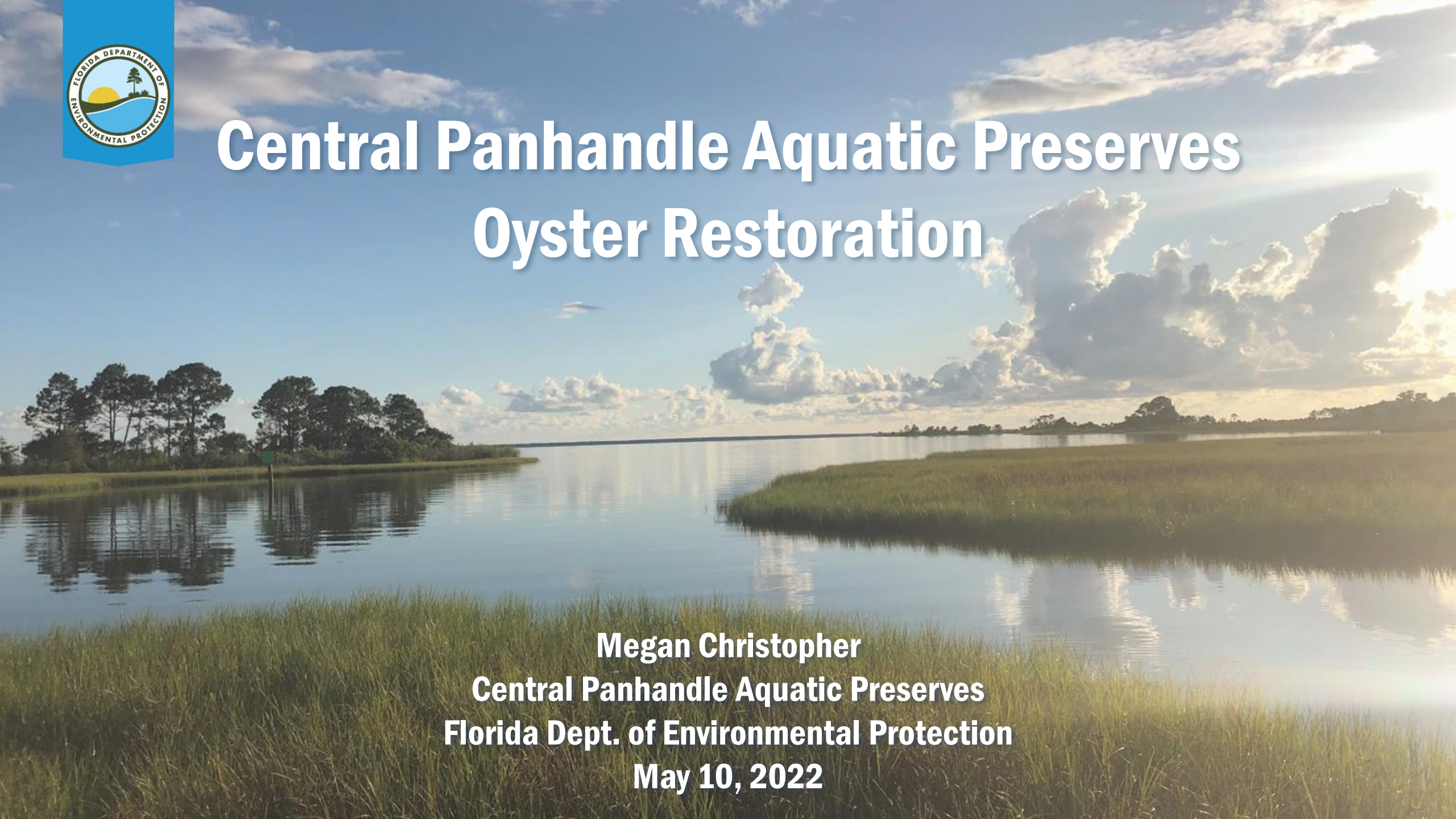

Central Panhandle Aquatic Preserves Oyster Restoration

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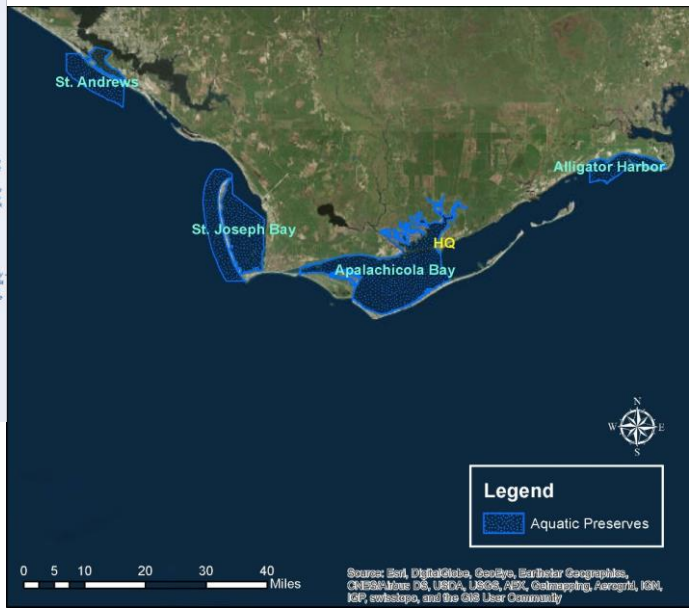
Central Panhandle Aquatic Preserves
Florida Dept. of Environmental Protection
May 10, 2022

Central Panhandle Aquatic Preserves (CPAP)

FLDEP-RCP

- HQ at Apalachicola National Estuarine Research Reserve (ANERR) facility in Eastpoint, FL.

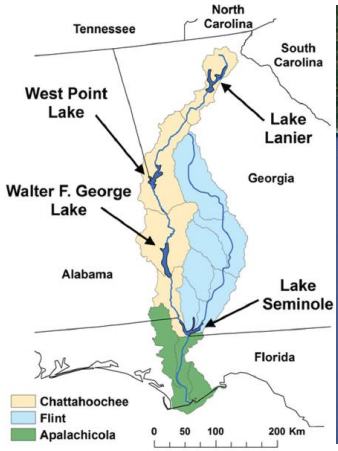
- APs in Franklin, Gulf and Bay counties.
  - ~174,000 acres.



Map Credits: FDEP/CPAP

Apalachicola Bay

- Classic salt wedge estuary.
- Fed by Apalachicola River.
  - Part of the ACF Basin.
    - 21,000 square miles (55,000 km^2).
  - 5th largest FW source entering Gulf of Mexico
    - 35,800 cu. ft./s (1,013 m^3/s).



Map Credits: Christopher J. Martinez (left) and FDEP/CPAP (right)

Photo Credits: FDEP/CPAP

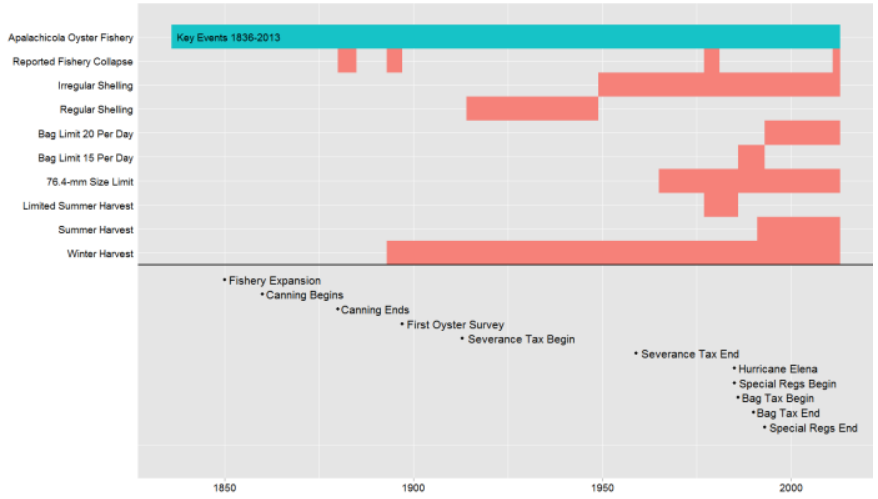
Apalachicola Bay Oysters

Photo Credits: Harris & Lyon

- AB system- ideal natural conditions support *Crassostrea virginica.*
  - Reach market size in ~18 months.
- FL provides 10% of US commercial harvest.
  - >90% from Apalachicola Bay.
- Historically important fishery.
  - Commercial industry first described ca. 1880.
  - Small vessel, hand tonging, culling on site.

Photo Credits: Taimy Alvarez (top), FDEP/CPAP (bottom)

Apalachicola Bay Oysters



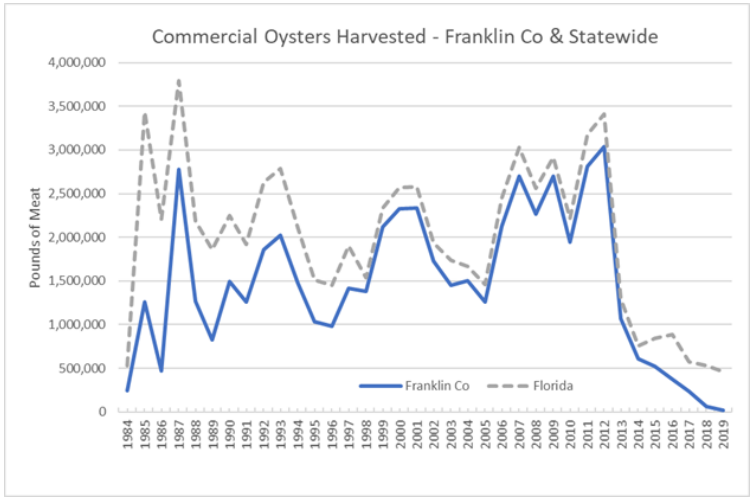


Figure Credits: Pine *et al* (top), FWC (bottom)

Decrease in landings.

- Regulations.
  - Size limits, bag limits, seasonal closures, trip reporting.
- 1985- Hurricanes Kate and Elena.
  - Shelling effort- 385 acres, 96,230 cu. yds. of clam shell.
- 2010- *Deepwater Horizon.*
  - Indirect effects from spill-related activities.

Federal fisheries disaster declared in 2012.

- Increased harvest pressure.
- Decreased freshwater input upriver.
- Habitat degradation.

Wild harvest closed Fall 2020 to December 2025.

Oyster Restoration

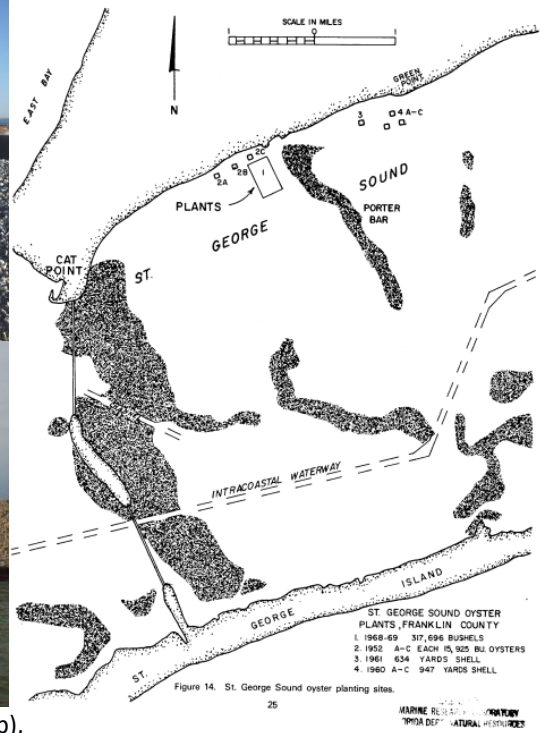
- Franklin Co. economy dependent on health of Apalachicola Bay's oysters
  - Ecological services.
    - Enhanced water quality.
    - Reefs support various taxa in multiple life stages.
  - →Economic services.
    - Seafood industry.
    - Recreation/Tourism.

Photo Credits: FDEP/CPAP

Oyster Restoration

- Via placement of ‘cultch’ on existing oyster bars.
  - Cultch - suitable substrate material for the attachment of settling oyster larvae (spat).
- Promote reef development through restoration of existing oyster habitat.
  - Historically productive bars now degraded, depleted or have reached productive lifespan.

Photo Credits: FDEP/CPAP (top), FDACS (bottom)



Map Credit: Whitfield/FDNR

Gulf Coast Ecosystem Restore Council (GCERC)

Apalachicola Bay Oyster Reef Restoration Project

‘RESTORE’- *Deepwater Horizon.*

- >95,000 cubic yards of lime rock aggregate in November 2017.
  - 14 oyster bars Apalachicola Bay system.
- 2.5-year monitoring period.
  - Ensure implementation.
  - Evaluate via performance criteria.
    - Monitor for effectiveness/success.

Map Credit: FDACS

RESTORE

Monitoring

Physical sampling at 6 months, year 1, year 2.

- Three ‘rounds’- Summer ‘18, Summer ‘19, Fall ‘21-Summer ‘22.

SCUBA for material collection.

- 0.25m^2 quadrat, haphazard placement.
  - 15 samples per midpoint.

Water quality/conditions at each site.

- Surface and bottom.
  - Salinity, temp (C°), DO, conductivity, pH, depth.

Spatial extent mapping.

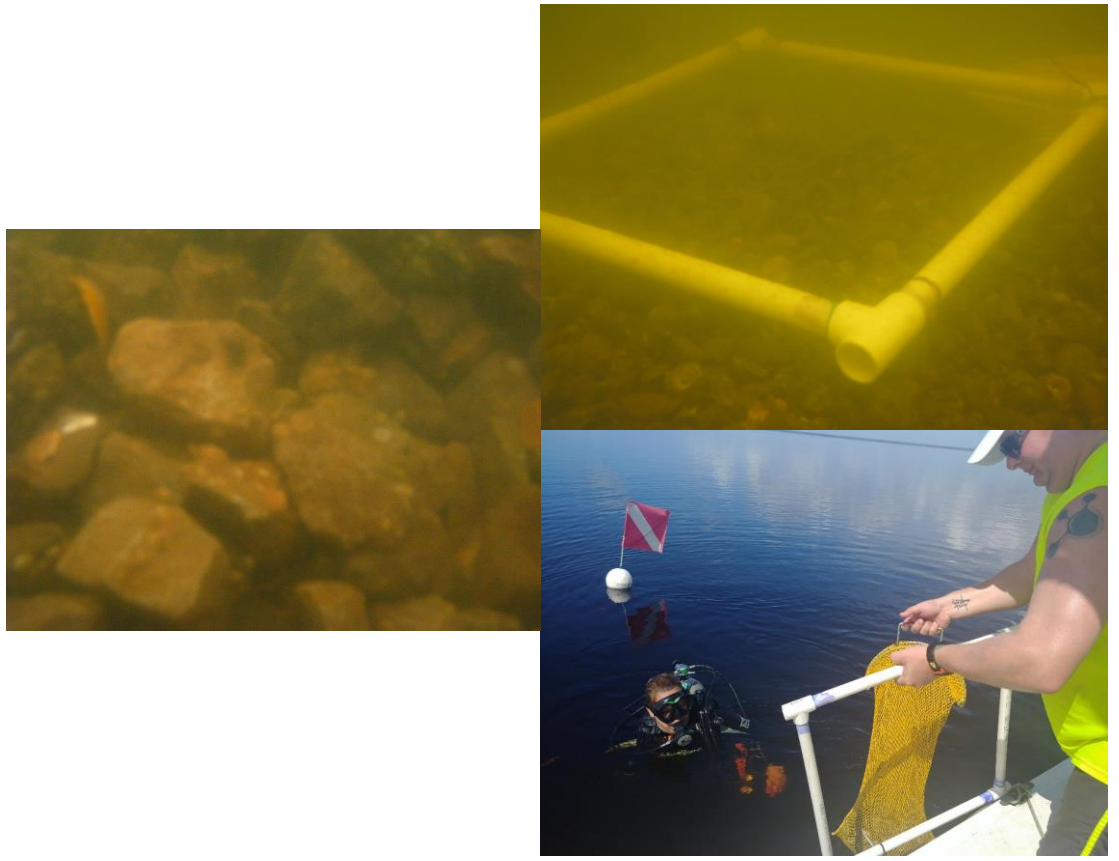


Photo Credits: FDEP/CPAP

RESTORE

Monitoring

Sample processing - fresh or frozen!

- Sample weight.
- Shell height of first 100 live oysters/sample.
  - Size classes:
    - Spat (≤25mm), Seed (26-74mm), Adult (≥75mm).
    - Count additional oysters by size class.
- Count all dead oysters.

Returned to AB system following processing.

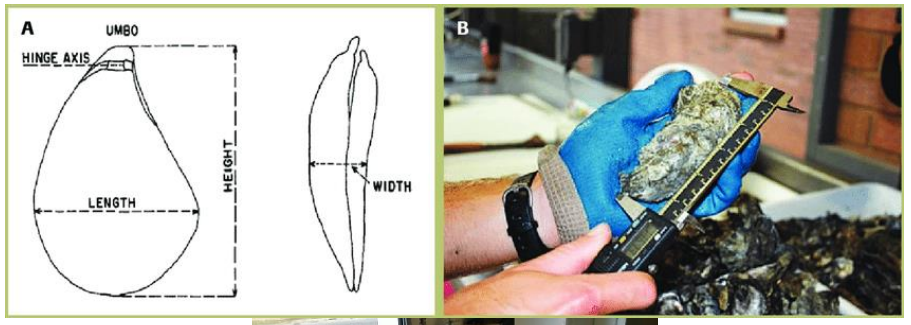


Figure Credit: Galtstoff (top left)

Photo Credits: Baggett/USA/DISL (top right)
FDEP/CPAP (bottom)

RESTORE

Data Analysis

Photo Credits: FDEP/CPAP

Three rounds- comparisons between individual sites, region (East vs. West), entire bay.

- Live vs. dead oysters.
- Live oysters by size class.
- Shell height distribution.
- Estimated density of live oysters*.
- Estimated bags of harvestable oysters per acre*.

*FDACS Standard Oyster Resource Management Protocol.

FDACS Standard Oyster Resource Management Protocol

Photo Credits: Taimy Alvarez

- Ingle and Whitfield (1968) and Whitfield (1973) ~400 bu/acre could be harvested from 'productive artificially constructed reefs' within two years of cultching.

Oyster Population Estimates

- >25mm used in population estimates.
- 50-70mm to predict growth rates, mortality and recruitment.
- ≥75mm ('Adult') to estimate marketable oyster density (per m^2) → calculate productivity (bags per acre).***

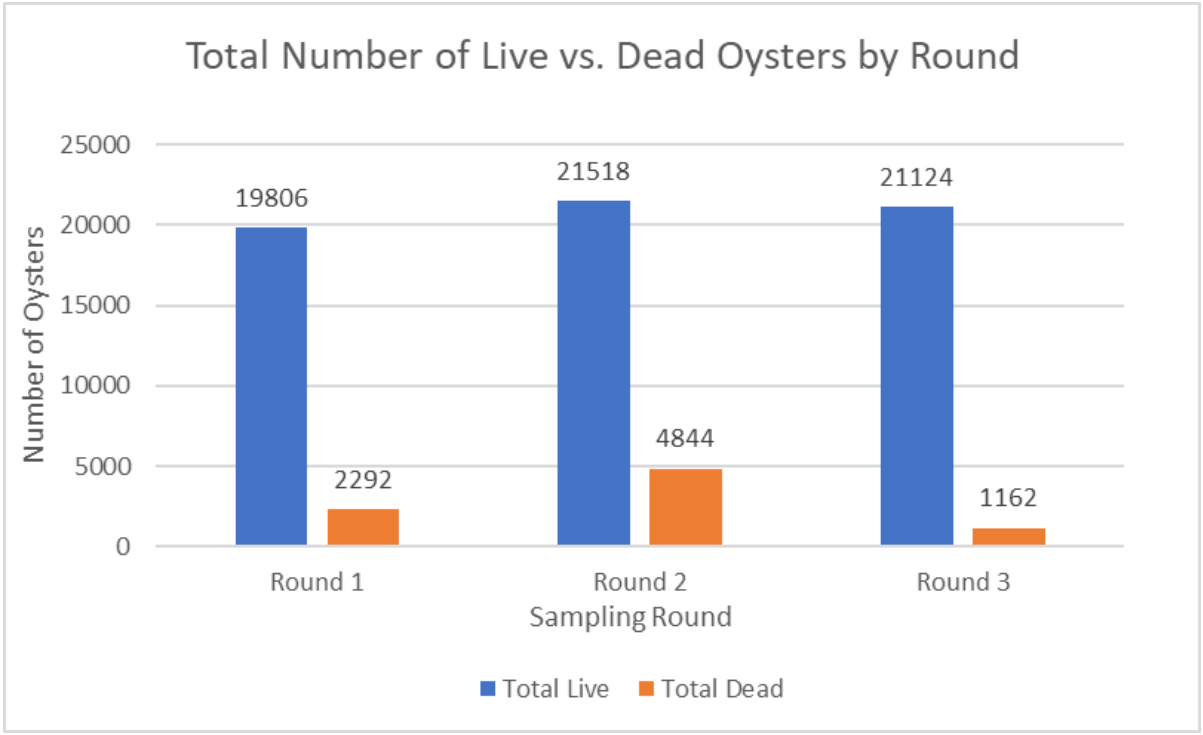
Harvest Sustainability Estimates

- >400 bags/acre - healthy, capable of sustaining commercial harvest.
- >200 bags/acre - capable of sustaining limited commercial harvest.
- <200 bags/acre - below level for sustaining commercial harvest.
- <100 bags/acre - depleted.

RESTORE

Results

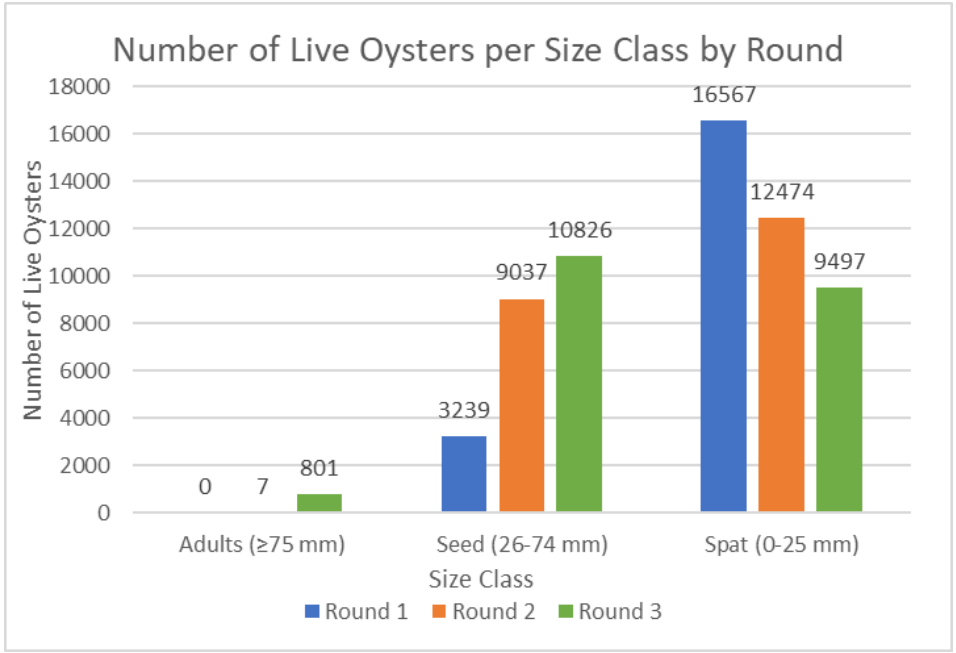
- Number of live oysters consistent across rounds.
  - Oysters present in all samples except 9-mile B in R2.
- Number of dead significantly different between rounds.
  - Round 2 several months post-Hurricane Michael.
- Round 1*- Hurricane Michael.
  - Affected ~19.5% (76) of R1 samples.

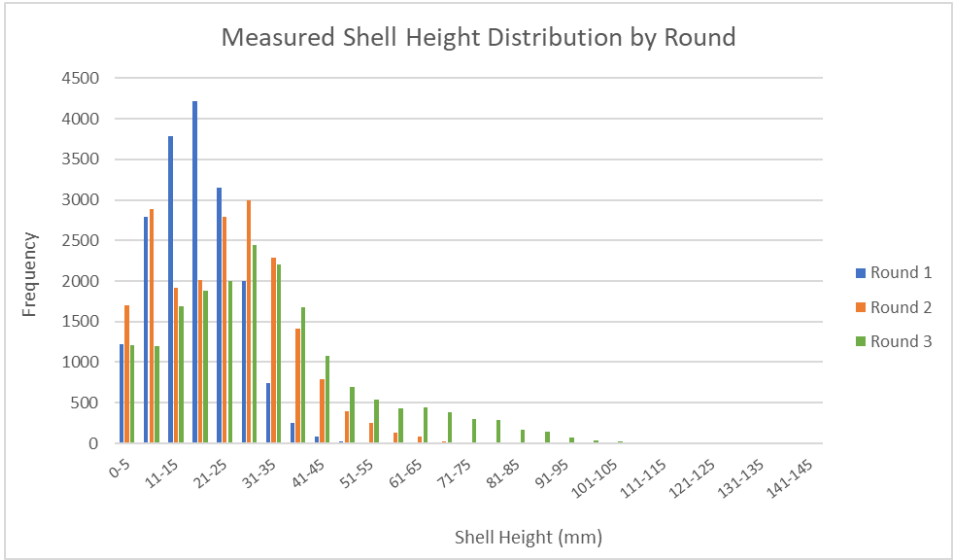


RESTORE

Results

- Spat most abundant size class in Rounds 1 and 2.
- Seed most abundant in Round 3.
- Adults least abundant across all rounds.
  - No adults in Round 1, few present in Round 2.
    - Expected following cultching given time from settlement to market size.
  - Increase in mean shell height (mm) R1→R3



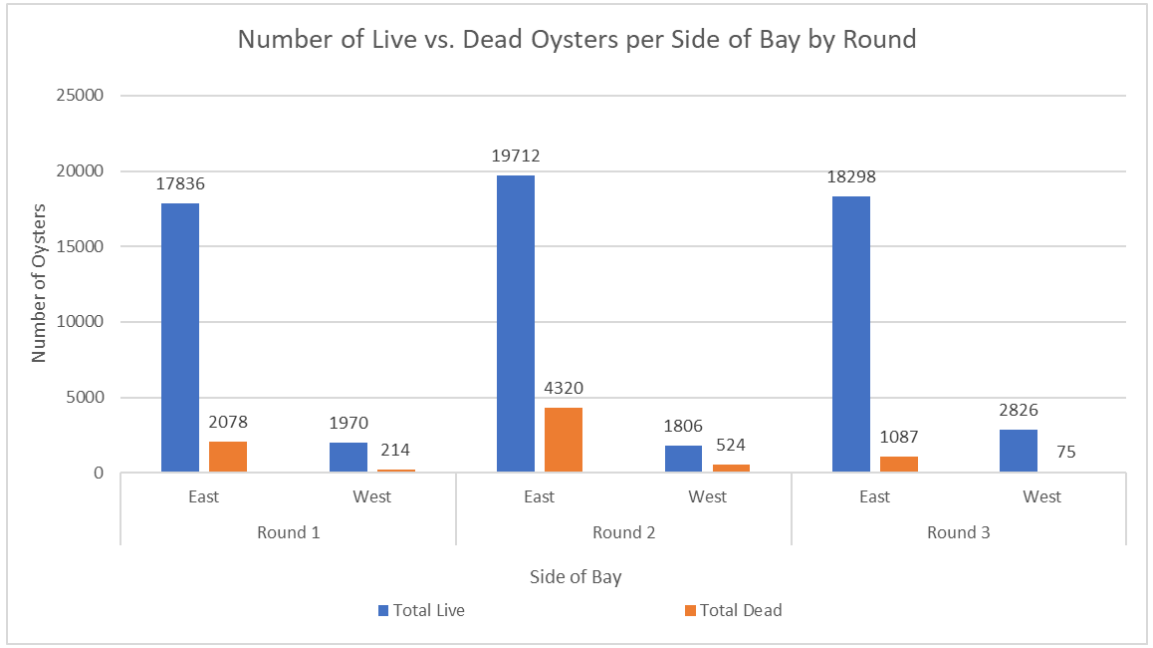


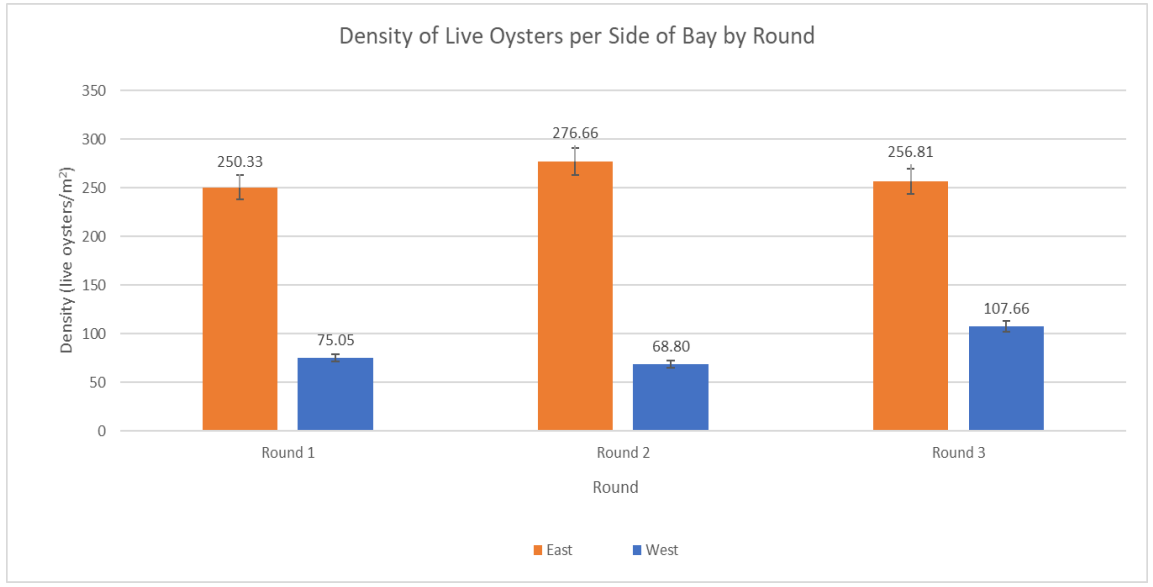
RESTORE

Results - Side of Bay

Regional differences in bay:

- Sediment/freshwater transport.
- East side historically more productive.
  - More oyster bars = more sample sites
- Higher density (live oysters/m^2) of live oysters on east side in each round.
  - Increase in density on west side (R3)

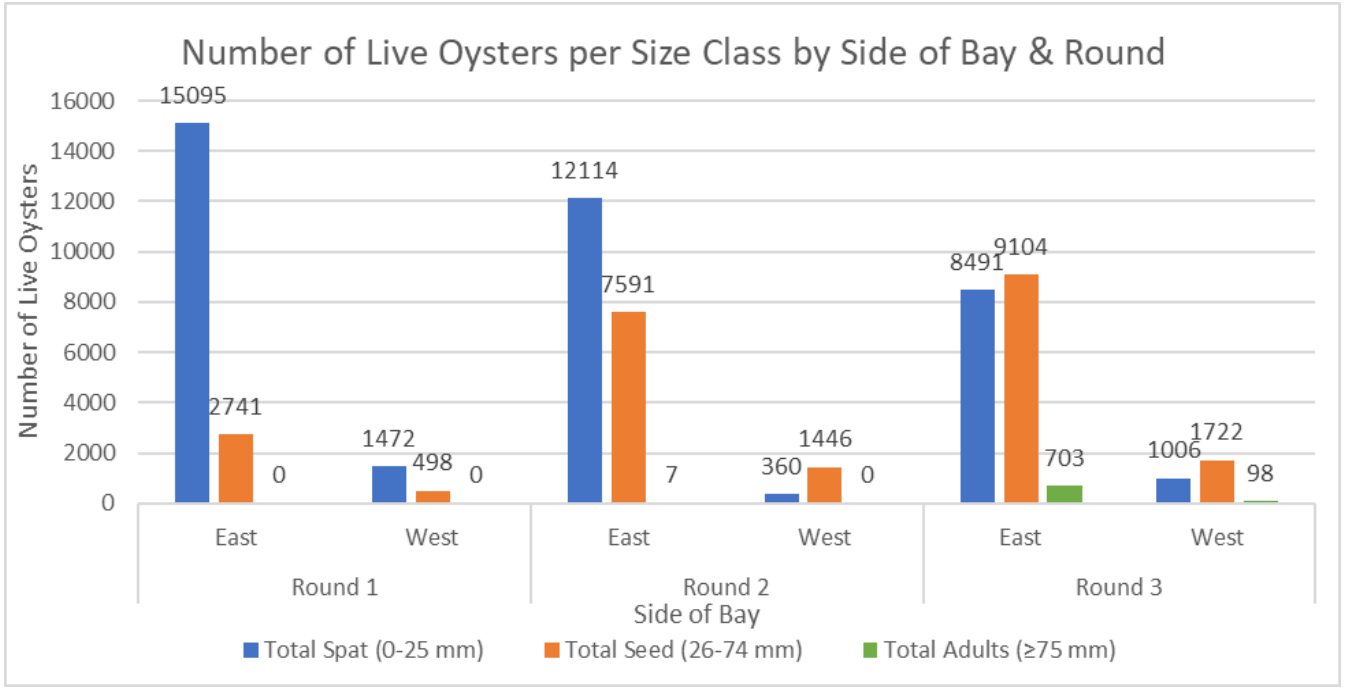




RESTORE

Results - Side of Bay

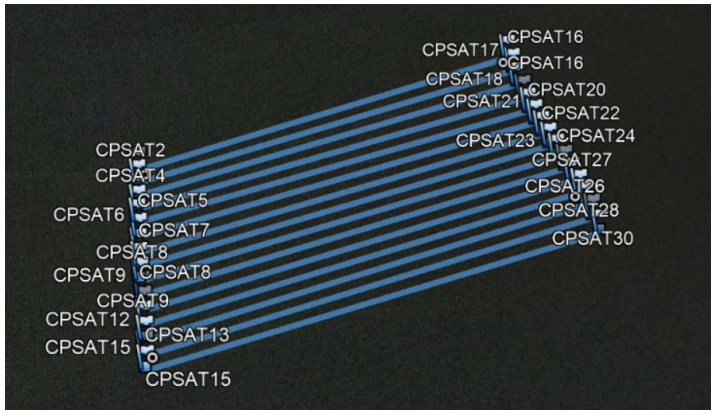
- Regional size class trends reflect AB system.
  - Seed most abundant in Round 3 on both sides of bay.
- Adults present on both sides of bay in Round 3.
  - Not found on west side prior to R3.

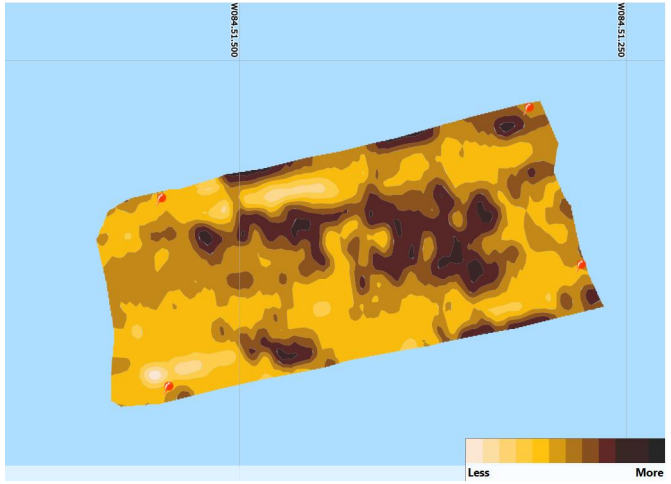


RESTORE

Spatial Extent Mapping

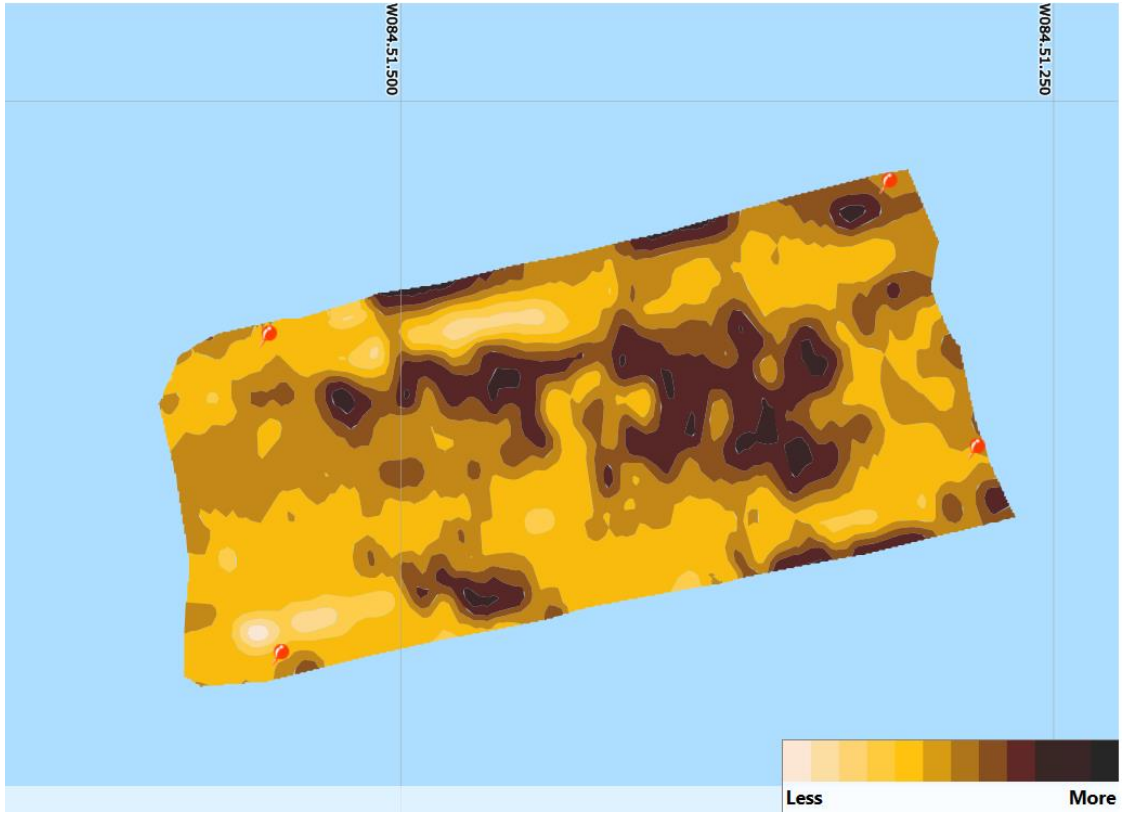
- Six months*, Year 1, Year 2.
  - Winter/Spring 2019 and Spring/Summer 2020.
- Sidescan SONAR.
  - Humminbird SOLIX 12 CHIRP MEGA SI.
  - Predetermined transect routes over reef footprint.
- Data imported into ReefMaster 2.0.
  - Reef mosaic → Bottom hardness.





RESTORE

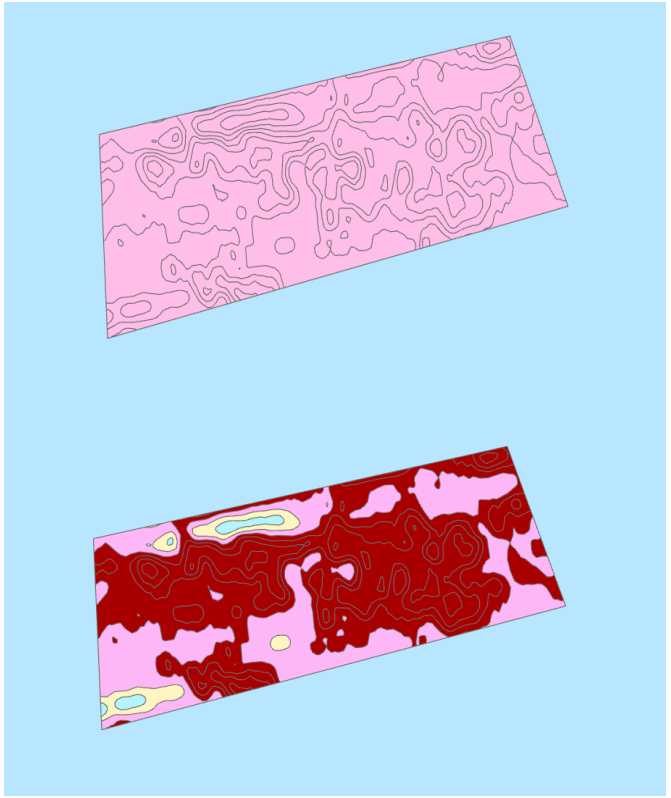
Spatial Extent Mapping- Cat Point Spur



RESTORE

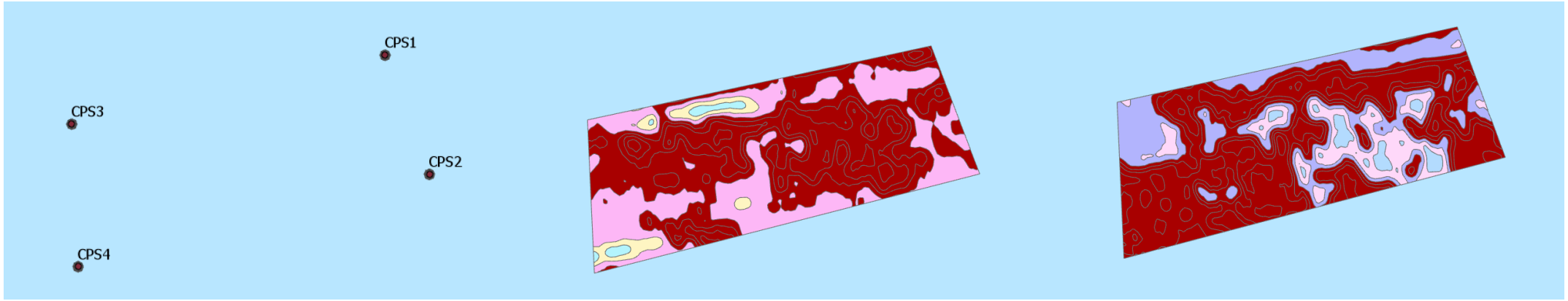
Spatial Extent Mapping

- ReefMaster 2.0 → ArcGIS PRO.
  - Identified areas with highest bottom hardness values.
- Hard Bottom Area = Reef Area.



RESTORE

Spatial Extent Mapping



- Cultching → Year 1 → Year 2 Comparison.
  - Initial clutched area values provided by FDACS report.
  - Visualization of reef area expansion, shifting and loss of material.

RESTORE

Mapping Results

Site	Initial Acreage (Reported)	Initial Acreage (ArcGIS)	Year 1 (2019) Total Acreage	Year 1 (2019) Net Change (%)	Year 2 (2020) Total Acreage	Year 1 to Year 2 Change (%)	Year 2 (2020) Net Change (%)
8-Mile	13.89	13.89	11.53	-17.03	9.80	-14.97	-29.45
9-Mile B	4.35	4.72	3.90	-17.39	1.66	-57.43	-64.83
Cabbage Top	5.49	5.49	4.91	-10.56	5.04	2.65	-8.20
Cat Point	56.72	38.74	26.90	-30.58	28.30	5.21	-26.96
Cat Point Spur	18.82	18.82	11.81	-37.25	12.25	3.73	-34.91
East Hole #1	44.43	44.43	25.34	-42.98	25.39	0.20	-42.87
East Hole #2	12.77	12.77	11.07	-13.35	6.59	-40.49	-48.43
Hotel Bar #1	27.51	27.51	21.30	-22.57	21.26	-0.21	-22.74
Hotel Bar #2	11.70	11.70	10.10	-13.68	8.62	-14.70	-26.37
King 9-Mile	1.99	0.97	0.95	-2.06	0.68	-28.42	-29.90
Monkey's Elbow	25.69	25.69	19.78	-23.01	19.80	0.08	-22.95
North Spur #2	38.80	38.80	35.81	-7.71	36.86	2.92	-5.01
Peanut Ridge	26.87	26.87	24.89	-7.39	21.49	-13.64	-20.02
South Bulkhead	31.19	31.19	18.36	-41.15	22.81	24.23	-26.88
Total	**320.21**	**301.59**	**226.62**	**-24.86**	**220.51**	**-2.70**	**-26.88**

- Net loss of reef area from initial cultching through Year 2.
- Gain of reef area on 50% of reefs from Year 1 → Year 2.

RESTORE

Discussion

Restored areas = increase in larger, harvestable oysters.

- Number of adults increased at all sites except North Spur #2 (n=0).
  - Spat and seed present at all sites over course of sampling.
    - Cultch material suitable for settlement at all sites.

All but 2 reefs saw increase in average sample weight.

- Despite net loss of total area across all reefs.
  - Increase in 3D complexity/biomass.

Photo Credit: FDEP/CPAP

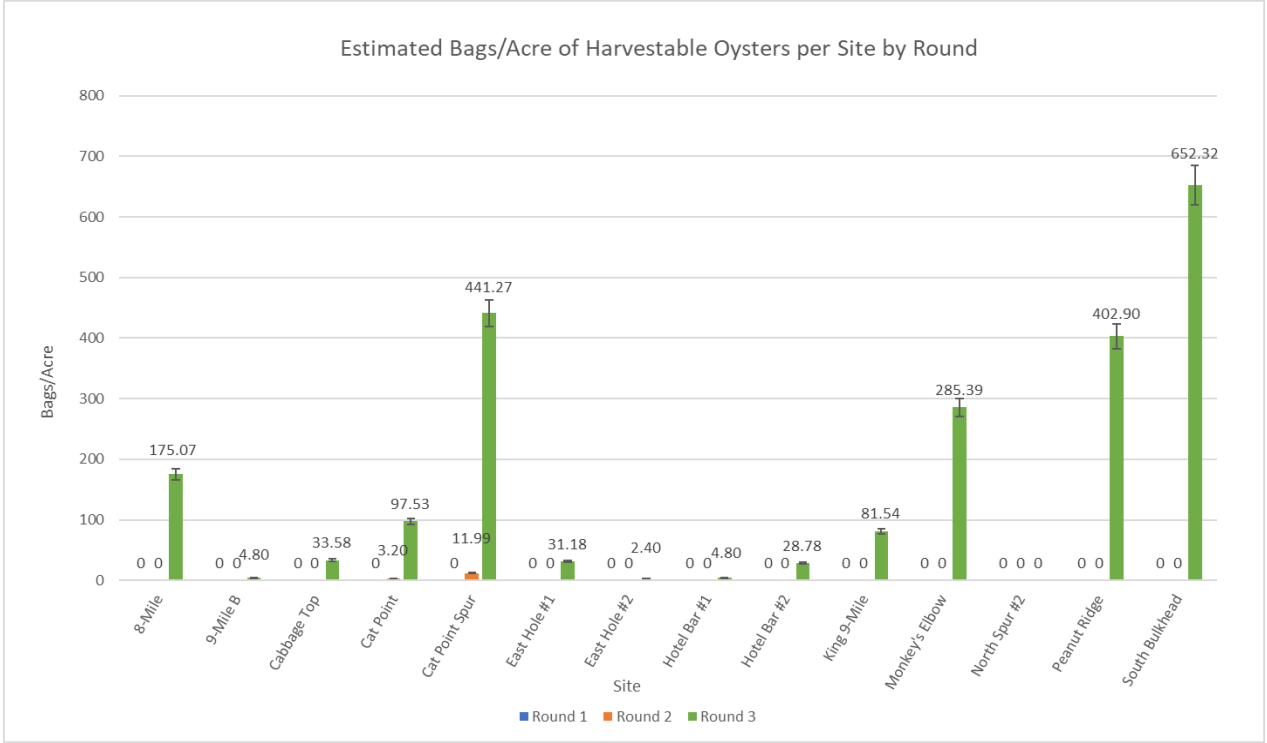
RESTORE
Discussion

4 sites capable of sustaining some form of commercial harvest by Round 3:

- South Bulkhead, Cat Point Spur, Monkey's Elbow (limited), Peanut Ridge*.

Year 1 → Year 2 increase in reef area observed at sites with greatest increases in bags/acre.

- Peanut Ridge- net loss of ~20% of reef area.
  - Close proximity to other productive reefs (east side).
    - Regional conditions? Reef connectivity?



RESTORE

Identifying Data Gaps

- Pre-cultch/post-cultch surveys (T_0 data).
  - Material sampling.
  - Bottom composition mapping.
- Irregular sampling intervals.
  - Missed 6-month mapping.
  - Seasonal variability in population trends.
- Coordinate timing of sampling with mapping efforts.
- Size-specific mortality data.
- Hurricane Michael.
  - Movement of material, water quality, mortality, etc.
  - Source of error.

Photo Credits: FDEP/CPAP

Future Efforts

- Similar, ongoing project across multiple bays.
  - Apalachicola, St. Andrews and Pensacola bays.
    - 10 years- longer term data set.
    - Comparison across different systems.
- Increase sampling effort.
  - 3D reef complexity.
    - Bottom contour data (ReefMaster 2.0).
  - Manual/visual transect surveys across reef footprint.
    - Ground truth reef area/3D complexity.
- In-depth data analysis for more focused/efficient efforts.
  - Site suitability.
  - Region/site specific cultching.
  - Connectivity between regions/sites.

Photo Credits: FDEP/CPAP

Thank you!

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