Oyster ROCKS

Restoration of Oyster Cultch and Knowledge Systems

Levy County – Cedar Key Oystermen's Association

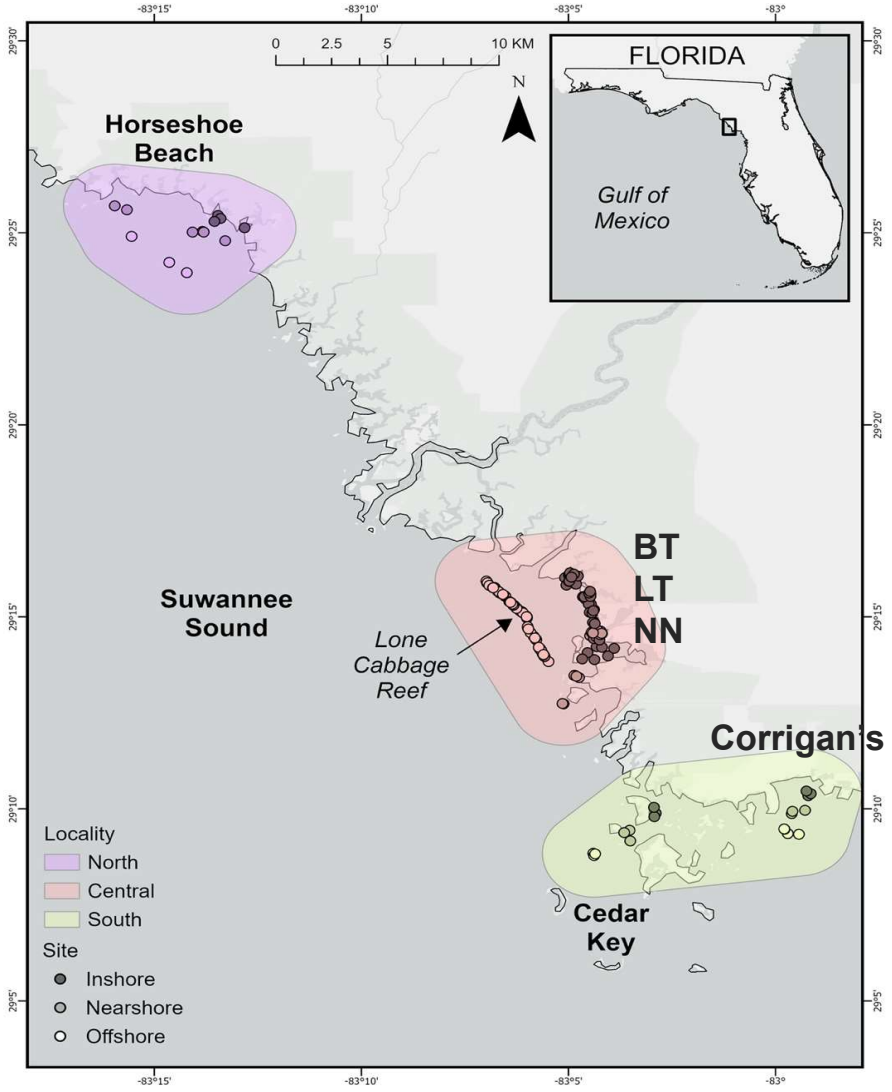
SWCA

GULF CONSORTIUM

Sound Science. Creative Solutions.®

Big Bend Oyster Resources

- Levy, Dixie, Taylor Counties
- “Nature Coast”
- Oyster reefs are primarily intertidal (~60-80%)
  - Intertidal = greater than -0.59m NAVD88
  - Legal size oysters found on subtidal reefs
- 66% decline in intertidal reefs from 1982-2011 Seavey et al. 2011



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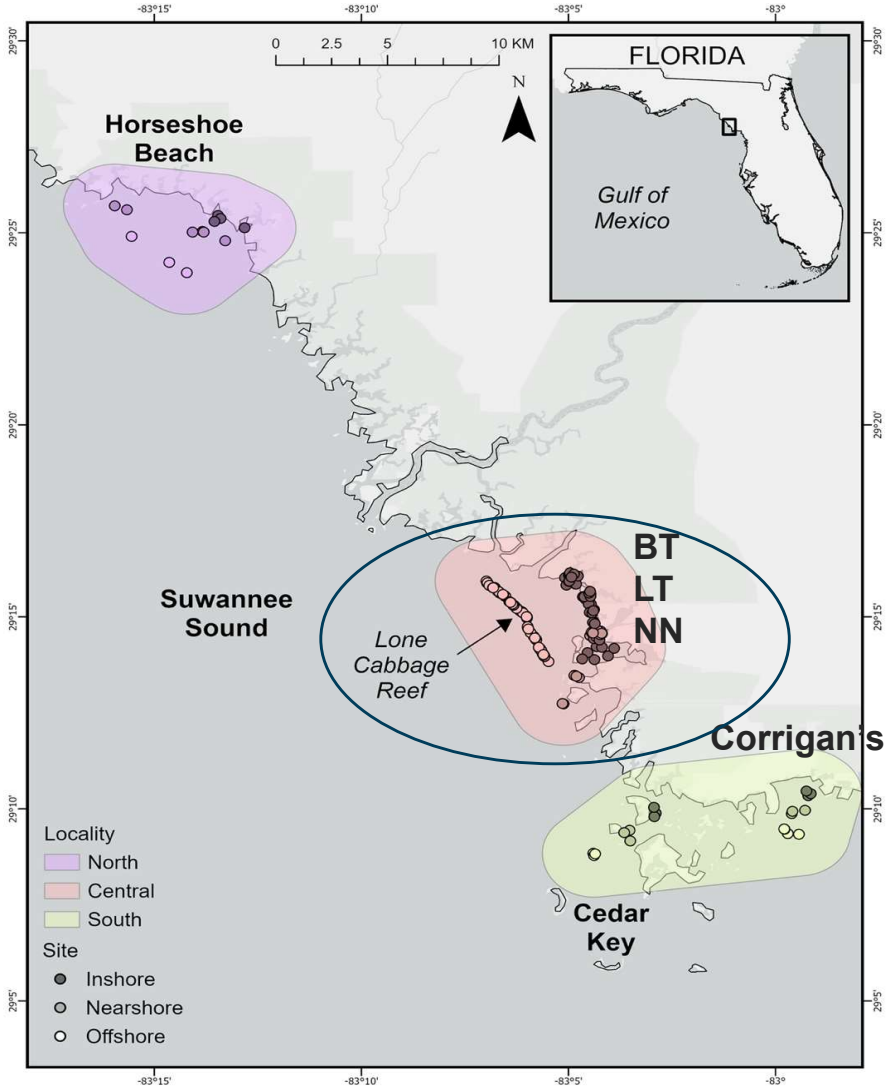
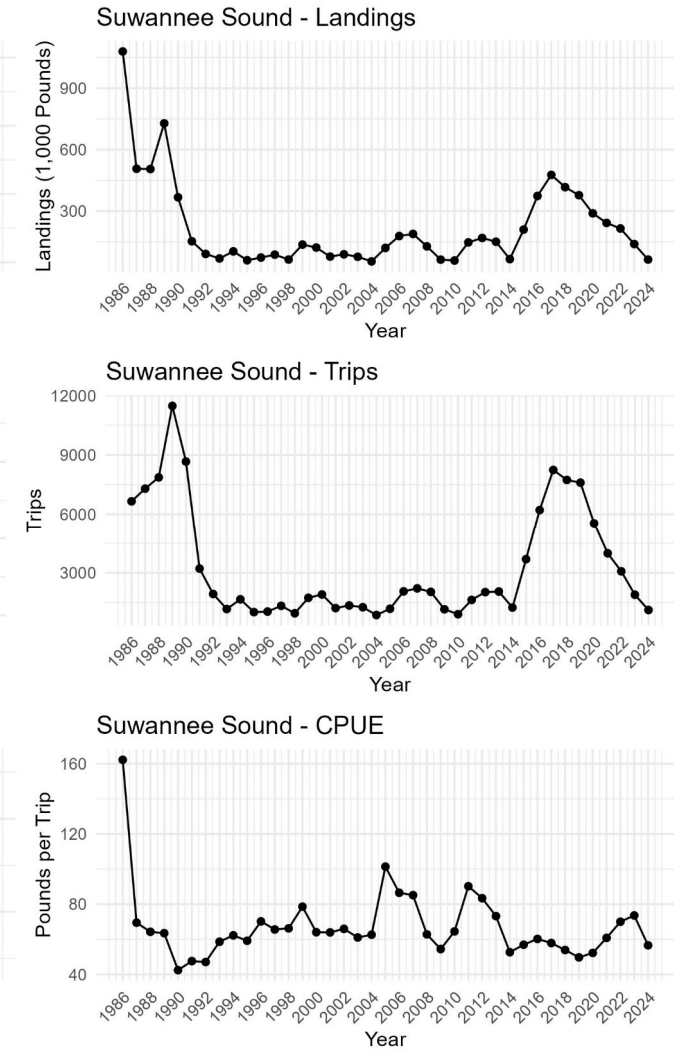


- **Historically Big Bend second largest oyster fishery in Florida**
  - **Trips, landings ~5% AB**
  - **~50 families wild oyster harvesters**
  - **~1500 trips per year**
  - **~150,000 lbs per year**

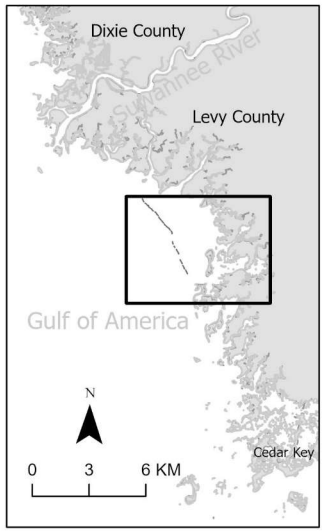


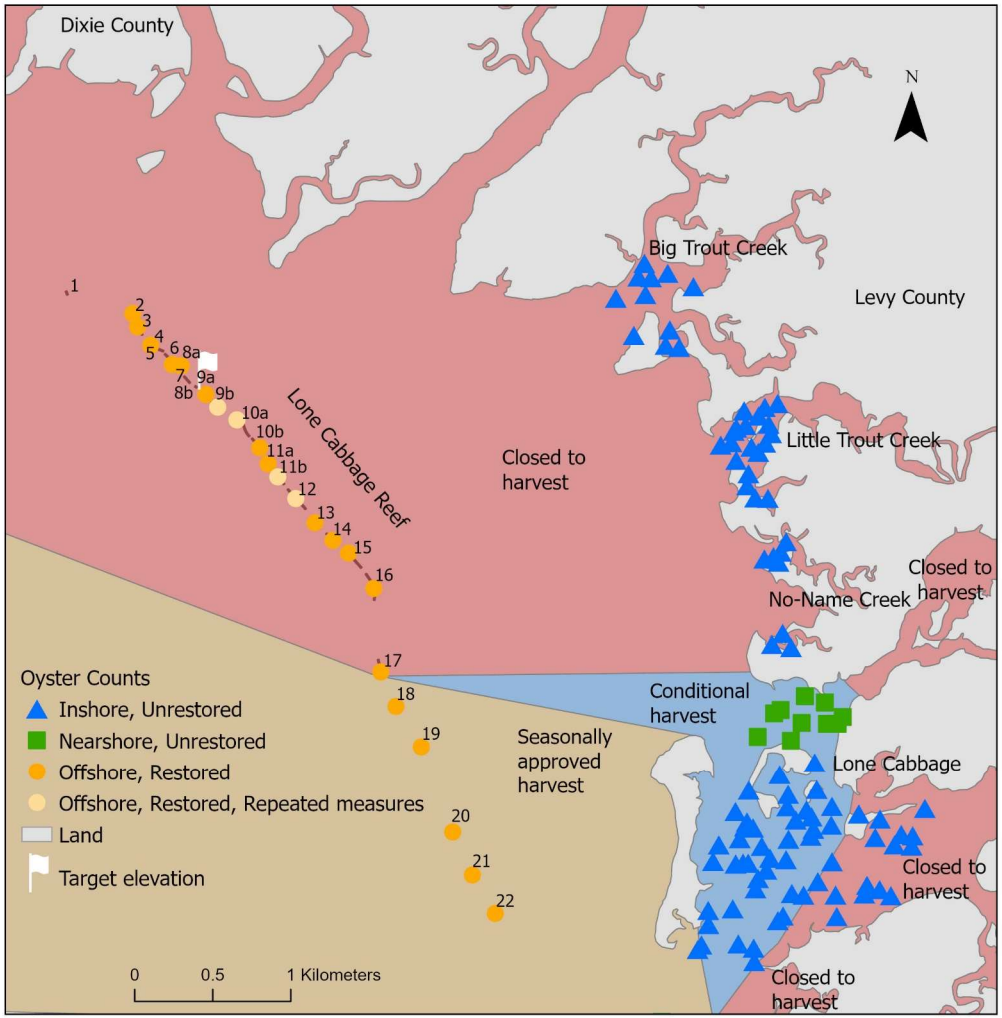
- **Review: Key lessons learned from 14+ years of oyster monitoring and restoration in Suwannee Sound…**

- **Introduce: Community led restoration effort in Levy County - Oyster ROCKS**

Lone Cabbage Reef Project 2010-2024

- Intertidal reef restoration and monitoring
- High resolution monitoring of oyster heights & counts
  - Restored & Unrestored areas
  - Open & Closed to harvest
  - >18 mm (winter, US dime size)
- Reef elevation (surveyor)
- Water quality





Rigorous design and analyses key to learning

Bootstrap methods can help evaluate monitoring program performance to inform restoration as part of an adaptive management program

Jennifer F. Moore and William E. Pine III

Department of Wildlife Ecology and Conservation, University of Florida, Gaines
United States of America

Journal of Shellfish Research, Vol. 44, No. 3, 479–494, 2025.

ASSESSING OYSTER SIZE DISTRIBUTIONS WITHIN INTERTIDAL EASTERN OYSTER *CRASSOSTREA VIRGINICA* (GMELIN, 1791) POPULATIONS ACROSS RESTORATION SITES, HARVEST ZONES, AND SPATIAL LOCATIONS IN THE BIG BEND OF FLORIDA

Restoration is a partial but not complete solution for long-term declines in oyster populations-a case history from the northeastern Gulf of America

ARTICLE

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

Collapsed oyster populations in large Florida estuaries appear resistant to restoration using traditional cultching methods—Insights from ongoing efforts in multiple systems

KEY LESSON 1 — DESIGN

Build to Target Elevation with Suitable, Stable, Durable Material

Aufmuth et al. 2025 — Lone Cabbage Reef

- Reefs built to elevation of healthy wild reefs using local dolomite limestone
- Increased elevation ~0.34m – we build up
- 99% of all survey points remained within target elevation 3-years post-restoration
- Restoration = +0.34 m elevation likely 100s to 1000 years of natural elevation accumulation

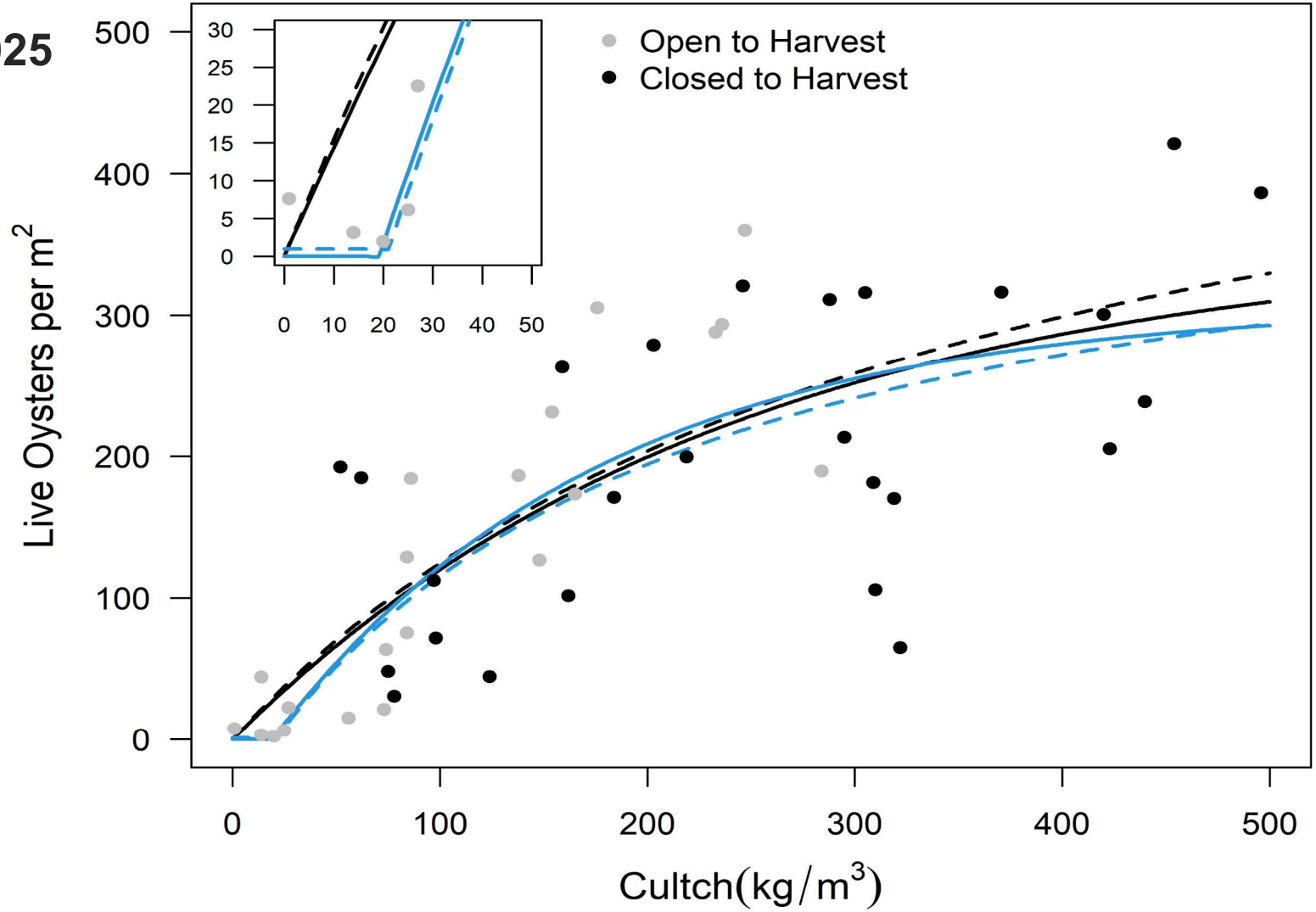
Why elevation matters

- Reduces sedimentation
- Promotes larval settlement
- Low-relief reefs in other FL estuaries poor performance Pine et al. 2023
- Reef height is a threshold driver of restoration success

KEY LESSON 2 — QUANTITY

Stay Above the Cultch Tipping Point

Casteel et al. 2025



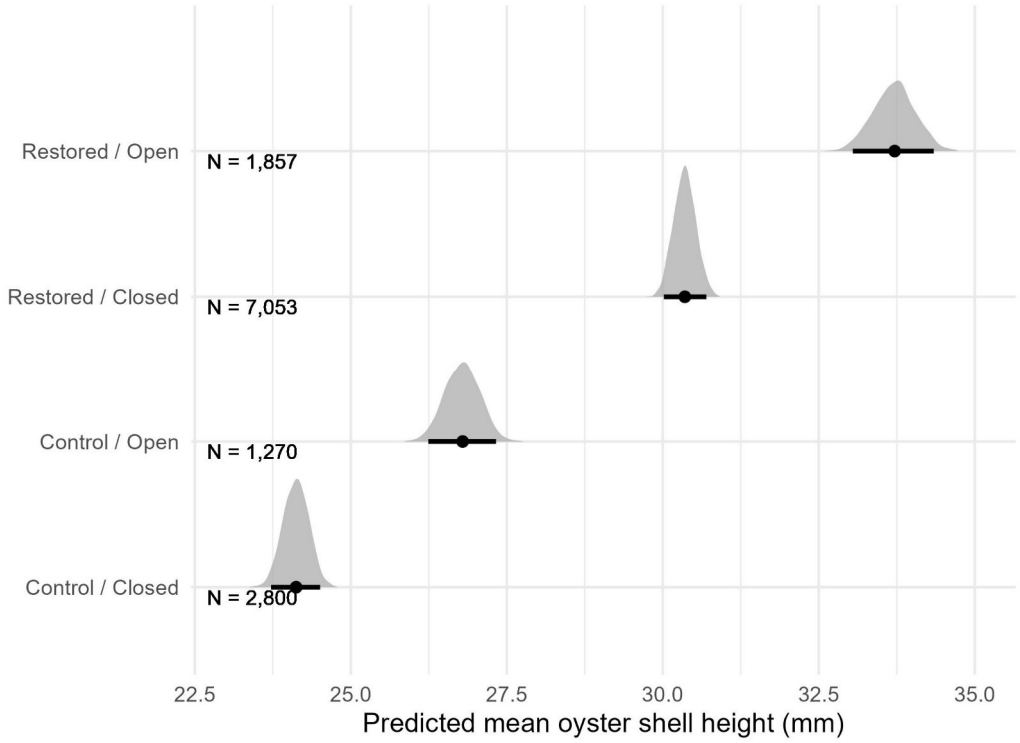
KEY LESSON 2 — QUANTITY

Stay Above the Cultch Tipping Point

- Below tipping point: recruitment may collapse — depensatory dynamics (bad feedback loop)
- Hysteresis: easier to prevent collapse than to recover from it

KEY LESSON 3 — RESPONSE

Oyster Response to Restoration Is Measurable

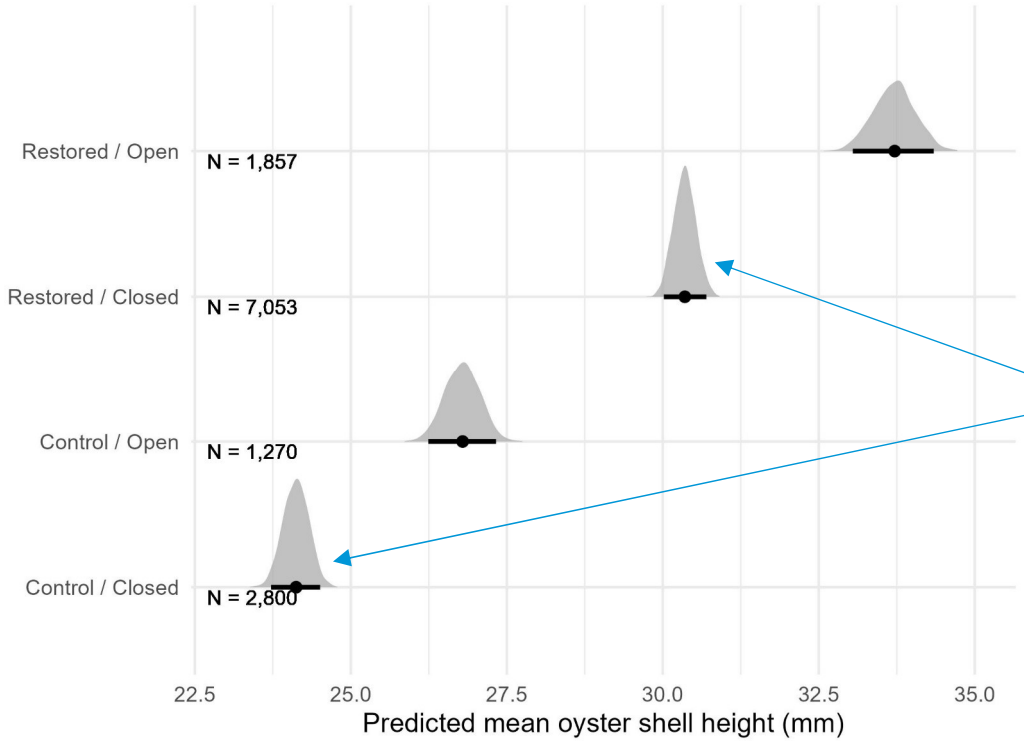


Pine et al. 2026
27,496 oyster heights measured 12 years

- **Only 409 legal oysters – 1.3% total**
  - **Intertidal reefs produce few legal oysters because of reduced growth**
- **Restoration +6 mm height in closed harvest areas; +9 mm in open areas**

KEY LESSON 3 — RESPONSE

Oyster Response to Restoration Is Rapid



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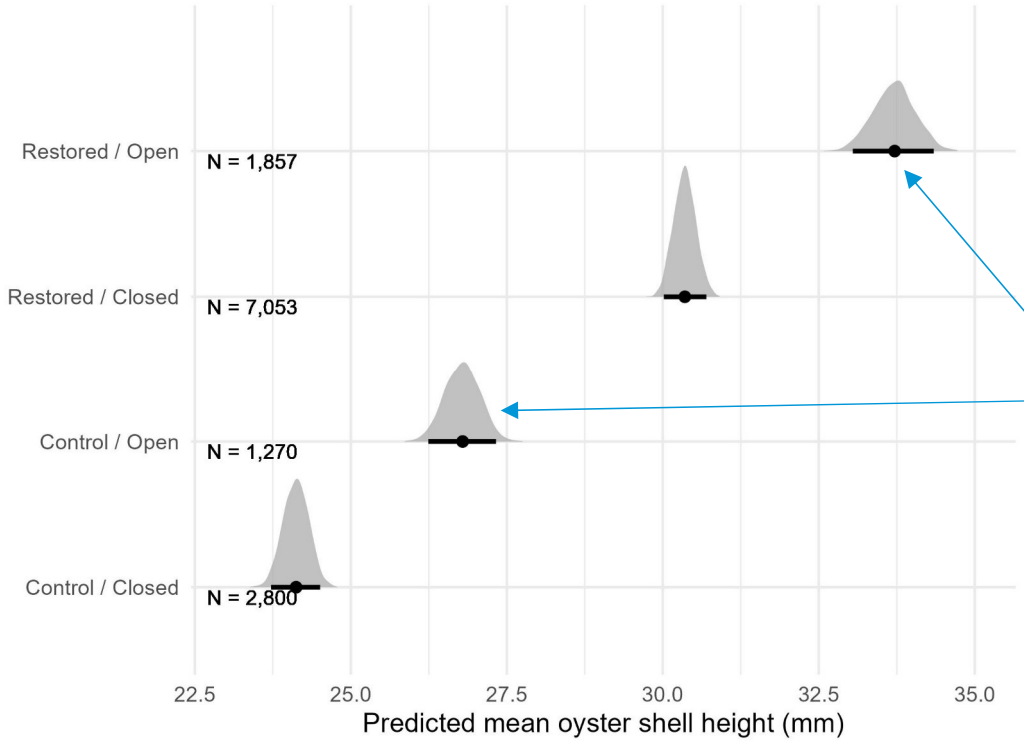

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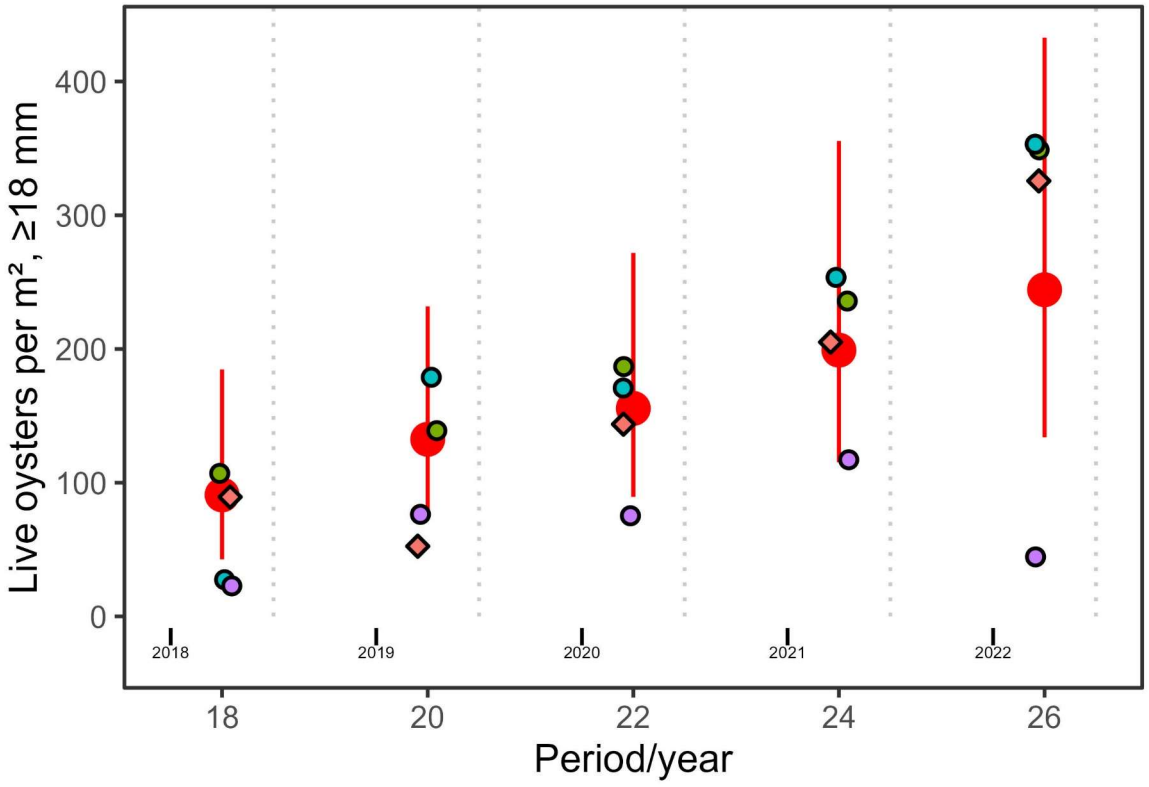


Pine et al. in-press

- Restored reefs increased oyster density each year post monitoring
- Unrestored reefs generally declined each year of monitoring
- Positive trajectory function of restoration, not system wide
- Restoration drives change in oyster density – not river discharge or fishery covariates

KEY LESSON 4 — HARVEST

Harvest Has Minimal Effect on Intertidal Oyster Restoration

What the data show

- Restoration effect: 10× larger than harvest effect on oyster heights
- Restoration effect: 24x increase in oyster density at Lone Cabbage Reef
- Intertidal oysters rarely reach legal size
- Harvest concentrated on subtidal reefs where oysters grow larger

Management implications

- Intertidal restoration can succeed even in areas open to harvest
- Source-sink dynamics: restored intertidal reefs may seed adjacent subtidal areas benefiting the fishery
    - Benefit reported for Lone Cabbage subtidal areas each of last 6+ years

Science → Community led restoration by REVERSING THE OYSTER FISHERY

1500

Average number of oyster trips per year in Suwannee Sound by commercial fleet ~10 years

2-4 yds

Amount of material moved per commercial oyster trip ~ 10 years

3000

1500 x 2 = 3000 yds of material that can be moved by the fleet at a minimum

Oyster ROCKS = Community-Led Restoration

- **Local oystermen employed as restoration specialists**
- **Work during summer harvest closures**
- **Local materials + labor = regional economic benefit**
- **Builds long-term community restoration capacity**

OYSTER ROCKS — PROJECT OVERVIEW

Science → Community led restoration by REVERSING THE OYSTER FISHERY

3,000

cubic yards of locally sourced dolomite limestone

3 Years

project timeline
2025 → 2027

$3.6M

estimated short-term economic activity for Big Bend

Reef Restoration

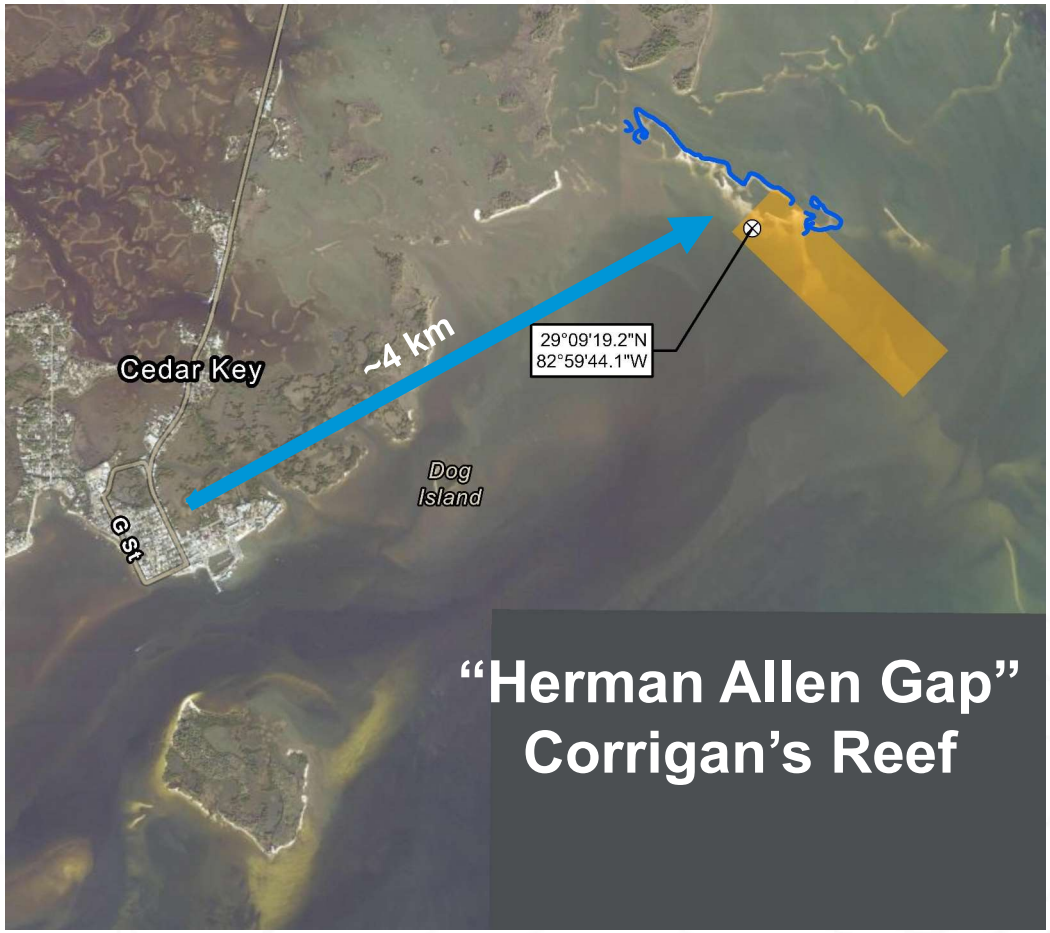
- Deploy cultch to degraded intertidal reefs
- Restore elevation Site: Corrigan's Reef south of Cedar Key
- Material: locally sourced dolomite limestone

Assessment & Monitoring

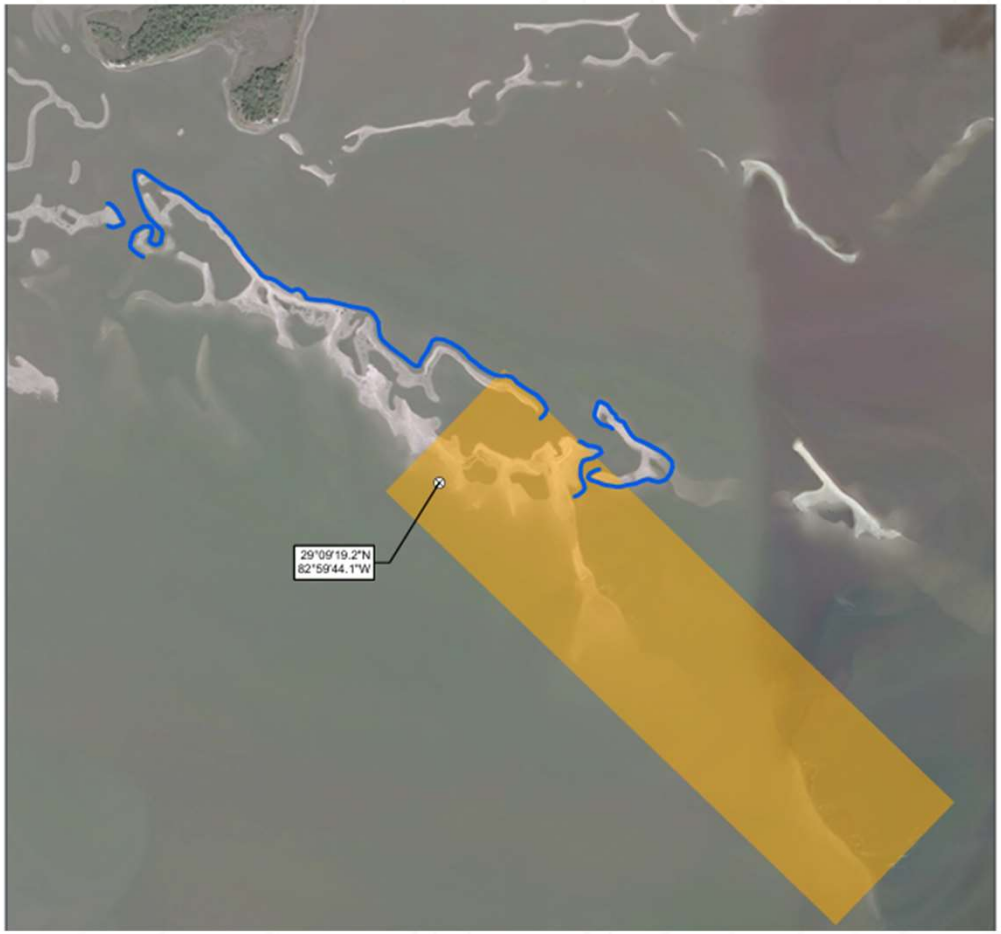
- Standardized pre- and post-restoration field surveys
- Led by oystermen (as in Lone Cabbage)

Community-Led Restoration

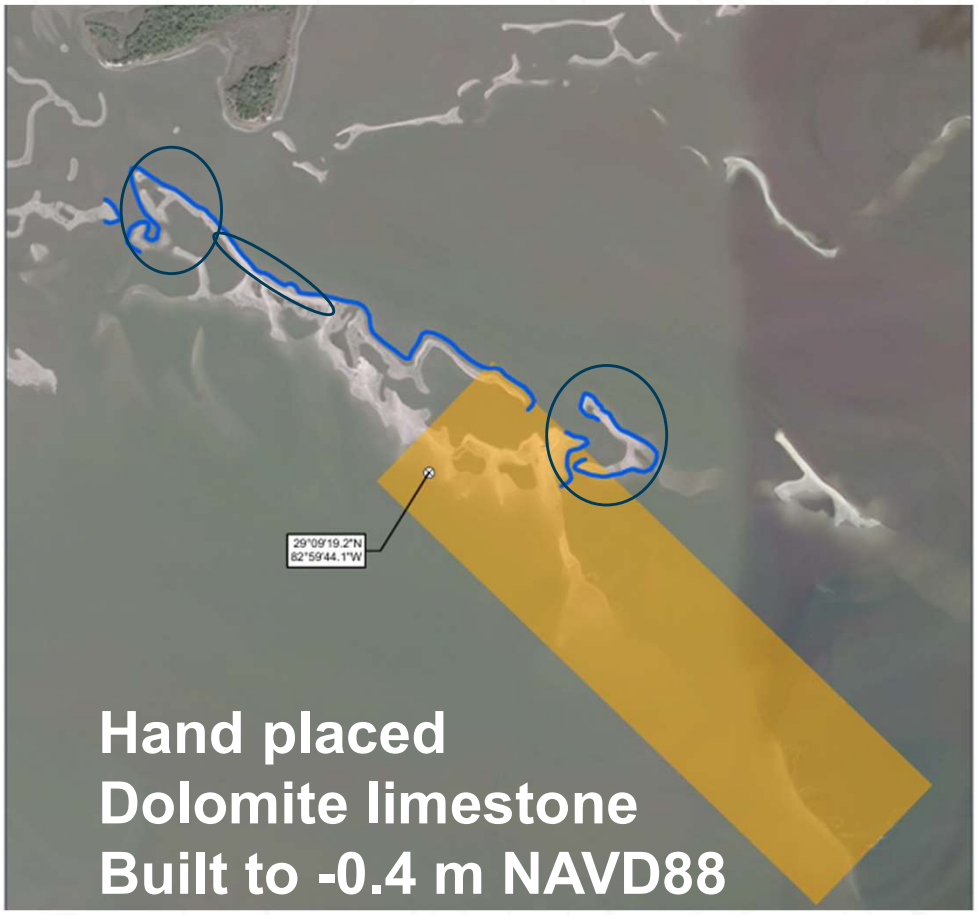
- Provide local economic benefit to seafood workers and regional economy



“Herman Allen Gap”
Corrigan’s Reef




29°09'19.2"N
82°59'44.1"W
Cedar Key
Dog
Island
G St


29°09'19.2"N
82°59'44.1"W
Hand placed
Dolomite limestone
Built to -0.4 m NAVD88

Why This Project Matters

Economic, Ecosystem, and Community Development

- Significant short-term local economic activity (IMPLAN; Botta et al. 2022)
- Diversification of employment opportunities in an underserved region
  - Post net-ban creation of clam aquaculture industry
- Demonstration model for community-led coastal restoration

From Science to Action

Oyster ROCKS
Restoration of Oyster Cultch and Knowledge Systems

- Peer-reviewed science from Lone Cabbage informs every decision
- Community-led: Levy County + local oystermen
- Project is small.
- <3% size of FDACS and FWC planned projects in region
  - Opportunities to link projects to magnify benefits to people and ecosystems

Contact: Bill Pine · bill.pine@swca.com · SWCA Environmental Consultants

SWCA

Thank you

Sound Science. Creative Solutions.®