






**Matagorda Bay
Ecosystem Assessment**

2020 Update Meeting
November 10, 2020

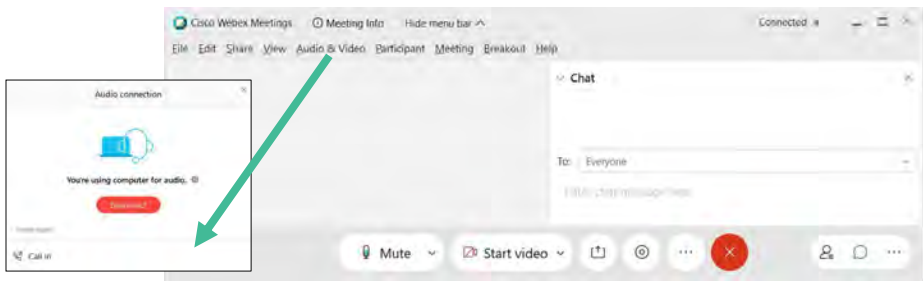






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Connect to audio

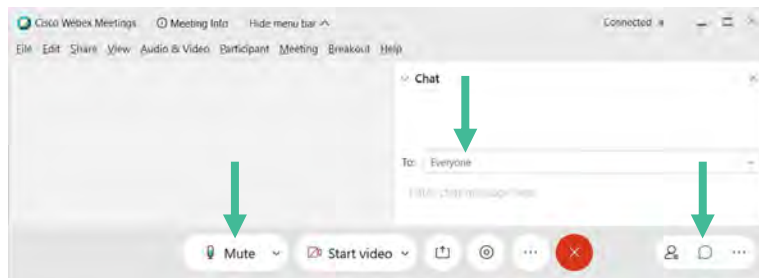


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Ask questions using the Chat feature



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Agenda

Welcome

Robert Wood, Associate Deputy Comptroller, Texas Comptroller's office

Natural Resources Program Overview

Chelsea Jones, Texas Comptroller's office

Matagorda Bay Ecosystem Assessment Updates

Texas A&M research team

Q & A session

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Welcome

*Robert Wood, Associate Deputy Comptroller,
Texas Comptroller's office*



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Natural Resources Program

We collaborate with communities & stakeholders to identify knowledge gaps and support ecological research to contribute to the ESA listing process and long-term conservation strategies.



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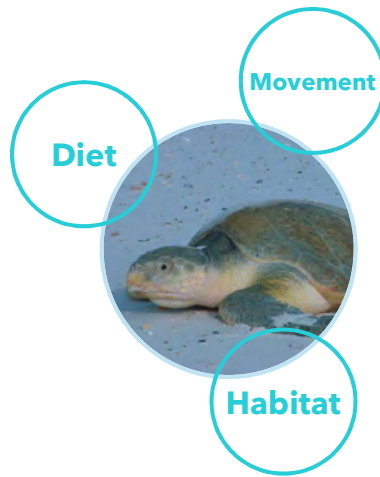


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Information gaps...

Missing data, trends, and insights needed to:

- understand the species
- understand what it takes to conserve the species



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Matagorda Bay Ecosystem Assessment



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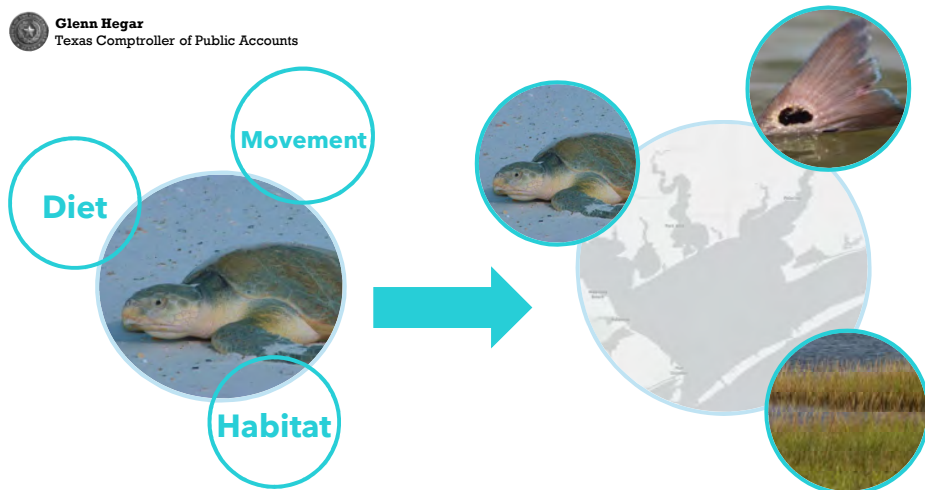
Matagorda Bay Ecosystem Assessment

1. inform the development of effective conservation strategies for endangered sea turtles
2. explore opportunities for avian conservation relative to potential impacts from flooding and sea rise by implementing a multi-disciplinary ecosystem assessment of Matagorda Bay

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StoryMap:

[Chapter 1. Introduction](#)

[Chapter 2. Open Waters](#)

Project Webpage:

[Natural Resources](#)

[Sportfish Center](#)



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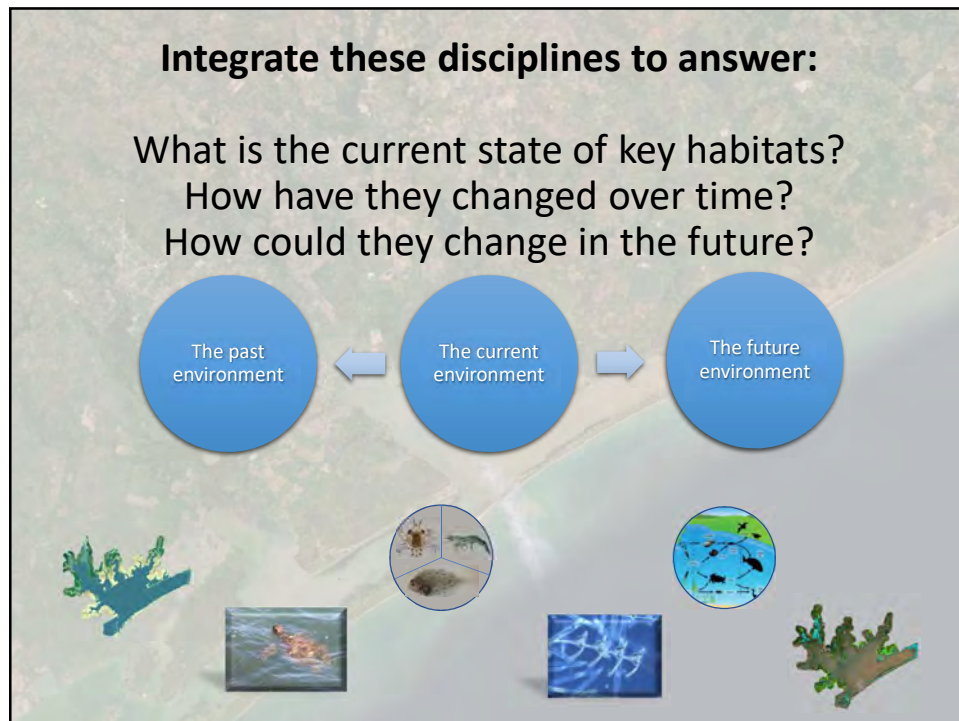
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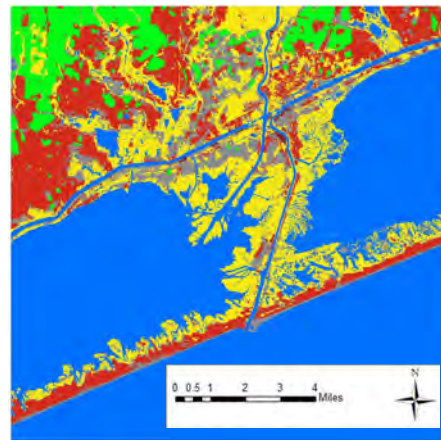


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Mapping Land Cover

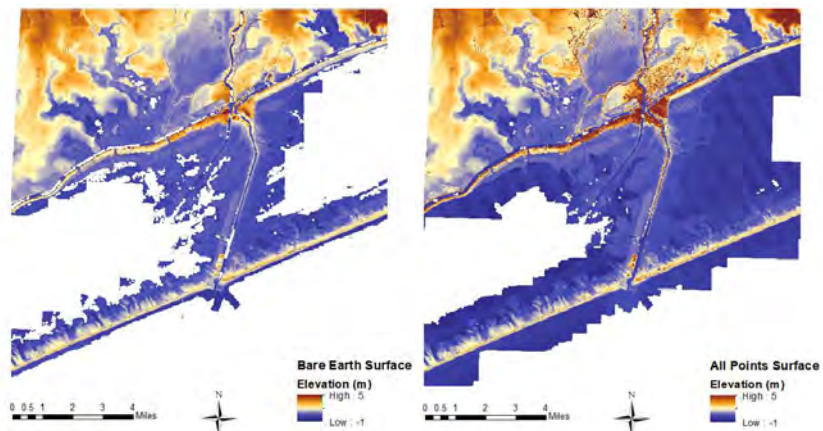


grey bare soil/impervious,
 green cultivated,
 dark red shrub,
 red grass-lawn,
 yellow herb-wetland,
 blue water.

- Classification of mosaic from 6 WV02 images from 2013 using blue, yellow, and red edge bands
- Approach is using UNet11 deep convolutional neural network
- Training sites continue to be collected
- Digital Elevation Model to be added to the classification

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2-m Digital Elevation Model

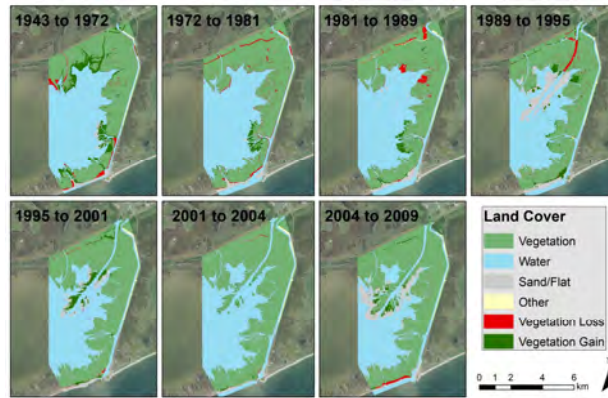
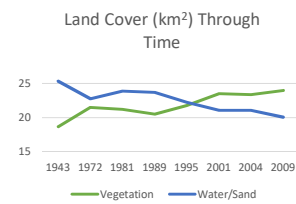


Derived from 7 different lidar surveys

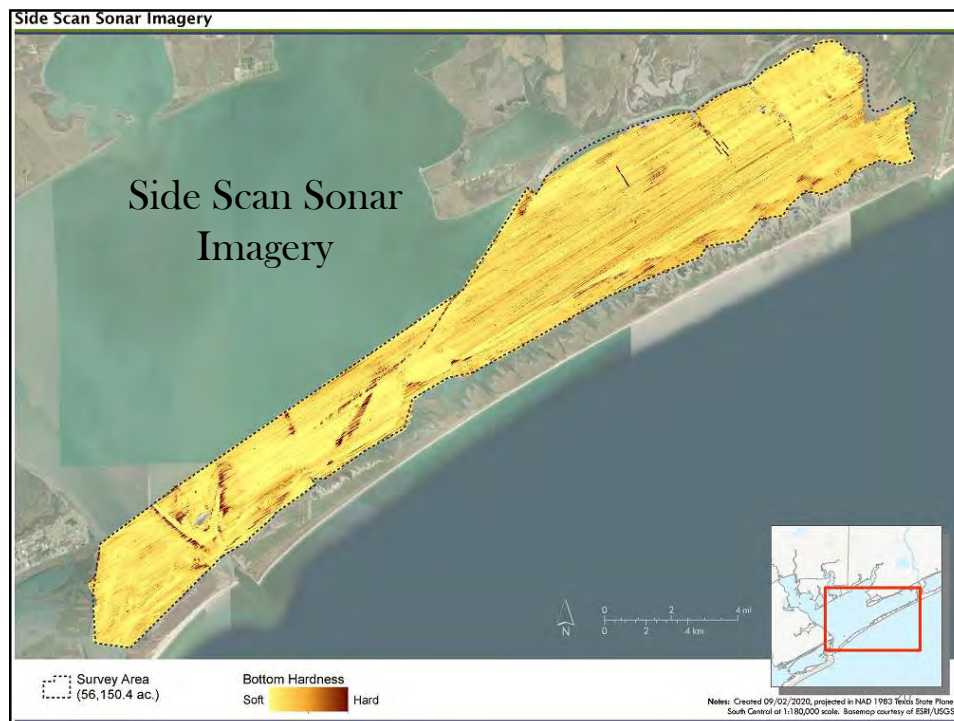
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Mapping Historical Land Cover

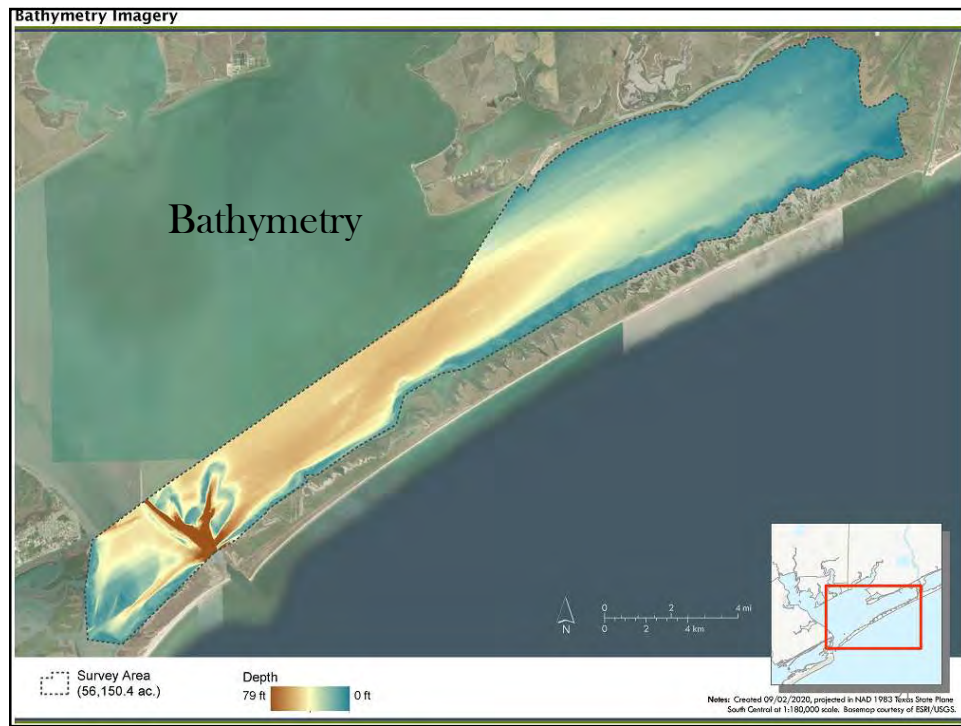
- From 1943 to 2009 there has been a gain in vegetation and a loss of water
 - Net Vegetation Gain: 5.3km²
 - Net Vegetation Loss (Gain Water): 5.2km²



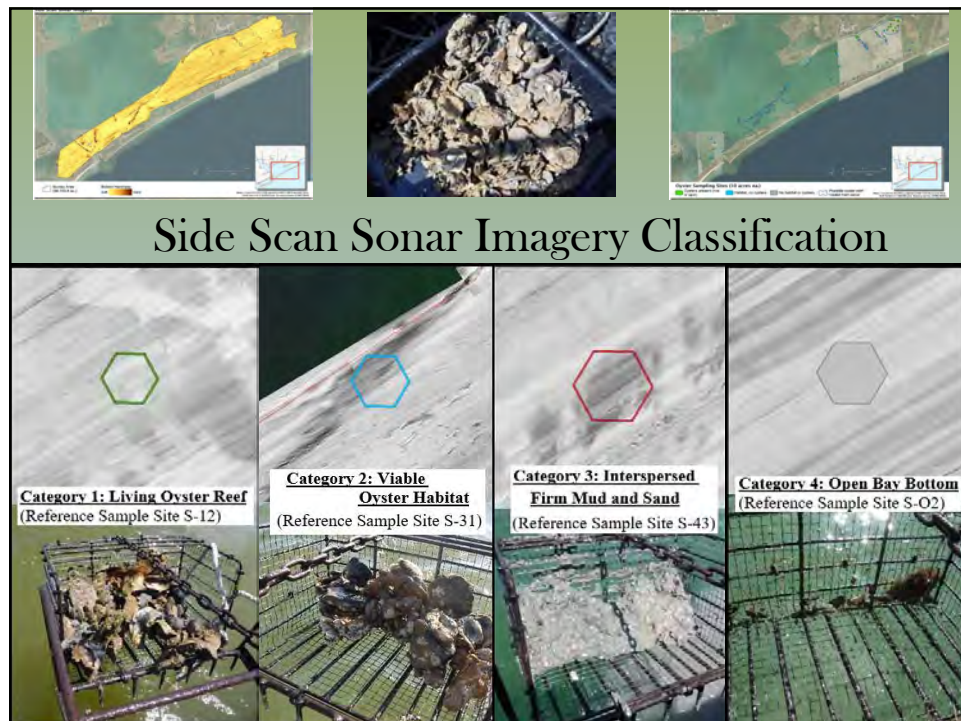
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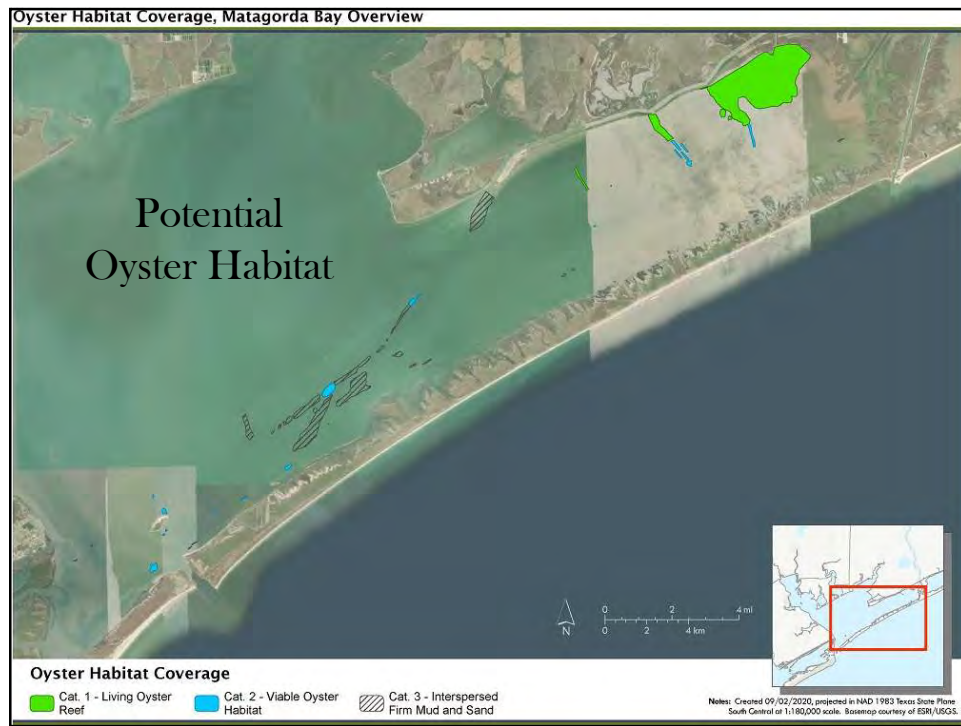
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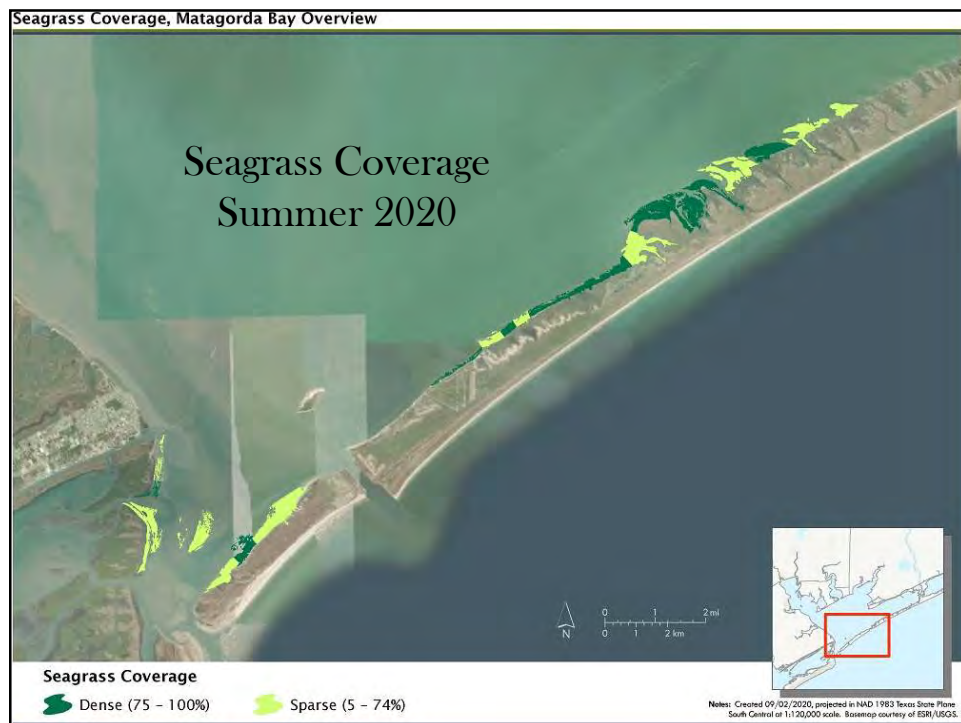
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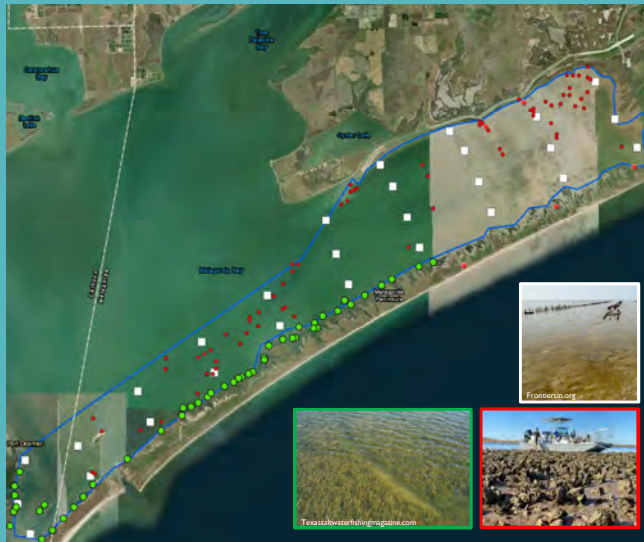
Field Activities and Next Steps

- **Coastal Bird Surveys**
 - Completed: Winter, Spring, Fall 2020 Surveys
 - Upcoming: Winter 2021
- **Marsh Vegetation**
 - Completed: Spring and Fall 2020 Surveys
 - Upcoming: Spring 2021

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MATAGORDA BAY SAMPLING EFFORTS TO DATE

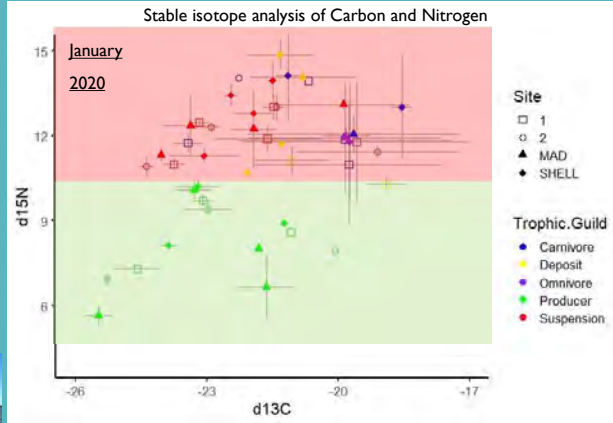
- Oyster Reefs (red)
- Seagrass Beds (green)
- Benthic habitats (white)



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TROPHIC ECOLOGY OF OYSTER REEFS

- Food resources (x-axis)
- Trophic levels (y-axis)
 - Producers (green)
 - Consumers (red)

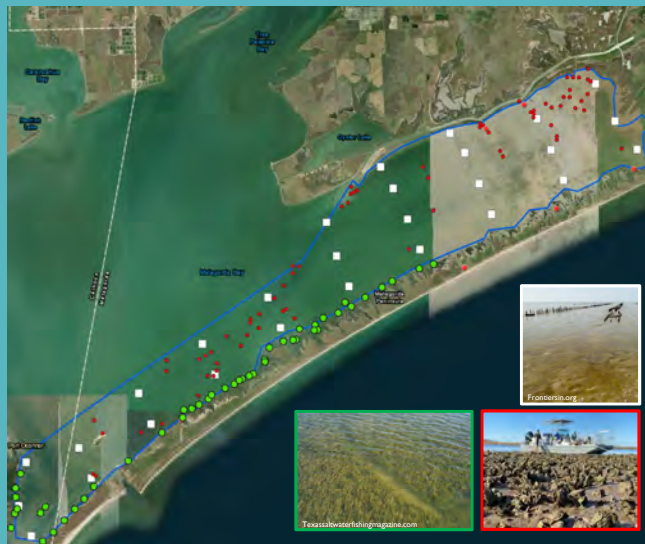


- Trophic structure similar between reef types
- Next step is to add biomass

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FUEL FOR MATAGORDA BAY FOOD WEB

- Seagrass Beds (green)
- Benthic habitats (white)
- Water samples
- Oyster Reefs (red)
- Quality & quantity of organic matter produced by each



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WIND TIDAL FLAT COMMUNITIES AND FOOD WEBS

Site Selection:

- Flats w/ algal mats (lt blue)
 - Cyanobacteria (blue-green algae) *Lyngbya* spp.
- Flats w/o algal mats (dk blue)
- Also considering
 - Bird surveys (hexagons)
 - Loggers (yellow)

Sampling:

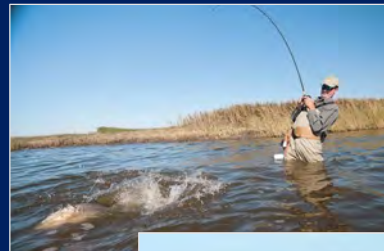
- Infauna & food resources



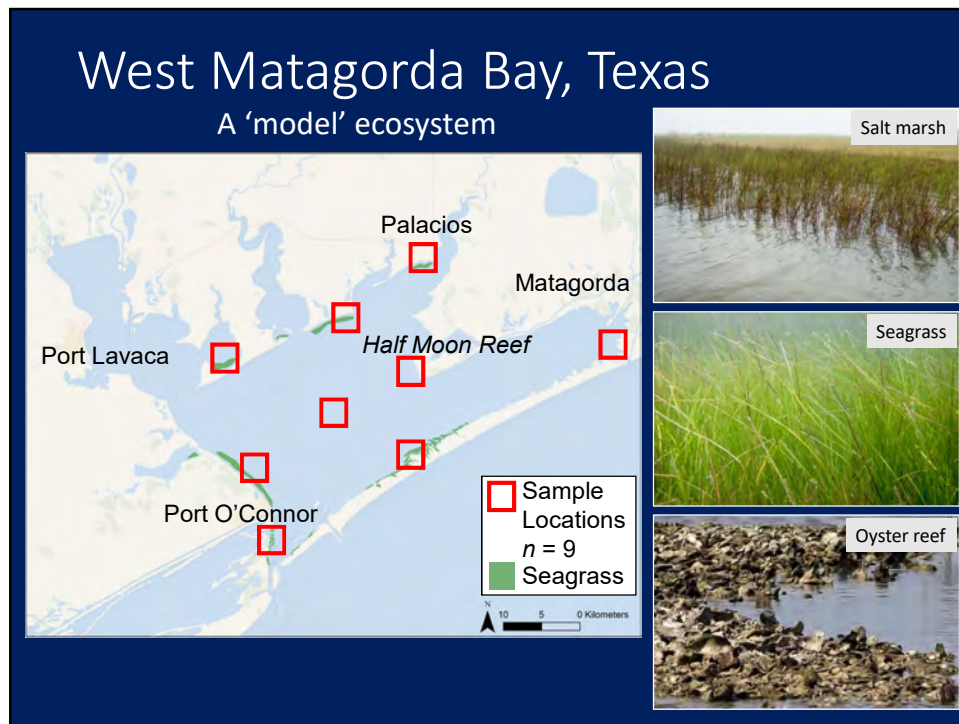
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Estuarine Food Webs

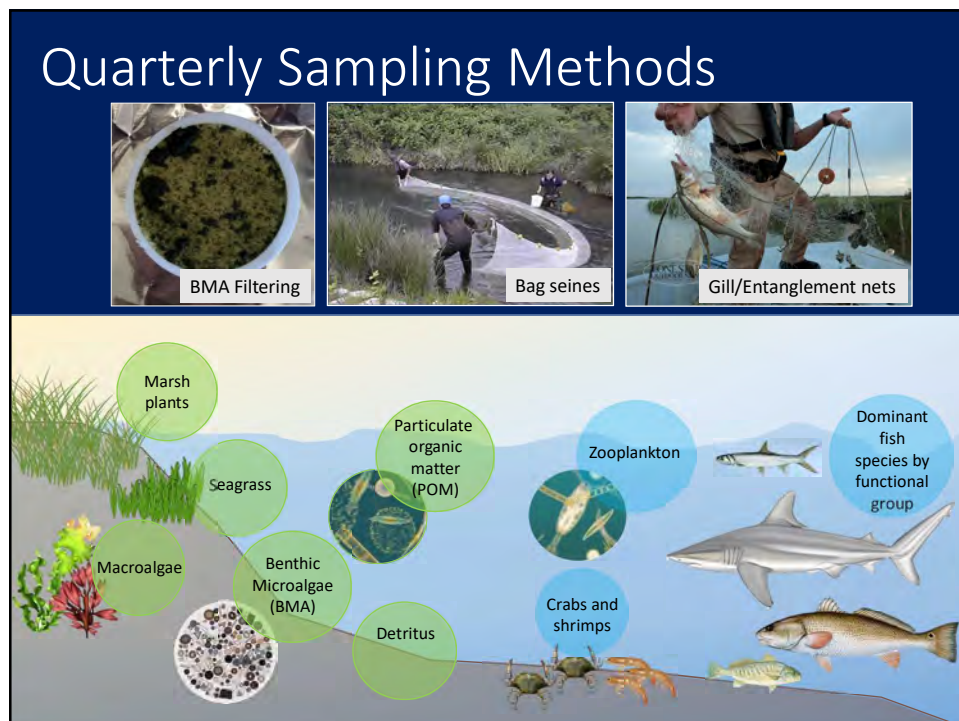
- Productive habitats supporting valuable species
- Food web studies of estuarine communities are needed and beneficial
- Understanding of functional roles between habitats and species is critical to management



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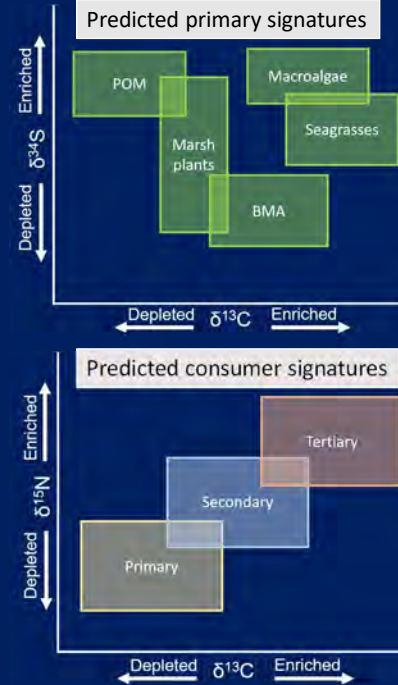


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Study Objectives

1. Characterize food web dynamics

- Primary contributions
- Estimate trophic position
- Isotopic niche overlap



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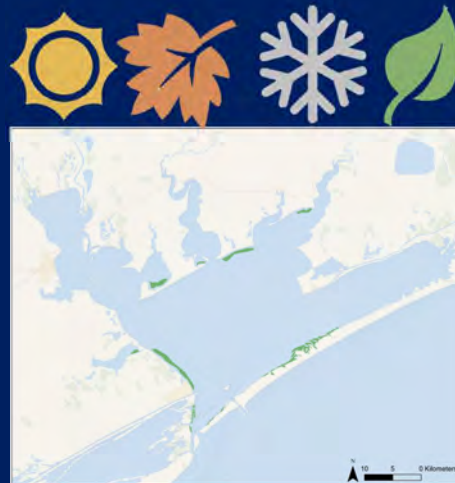
Study Objectives

1. Characterize food web dynamics

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2. Quantify seasonal spatiotemporal dynamics

- Primary production
- Consumer isotopic values



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Study Objectives

1. Characterize food web dynamics
 - Primary contributions
 - Estimate trophic position
 - Isotopic niche overlap
2. Quantify seasonal spatiotemporal dynamics
 - Primary production
 - Consumer isotopic values
3. Identify important habitats within West Matagorda Bay



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Progress to Date: Field Collections

- 3 Quarters completed
 - March 2020
 - June 2020
 - September 2020
- Opportunistic consumer sampling during monthly collections
 - May 2020
 - August 2020
 - October 2020
- >250 organisms collected



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Progress to Date: Sample Processing

- Primary producers
 - All quarterly primary producers have been processed
 - Shipping to UC Davis isotope lab this week
- Consumers
 - All quarterly seines
 - Identified to species
 - Half way through removing muscle for processing
 - All biopsies
 - Cleaned and ready to process



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Ecosystem Services: Value as Nursery Habitat

- **Aim:** Identify habitats, regions, and environmental conditions in WMB = "nurseries" and **support overall ecosystem productivity and resilience**

- Selected metrics for assessing ecosystem health in WMB nurseries:



- 1) **Abundance** and **survival** of recruits inhabiting nurseries
- 2) **Taxonomic diversity** of juvenile assemblages (species rich ecosystems more resilient to changing conditions—portfolio effect)
- 3) **Nutritional condition** of model species inhabiting nurseries

- Ancillary benefit: establish **baselines** of abundance, taxonomic diversity, condition of key components of the WMB ecosystem for assessing future impacts to the system→ baselines critical



Jay Rooker (Advisor)
Liam Batchelder (Grad Student)

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Collections

- Quarterly sampling initiated in Fall 2019
- Completed surveys: Nov 2019, Mar 2020, June 2020, Sep 2020; Future surveys: Dec 2020, Mar 2021, June 2021, Sep 2021, Dec 2021



- Gear: **Benthic Sled** → invertebrates and fishes from two nursery habitats:

- 1) **Seagrass**
- 2) **Marsh Edge**



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Sampling Design

- 9 Sites:** 3 replicates per habitat type at each site during each Q survey: combination of **Seagrass only (S)**, **Marsh Edge only (M)**, and **Seagrass/Marsh Edge (S/M)** sites

- Environmental data for habitat modeling**

Temperature, Salinity
Depth, Turbidity, Substrate,
SG Shoot Density

Additional Explanatory
Variables: Distance to
Pass, Distance to FW Inflow

Explanatory variables →
influence on **abundance**
and **biodiversity** of fishes
and invertebrates inhabiting
presumed nurseries (drivers
of high-quality habitat)



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Nursery Habitat 'Quality'

- Nursery habitat quality will be assessed using measures of **abundance** (proxy for potential production) and **diversity** for both invertebrate and fish assemblages → also serve as baselines for future assessments
- **Nutritional condition** (measure of fitness) of a model species (spotted seatrout) will also be determined to assess the **habitat quality** of different nurseries
- Rear juvenile spotted seatrout under variable conditions (well feed to food limited) to establish baseline for low vs. high quality foraging/growth conditions in terms of RNA:DNA ratio
- Determine the condition of 'wild-caught' spotted seatrout from different nurseries/regions in Matagorda Bay using relationship established above



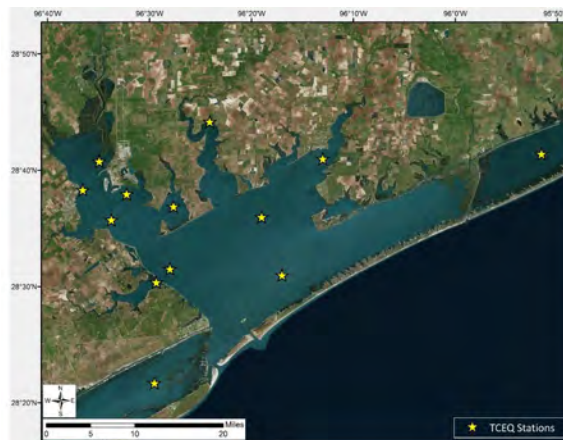
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Water Quality Assessment of the Lavaca-Colorado Estuary

Goal #1: Quantify long-term trends and identify “hot spots” of concern

Approach: Analysis of historical (to present) TCEQ water quality data

- Analysis will commence in early 2021 and conclude by summer 2021

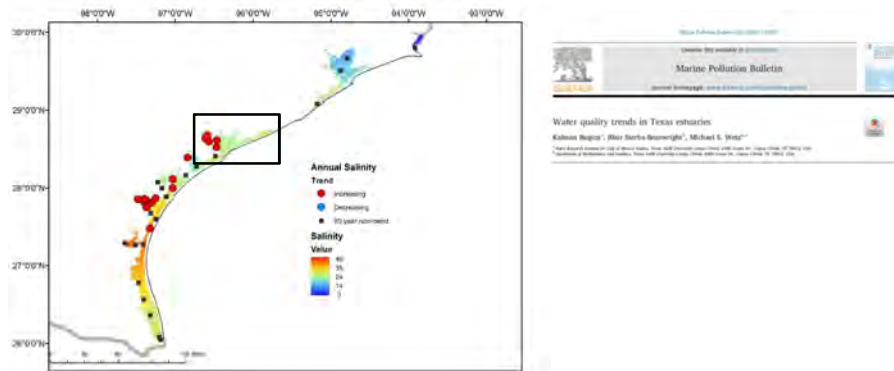


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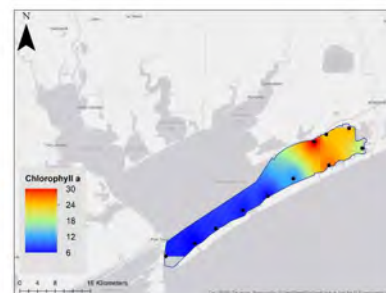
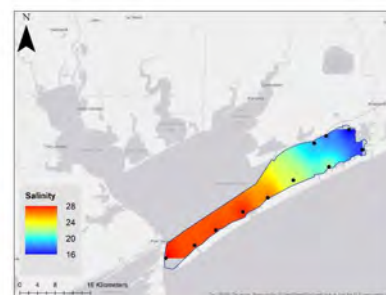


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Water Quality Sampling to Support Habitat Characterization & Food Web Assessment

Goal #2: Quantify water quality patterns & variability at critical habitat(s) in outer bay

Approach: Monthly boat-based water quality sampling at 11 fixed stations along salinity/productivity gradient



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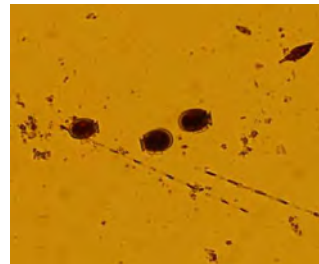
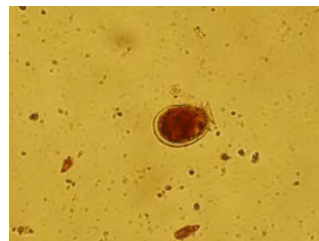
Volunteers "In Action"



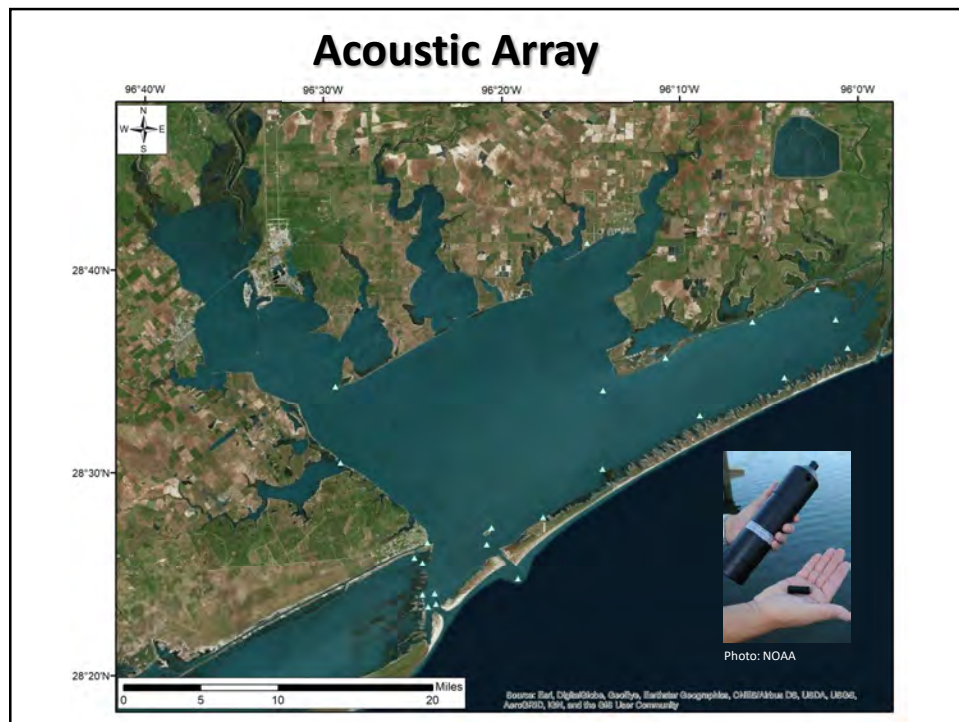
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An Algal Bloom Affects Shellfishing...

- Toxic alga, *Dinophysis sp.*, detected at 6 of 11 stations on Jan 27th, 2020
- Informed TX DSHS & TPWD, who monitored coastwide event
- Commercial shellfish beds temporarily shut down
- Aim to get additional samples in 2021 to better understand conditions leading to blooms

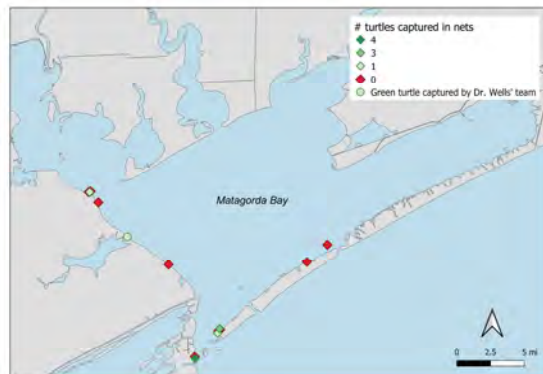


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Team Turtle: netting success

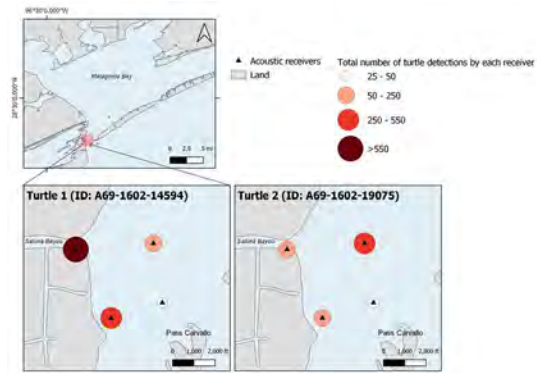


- We have sampled 13 locations
- 9 turtles captured in 4 locations
 - 8 in 2019 (2 acoustic + 3 satellite)
 - 1 in 2020 (1 satellite)



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Team Turtle: Acoustic tracking



- 2 turtles tracked from Nov-2019 to March-2020

- Turtles were captured in the same location, but showed different behaviors

All activities conducted pursuant to NMFS permit #18029

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Team Turtle: Satellite tracking

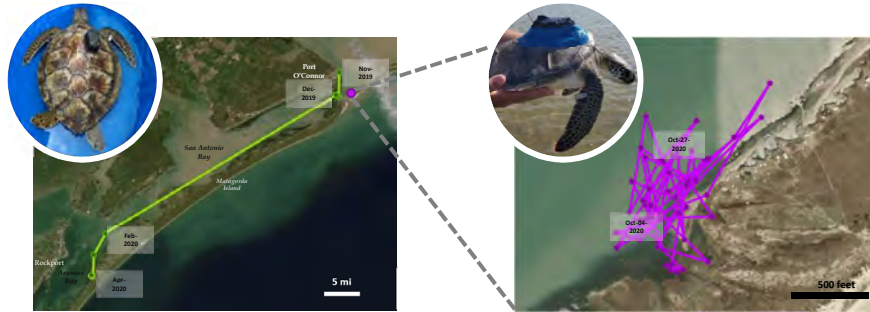


"Grace" travelled ~54 miles south in winter

All activities conducted pursuant to NMFS permit #18029

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Team Turtle: Satellite tracking



"Grace" travelled ~54 miles south in winter

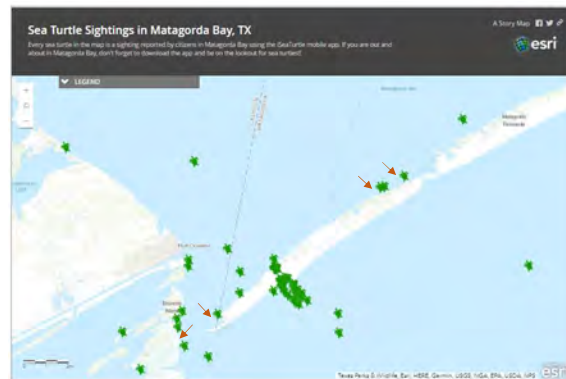
"Anna" has stayed within ~0.01 sq. miles area

All activities conducted pursuant to NMFS permit #18029

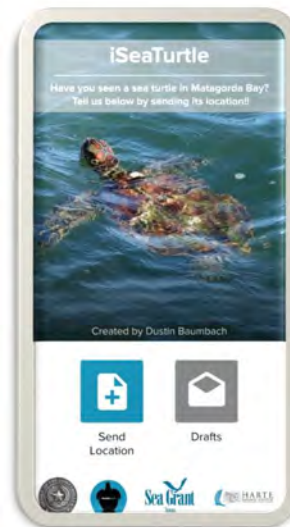
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iSeaTurtle

Encourage citizens to contribute to sea turtle science



<http://tx.ag/iseaturtle>



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Team Turtle: Next steps

- More field trips in 2020 and 2021
 - 5 satellite transmitters
 - 10 acoustic transmitters
- New netting locations informed by *iSeaTurtle* reports + proximity to sampling stations of other teams
- Discovering the whereabouts of our turtles:
 - You can follow them!: <https://portal.atn.ioos.us/#>
Search: Matagorda
- Integrating sea turtle movements with habitat sampling and mapping

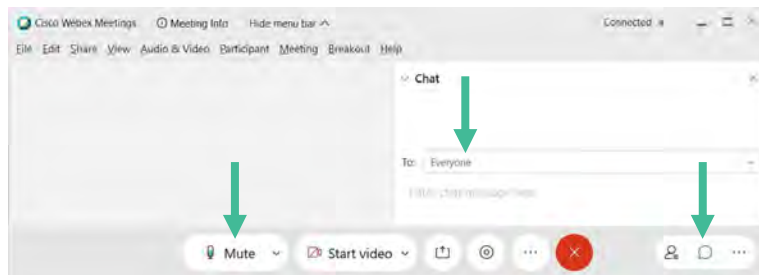


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Ask questions using the Chat feature



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More information:

StoryMap:

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GALVESTON CAMPUS



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Overall Project Goals

Ecosystem Approach



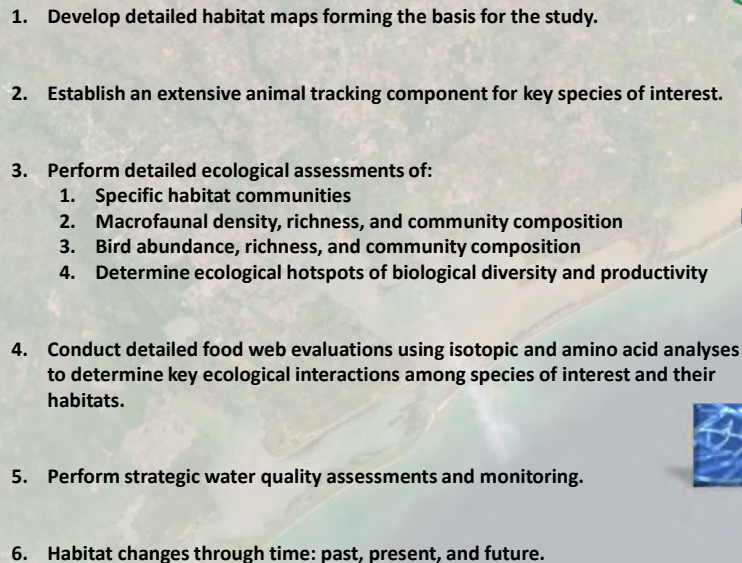
Ecosystem-based Management

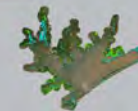
(1) Inform the development of effective restoration and conservation strategies for endangered sea turtles and birds.

(2) Explore future priorities for conservation, mitigation, and restoration using a multi-disciplinary ecosystem assessment.

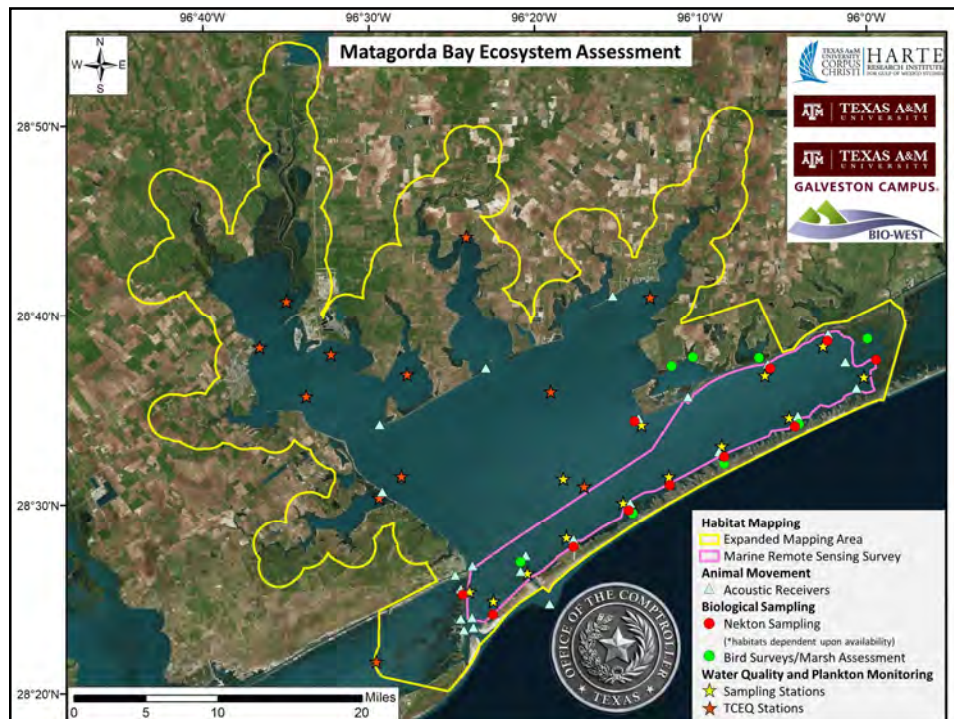
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Major Milestones:

- 
1. Develop detailed habitat maps forming the basis for the study.
 2. Establish an extensive animal tracking component for key species of interest.
 3. Perform detailed ecological assessments of:
 1. Specific habitat communities
 2. Macrofaunal density, richness, and community composition
 3. Bird abundance, richness, and community composition
 4. Determine ecological hotspots of biological diversity and productivity
 4. Conduct detailed food web evaluations using isotopic and amino acid analyses to determine key ecological interactions among species of interest and their habitats.
 5. Perform strategic water quality assessments and monitoring.
 6. Habitat changes through time: past, present, and future.



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