Fish and Wildlife Research Institute
Oyster Monitoring – Apalachicola Bay

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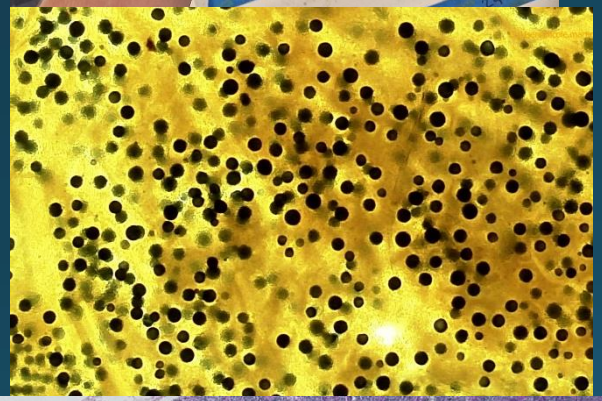

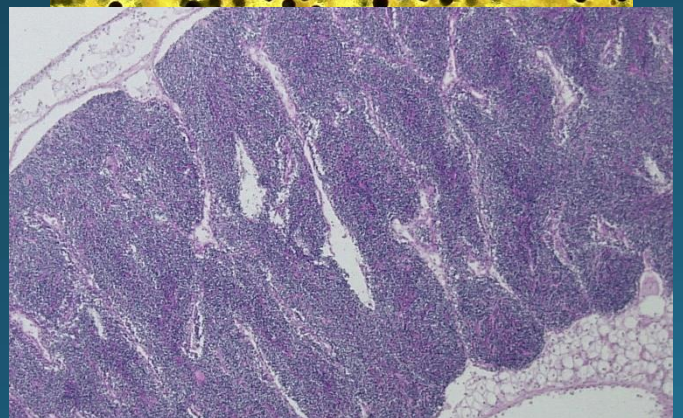

FWRI
Oyster Monitoring

- Oyster health
  - Monthly (year-round)
  - Condition Index
  - Dermo (disease)
  - Reproduction
  - Shell Pest
- Recruitment Monitoring
  - Monthly (year-round)
  - Recruitment arrays deployed at fixed stations
  - Oyster spat settle on suspended oyster shell
  - Number of spat are counted in the lab

Oyster Surveys Prior to 2025

- Oyster Density
  - Quarterly
- SCUBA divers use ¼ meter² quadrats
  - 15 quadrats per location
- Locations
  - Historic, unclutched bars
  - NFWF 2021 (3 areas)
- Data recorded:
  - Sample Weight
  - Number and size of live oysters
  - Number of recently dead oysters
  - Shell height measurements
  - Sample and volume weight
  - Number of oyster drills
  - Water quality (temperature, salinity, dissolved oxygen concentration, pH, turbidity)
  - Water depth

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Oyster Surveys
2025

- Oyster Density
  - Annually (April – June)
- SCUBA divers use ¼ meter² quadrats
  - 30 quadrats minimum per location
- Locations
  - Historic, unclutched bars – *15 quadrats*
  - RESTORE 2017 (7 areas)
  - NFWF 2021 (3 areas)
- Data recorded:
  - Sample Weight
  - Number and size of live oysters
  - Count of legal-size oysters (>= 75 mm SH) oysters
  - Number of recently dead oysters
  - Shell height measurements
  - Number of oyster drills
  - Water quality (temperature, salinity, dissolved oxygen concentration, pH, turbidity)
  - Water depth

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Oyster Surveys 2025

- Restoration Bars
  - RESTORE 2017 (7 areas)
  - NFWF 2021 (3 areas)
  - Minimum of 30 quadrats
  - 10 quadrats at each sample location
    - Ex. NFWF-2021-01 is 11 acres.
      - 10 quadrats @ 3 sample locations = 30 quadrats total
    - Ex. RESTORE-2017-07 is 43 acres.
      - 10 quadrats @ 5 sample locations = 50 quadrats total

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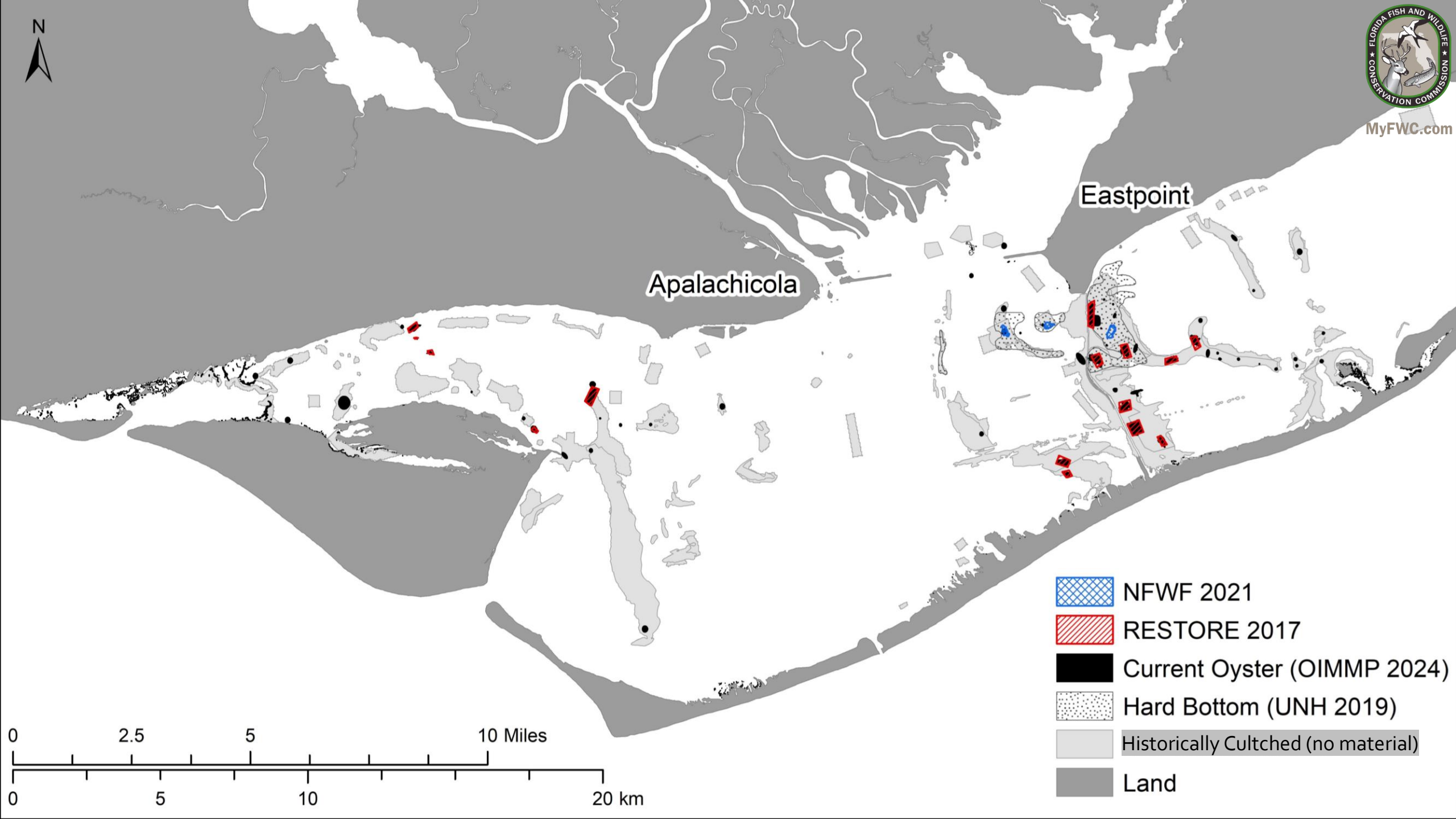
N
Eastpoint
Apalachicola
MyFWC.com
NFWF 2021
RESTORE 2017
Current Oyster (OIMMP 2024)
Hard Bottom (UNH 2019)
Historically Cultched (no material)
Land
0
2.5
5
10 Miles
0
5
10
20 km

Oyster Monitoring
Apalachicola

★ Health, Recruitment, Survey

★ Survey

MyFWC.com

FWRI Procedures

- https://myfwc.com/research/habitat/coastal-wetlands/oimmp/
- **Chapter 11: Fish and Wildlife Research Institute Oyster Monitoring Procedures**
  (version 2.0, added 10/2021)
- Includes:
  - Oyster size and density
  - Oyster spat
  - Disease and reproduction
  - Condition index
  - Shell pests
  - Growth and mortality

Chapter 11

Florida Fish and Wildlife Conservation Commission
Fish and Wildlife Research Institute
Oyster Monitoring Procedures

Introduction

The Florida Fish and Wildlife Conservation Commission (FWC) Fish and Wildlife Research Institute (FWRI) has routinely monitored oysters in estuaries across Florida since 2005 (Fig. 11.1). While monitoring stations and parameters have varied over time and among estuaries, FWRI monitoring represents the most widespread and comprehensive oyster monitoring in Florida. The methods described in this chapter include the monitoring procedures in most common practice by the Molluscan Fisheries Research Group at FWRI in many of the estuaries in Fig. 11.1. They are provided here as a resource for other monitoring efforts.

This document provides instructions for field monitoring, construction of monitoring equipment such as spat trees and quadrats, and related laboratory analyses. While monitoring and laboratory procedures are written following the International System of units, construction instructions and materials are given in United States Cus-

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Monitoring Data Analyses

1) Mapping
2) Modelled data to answer:
   - What is our ability to determine the 'true' mean with current sampling protocols?
   - How does increasing sampling decrease uncertainty, if at all?
   - What is our ability to detect change in mean oyster densities?
3) Adjust monitoring as needed
4) Model 2025 data specifically to extrapolate sampling densities to estimate abundance of oyster

Methods

- Determine which reefs had legal-size oysters.
- Each reef was analyzed separately.
- Data were fit to negative binomial and Poisson regression models – with and without zero inflation.
- Model selection for predictions and extrapolations were based on goodness of fit and AIC.
  - Negative binomial regression without zero-inflation was top model for all locations except one.
- The best fitting model was used to assess the root mean squared error (RRMSE) and bias in the predicted mean densities, through simulations.

Results

- 1) Pre-2025 sampling did a good job of predicting the mean density of oysters on a reef.
  - Regardless, we increased the number of quadrats and spatial coverage to reduce variability.
  - Doubling sampling effort to 30 quadrats reduced variability in our density estimates of total number of legal-size oysters per reef.
- 2) Detecting anything less than a 50% change in oyster density is unlikely.
  - In-season monitoring for harvest is not a viable option.

Challenges in Extrapolating Densities

- Since the collapse of AB oyster fishery, monitoring has been geared towards determining where oysters are, examining restoration materials, and monitoring the success of restoration projects.
  - These original protocols were not intended to determine abundance or standing stock of oysters.
- Variability of oyster densities within and among reefs
- Extrapolating a density assumes homogeneity of oyster density.
- Accuracy of acreage calculations – software and mapping techniques can differ.
- Accuracy of acreage calculations don't include reef loss over time.
- To overcome these uncertainties, we used the lower end of the confidence interval.

2025 Monitoring Data

StationName	Reef Area (acres)	Total Bags	Bags/Acre
RESTORE Cat Point	50	13,374	266
RESTORE Monkey's Elbow	27	3,779	139
RESTORE Peanut Ridge	**21**	**10,854**	**529**
RESTORE Cat Point Spur	**12**	**4,986**	**400**
RESTORE Platform	22	411	19
RESTORE East Bulkhead	24	8,395	351
RESTORE Easthole	**43**	**23,184**	**541**
NFWF Lighthouse	11	3,611	339
NFWF East Lumps	9	3,265	348
NFWF Cat Point	**18**	**10,421**	**571**

Estimates using lower 95% confidence interval
Bold indicates a reef with >400 bags/acre, based on FDACS thresholds for reefs capable of sustaining harvest


Eastpoint
Apalachicola
NFWF 2021
RESTORE 2017
Historic Uncultched
0
2.5
5
10 Miles

Questions?