

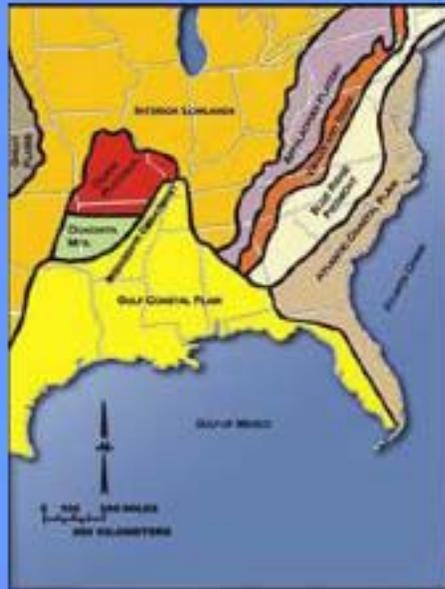
Beach Dynamics

Dr. Michael Katuna
Department of Geology and Environmental Geosciences
College of Charleston

Evolution of the Coast

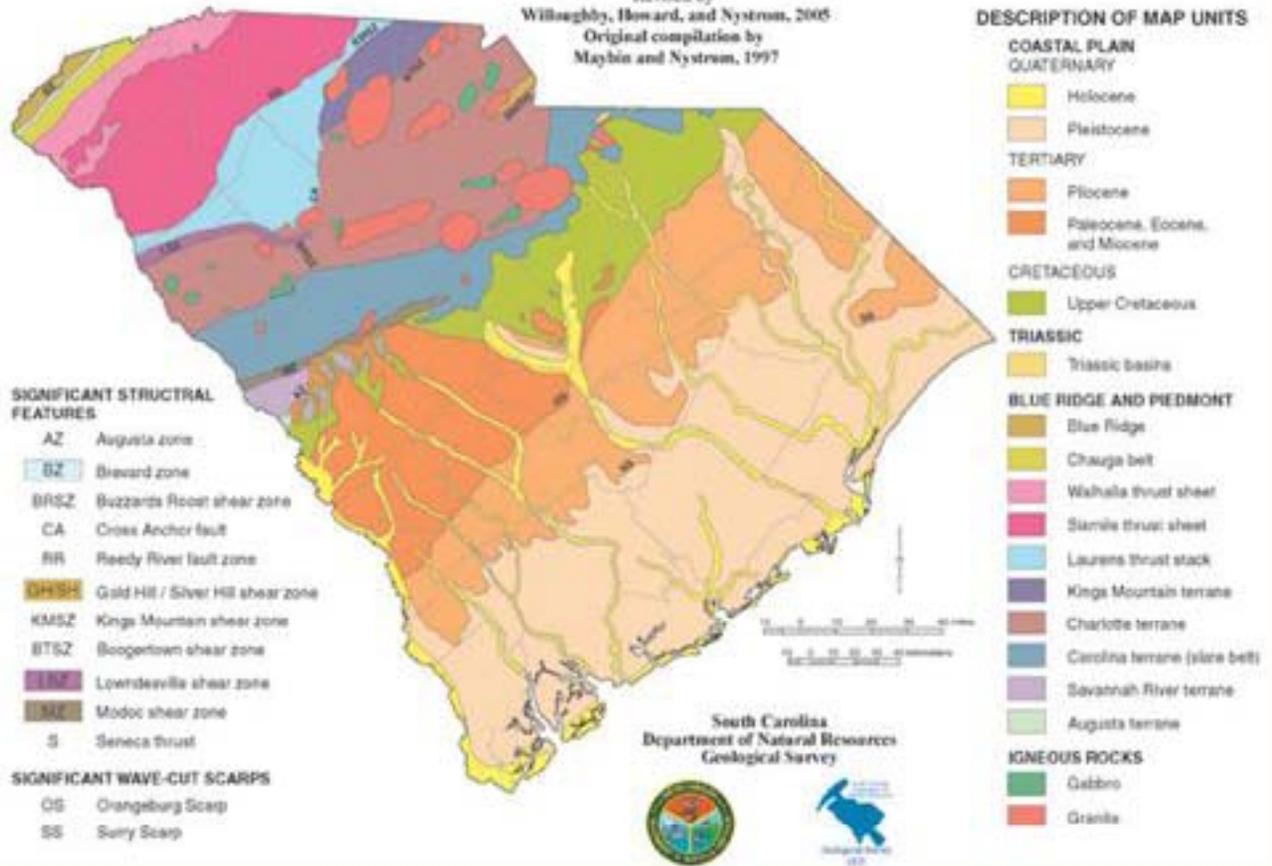
- Sealevel Fluctuations
- Origin and Age of the Barrier Islands
- Coastal Geomorphology

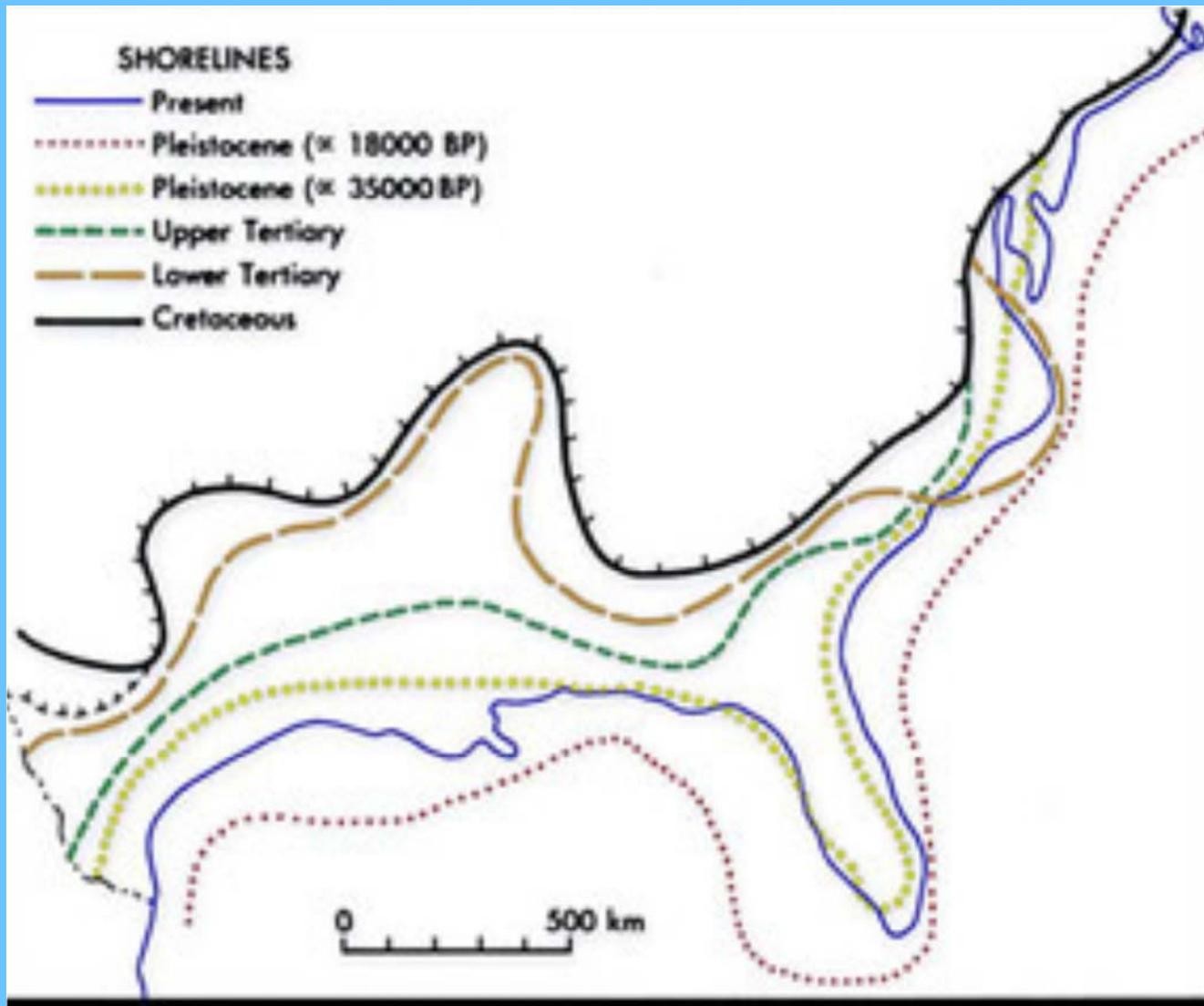
General Geology



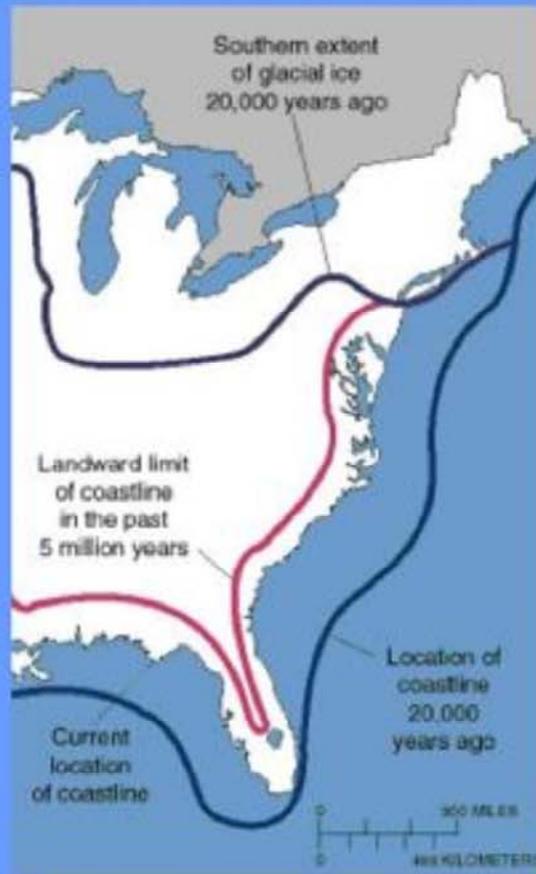
Generalized Geologic Map of South Carolina 2005

Revised by
Willoughby, Howard, and Nyström, 2005
Original compilation by
Maybin and Nyström, 1997





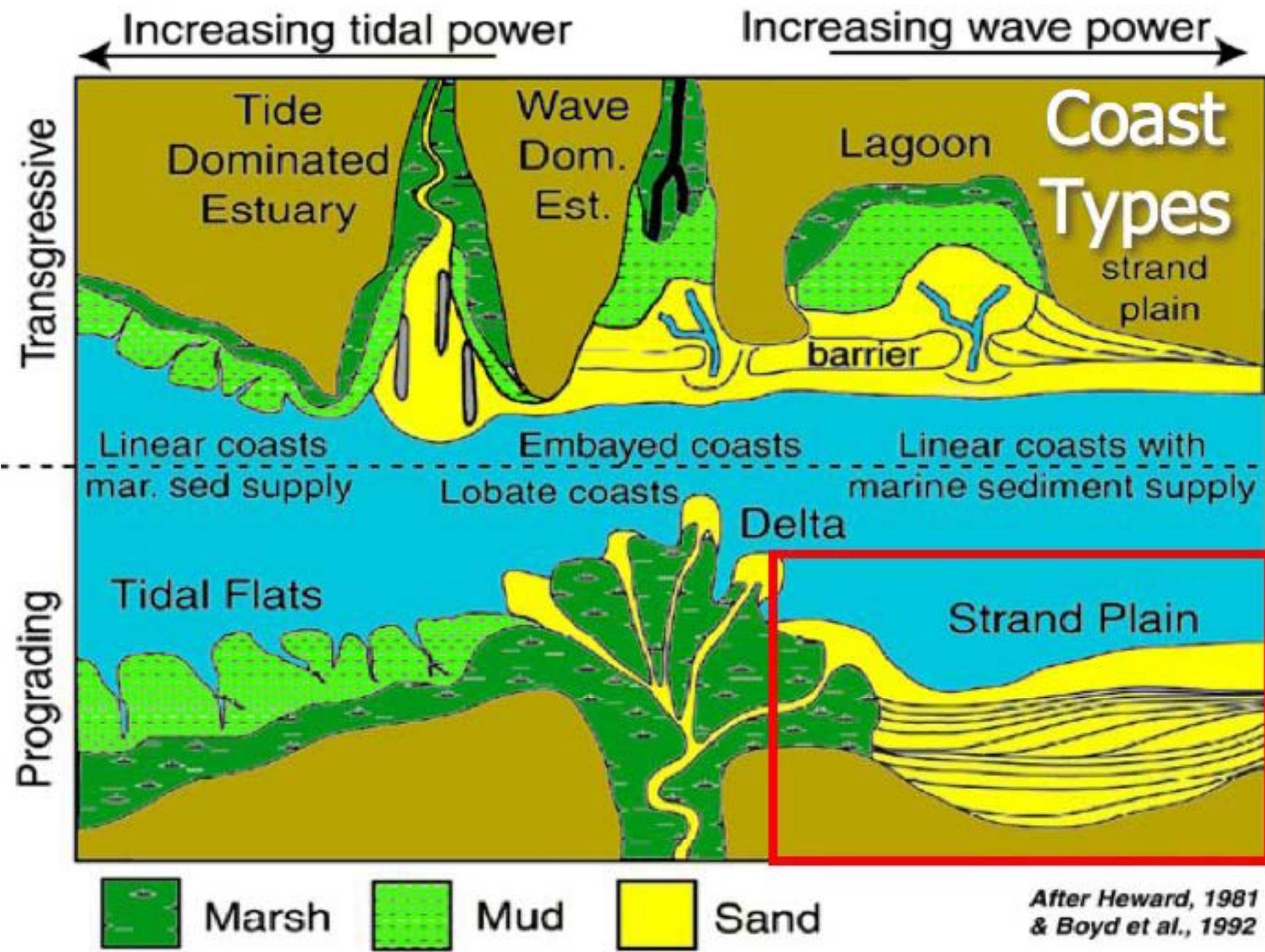
Shoreline Changes Over Time



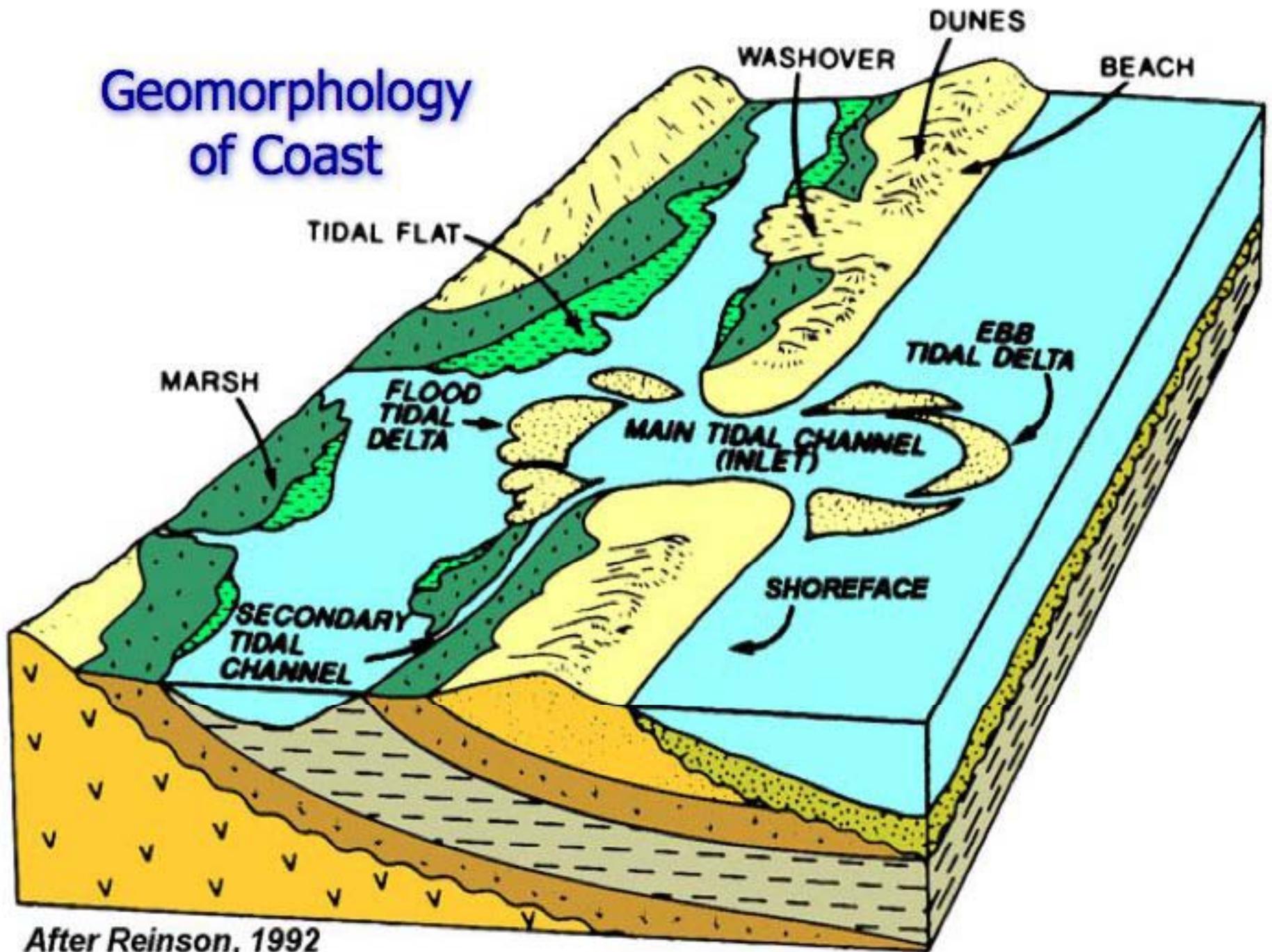
Historical Sea Level Changes

Coastal Morphology



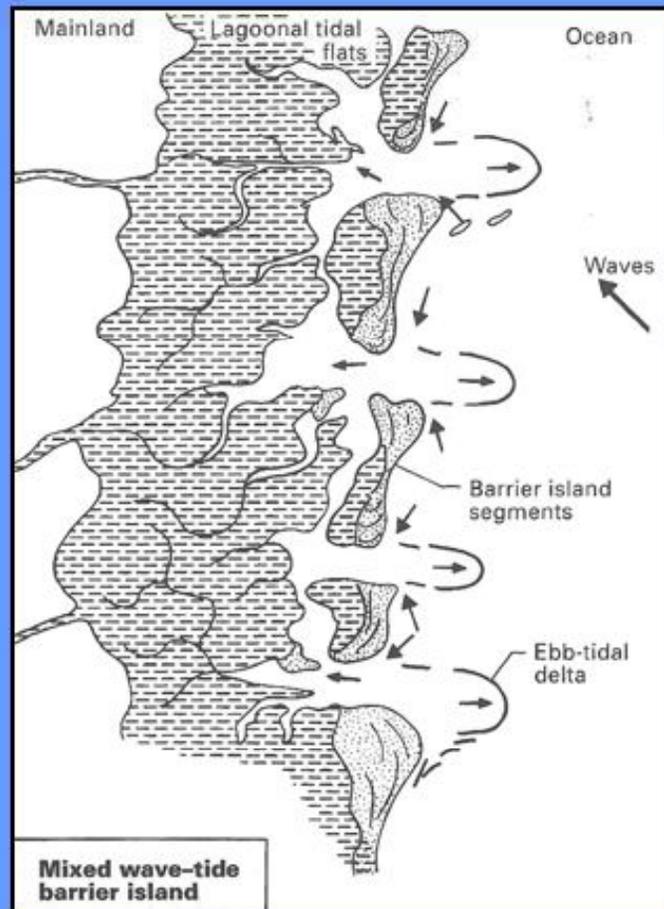


Geomorphology of Coast

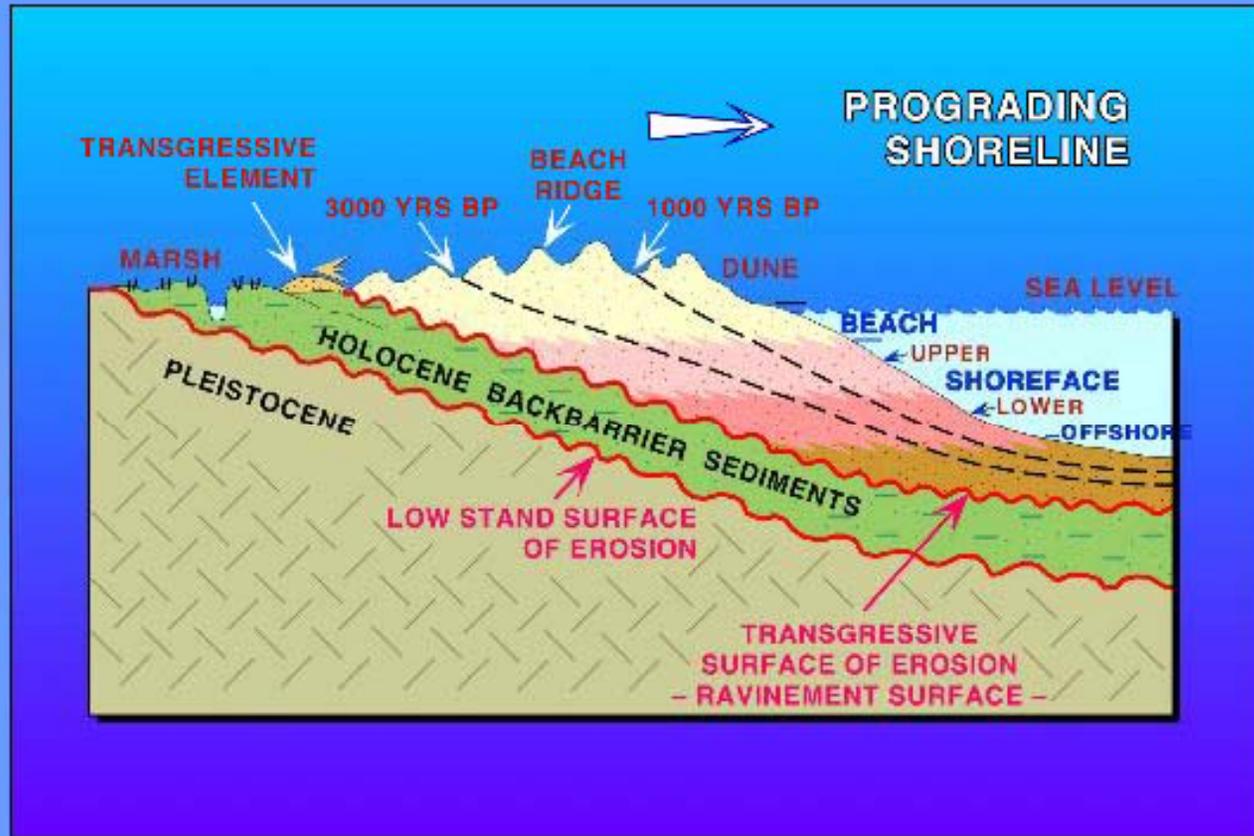


After Reinson, 1992

Typical Barrier Island Coastline

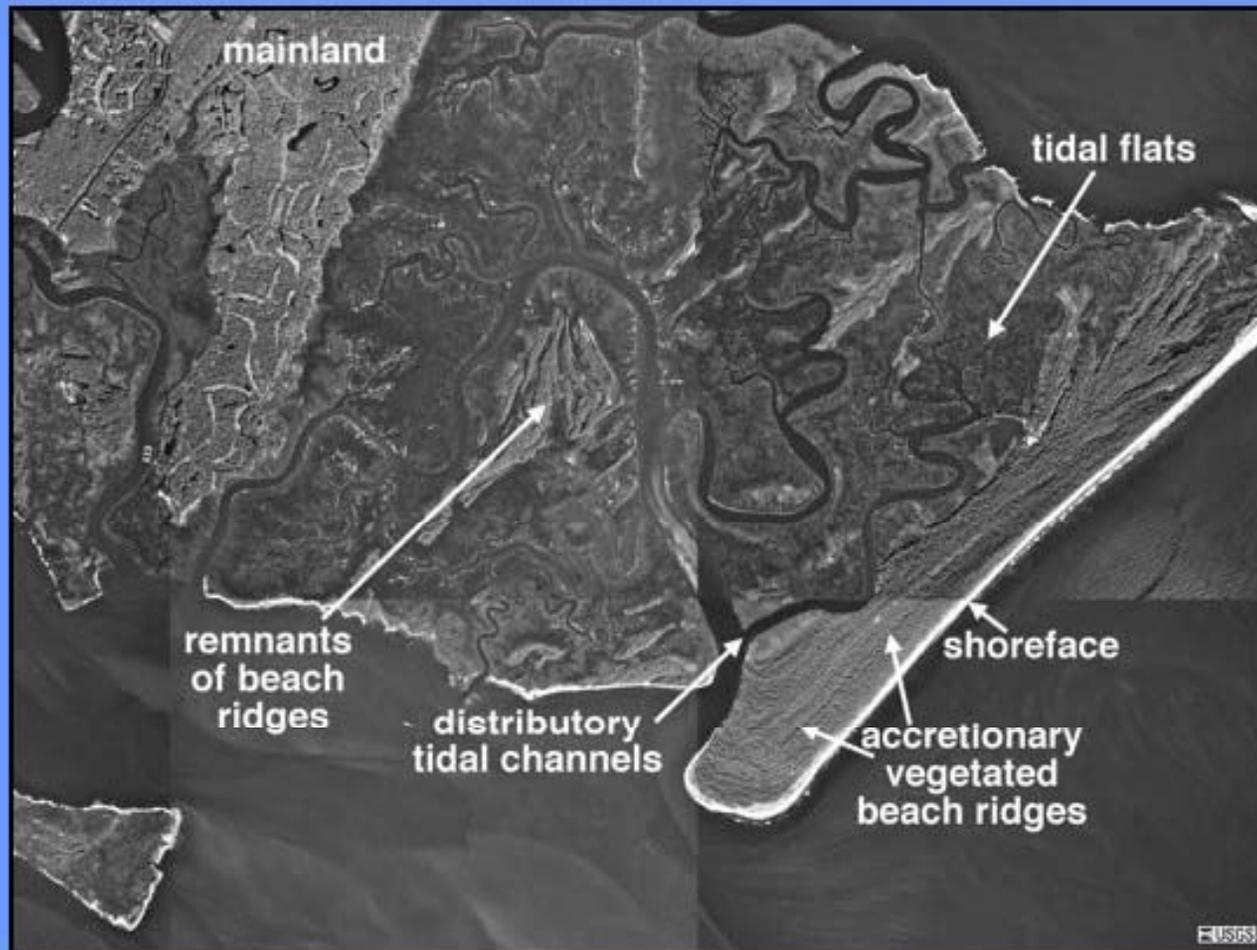


Hayes, 1979

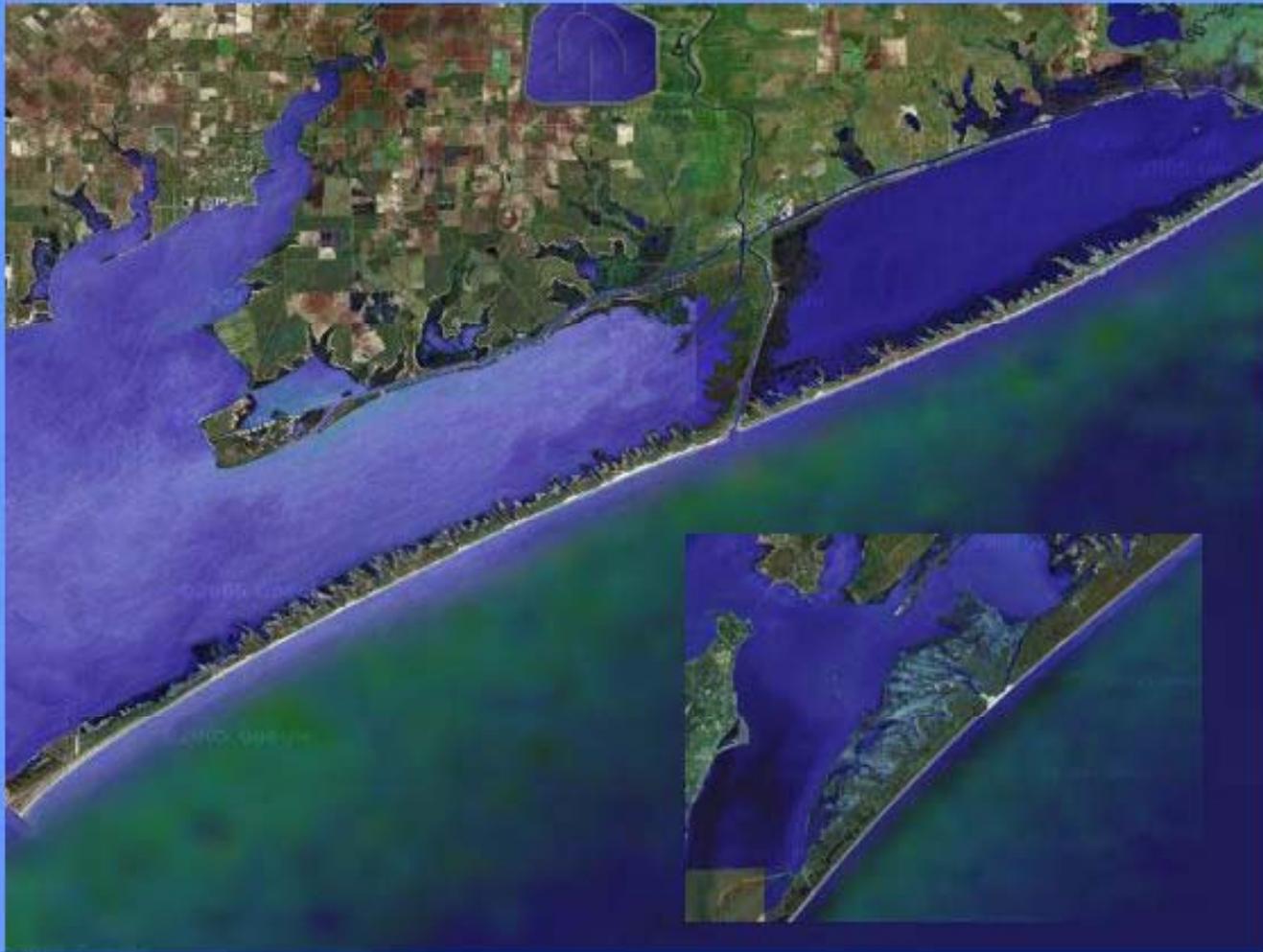


Prograding Shoreline (Hayes, 1998)

Coastal Morphology



Wave Dominated - Texas Coast

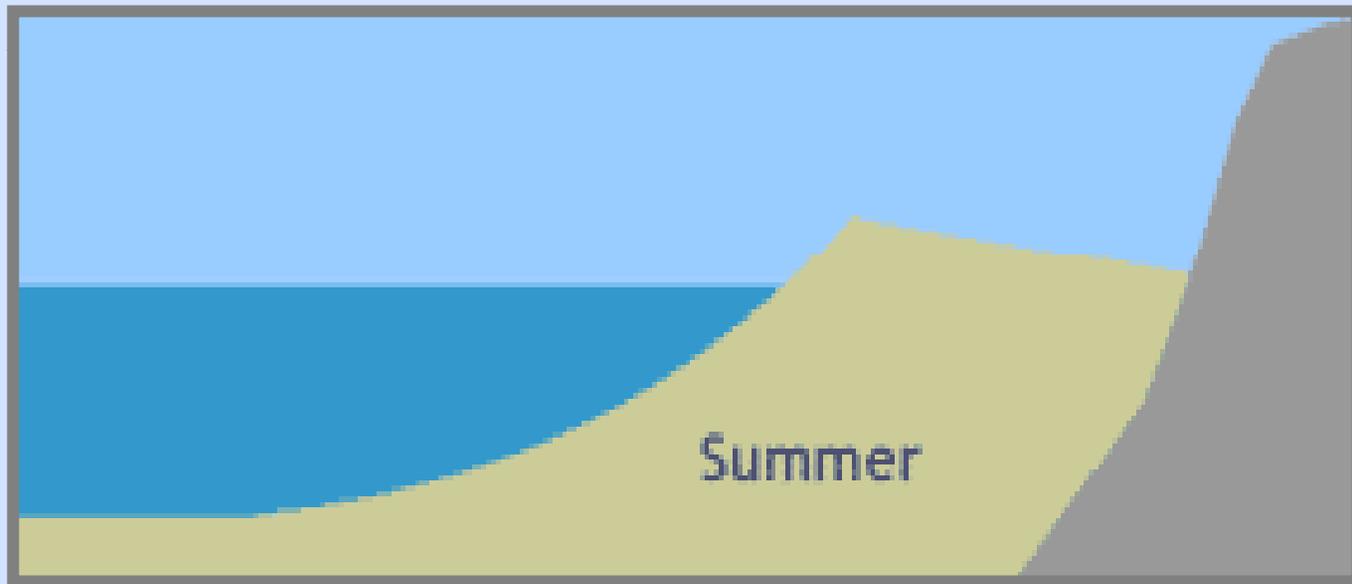


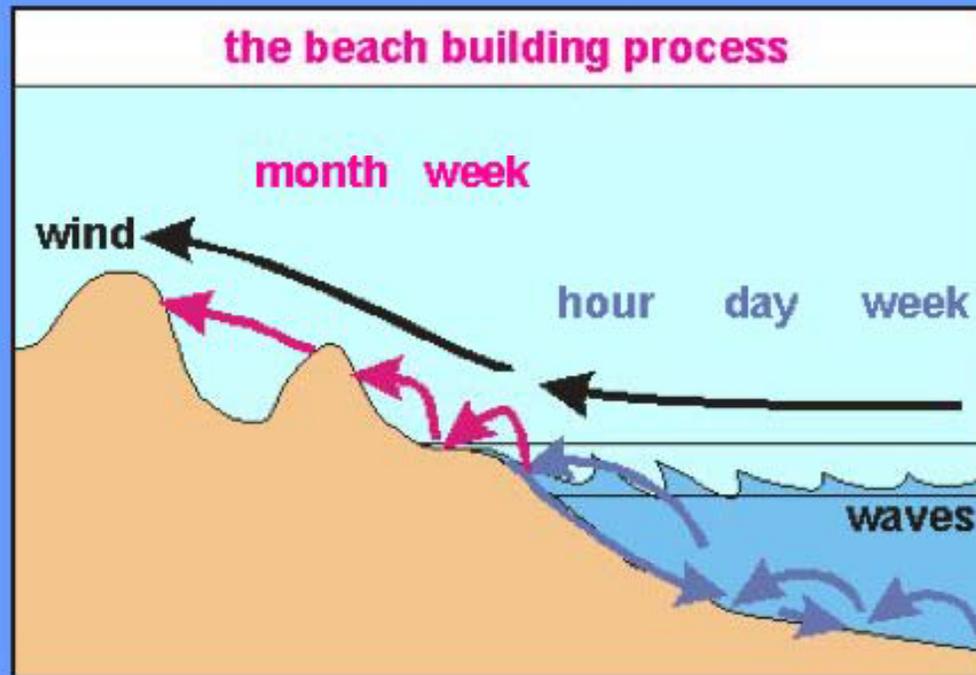
Modern Coastal Processes



Wave Energy

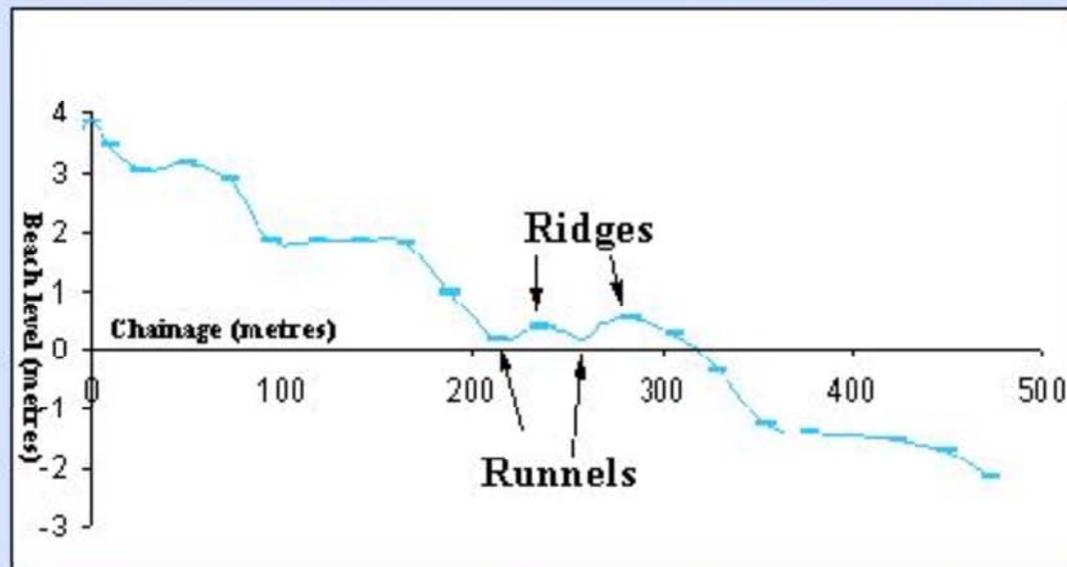
Seasonal Changes in Beach Topography





Beach Building Process

Ridge and Runnel Systems

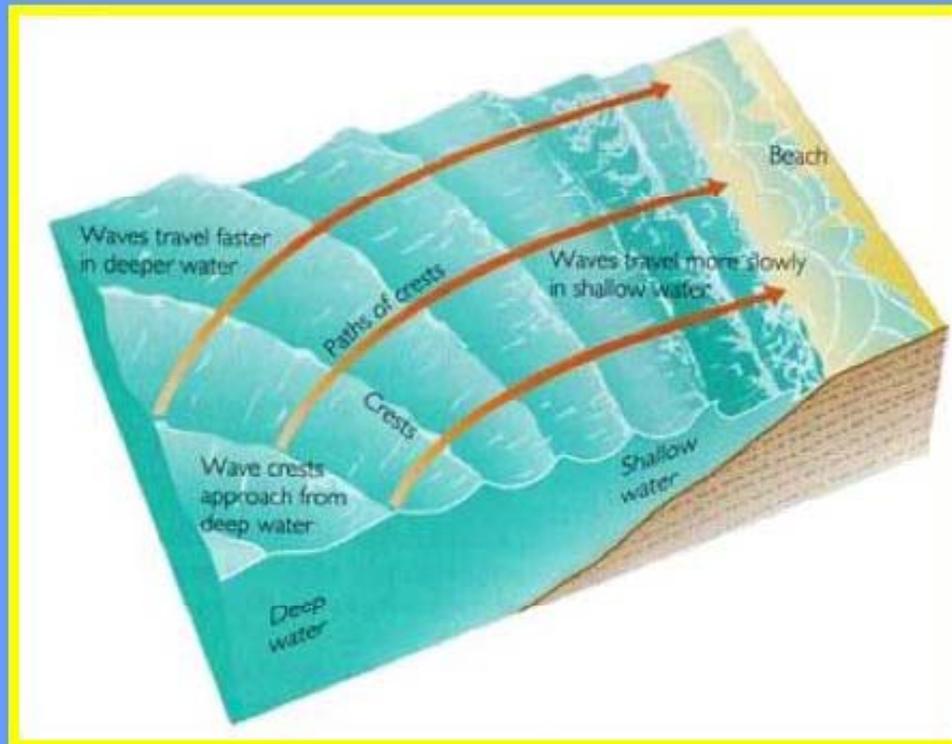




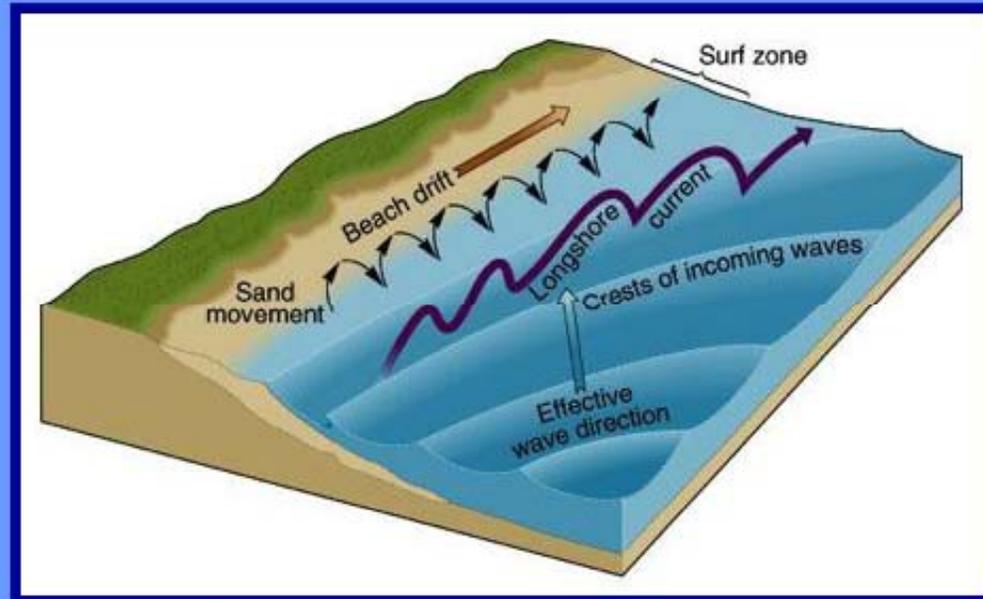
Ridge/Runnel System on Kiawah Island



Beach Development - Bulls Island (Hayes, 1998)



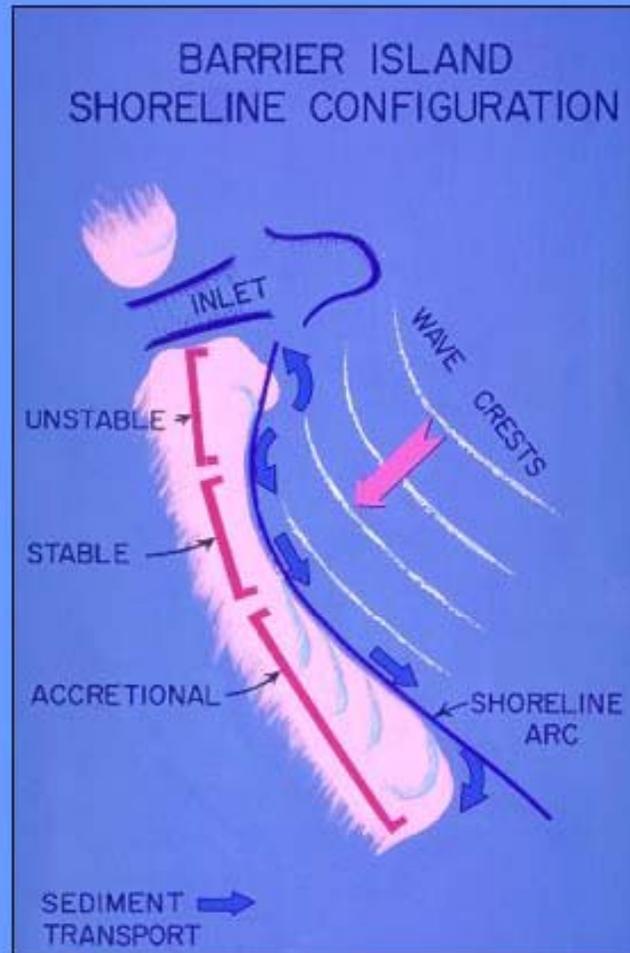
Wave Refraction



Longshore Drift



Longshore sediment transport Kiawah Island

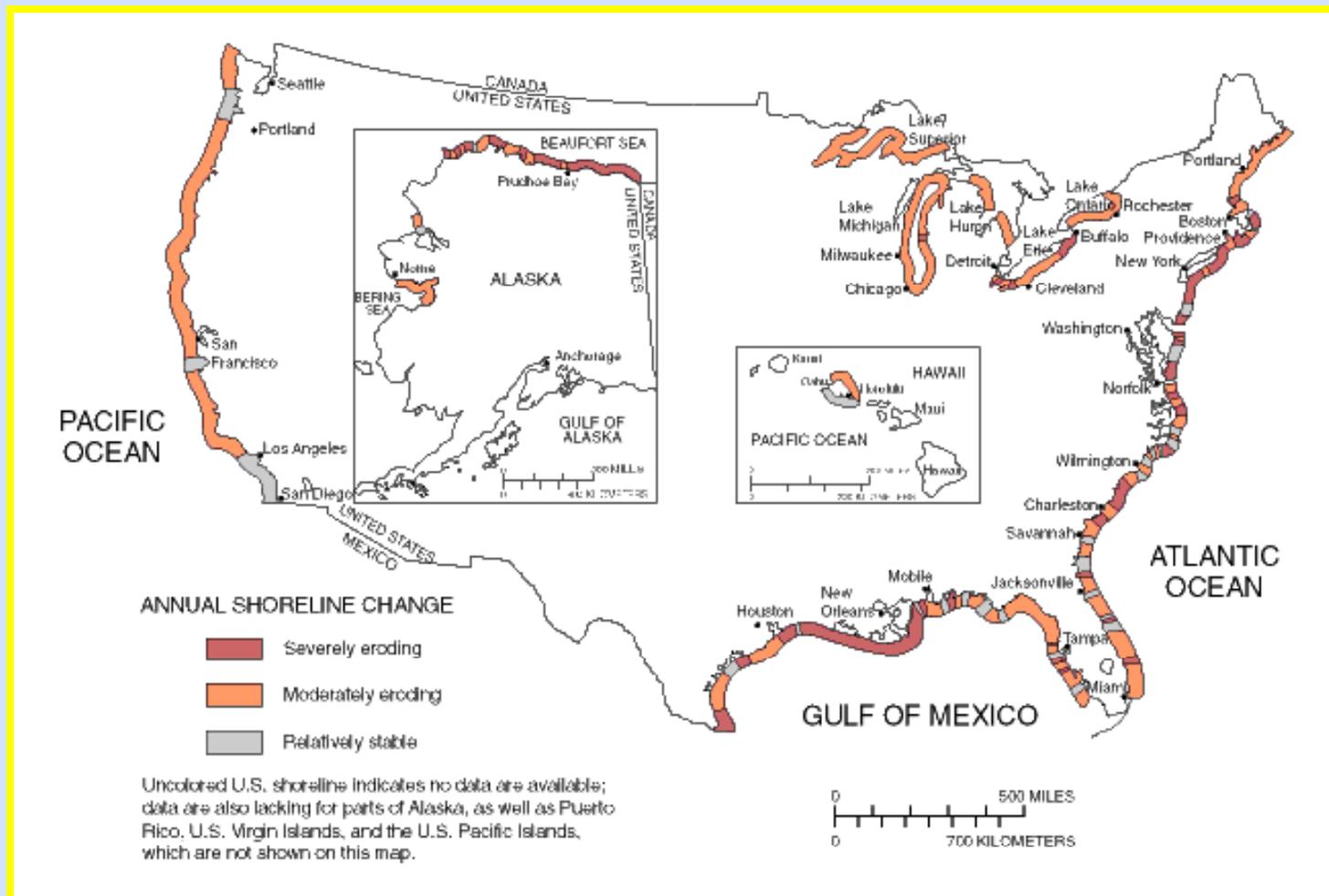


Barrier Island Morphology (Hayes, 1998)

Our Eroding Beaches



Edingsville Beach

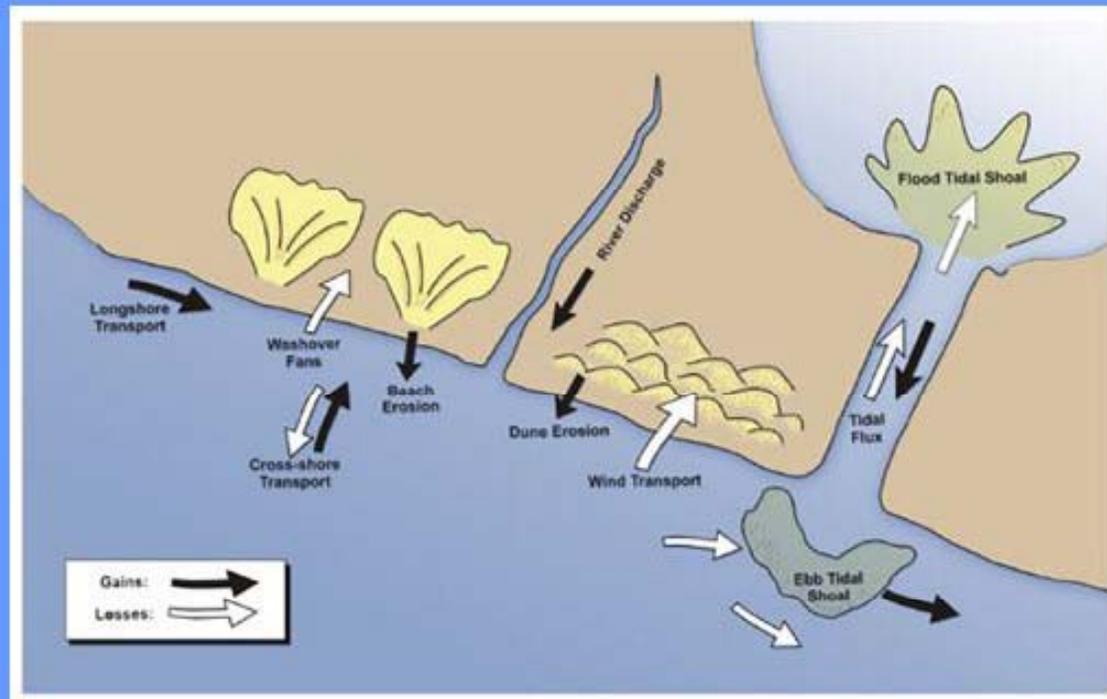


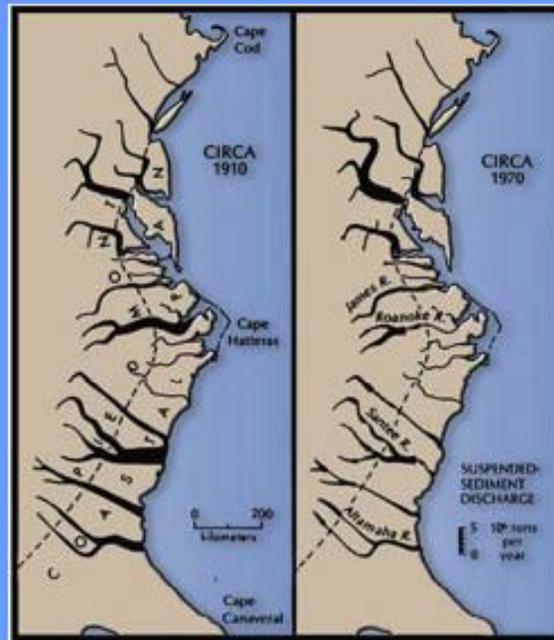
Most Beaches Along the U.S. Coastline are Eroding

Erosion of Protective Dune System - Capers Island



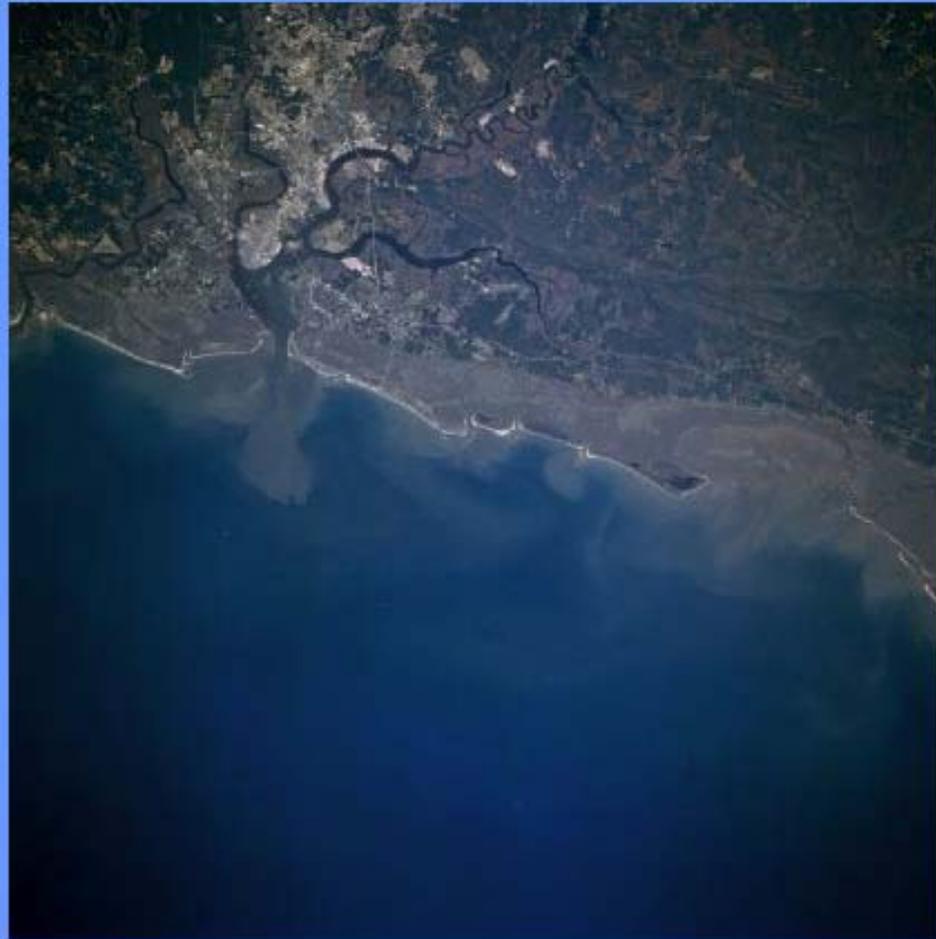
Where does the sand go?





Reduction in River Sediment Discharge

What affect has the damming of the Santee River had on sediment supply?



Satellite View of Coast

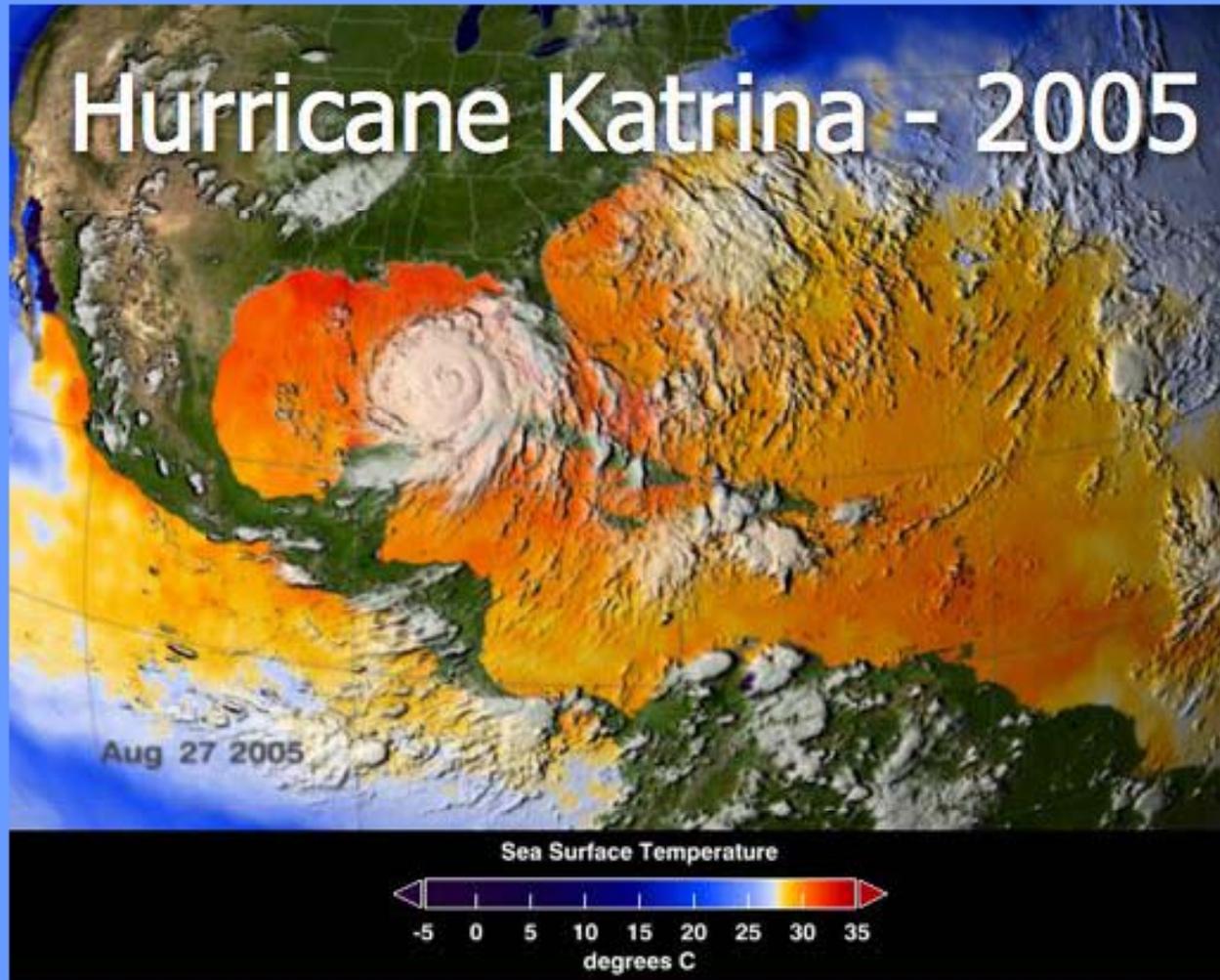


Ebb Tidal Delta at Price Inlet

Storm Effects on Our Coastline



Hurricane Katrina - 2005





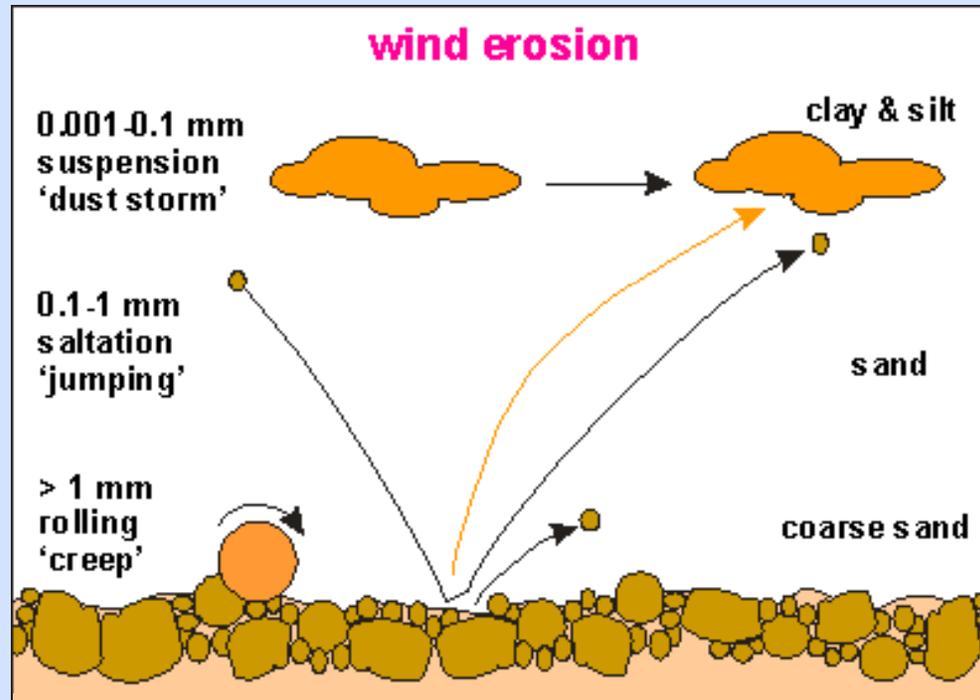
Hurricane Hugo
September 21, 1989

Need for Maintaining the Sand Dunes

- serve as a buffer against erosion and flooding
- first line of defense against storms
- sand reservoir for the beach
- part of the natural character of the coastline



Sand Dune Construction



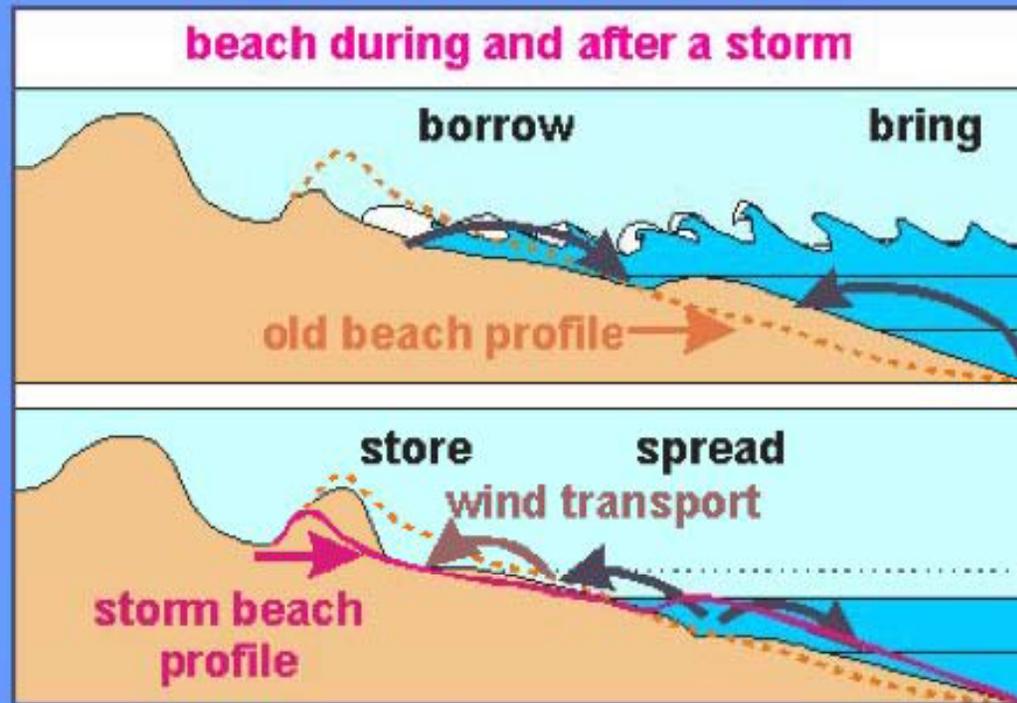
Sand Transport (Saltation) of Beach Sediments

Development of Incipient Dunes



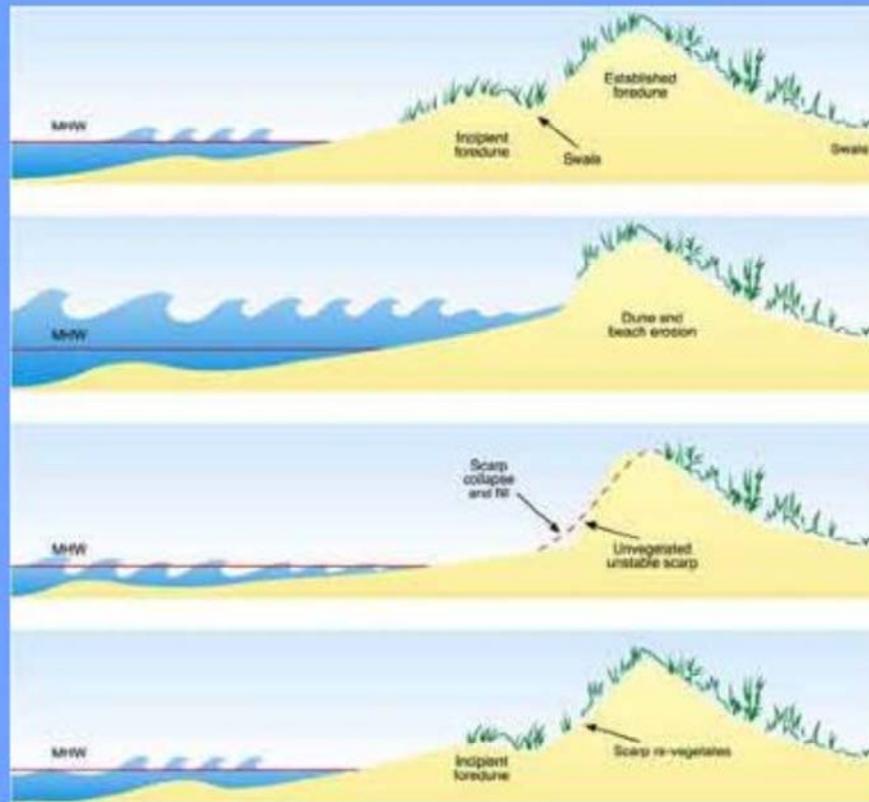
Embryo Dunes

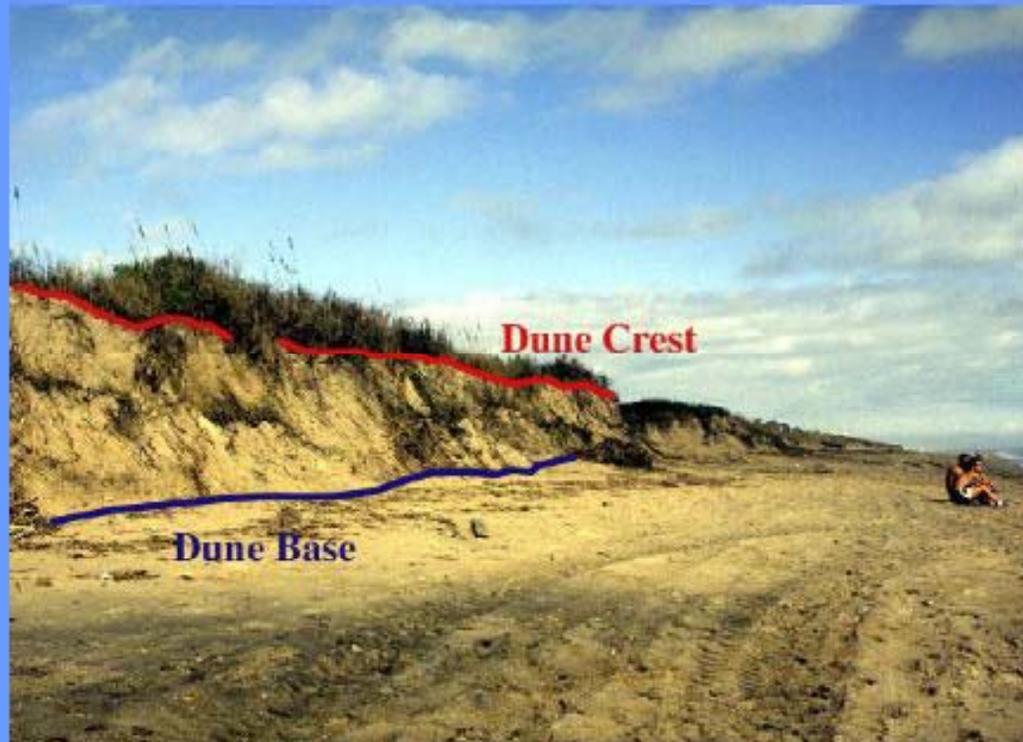




Beach Behavior - Beach/Dune System

Storm Effects on the Dunes



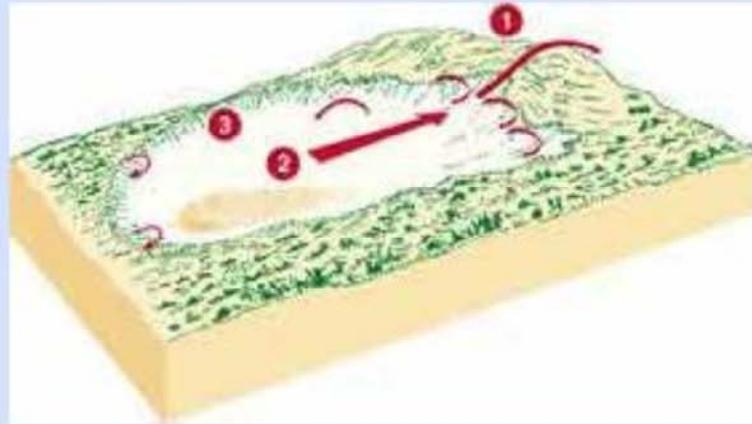


Dune Erosion

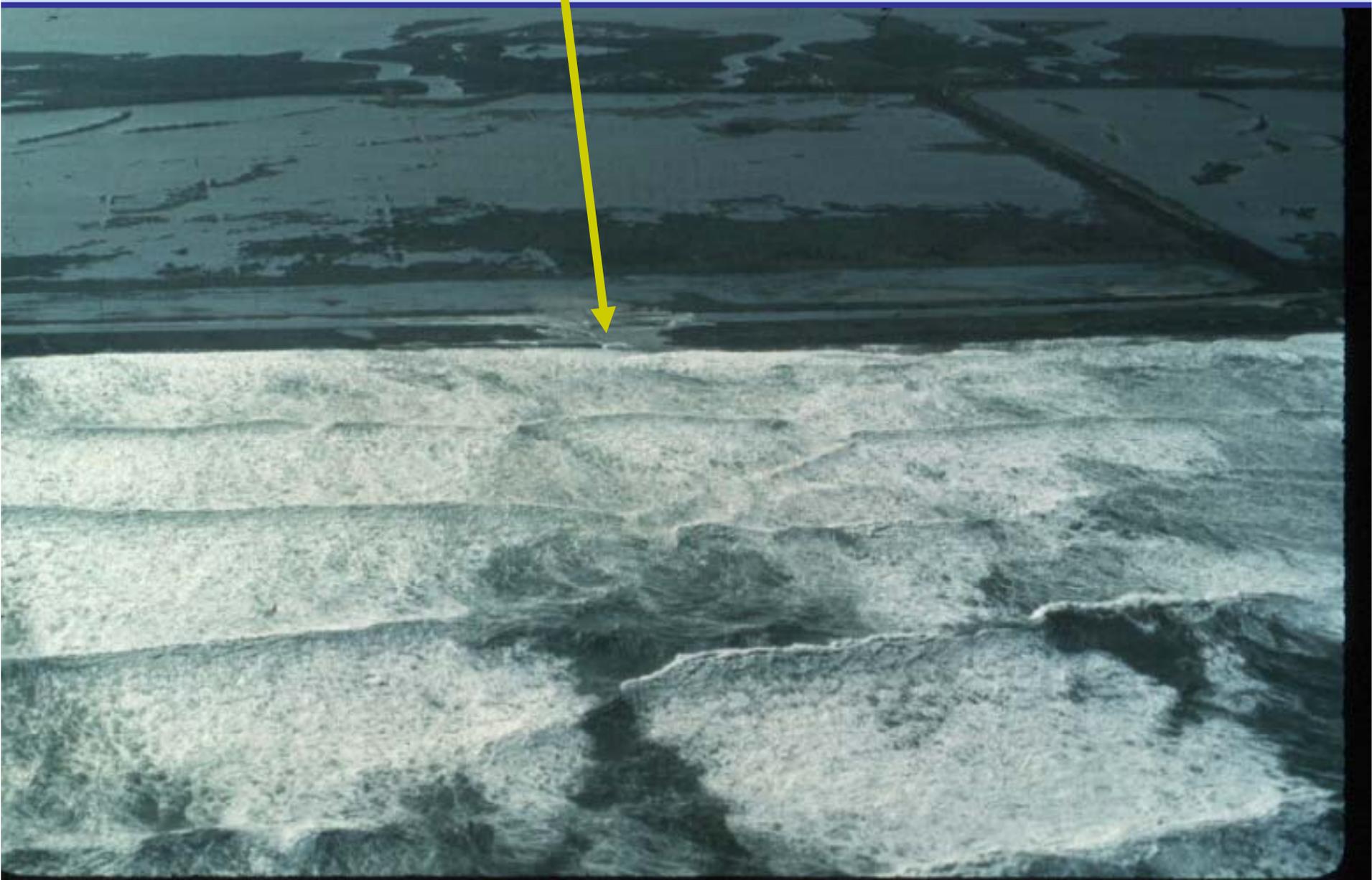
Development of Dune Scarp



Removal of vegetation may result in the formation of depressions called Blowouts or Deflation Basins



Dune breach



Storm Washover Deposits

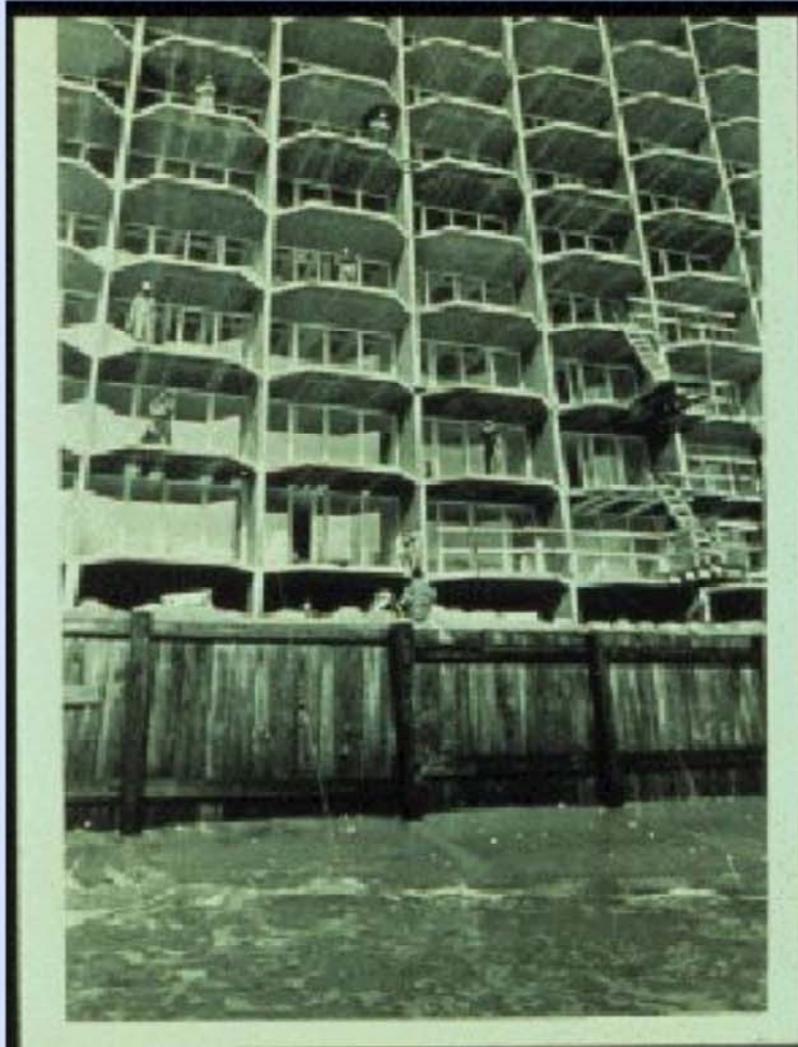


Man's Effect on our Coastline

- Hard Stabilization
- Soft Stabilization

Vero Beach, FL - Hard stabilization takes many forms

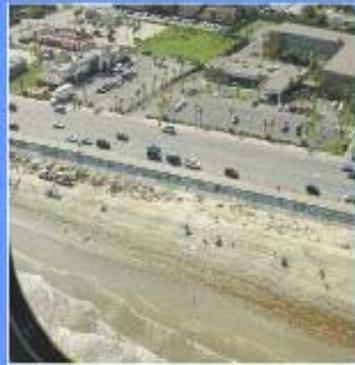




North Carolina - Don't buy this condo!

Photo(1986) from The Coastal Observer. Construction workers fishing from the balconies of a condo, celebrating the "topping out" of the building. The seawall was destroyed in January 1987 by a Northeaster. It was rebuilt to stronger specifications and destroyed again in 1989 by hurricane Hugo.

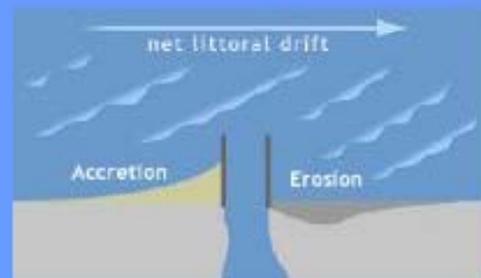
Consideration - if you can fish from your window - don't buy!



Effect of Seawalls, Revetments and Bulkheads

Effect of Groins in Trapping Littoral Drift





Effect of Jetties on Sediment Transport

Folly Beach erosion resulting from the construction of the Charleston Harbor Jetties



Geotextile Tubes





Beach Nourishment

North Myrtle Beach, S.C.



Myrtle Beach, SC



Which is more important, preservation of the beach or the buildings?