

# Oyster Integrated Mapping and Monitoring Program (OIMMP) Workshop

*Florida Fish and Wildlife Conservation  
Commission*

*Fish and Wildlife Research Institute*

*October 9-10 2019*

Kara Radabaugh, Steve Geiger,

Ryan Moyer, Christi Santi



# OIMMP Introduction

- OIMMP is funded by Florida's State Wildlife Grants (SWG) Program in order to support the study of high priority coastal habitats and meet requirements of the State Wildlife Action Plan



# OIMMP Team



**Ryan P. Moyer, Ph.D. (PI)**



**Kara Radabaugh, Ph.D. (Coordinator, Co-PI)**



**Steve Geiger, Ph.D. (Co-PI)**



**Christi Santi (GIS specialist)**

- Many statewide collaborators!
- Workshop attendee introductions



# IMMP Origins: SIMM

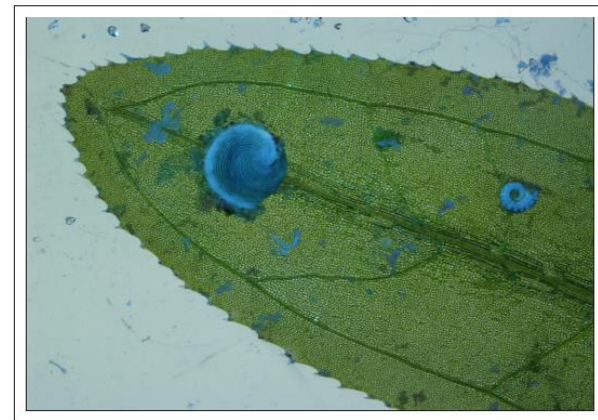
- Seagrass Integrated Mapping and Monitoring (SIMM) program
- SIMM report:

<https://myfwc.com/research/habitat/seagrasses/projects/active/simm/>



## Seagrass Integrated Mapping and Monitoring Program Mapping and Monitoring Report No. 2

Laura A. Yarbro and Paul R. Carlson, Jr.  
Editors



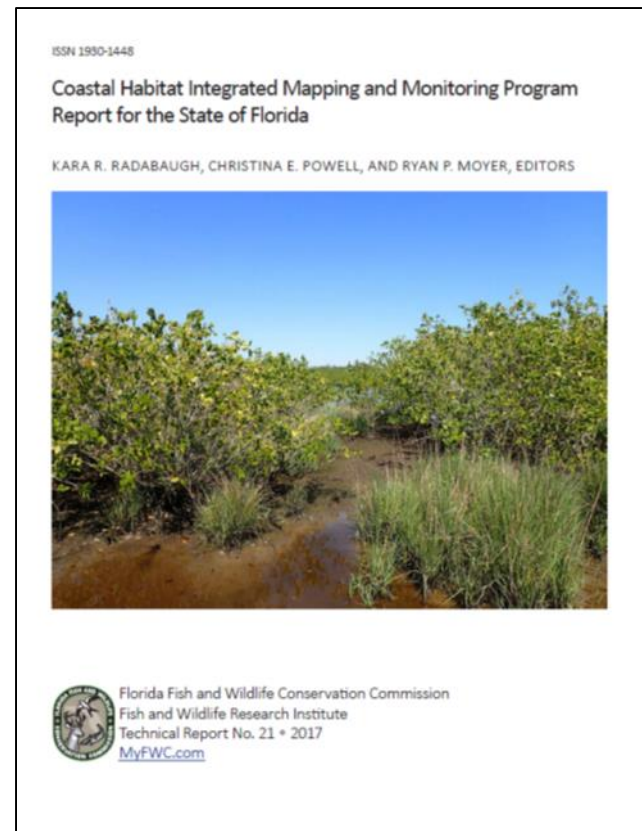
Florida Fish and Wildlife  
Conservation Commission





# IMMP Origins: CHIMMP

- Coastal Habitat Integrated Mapping and Monitoring Program (CHIMMP)
- CHIMMP report published in 2017  
<https://myfwc.com/research/habitat/coastal-wetlands/projects/chimmp/>



# IMMP Origins: CHIMMP

- Four-year program, 2013-2017 funded by SWG
- Resources and presentations from three workshops available at <https://ocean.floridamarine.org/CHIMMP/>
- Recently funded (2019-2020) for small-scale report updates
- CHIMMP workshop to be held in Spring 2020



Florida Fish and Wildlife  
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[Home](#) > [FWC Fish and Wildlife Research Institute](#) > [Habitat](#) > [Coastal Wetlands](#) > [Coastal Habitat Projects](#) >  
[Coastal Habitat Integrated Mapping and Monitoring Program \(CHIMMP\)](#)

## Coastal Habitat Integrated Mapping and Monitoring Program (CHIMMP)

Salt marshes and mangroves provide valuable ecosystem services to coastal communities in Florida. Coastal wetlands stabilize shorelines, filter surface water runoff, sequester large amounts of organic carbon, and provide important fisheries habitat. However, the statewide extent of coastal wetlands is shifting. Future sea-level rise is expected to cause fragmentation of salt marshes and loss of acreage where hardened shorelines, coastal development, and other obstacles prevent the landward migration of salt marsh vegetation. Mangrove distribution is also changing and mangrove forests are encroaching into marsh habitats in response to climate change and sea-level rise. Thus, a coordinated statewide mapping and monitoring program was deemed necessary to better





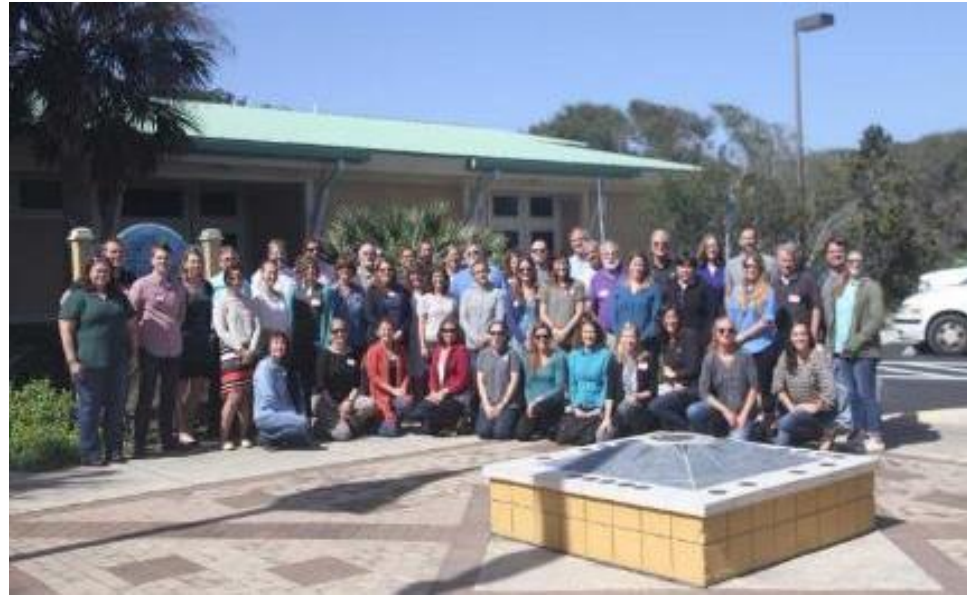
# OIMMP Goals

- **Inventory existing mapping and monitoring programs in FL**
  - Create publicly available mapping layer and collaborative statewide report
- **Bring together representatives from mapping and monitoring programs across the state and region**
  - Increase communication
  - Compare current mapping and monitoring methods
  - Identify data gaps, needs, and priorities for future efforts
- **Complete pilot studies of oyster mapping and monitoring**



# Past OIMMP Workshops

- Workshops I (2017) and II (2018) held at GTMNERR
- Past workshop presentations available on OIMMP website  
<https://ocean.floridamarine.org/OIMMP/>





# OIMMP Workshop III Agenda

- **Day 1** (Wednesday 9 October)
  - OIMMP updates and publications
  - Available Resources and Needs
  - Attendee presentations
  - Social event at Hollander Hotel 6 - 8 pm
- **Day 2** (Thursday 10 October)
  - Continuation of attendee presentations
  - Breakout Discussion
  - Conference Wrap Up

# OIMMP Report Published!

ISSN 1930-1448

## Oyster Integrated Mapping and Monitoring Program Report for the State of Florida

KARA R. RADABAUGH, STEPHEN P. GEIGER, RYAN P. MOYER, EDITORS



Florida Fish and Wildlife Conservation Commission  
Fish and Wildlife Research Institute  
Technical Report No. 22 - 2019  
MyFWC.com

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



# OIMMP Coauthors and Contributors

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Ray Grizzle	UNH	Mark Thompson	SCCF
Gregory Herbert	USF	Linda Walters	UCF
Erica Hernandez	Alachua Conservation Trust	Amber Whittle	FWC
Stephen Hesterberg	USF	Estelle Wilson	NOAA



# FWRI Technical Report Process

- Writing & review process
  - Create maps and charts (Christi Santi & Kara Radabaugh)
  - Write draft (Kara Radabaugh & coauthors)
  - OIMMP editor revisions (Kara Radabaugh, Ryan Moyer, Steve Geiger)
  - Technical review & revisions (Bill Arnold, Amber Whittle)
  - Copy editing review & revisions (Bland Crowder)
  - Formatting (Bland Crowder)

# OIMMP Regions







# OIMMP report chapter contents

- Regional maps
- Introduction to regional history/ecology, description of local oysters
- Threats to oyster reefs
- Summary of select mapping and monitoring programs
- Recommendations for management, mapping, and monitoring

# Oyster Beds in Florida Map



Statewide oyster map available for download at  
<http://geodata.myfwc.com/datasets/oyster-beds-in-florida>

# Statewide Oyster Mapping and FWC GIS Resources



*Christi Santi*

*Florida Fish and Wildlife Conservation  
Commission*

*Fish and Wildlife Research Institute*





# Statewide Oyster Progress

- Now 31 total source datasets.
- 3 areas with additions – Indian River Lagoon, Chokoloskee, West Bay
- Minor revision in Choctawhatchee Bay

# Statewide Oyster Progress

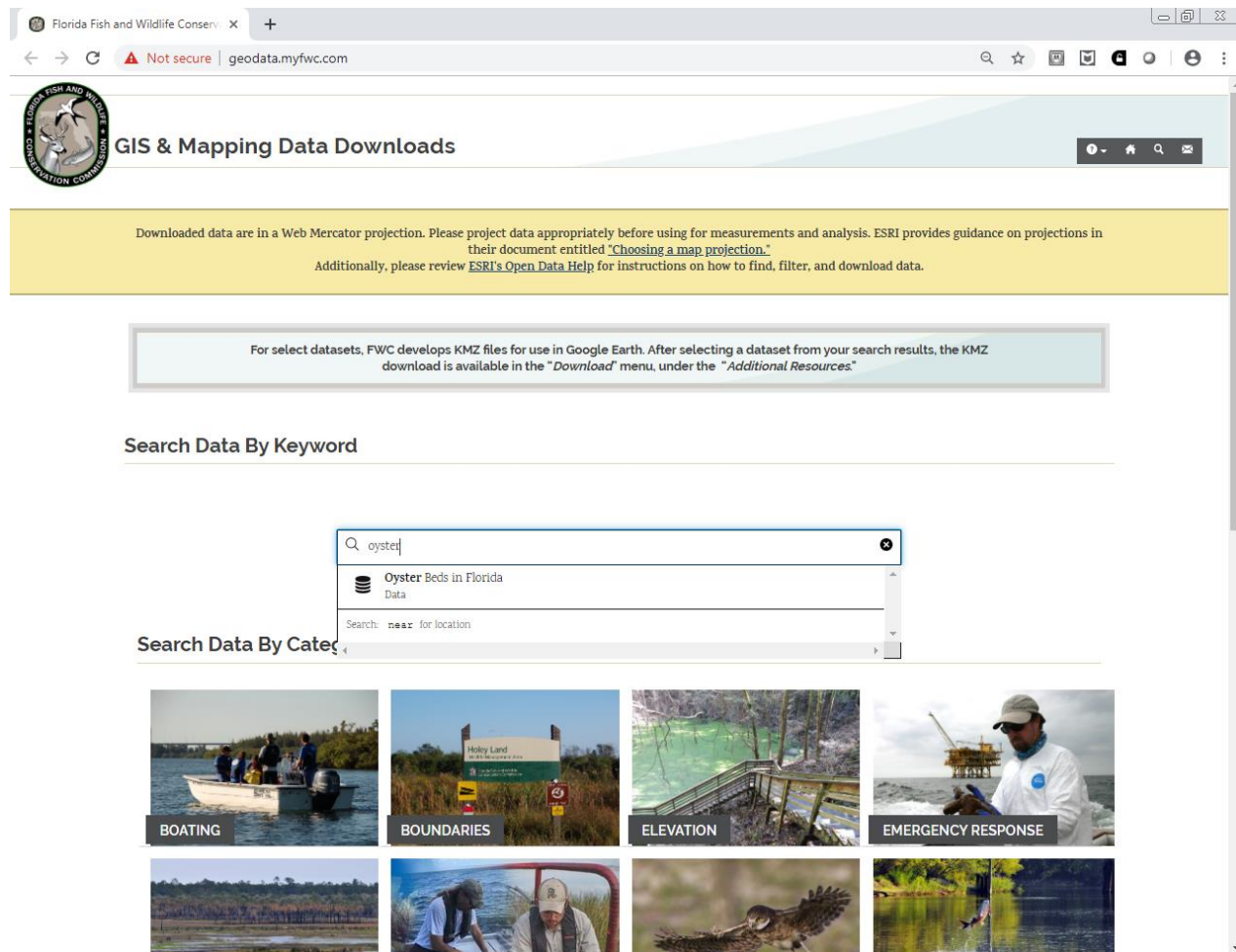


# Statewide Oyster Progress






# FWC GIS Data



The screenshot shows a web browser window with the address bar displaying "geodata.myfwc.com". The page title is "GIS & Mapping Data Downloads". A yellow banner contains a disclaimer about Web Mercator projection. Below this, a light blue box provides information about KMZ files. The "Search Data By Keyword" section features a search box with "oyster" entered, showing a dropdown menu with "Oyster Beds in Florida" as the selected result. Below the search box, the "Search Data By Category" section displays a grid of eight categories with corresponding images: BOATING, BOUNDARIES, ELEVATION, EMERGENCY RESPONSE, and four others.

Florida Fish and Wildlife Conserv... x +

Not secure | geodata.myfwc.com

 GIS & Mapping Data Downloads

Downloaded data are in a Web Mercator projection. Please project data appropriately before using for measurements and analysis. ESRI provides guidance on projections in their document entitled "Choosing a map projection." Additionally, please review [ESRI's Open Data Help](#) for instructions on how to find, filter, and download data.

For select datasets, FWC develops KMZ files for use in Google Earth. After selecting a dataset from your search results, the KMZ download is available in the "Download" menu, under the "Additional Resources."

Search Data By Keyword

Q oyster

Oyster Beds in Florida  
Data

Search: near for location

Search Data By Category

BOATING

BOUNDARIES

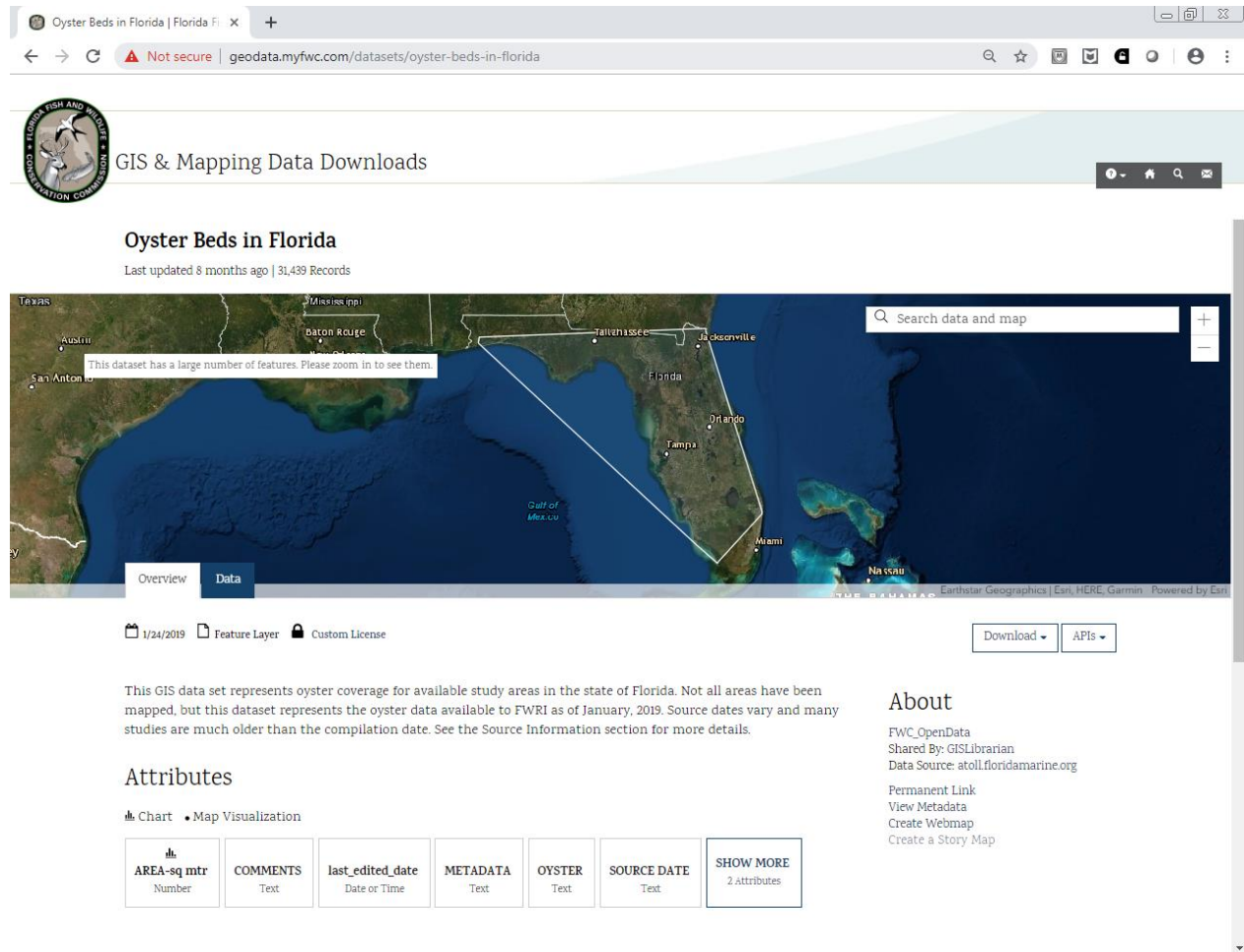
ELEVATION

EMERGENCY RESPONSE

On the FWC geodata website type "Oyster" in the Search Box and select the "Oyster Beds in Florida" link.

<http://geodata.myfwc.com/>

# FWC GIS Data



<http://geodata.myfwc.com/>

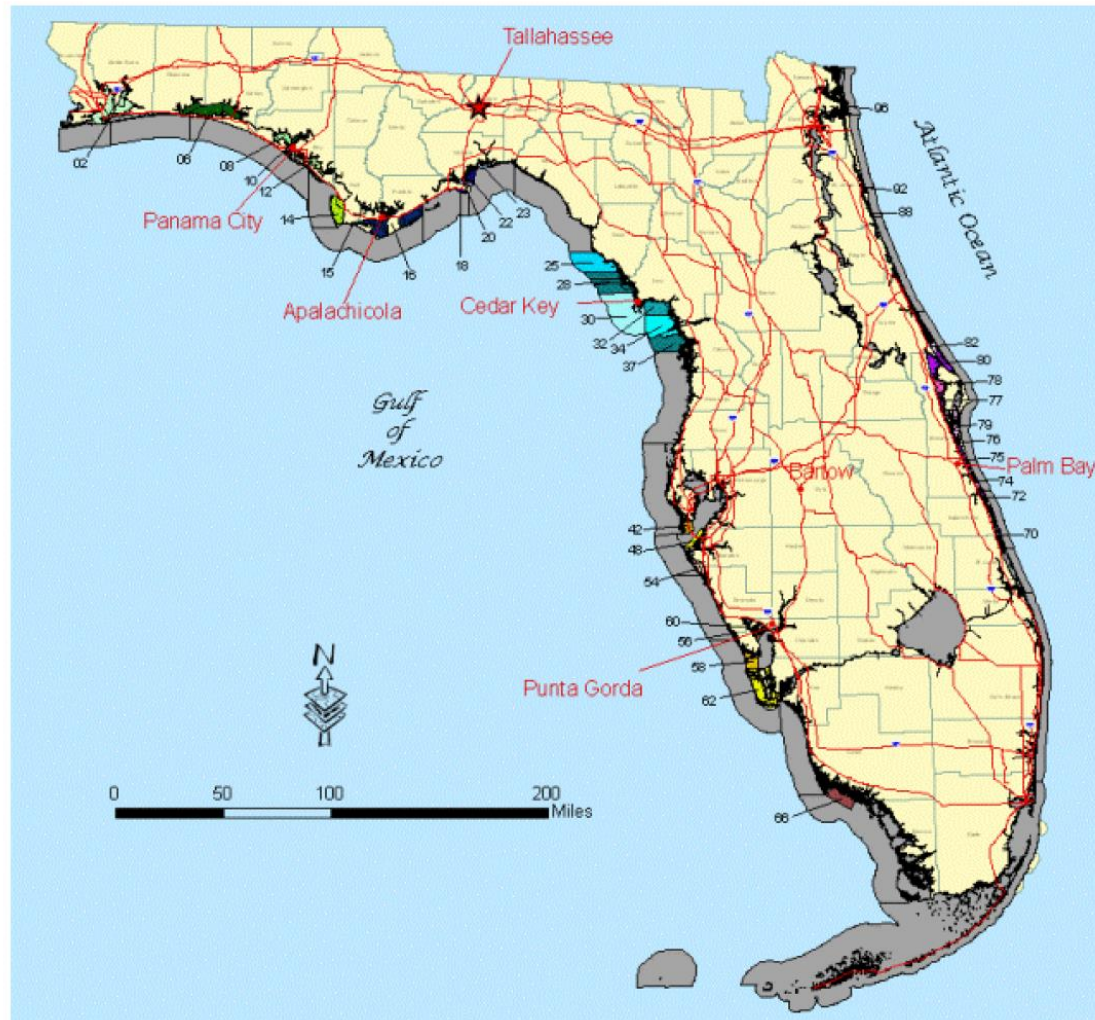


# Resource links

- FWC GIS Downloads and Map Products:  
<http://geodata.myfwc.com/>
- FWC GIS Email:  
[GISLibrarian@MyFWC.com](mailto:GISLibrarian@MyFWC.com)



# FDACS Shellfish Harvesting Areas



<https://www.fdacs.gov/Agriculture-Industry/Aquaculture/Shellfish-Harvesting-Area-Classification/Shellfish-Harvesting-Area-Maps>

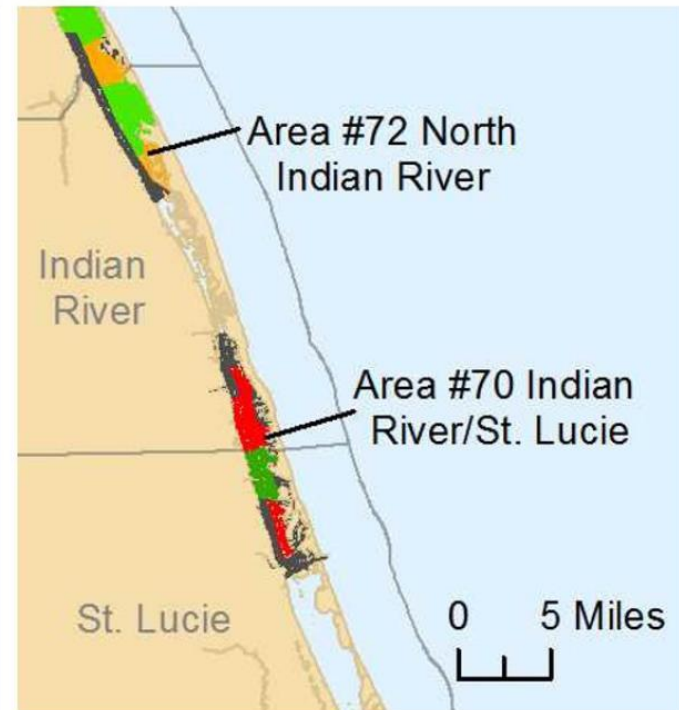
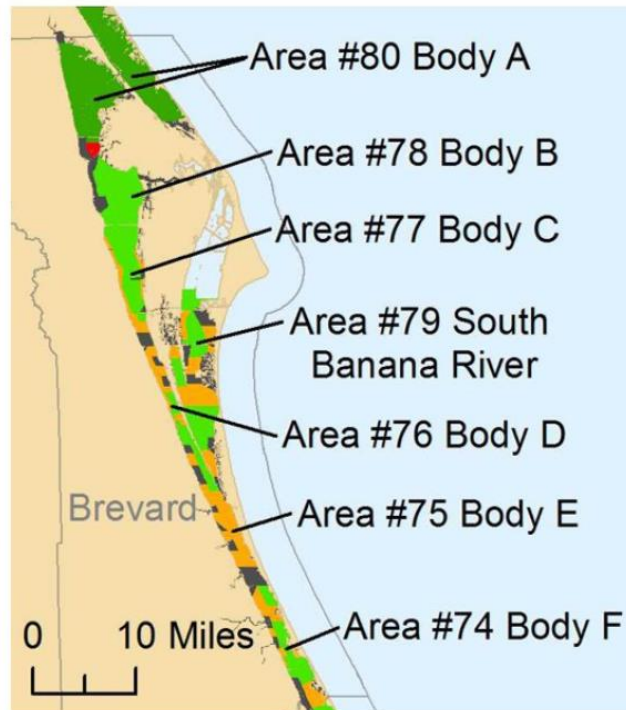
# FDACS Shellfish Harvesting Areas



## Legend



These data are intended for informational use only and should not be considered authoritative for navigation, engineering, legal, or other site-specific purpose. FWC does not assume any legal liability or responsibility arising from the use of this product in a manner not intended by the author.



- Maps in each regional chapter
- Shapefiles available for download at <https://ocean.floridamarine.org/OIMMP/>



# Mapping Needs in Florida

- Fill mapping gaps
- Update old maps
- Map oysters in peripheral habitats
- Complete estimates of historical extent
- Differentiate between live and dead sections of reefs



# Florida Mapping Gaps - 2018 Workshop

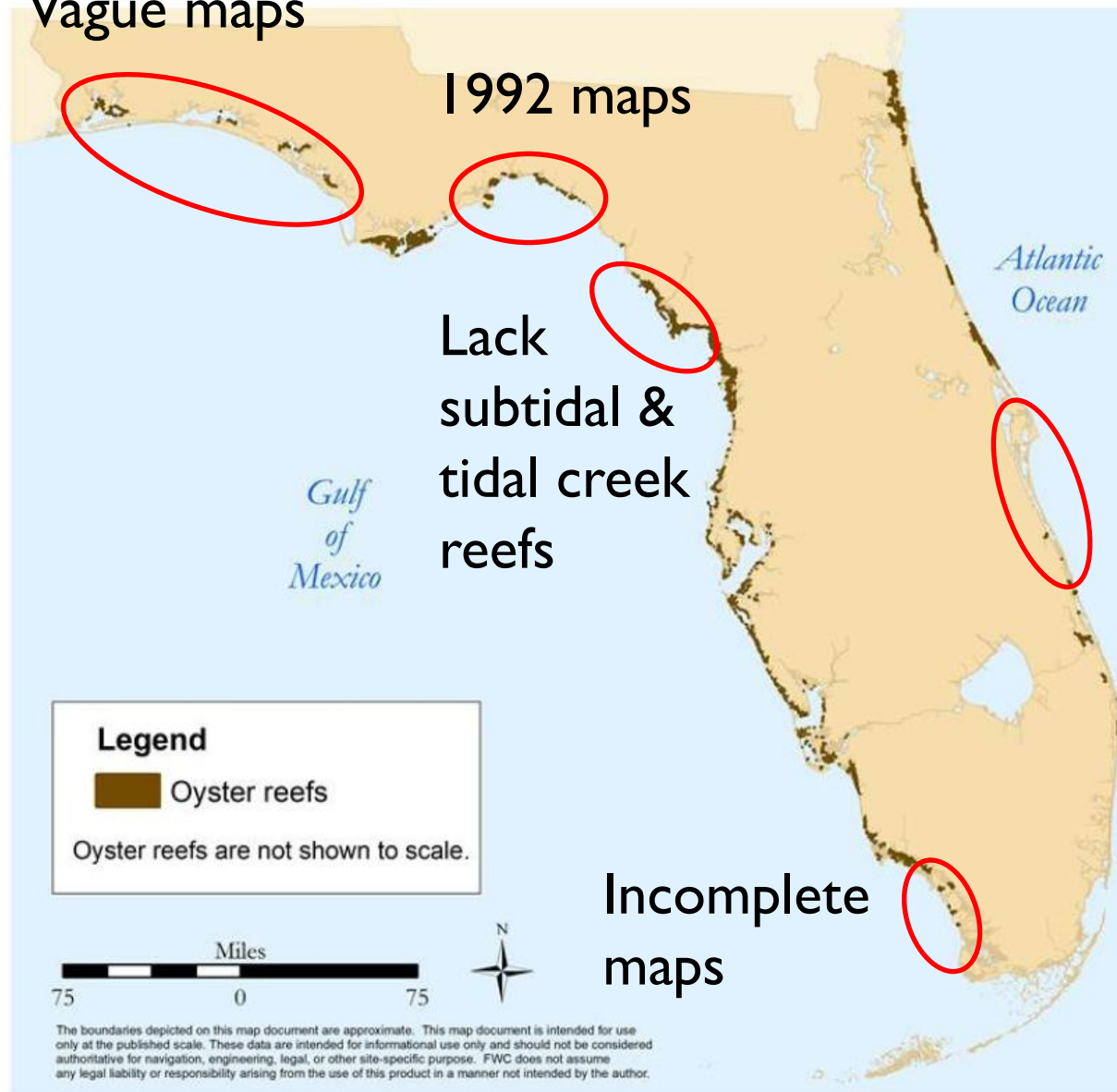
Vague maps

1992 maps

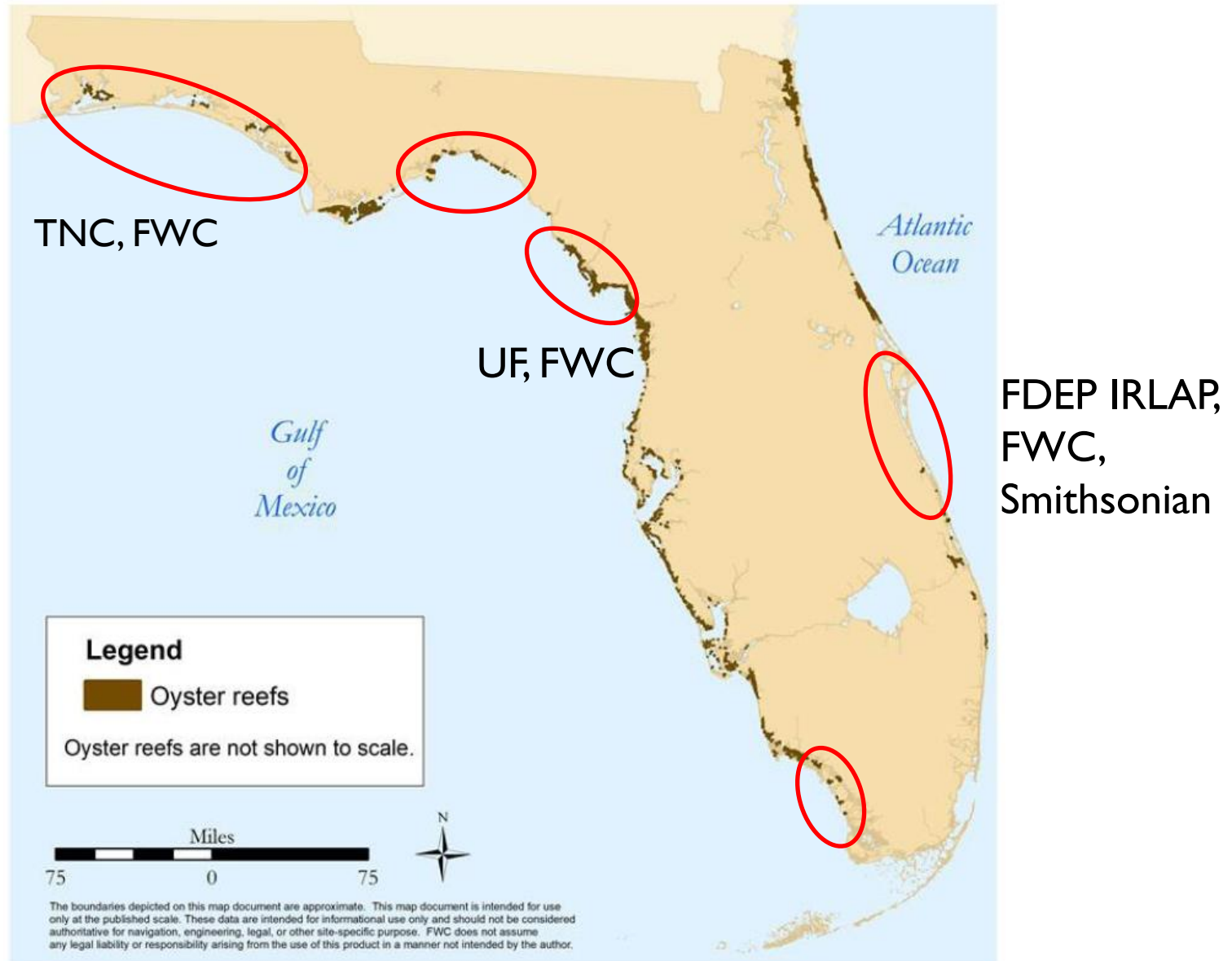
Lack  
subtidal &  
tidal creek  
reefs

Incomplete  
maps

Incomplete  
maps



# Filling Florida Mapping Gaps



# Mapping Peripheral Oyster Habitats

- Include oysters on mangrove roots, under vegetation, seawalls, pilings, etc.
- Difficult to see in aerial imagery
- In some cases, only type of oyster aggregations present (e.g. SE FL)





# Mapping Peripheral Oyster Habitats



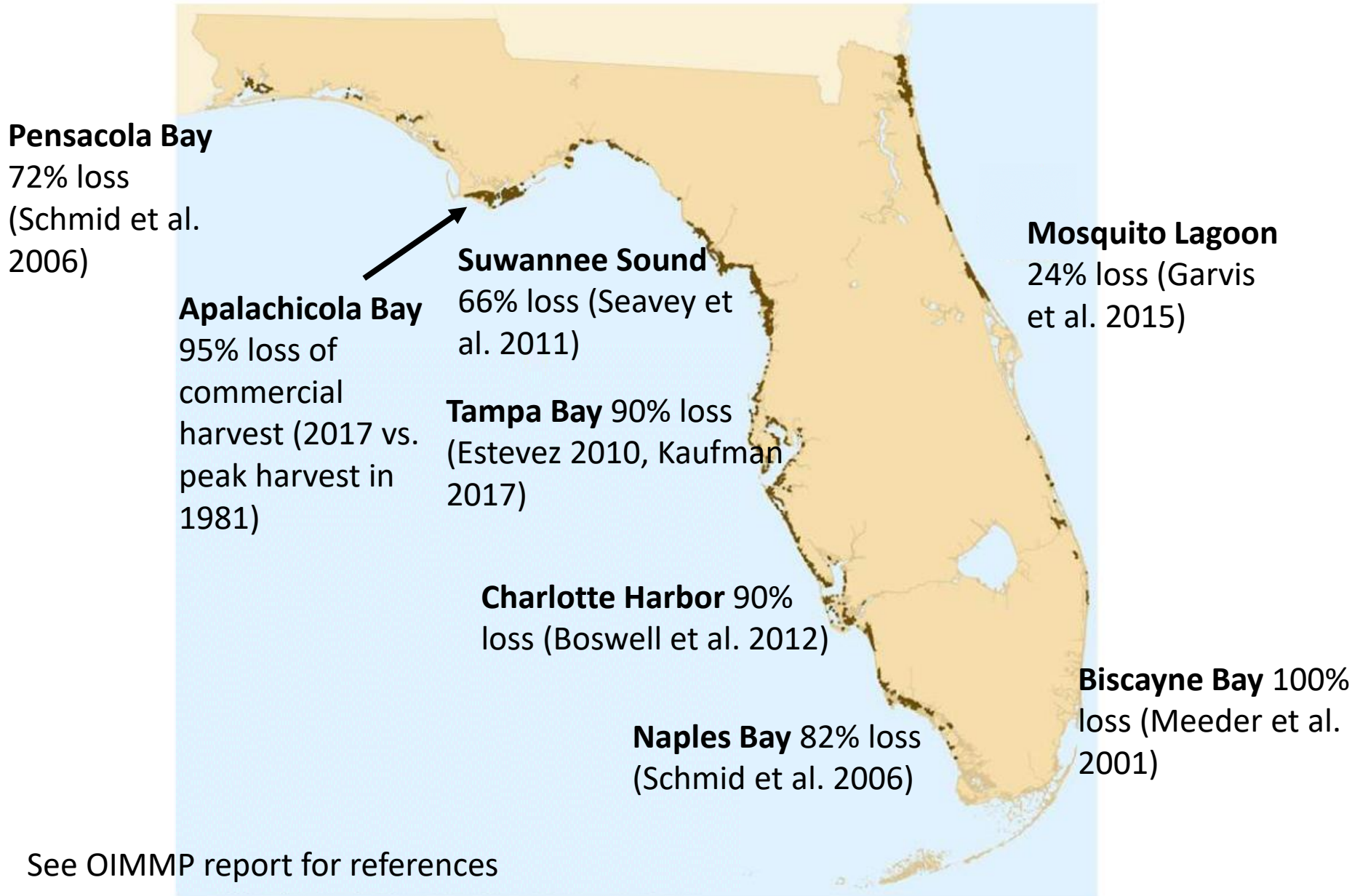
- Sarasota County best example of mapping peripheral oyster habitats

Habitat Characterization Codes	
Habitat	Code
Oyster Clumps/Reef	CR
Mangrove Apron	MA
Mangrove Root Oys.	MRO
Seawall	SW
Rip Rap	RR

Figure from Meaux et al. 2016

Methods manual available from <https://sarasota.wateratlas.usf.edu/oysters/>

# Historical losses of oyster reef



# Map Reef Quality

- Map dead margins or unconsolidated reefs to track reef migration or change in quality
- Oyster reefs shifting away from boat wakes in Intracoastal Waterway (Grizzle et al. 2002; Wall et al. 2005)



Mosquito Lagoon reef with dead margin. Photo credit: Linda Walters



# Map Reef Quality

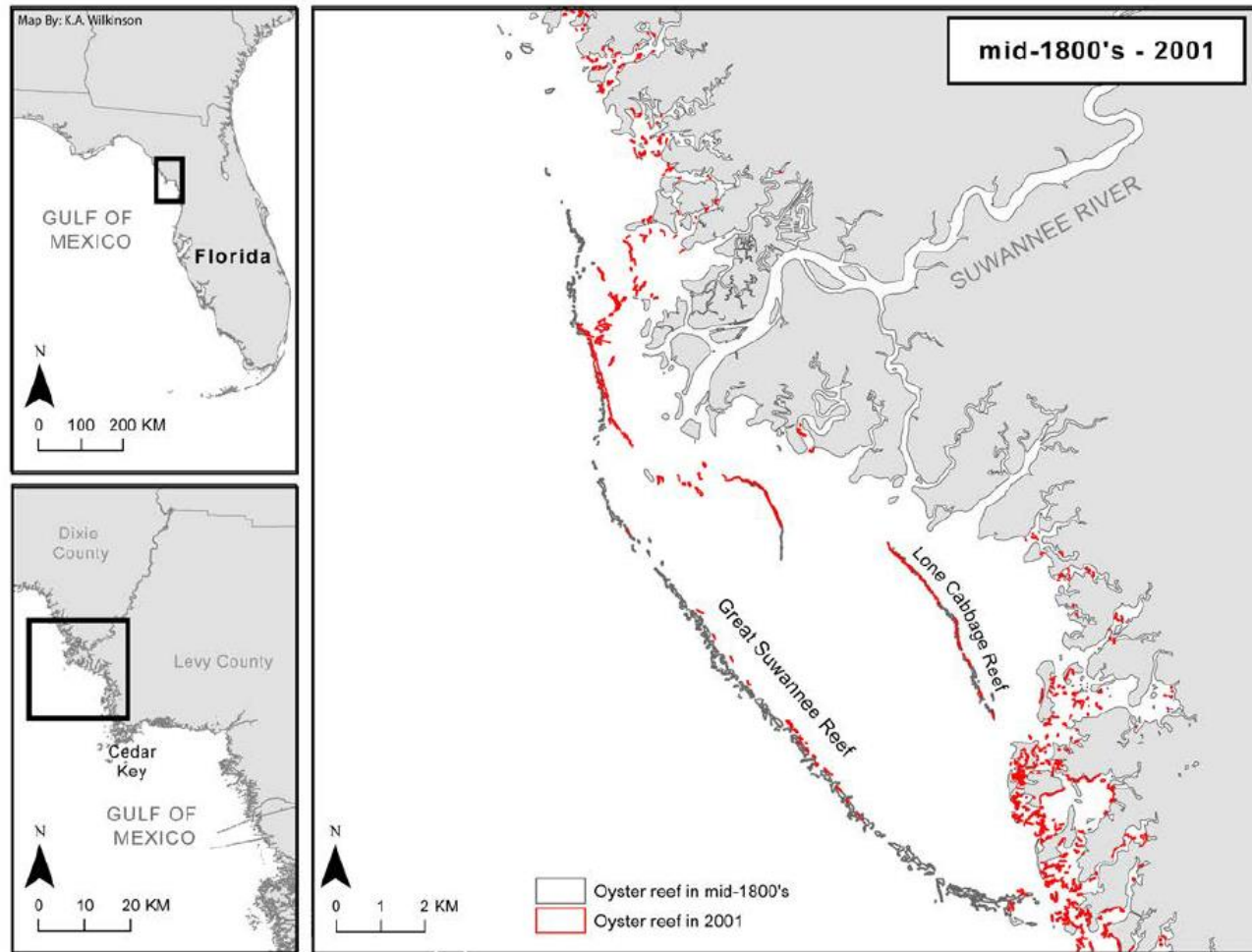
- Shell rakes common in NE FL along Intracoastal Waterway



Photo credits: GTMNERR (Nikki Dix) and UCF (Linda Walters)

# Map Reef Quality

- Oyster collapse in Suwannee Sound led to apparent “increase” in reef area as dead shell was spread over a larger area (Seavey et al. 2011)
- Oyster reefs shifting inland following salinity regimes. Seen in Big Bend and Everglades (Volety et al. 2009)



Oyster reef extent in Suwannee Sound in the mid-1800s (gray) and 2001 (red). Map by Krystan A. Wilkinson. Data sources: Raabe et al. 2004 (from 19th century topographic sheets), SRWMD 2001a (from 2001 photographs).



# Questions or comments?





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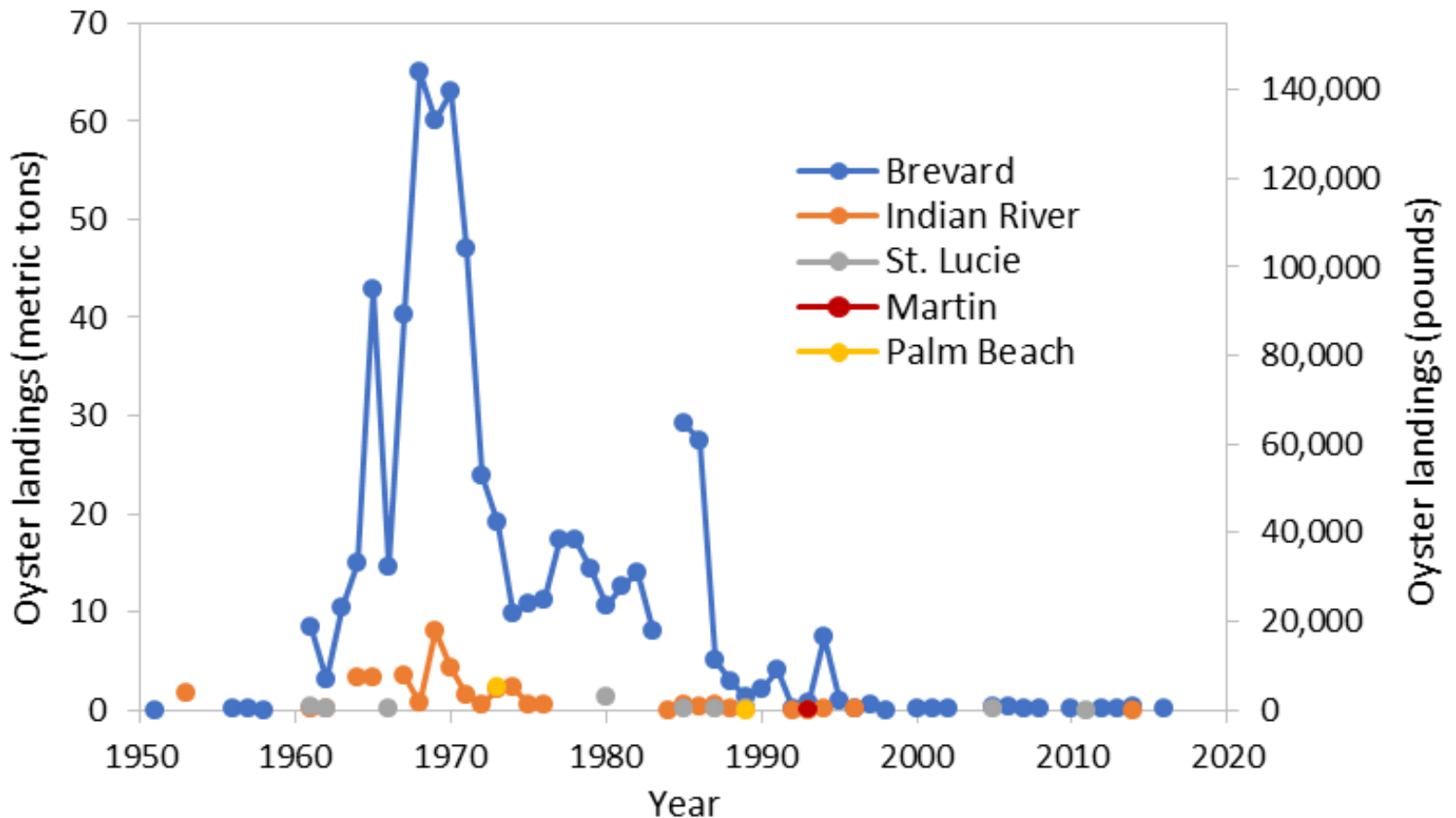


# Historical Oyster Data Sources

- Oyster harvesting data
- Historical mapping data and imagery



# Commercial Harvest Data



- County harvest data included in each chapter




# Commercial Harvest Data

Table A-1. Reported commercial yields of pounds of oyster meats harvested annually 1950–1983.

Year	Published east coast total	Published west coast total	Published statewide total	Bay, Gulf, and Washington	Bay and Gulf	Bay	Bay and Washington
1950†	22,715	872,553	895,248				
1951			735,304			42,368	
1952	20,907	542,080	562,987			30,304	
1953*	21,576	563,780	585,356		59,956		
1954	17,907	667,589	685,496		67,992		
1955	19,340	630,241	649,581	48,141			
1956	32,304	856,431	888,735		89,830		
1957	24,754	710,124	734,878		68,961		
1958	29,759	794,970	824,729		60,206		
1959	40,045	1,414,953	1,454,998		93,934		
1960*	44,644	1,930,756	1,975,400		89,458		
1961	72,542	3,254,059	3,326,601		127,367		
1962	67,091	4,952,680	5,019,771		259,664		

1950 – 1983 data from printed copies of summary of Florida commercial marine fish landings. Data are available in OIMMP Report Appendix A and at <https://ocean.floridamarine.org/OIMMP/>

# Commercial Harvest Data



Ask FWC About Contact News Calendar Get Involved

Florida Fish and Wildlife Conservation Commission

Fishing Boating Hunting Licenses & Permits Wildlife Viewing Wildlife & Habitats Research Education Conservation

## Commercial Fisheries Landings Summaries

Filters

Years: 2019 - 2019

Species Set: ☐ Aquaculture ☒ Food and Bait ☐ Marine Life

Species \*:

- ALL FOOD AND BAIT
- AMBERJACKS
- BAIT FISH
- BALLYHOO
- BLUE RUNNER
- BLUEFISH
- BUMPER, ATLANTIC
- CATFISH
- CHUB, BERMUDA
- CLAMS, HARD, BUTTON
- CLAMS, HARD, CHERRY
- CLAMS, HARD, CHOWDER
- CLAMS, HARD, LITTLENECK
- CLAMS, HARD, MIDDLENECK
- CLAMS, HARD, TOPNECK
- CLAMS, HARD, UNGRADED
- CLAMS, SUNRAY VENUS

Standard Output Columns

Year, Species, and Trips

Additional Output Columns

- ☒ Area, Area Description, Pounds, Average Price, and Estimated Value
- ☐ County, Pounds, Average Price, and Estimated Value
- ☐ Coast, Pounds, Average Price, and Estimated Value
- ☐ Month, Pounds, Average Price, and Estimated Value
- ☐ Statewide: Pounds, Average Price, and Estimated Value

Actions

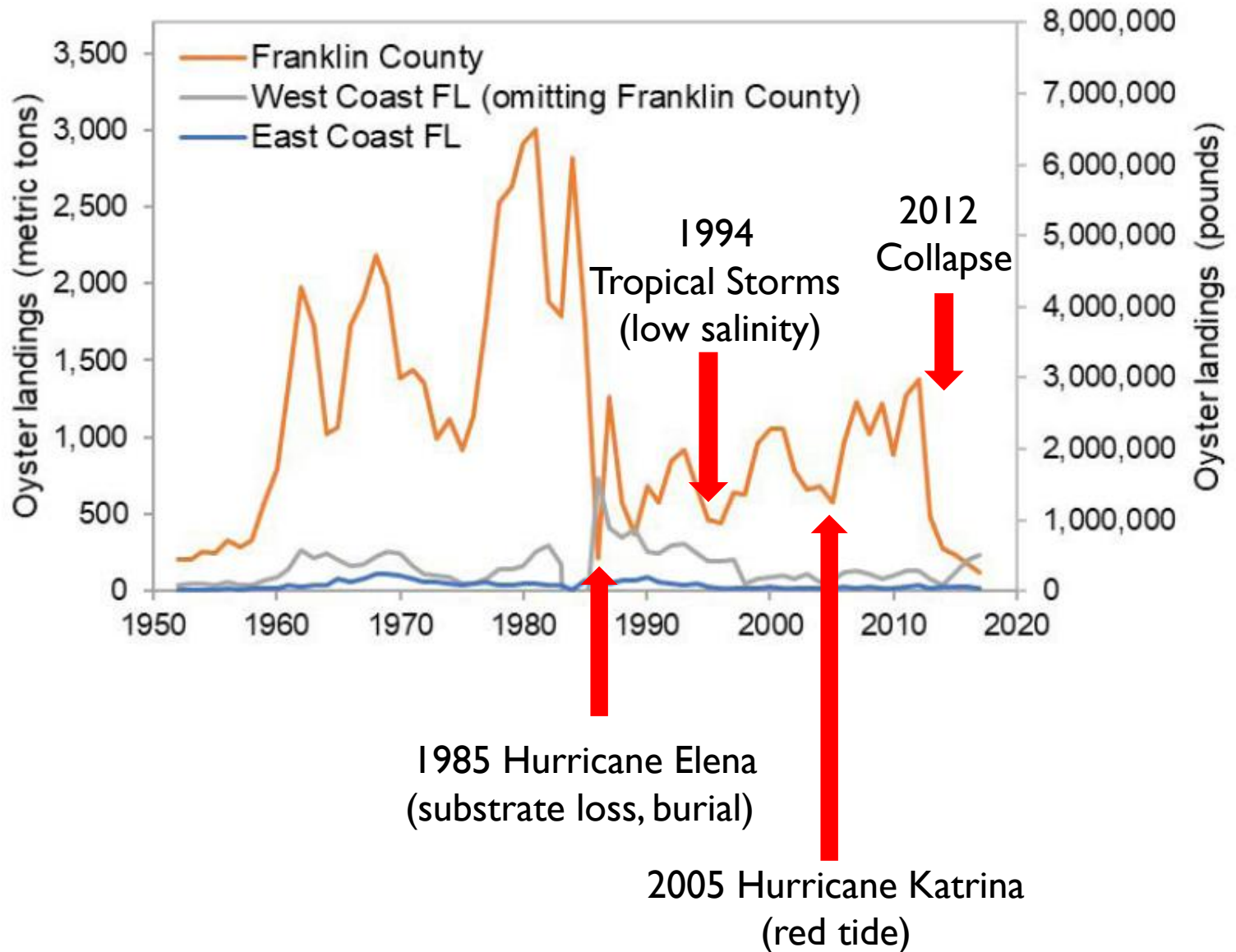
[Export Report](#)

\* When species are selected, only they will be included in the report. Otherwise, all shown species will be included.  
\* Number of trips cannot be summed across species because more than one species can be harvested on a single trip.

Commercial Fisheries Landings Summaries - About - Privacy Policy  
Contact Number: 727-896-8626

- State assumed control of reporting landings in 1984 and instituted a mandatory trip-ticket program in 1986
- 1984 – present data available from <https://public.myfwc.com/FWRI/PFDM/ReportCreator.aspx>

# 1951-2017 Commercial FL Oyster Harvest





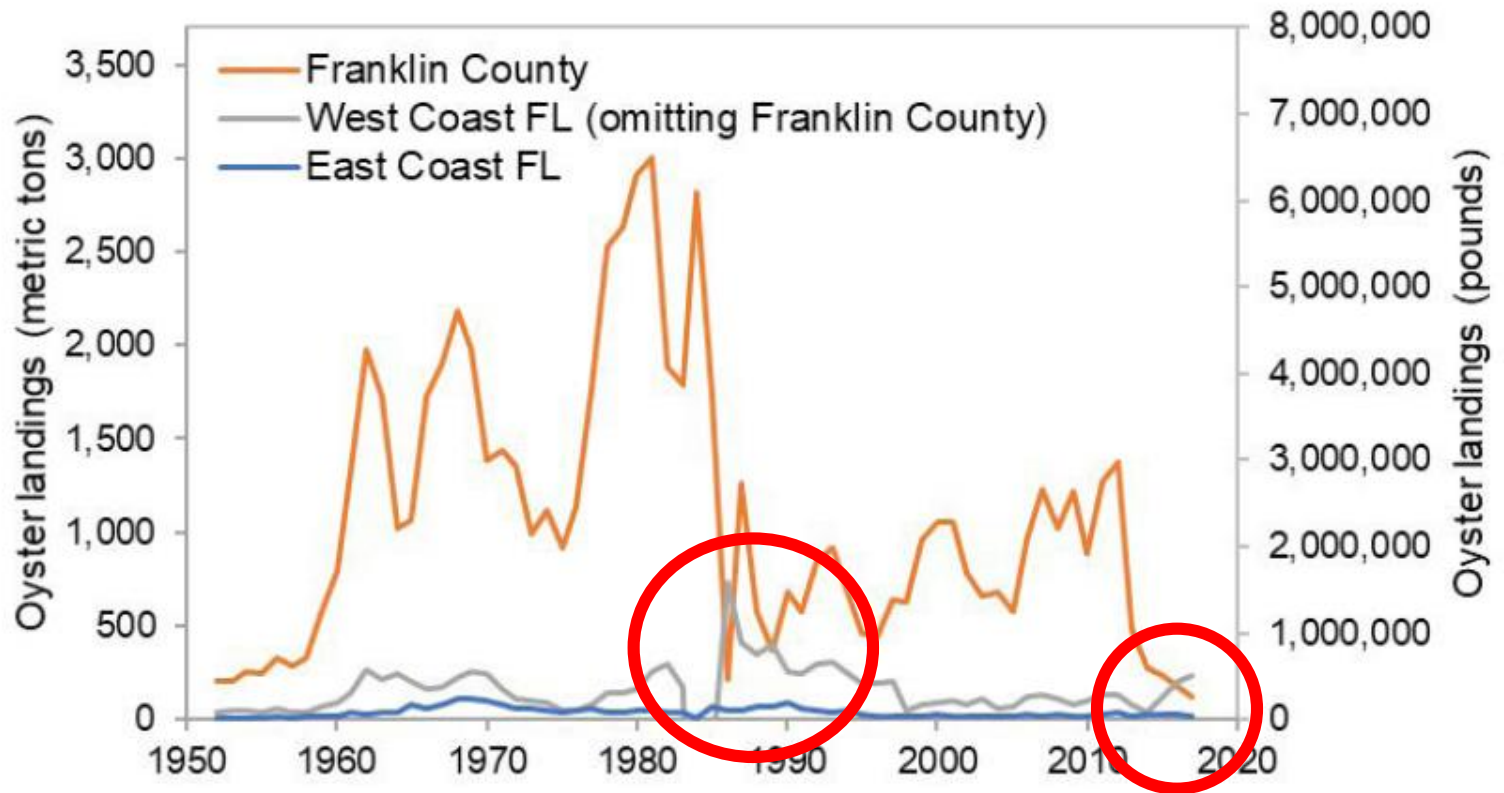


# 2012-2013 Apalachicola Collapse

Camp et al. 2015 (Ecology and Society 20(3):45):

- (1) low river flow led to increased salinity in Apalachicola Bay for a multiyear period;*
- (2) which likely led to increases in oyster parasites, predators, or unknown pathogens;*
- (3) causing elevated mortality, particularly among juvenile oysters;*
- (4) which led to recruitment failure, potentially exacerbated by shell removal from fishing or environmental events; and then*
- (5) population collapse of adult oysters*

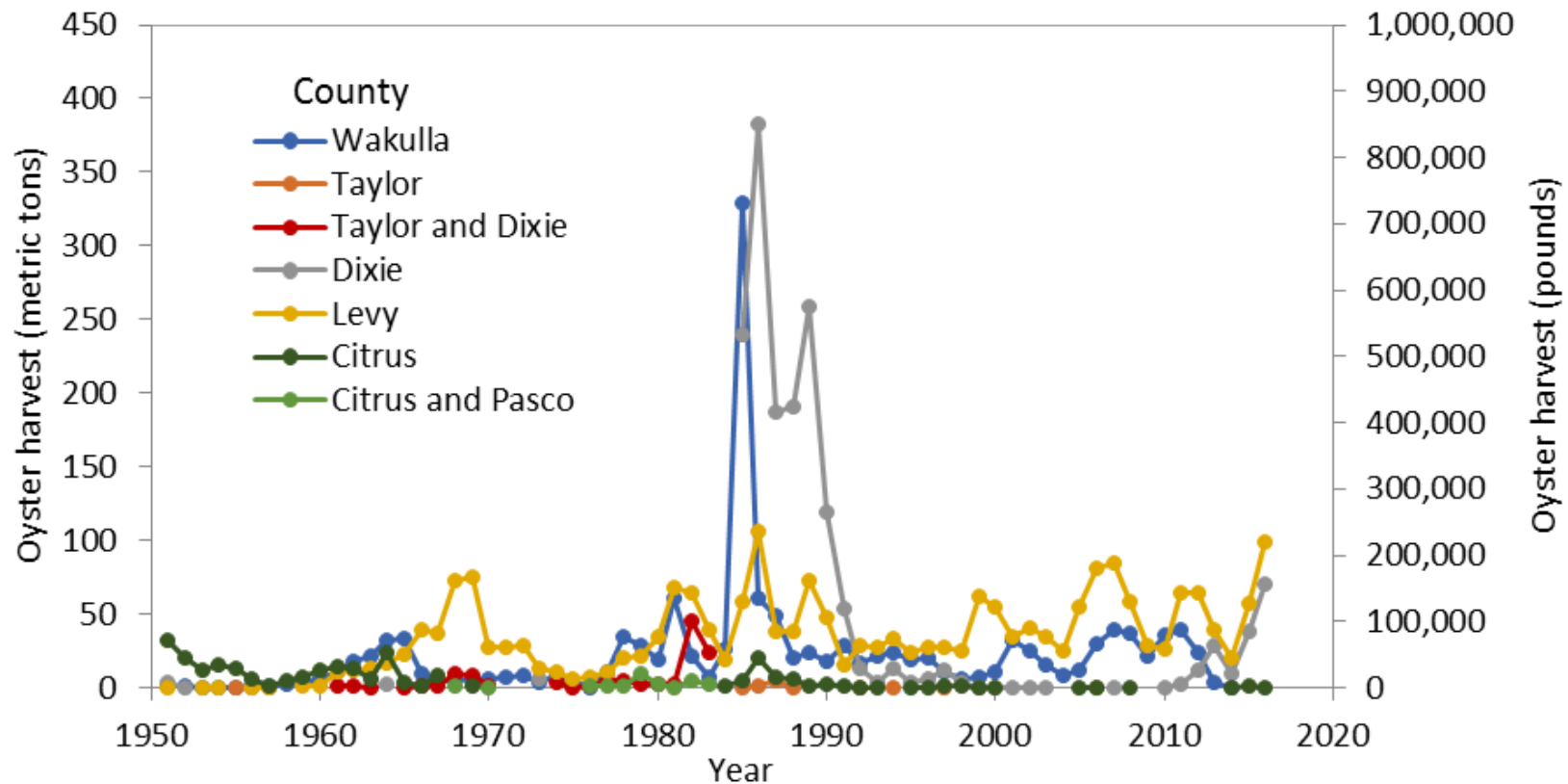
# 1951-2017 Commercial FL Oyster Harvest



Increased fishing pressure in Apalachee Bay (Wakulla County) and Big Bend

Increased fishing pressure in Big Bend (Levy and Dixie Counties)

# 1951-2017 Commercial FL Oyster Harvest



1985 Hurricane  
Elena

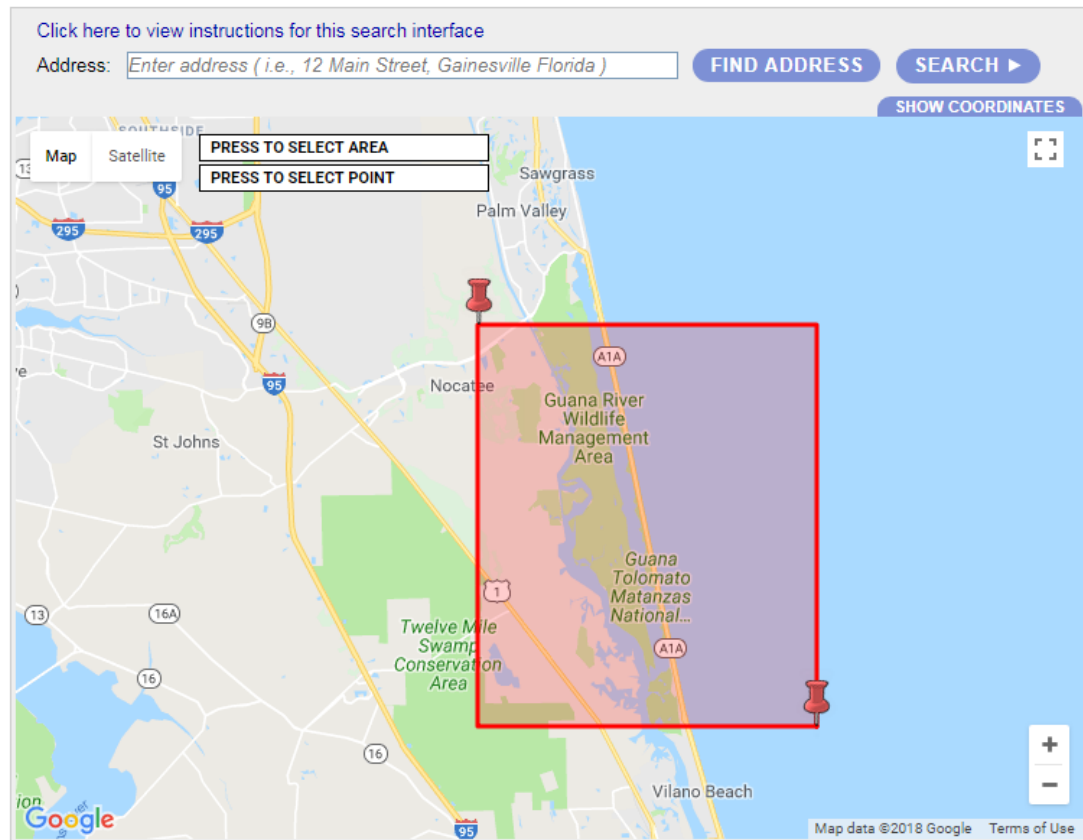
2012-2013 Apalachicola  
Collapse



# Online Resources

- Historical habitat data
- University of Florida Aerial Photo Library

<http://ufdc.ufl.edu/aerials>



# Online Resources

- Historical habitat data
- University of Florida Aerial Photo Library

<http://ufdc.ufl.edu/aerials>

UF | George A Smathers Libraries

UFDC Home | Aerial Photography: Florida

University of Florida Digital Collections

myUFDC Home | Help

Aerial photographs of St. Johns County - Flight 4C (1942)


DESCRIPTION ▾ ALL VOLUMES SEARCH RESULTS THUMBNAILS PAGE IMAGES ▾ DOWNLOADS

PRINT SEND +ADD SHARE

Go To: Tile 22 ▾


NEXT LAST

Click on image below to switch to zoomable version



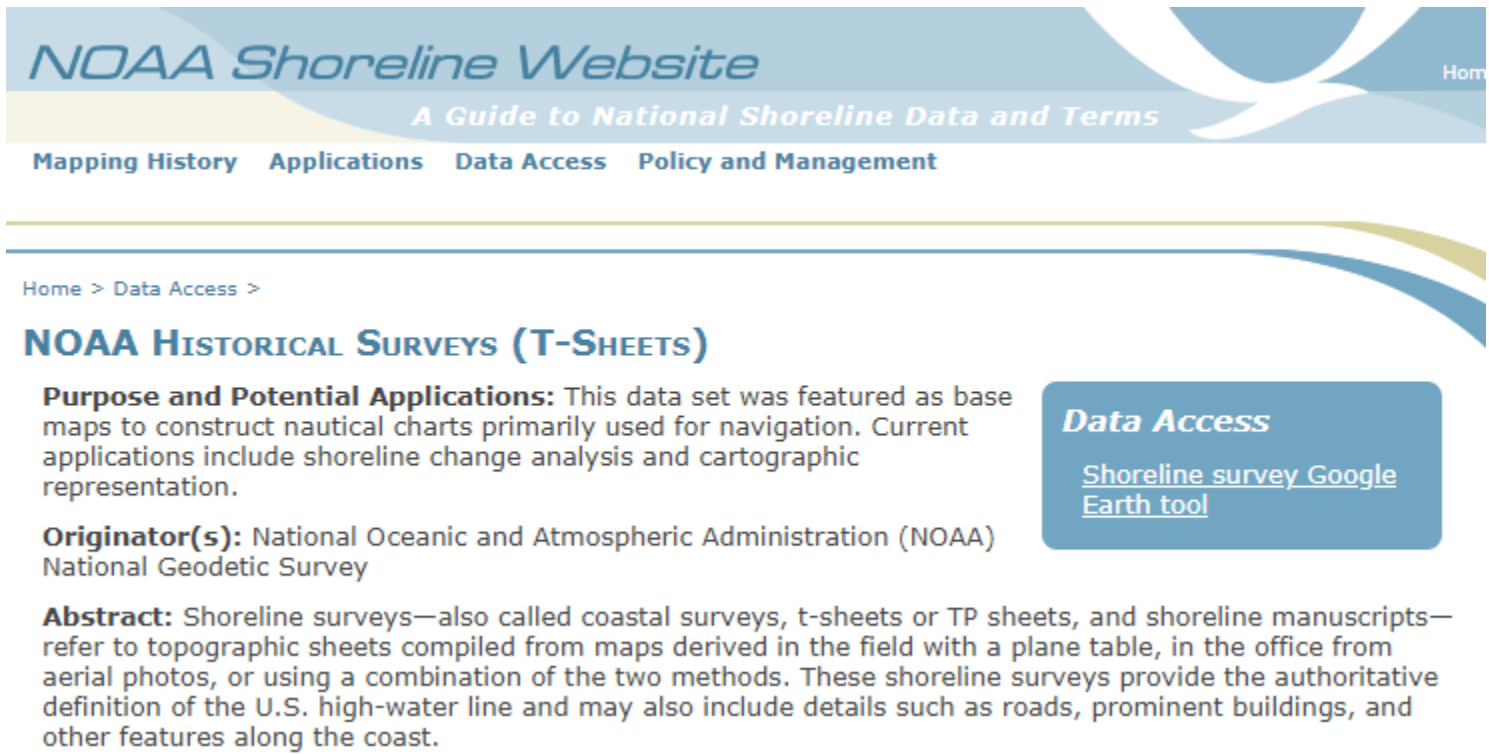
UF | Map and Imagery Library

STATE LIBRARY AND ARCHIVES OF FLORIDA



# Online Resources

- Historic habitat data
- NOAA topographic surveys (T-sheets)
- <https://shoreline.noaa.gov/data/datasheets/t-sheets.html>



The screenshot shows the NOAA Shoreline Website. The header features the text "NOAA Shoreline Website" and "A Guide to National Shoreline Data and Terms". Below the header is a navigation bar with links: "Mapping History", "Applications", "Data Access", and "Policy and Management". The main content area has a breadcrumb trail "Home > Data Access >". The title "NOAA HISTORICAL SURVEYS (T-SHEETS)" is displayed. The "Purpose and Potential Applications" section states that this data set was featured as base maps to construct nautical charts primarily used for navigation. Current applications include shoreline change analysis and cartographic representation. The "Originator(s)" section lists the National Oceanic and Atmospheric Administration (NOAA) and the National Geodetic Survey. The "Abstract" section explains that shoreline surveys—also called coastal surveys, t-sheets or TP sheets, and shoreline manuscripts—refer to topographic sheets compiled from maps derived in the field with a plane table, in the office from aerial photos, or using a combination of the two methods. These shoreline surveys provide the authoritative definition of the U.S. high-water line and may also include details such as roads, prominent buildings, and other features along the coast. A blue box on the right side of the page contains the text "Data Access" and a link to "Shoreline survey Google Earth tool".

*NOAA Shoreline Website*  
*A Guide to National Shoreline Data and Terms*

Mapping History Applications Data Access Policy and Management

Home > Data Access >

## NOAA HISTORICAL SURVEYS (T-SHEETS)

**Purpose and Potential Applications:** This data set was featured as base maps to construct nautical charts primarily used for navigation. Current applications include shoreline change analysis and cartographic representation.

**Originator(s):** National Oceanic and Atmospheric Administration (NOAA)  
National Geodetic Survey

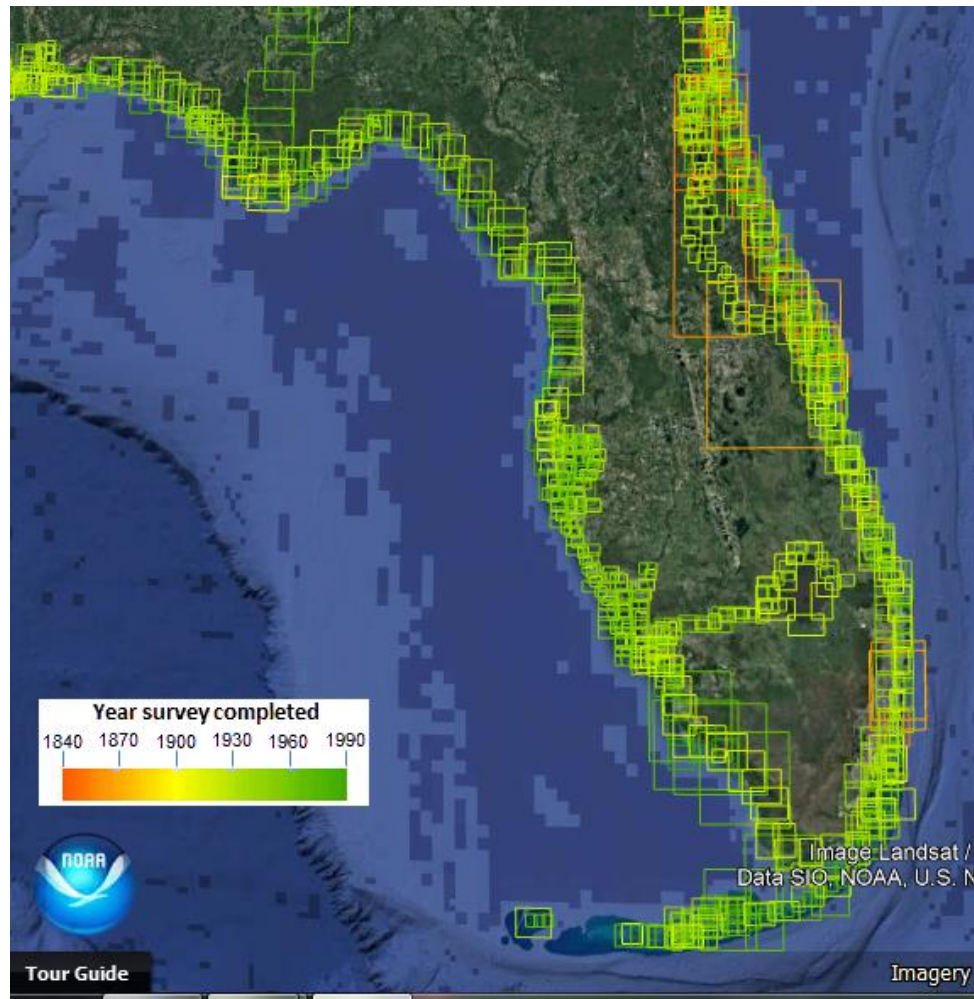
**Abstract:** Shoreline surveys—also called coastal surveys, t-sheets or TP sheets, and shoreline manuscripts—refer to topographic sheets compiled from maps derived in the field with a plane table, in the office from aerial photos, or using a combination of the two methods. These shoreline surveys provide the authoritative definition of the U.S. high-water line and may also include details such as roads, prominent buildings, and other features along the coast.

**Data Access**  
[Shoreline survey Google Earth tool](#)



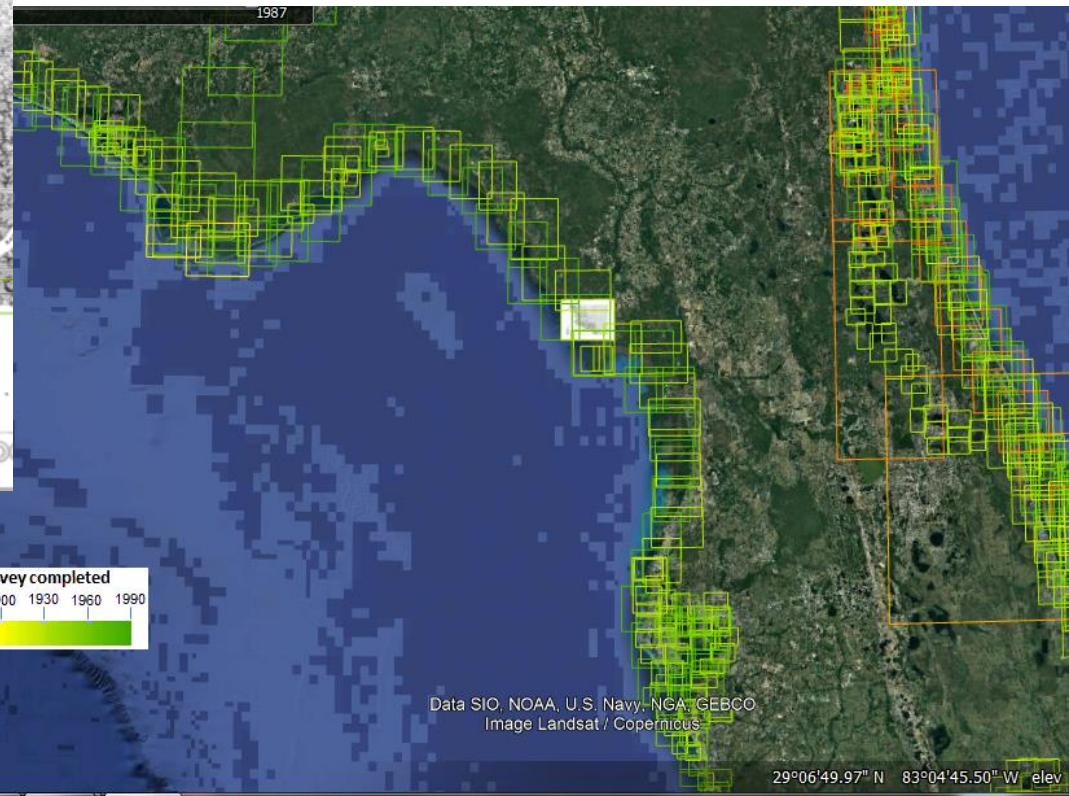
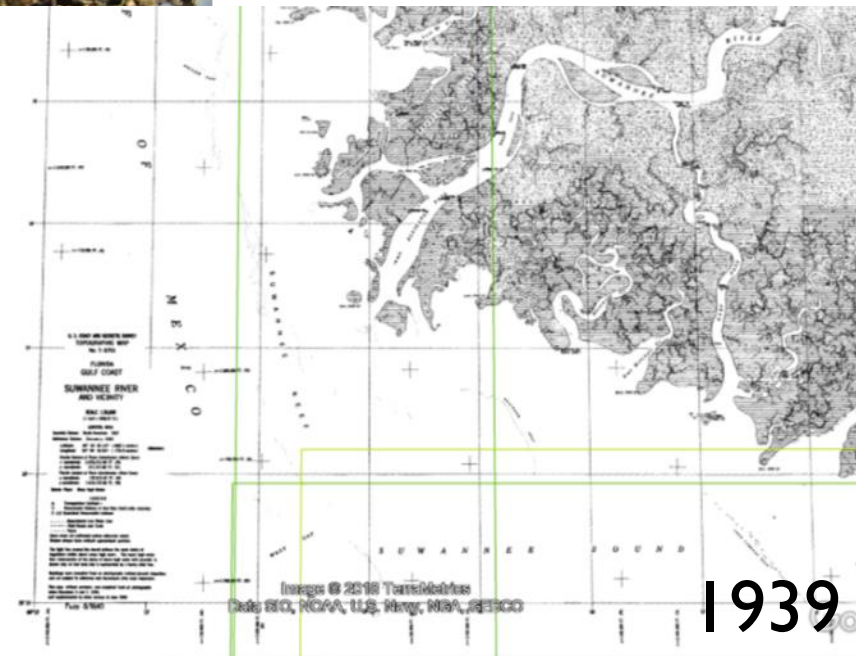
# Online Resources

- Historic habitat data
- NOAA topographic surveys (T-sheets)



# Online Resources

- Historic habitat data
- NOAA topographic surveys (T-sheets)



# Online Resources

- Historic habitat data
- NOAA topographic surveys (T-sheets)
  - Not all georeferenced (especially older T-sheets from 1800s)



## Non-georeferenced NOAA Shoreline Survey Scans (t-sheets and tp-sheets)

[Survey Index 1 \(50MB PDF\)](#)

[Survey Index 2 \(44MB PDF\)](#)

[NOAA Historical Shoreline Survey Viewer](#)


[NOAA Historical Shoreline Su](#)

<a href="#">T-00106</a>	<a href="#">T-00380_1</a>	<a href="#">T-00380_2</a>	<a href="#">T-00381_1a</a>	<a href="#">T-00381_1b</a>	<a href="#">T-00381_2a</a>	<a href="#">T-00381_2b</a>
<a href="#">T-00466b</a>	<a href="#">T-00731a</a>	<a href="#">T-00731b</a>	<a href="#">T-01032a</a>	<a href="#">T-01032b</a>	<a href="#">T-01139aa</a>	<a href="#">T-01139ab</a>
<a href="#">T-01140ab</a>	<a href="#">T-01140ba</a>	<a href="#">T-01140bb</a>	<a href="#">T-01141a</a>	<a href="#">T-01141b</a>	<a href="#">T-01141ba</a>	<a href="#">T-01141bb</a>
<a href="#">T-01142b</a>	<a href="#">T-01143aa</a>	<a href="#">T-01143ab</a>	<a href="#">T-01143ba</a>	<a href="#">T-01143bb</a>	<a href="#">T-01144aa</a>	<a href="#">T-01144ab</a>
<a href="#">T-01147ab</a>	<a href="#">T-01147ba</a>	<a href="#">T-01147bb</a>	<a href="#">T-01157aa</a>	<a href="#">T-01157ab</a>	<a href="#">T-01157ba</a>	<a href="#">T-01157bb</a>
<a href="#">T-01187b</a>	<a href="#">T-01383aa</a>	<a href="#">T-01383ab</a>	<a href="#">T-01383ba</a>	<a href="#">T-01383bb</a>	<a href="#">T-01383ca</a>	<a href="#">T-01383cb</a>



# SEACAR monitoring database

- FDEP's Statewide Ecosystem Assessment of Coastal and Aquatic Resources (SEACAR)
- Monitoring database now available online:
- <https://dev.seacar.waterinstitute.usf.edu/programs>



**SEACAR Data Discovery**  
Statewide Ecosystem Assessment of Coastal and Aquatic Resources

Welcome | Home | Monitoring Programs | Program Matrix | Data Discovery Interface | Map

Filter by Habitats:  Filter by Indicator:

Search:

ID	Program Name
<a href="#">102</a>	<a href="#">National Status and Trends Mussel Watch</a>
<a href="#">456</a>	<a href="#">Oyster Sentinel</a>
<a href="#">522</a>	<a href="#">Florida Southeast Area Monitoring and Assessment Program (SEAMAP) - Reef Fish Surveys</a>
<a href="#">536</a>	<a href="#">Florida Wild Oyster Monitoring</a>
<a href="#">542</a>	<a href="#">Apalachicola National Estuarine Research Reserve Oyster Growth Project</a>
<a href="#">967</a>	<a href="#">Apalachicola Bay Oyster Restoration Monitoring</a>
<a href="#">968</a>	<a href="#">Apalachicola Bay State-Funded Oyster Monitoring</a>

Questions or comments?

