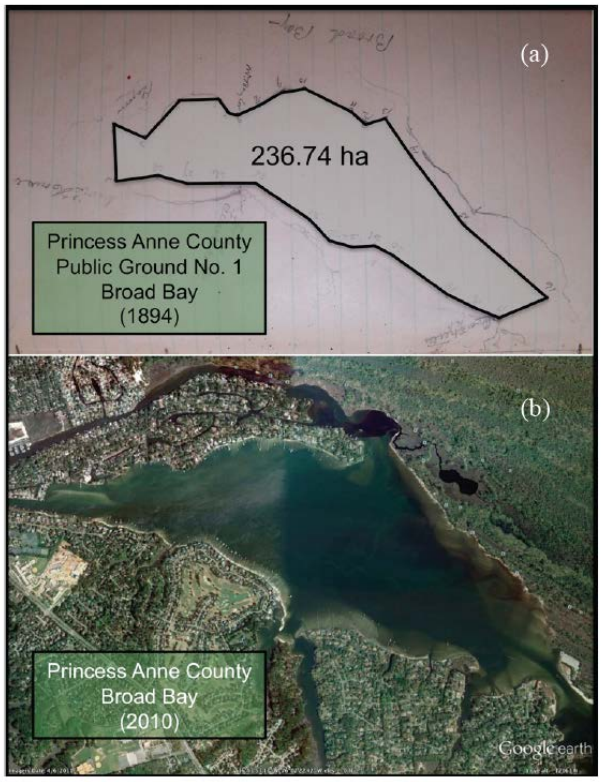
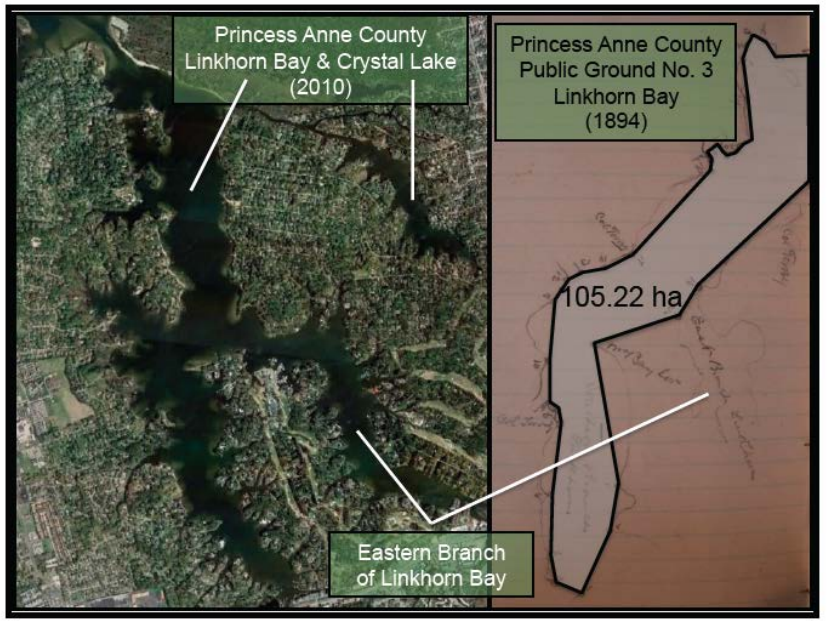
Lynnhaven River Oyster Ecosystem Restoration

Overarching Goals

Baylor Grounds in Lynnhaven River

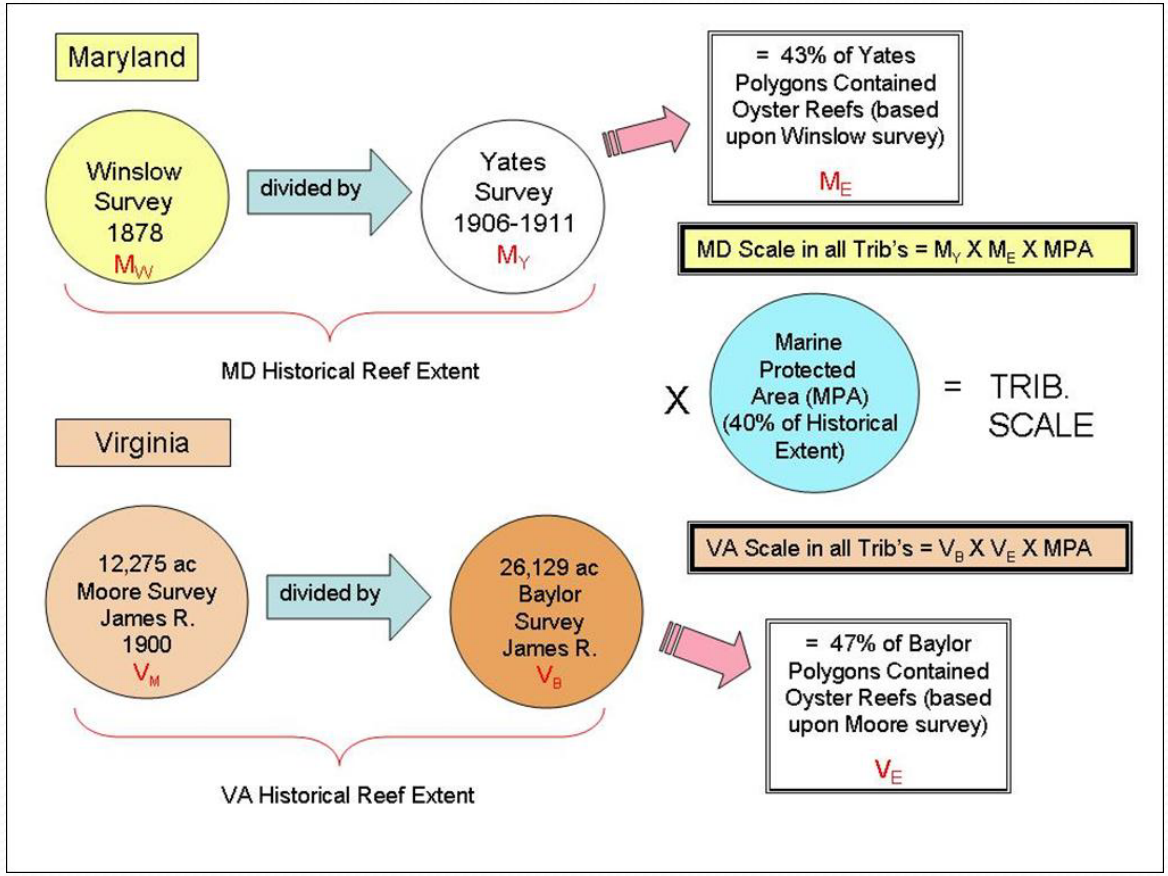




Restoration Targets: USACE Native Oyster Restoration Master Plan

Tier 1 Tributaries/Areas	Restoration Target (Acres)
Great Wicomico River	100 - 400
Lower Rappahannock River	1,300 - 2,600
Piankatank River	700 - 1,300
Mobjack Bay	800 - 1,700
Lower York River	1,100 - 2,100
Pomocoke/Tangier Sound	3,000 - 5,900
Lower James River	900 - 1,800
Upper James River	2,000 - 3,900
Elizabeth River	200 - 500
Lynnhaven River	90-200

Master Plan: How did USACE calculate the acreage ranges?



GIT Oyster Metric Operational Goals

- Reef-level
  - Shell, alternative substrate, or spat-on-shell should cover a minimum of 30% coverage throughout the target reef area.

- Tributary-level:
  - A minimum of 50% of currently restorable area that constitutes at least 8% of historic oyster habitat within a given tributary meets the reef-level goals defined above.
    - 50% restorable area (250 acres suitable) = 125 acres
    - 8% of historic oyster habitat (990 acres) = 80 acres

GIT Reef-Level Success Metrics

Threshold (minimum)

- 15 oysters/m^2
- 15 grams dry weight /m^2
- From two year classes
- Covering at least 30% of the reef area

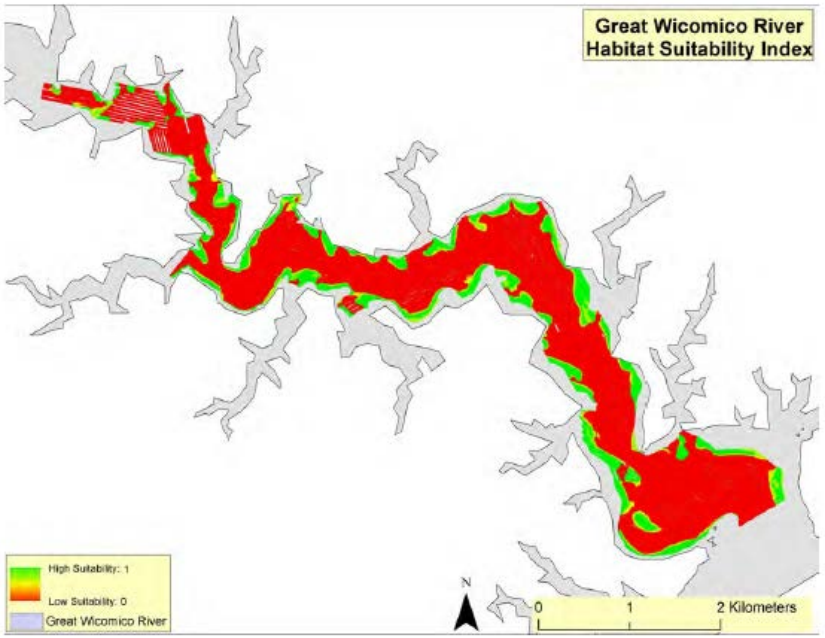
Target (goal)

- 50 oysters/m^2
- 50 grams dry weight /m^2
- From two year classes
- Covering at least 30% of the reef area

- Neutral or positive shell budget and change in reef spatial extent and height

GIT Tributary-Level Success Metrics

- Minimum of 50% of the currently restorable bottom
  - That comprises at least 8% of the historic oyster bottom
    - And meets the reef-level goals



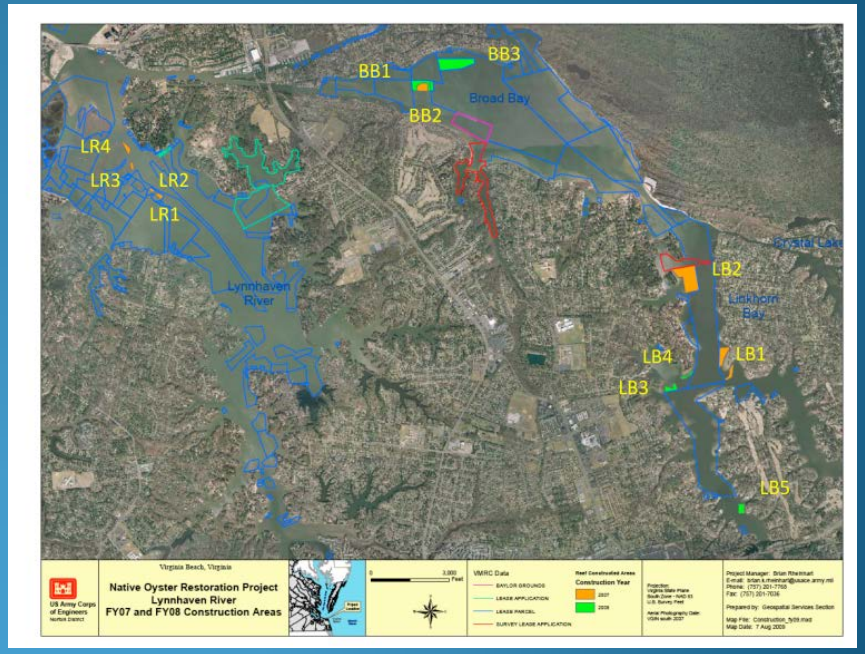
Oyster Restoration Goals

- Executive Order 13508: "Strategy for Protecting and Restoring the Chesapeake Bay Watershed"
  - Restore native oyster habitat and populations in 10 tributaries by 2025

LYNNHAVEN

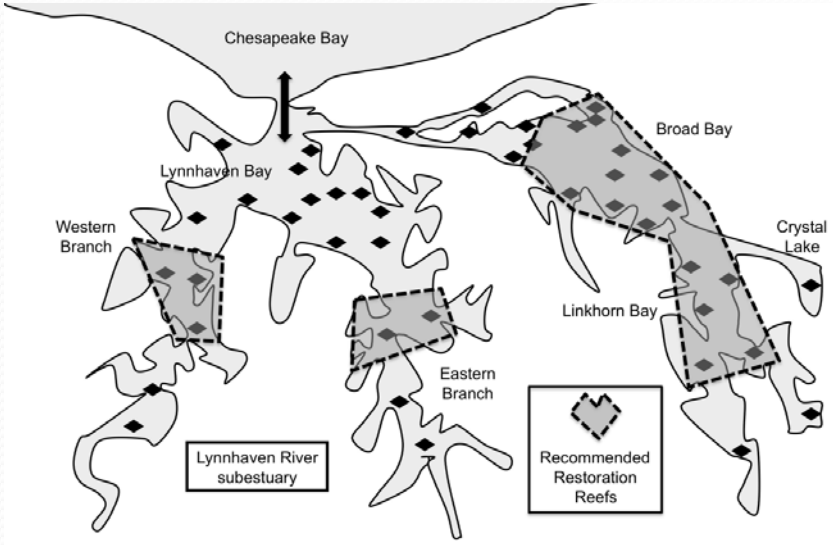
Ecosystem Restoration Sites

Currently Restored Reefs (USACE only)



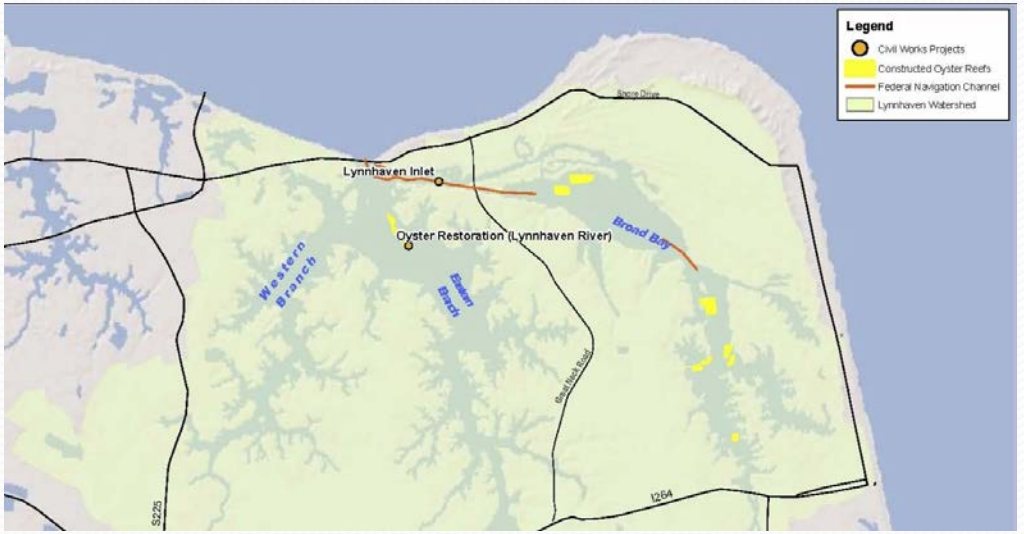
Lynnhaven Details

- 58 acres of sanctuary reefs constructed by USACE, 63 acres total (VMRC, VA Beach, Lynnhaven River NOW)
- Construction completed 2007-2008
- $5 million in federal funds



Present…

- High recruitment and large numbers
- Some oysters as large as 8-inches in length!



Lynnhaven River Oysters

- Shell Length:
  - Age 0 oysters – shell length generally < 30 mm
  - Adult oysters – 30 – 200 mm
- Density
- Biomass
- Abundance – total almost 16 million
  - Juvenile – 3,784,221
  - Adult – 12,086,971

Table 4. Estimated juvenile and adult abundance on the constructed reefs. Total abundance of juveniles and adults was 15,871,192.

Location	Juvenile abundance	Adult abundance
Lynnhaven River	1,133,724	1,043,481
Broad Bay 1 and 2	505,376	3,624,532
Broad Bay 3	429,373	2,265,328
Linkhorn Bay 1	315,860	1,279,247
Linkhorn Bay 2	890,550	3,347,273
Linkhorn Bay 3, 4 and 5	509,338	527,110
Total	3,784,221	12,086,971

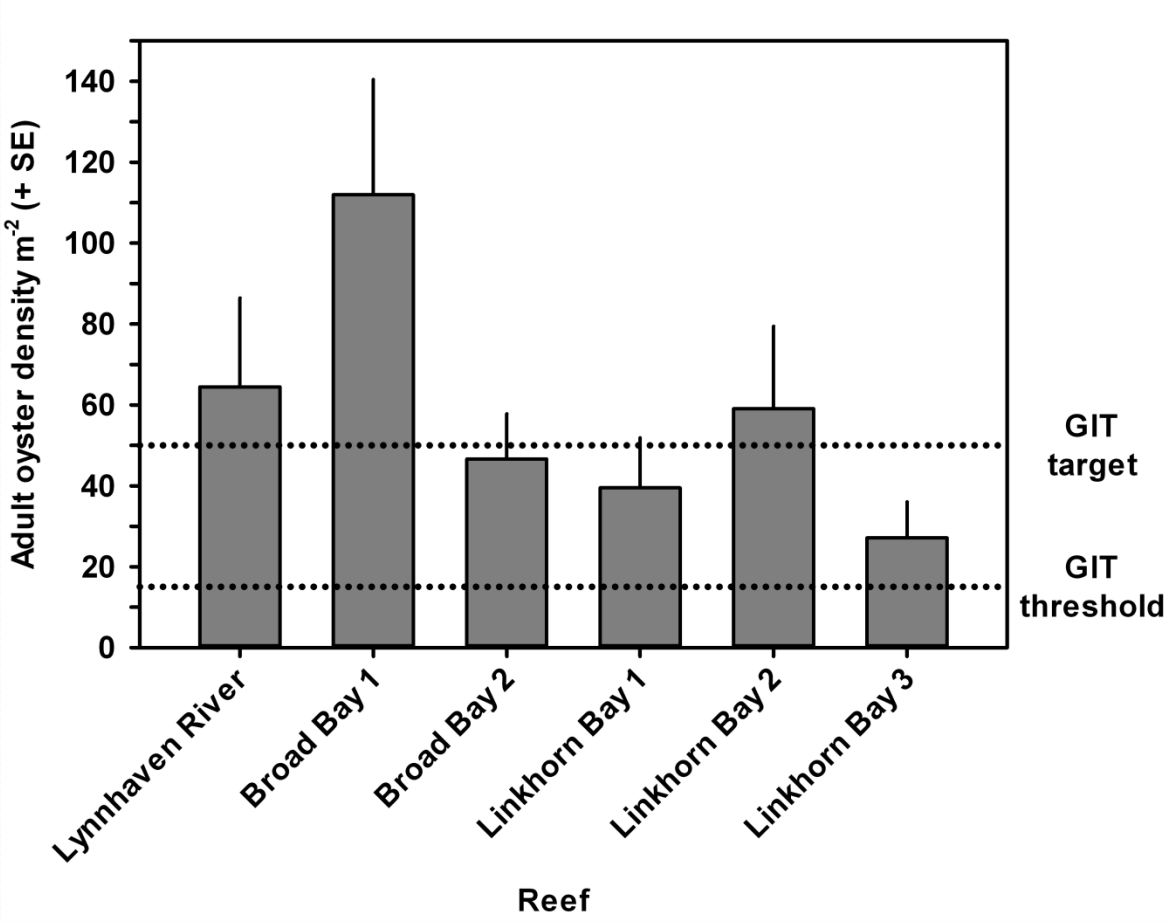
Lynnhaven River Oysters

Location	Acres	Adult density m^{-2}	Adult biomass m^{-2}	GIT Threshold?
Lynnhaven River 1 & 2	4.00	64.46	166.58	Yes
Broad Bay 1 & 2	8.01	111.95	84.71	Yes
Broad Bay 3	12.01	46.65	25.09	Yes
Linkhorn Bay 1	8.01	39.51	34.02	Yes
Linkhorn Bay 2	14.01	59.08	95.74	Yes
Linkhorn Bay 3, 4 & 5	4.79	27.13	19.46	Yes
Total	50.83			100%

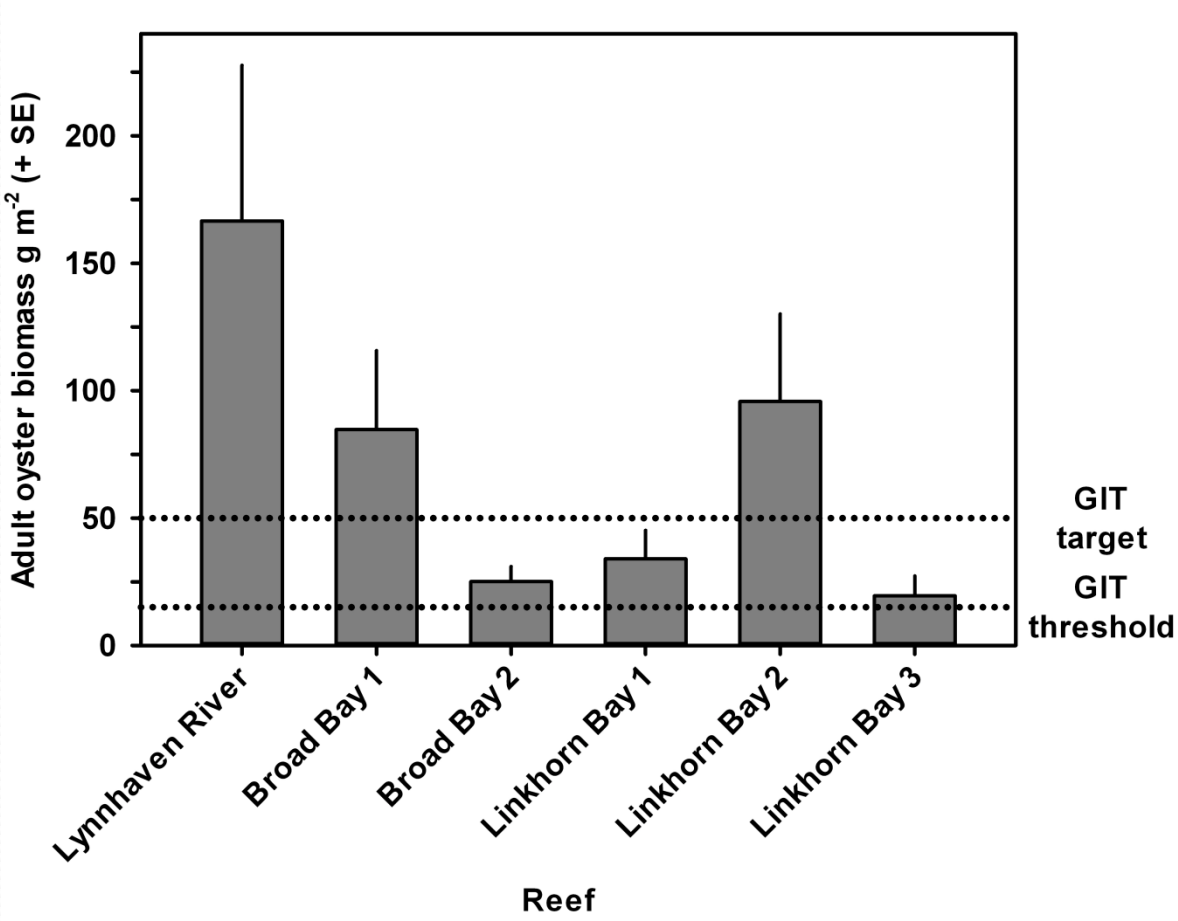
Lynnhaven River Oysters

- All reefs (50.83 acres) sampled exceeded the GIT thresholds for adult oyster density and biomass.
- Two smaller reefs in the Lynnhaven River could not be sampled due to their shallow water depth, and are not included in this analysis.
- The GIT targets, 50 oysters m^{-2} and 50 AFDM g m^{-2} of oysters, were exceeded in 51.2% (26.02 acres) of the reef acreage.

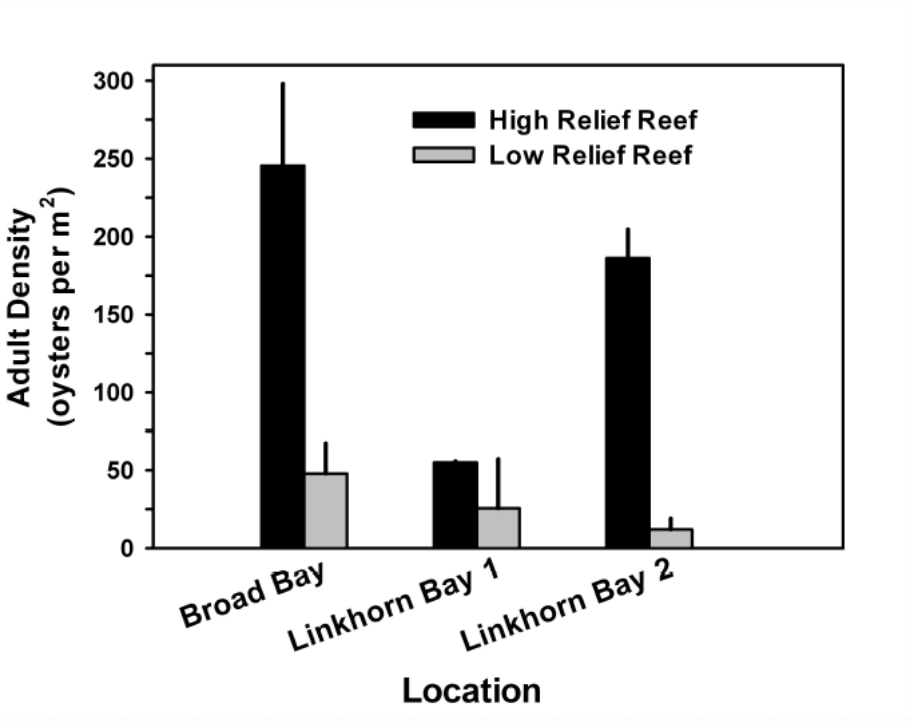
Adult Oyster Density



Adult Oyster Biomass

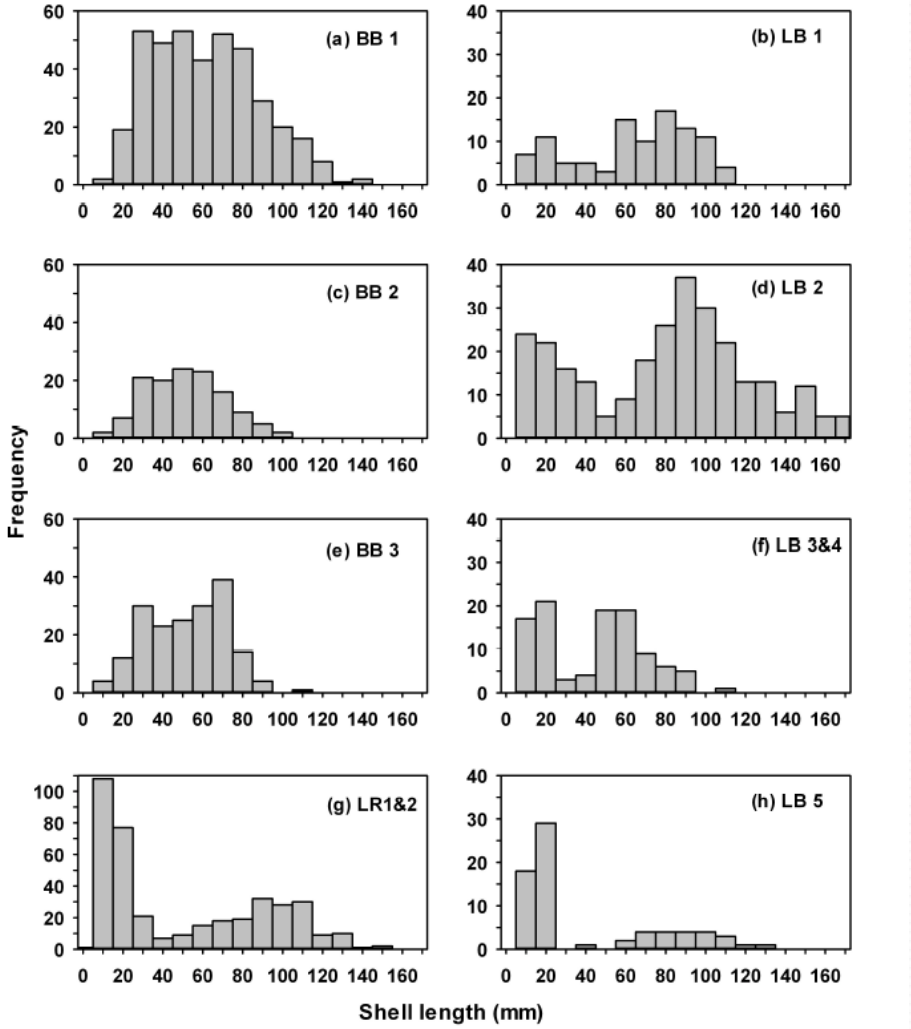


High vs Low Relief Reefs



- Not all reefs were fully mapped post construction using hydroacoustics
- From those that were, we see a significant difference in performance between high and low-relief reefs

Oyster Size/Frequency Distributions by Reef



Where are We Now?

- 40 - 150 acres needed to be restored
- 63 acres restored so far

Lynnhaven at Present

Subtidal Sanctuary Reef Built in 2007, USACE, May 2015

Intertidal Oyster Castles, May 2015, Lynnhaven River Now

Future…

- 38 acres wetland restoration and diversification
- 94 acres restoration of SAV beds
- 31 acres hard reef habitat - not formulated for oysters but oysters are likely result

Conclusions

- Reefs built nearly 8 years ago are still performing well
  - High salinity and high (potential) for disease mortality does not appear to have prevented the reefs from thriving
- Poaching, unlike in the Great Wicomico, does not appear to have occurred
- The ecosystem restoration project's fish reefs will also function as high-relief oyster reefs
  - If this project is implemented, the river would fulfill the GIT requirements of "fully restored"