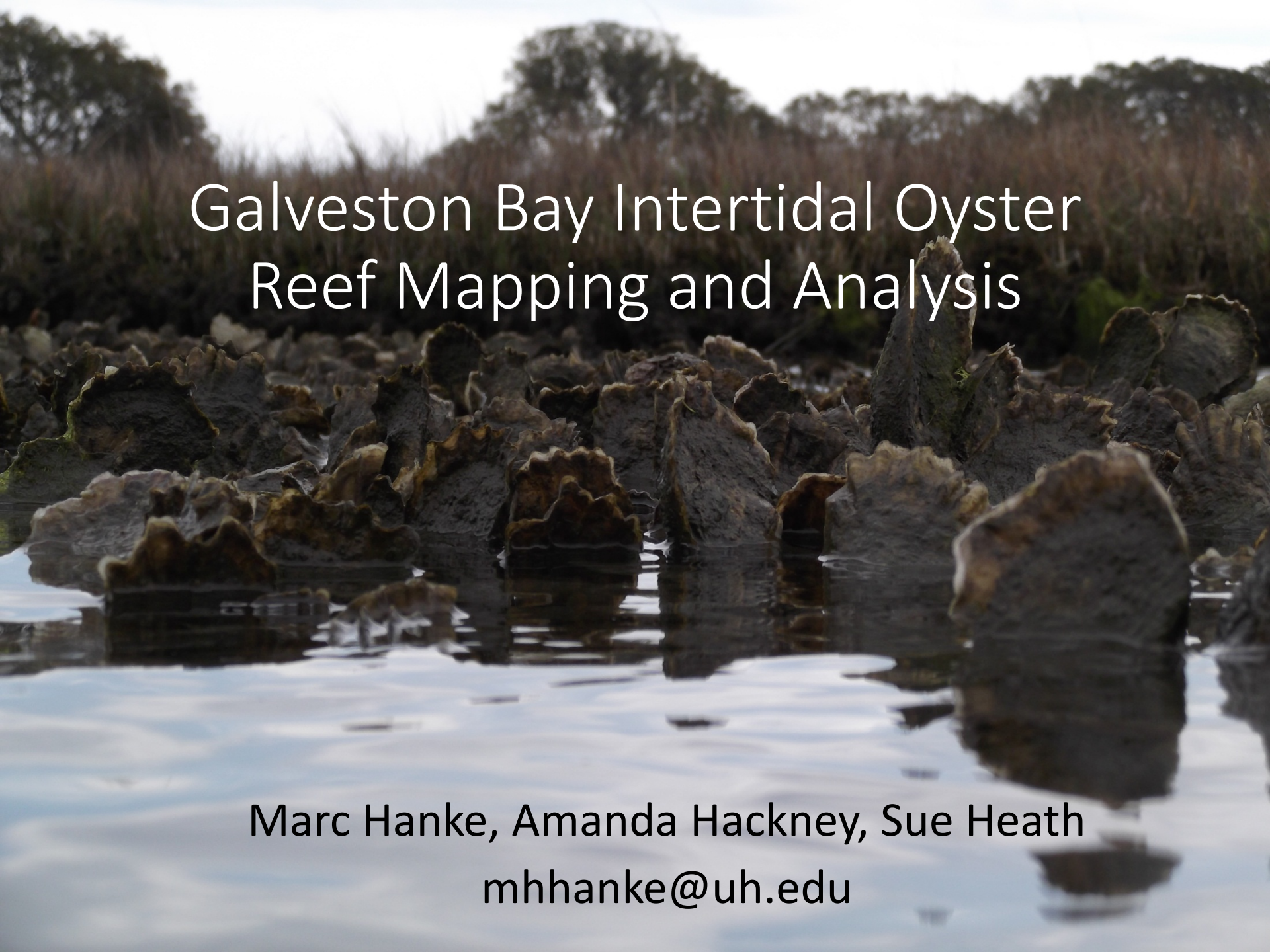


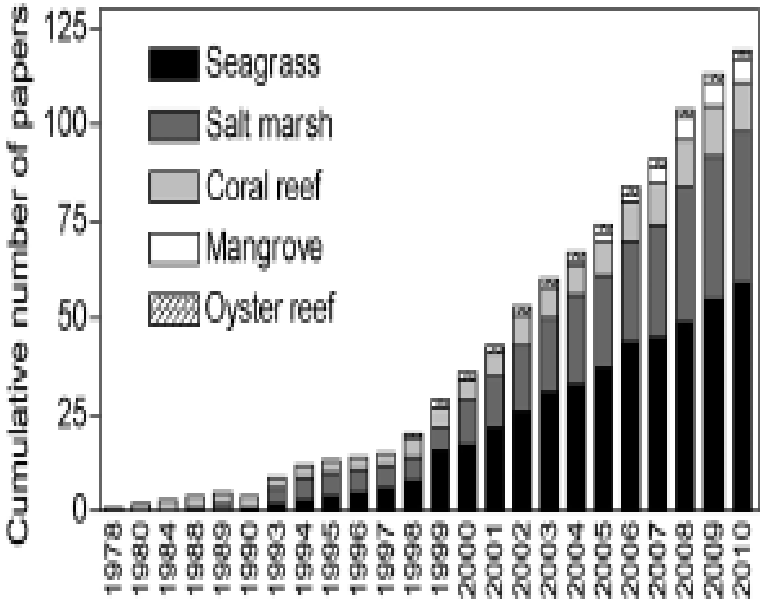
Galveston Bay Intertidal Oyster Reef Mapping and Analysis

Marc Hanke, Amanda Hackney, Sue Heath

mhhanke@uh.edu

Intertidal Reefs as Habitat

- Oyster reefs as habitat
  - Structurally complex habitat
  - Support over 300 species (Wells 1961)
- Current landscape setting of intertidal reefs in West Galveston Bay
  - Spatial Distribution
  - Importance



Bostrom et al. 2011

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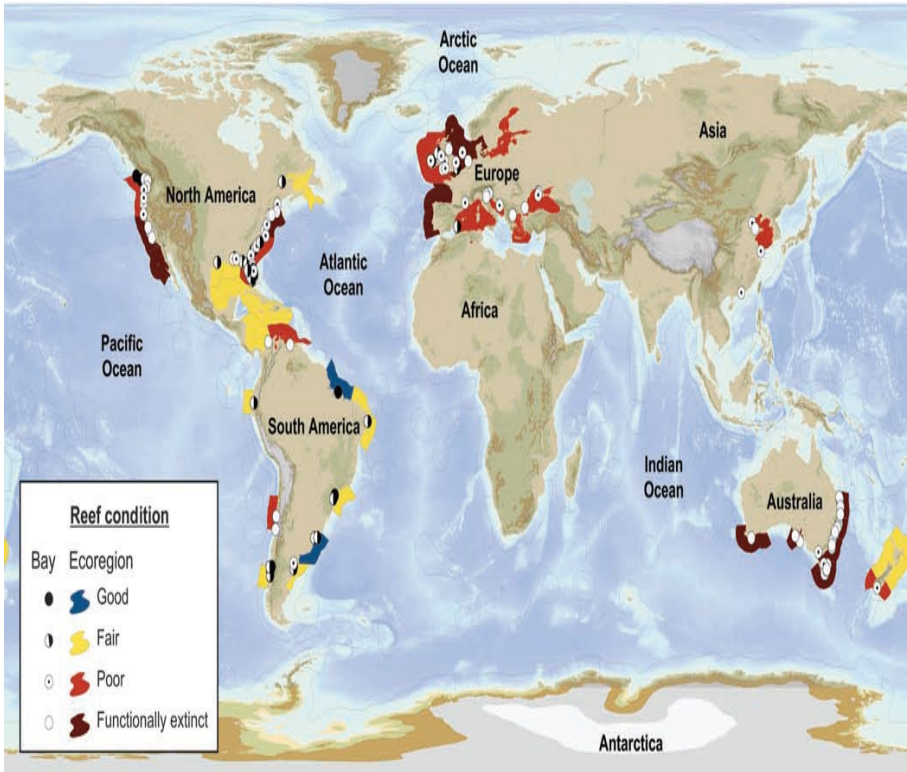

Research Objectives

- Map and quantify intertidal reefs in West Galveston Bay
- Determine the physical characteristics of intertidal reefs
- Quantify intertidal oyster populations characteristics
- Evaluate infaunal and avian community composition for intertidal oyster reefs

GIS Methods

- 2015 TOP aerial photography- recorded in a 0.5 m resolution
- Flown from October 2014 to August 2015
- Each covers one 4th of a USGS Digital Orthophoto Quad (DOQ)
  - Digital Orthophoto Quarter-Quad (DOQQ) or approximately 16 square miles

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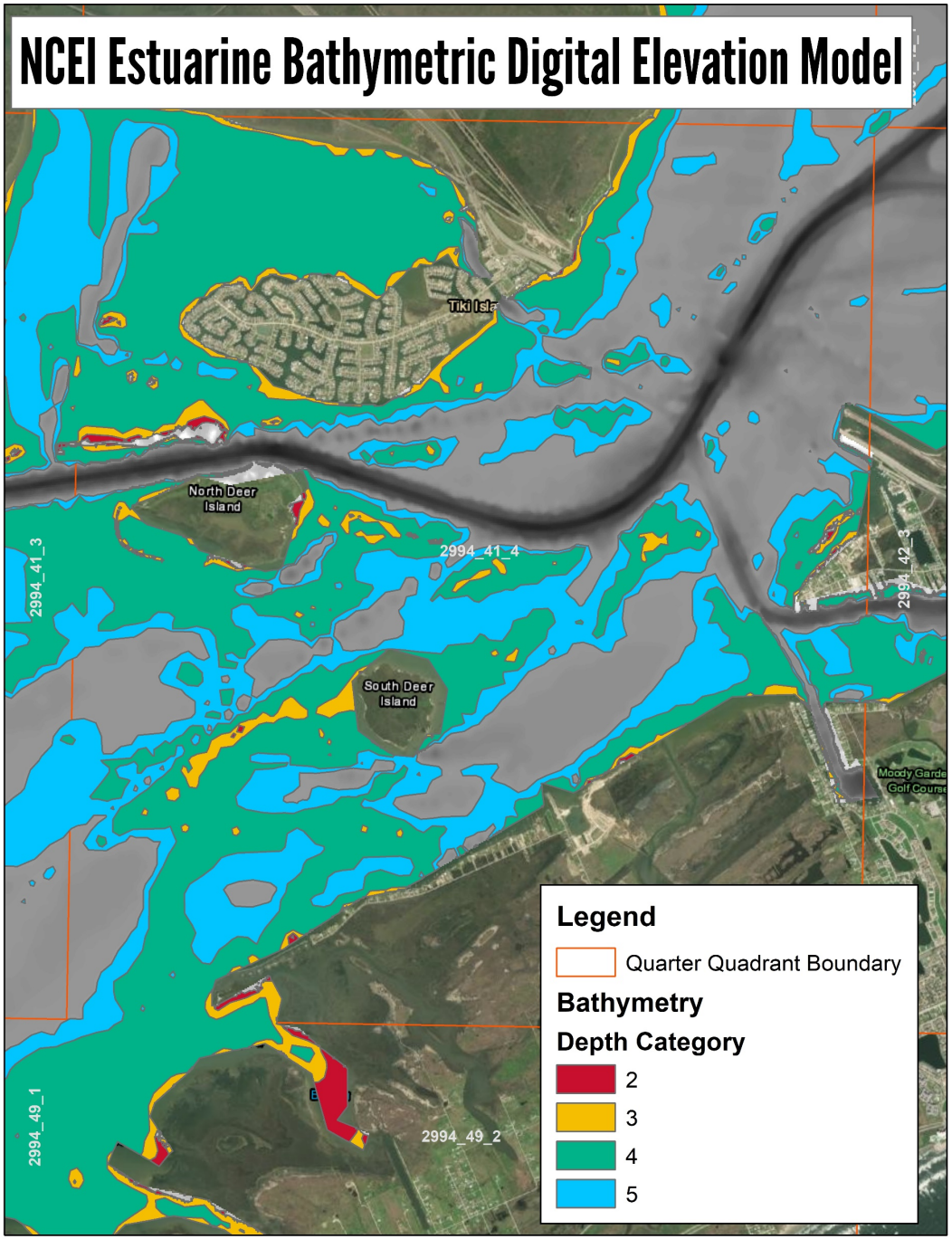
GIS Methods

- Clipped by water depths that could support intertidal reef
- NOAA tide gauges.
  - Galveston Railroad Bridge
  - San Luis Pass
- Data on (MHW), (MSL), (MLLW),Extreme Low Water
- Levels were recorded and averaged between the two stations

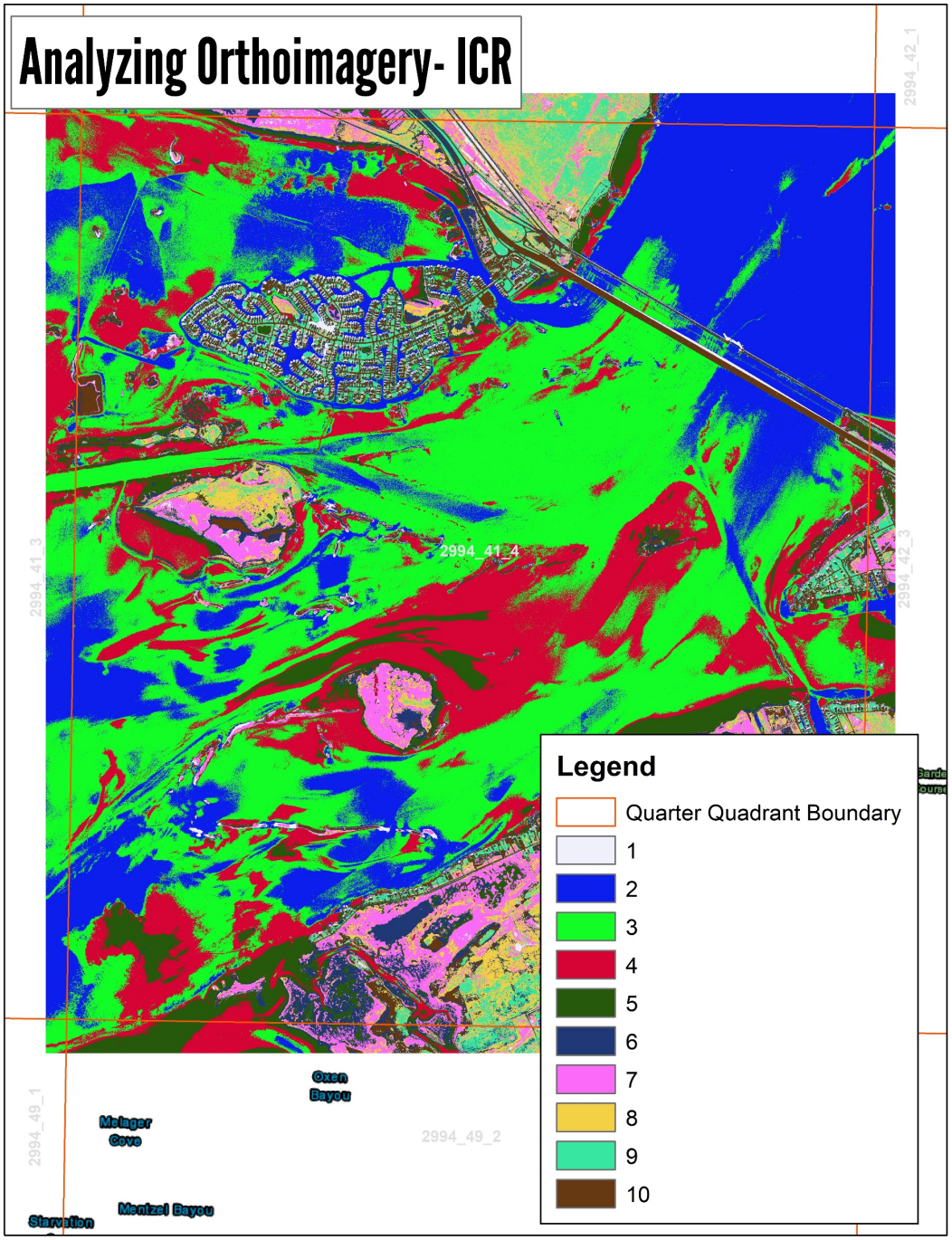
GIS Methods

- Water depths above Mean High Water (0.225 m) =1
  - discarded as not inundated enough for intertidal habitat
- Depths between MHW (0.255) and MSL (0.12m) = 2
- MSL (0.12) to MLLW (-0.105m) = 3
- MLLW (-0.105m) to Extreme Low (-0.6575m) = 4
- Extreme Low (-0.6575m) to -1m = 5
- any depth greater than -1m = 6
  - considered too deep



GIS Methods

- Iso cluster unsupervised classification tool
  - sorted into categories based on pixel colors
  - using the Iso Cluster and Maximum Likelihood Classification tools
- Run with 10 classes
- QQ analyzed individually
  - changes in color and reflections
    - time and day of data recording
    - light variance



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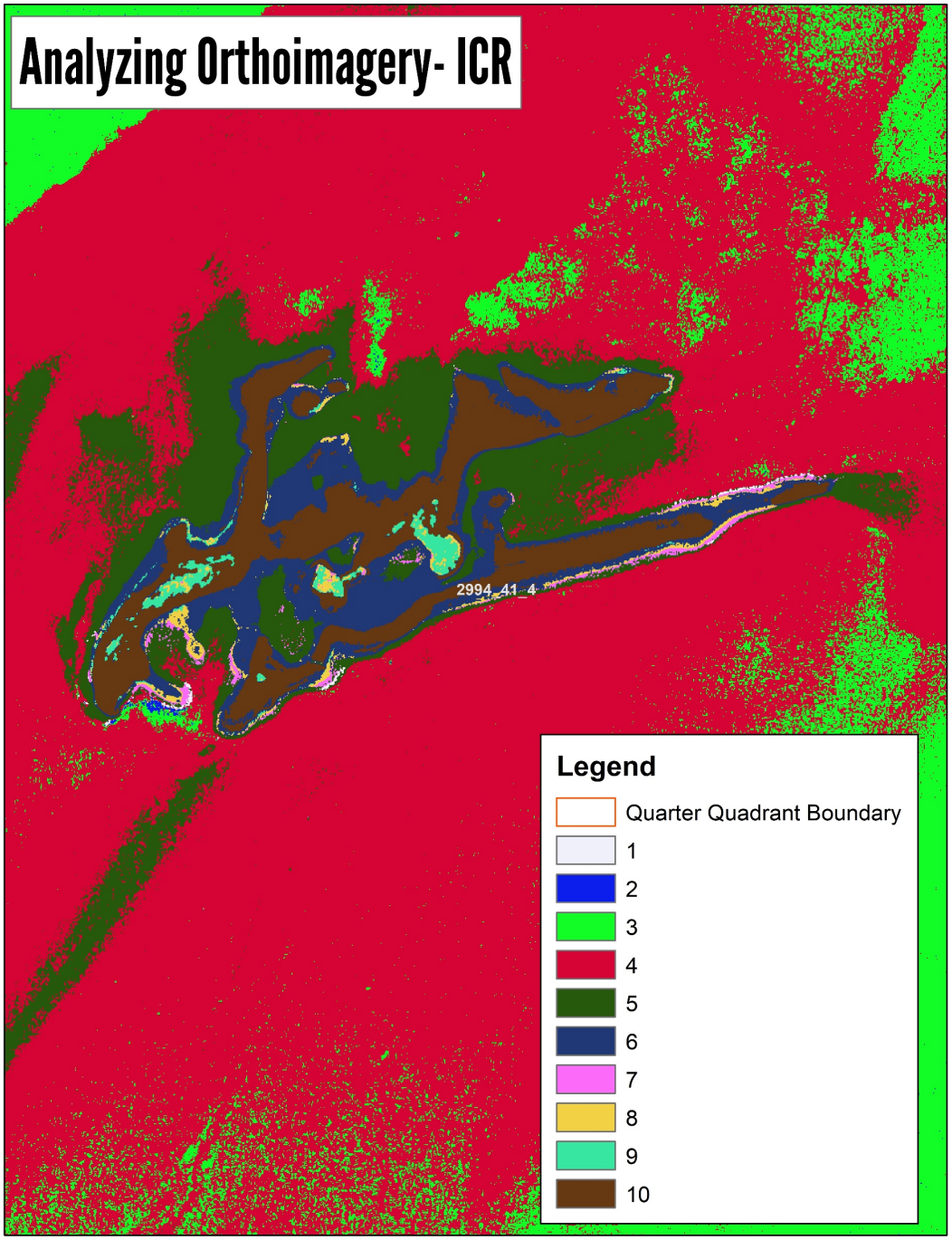
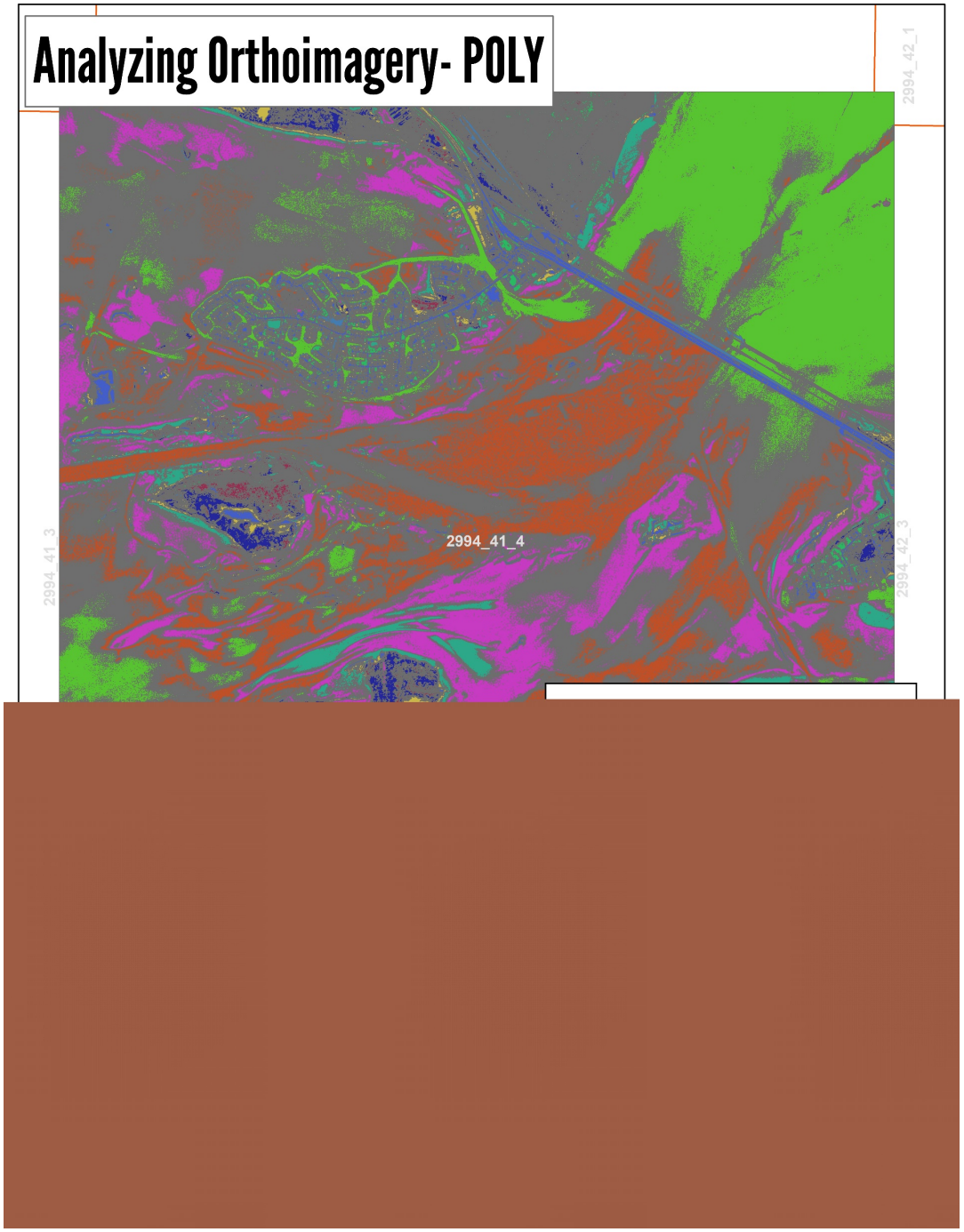


GIS Methods

- Rasters converted to polygons using the Raster to Polygon tool in Modelbuilder



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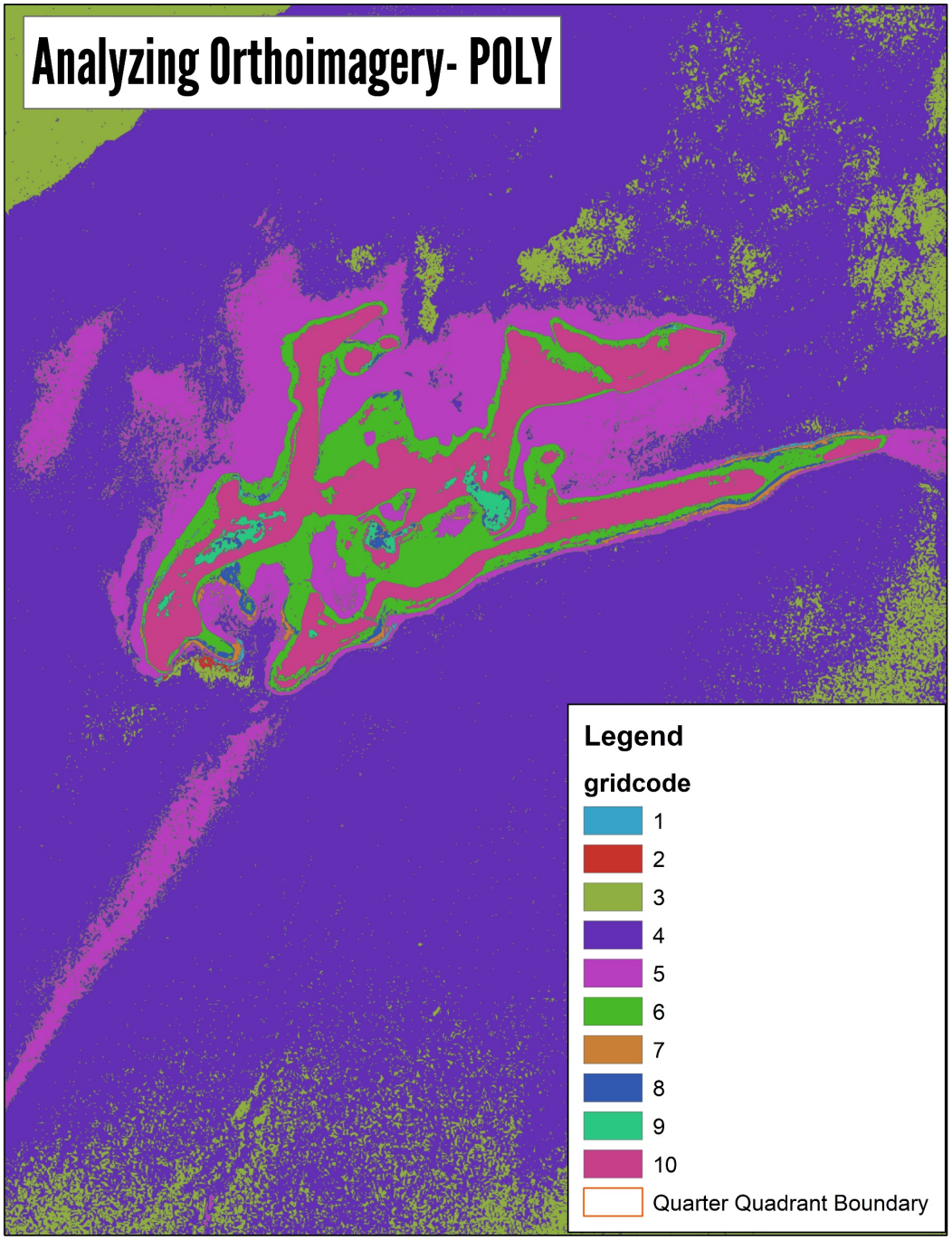
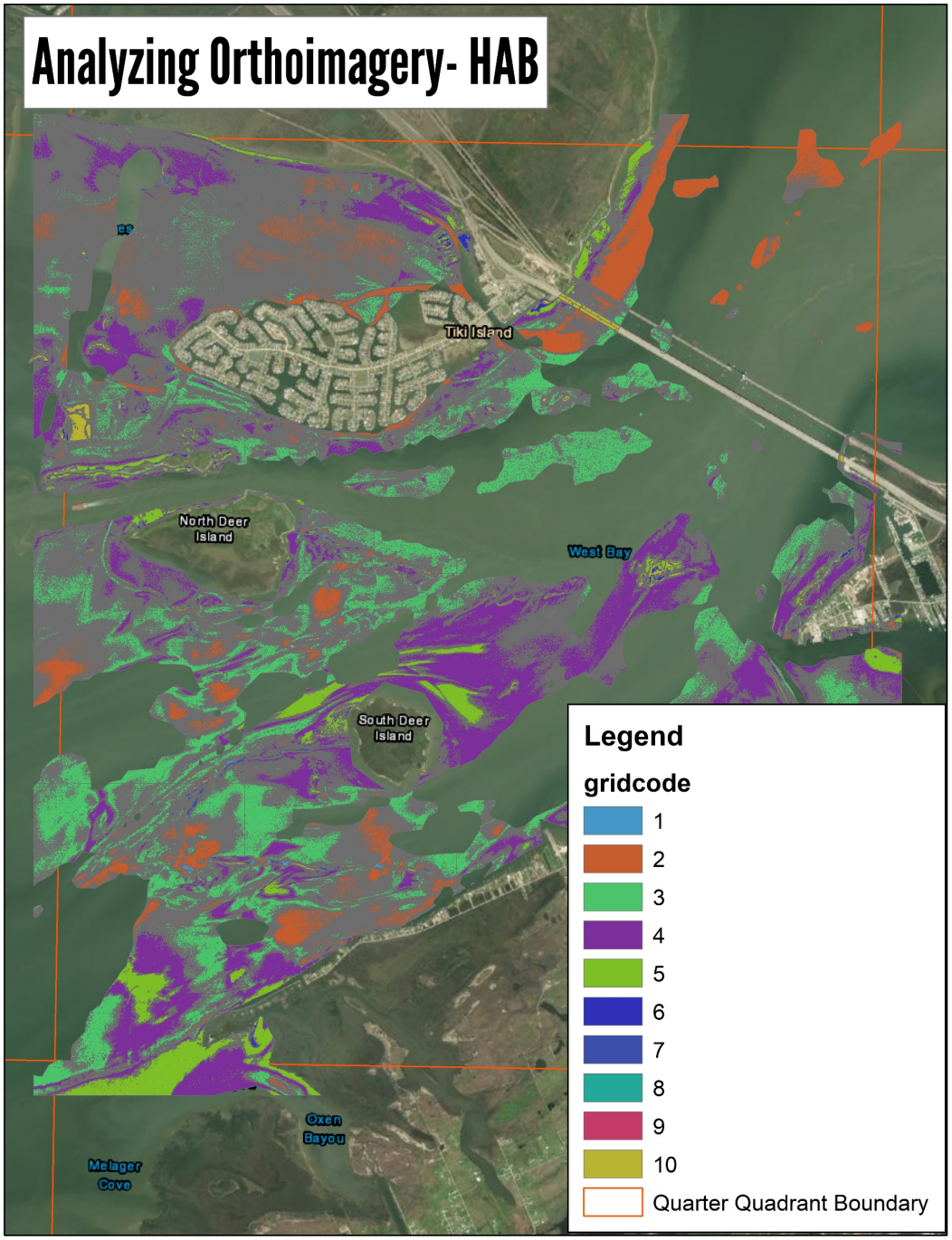


GIS Methods

- Polygons were clipped to water depths that could support intertidal reef



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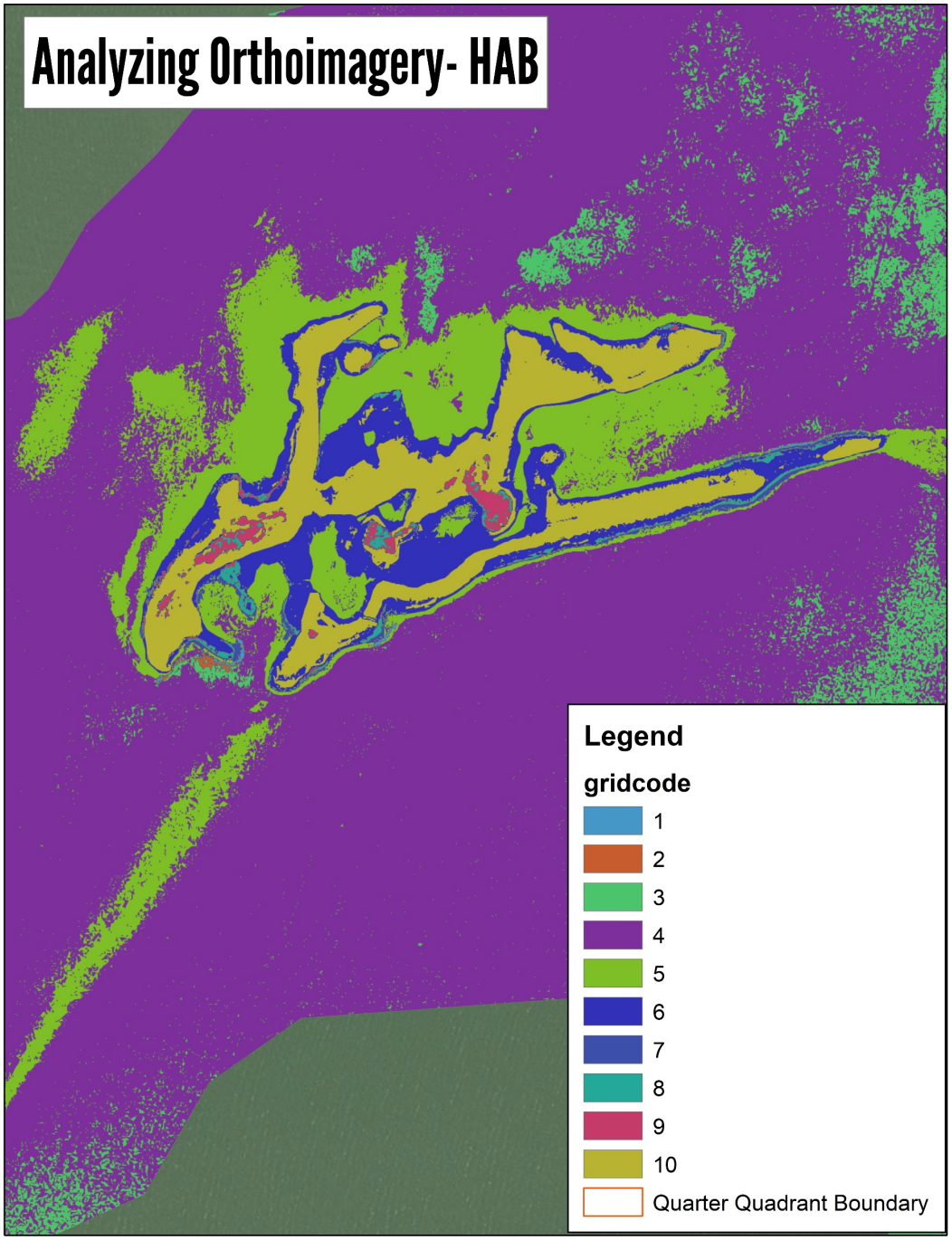
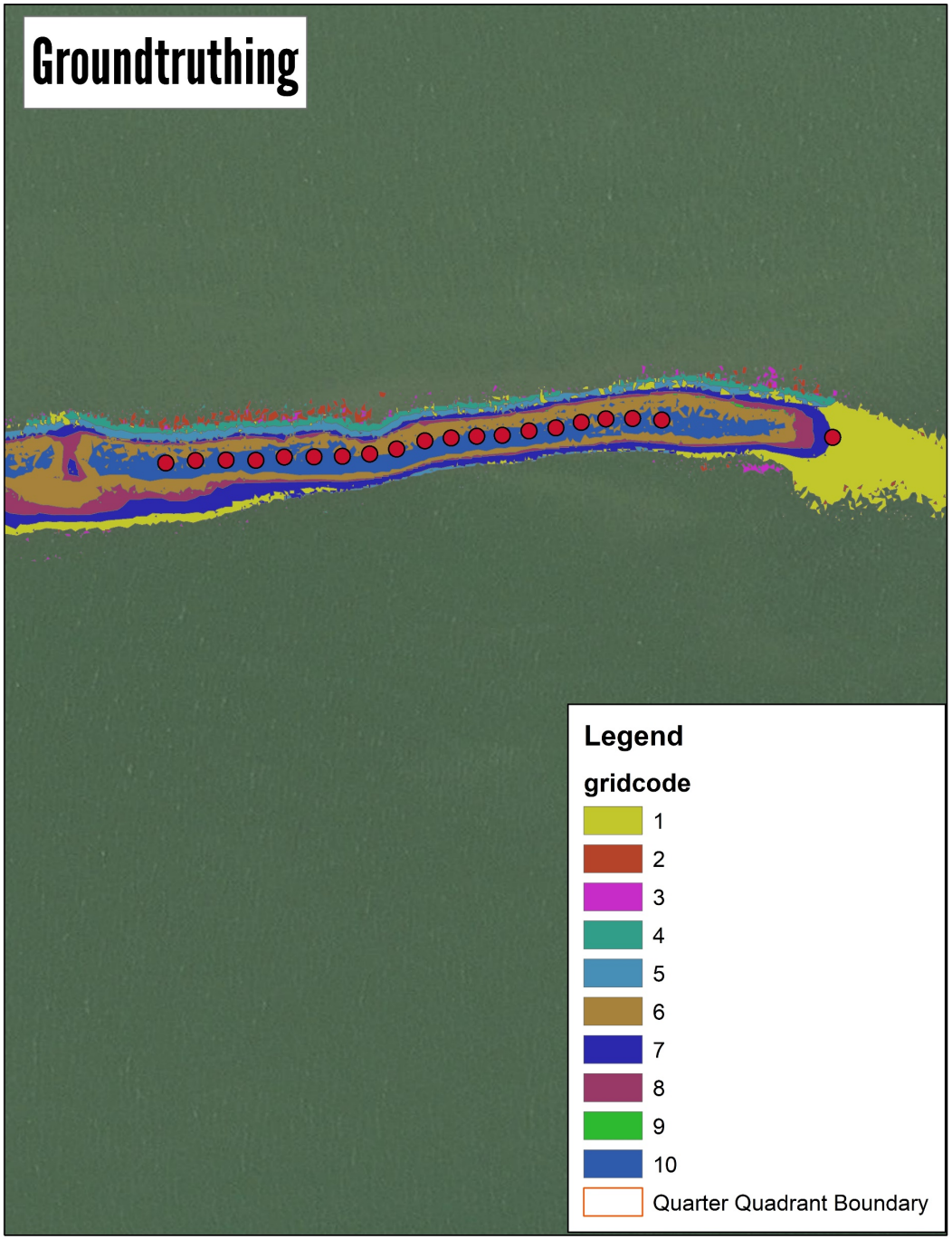


GIS Methods

- Polygons removed that were obviously vegetation, other habitat types

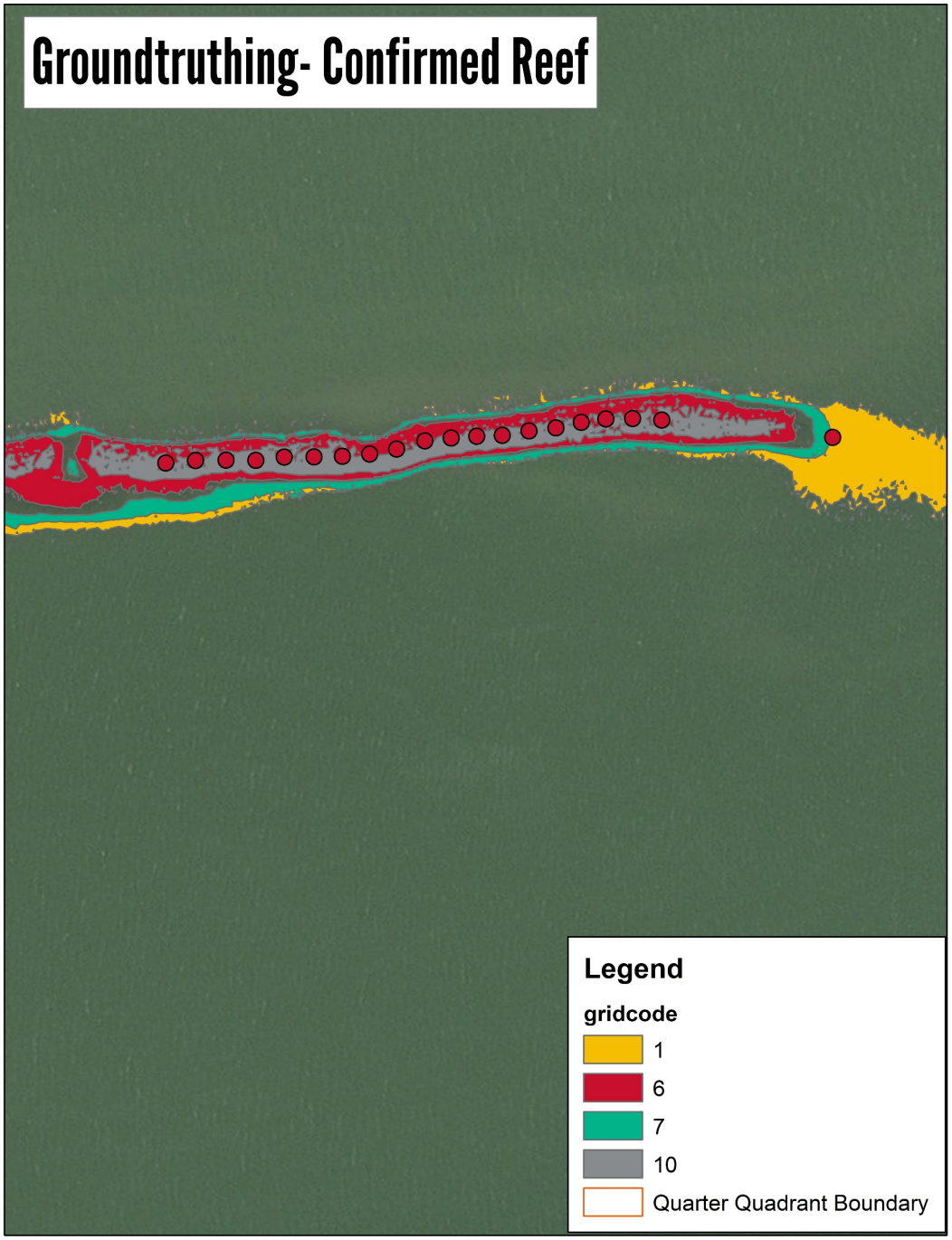
GIS Methods

- Groundtruthed October 2019-February 2020 for accuracy
- 10 randomized points were generated in possible reef polygons for each QQ
- Start at 1, progress to next if no reef
- Once reef found, GPS points taken of confirmed habitat



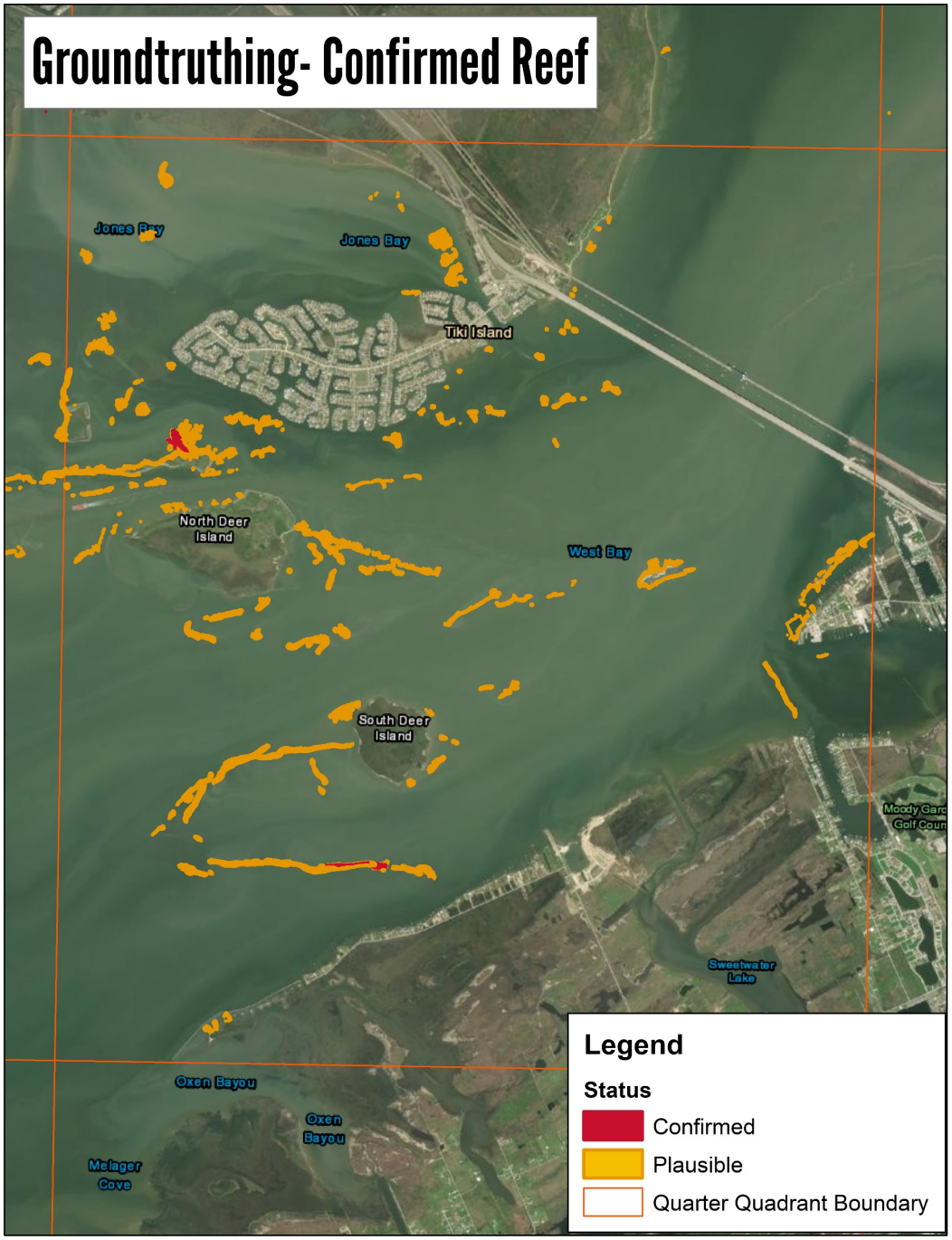
GIS Methods

- Once reef found, GPS points taken of confirmed habitat
- Gridcodes of polygons that held confirmed GPS points recorded



GIS Methods

- Once reef found, GPS points taken of confirmed habitat
- Gridcodes of polygons that held confirmed GPS points recorded
- Polygons with the same gridcode # as confirmed were labeled “Plausible” reef



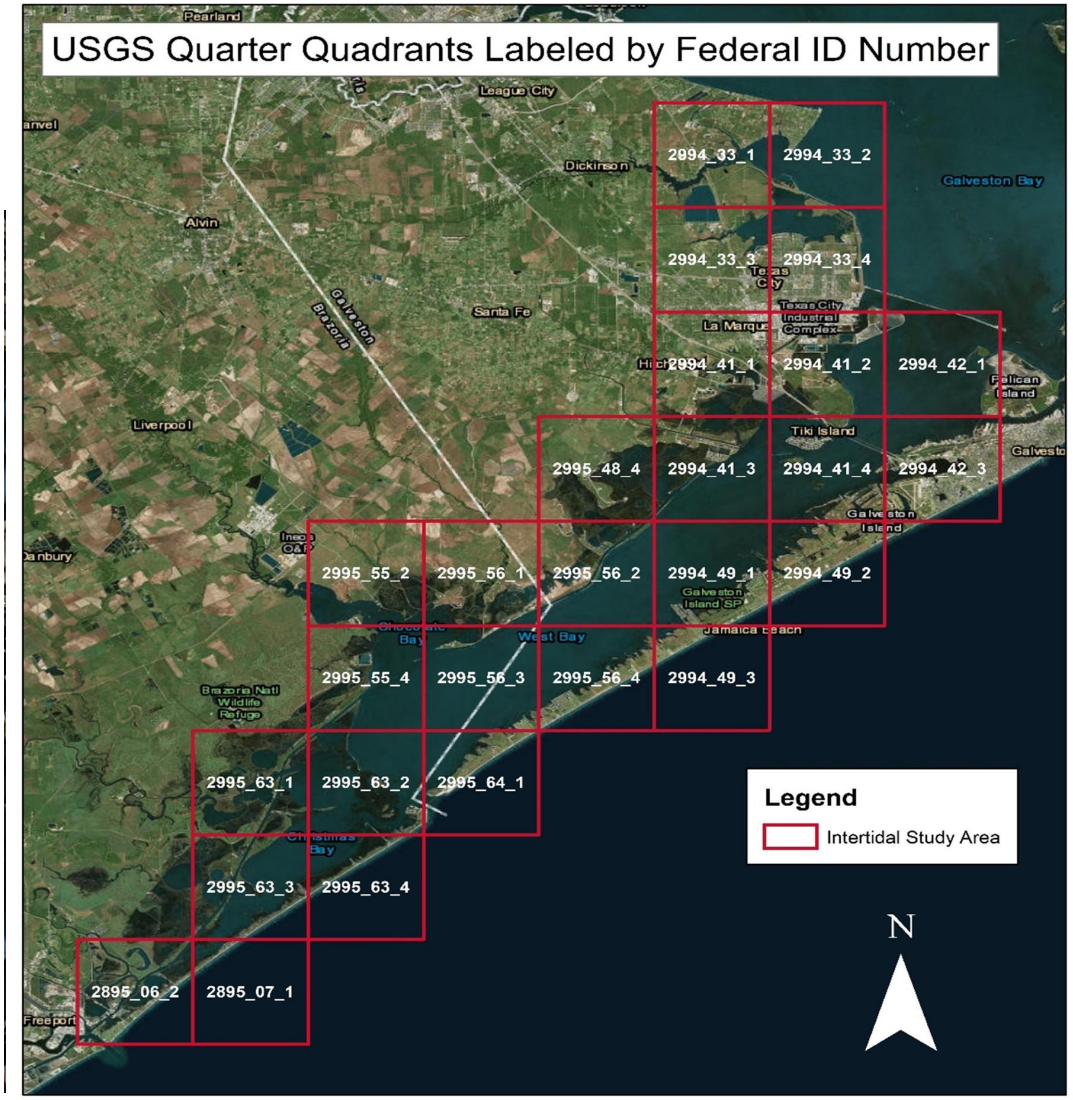

Groundtruthing- Confirmed Reef
Legend
Status
Plausible
Quarter Quadrant Boundary


Analyzing Orthoimagery- Jigsaw Island
Legend
Quarter Quadrant Boundary
2015 TOP Image
RGB
Red: Band_1
Green: Band_2
Blue: Band_3

Field Methods

Representative intertidal reefs from QQs with accessible reefs (n=13)

- Reef characteristics
- Oyster Population characteristics
- Reef associated benthic macrofauna (ABM)
- Avian utilization



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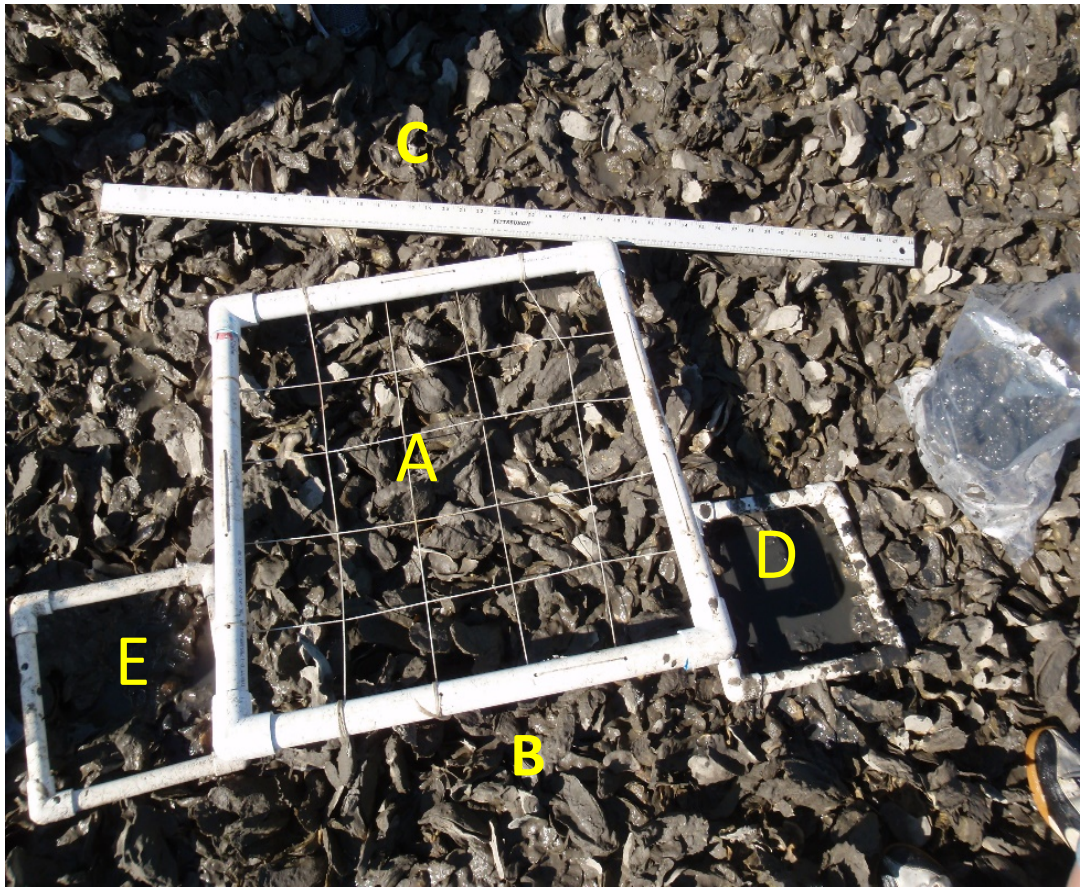

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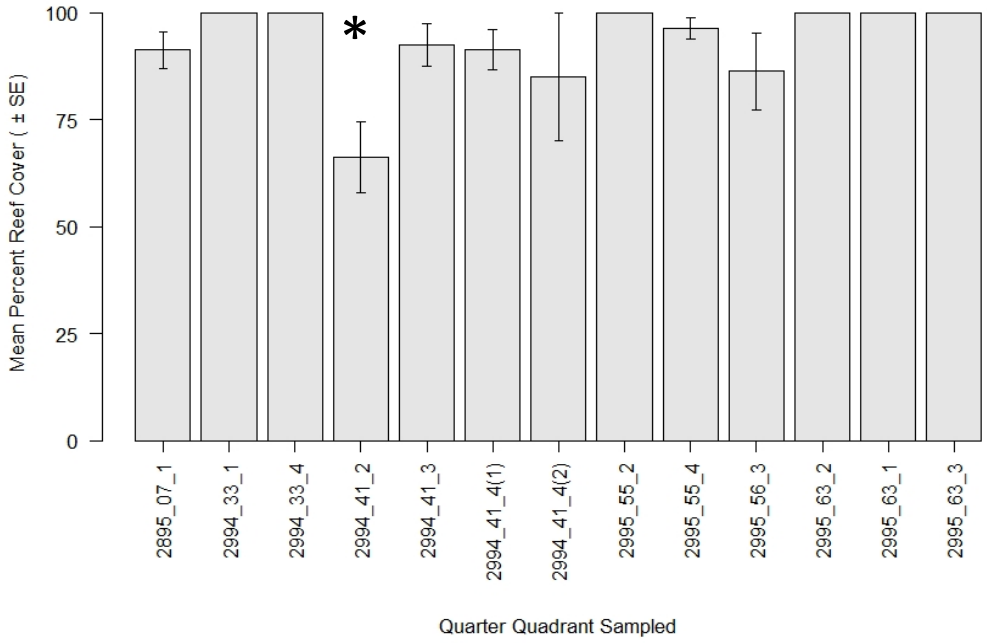
Avian Reef Survey Ethogram

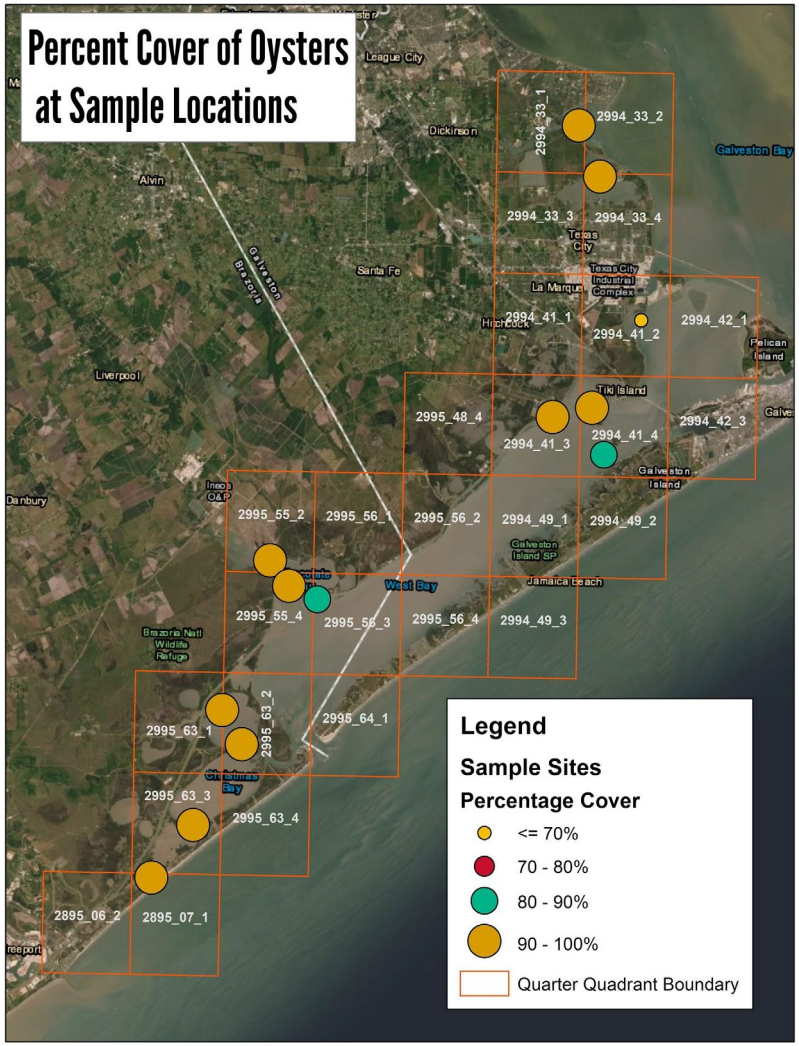
	Loafing	Bird is alert and standing or laying on reef without head tucked.
 	Feeding	Bird is actively searching for food along reef or handling prey
	Roosting	Bird is standing or laying down with head turned backwards and tucked under wing or bill laying along back.
	Preening	Bird is actively preening or arranging it's feathers
	Bathing	Bird is splashing in water, throwing water over its back or dipping under the water.
	Other	Any behavior not listed above, note what bird is doing on datasheet

Landscape Influence on Oyster Populations: Results

- Reef Characteristics
  - Percent Reef Cover
  - Percent Live Oysters
  - Mean Reef Height
  - Reef Rugosity
- Oyster Population Characteristics
  - Oyster Density
  - Oyster Size (SH)
  - Oyster Condition
- ABM
  - Richness
  - Diversity
  - Driving Factors
- Avian Utilization

Percent Reef Cover





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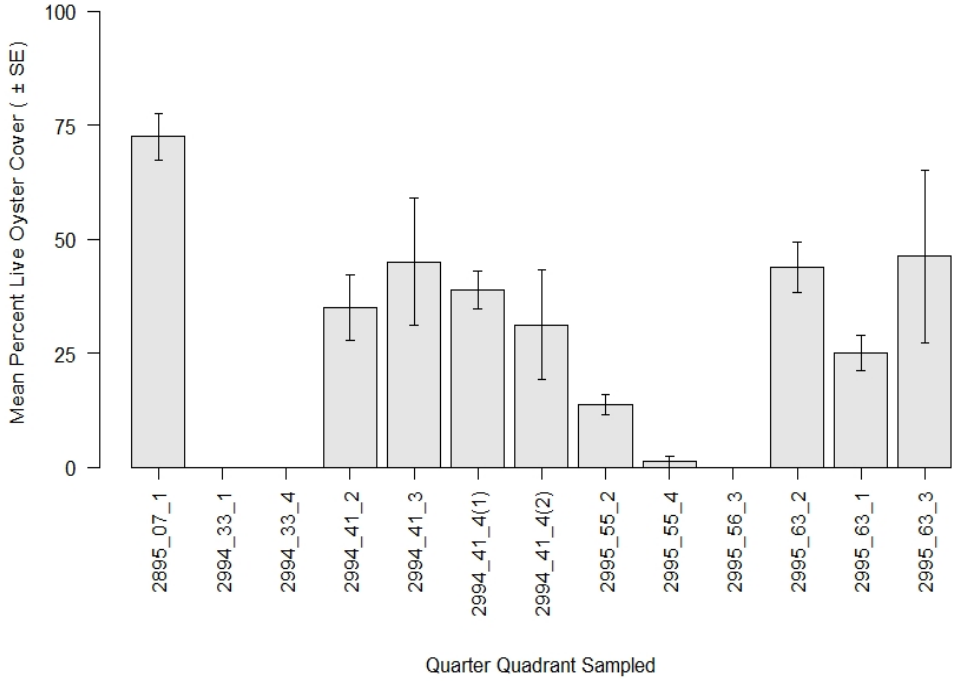
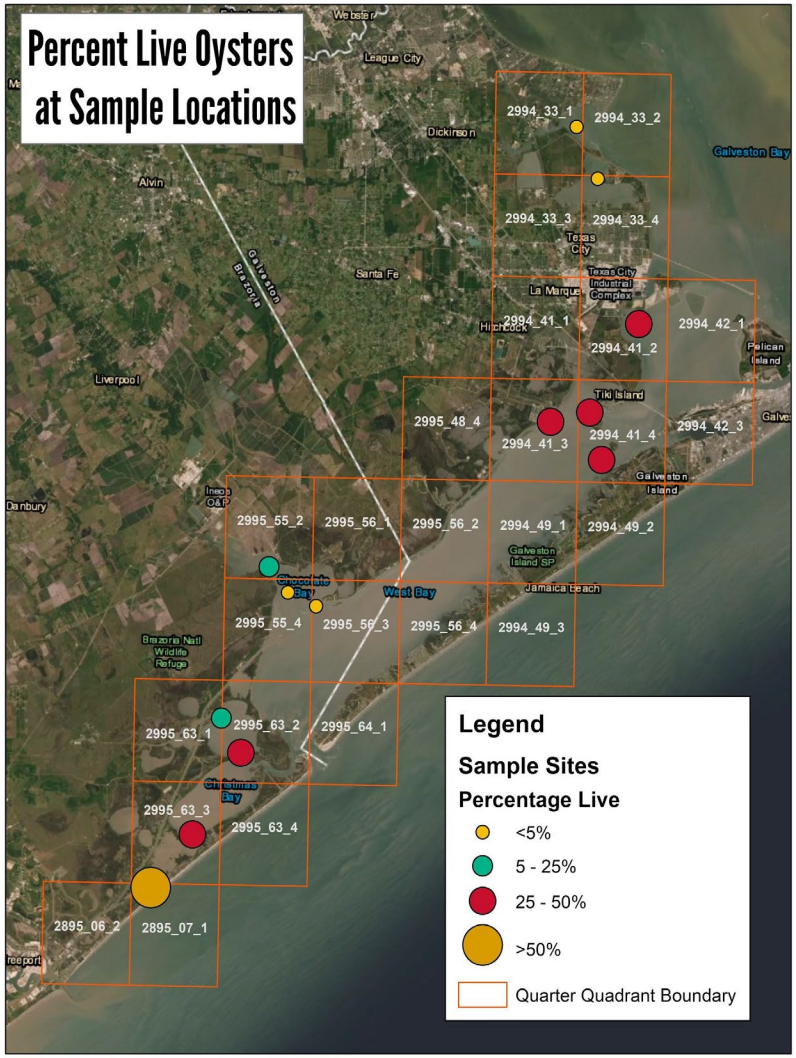
Percent Live Oysters





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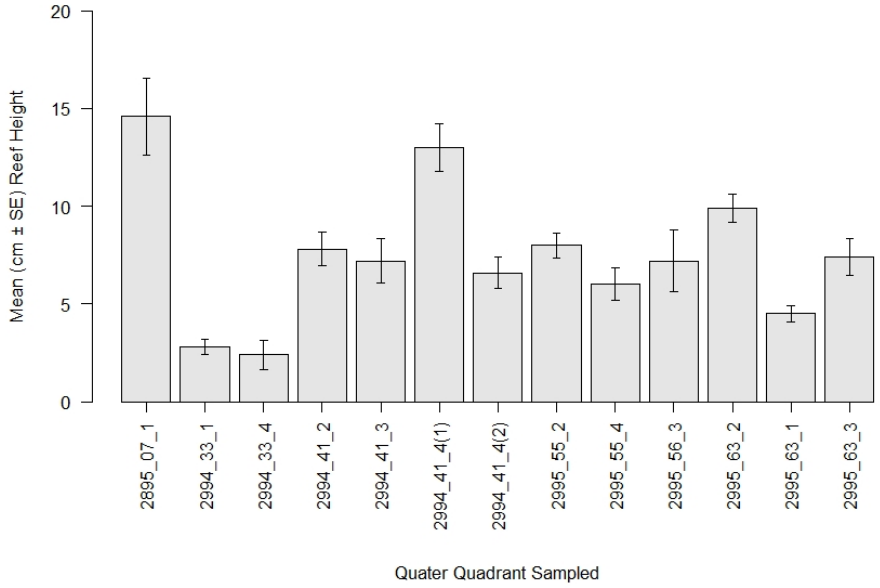
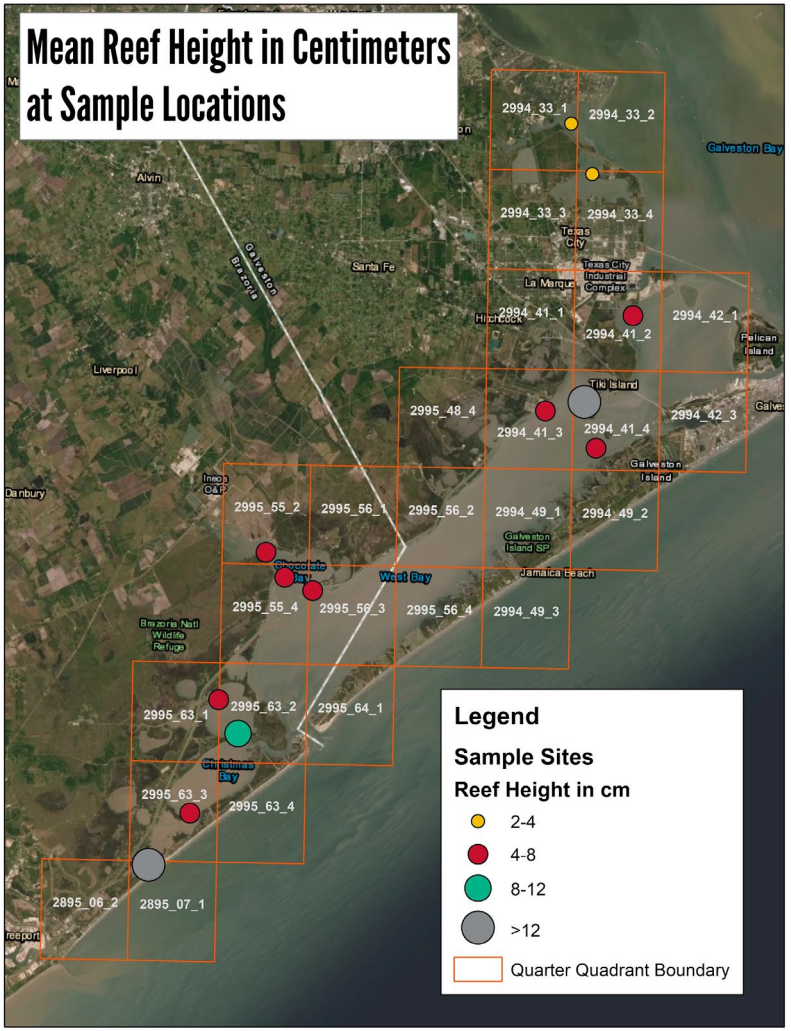
Mean Reef Height





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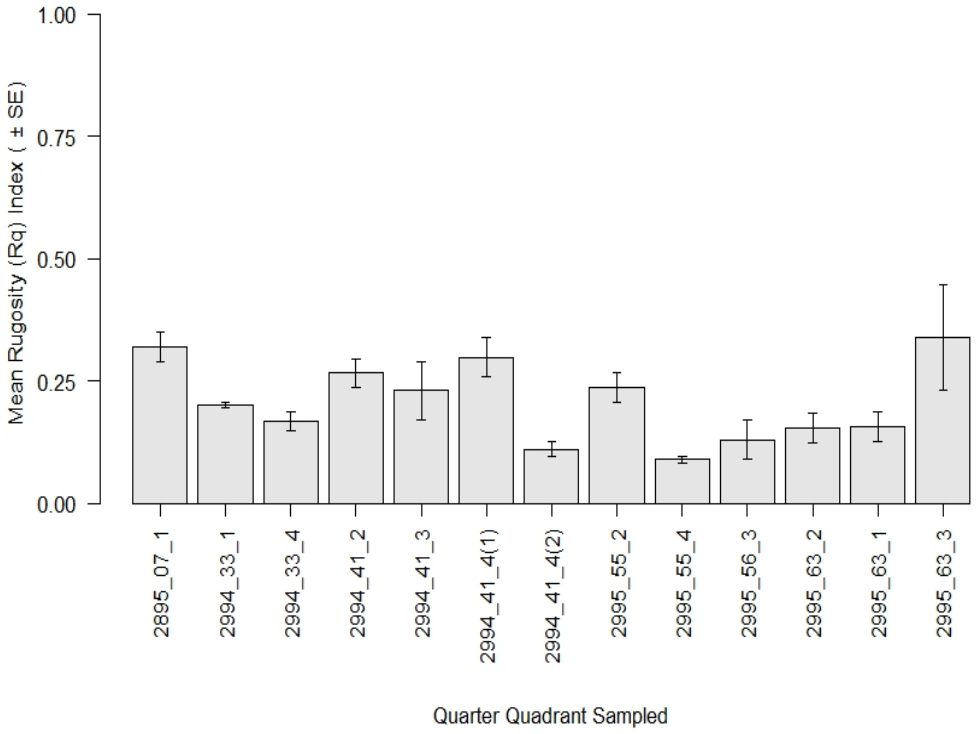
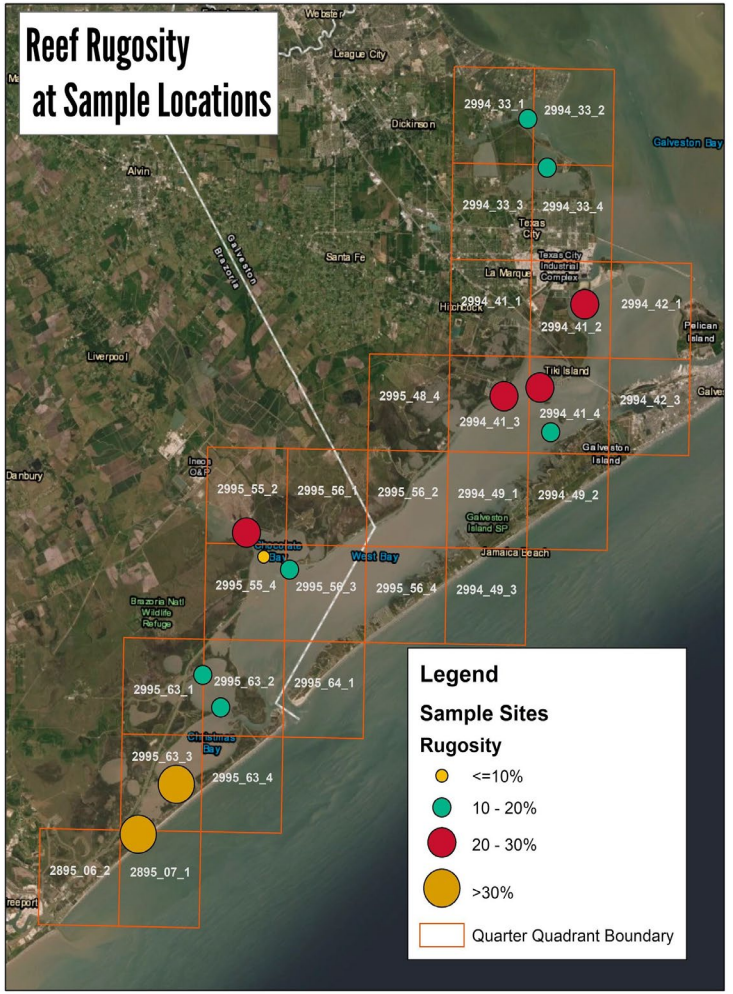
Reef Rugosity





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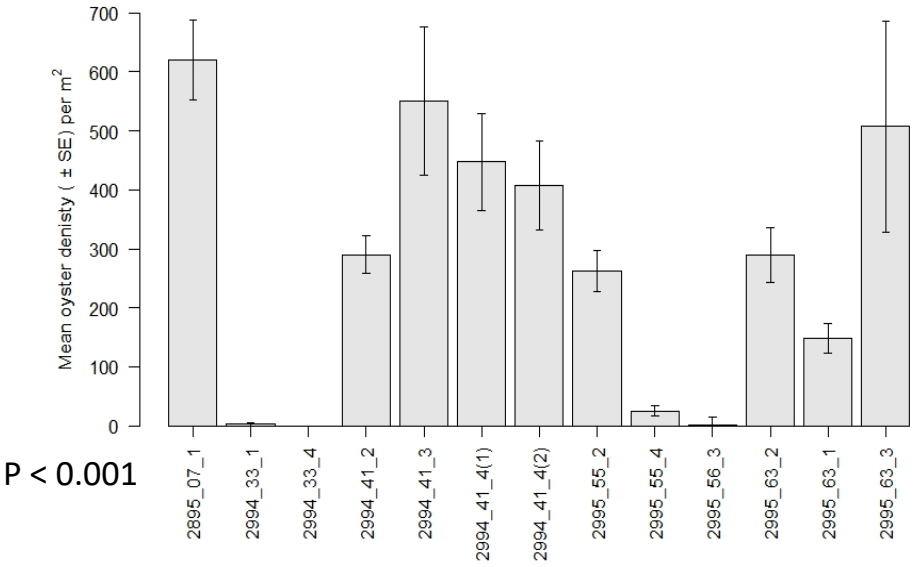
Oyster Density



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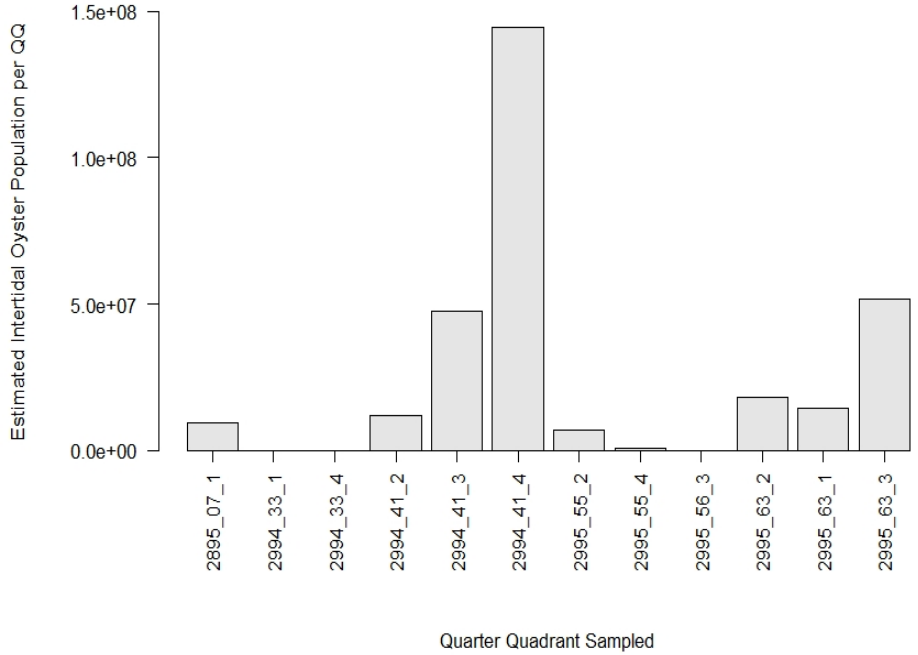
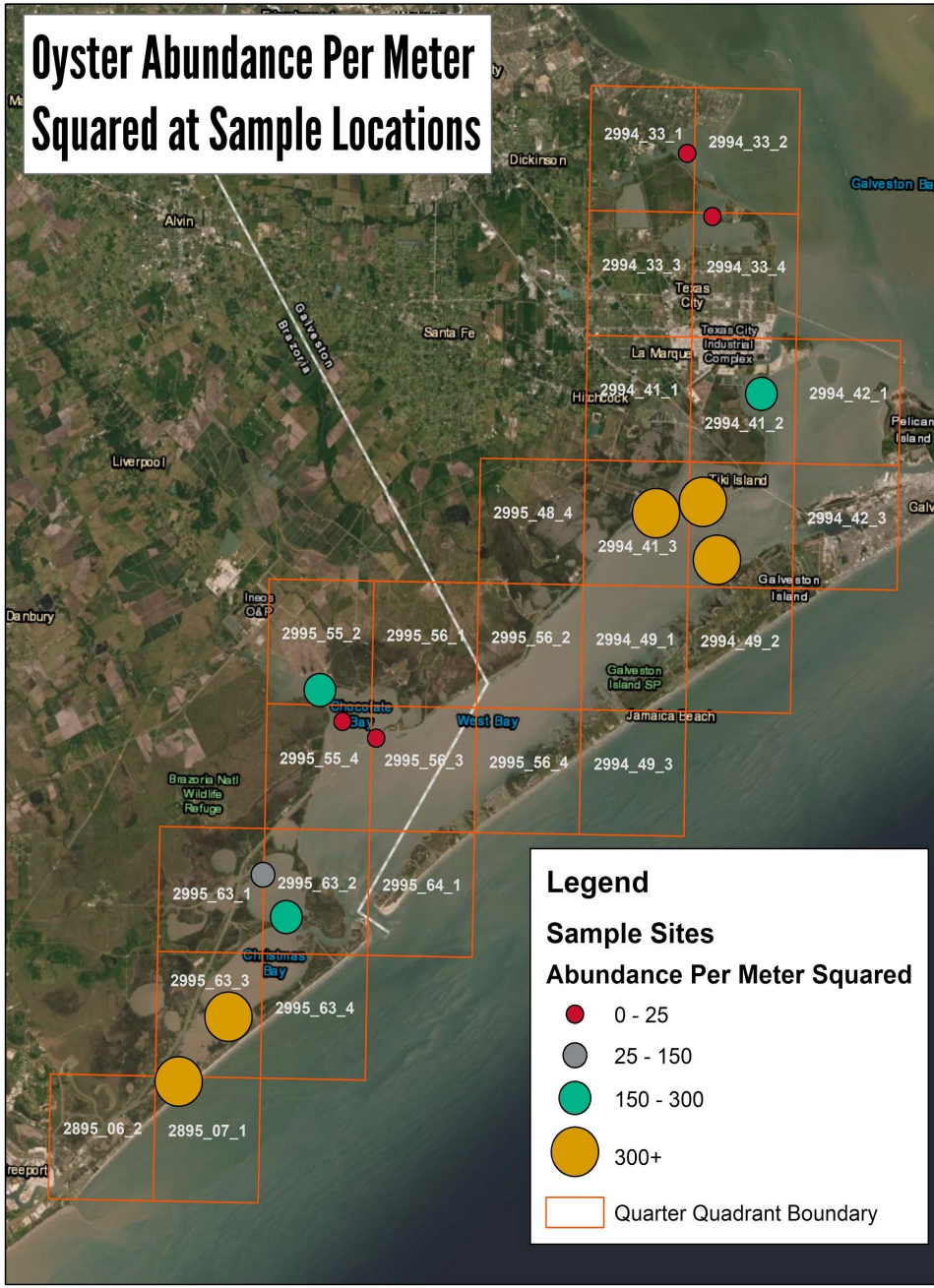
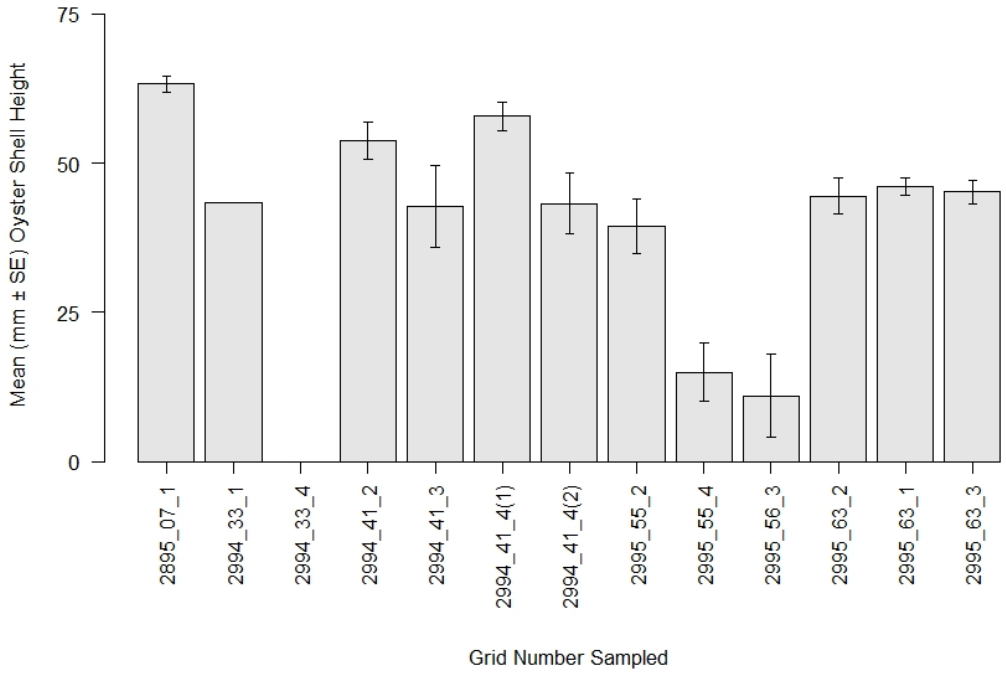
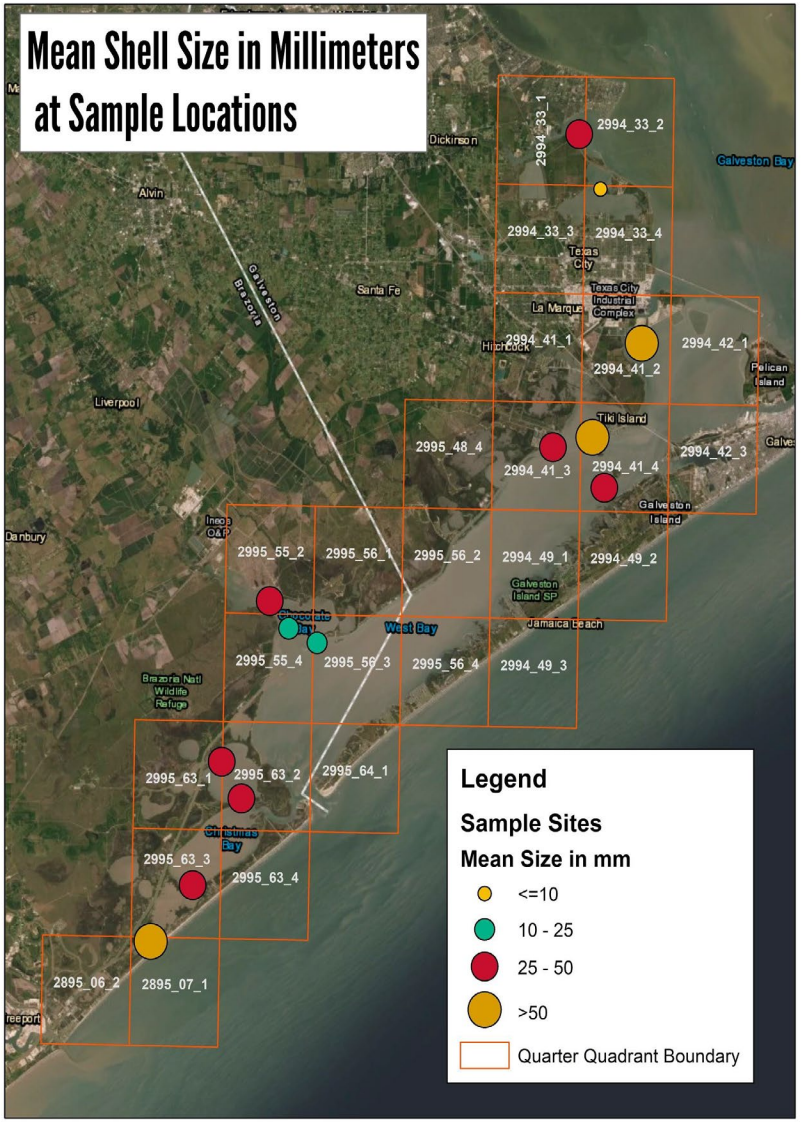




Oyster Size (SH)





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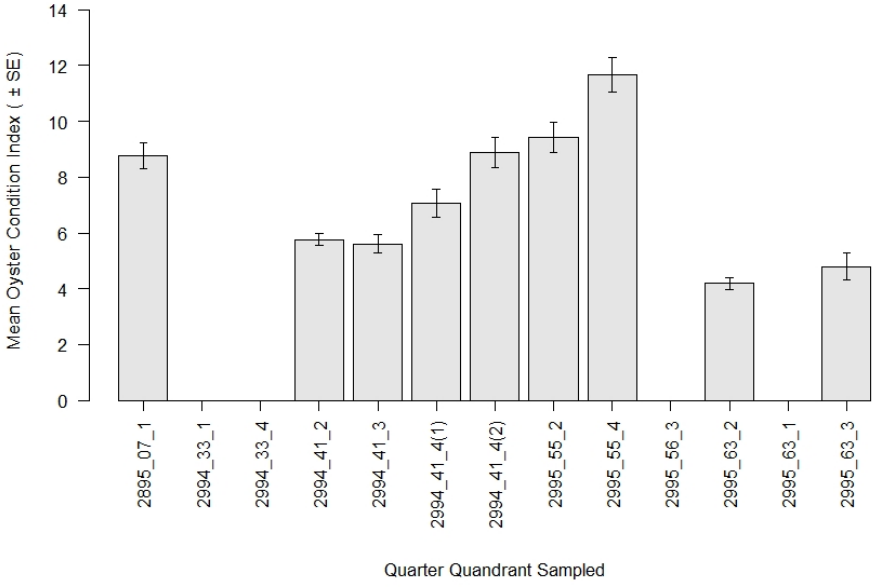
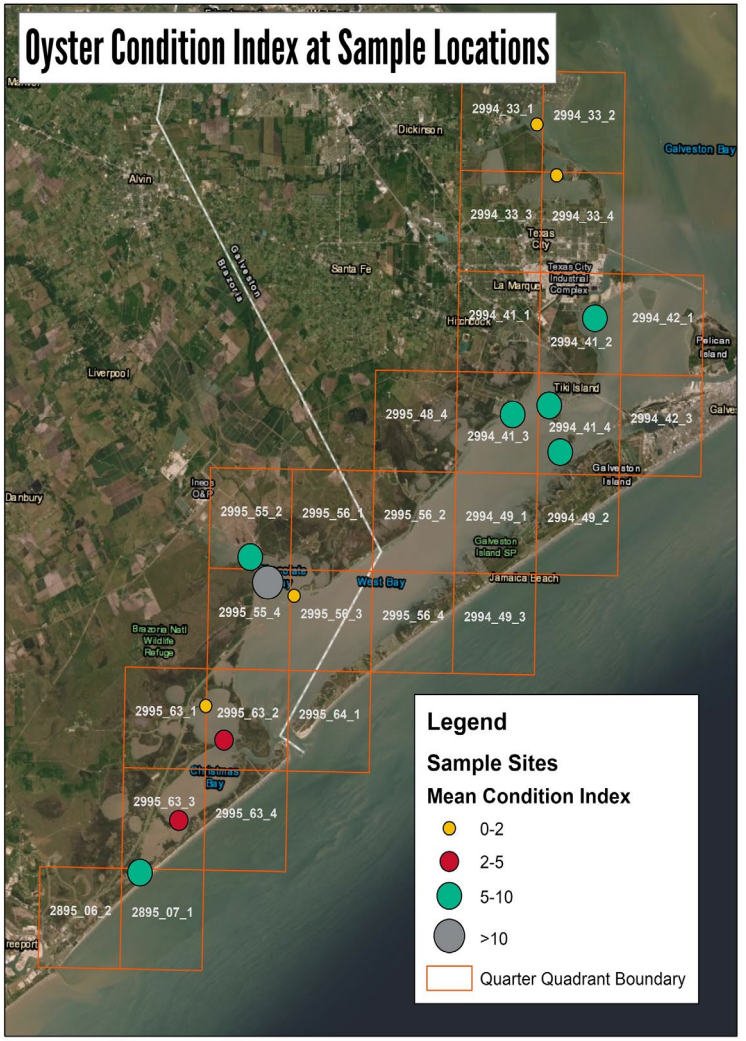
Oyster CI





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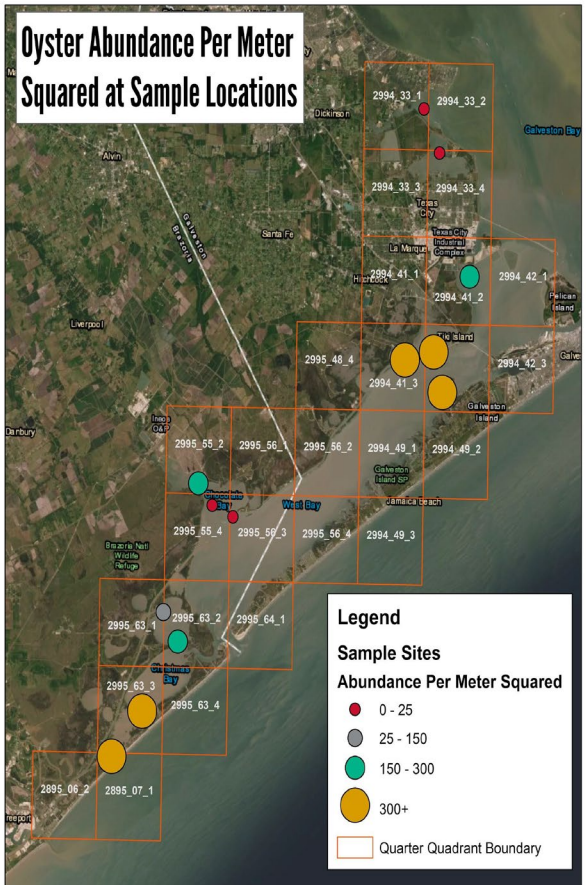
Intertidal Reefs in West Galveston Bay Summary

- Spatial Location of Intertidal Reefs
  - 59,931 m^2 (14.8 acres) of intertidal reef were confirmed by ground truthing across
  - predict that an additional 758,197 m^2 (187.35 acres) of reef habitat is plausible
  - The greatest amount of confirmed reef was located in:
  - 2994_41_2 (VIRGINIA POINT NE) QQ at 18,474.82 m^2,
  - 2994_41_4 (VIRGINIA POINT SE) QQ at 11,485.48 m^2
  - Importance of habitat quality

Intertidal Reefs in West Galveston Bay Summary

- Spatial Location of Intertidal Reefs
- Categorization of Intertidal reef types:

Shell Rakes



Functional Reefs

Landscape Influence on Oyster Populations: Results

- Reef Characteristics
  - Percent Reef Cover
  - Percent Live Oysters
  - Mean Reef Height
  - Reef Rugosity
- Oyster Population Characteristics
  - Oyster Density
  - Oyster Size (SH)
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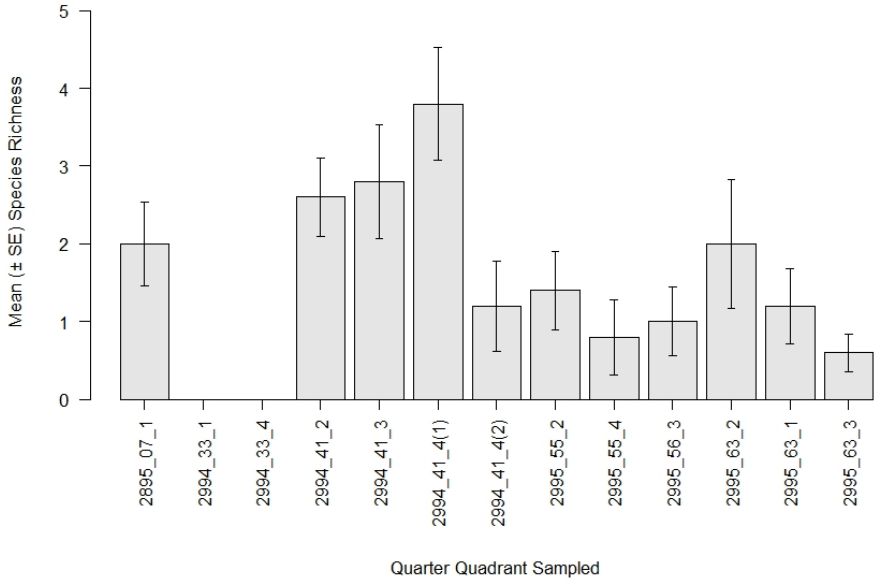
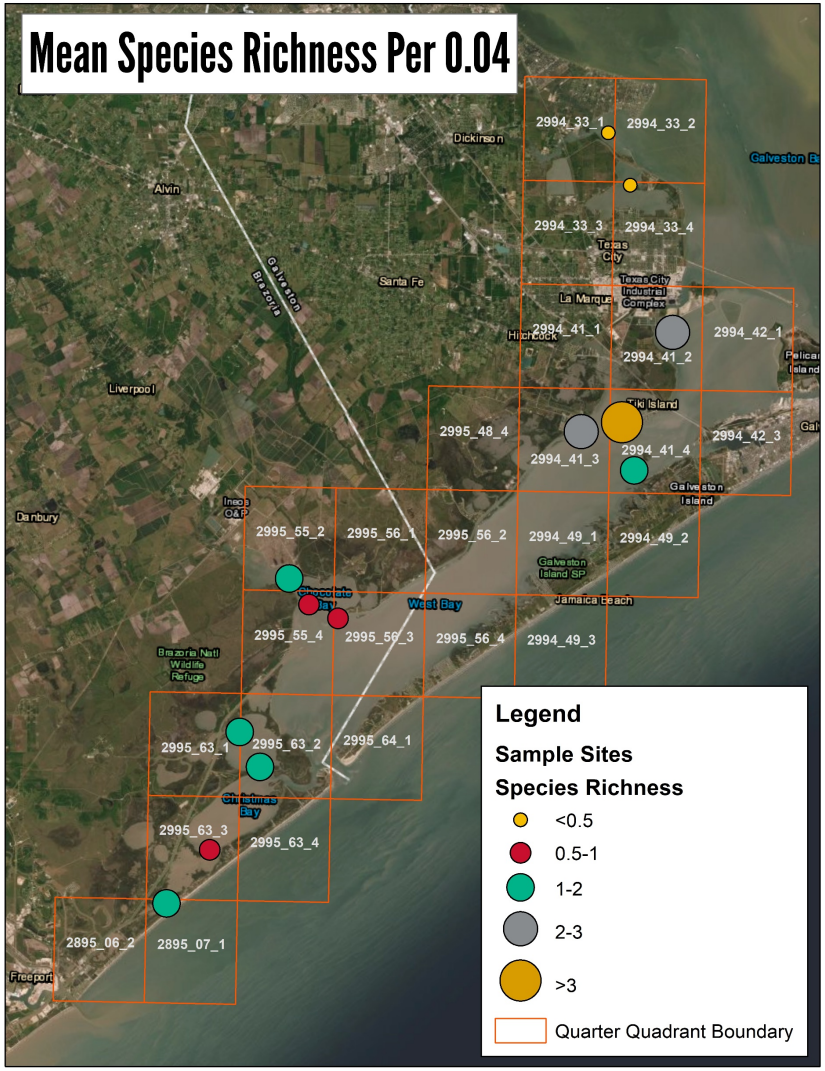
  - Richness
  - Diversity
  - Driving Factors
- Avian Utilization

ABM Richness





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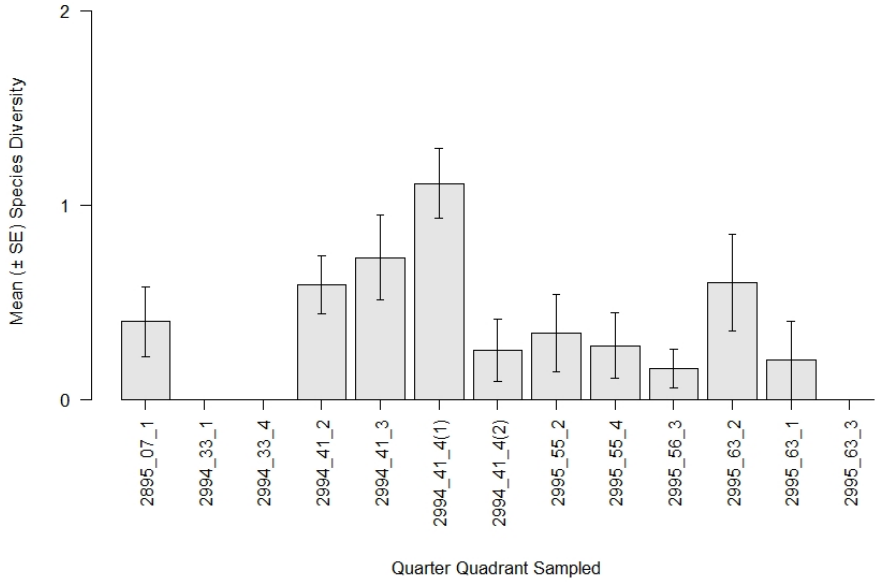
ABM Diversity



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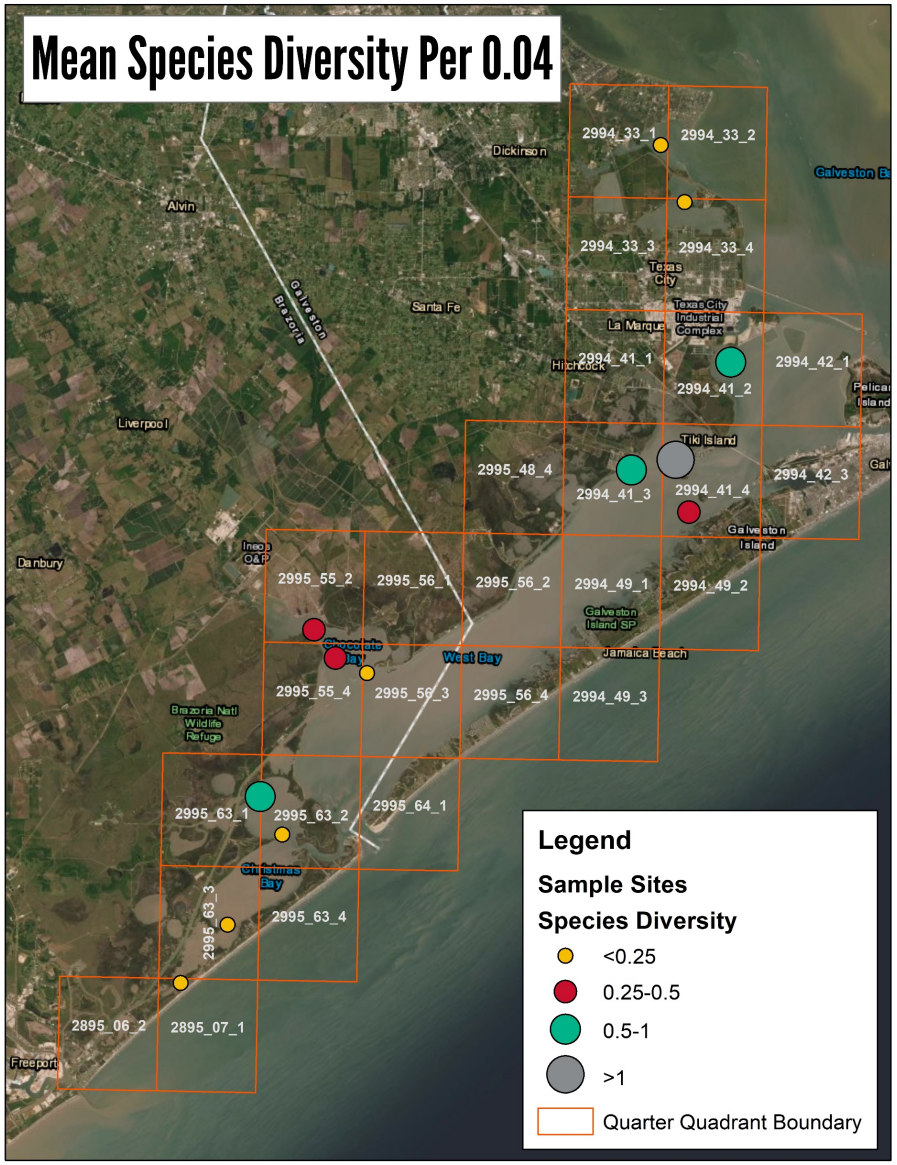
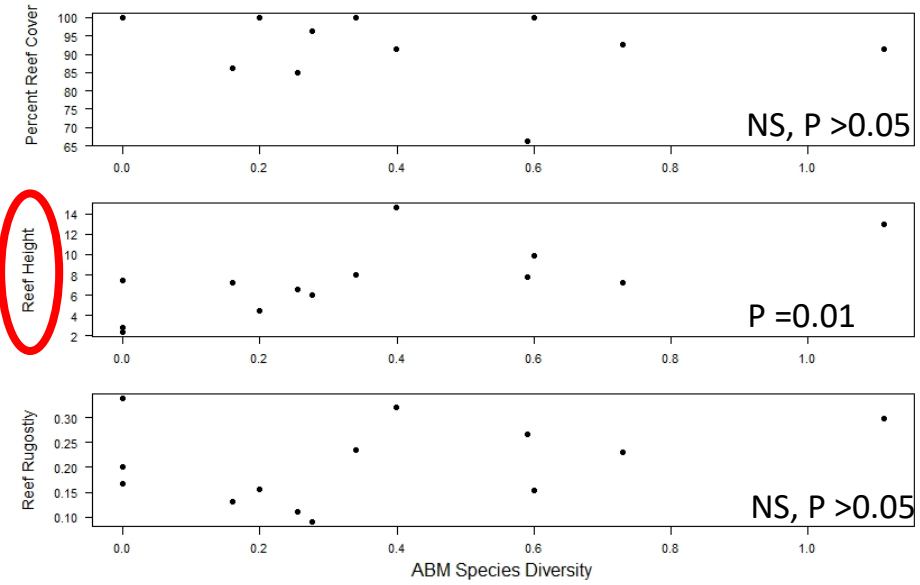
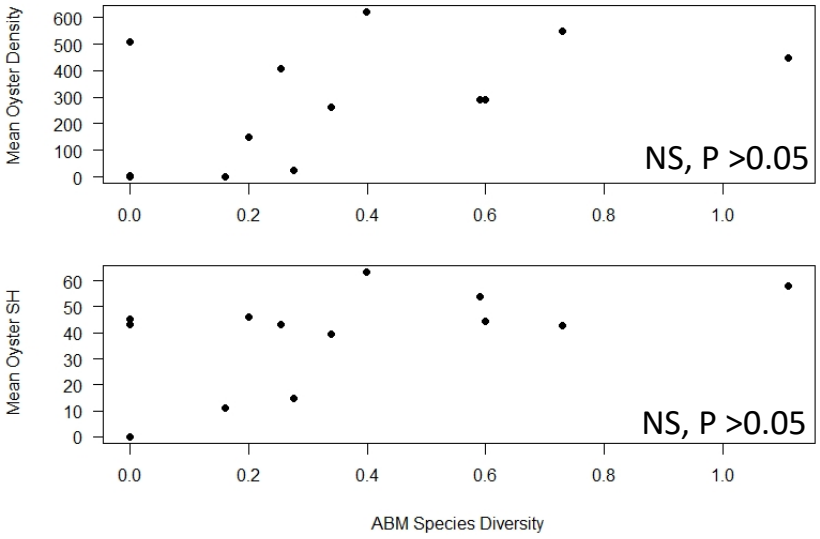


Factors Driving ABM Community

Reef Characteristics



Oyster Population Characteristics



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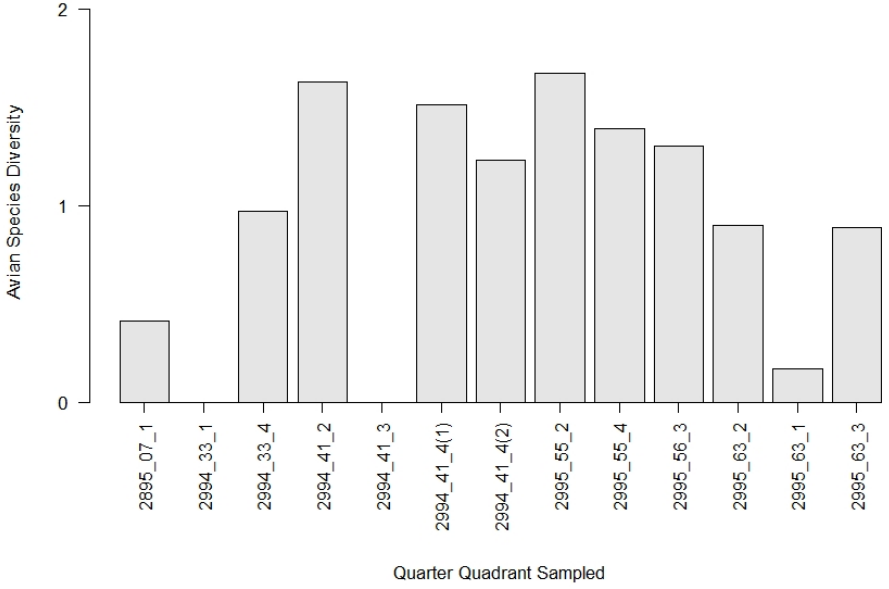
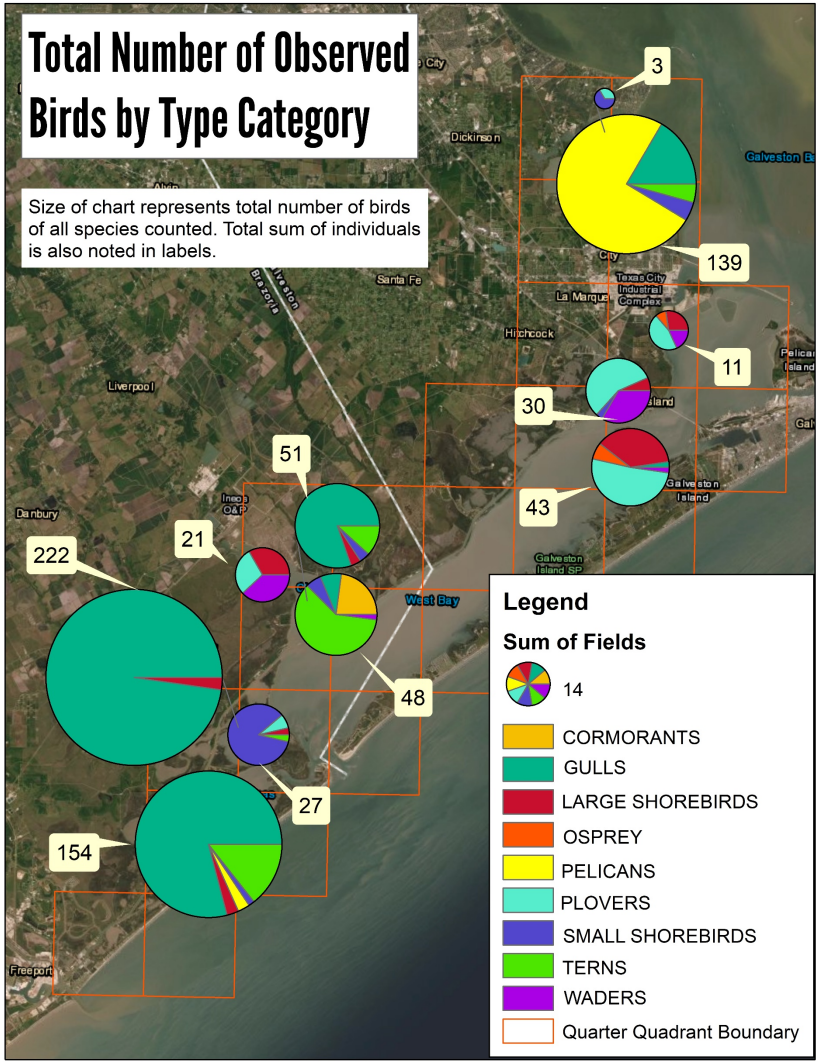
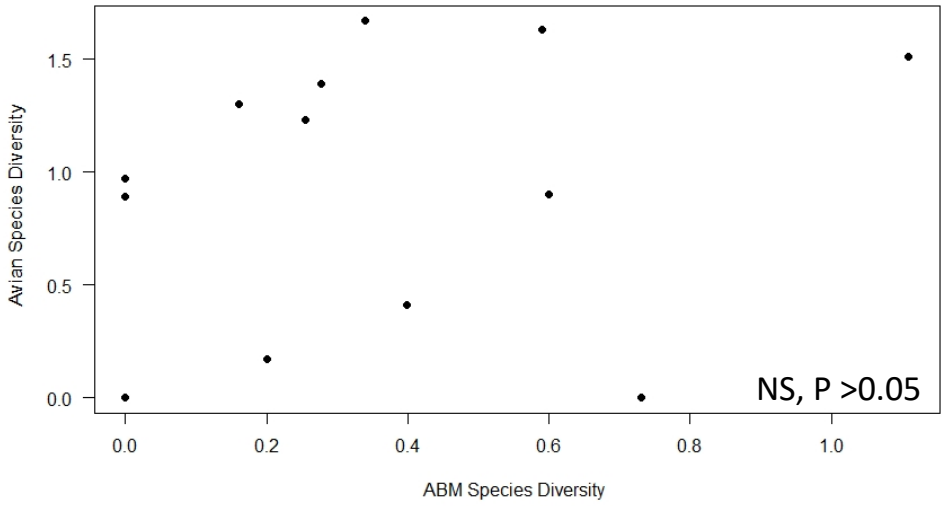
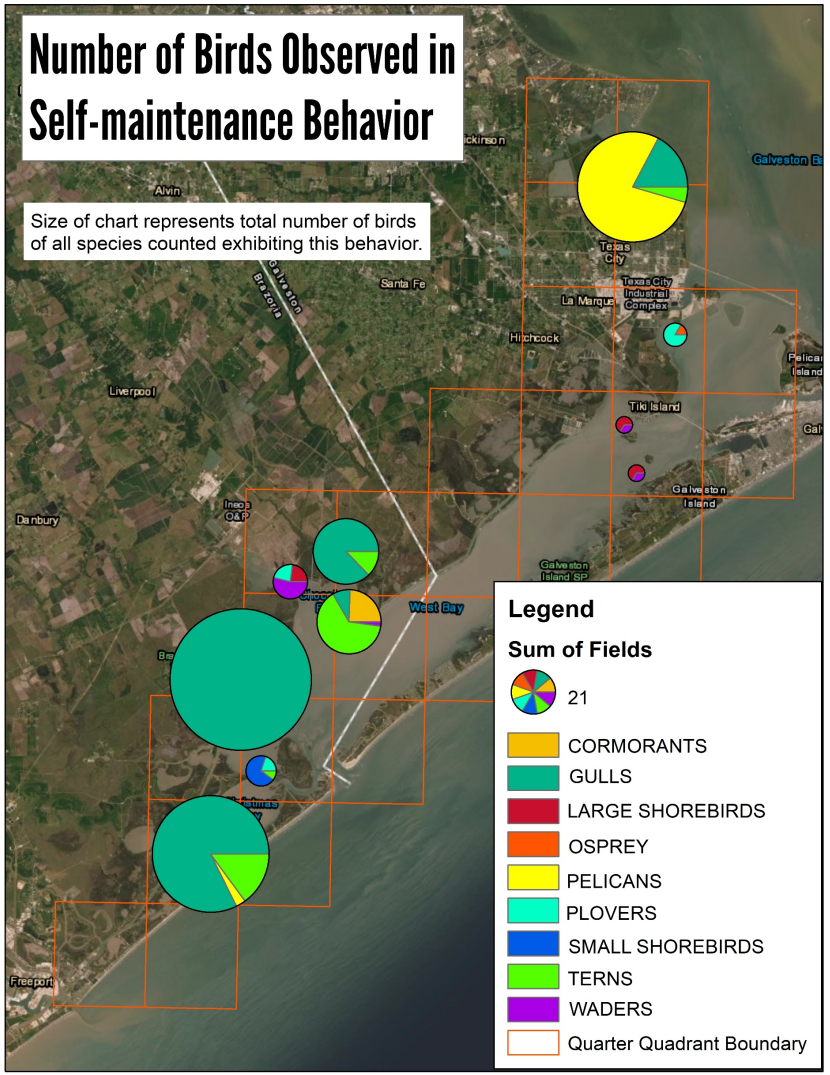




Avian Behavior





PPE Supported Story Map

https://arcg.is/1XHKGS0