

Florida Oysters – Community, Fishery, Management



Presenter: Devin Resko



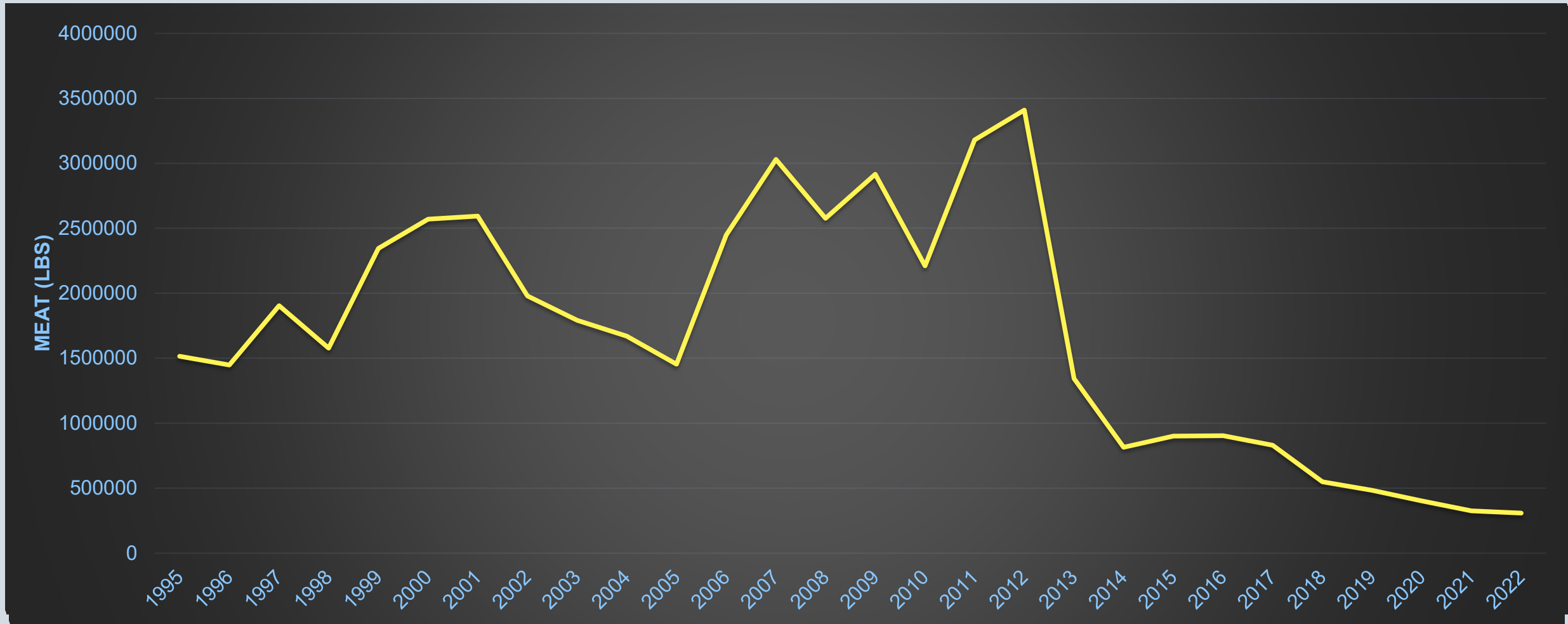
Florida Fish and Wildlife Conservation Commission

Florida's Oyster Industry

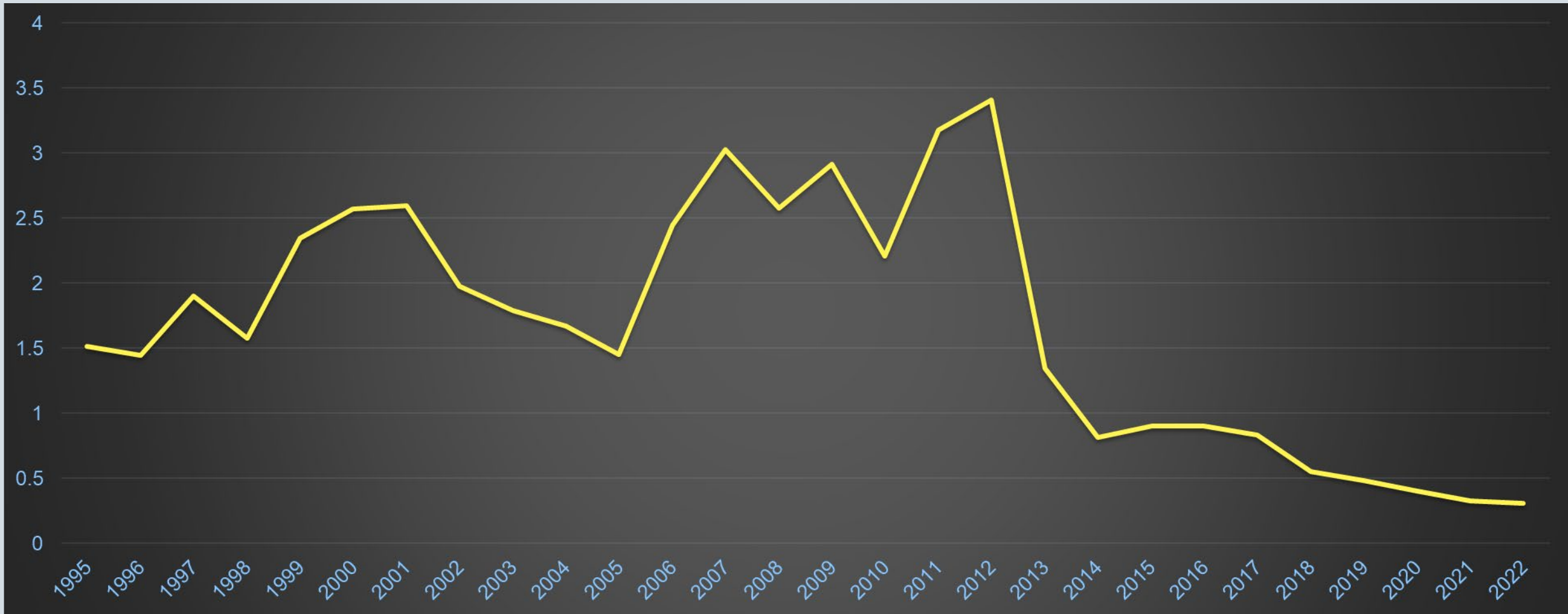
- Statewide fishery, focused in northwest Florida and Big Bend
 - Historically dominated by Apalachicola Bay
- Primarily wild oyster harvest
 - Publicly-accessible reefs
 - Harvested by hand or tongs
- Aquaculture rapidly expanding
 - Oysters grown on leased parcels
- Considerable decline in number of license holders who commercially harvest oysters



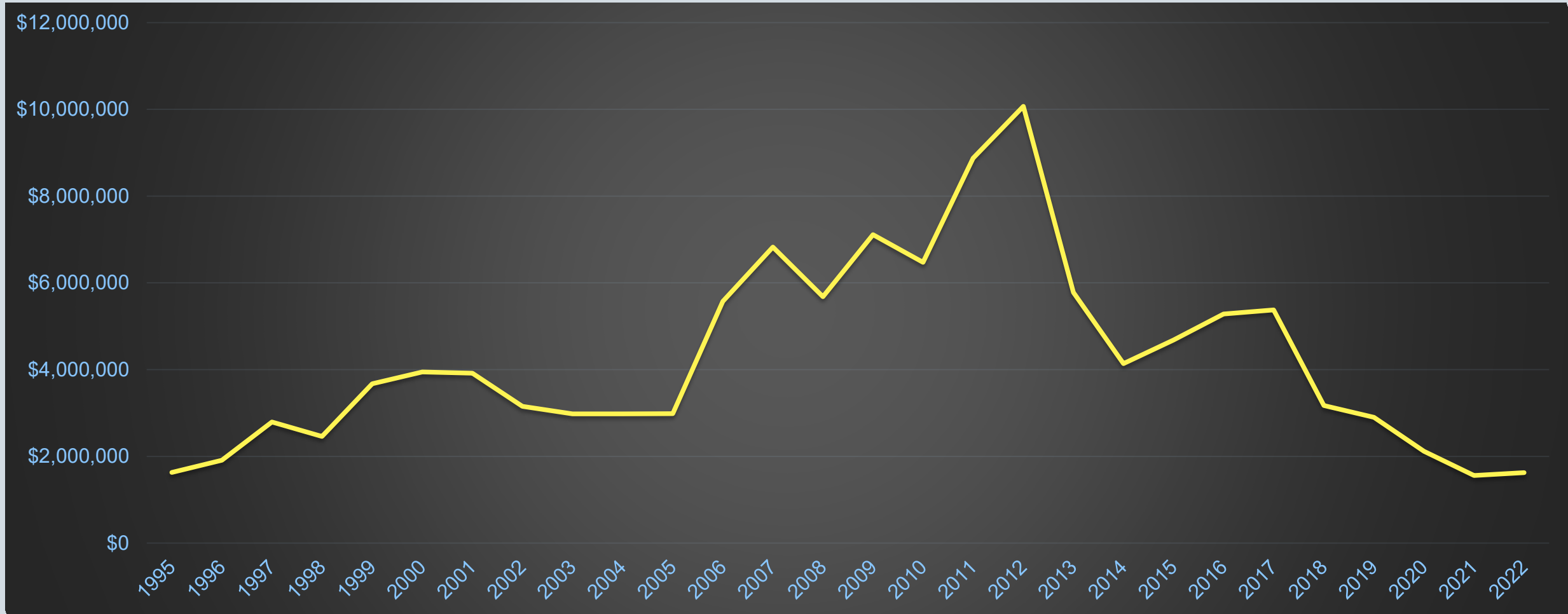
Florida's Oyster Industry – Statewide Landed Pounds

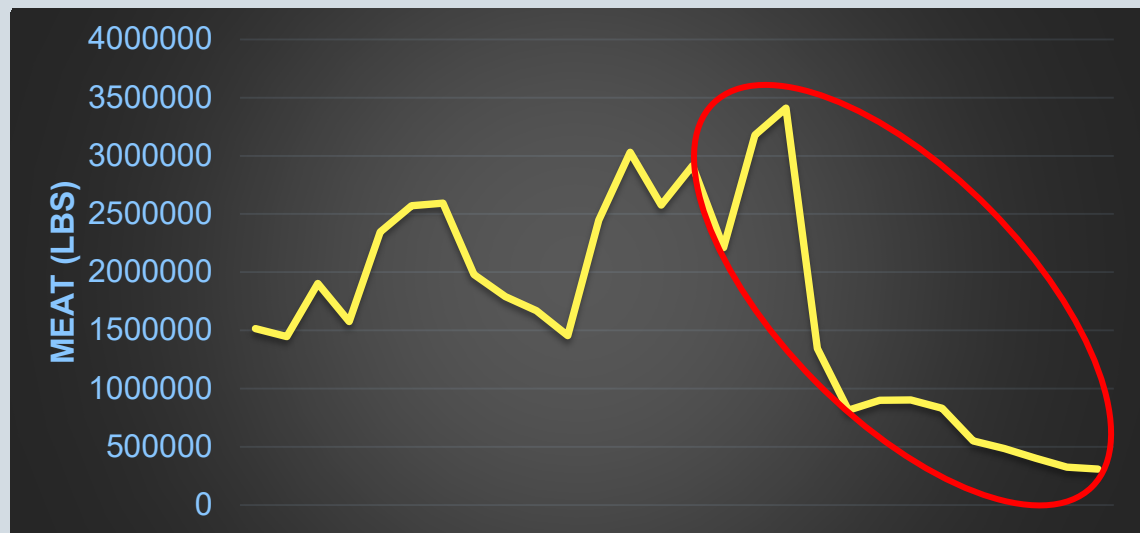
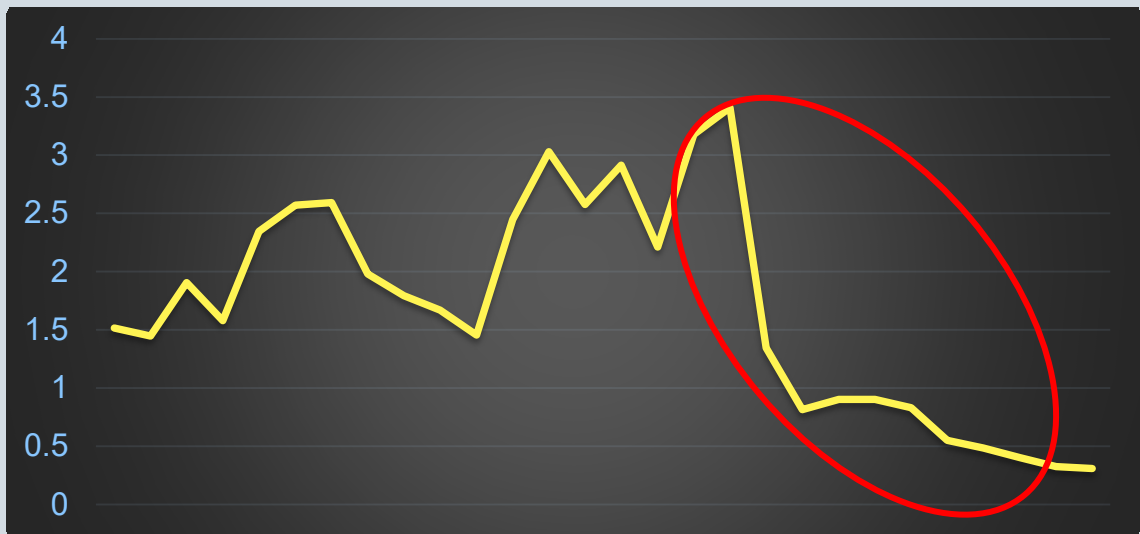
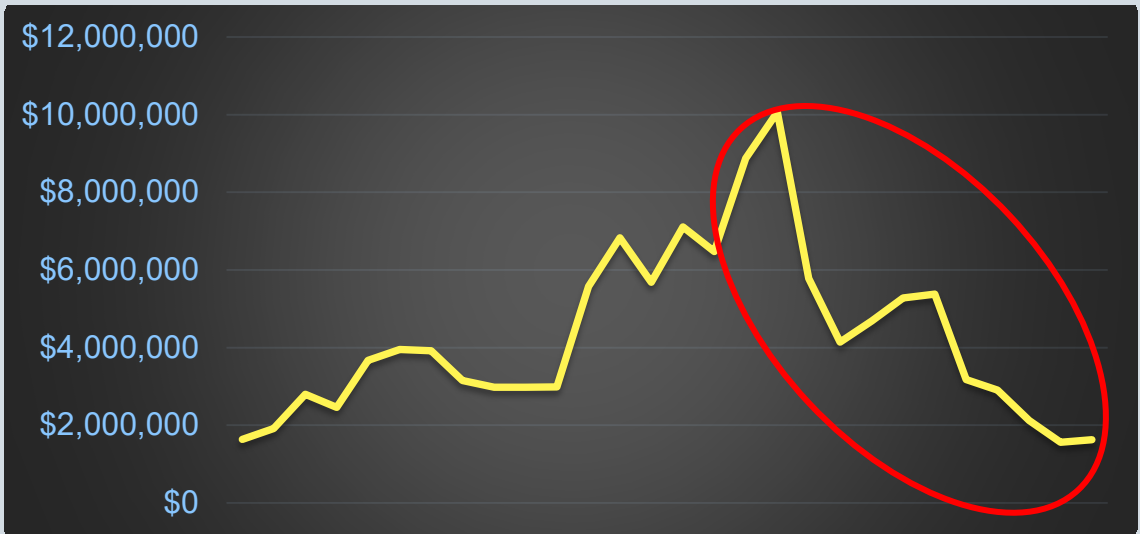


Florida's Oyster Industry – Statewide Trips

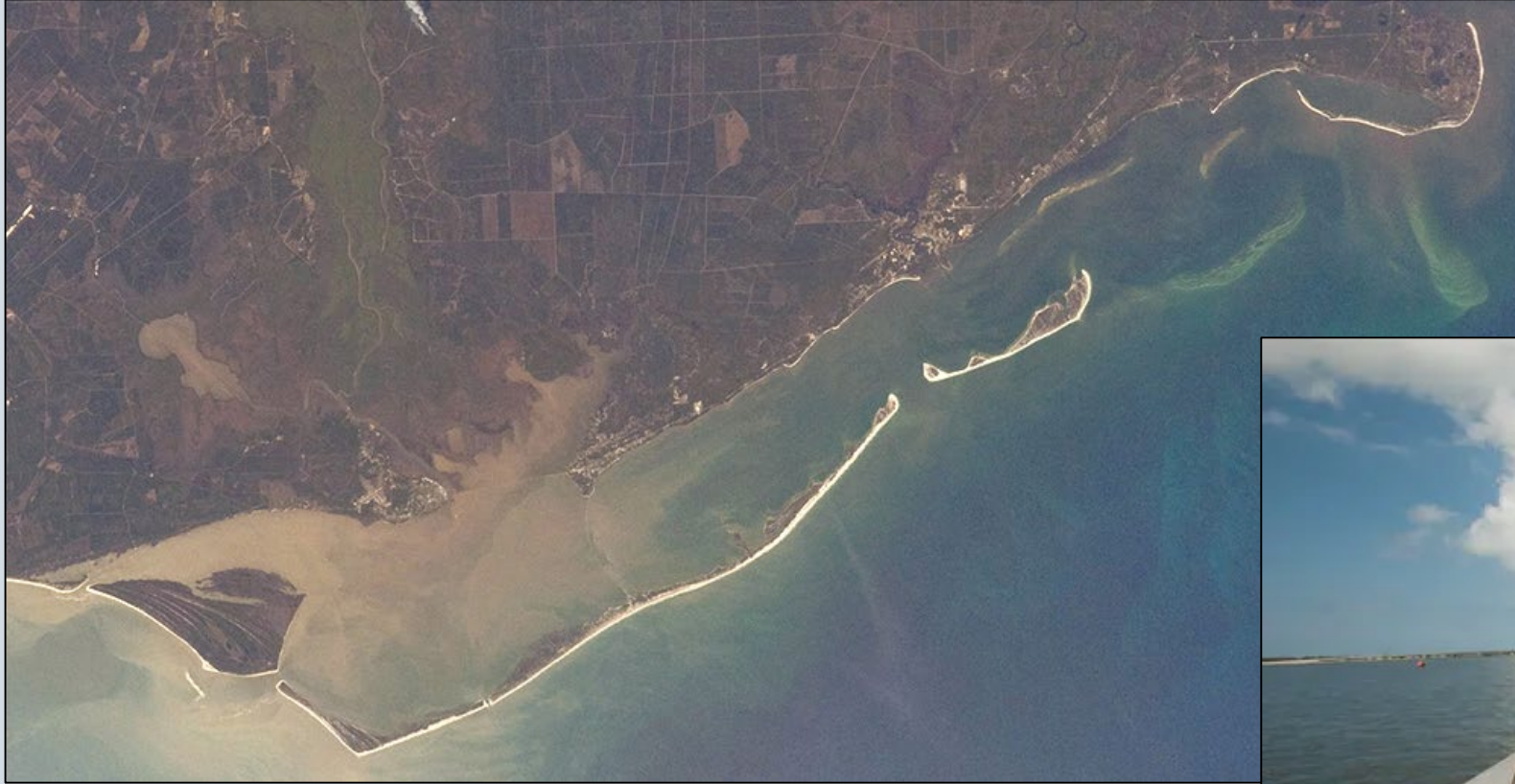


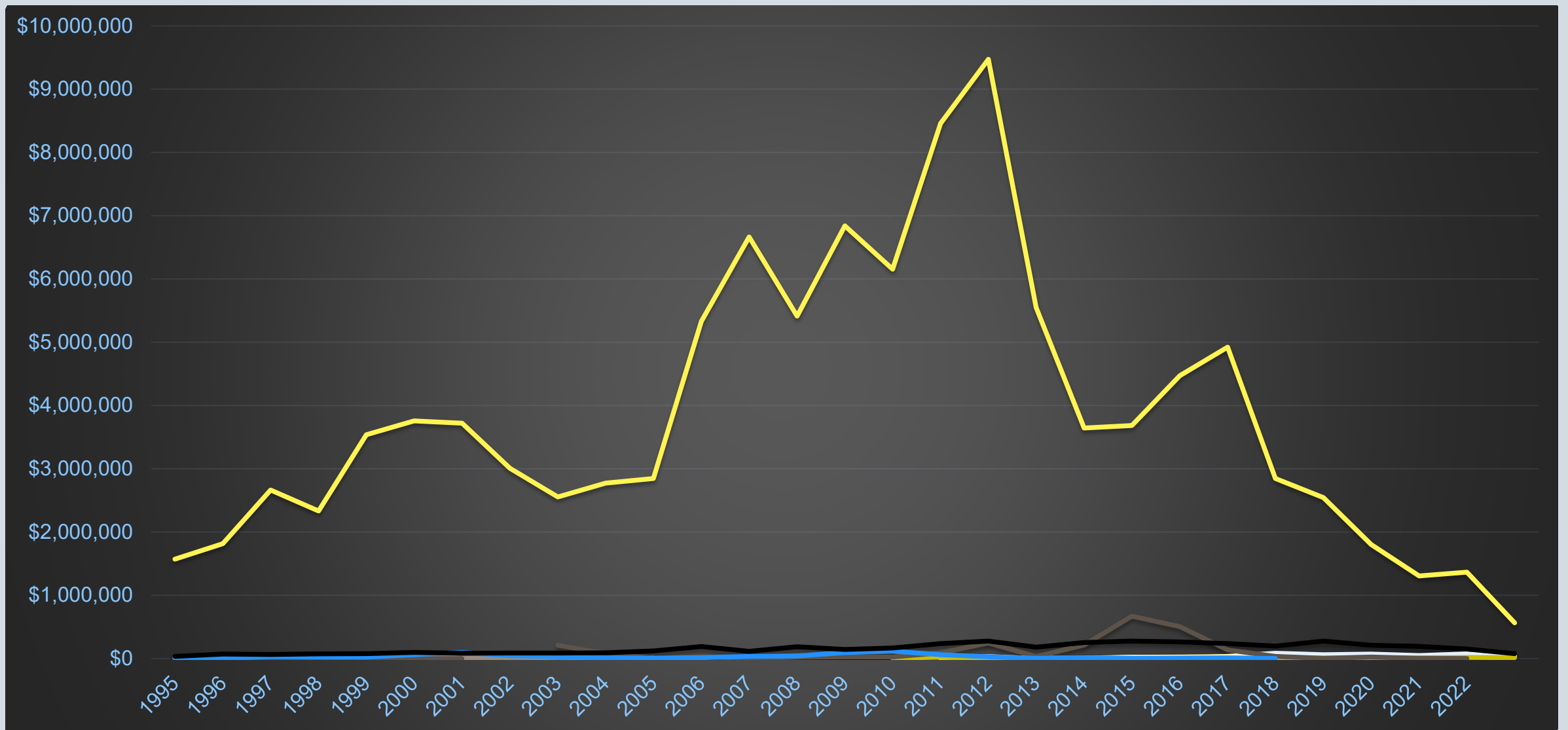
Florida's Oyster Industry – Statewide Landings

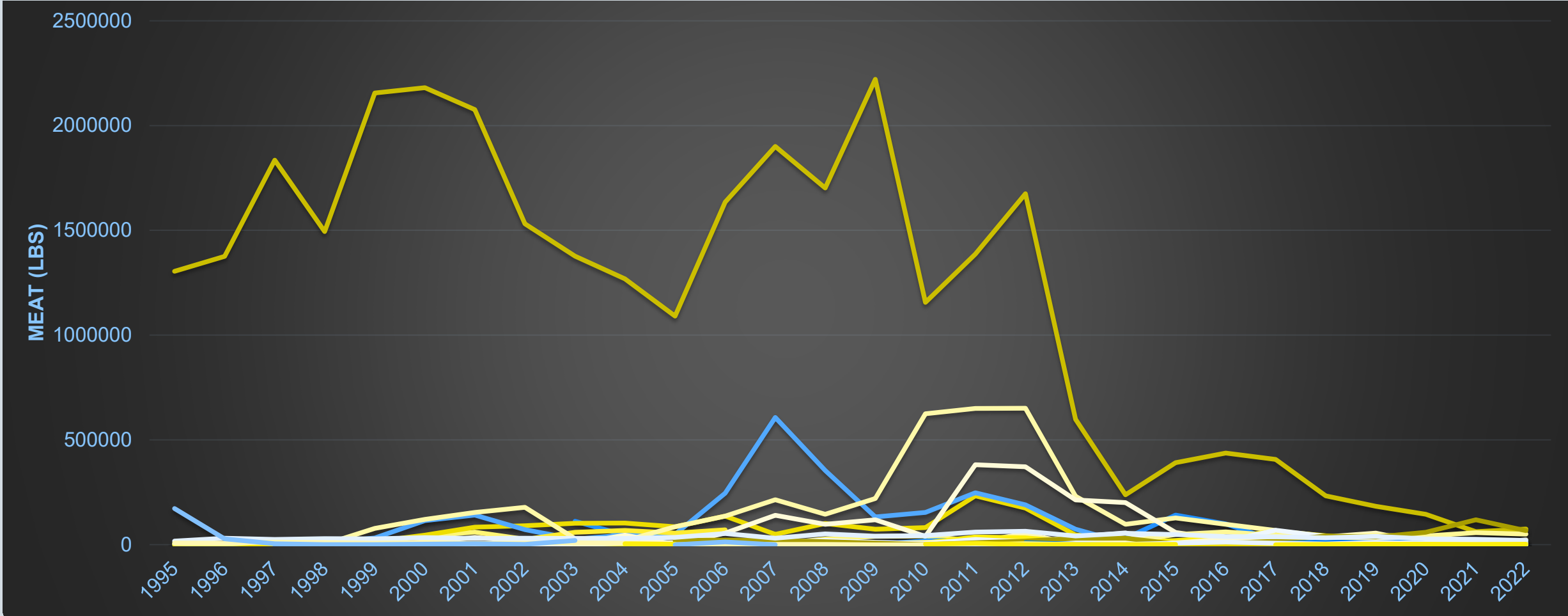




Case Study – Apalachicola Bay

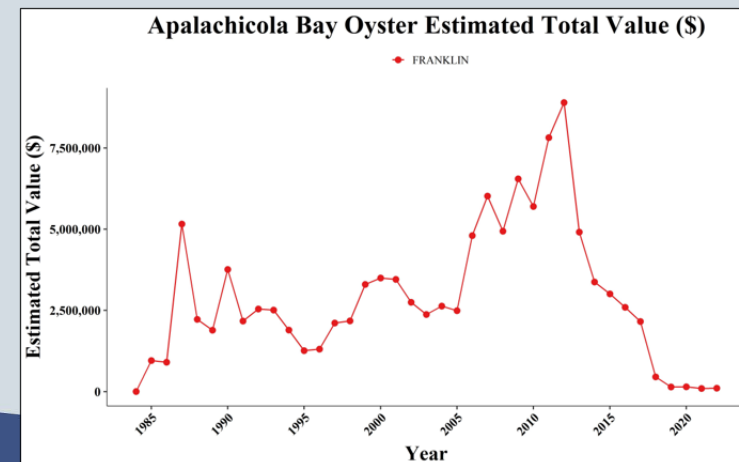
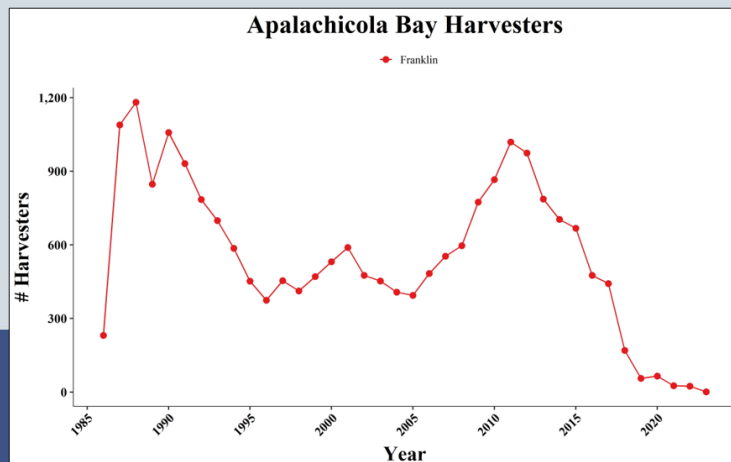
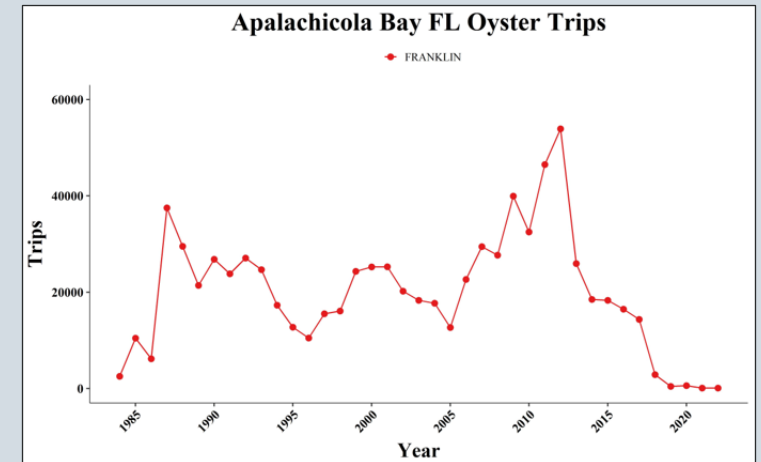
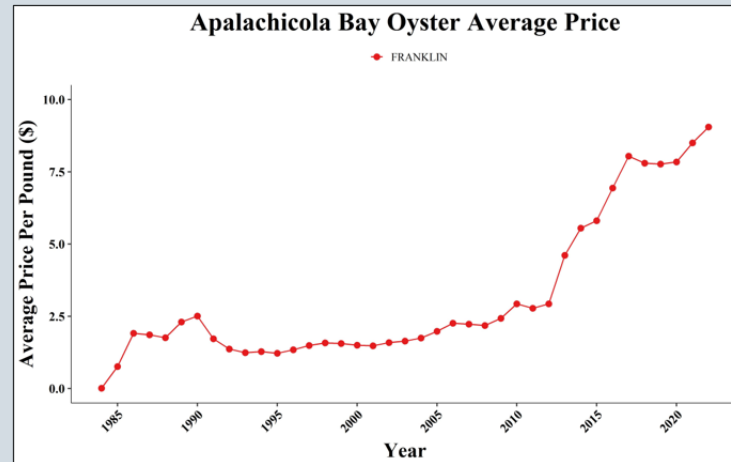
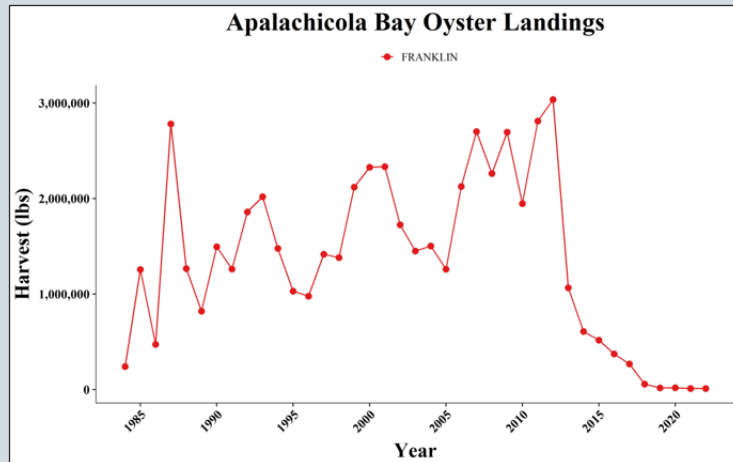






Florida's Oyster Industry

- Apalachicola Bay accounted for 93% of oyster landings since 1995
- Wild oyster harvest suspended in 2020 due to fishery collapse



Florida's Oyster Industry

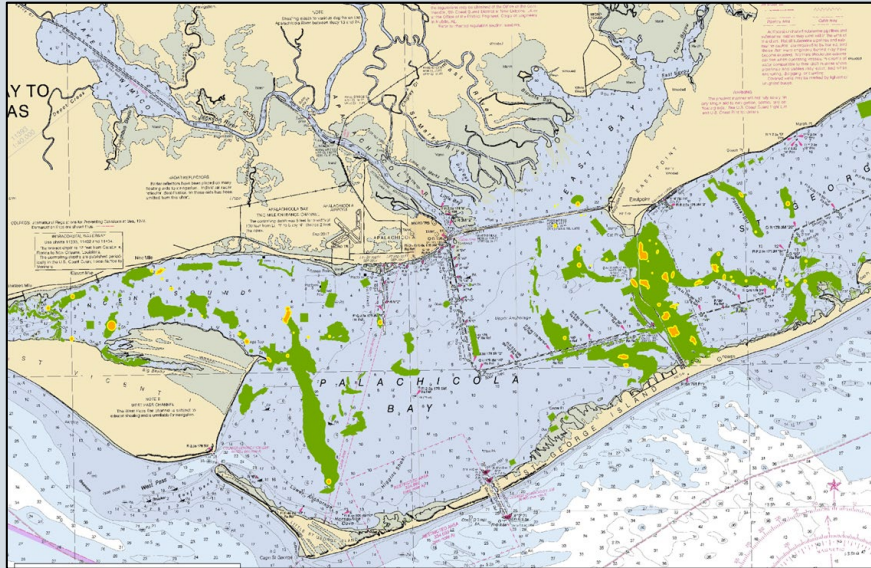
- Apalachicola Bay accounted for 93% of oyster landings since 1995
- Wild oyster harvest suspended in 2020 due to fishery collapse
- Ripple effects of closure felt throughout Gulf
 - Immediate movement of harvest pressure to Panama City
 - Long-term pressure increase in Big Bend area, east of Apalachicola Bay



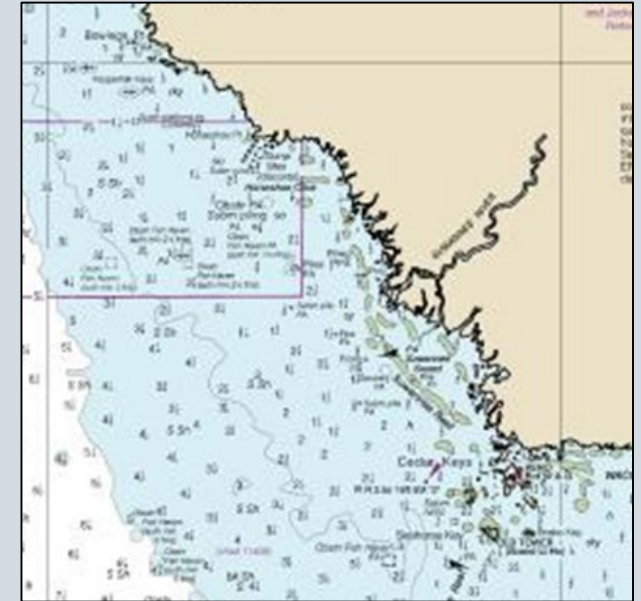
Mapping and Monitoring

- Mapping
 - Subtidal and Intertidal
- Monitoring
 - Oyster size and density
 - Spat monitoring
 - Disease and reproduction
 - Condition Index
 - Shell pests
 - Growth and mortality
 - Shell budget

Apalachicola Bay



Suwannee Sound



Florida's Oyster Industry

- Declines in oyster populations are being observed statewide
- Restoration efforts throughout the state
 - Primarily in Apalachicola Bay, other areas within Panhandle
- Working groups in Big Bend area discussing management strategies with stakeholders
 - *If status quo cannot be continued, what restrictions are amendable?*
 - *How best can management and stakeholders work together to increase resiliency of this fishery?*
- Stakeholder opinion of FWC oyster management mixed, varies among regions



Workshop Goals

- How to assess success for oyster restoration efforts.
- Balancing ecosystem services versus fishery outlooks regarding funding opportunities.
- Implementation of stricter management strategies.
- Appropriate targets and limits for opening areas for harvest for the Gulf.
- Stakeholder engagement
 - Collaboration, education, decision making
 - Managing reactions if management changes are implemented
- Improved understanding of resilient oyster fishery management through discussion, engagement, and learning



Florida Oysters – Community, Fishery, Management



Presenters: Ryan Gandy, Erika Burgess

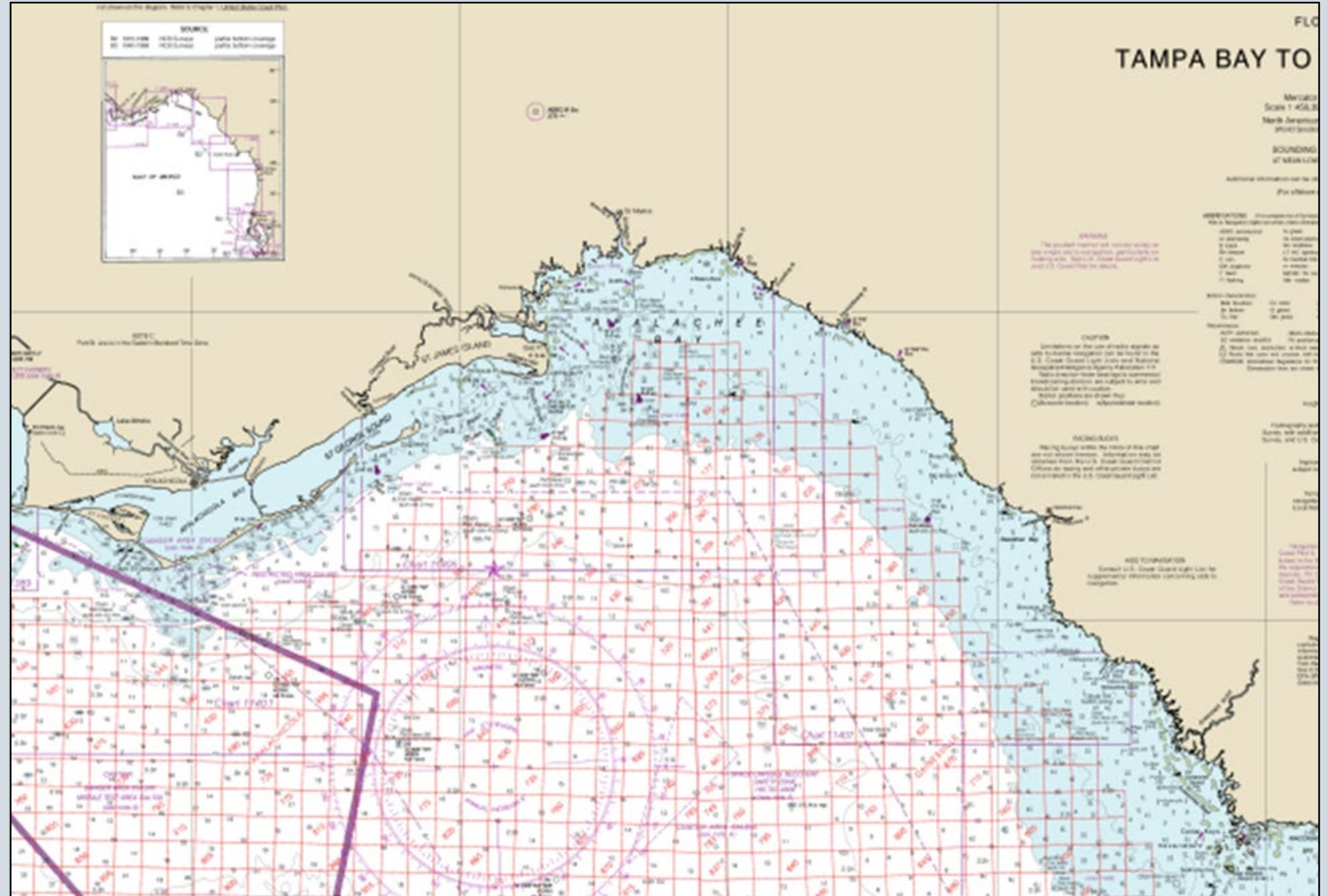


Florida Fish and Wildlife Conservation Commission

Florida Oyster Resources

FWC Oyster Monitoring

- Long term monitoring (20+ years) only in three non-fished areas associated with water management projects.
- Oyster fishery concentrated in Apalachee Bay extending from Apalachicola Bay to Cedar Key.



Florida Oyster Resources

FWC Oyster Monitoring

- Fisheries Independent Monitoring in Apalachicola Bay started in 2015 in response to fishery collapse.
- The statewide oyster resource is data poor but improving.
- Ongoing efforts to compile existing information on the status of the resource.
 - FWC-FWRI- Oyster Integrated Mapping and Monitoring Program (OIMP).
 - FDEP- Statewide Ecosystem Assessment of Coastal and Aquatic Resources (SEACAR).



Florida Oyster Open Access Resources

Oyster Integrated Mapping and Monitoring Program (OIMP)

- Developed as a community of practice to standardize methods and continually compile statewide information on oyster resources, recent mapping, monitoring, and to serve as an outlet for FIM data.
- White paper format arranged in regional chapters rather than only a database.
- Provides SOPs for monitoring, restoration, and assessment of ecosystem services.
- Primary focus is on oyster habitats across Florida.
- Coauthors include Florida oyster researchers and practitioners.
- Includes regularly updated statewide oyster map and annual oyster harvest data.

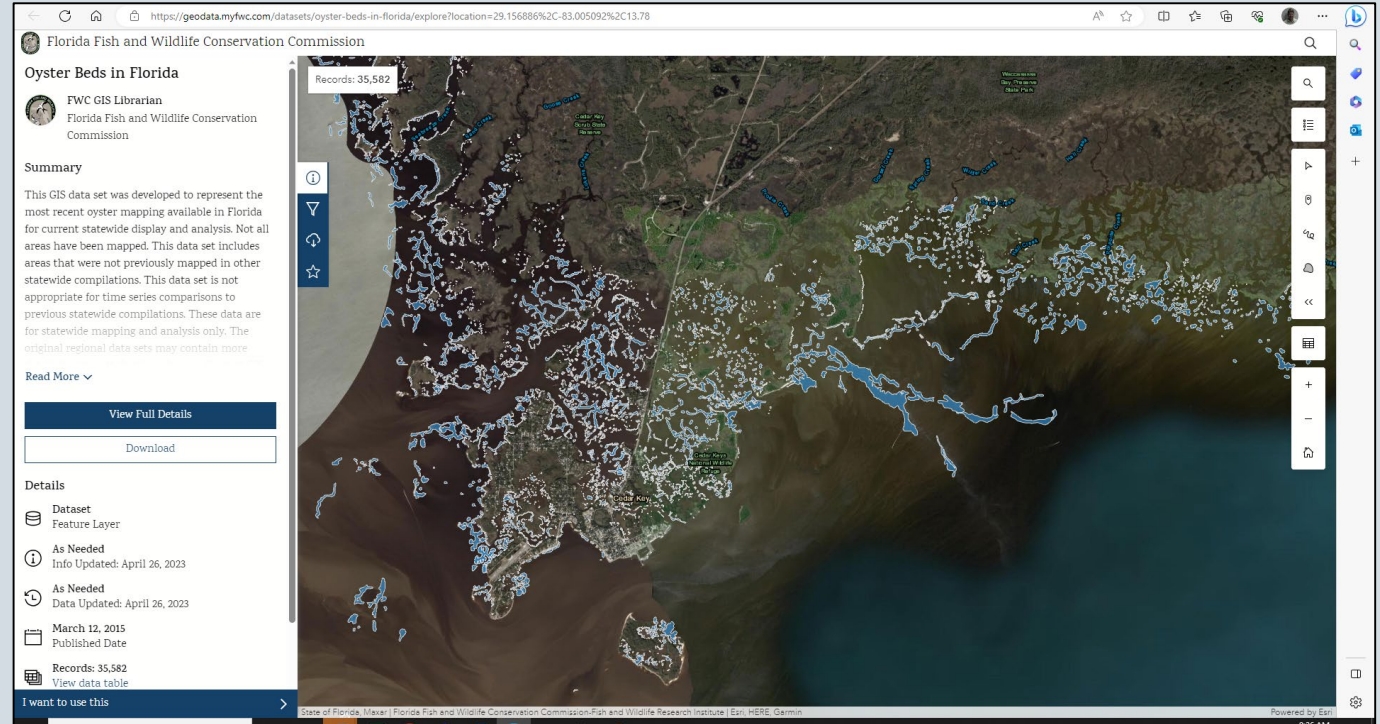


<https://myfwc.com/research/habitat/coastal-wetlands/projects/oimmp/>

Oyster Integrated Mapping and Monitoring Program

Mapping

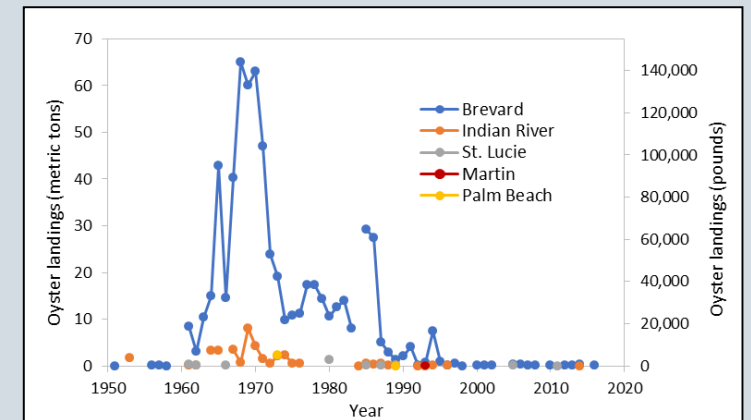
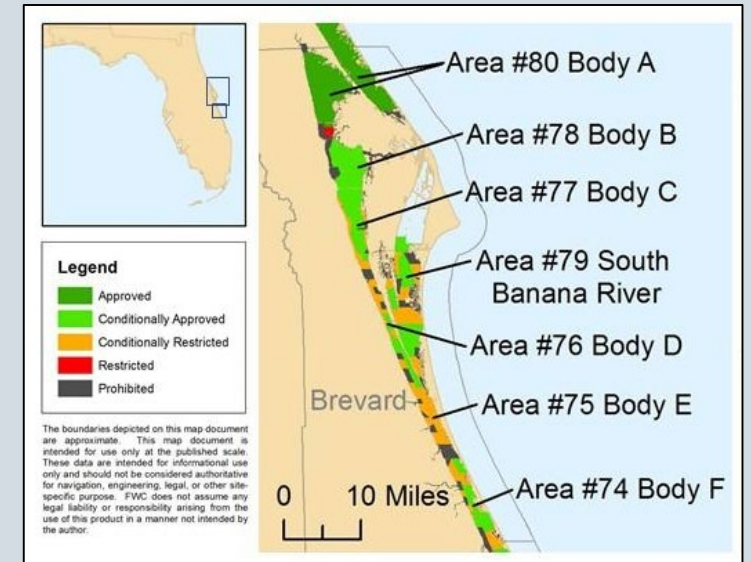
- Statewide oyster map available for viewing and download at:
<http://geodata.myfwc.com/datasets/oyster-beds-in-florida>
- Map is a compilation of many local oyster mapping efforts sourced from the community and is updated annually.
- Groundtruthing and density assessment ongoing.



Oyster Integrated Mapping and Monitoring Program

Commercial Harvest Data

- OIMMP report includes map of shellfish harvest areas and annual oyster landings
- 1950 – 1983 commercial harvest data from summary of Florida commercial marine fish landings. Data are available in OIMMP Report Appendix A and at <https://ocean.floridamarine.org/OIMMP/>
- 1984 – present commercial harvest data available from <https://public.myfwc.com/FWRI/PFDM/ReportCreator.aspx>



Oyster Integrated Mapping and Monitoring Program

Monitoring Methods

- Manual of FWRI Standard Operating Procedures
 - Oyster size and density
 - Spat monitoring
 - Disease and reproduction
 - Condition Index
 - Shell pests
 - Growth and mortality
 - Shell budget
- This will eventually be the site where regional trends and open-source data will be posted annually.



Oysters along the Gulf Coast of Florida

Regional Oyster Reef Types

Panhandle/Northwest FL

- Dominated by subtidal bars
 - primary source of fished oysters



Big Bend/Springs Coast

- Few Subtidal Bars
 - source of fished oysters
- Dominated by intertidal oysters
- few legal
 - bordering closed waters
- Intertidal mixed with saltmarsh
 - few legal
 - within closed waters
- Tropicalization and mangroves moving up the coast onto oyster bars.



Oysters along the Gulf Coast of Florida

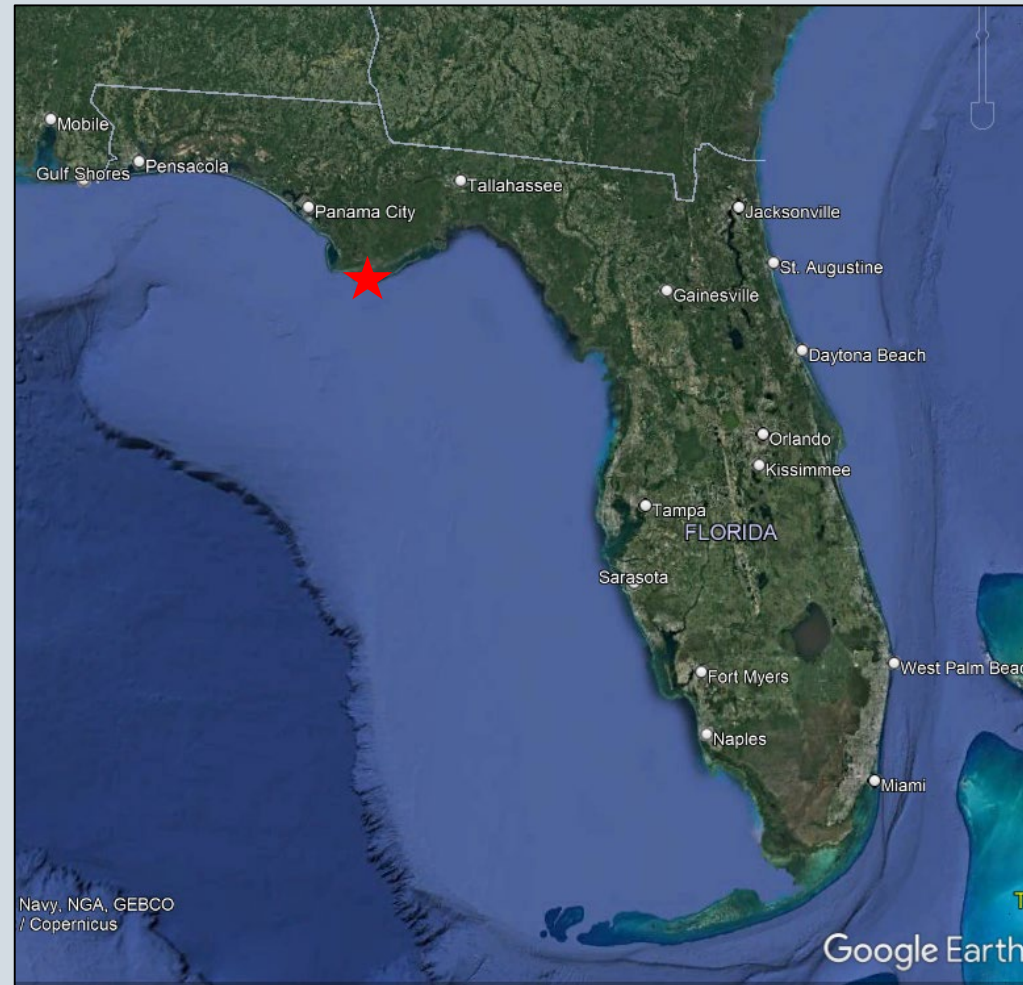
Regional Oyster Reef Types

South Florida

- Intertidal oysters
 - majority closed waters
- Mixed into mangroves and hardened shorelines
 - majority closed waters



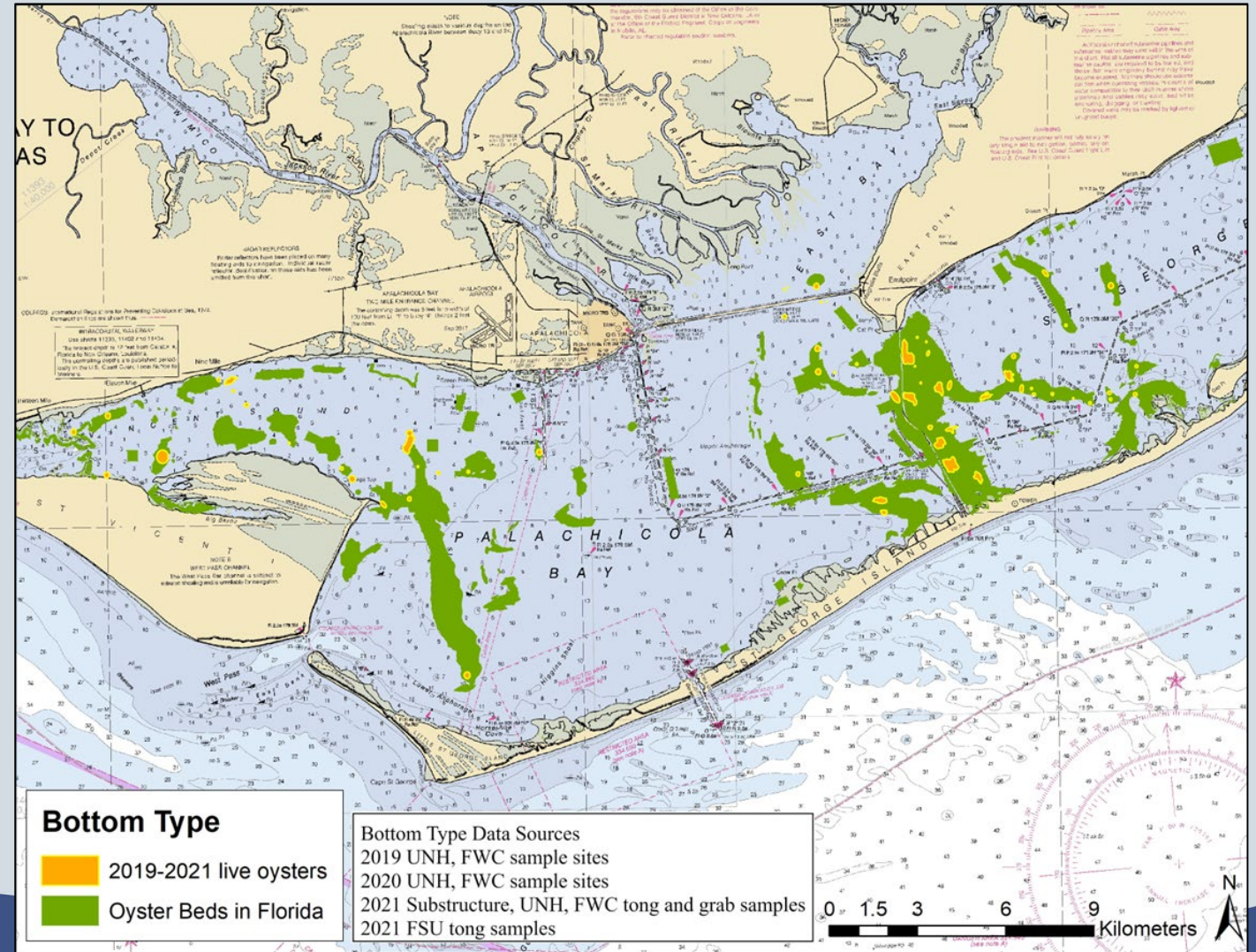
Apalachicola Bay



Apalachicola Bay

Trends

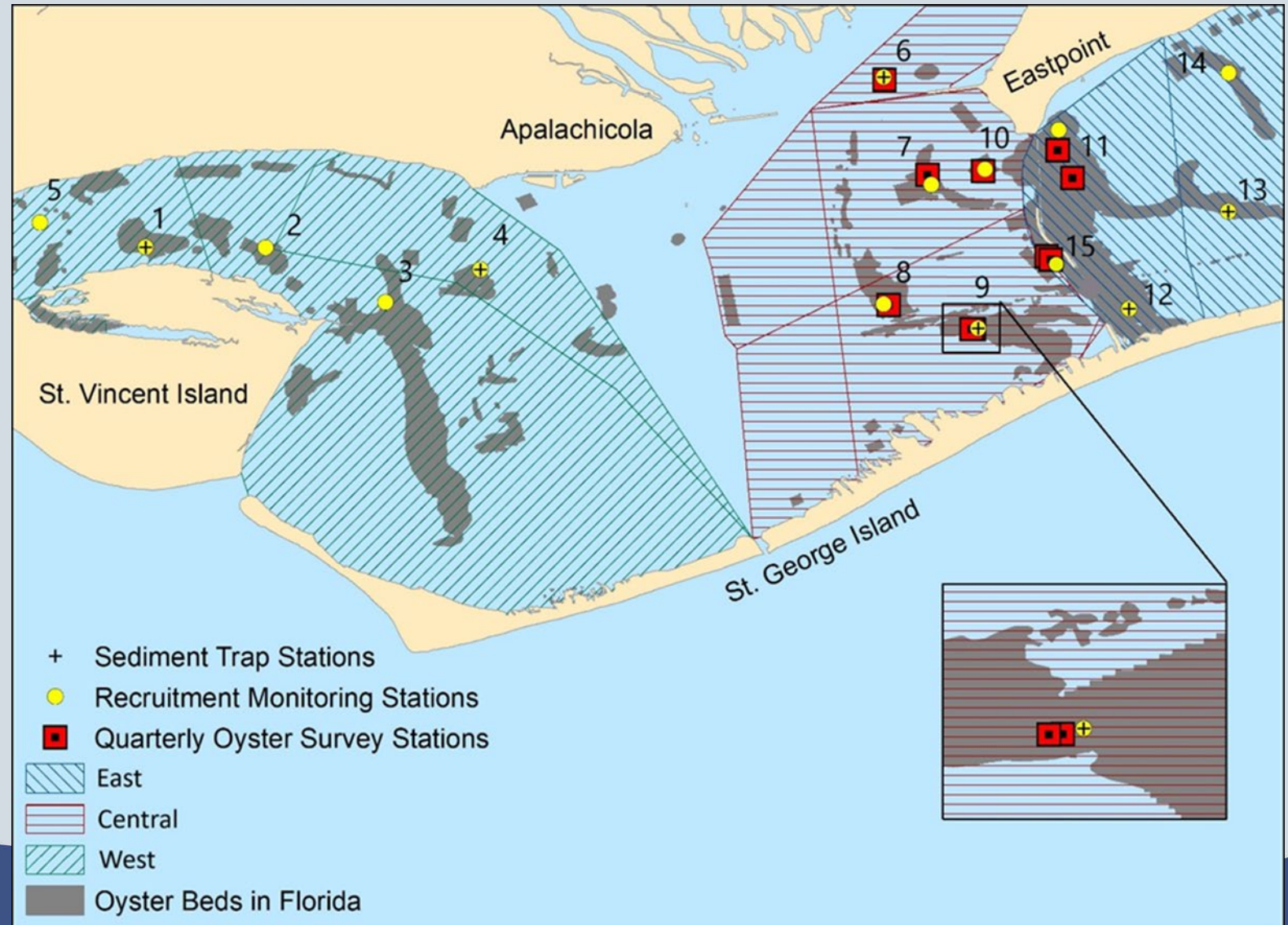
- Historic estimates 10,000 acres
- 2022 UNH Mapping Reports 500 acres with a presence of live oyster.



Apalachicola Bay

FWC Oyster Monitoring

- 2015-2023 FWRI field sampling sites and recruitment monitoring, sediment trap, and quarterly oyster survey stations in Apalachicola Bay, Florida.



Apalachicola Bay

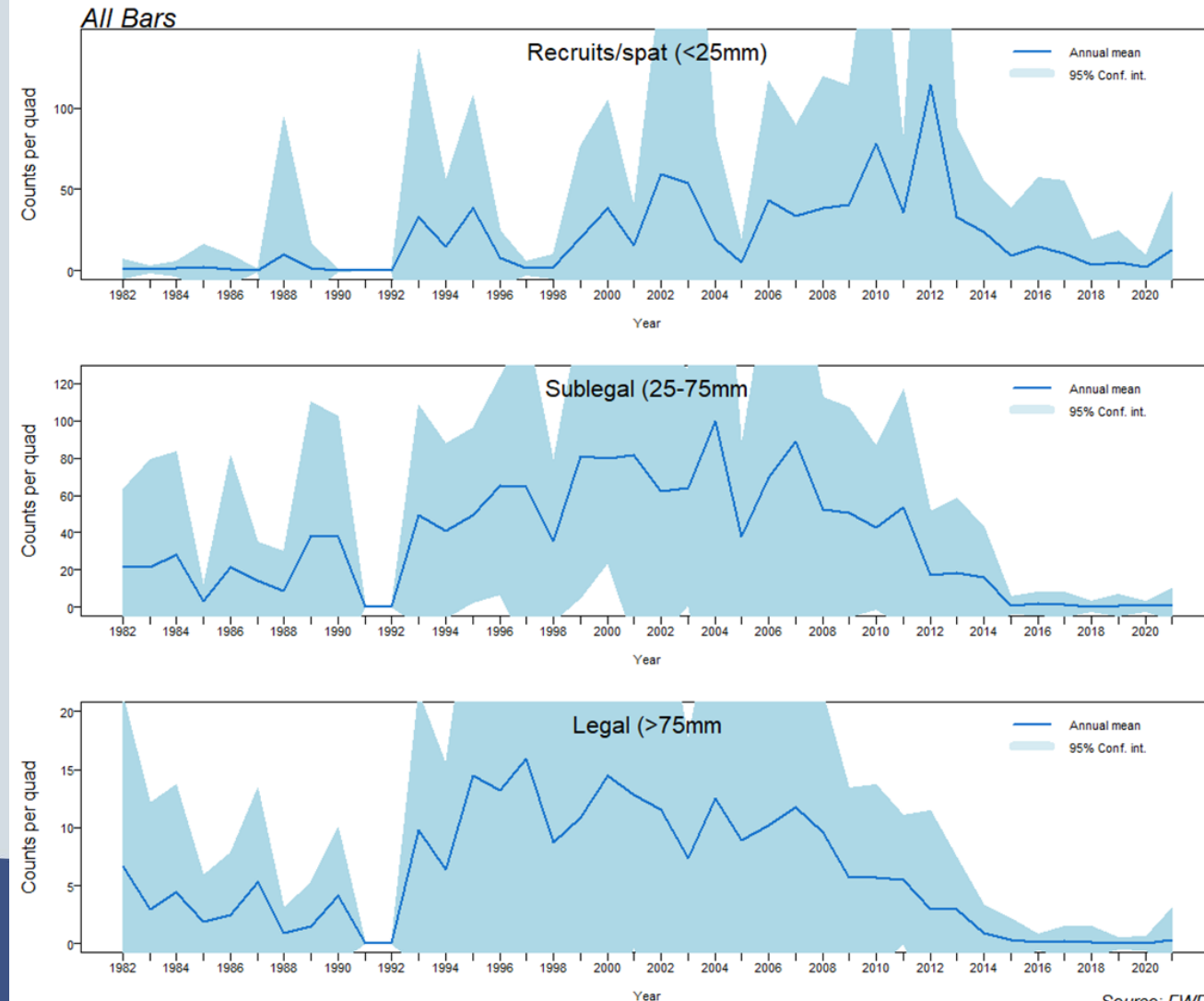
Apalachicola Bay Oyster Trends



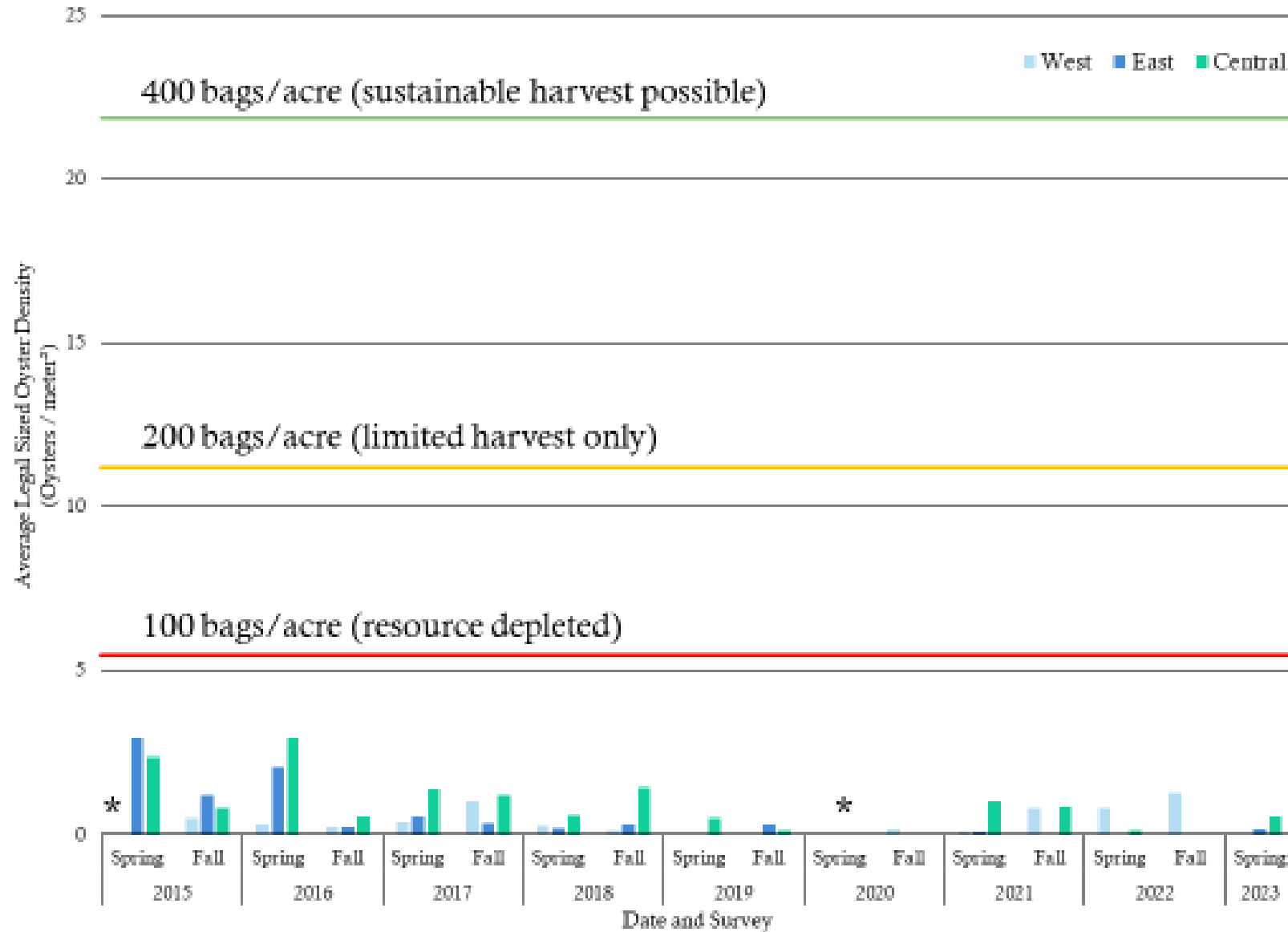
Apalachicola Bay

Apalachicola Bay Oyster Trends

University of Florida
analysis using
FDACS and FWRI
data.



Average Density of Legal Sized Oysters by Survey

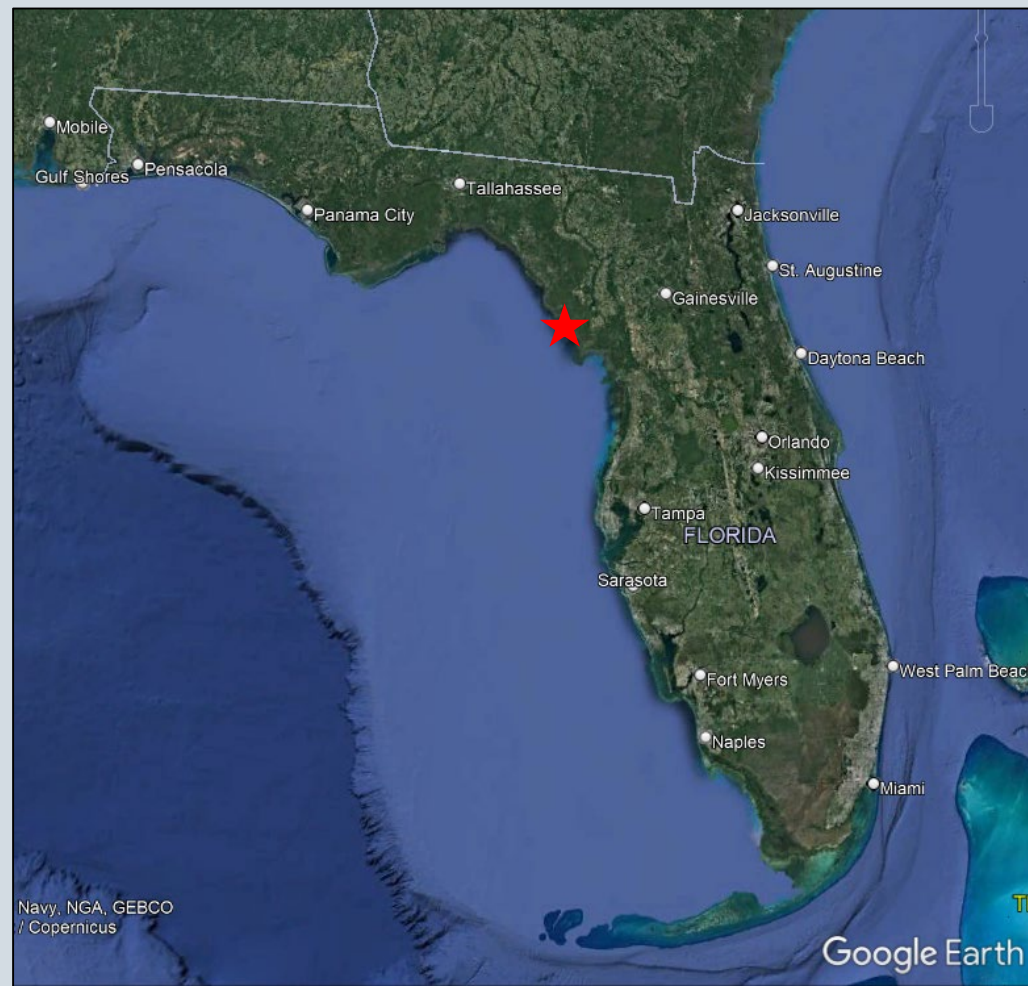


* Survey not completed

Legal size =
shell height
of 3 inches
(76 mm)



Suwannee Sound



Suwannee Sound

Monitoring

- Suwannee Sound is extremely data poor (monitoring and mapping).
- Starting in 2021 a NFWF funded project and FL TIG funded project began mapping, ground truthing, surveying and developing sampling strategy for the region.
- These are short term projects ending in 2026 and long-term state funding is being sought to develop a Fisheries Independent Monitoring program for oysters in the region.
- The only available information on recent trends is from non-state projects and previous studies of oysters in the region.



Suwannee Sound

Trends

Decadal changes in oyster reefs in the Big Bend of Florida's Gulf Coast

J. R. SEAVEY,^{1,†} W. E. PINE, III,¹ P. FREDERICK,¹ L. STURMER,² AND M. BERRIGAN³

Trends in Oyster Populations in the Northeastern Gulf of Mexico: An Assessment of River Discharge and Fishing Effects over Time and Space

J. F. Moore,  W. E. Pine III,*  P.C. Frederick, S. Beck, and M. Moreno

Department of Wildlife Ecology and Conservation, University of Florida, 110 Newins-Ziegler Hall, Gainesville, Florida 32611, USA



Suwannee Sound

Trends

- Seavey et al. 2011
- Assessed trends in oyster habitat along the Big Bend region between 1982 and 2011 by examining changes in areal extent and distance of oyster reefs from shore (offshore, nearshore and inshore).
- Findings
 - 66% net loss of oyster reef area (124.05 ha).
 - Losses concentrated on offshore (88%), followed by nearshore (61%), and inshore reefs (50%).
 - The spatial distribution of oyster reefs was moving inland.



Suwannee Sound

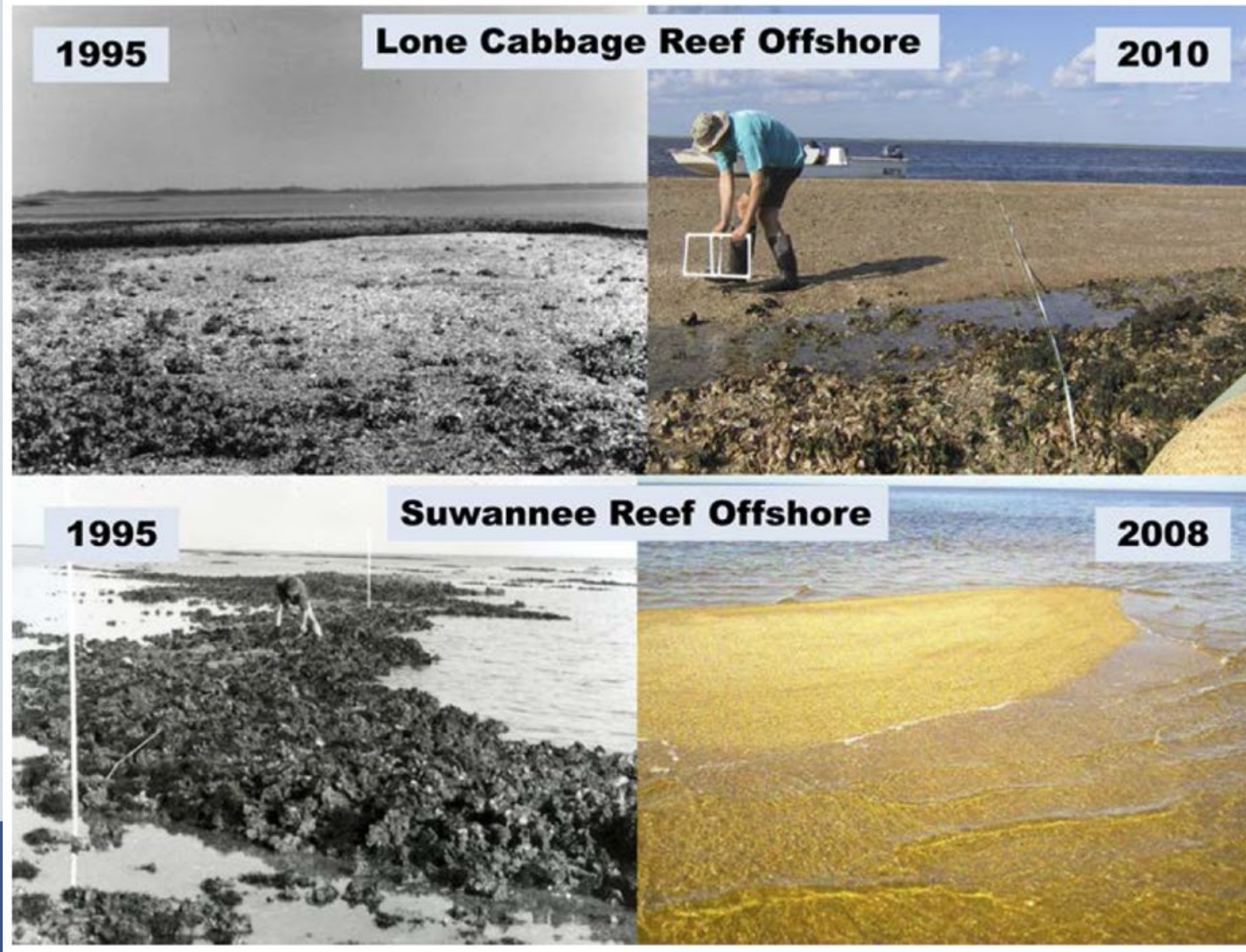
Trends

- Seavey et al 2011
- Multiple lines of evidence suggest that the primary mechanism for these observed losses in oyster reefs is reduced survival and recruitment, likely a result of decreased freshwater inputs which increases existing reef vulnerability to wave action and sea level rise.
- Once oyster reef substrate becomes unconsolidated and the nucleation site is lost, the regeneration of the oyster reef may not be reversible through natural processes.



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Suwannee Sound

Moore et al. 2020

- Assessed trends in intertidal oyster populations (inshore), river discharge, and commercial fishing activity in the Suwannee River estuary within the Big Bend region using fisheries-independent data (2011-2019) from irregular monitoring efforts and publicly available environmental data.
- Intertidal oyster counts have declined over time and that most of these declines are found in inshore intertidal oyster bars, which are becoming degraded.
- Oyster density results over time and space also show declines in oyster counts, with the largest declines occurring in inshore areas, which may be becoming more like offshore and nearshore regions based on counts.
- Seavey et al. (2011) reported the inland colonization of a salt marsh by oysters in inshore areas of Suwannee Sound, but those increases did not offset net losses experienced in nearshore and offshore reefs.



Suwannee Sound

Moore et al. 2020

- At century time scales, sea level rise may negate many short-term benefits of reef restoration because reefs may become inundated with higher salinity water.
- Observed sea level rise in this region based on a 100-year record is on average about 2.13 mm/year (95% CI = 1.95– 2.31mm/year) but the observed rate in recent years is higher.
- Simply put, restoration efforts could be swamped by a rising sea level regardless of river discharge conditions.

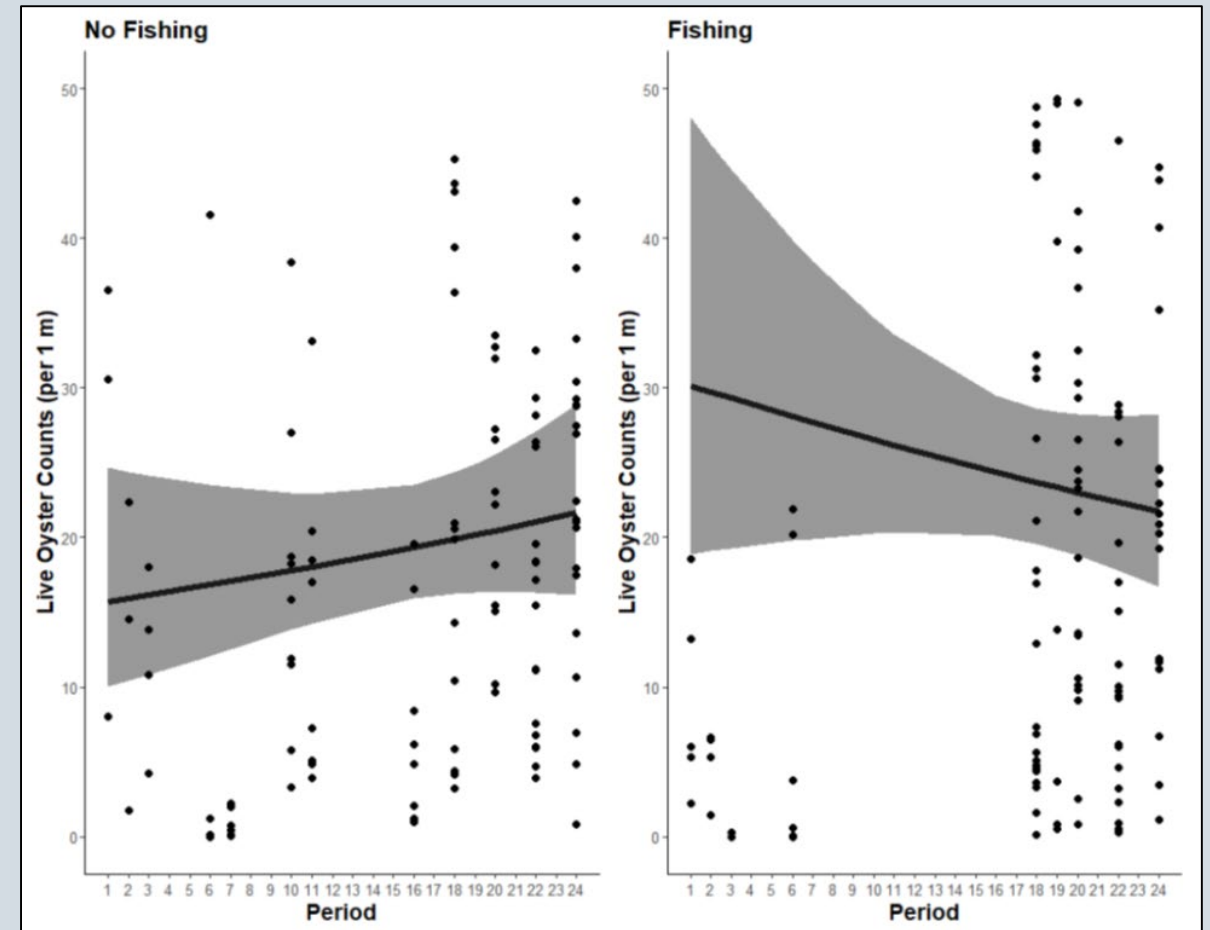


Suwannee Sound

Trends

Recent sampling from the University of Florida Lone Cabbage Reef Restoration

2010 to 2022, oyster counts in areas open to harvest have been declining, while areas closed to harvest have experienced a significant increase in oyster counts but not legal sizes.

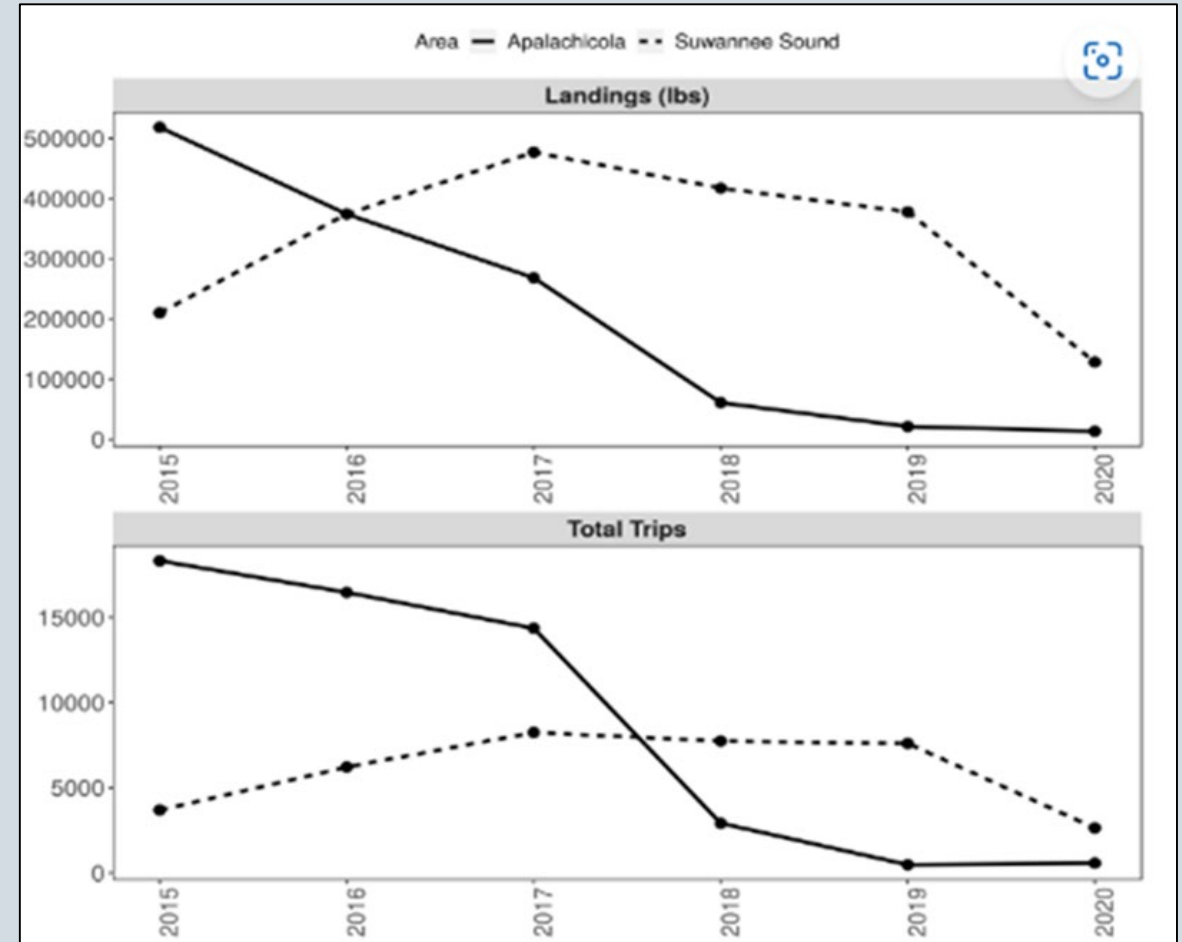


Florida Lone Cabbage Reef Restoration project
(<https://lcroysterproject.github.io/oysterproject/>)

Suwannee Sound

Trends

Harvest in the Suwannee Sound region is declining to near zero.



Florida Lone Cabbage Reef Restoration project
(<https://lcroysterproject.github.io/oysterproject/>)



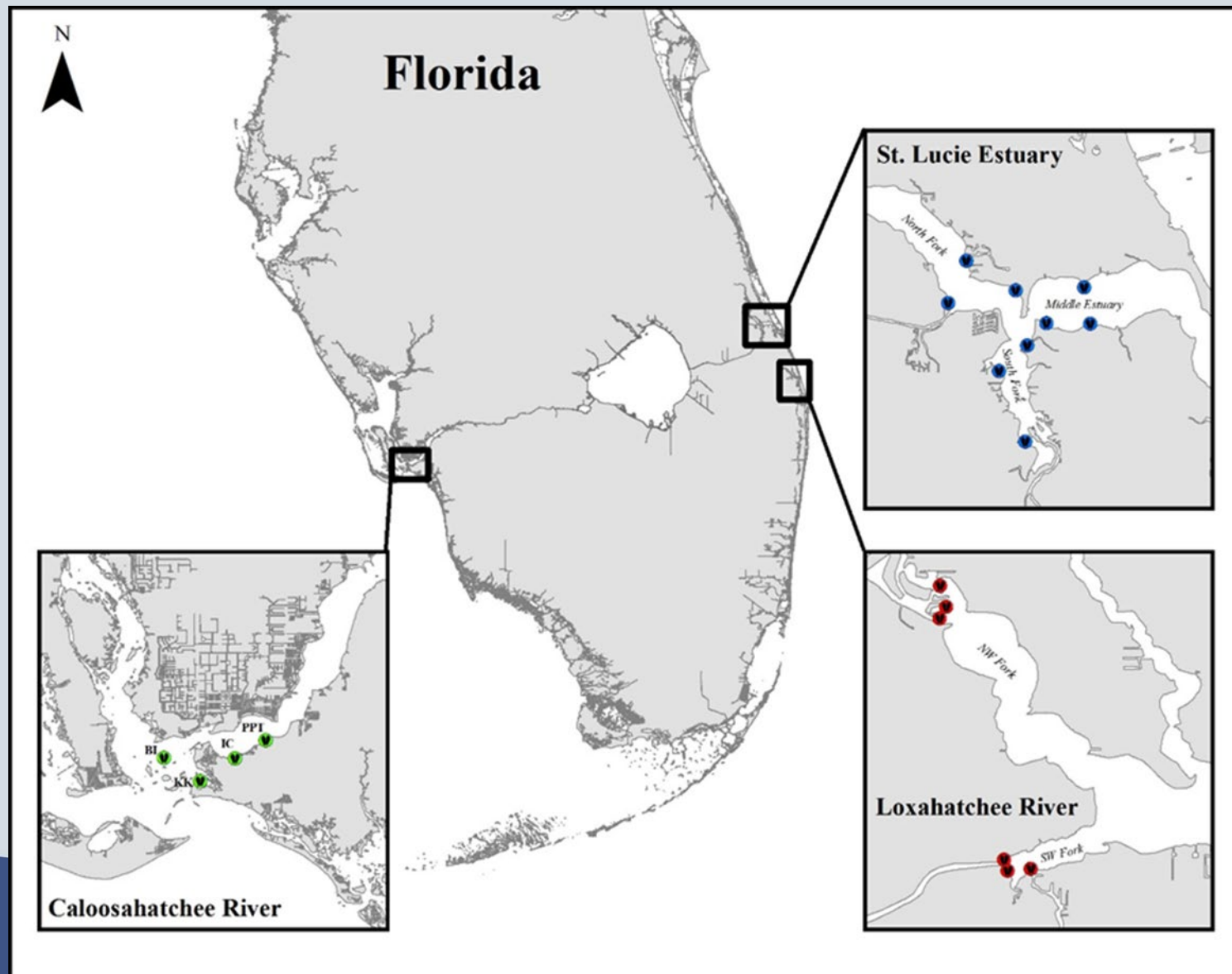
South Florida

Trends

Managed flow for Comprehensive Everglades Restoration (CERP)

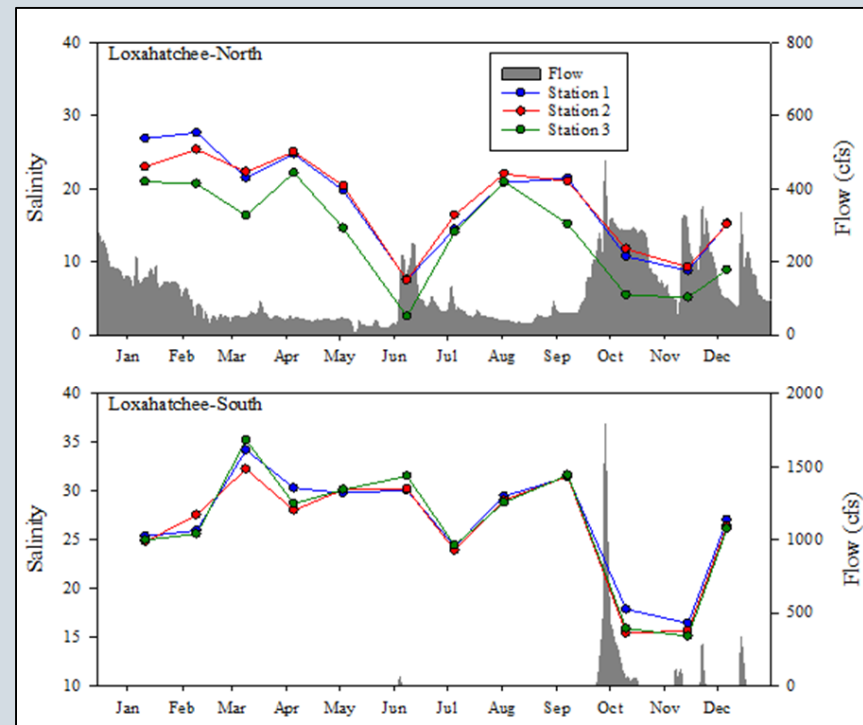
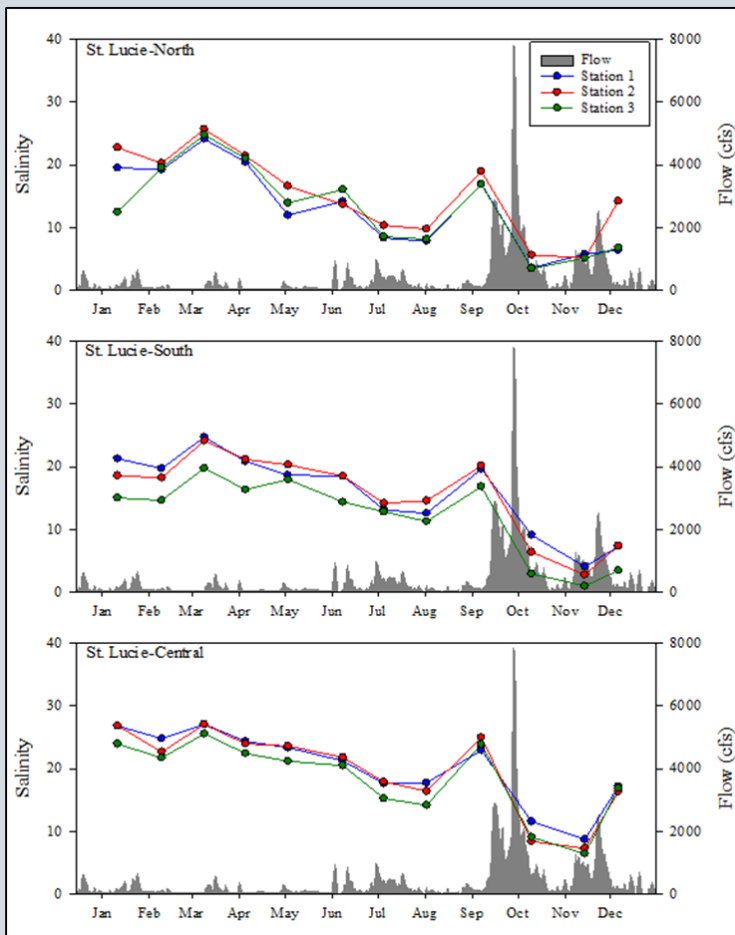
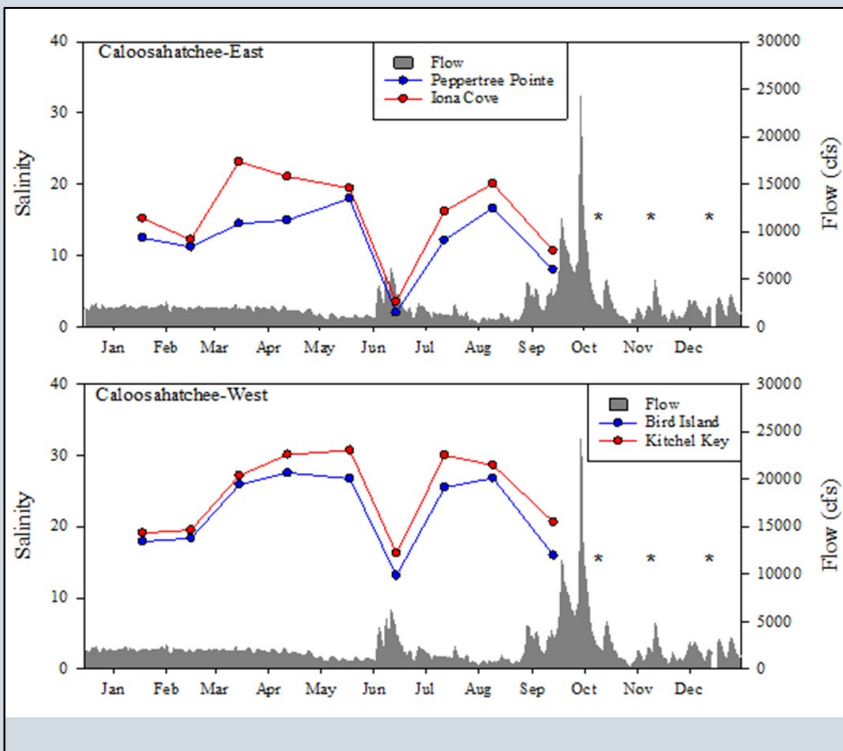
Monitoring 2005-present

- Caloosahatchee (West Coast)
- St Lucie & Loxahatchee (East Coast)



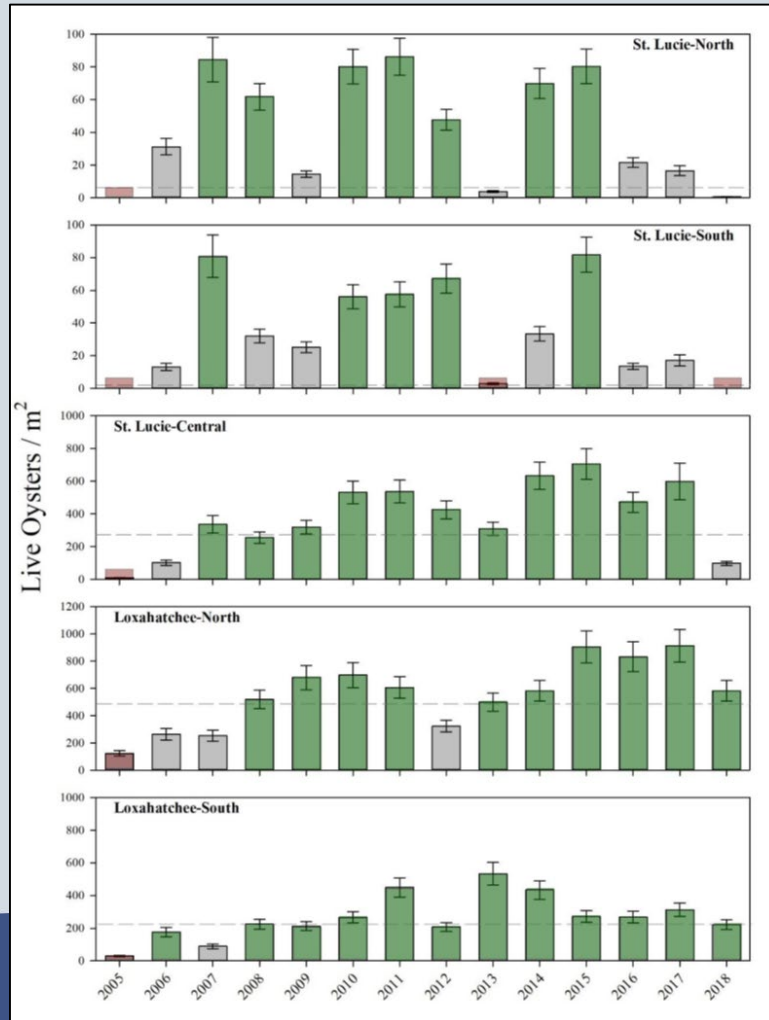
South Florida

CERP Flow and Salinity



South Florida

Oyster Reef Density Crashes



Before Release



After Release



Florida's Oyster Industry – Overview

- Statewide fishery, mostly in northwest Florida and Big Bend
- Primarily wild oyster harvest
 - Publicly-accessible reefs
 - Harvested by hand or tongs
- Aquaculture rapidly expanding
 - Oysters grown on leased parcels

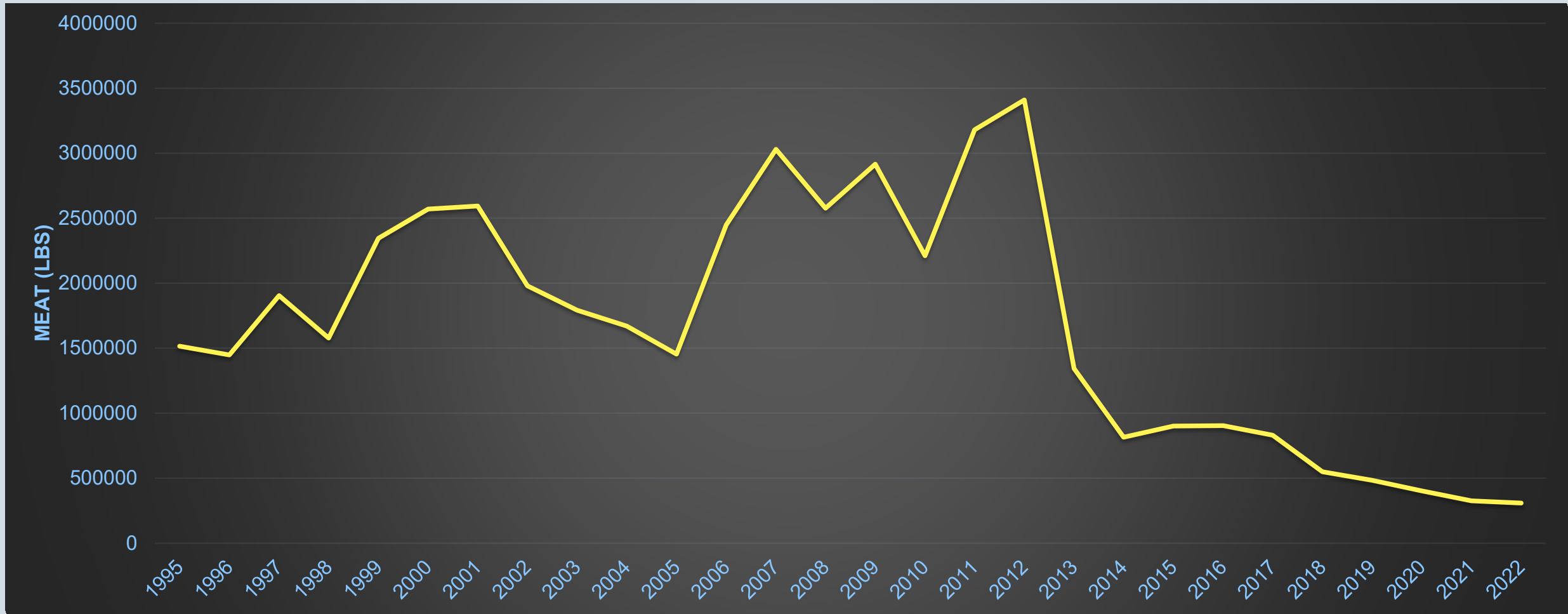


Florida's Oyster Industry – Snapshot of the Harvesters

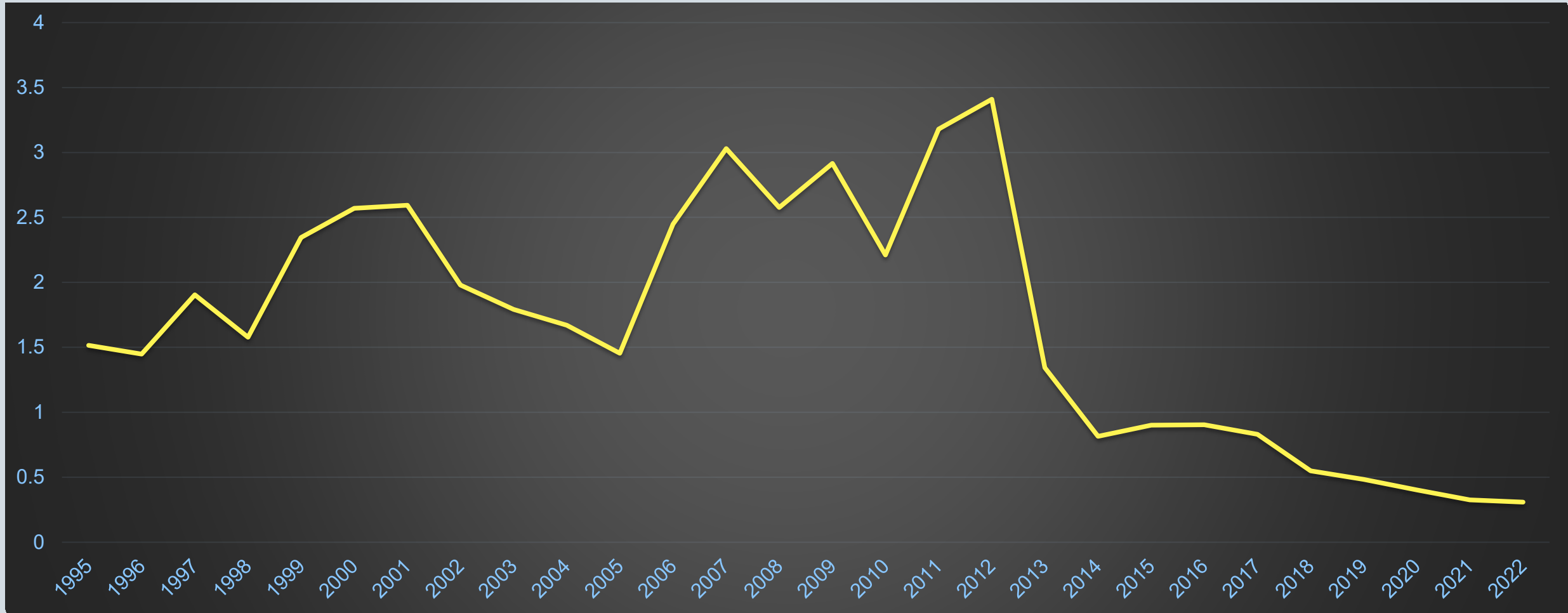
- Observed trends*:
 - Landings of oysters averaged \$4.27M per year
 - 636 license holders who land oysters annually
 - Considerable decline in license holders since 2011 (147 in 2022)
 - Average age of harvesters increases throughout time
 - Over two-thirds of harvesters live in Apalachicola Bay region
 - Next largest region of harvesters in Levy, Dixie Counties (Suwannee Sound)



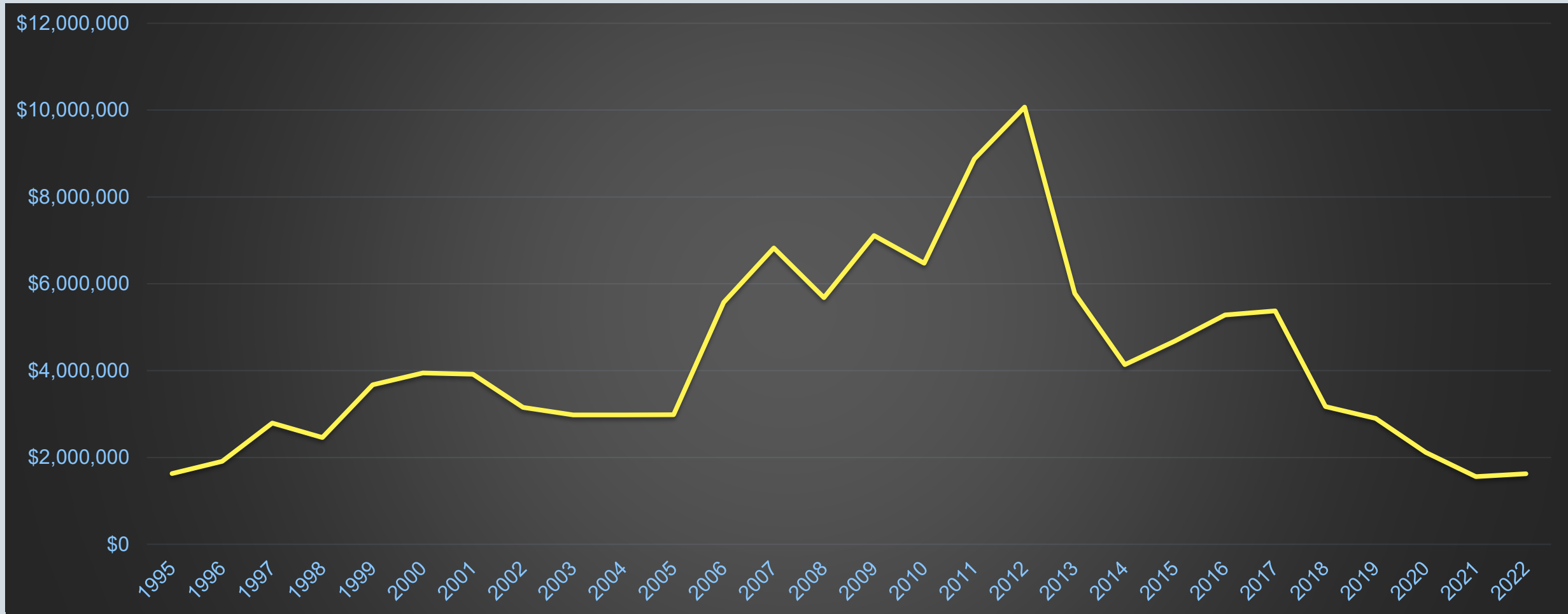
Florida's Oyster Industry – Statewide Landed Pounds

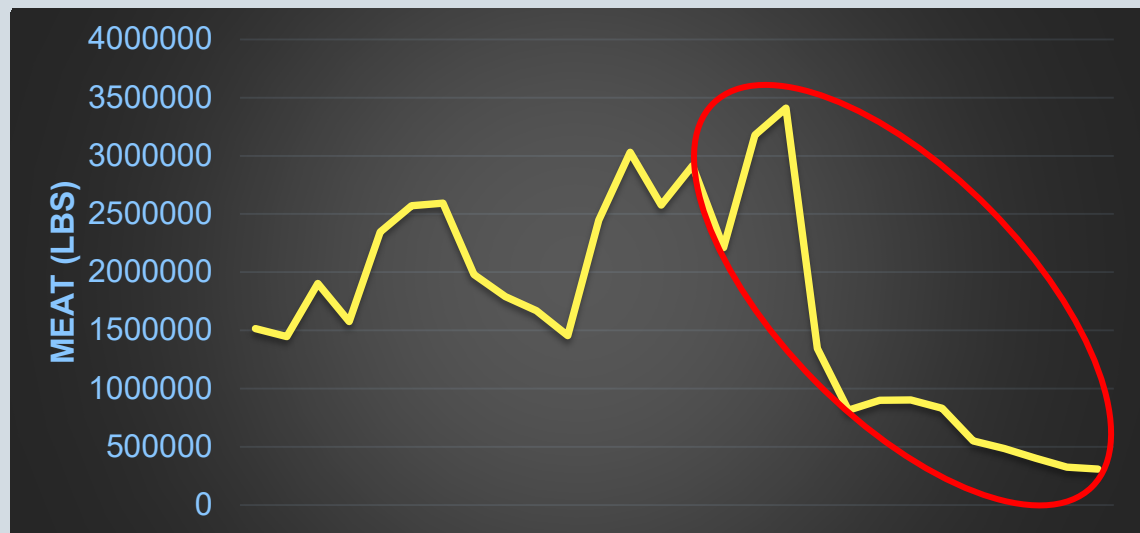
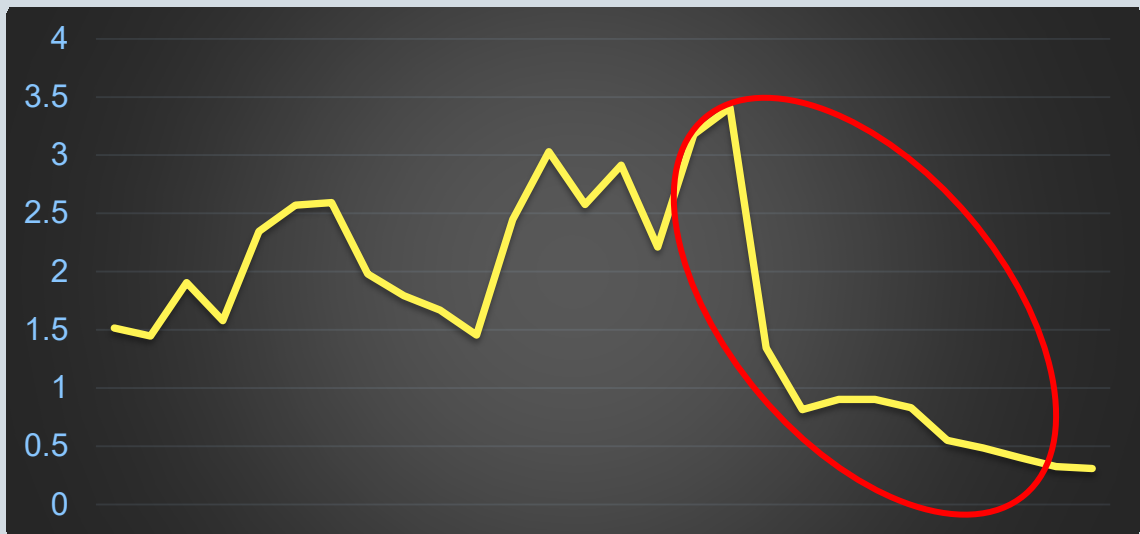
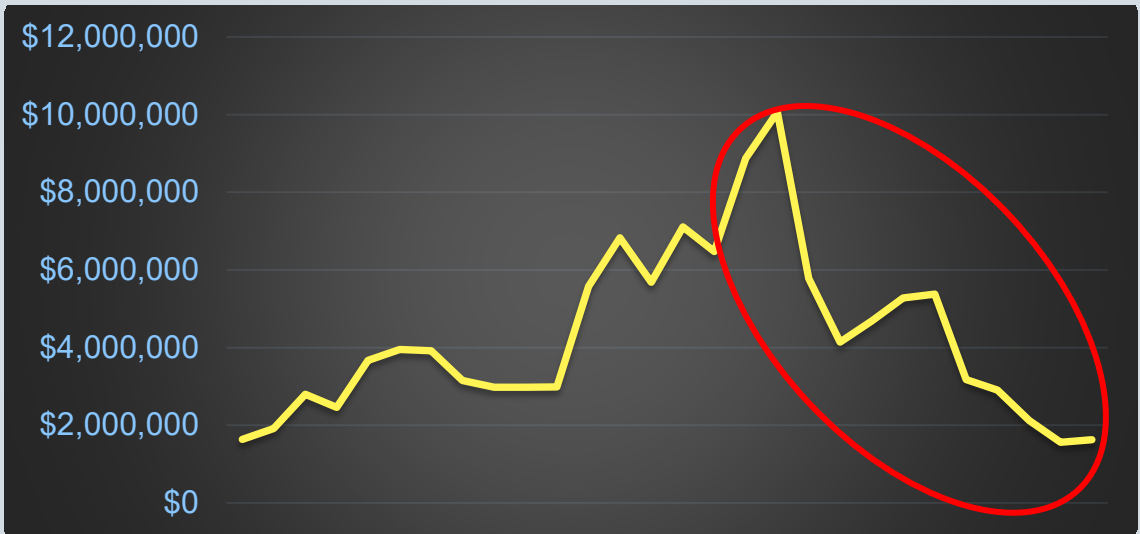


Florida's Oyster Industry – Statewide Trips



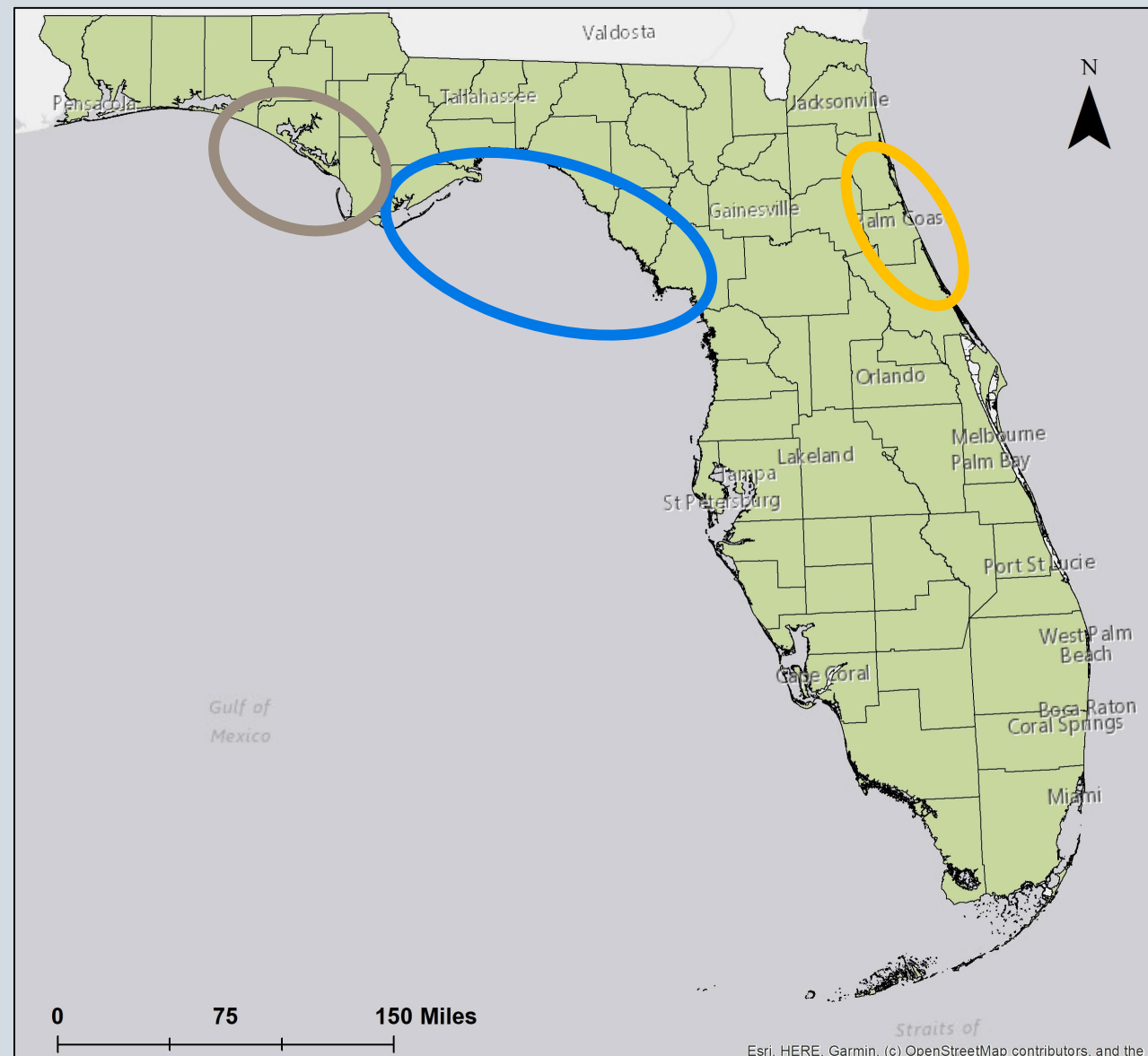
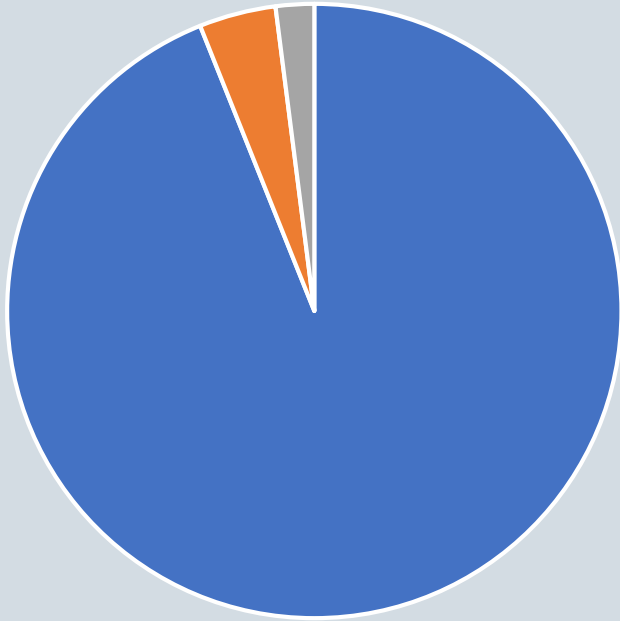
Florida's Oyster Industry – Statewide Landings





Florida's Oyster Industry

- Oyster landings 1995 - 2022



Florida Oyster Management

Florida Fish and Wildlife Conservation Commission (FWC)



- Wild oyster harvest
 - Licenses, seasons, harvest limits, closed areas
- Provide law enforcement
- Monitor wild oyster populations and harvest

Florida Department of Agriculture and Consumer Services (FDACS)

- Administer aquaculture leasing programs
- Certify and inspect processing plants
- Monitor water quality for human health concerns related to shellfish
 - Institute area closures



FWC Oyster Regulations

	Apalachicola Bay *	Elsewhere
Seasons	Summer: Jun. 1 – Aug. 31 Winter: Sept. 1 – May 31	Wakulla, Dixie, Levy counties: Sept. 1 – May 31 Remaining counties: Oct. 1 – Jun. 30
Monitoring closure	< 300 bags per acre: closed Fri-Sun	N/A
Commercial licenses	SPL, Bay License	SPL, Shellfish Endorsement
Recreational license	Saltwater fishing license	
Bag limit (1 bag = 60 lbs.)	Commercial: 20 bags Recreational: 2 bags	
Minimum size limit	3" (undersized tolerance: 15% attached, 5% unattached)	
Allowable gear	Tongs or by hand	
FDACS training	Commercial: Shellfish Harvester & Aquaculture Training Course	
FDACS closures	Harvest subject to daily closures for seafood safety concerns	
FDACS processing	Oysters must be delivered to certified dealer by certain times. Varies seasonally.	



* Apalachicola Bay: regulations in place prior to closure

Florida Oyster Management – Decline in Cultch

- Transition to a half-shell market has significantly decreased amount of material being returned to the environment
- Discussion from stakeholders about improper culling (i.e., culling over non-oyster habitat) resulting in lost material
- Overall degradation of oyster reef habitat
- FDACS performed annual re-shelling operations for several oyster reefs within Panhandle
 - Operations ceased after 2018

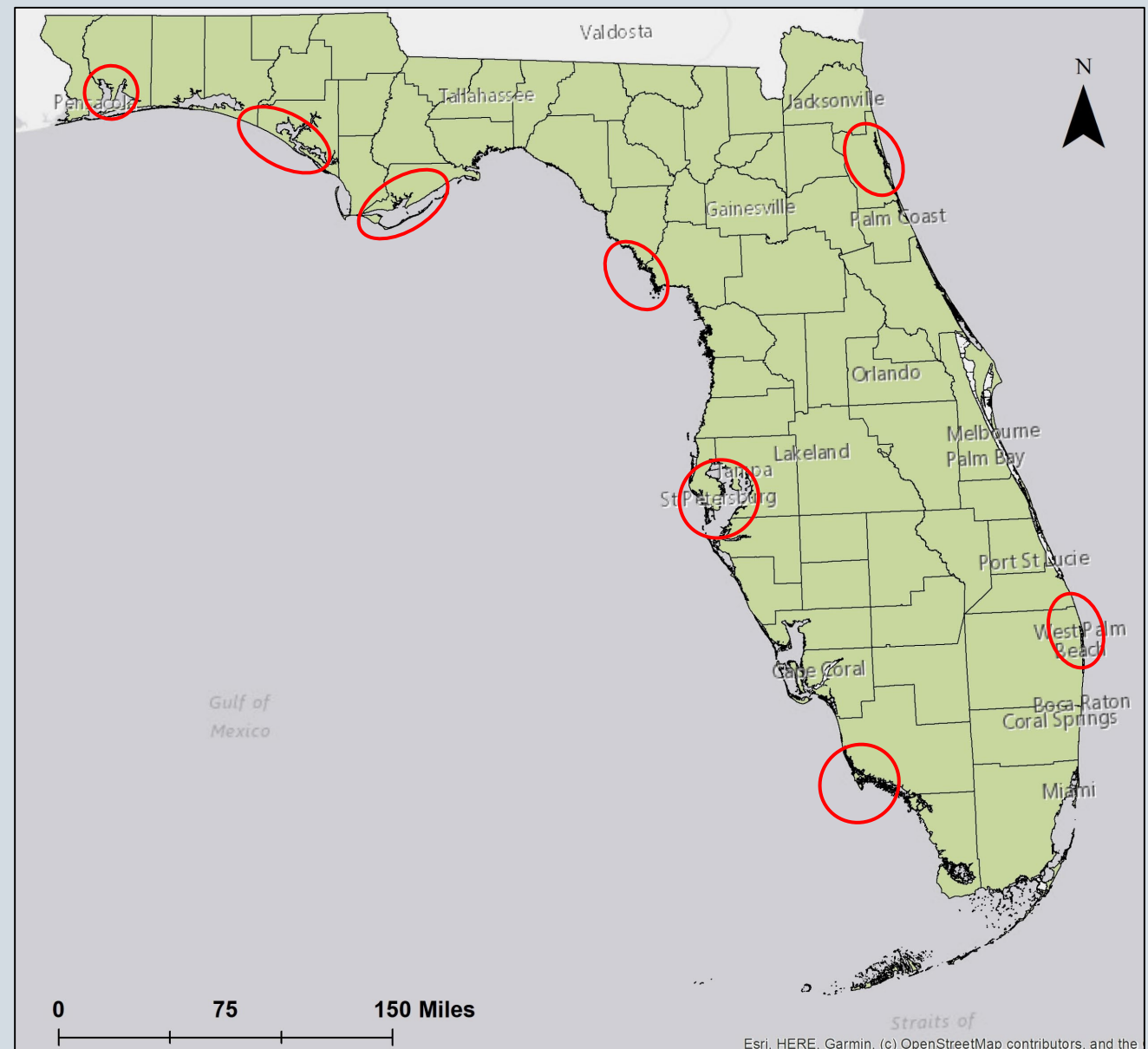


Florida Oyster Management – Restoration Efforts



Recent Restoration Efforts

- Restoration projects throughout FL over last decade
- Wide range of projects
 - Subtidal – Intertidal
 - Shell – Large, limestone boulders
 - Ecosystem Services – Fishery Focused
 - “Postage stamp” – 100+ acres
- Project funds exceed \$50 million*
- Focus has been Apalachicola Bay



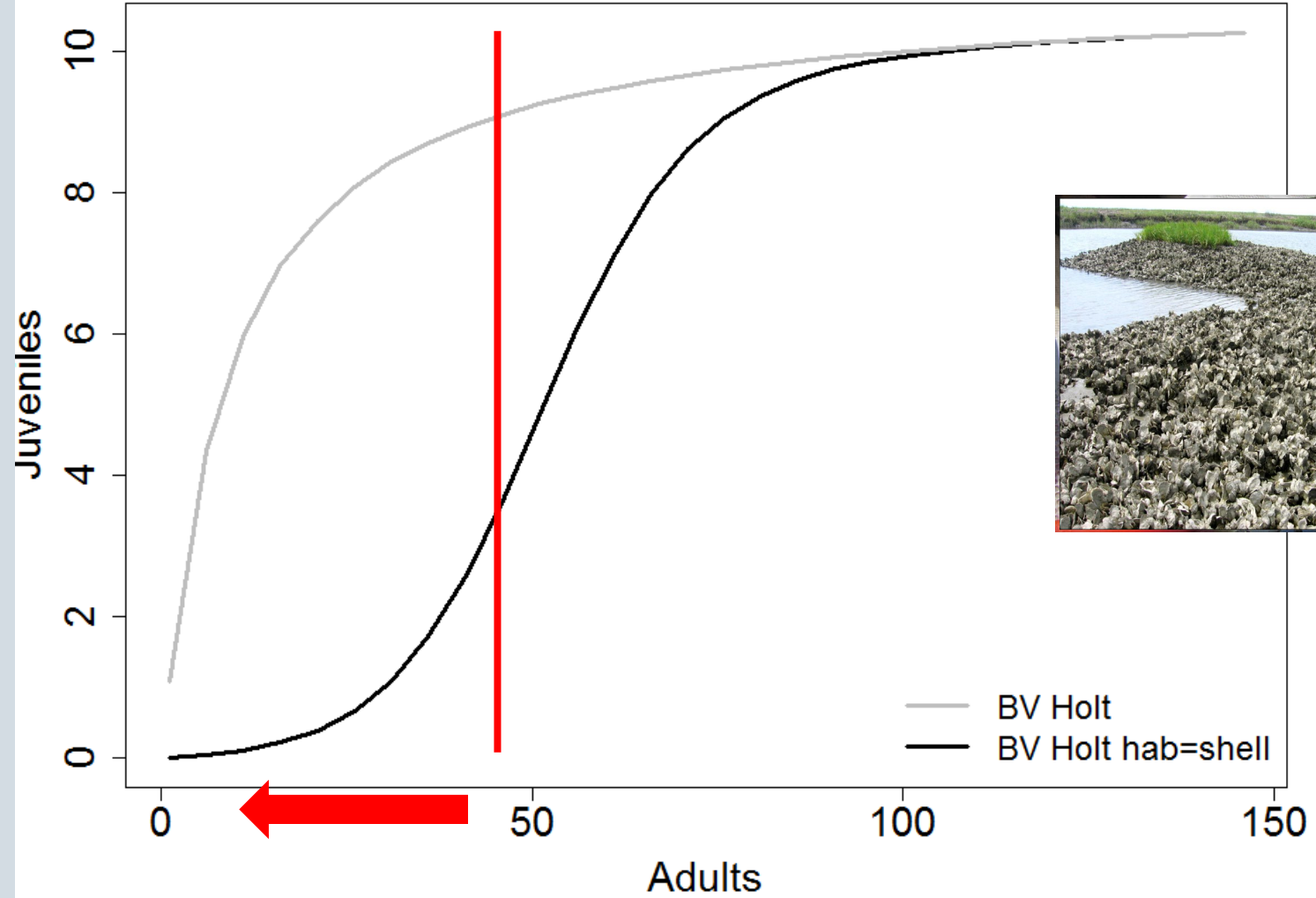
* Not all funds allocated to restoration efforts

Florida Oyster Management – Restoration Hurdles

- Multiple issues have resulted in many habitats showing significantly decreased amounts of material
- Increased costs for restoration materials, effort
- Results sometimes showing 25 – 50% success rate
 - *Is that considered a success?*
 - *How best can managers determine a successful restoration project?*
- Threshold minimum that must be realized for effective restoration
 - Inflexion point (i.e., tipping point) which results in beneficial restoration
 - A reef can be restored to 99% of the inflexion point, but see no beneficial results



Stock-recruit

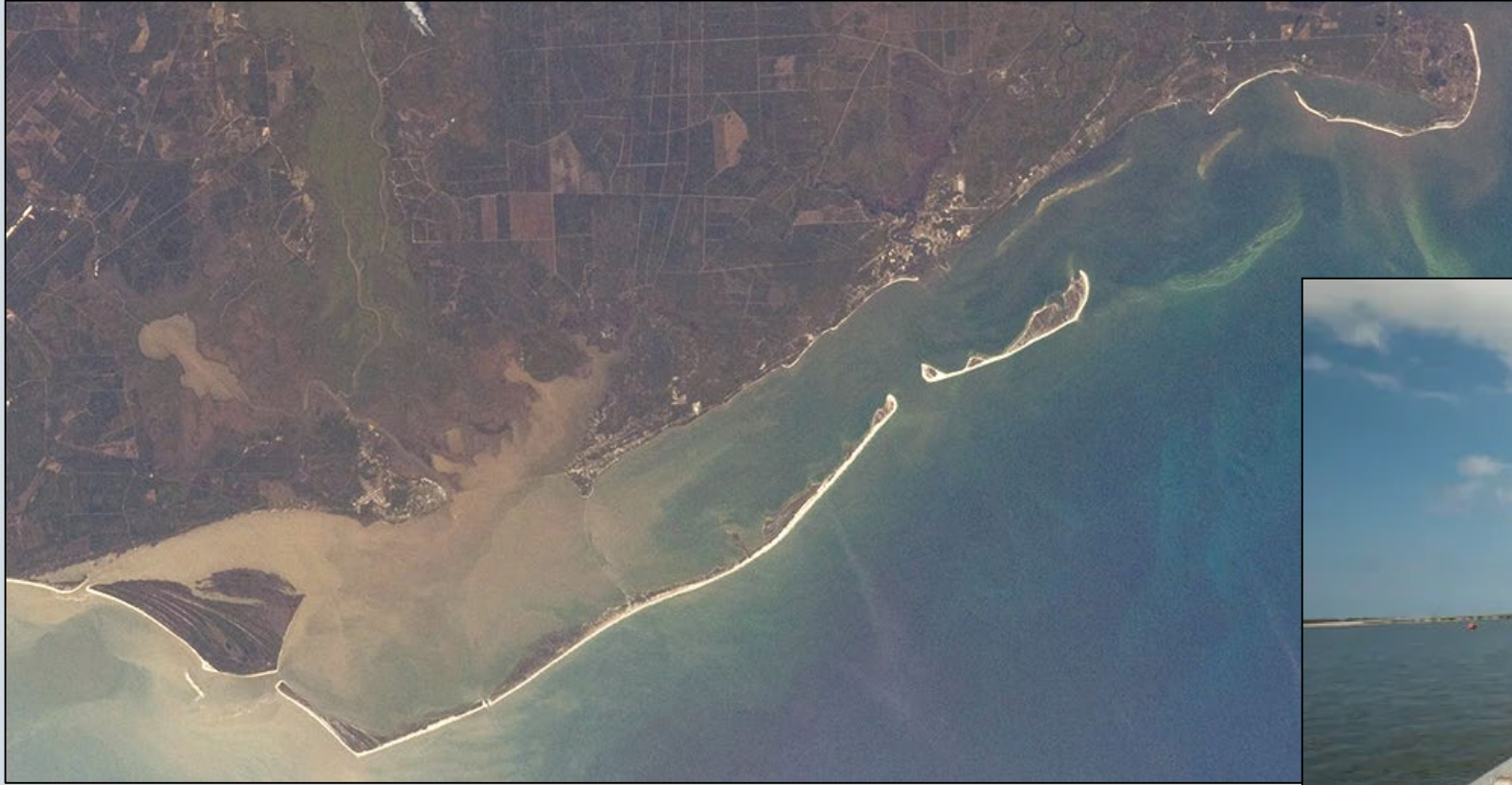


Florida Oyster Management – Hindrances

- Biological data gaps
 - Lack of long-term monitoring in areas experiencing increased harvest
 - *How many bags can be harvested while maintaining suitable habitat?*
- Levels of illegal harvest
- Data issues with reporting harvest
- Funding
 - Regular restoration effort
 - Increased sampling and monitoring
- Stakeholder objections to management changes from *status quo*



Case Study – Apalachicola Bay

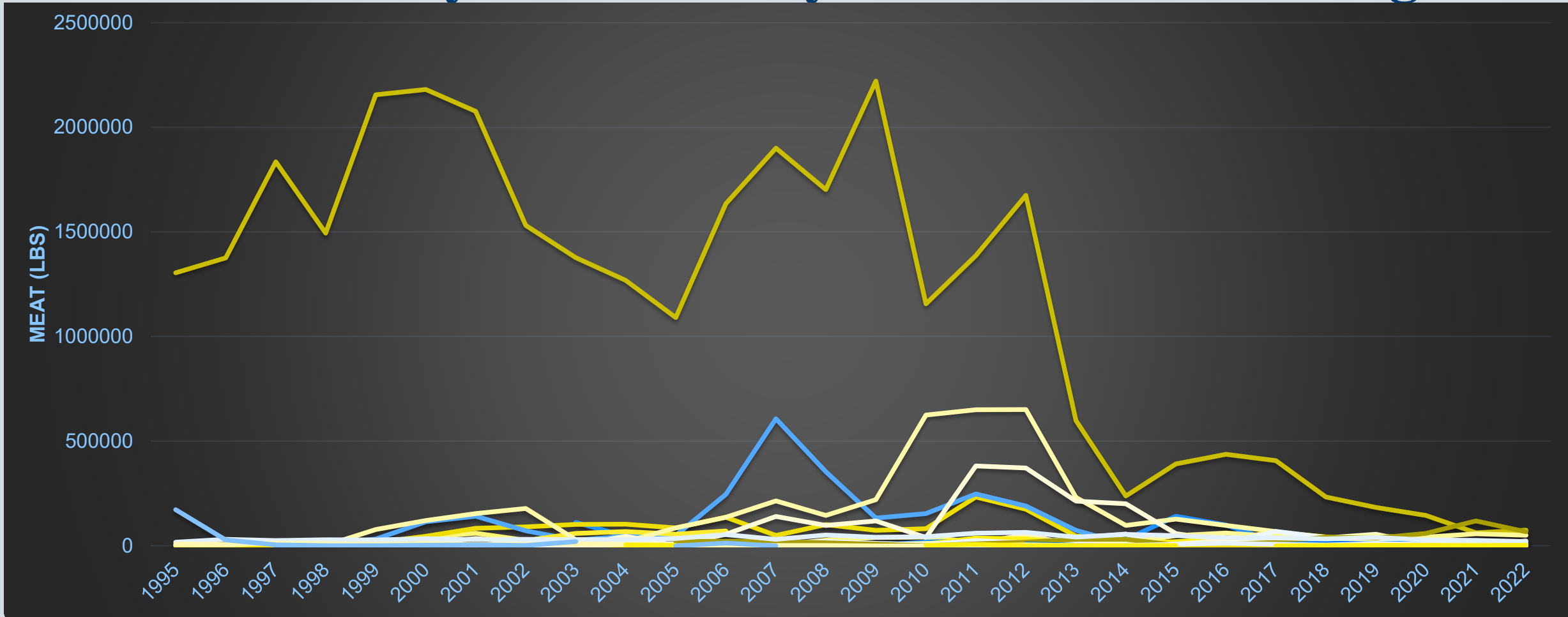


Apalachicola Bay Oysters – Background

- Iconic fishery
 - Over 90% of Florida's commercially-harvested oysters
 - Approximately 10% of the nation's wild-harvested oysters
- Economically and ecologically important
 - Provide habitat and food for commercially and recreationally important fish
 - Filter water
 - Stabilize coastlines



Florida's Oyster Industry – Statewide Landings

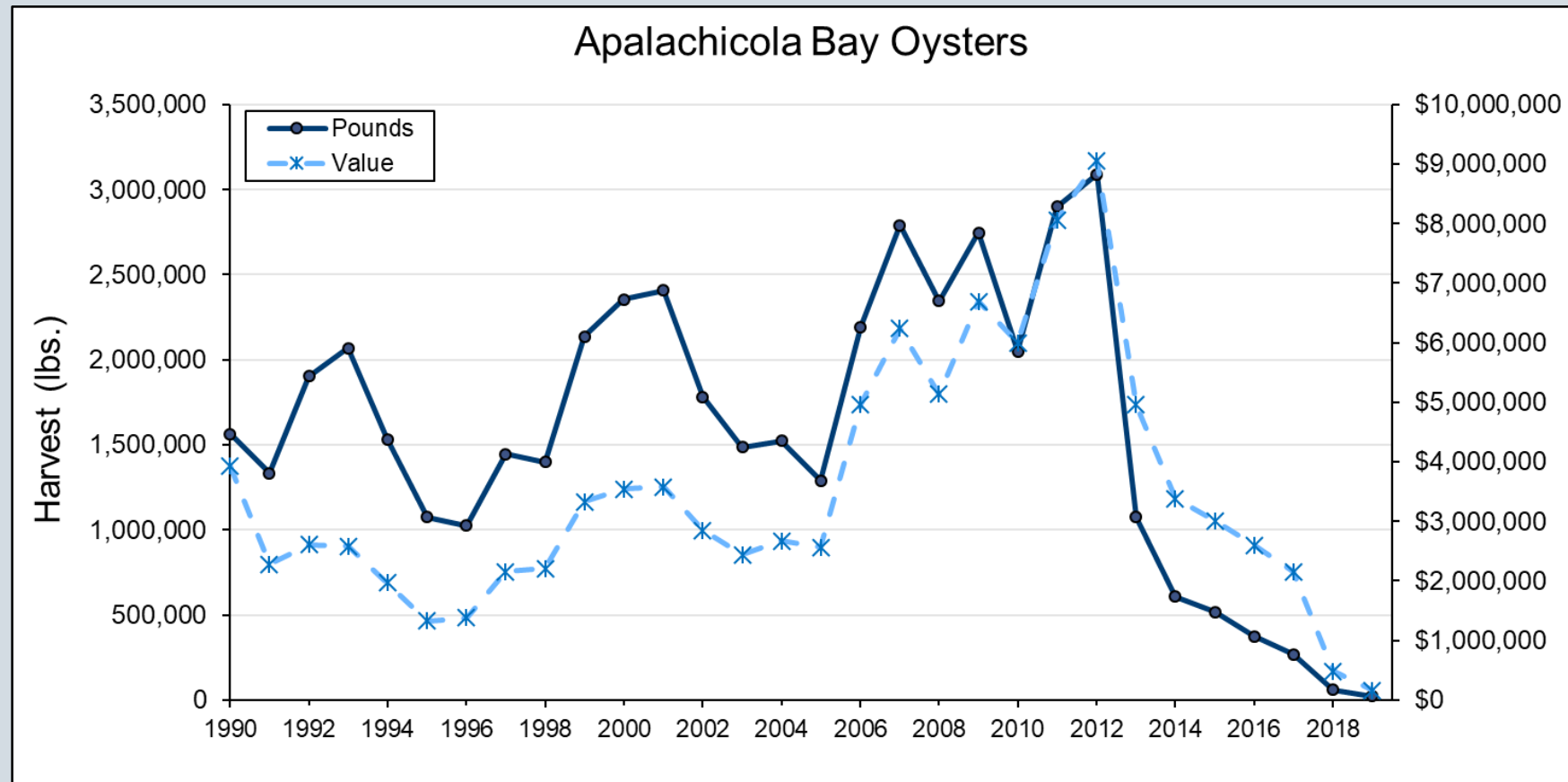


Apalachicola Bay Oysters – Fishery Collapse

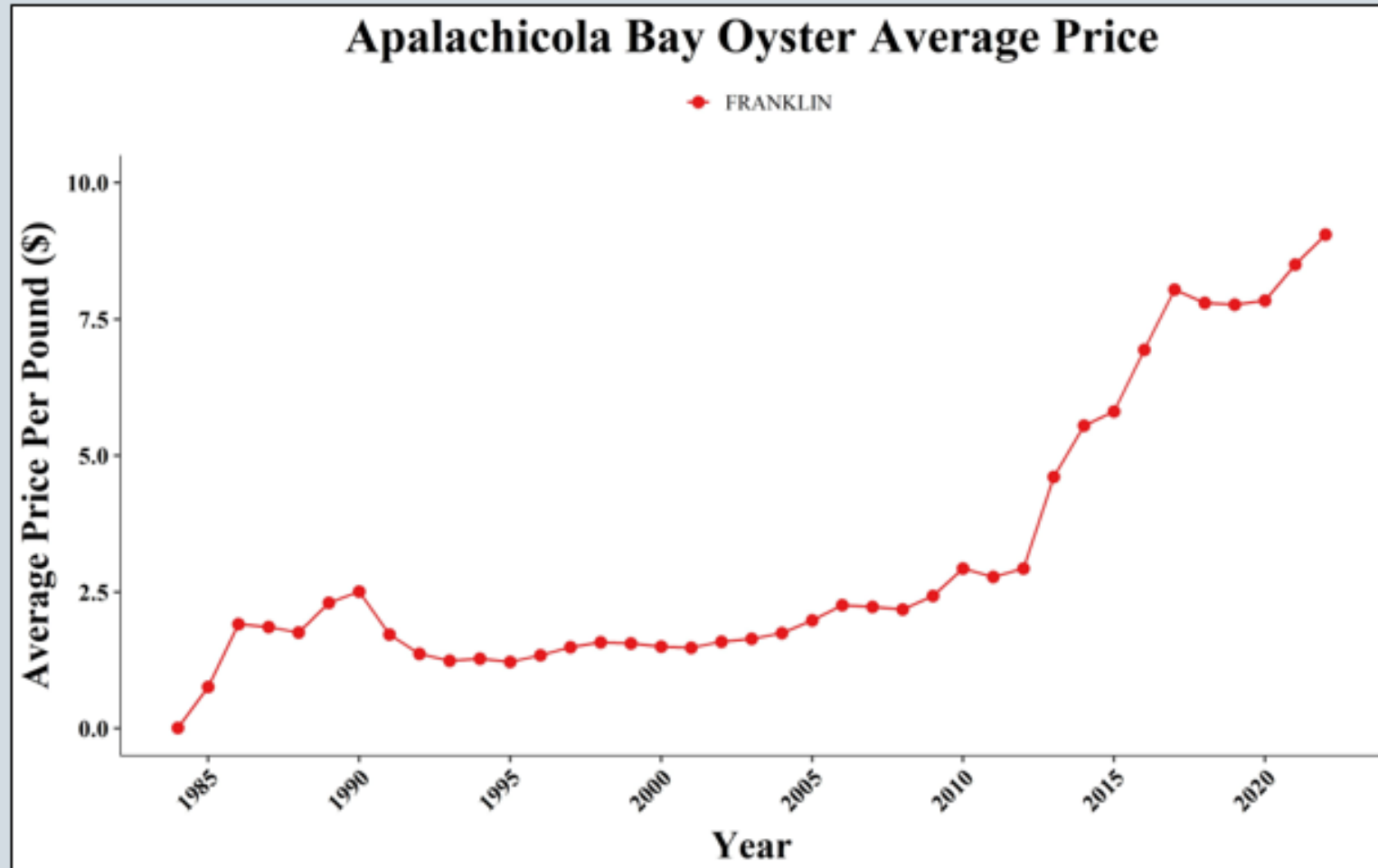
- Fishery collapsed in 2013
 - Federal fisheries disaster declared in 2013
- 2020: FWC approved rules to suspend wild harvest through 2025
- Adult abundance and juvenile recruitment remain at historic lows
 - Small areas showing promise, but not as quickly or as expansive as researchers hoped for



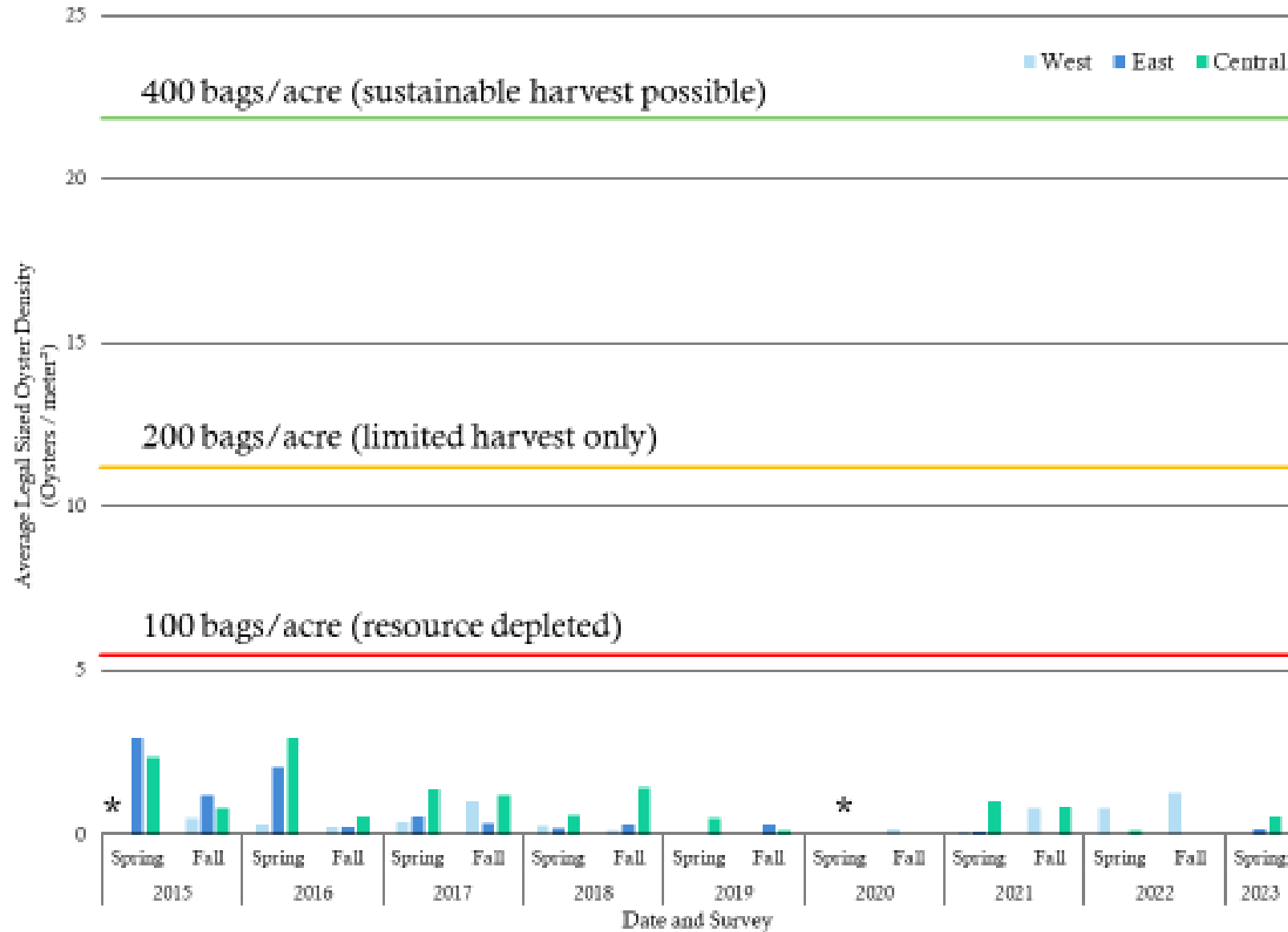
Collapse of the Apalachicola Bay Oyster Fishery



Collapse of the Apalachicola Bay Oyster Fishery



Average Density of Legal Sized Oysters by Survey



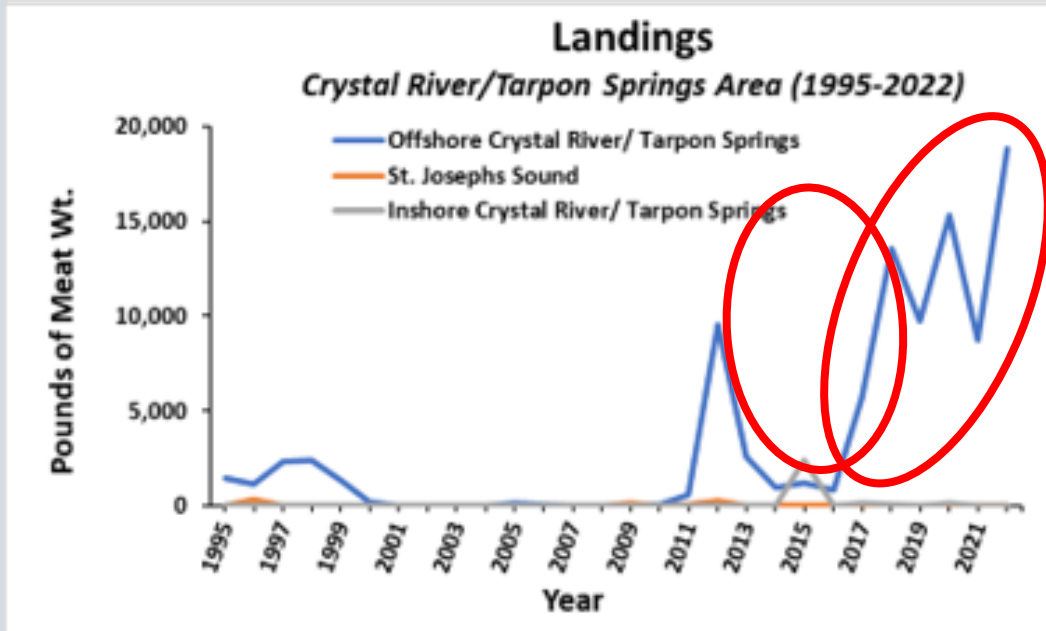
* Survey not completed

Legal size =
shell height
of 3 inches
(76 mm)

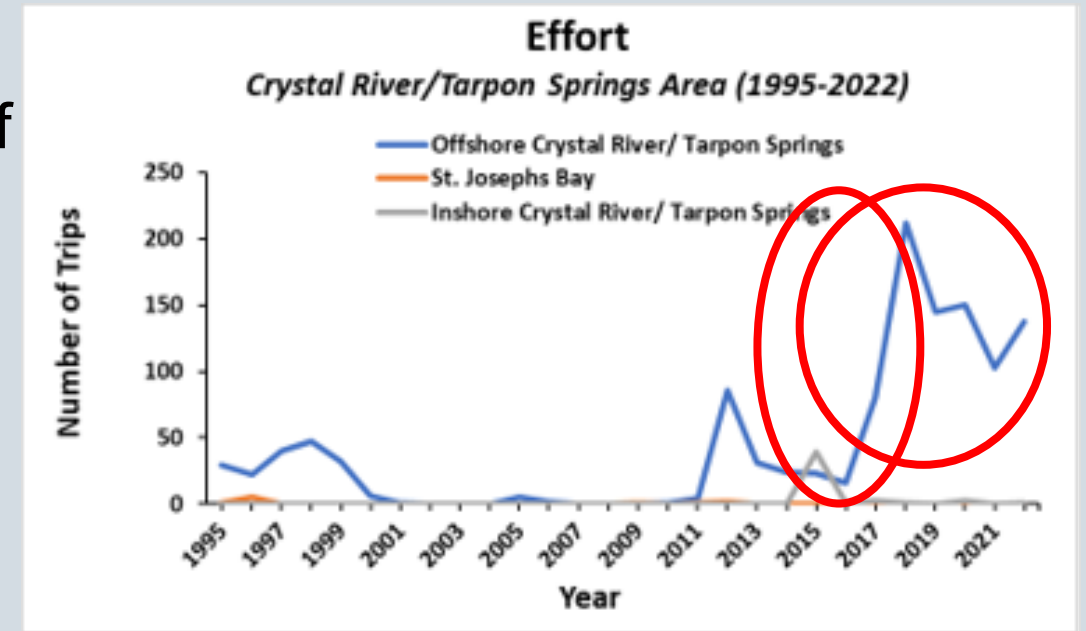


Apalachicola Bay Collapse's Effects

- Wild oyster harvest suspended in 2020 due to fishery collapse
- Movement of harvest pressure from Apalachicola to nearby areas



area
east of



Apalachicola Bay Oysters – “What caused the collapse?”

- What caused the drastic collapse?
 - Poor water quality
 - Increased predation
 - Stressed oysters → higher mortality
 - Loss of material suitable for habitat
 - Effects of harvest
- “Death by a thousand cuts”



Apalachicola Bay Oysters – Recent Restoration

Year	Agency	Project	Locations	Material	Amount (yd ³)	Density
2015	FWC	NFWF	3	Quarried shell	9,600	100, 200, 300, 400
2016	FDEP	NRDA	16	Quarried shell	24,840	200
2017	FDEP	GEBF	14	Limerock	95,500	300
2021	FWC	NFWF – 2021	3	Limerock	9,600	300



Apalachicola Bay Oysters – Restoration Results

- Past restoration efforts in Apalachicola Bay have not performed as well as expected, either logistically or biologically
- Some material types have eroded away, or been carried off by strong current due to poor deployment execution
- High levels of recruitment, followed by significant number of sub-adults not surviving to adulthood
- Large number of unknowns still present regarding effective restoration
 - Type of material
 - Amount of material
 - Elevation of restored material “*Think feet, not inches*”
 - Ecological conditions where material placed



NFWF Gulf Environmental Benefit Fund – \$20,057,000 *

- National Fish and Wildlife Foundation
- Apalachicola Bay and Suwannee Sound
- Oyster reef restoration
- Revise oyster management strategies
- Multiple partnerships
- Collaboration with management agencies, universities, and local, public stakeholders



* Additional \$10 million provided by State for restoration

Apalachicola Bay Oysters – Stakeholder Engagement

- Success through the culmination of work from management entities, university researchers, and local stakeholders
- Staff sit on the FSU Apalachicola Bay System Imitative Community Advisory Board (ABSI CAB)
- Engage with stakeholders at ABSI CAB Community Workshops
- Update County Commissioners, other elected officials
- Conduct ride-a-longs with stakeholders



Apalachicola Bay Oysters – Stakeholder Feelings Towards FWC

- Stakeholder feelings towards FWC work in Apalachicola mixed
 - “I wish they would just listen to us.”
 - “We need to take matters into our own hands and get rid of these Communists.”
- Difficulties with informing public that *good ol’ days* of fishery are no longer
- Stakeholder intolerance to restricting harvest when multiple factors led to collapse
 - Harvest is one of the factors FWC can control
- Balancing local stakeholder knowledge with scientific data
 - Especially when they conflict



Apalachicola Bay Oysters – Restoration

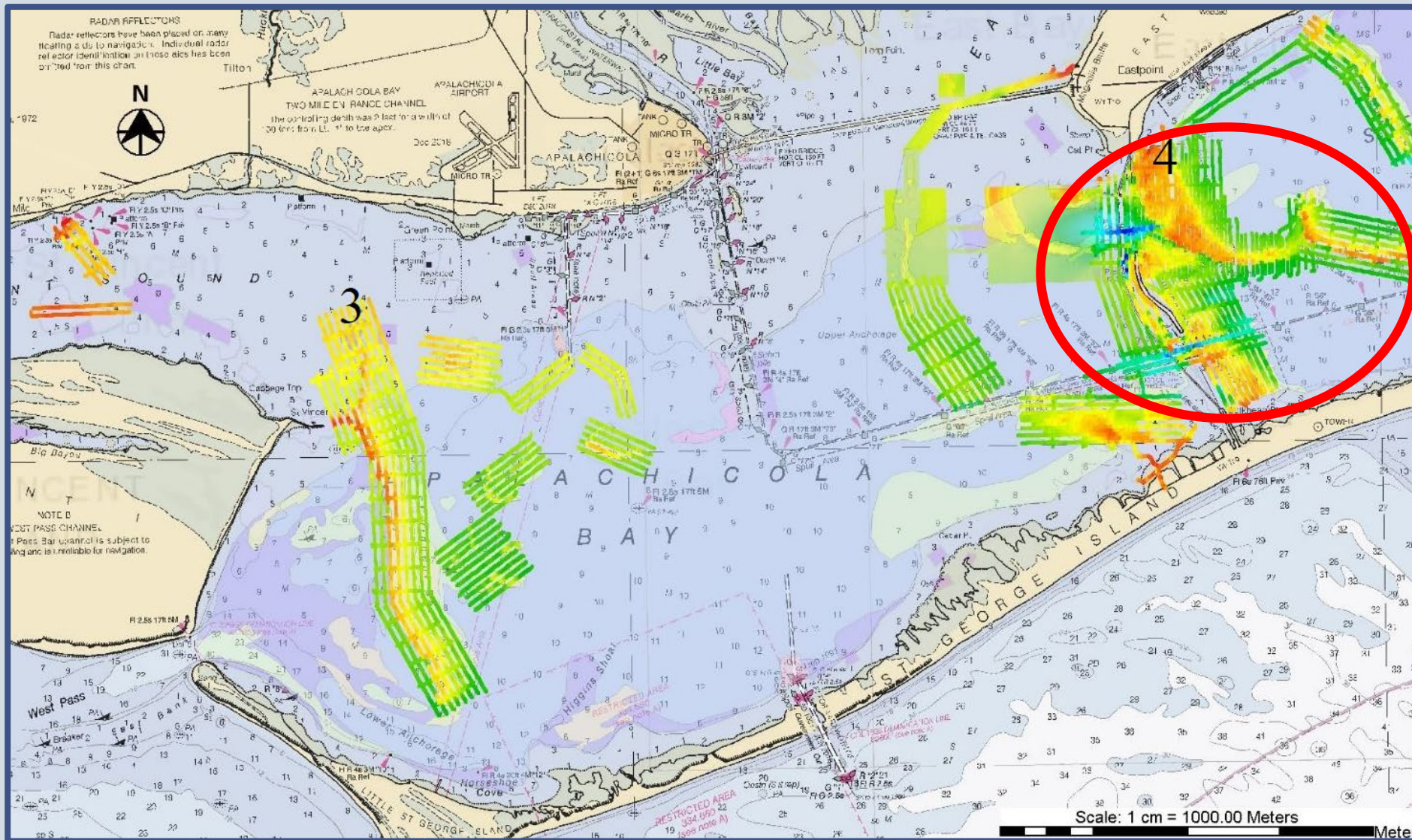
- Past restoration efforts in the Bay did not perform as well as expected
- FWC will conduct a large-scale pilot study testing several components of restoration
 - FSU will conduct complementary studies (much smaller in size)
- FWRI will conduct sampling and monitoring oversight
- Utilizing these studies, FWC will have more data to construct and perform larger restoration activity



Pilot Study Details – Material Size

- Major concern is overall degradation of the Bay's reefs
 - *“These oyster reefs have flattened out and look like a parking lots.”*
- Material size: 6” (small) & 12” (large) FL dolostone
 - Large rock opposed by local stakeholders
- Large-sized material is an effective strategy to rebuild reefs off bottom
- If no significant difference is observed between sizes, tongable material would be used for harvestable reefs during future large-scale restoration
- Reef heights: 12” (low) & 24” (high)
 - Elevation off the bottom important factor for oyster communities





Adaptative Management and Restoration Plan



Pilot Studies

Large-scale Restoration

Pros and cons for future restoration activities

Informs FWC on management options for local fishery

No
oysters

Pause & Regroup



Apalachicola Bay Oysters – Fishery Management

- FWC contracted with Dr. Ed Camp (UF) to perform estimation and simulation models of the fishery
- Provide predictions, projections on how fishery could reopen under different management strategies given restoration effort



Questions for Discussion

1. How are states balancing funding resources' focus on ecosystem services versus the need to ensure a sustainable and productive fishery?
2. If more drastic management strategies have been imposed (e.g., limited entry), how was the implementation navigated with respect to stakeholders?
3. Have other states explored quantitative linkages between live oyster habitat and water quality? For example, need *X amount* of oyster habitat to ensure *Y amount* of nitrogen filtration.
4. What are restoration metrics for assessing success?
5. What are appropriate targets and limits for opening areas for harvest for the Gulf?

