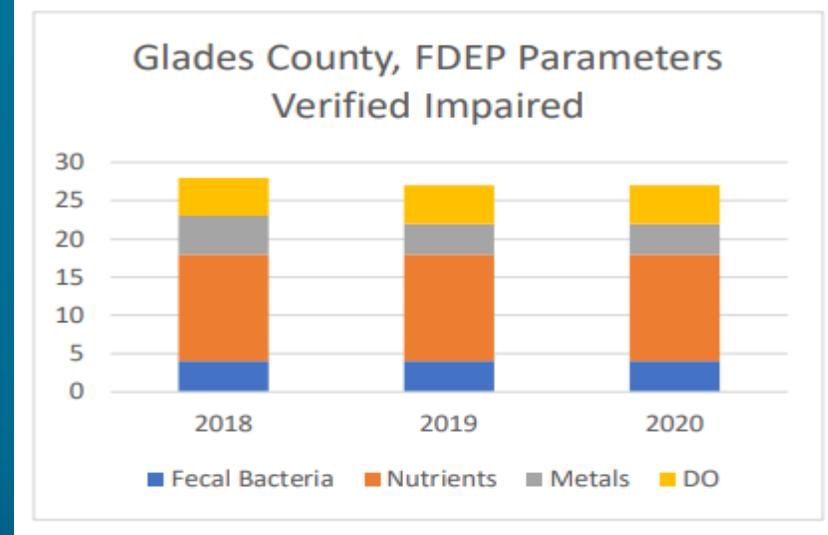
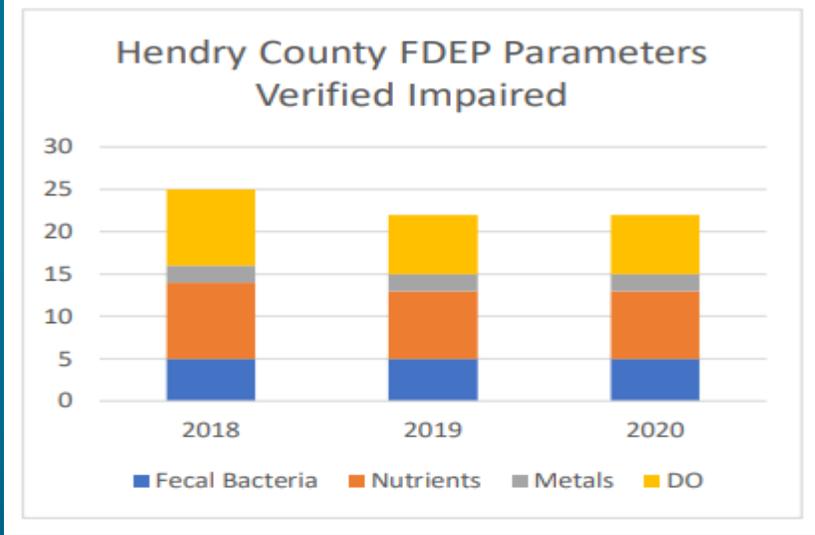
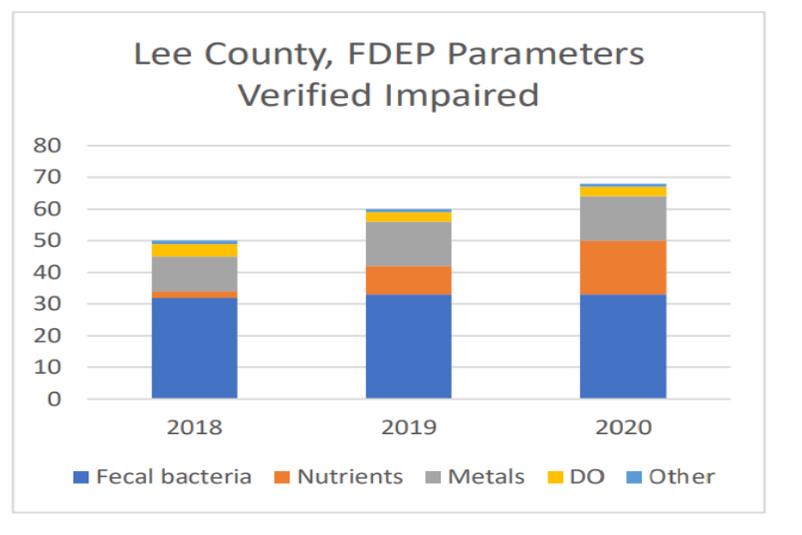
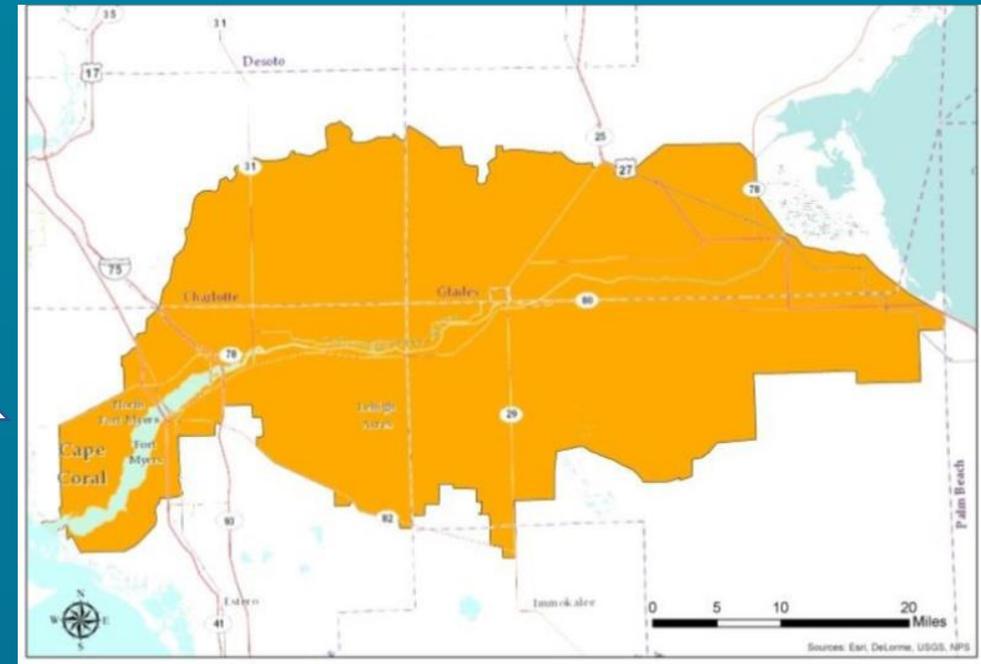


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CALOOSA HATCHEE ESTUARY

- Impaired (FDEP IWR)
 - Nutrients, DO, Fecal Coliform, Iron, and Mercury
- WQ Report Card Grade; D-

- Seagrass: Decreasing
- Algae: Increasing

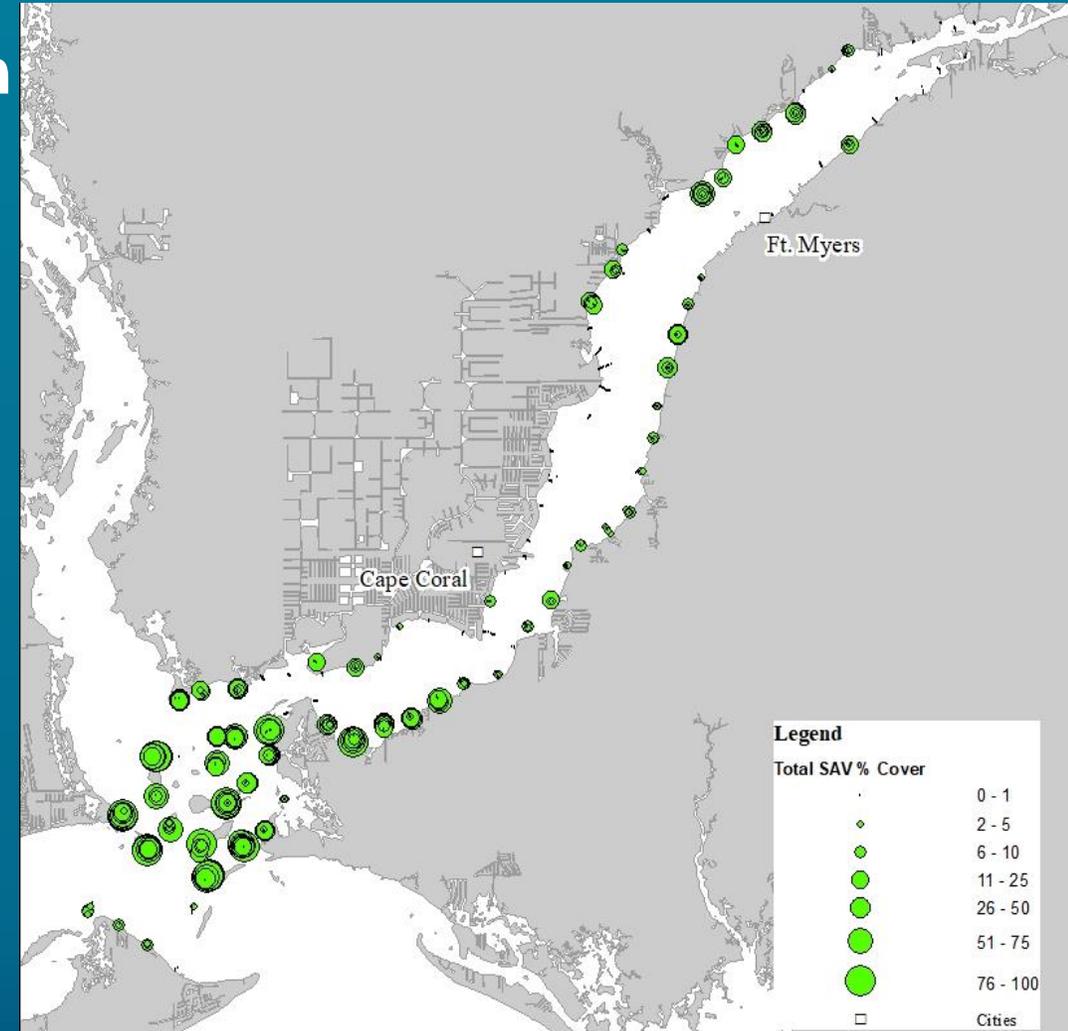
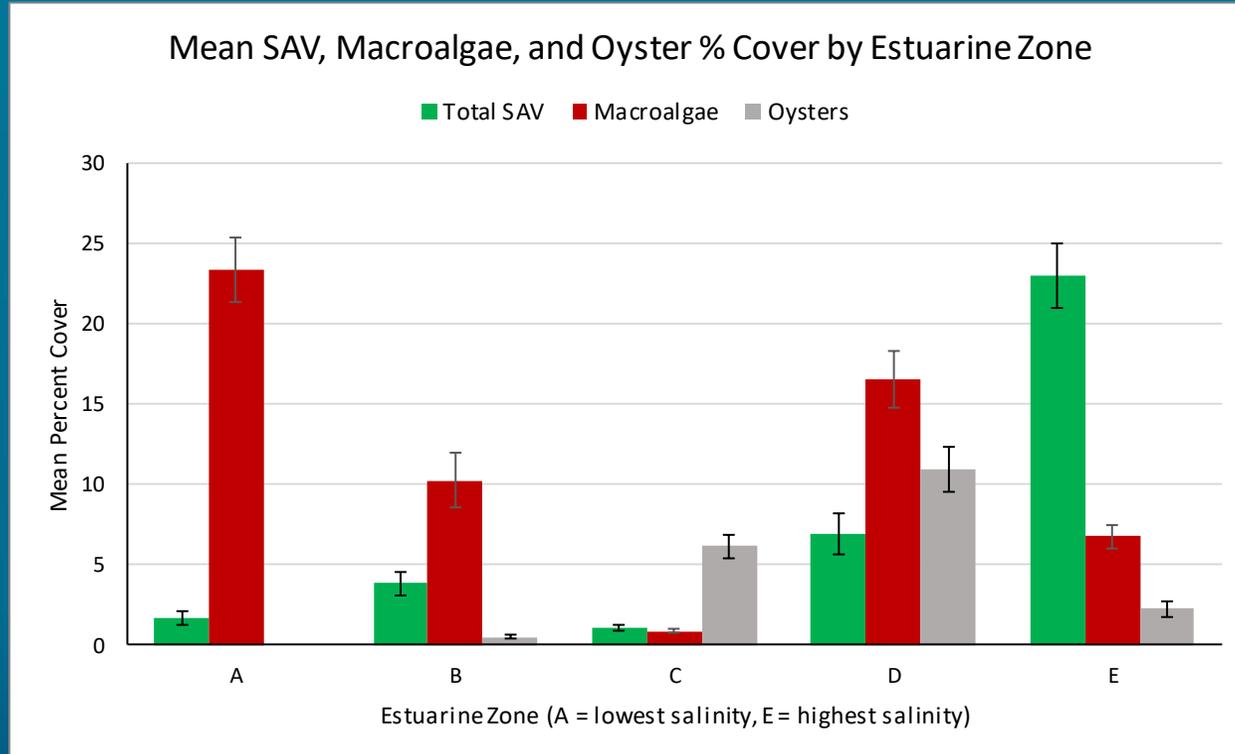


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Source: Conservancy of Southwest Florida

CALOOSAHATCHEE SEAGRASS

- Overall percent cover is low, particularly in areas in where *Vallisneria americana* is much less prevalent than in the past.

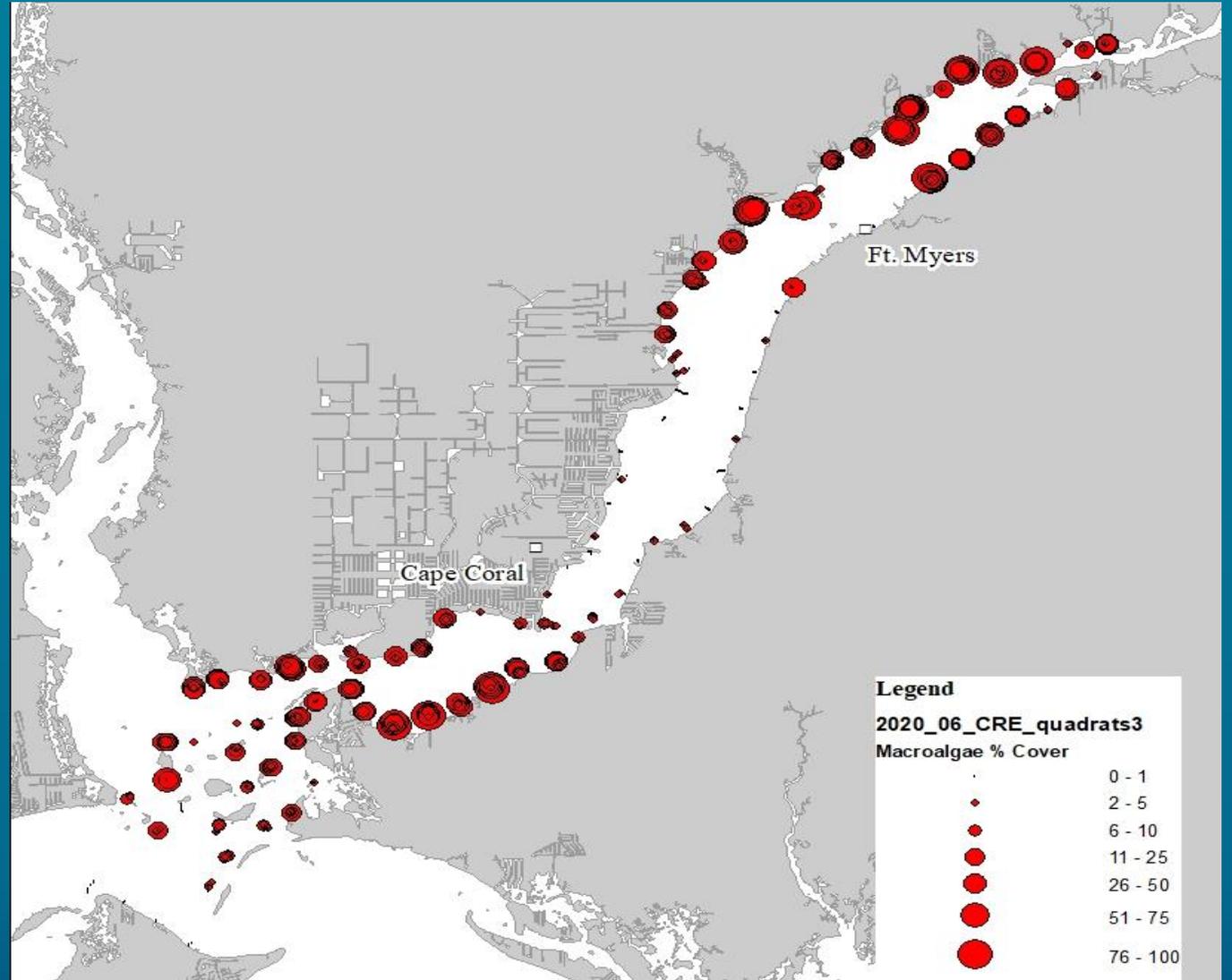


CALOOSAHATCHEE ALGAE

- FGCU and SCCF scientists documented algae and seagrass Macroalgae cover exceeded SAV cover in areas with less salinity
- Benthic mats clotted the bottom and coated sparse seagrass



Sources: Florida Gulf Coast University Water ,Sanibel Captiva Conservation Foundation

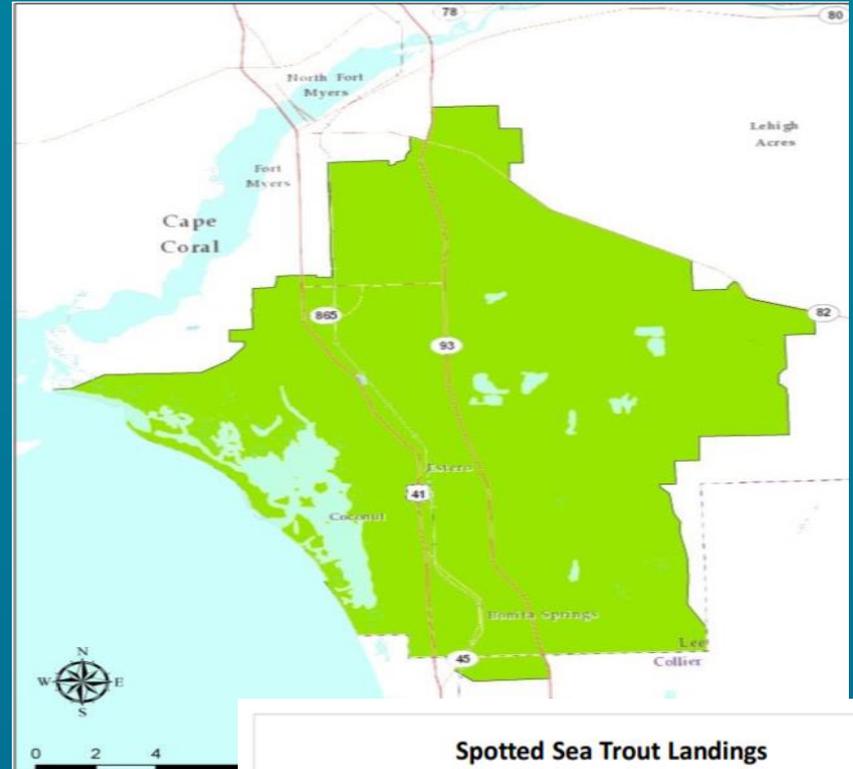


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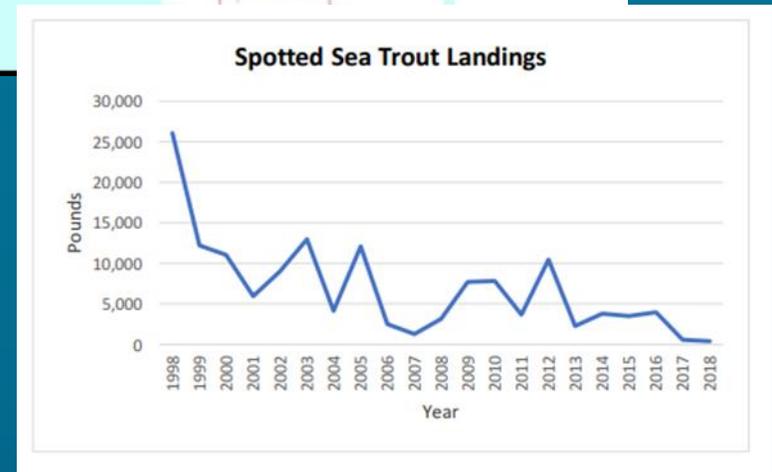
ESTERO BAY ESTUARY

- Impaired (FDEP IWR) for Mercury
Nitrogen and Bacteria
- WQ Report Card Grade: D
- Seagrass: Decreasing ↓
- Algae: Increasing ↑

Verified as Impaired in 2018 by Florida Department of Environmental Protection
 Verified as Impaired in 2019 by Florida Department of Environmental Protection



	Chlorophyll-a	DO	Fecal Coliform	Enterococci	Escherichia coli	Total Nitrogen
Estuarine						
Estero Bay			V18			V19
Hendry Creek						V19
Mullock Creek			V18	V19		V18
Estero River				V19		
Spring Creek			V18	V19		V19
Imperial River		V19	V18	V19		V19

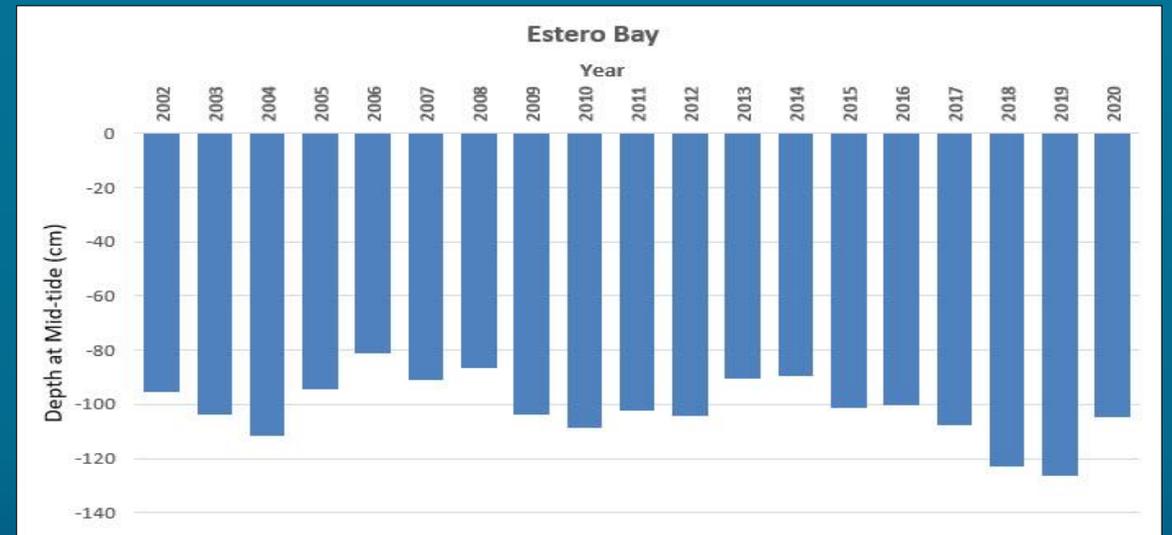
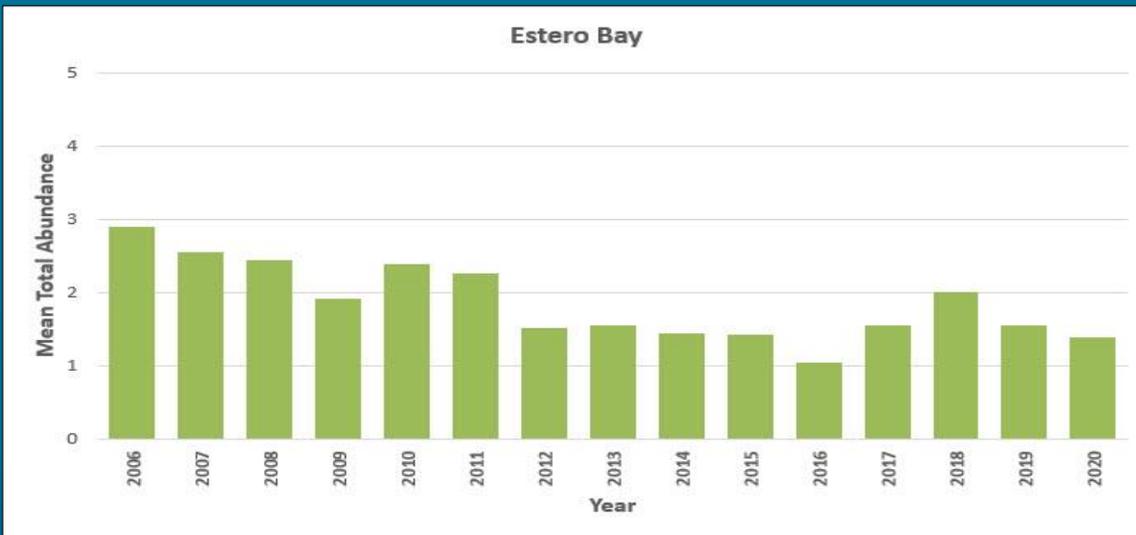
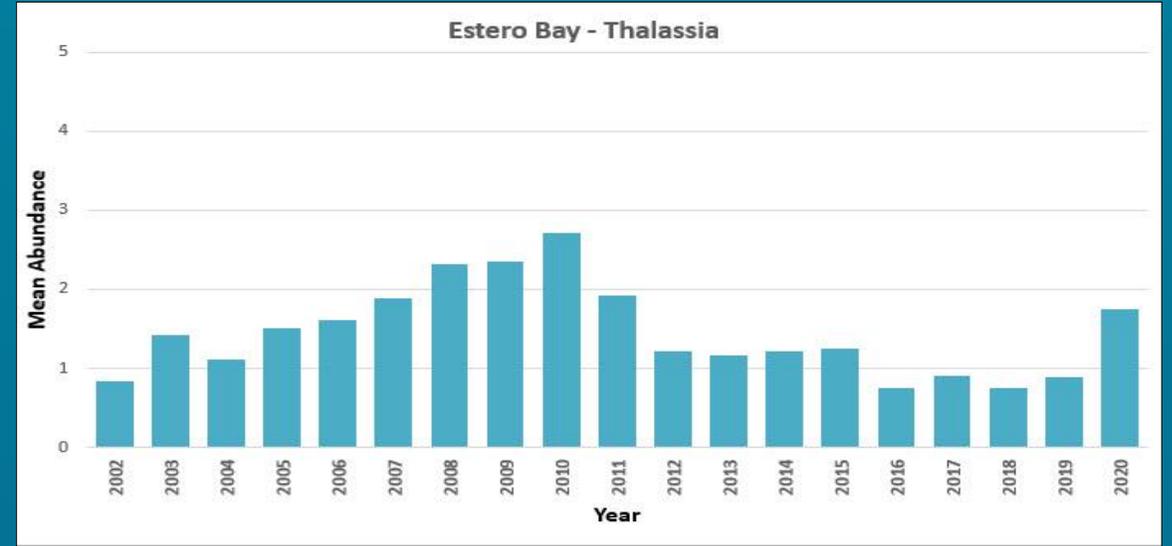
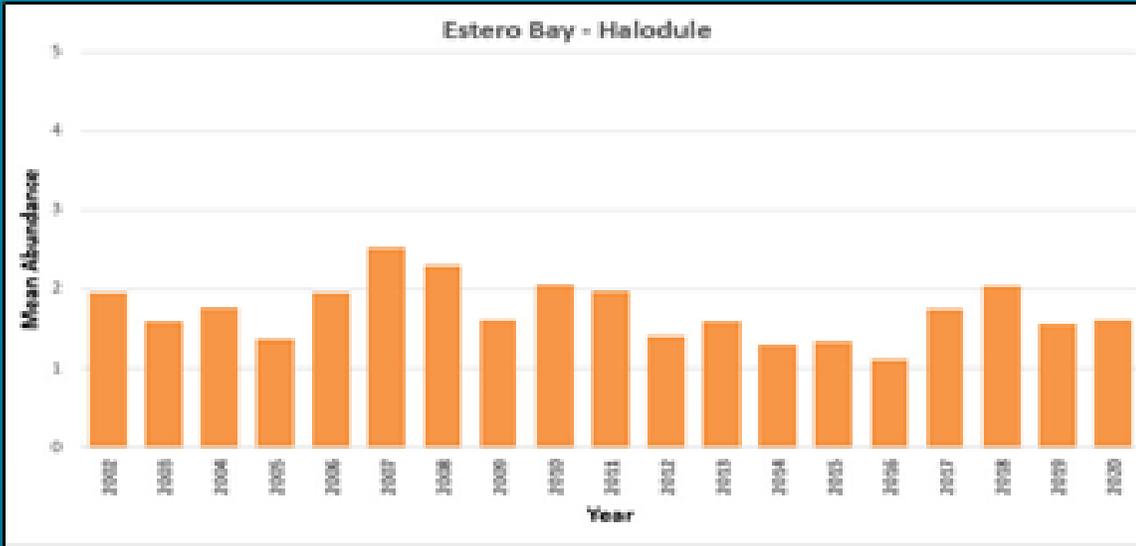


Sources: Conservancy of Southwest Florida, Estero Bay Agency on Bay Management



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SEAGRASS DIVERSITY AND HEALTH



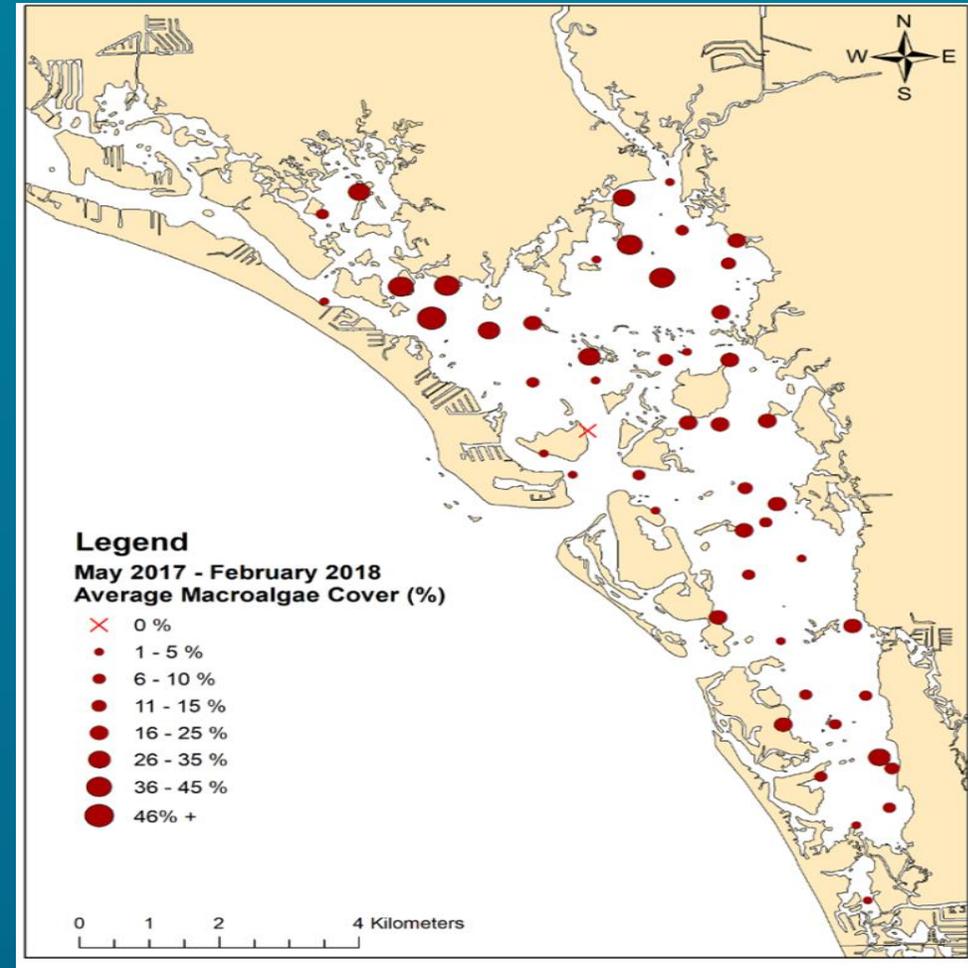
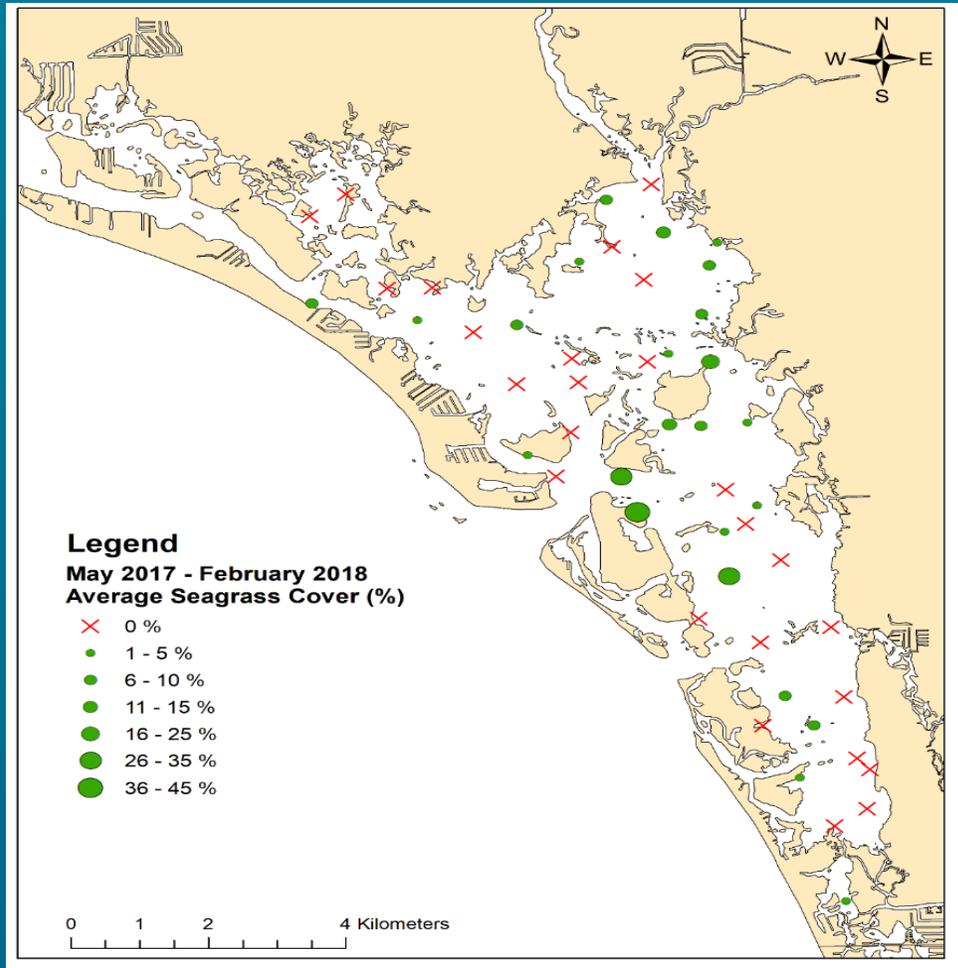
Source: Estero Bay Aquatic Preserve, Florida Department of Environmental Protection.



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ESTERO BAY ALGAE

FGCU analysis of Estero Bay Aquatic Preserve seagrass and macroalgae data



Sources: Estero Bay Aquatic Preserves, Florida Gulf Coast University



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FUTURE RESEARCH NEEDS

- Funding for more frequent aerial surveys/
District surveys done in coordination.
Supplement with drone footage gathered in hot spots? Use machine learning to analyze large amounts of data quickly.
- Analysis of data to look at hot spatial coverage and seagrass quality changes (including species composition and water clarity) together to get better understanding
- Need to establish regular (annual or semi-annual) field monitoring and spatial extent mapping of macroalgae with seagrass and WQ trends



MANAGEMENT NEEDS

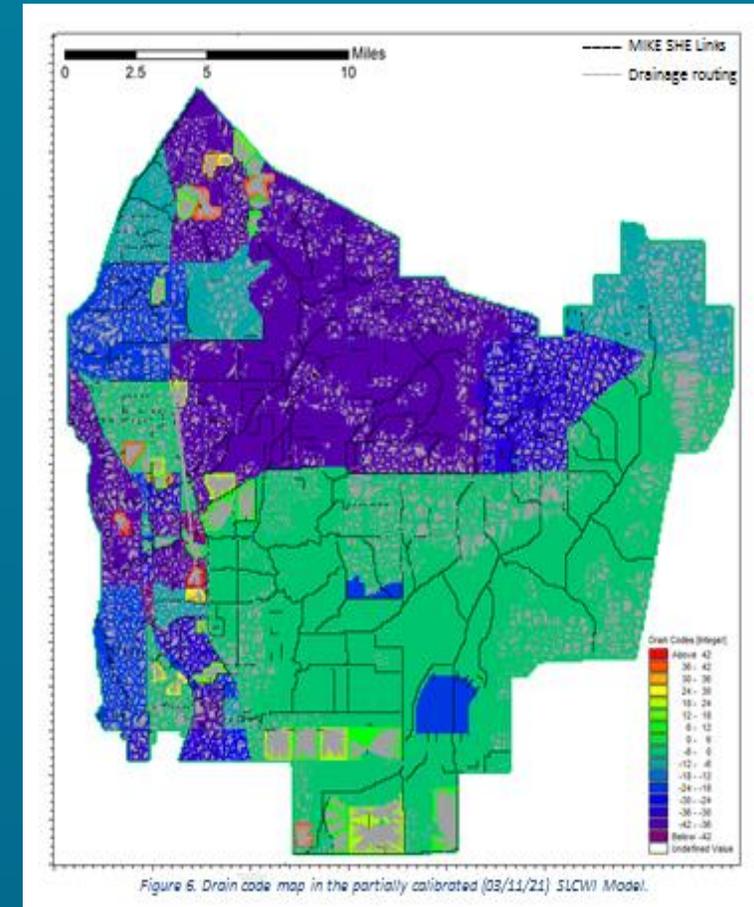
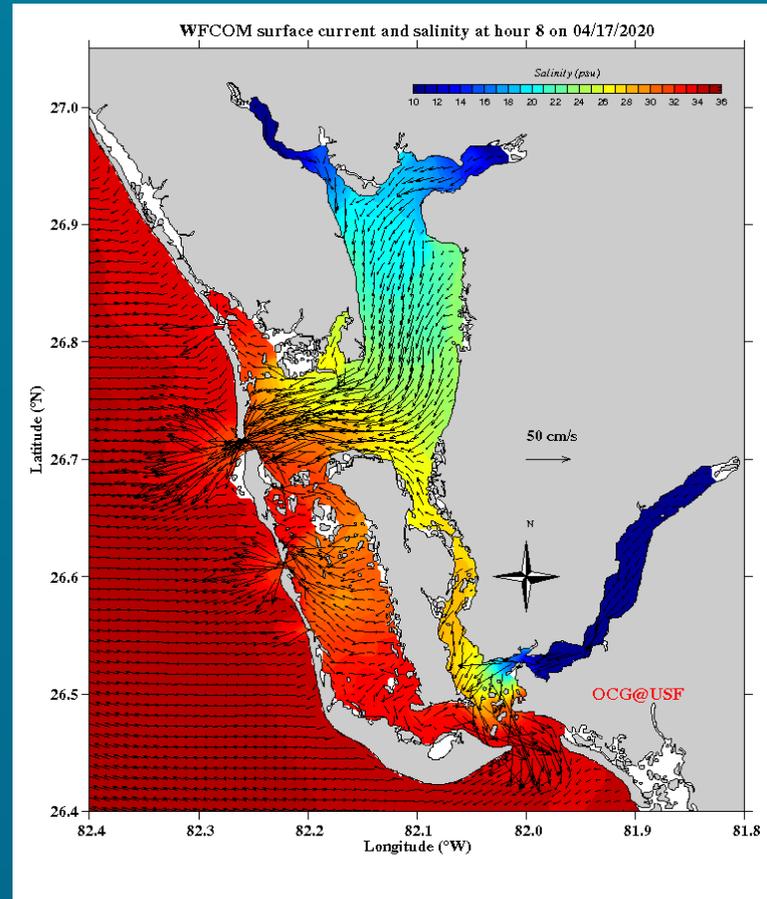
- Re-evaluate water quality ‘targets’ for bio-indicators seagrass/macroalgae
- Bring segregated datasets together
- Holistic approach to evaluating health from an ecosystem perspective, the shift from seagrass to algae could have cascading impacts as animals dependent upon seagrass for food and shelter
- Investigate to establish source/concentration for increased nutrients and manage our watersheds to mitigate
- Climate change will only exacerbate stressors causing current bloom-increased temperatures, more frequent/intense storms causing more nutrient pollution runoff from land as well as possible sedimentation of existing seagrass



ADDITIONAL RESEARCH & MANAGEMENT CONSIDERATIONS

Additional data considerations for holistic approach. Data for the region includes:

- Predictive Modeling of circulation: West Florida Coastal Ocean Model for Charlotte Harbor
- Hydrological modeling in the Charlotte Harbor and Estero Bay watersheds



Sources: University of South Florida, College of Marine Science – Ocean Circulation Group,



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THE POWER OF PARTNERSHIP

Current Partnership projects and resources:

- Coastal Charlotte Harbor Water Monitoring Network and Charlotte Harbor Estuaries Volunteer Water Quality Program. Continued seagrass, algae, and fisheries monitoring (FWC, CHAP, Sea Grant, FDEP, CHNEP, SWFWMD and Municipalities)
- CHNEP Water Atlas public website with analytical tools. NEW Seagrass pages and fact sheets and analytical tools such as heat maps and circulation models chnep.wateratlas.usf.edu/
- Large-scale watershed hydrological modeling and restoration planning projects for improving flows to natural systems
- UF/IFAS, FSG, CHAP, SCCF, FGCU/CHNEP studies on nutrient cycling, seagrass data analysis, and quantify nutrient removal benefits of seagrass



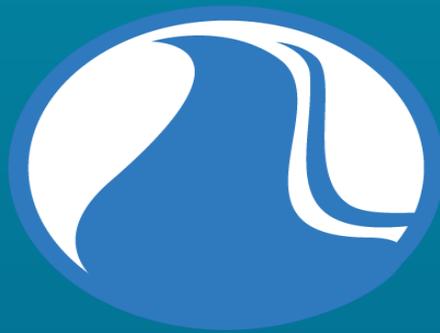
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Reducing Nutrient Pollution

- **Improved wastewater, stormwater and ag/industrial runoff retention and treatment**
- **Increased nutrient sampling for more assessment, TMDLs and BMAPs**
- **Improved stormwater treatment regulation**



Restoring Hydrological Flow

- **Flow volume affects pollution concentrations and loads - so restoring appropriate flows with hydrological restoration and better flow management is important**



Restoring Aquatic Habitat

- **Seagrass and shellfish restoration, wetlands, and living shorelines provide natural systems approaches to nutrient uptake, as well as assist natural systems being more resilient to the impacts of algae blooms**



Outreach and Public Engagement

- **Environmental education and citizen engagement spread community support and involvement in nutrient pollution reducing behaviors Providing resources to Policymakers for decision-making**



CHNEP RESOURCES

- To read more about how CHNEP is *Uniting Central and Southwest Florida to Protect Water and Wildlife*, go to the CHNEP Comprehensive Conservation & Management Plan at <https://www.chnep.org/our-plan>
- Read our full publications at <https://www.chnep.org/publications>
- CHNEP Water Atlas available at <https://chnep.wateratlas.usf.edu/>



Improve Water
Quality



Restore
Hydrological Flow



Protect Fish, Wildlife
and their Habitat



Educate and
Engage the Public



Uniting Central and Southwest Florida to Protect Water and Wildlife

THANK YOU

Many partners continuing to research to find better ways to manage our waterways and habitats!

- Concerned community members and citizen-scientists collecting data
- Florida Department of Environmental Protection (FDEP)
- Southwest and South Florida Water Management District (SWFWMD) (SFWMD)
- The National Estuary Program and Florida NEP's
- Florida Fish and Wildlife Conservation Commission (FWC)
- Florida Sea Grant (UF)
- Counties and Local Municipalities
- Universities and NGO's



Courtesy of: FDEP CHAP



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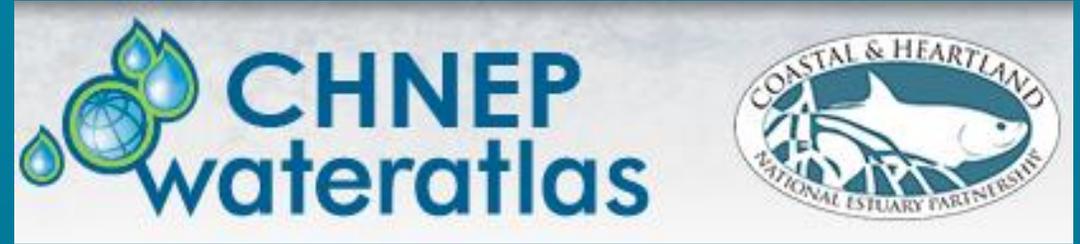
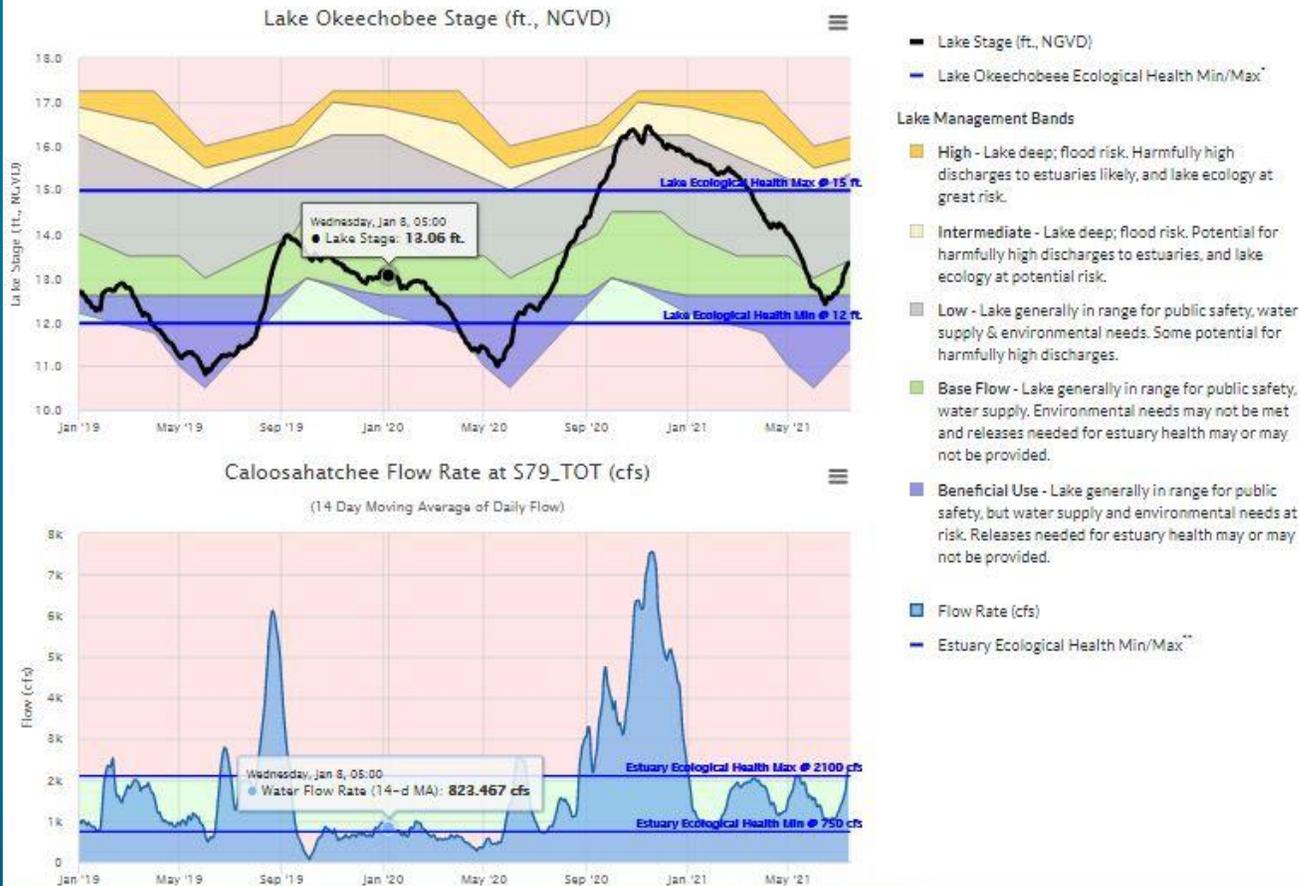
CHNEP WATER ATLAS

Lake Okeechobee & Caloosahatchee Estuary Tracker

The graphs below show recent elevation levels¹ of Lake Okeechobee, and the corresponding rate of discharge (flow)² of water into the Caloosahatchee River. "Lake Management Bands" comprise the background of the graphs; these bands are defined in the LOSDM. The health minimum and maximum define the optimum ranges for lake level and river flow.

¹ As measured by SFWMD station LAKEOKEE, which is a composite "pseudo-station" that reports the daily mean of eight elevation gages operated by the Army Corps of Engineers (ACOE).

² Mean daily flow of water from Lake Okeechobee into the Caloosahatchee River, as measured at the WP Franklin Lock, in cubic feet per second (cfs).



- User-friendly maps and charts.
- Lake Okeechobee and Caloosahatchee Release Levels
- Seagrass Health, Diversity, and Acreage
- Water Quality Status and Trends
- Habitat Restoration Needs Plan Pages



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COASTAL CHARLOTTE HARBOR MONITORING NETWORK (CCHMN)

The CCHMN is a regional partnership of agencies (managed under CHNEP) that collect monthly water quality data using consistent, technically-sound sampling design allows scientific assessment of status and trends. Partners collect and analyze water samples from 60 randomly selected field sites throughout 10 waterbodies each month.

- Partners: CHNEP, FWC, FDEP, SWFWMD, Charlotte County, City of Cape Coral, and Lee County
- Implemented: 2001-
Present Status: Ongoing



SLC WATERSHED INITIATIVE HYDROLOGICAL MODELING PROJECT

The South Lee County Watershed Initiative addresses areas highly susceptible to over-drainage, flooding, habitat changes, water quality degradation, and climate change stressors and aims to :

- Expand informed decision making
- Improve water quality



- **Location:** Lee County, FL
- **Partners:**
 - South Florida Water Management District, Southwest Florida Regional Planning Council, City of Bonita Springs, Lee County, Village of Estero, Bonita Springs Utilities, Florida Department of Transportation, Conservancy of Southwest Florida, Audubon Society, Corkscrew Swamp Sanctuary, and the Estero Council of Community Leaders.
- **Implemented:** 2020
- **Status:** 2020
- **CHNEP Cost:** \$195,296
- **Funding Source:**
 - Environmental Protection Agency, South Florida Water Management District



CHARLOTTE HARBOR FLATWOODS HYDROLOGICAL RESTORATION INITIATIVE



The Charlotte Harbor Flatwoods Hydrologic Restoration Initiative (CHFI) encompasses 80,000 acres of land and has the goals of:

- Flood reduction
- Improved water quality
- Enhance fish and wildlife habitat



- **Location:** Charlotte and Lee Counties, FL
- **Partners:** Charlotte County, Southwest Florida Water Management District, South Florida Water Management District, and Florida Fish and Wildlife Conservation Commission
- **Implemented:** 2020
- **Status:** Upcoming
- **CHNEP Cost:** \$573,060



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GATEWAY TO MYAKKA MARSH RESTORATION



The Myakka is designated a “Florida Wild and Scenic River” with a wide variety of habitats found along its shores.

- Enhanced habitat
- Recreational and Educational benefits
- Economic benefits



- Location: Sarasota and Manatee Counties, FL
- Partners: Conservation Foundation of the Gulf Coast, Beautiful Ponds, Inc., Myakka River State Park, National Fish and Wildlife Foundation, USDA Natural Resources Conservation Service, Southwest Florida Water Management District, Disney Conservation Fund, and Selby Foundation
- Implemented: 2019
- Status: Ongoing
- Funding Source: Environmental Protection Agency



PINE ISLAND FLATWOODS PRESERVE WETLAND HABITAT ENHANCEMENT



Pine Island Flatwoods Preserve (part of the Lee County Conservation 20/20 Program) is a 919-acre passive area and will result in:

- Enhance quality of wildlife habitat
- Restore hydrology
- Increase wetlands



- **Location:** Lee County, FL
- **Partners:** Florida Fish and Wildlife Conservation Commission, Lee County Parks and Recreation Conservation 20/20
Implemented: 2020
- **Status:** Upcoming
- **CHNEP Cost:** \$86,000
- **Funding Source:** CHNEP



CALOOSAHATCHEE CYANOBACTERIA RAPID RESPONSE PILOT PROGRAM

- This project is working to test the use of open-cell foam technology known as AquaFlex to absorb and remove excess nutrients along with Cyanobacteria and the toxin it produces, with the anticipated benefits of:



- **Location:** Lee County, FL
- **Partners:**
 - Sea and Shoreline Aquatic Restoration, Florida Gulf Coast University, AquaFlex Holdings LLC
- **Implemented:** 2020
- **Status:** 2020
- **CHNEP Cost:** \$65,000
- **Funding Source:**
 - Environmental Protection Agency



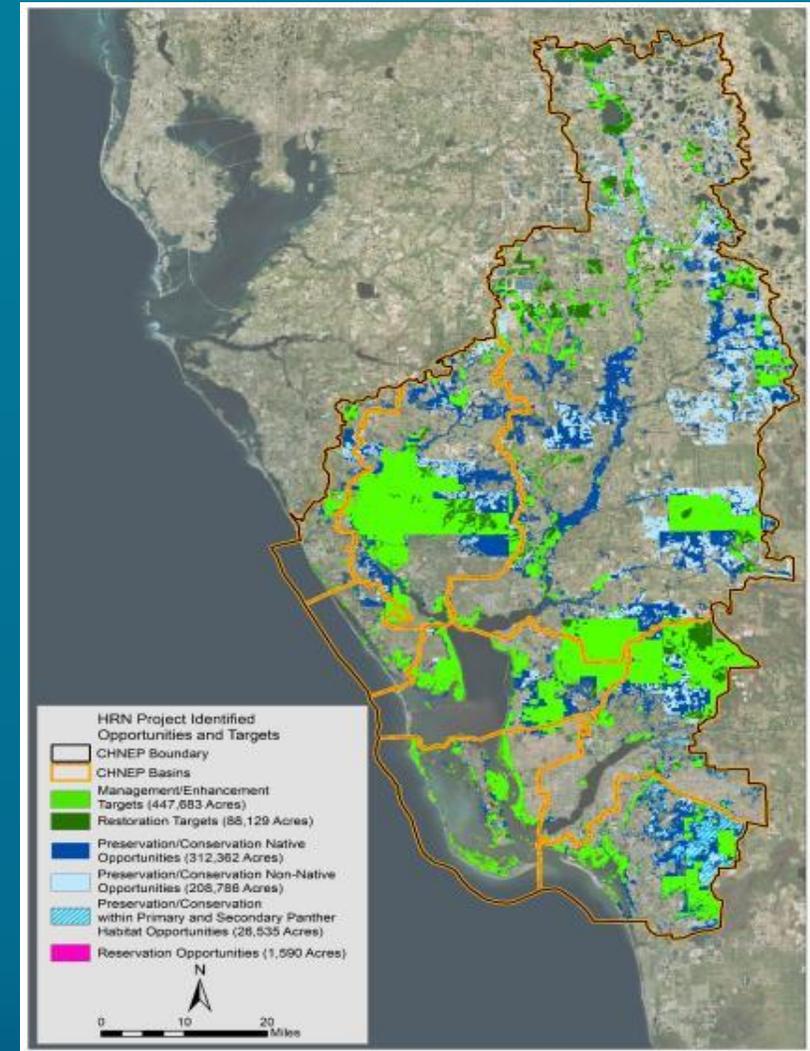
HABITAT RESTORATION NEEDS PLAN

CHNEP funded data gathering, mapping and analysis of all identified important habitat areas to create a master plan for landscape-level habitat protection.

Helps agencies and organizations identify:

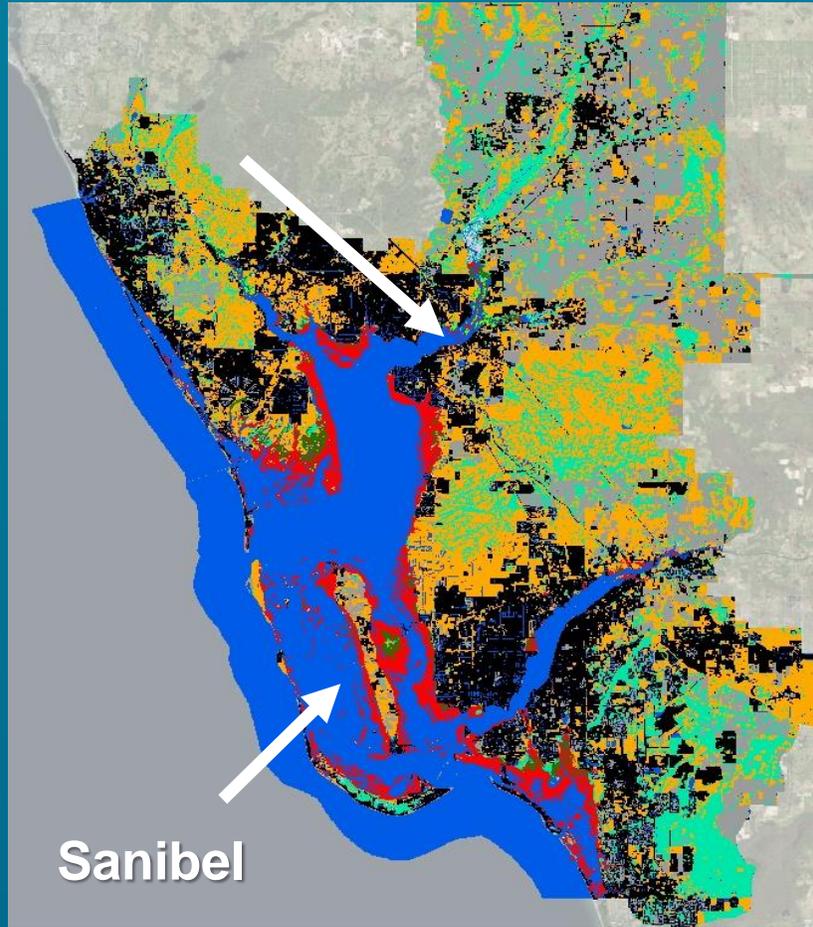
1. Preservation/Conservation Opportunities
2. Reservation Opportunities
3. Management/Enhancement Targets
4. Restoration Targets

When combined, the private habitat area opportunities (blues), fit together with public habitat area targets (greens), to create landscape-level habitat corridors and contiguous habitat areas

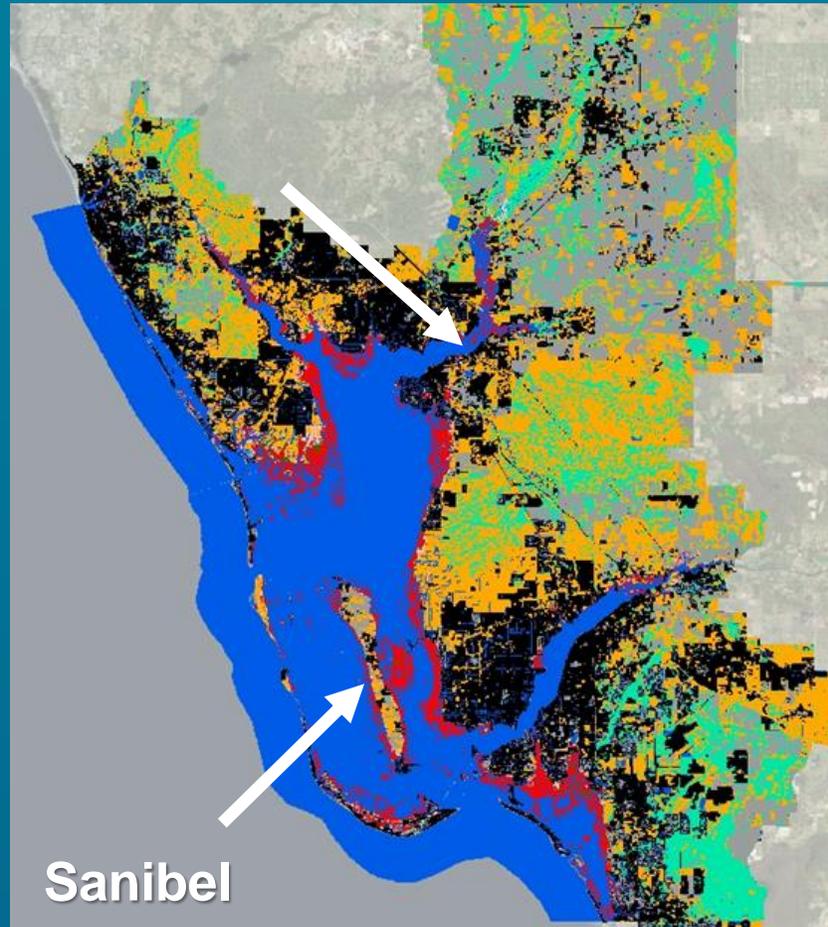


MODELING HABITAT SHIFTS: SEA LEVEL RISE

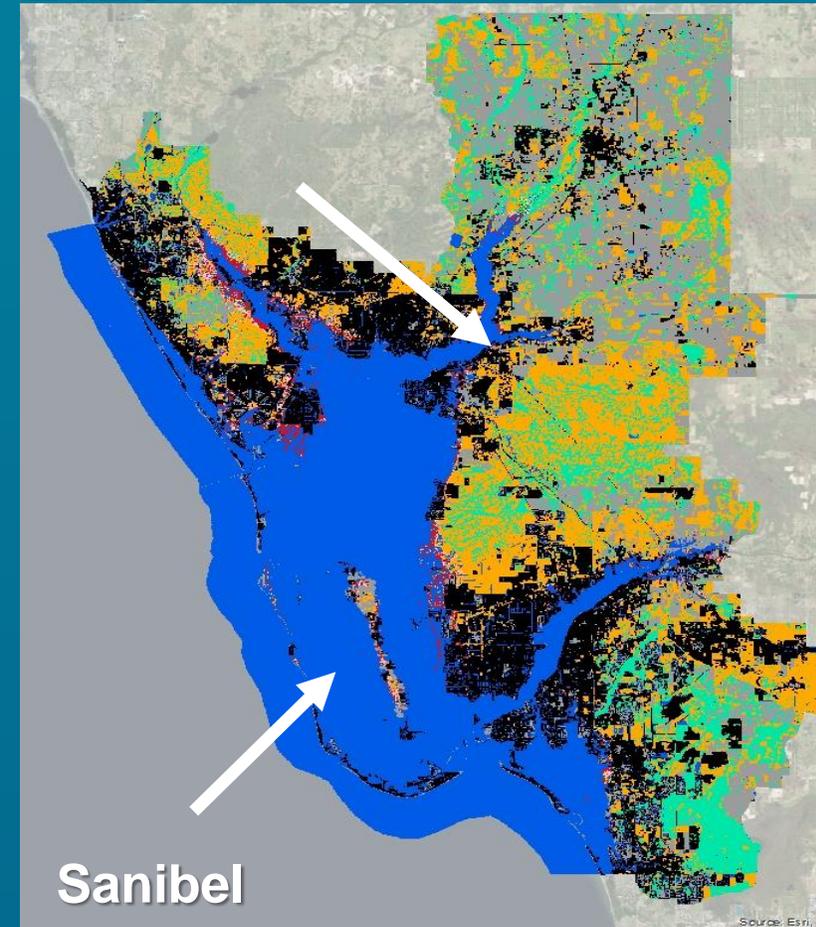
2016



2070



2120



NOAA Intermediate-High SLR, Low Accretion



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RESOURCES FOR STAYING ENGAGED

- Find more info on the CHNEP *Water Atlas website*
- The site has all the publicly available water quality data, flow data, water quality and clarity trends analysis, and other types of data and tools to assess water conditions.
- Water Quality Dashboard, Numeric Nutrient Calculator and Seagrass map pages are coming soon!
- CHNEP Water Atlas available at <https://chnep.wateratlas.usf.edu/>

The screenshot shows the CHNEP Water Atlas website. At the top, there are logos for CHNEP wateratlas and Coastal & Heartland National Estuary Partnership. A navigation menu includes HOME, MAPPING, ANALYSIS, LEARN, PARTICIPATE, and ABOUT. The main banner features a scenic image of a wetland with the text: "CHNEP Water Atlas. A collection of data, information and educational materials dedicated to the natural resources found within the study area of the Coastal & Heartland National Estuary Partnership." Below this is a "WELCOME TO THE CHNEP WATER ATLAS" section with a subtitle: "The Coastal & Heartland National Estuary Partnership: Uniting Central and Southwest Florida to Protect Water and Wildlife" and a list of served basins: "Serving Dona and Roberts Bays, Lemon Bay, Charlotte Harbor, Pine Island Sound, Estero Bay, as well as the Peace, Myakka, and Caloosahatchee River Basins." The lower section is titled "Find a Waterbody" and includes a search bar with the prompt "Type the name of a water resource in the box below." and a map of Florida showing water bodies. A list of popular resources is shown on the right, including Gulf Of Mexico, Cape Coral Canal System, Tidal Caloosahatchee River, Charlotte Harbor, and Caloosahatchee River. A "Find Nearby Waterbodies" button is at the bottom right.



PUBLIC ENGAGEMENT



- Harbor Happenings Magazine
- Annual Nature Calendar
- Monthly Volunteer Events
- Attend outreach festivals in each county
- Conservation Grants



Coastal & Heartland National Estuary Partnership



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