TEXAS COASTAL ECOSYSTEMS: LAGUNA MADRE

Holly Grand
Coastal Outreach Coordinator
holly.grand@tpwd.texas.gov

TEXAS PARKS & WILDLIFE

WHAT IS A FISHERY?

- Fishery (FAO definition):
  - Generally, a fishery is an activity leading to harvesting of fish. It may involve capture of wild fish or raising of fish through aquaculture.

TPWD FISH AND WILDLIFE - MANAGEMENT

- Fisheries independent sampling
  - **Bag seines**
  - **Bay/gulf trawls**
  - **Gill nets**
  - Long lines
  - Oyster dredges
- Fisheries dependent sampling
  - Creel surveys
  - Commercial fish house surveys

FISHERIES INDEPENDENT SAMPLING

FISHERIES INDEPENDENT SAMPLING

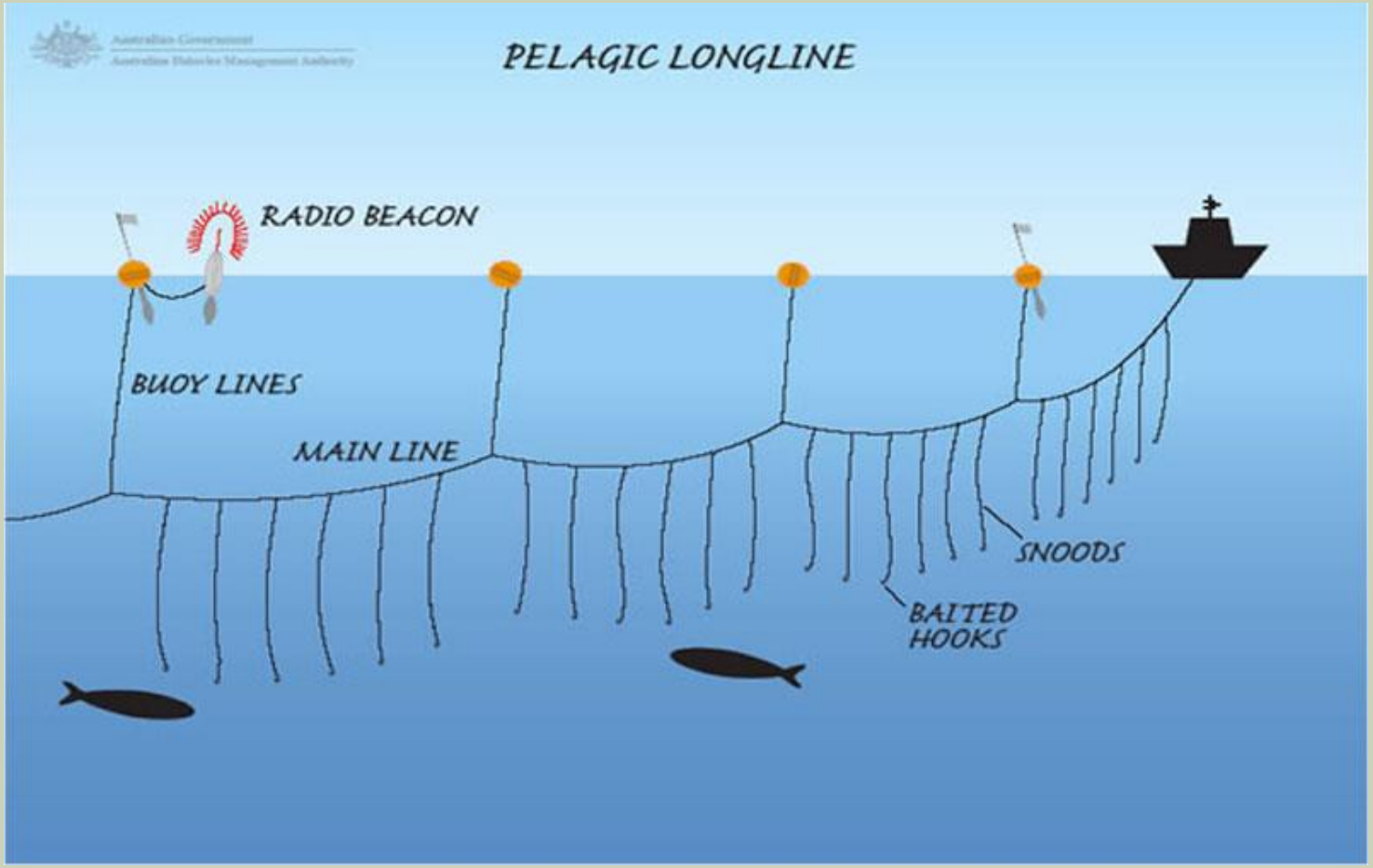
- Bag seine
  - For juvenile fin fish
  - Invertebrates
- Trawls
  - For adult invertebrates
  - Sub adult fish

FISHERIES INDEPENDENT SAMPLING

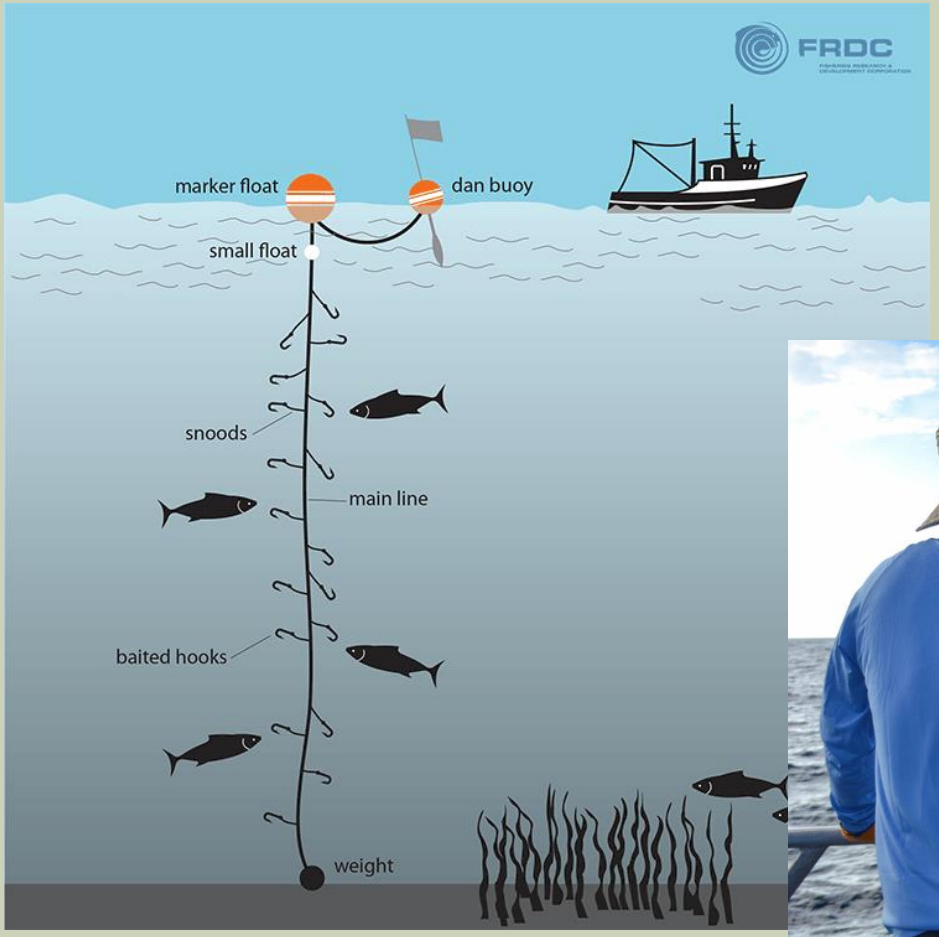
- Gill netting
  - 10 weeks in the spring and 10 weeks in the fall
  - For adult fin fish

FISHERIES INDEPENDENT SAMPLING

FISHERIES INDEPENDENT SAMPLING



FISHERIES INDEPENDENT SAMPLING



FISHERIES DEPENDENT SAMPLING

- Creel surveys
  - Interview anglers about trip
  - Measure and count all fish caught during trip

STOCK ENHANCEMENT

- Stock enhancement:
  - Produce red drum, spotted seatrout, flounder to stock into Texas bays
  - Tool to manage fishery
  - 25 million juveniles (~35mm in length) are released into the wild annually
  - Broodstock spawn in indoor tanks, eggs hatch in incubators, larvae (1mm) are stocked in outdoor ponds for 1-2 months

ARTIFICIAL REEF PROGRAM

- Promotes, develops, maintains, monitors and enhances the artificial reef potential of Texas offshore waters.
- The Artificial Reef Program focuses its efforts on three types of materials:
  - Decommissioned drilling rigs in the **Rigs-to-Reefs Program**.
  - Highway bridge materials and other sources of concrete and heavy-gauge steel in the **Nearshore Reefing Program**.
  - Large marine vessels in the **Ships-to-Reefs Program**.

RIGS TO REEFS

SHIPS TO REEFS - TEXAS CLIPPER

TEXAS PARKS AND WILDLIFE – ECOSYSTEM RESOURCE PROTECTION

- Permitting
- Grant reviews
- Kills and Spills Team
  - Investigate kills from pollution or natural events (algal blooms, salinity)
  - Determine cause of events and assess impacts to fishery resources and
- Habitat Assessment Team
  - Ecosystem based fisheries management
  - Monitoring coastal habitats: oyster reef, seagrass, artificial reef, etc. and the interactions organisms have with those habitats.

POLL QUESTION

- What is hypersalinity?
  - The concentration of salt in a body of water is lower than average
  - The concentration of salt in a body of water is higher than average

LAGUNA MADRE

- One of six hypersaline lagoons in the world
- Shallow (~3.3 ft), little freshwater inflow, evaporation, isolation from other water bodies
- Upper and Lower Laguna Madre separated by tidal flats.
- Padre Island is longest barrier island

PASSES

- Passes provide flow of estuarine waters to the Gulf and allows tidal waters to flow into the bay systems.
- Recreational benefits

UPPER LAGUNA MADRE

WHAT DOES HYPERSALINITY MEAN FOR THE ENVIRONMENT?

- Low diversity of organisms, but great abundance of those that can tolerate stressful environment
- Fish Kills

YARBOROUGH PASS

- 1930s millions of fish died due to hypersalinity
  - 1937: ~25 million pounds
- Dredged four times between 1941-1944
- Between 1941 and 1944, only open for 10 months
- Salinities reduced by 0.5-1.0 ppt in the immediate area of the pass

GULF INTRACOASTAL WATERWAY

- Dredging completed 1949
- Water exchange with Lower Laguna Madre = decreased and more stable salinities for Upper Laguna Madre

POLL QUESTION

- Mudflats are commonly found adjacent to the Laguna Madre. These are regularly flooded and then exposed to air due to which type of tide?
  - Meteorological (wind)
  - Astronomical (gravitational effects from sun/moon)

INTERTIDAL FLATS

KNOWN BY:

- Sand Flats
- Wind Flats
- Mud Flats
- Salt Flats

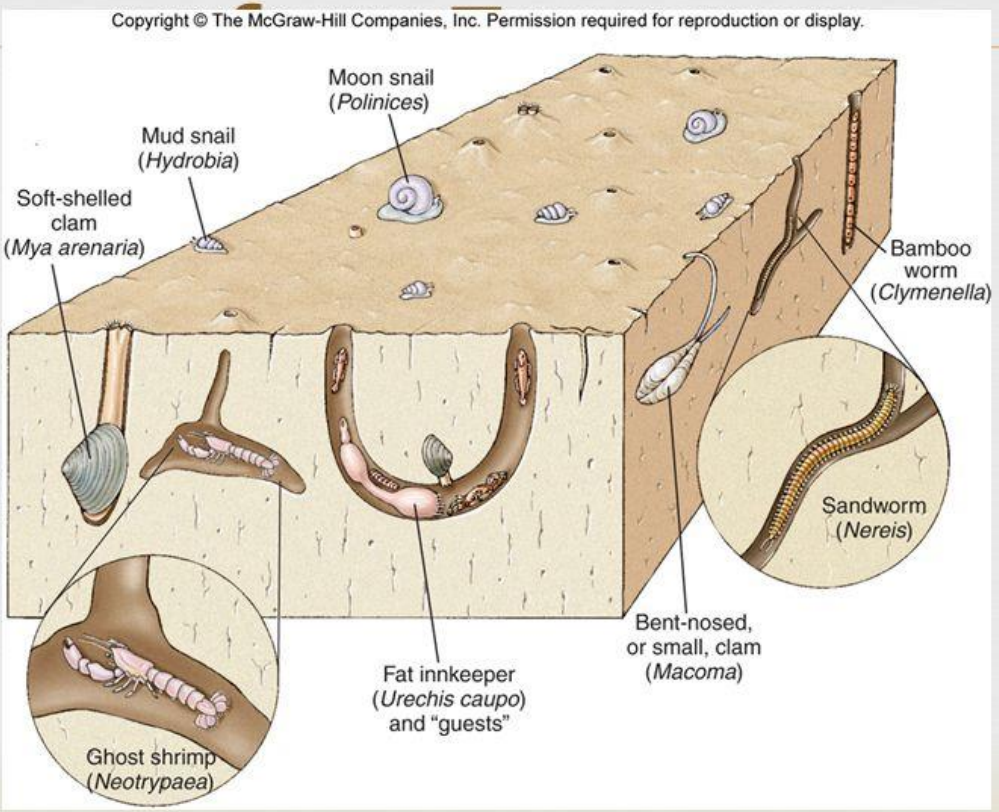
LIFE CONSISTS OF:

- Epifauna – benthic organisms that live on the surface of the substrate.
- Infauna- Live inside or within the substrate.

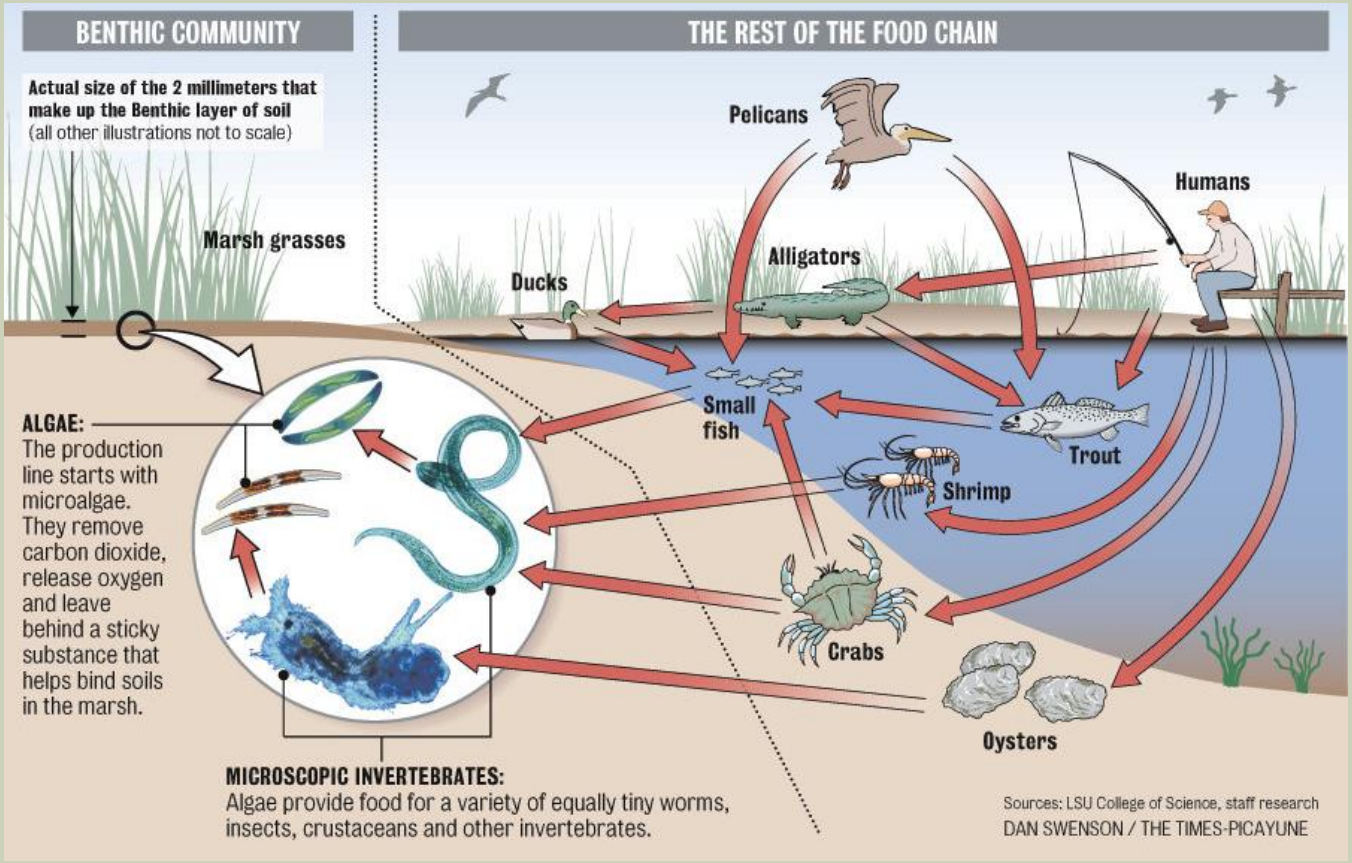
WHERE LIFE BEGINS AND ENDS

- Primary producers
  - Microscopic algae live on surface
  - Bacteria produce organic matter
- Home for different species of polychaetes, mollusks and crustaceans

Representative Inhabitants in a Mudflat

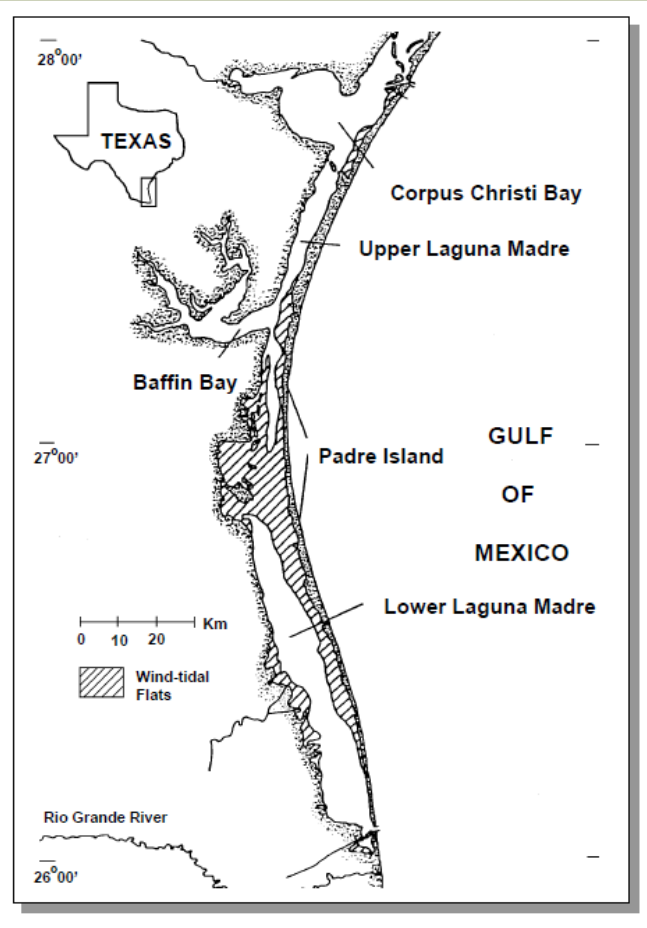


IMPORTANT PART OF THE FOOD WEB



THREATS

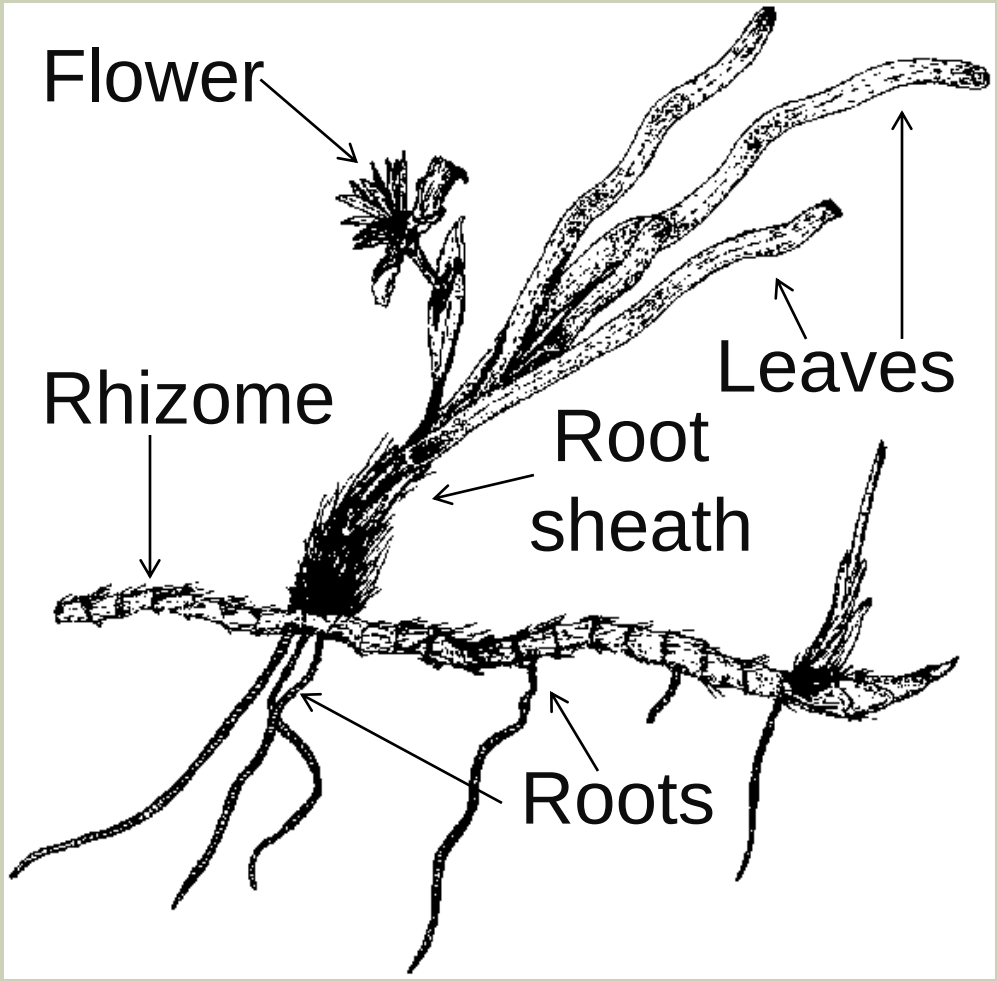
- Development
- Off-road driving
- Dredging



POLL QUESTION

- How many species of seagrass are native to Texas?
  - 3
  - 5
  - 8
  - 10

SEAGRASS STRUCTURE



Flowers pollinate seeds

Leaves gather sunlight for photosynthesis

Rhizomes store starch and transport oxygen to the sediment

Roots allow for nutrient uptake and transport of oxygen to the sediment

SEAGRASS VS ALGAE

- Root structure
- Vascular tissue to transport food and water
- Seeds create new plants

- No root structure
- No vascular tissue
- Spores create new plants

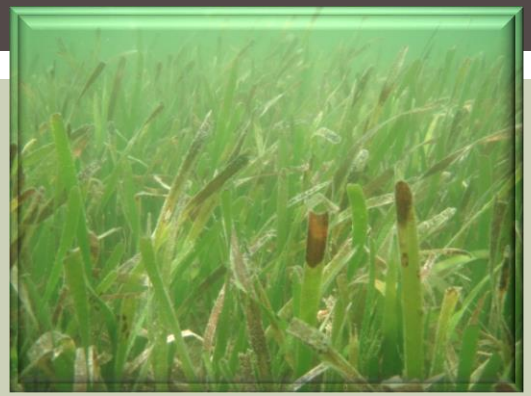
SEAGRASS REQUIREMENTS

- Sunlight
- Soft substrate for below ground root structure
- Nutrients in the sediment (C,N,P,K, etc.)
- Moderate salinity levels (20-50 ppt)

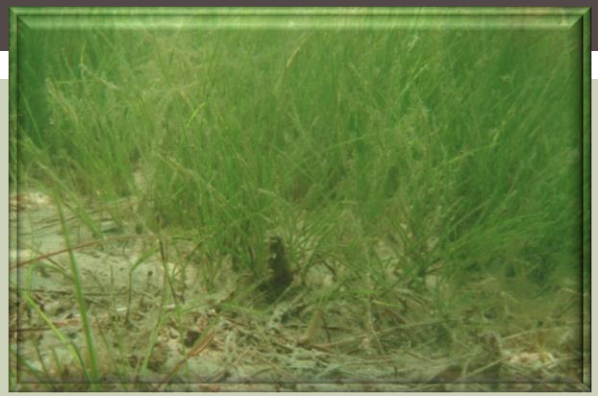
ECOLOGICAL IMPORTANCE OF SEAGRASS

- Reduce Coastal Erosion
- Provide Habitat
- Source of Food
- Improve Water Quality
- Oxygenate water

Texas' Five Seagrass Species

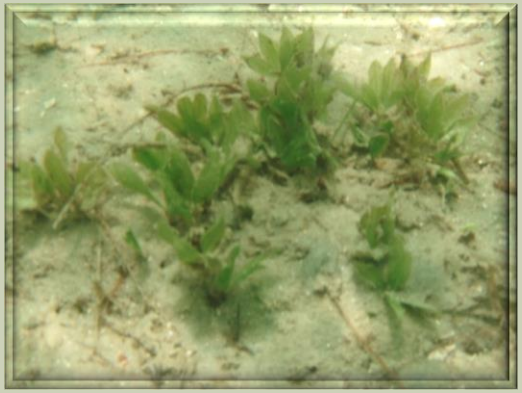


Turtle Grass
(*Thalassia testudinum*)



Shoal Grass
(*Halodule beaudettei*)

Widgeon Grass
(*Ruppia maritima*)



Star Grass
(*Halophila engelmannii*)

Manatee Grass
(Cymodocea filiformis)

DISTURBANCES

Natural

- Storms
- Bioturbation
- Sedimentation
- Algal Blooms

Anthropogenic

- Dredging
- Excess Nutrients
- Coastal Development
- Boating impacts

Propeller Scar or “Prop” Scar

POLL QUESTION

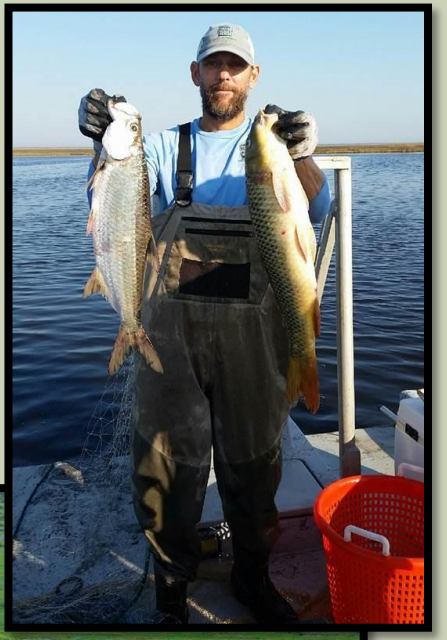
- What are the ecological benefits of hurricanes?

A. Drought relief
B. Adding height and width to barrier islands
C. Upwelling of nutrients; increasing ocean productivity
D. All of the above
E. A and C

HURRICANE HARVEY – BIOLOGIC IMPACTS

HURRICANE HARVEY – BIOLOGIC IMPACTS

- Increased fish abundance
- Increase in freshwater species in bays
- Rookery Island erosion
- Oyster mortalities
- Flooded Wetlands



Images provided by Audubon Texas

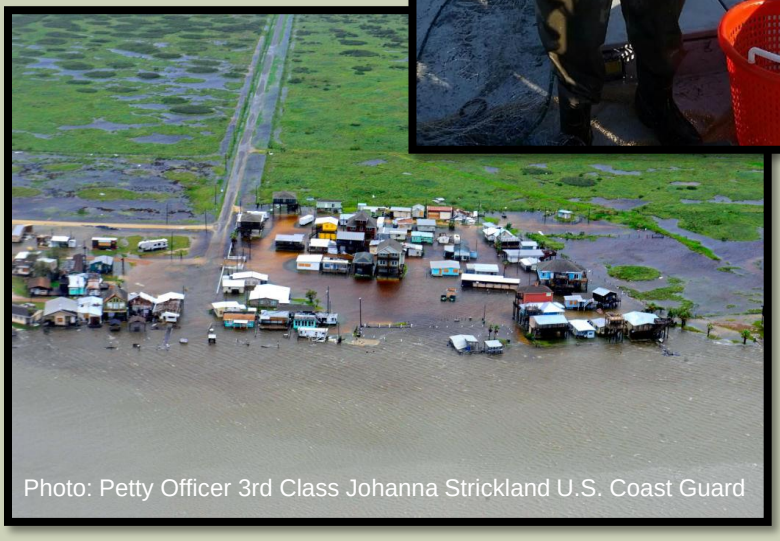
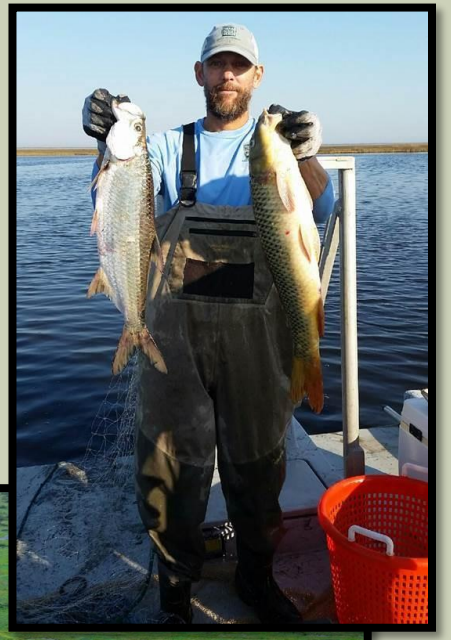


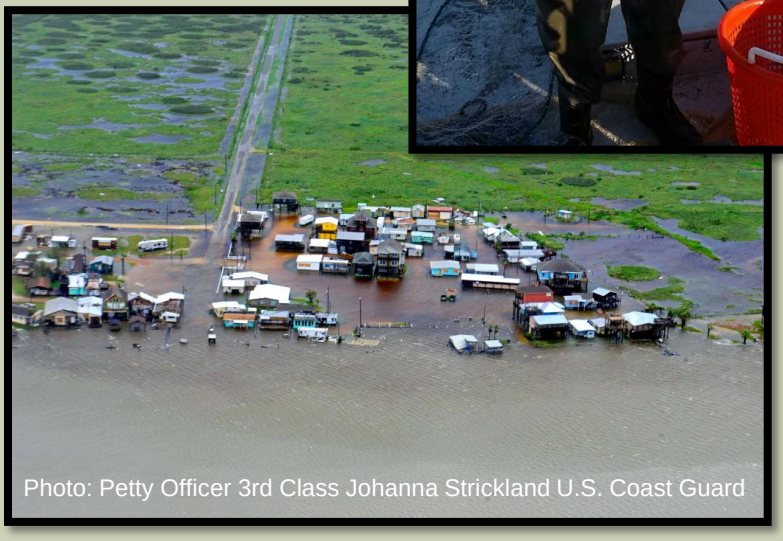
Photo: Petty Officer 3rd Class Johanna Strickland U.S. Coast Guard

HURRICANE HARVEY – BIOLOGIC IMPACTS

- Increased fish abundance
- Increase in freshwater species in bays
- **Rookery Island erosion**
- Oyster mortalities
- Flooded Wetlands

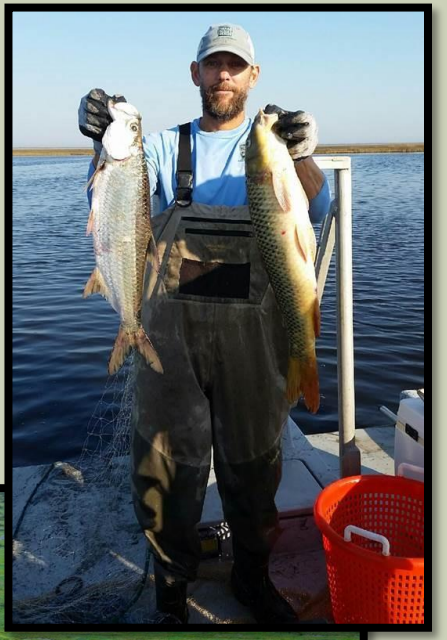
Images provided by Audubon Texas



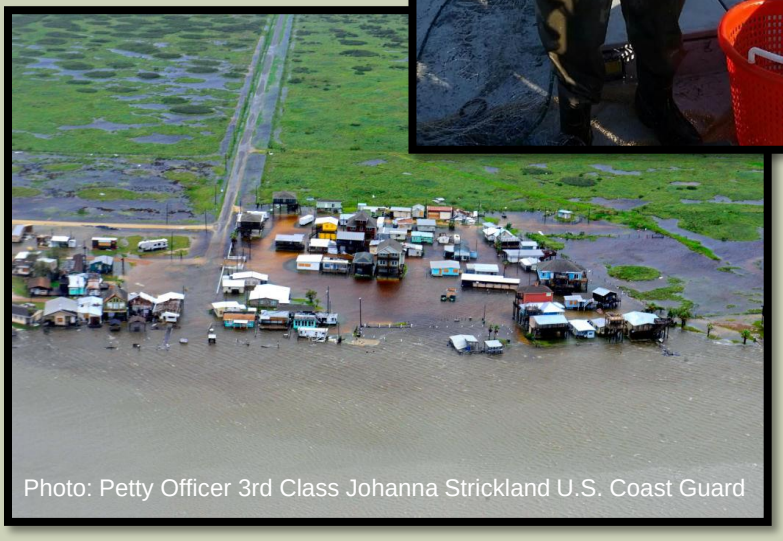


HURRICANE HARVEY – BIOLOGIC IMPACTS

- Increased fish abundance
- Increase in freshwater species in bays
- **Rookery Island erosion**
- **Oyster mortalities**
- Flooded Wetlands

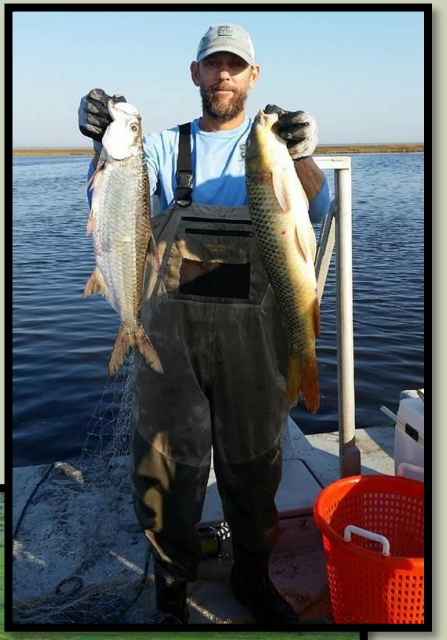


Images provided by Audubon Texas

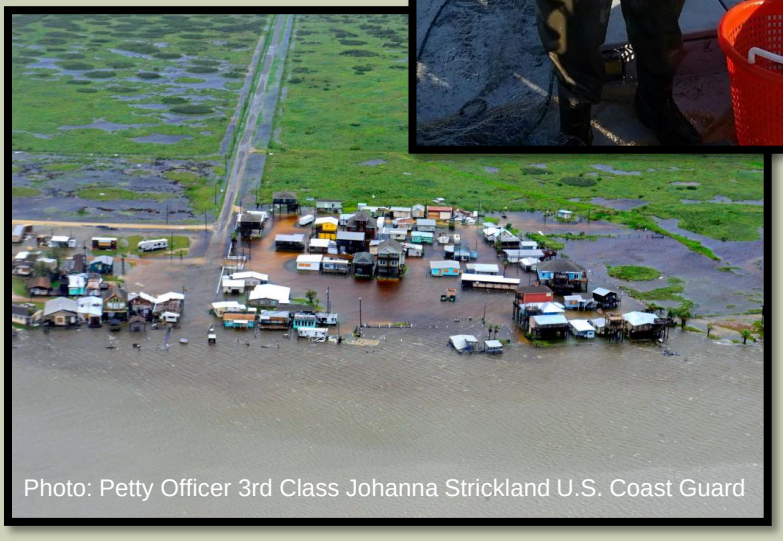


HURRICANE HARVEY – BIOLOGIC IMPACTS

- Increased fish abundance
- Increase in freshwater species in bays
- **Rookery Island erosion**
- **Oyster mortalities**
- Flooded Wetlands



Images provided by Audubon Texas



HURRICANE HARVEY – BIOLOGIC IMPACTS

Tern Island:

proximately 15-40

t of shoreline loss

HURRICANE HARVEY – BIOLOGIC IMPACTS

- Reef sedimentation unknown
- Low salinities
  - Mid-September <2ppt
  - Mid-October ~11ppt
- Mortality
  - Dependent upon bay
  - Anywhere from 18-100%

HURRICANE HARVEY: ECONOMIC IMPACTS

- Commercial seafood landings in 2014 totaled $278 million
  - Majority shrimp
- Commercial fisheries generates $2.8 billion in sales
- Recreational fishing generates $1.8 billion in sales

HURRICANE HARVEY – ECONOMIC IMPACTS

- 30 bait stands closed after the storm
  - As of July, only 6 remained closed
- 15% of boat ramps in Rockport and Port Aransas were damaged or destroyed
  - As of July, most are open
- Decreased fishing pressure after storm
  - License sales

FIND US HERE:

- Texas Parks and Wildlife Department
  - https://www.tpwd.texas.gov
- Coastal Fisheries – Texas Parks and Wildlife Department Facebook
  - https://www.facebook.com/TPWDCoastal/


TEXAS
PARKS &
WILDLIFE