

Ensuring habitat considerations in beach and shoreline management along Delaware Bay  
– a bay wide perspective.



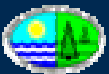
Kimberly B. Cole, David B. Carter, Tricia K. Arndt

Delaware Coastal Programs

# Delaware Bay Coastal Resources



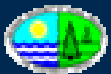
- Extensive areas of tidal wetlands, mudflats and sandy beaches
- About 70% of Delaware's coastline is permanently protected



# Delaware Bay Coastal Resources



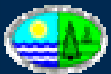
- Internationally recognized as a critical staging area for migratory shorebird species.
- World's largest horseshoe crab spawning population



# Delaware Bay Beach & Shoreline Management



- Erosion rates of 2-6 meters per year
  - ✓ Natural forces
    - *Wind and wave action*
  - ✓ Human influenced forces
    - *Sea level rise and development activities*
  
- Division of Soil & Water Conservation
  - ✓ Responsible for management and protection of shoreline for 30 years
  - ✓ Includes shoreline stabilization and beach replenishment
    - *Storm hazard protection against public and personal property damage*



# The Role of Coastal Management – *balancing the many needs and uses of coastal areas*



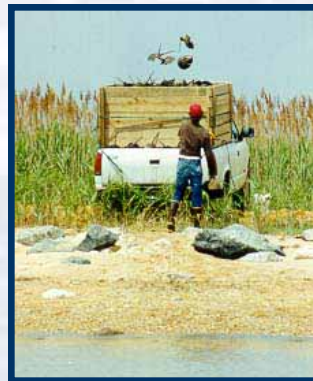
Recreation use of  
beaches and tourism



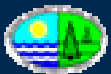
Maintain stable  
populations



Shoreline protection

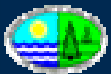


Commercial Uses



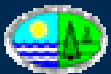
# Our Role – creating partnerships

- Delaware Dept. of Natural Resources and Environmental Control
  - ✓ Division of Soil & Water Conservation
    - **Shoreline & Waterway Section**
    - **Coastal Programs**
      - Coastal Management
      - National Estuarine Research Reserve
  - ✓ Division of Fish & Wildlife
    - **Natural Heritage**
    - **Fisheries**
  - ✓ Division of Water Resources
    - **Wetlands & Subaqueous Lands**
- British Trust for Ornithology
- Wash Wader Ringing Group
- Manomet Center for Conservation Science
- Delaware Museum of Natural History
- Tri-State Bird and Rescue
- University of Delaware
  - ✓ Geology Department
  - ✓ Marine Science Department
- NJ Institute of Technology
- Rutgers University
- University of Georgia
- Virginia Tech
- Royal Ontario Museum
- NOAA
  - ✓ Ocean and Coastal Resource Management
  - ✓ Coastal Services Center
- US Army Corps of Engineers
- USFWS
  - ✓ Delaware Estuary Program
  - ✓ Bombay Hook National Wildlife Refuge
  - ✓ Prime Hook National Wildlife Refuge
- USGS, Leetown Science Center
- Patuxent Wildlife Center
- Delaware River Basin Commission
- Delaware River & Bay Authority
- Delmarva Ornithological Society
- The Nature Conservancy
- Delaware Wildlands
- Sierra Club
- New Jersey Dept. of Environmental Protection
  - ✓ Coastal Management Program
  - ✓ Fish and Wildlife
- Town of Slaughter Beach, Delaware
- Town of Bowers Beach, Delaware

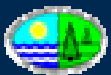


# Our Role – creating partnerships

- **Gather information and data needed to help make management decisions**
- **Seek opportunities to collaborate to enhance, restore or protect coastal resources**
  - ✓ Are all the right people in the room?



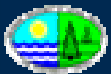
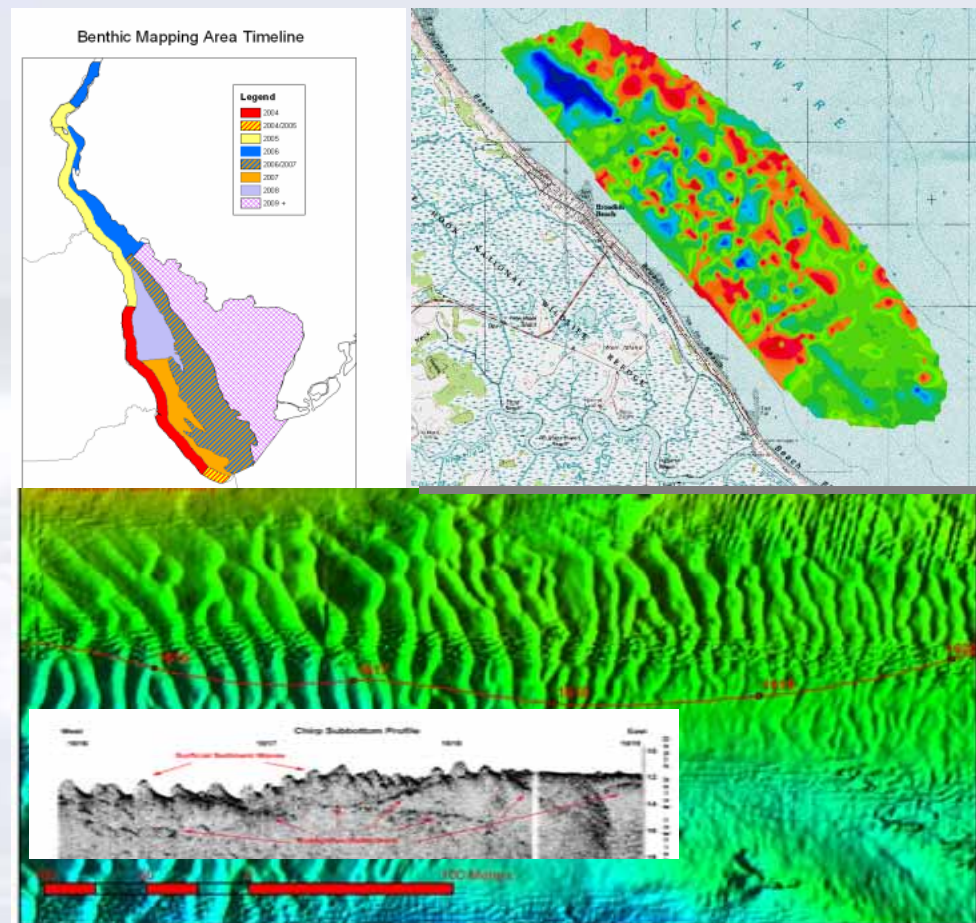
# Striving for Science Based Management of Shorebirds & Horseshoe Crabs





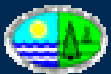
# Benthic Habitat Mapping

- The Delaware Bay represents almost one quarter of the surface area of the State of Delaware.
- What lies under the Bay is one of the least understood areas of the State.
- Decisions are routinely made with little knowledge of how they will affect the Bay.



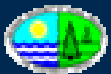
# Benthic Habitat Mapping

- The information gathered from this initiative will allow the State of Delaware and other entities to better understand and effectively manage this coastal resource.
  - ✓ Identifying Essential Fish Habitat (EFH), which includes areas of *Sabellaria vulgaris* and other benthic organisms that are a food source to both commercial and recreational fishes,
  - ✓ Identifying preferred habitat of protected species like the horseshoe crab and Atlantic sturgeon,
  - ✓ Identifying and mapping shellfish beds and monitoring artificial reefs to determine their longevity.
  - ✓ Monitoring historic dredge sites to examine the recovery rate and infilling material, the identification of sand resources including quantity, quality and overburden to be used in beach replenishment and habitat restoration projects.
  - ✓ Assess habitat damage from commercial trawling and dredging.
  - ✓ Develop high resolution maps for modeling applications.
  - ✓ Pre and post storm event mapping of the nearshore can be performed to catalogue the benthic changes from such events.
- The fundamental concern is the need to identify and protect the biodiversity of the Delaware Bay.



# Horseshoe Crab Studies

- Since 1997 targeted studies of horseshoe crab egg density and beach characteristics to determine:
  - ✓ preferred spawning habitat characteristics. Enables coastal managers to make habitat restoration recommendations
  - ✓ eggs available to migratory shorebirds
- Adult spawning surveys
- Radio Tagging





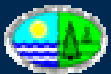
Habitat Variables of Interest

- Beach Slope
- Orientation to Wind/Waves
- Shelter from Wind/Waves
- Sand Grain Size
- Sand Depth

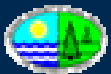
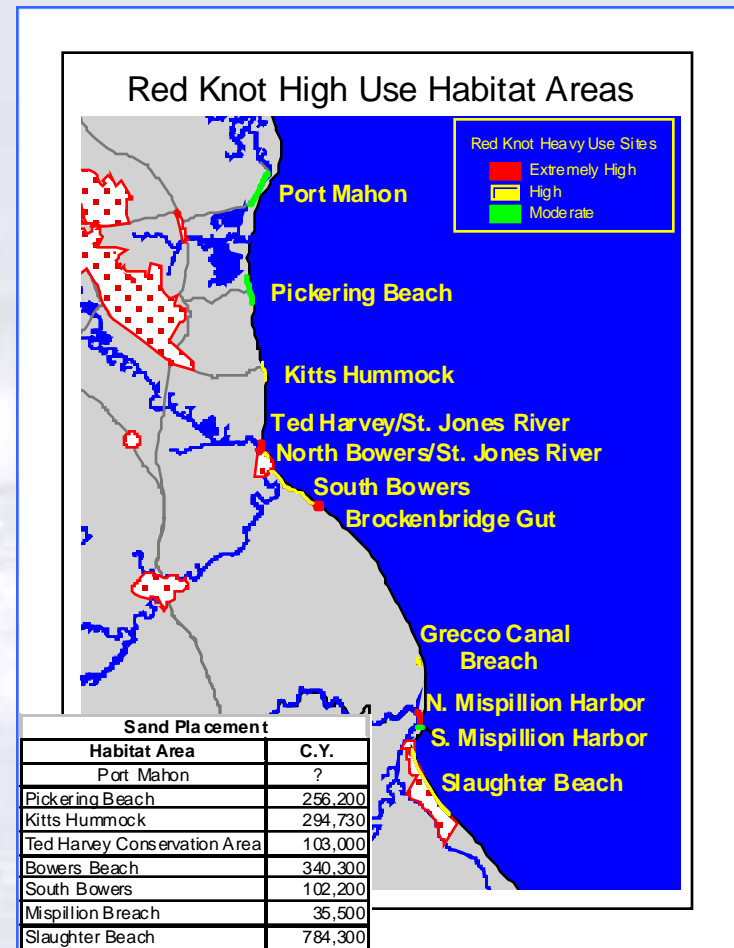
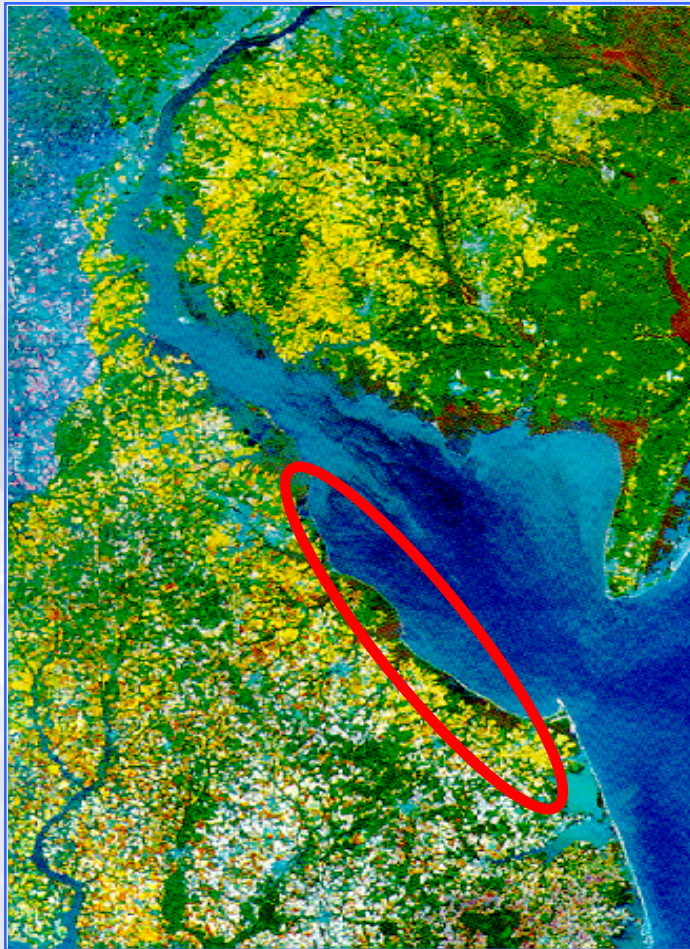
# Shorebird Studies



- Since 1997 targeted studies:
  - ✓ Shorebird Population Levels & Trends
  - ✓ Shorebird Stopover Fitness - Arriving and Departing Timing & Physical Conditions
  - ✓ Habitat Use and Characteristics
  - ✓ Effects of Human Disturbance



# Red Knot (S shorebird) Habitat Use and Characteristics



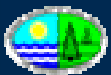
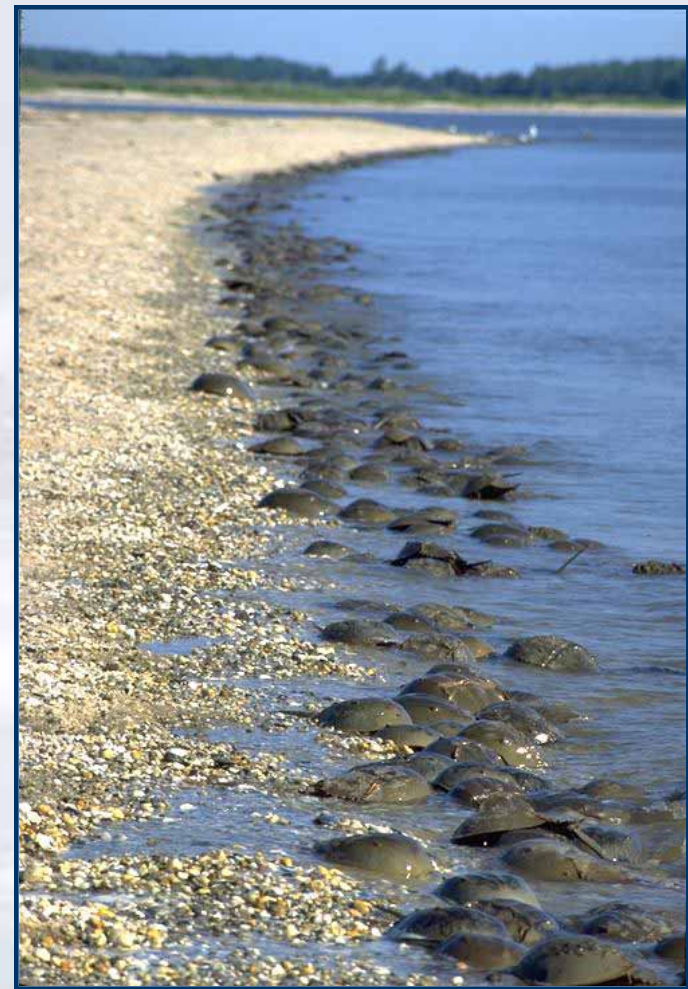
Bowers Beach 1975







# Bowers Beach 1997

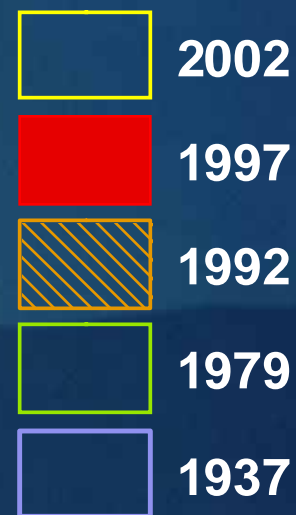




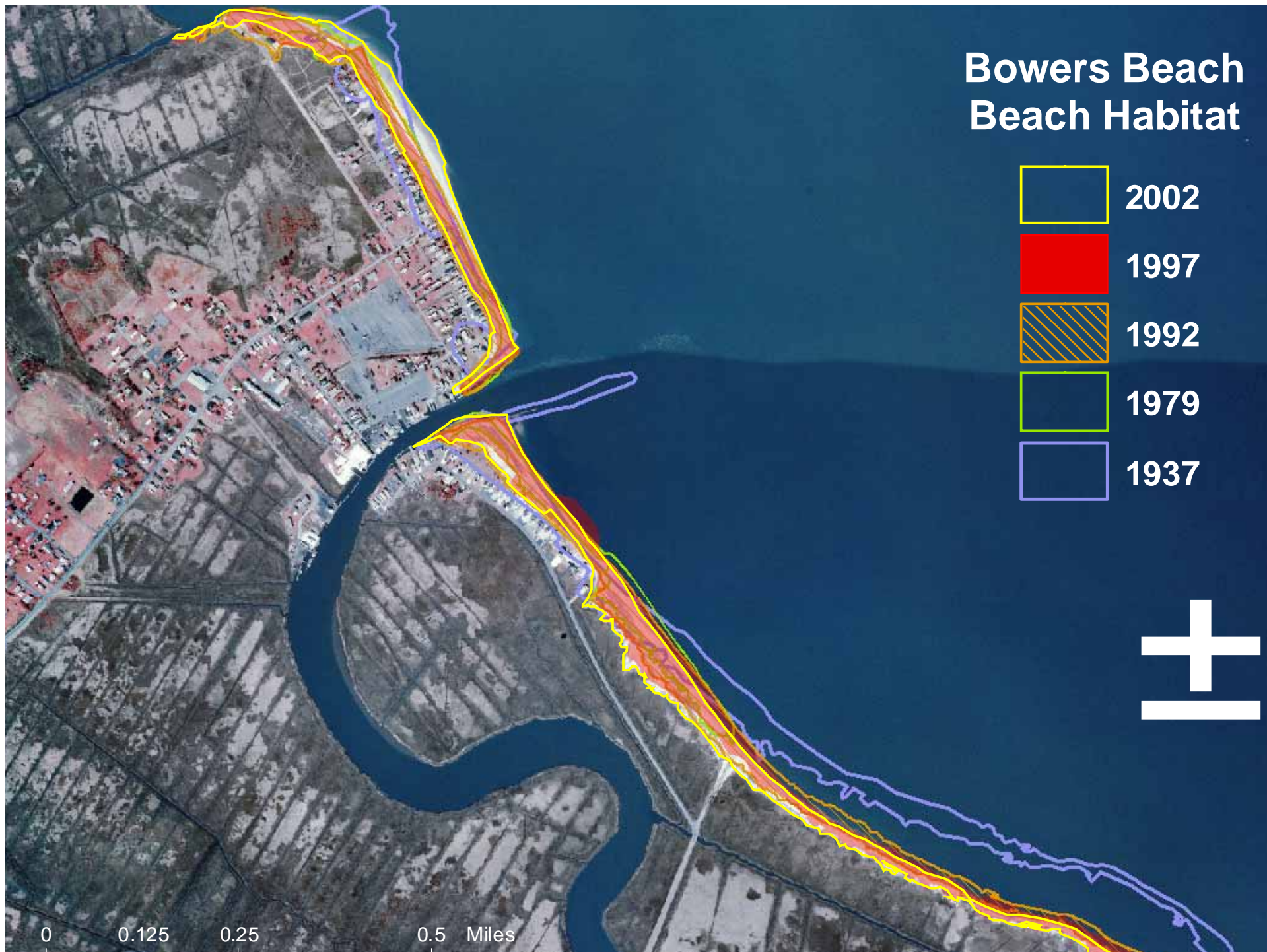
# Bowers Beach 1937-1997



# Bowers Beach Beach Habitat



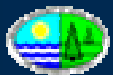
0 0.125 0.25 0.5 Miles



# Port Mahon 1973



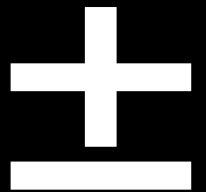
# Port Mahon 2001





# Port Mahon Beach Habitat

- 2002
- 1997
- 1992
- 1937



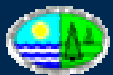
0 0.15 0.3 0.6 Miles

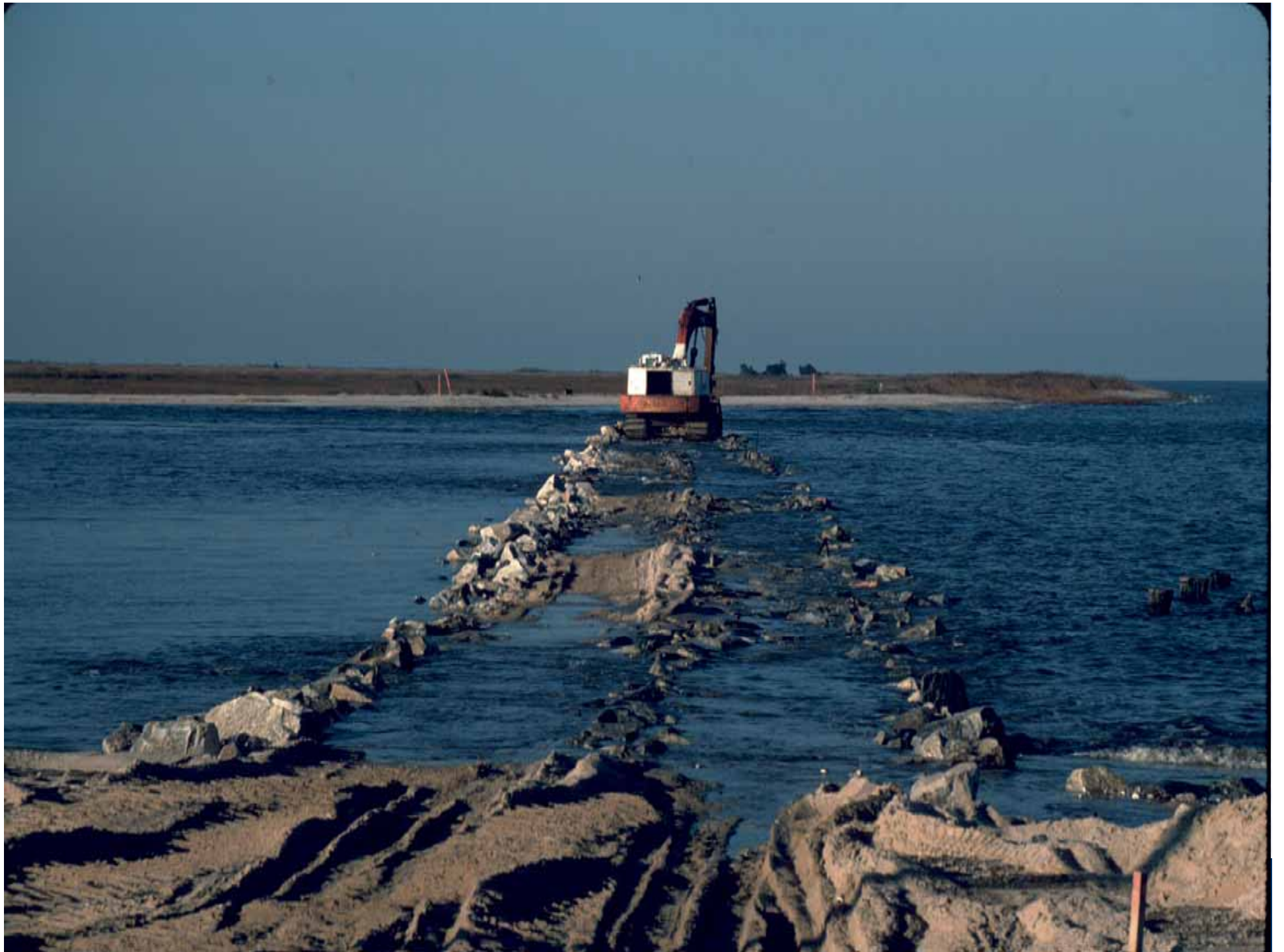


Misphillion Harbor



# Mispillion Harbor



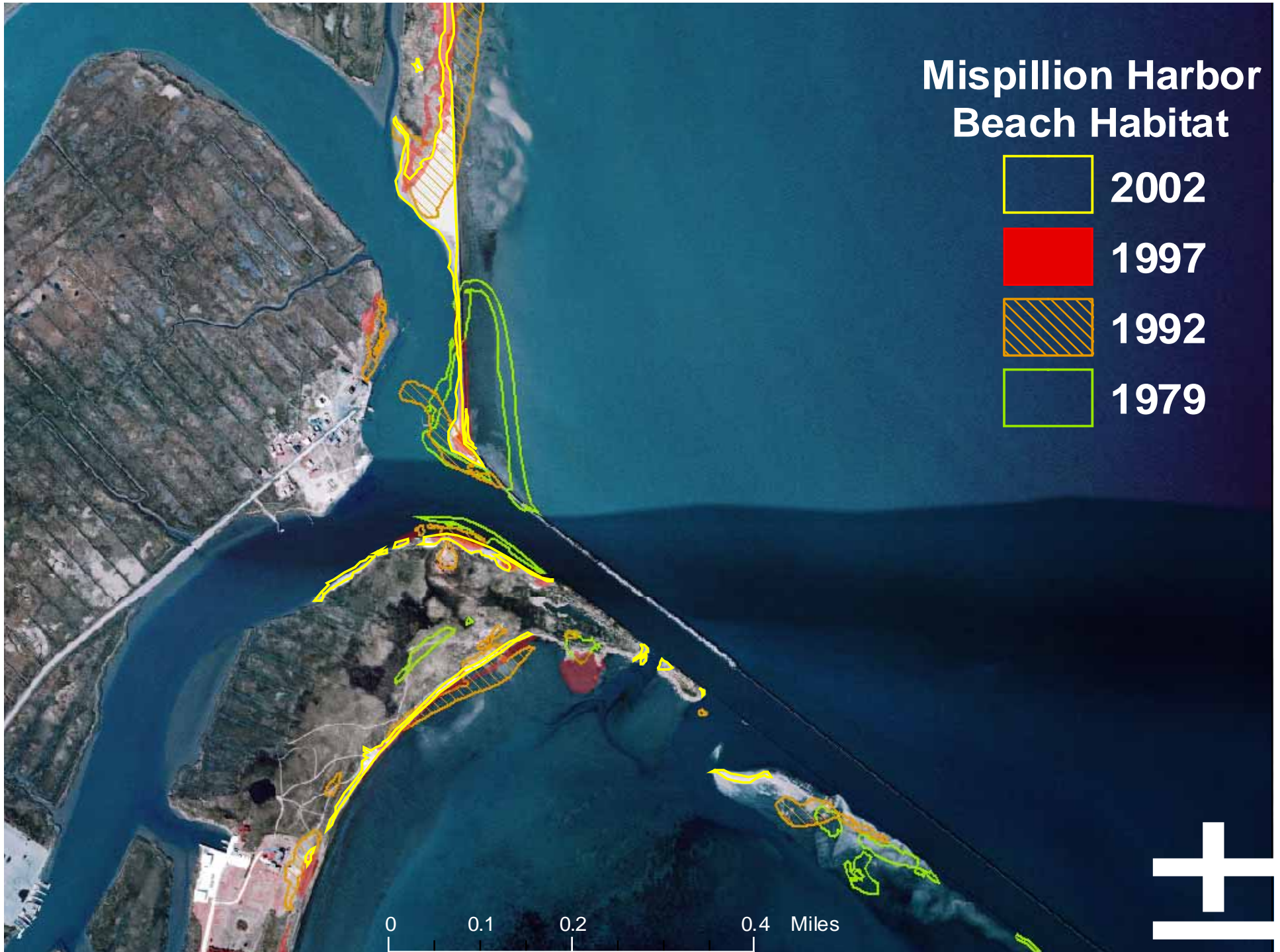
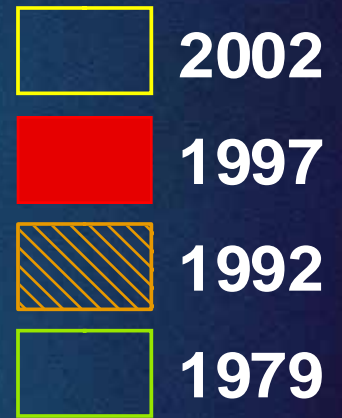


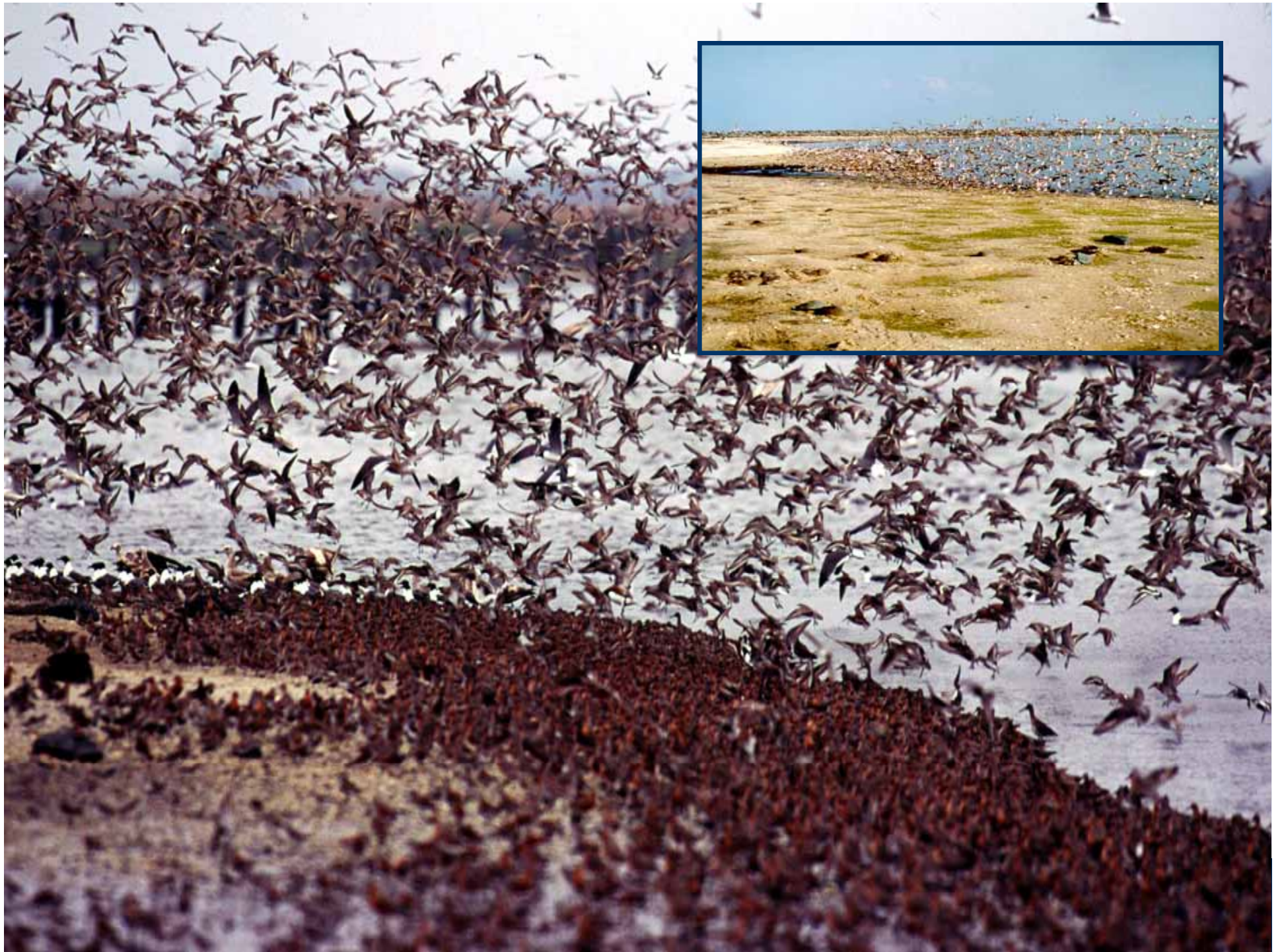


# Mispillion Harbor



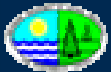
# Mispillion Harbor Beach Habitat





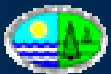
# Ensuring habitat considerations...

- Need to look at the entire Bay as a system
  - ✓ Mosaic of habitats
    - ***Spawning habitat***
      - Superabundance of eggs
    - ***Roosting habitat***
  - ✓ Redundancy
  
- Be opportunistic
  - ✓ Town of Slaughter Beach
    - ***Mispyllion River navigation maintenance***



# Ensuring habitat considerations...

- Is everyone in the room?
- Ensure the information to make decisions is available
  - ✓ If not available, get it
    - ***Benthic Habitat Mapping***
    - ***Horseshoe Crab and Shorebird Studies***
- Learn from past efforts
  - ✓ Monitoring is key





# For More Information

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