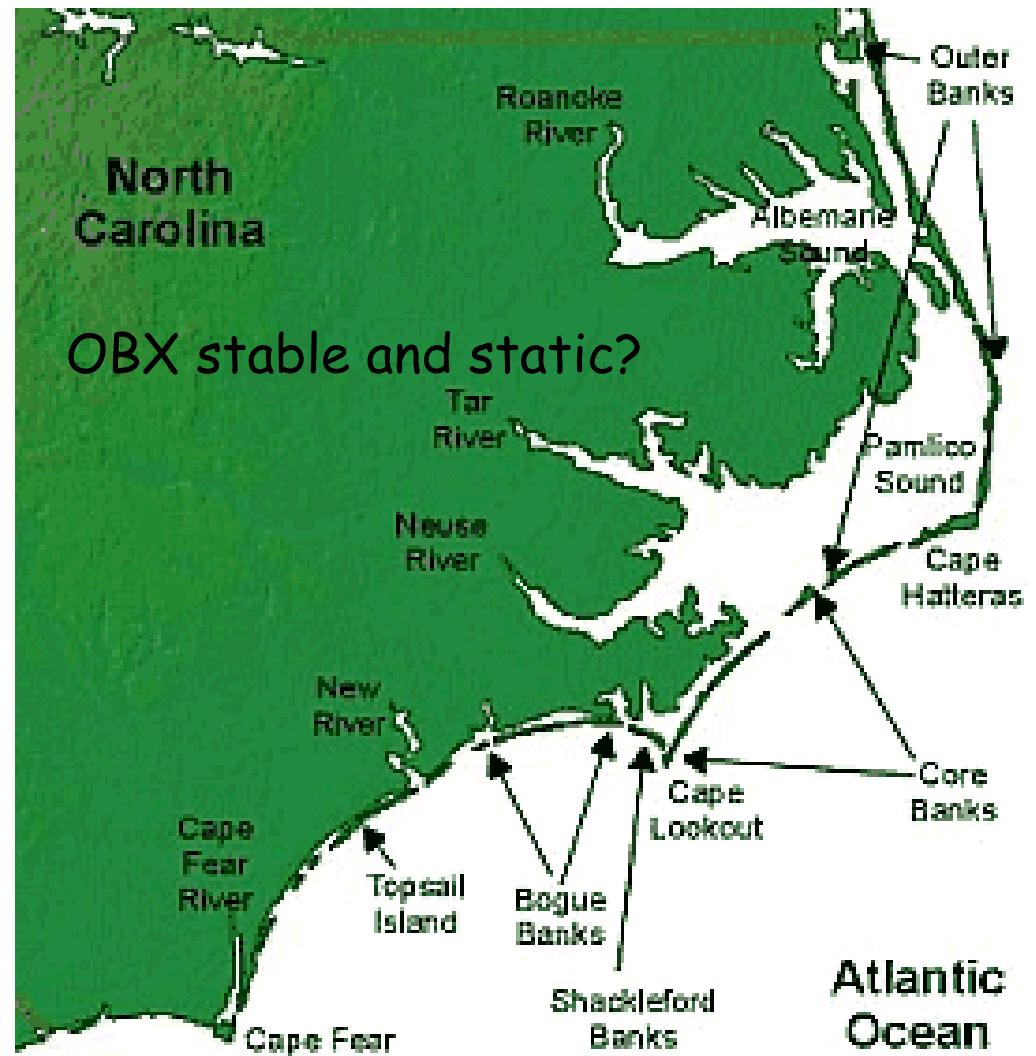


Coastal Processes: General Topics

- Hatteras Light
- review of beach processes
- human intervention

Barrier islands

- basics
- evolution
- ecology
- tourism



Hatteras Light ...
... the tourist attraction



... the knick knack

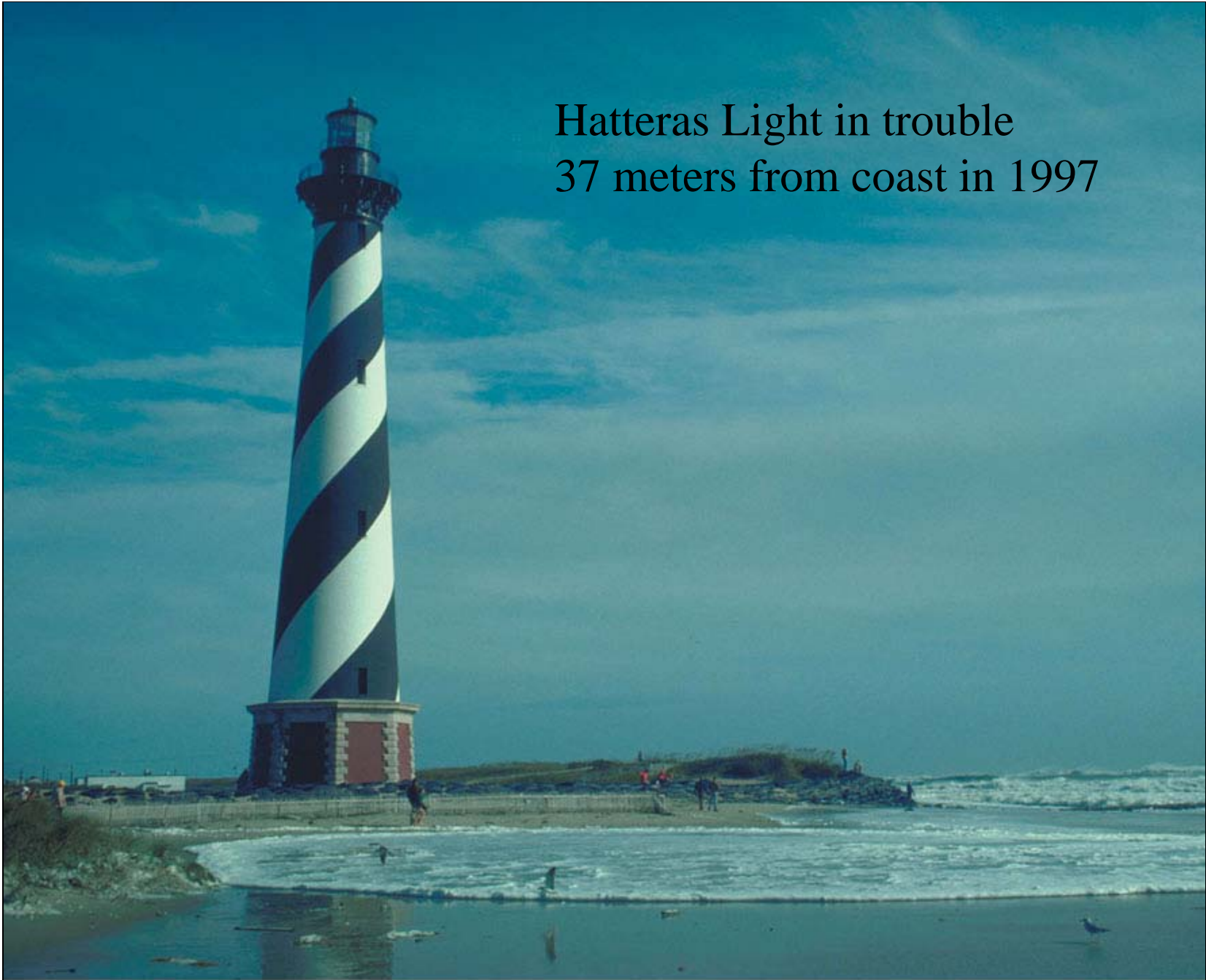


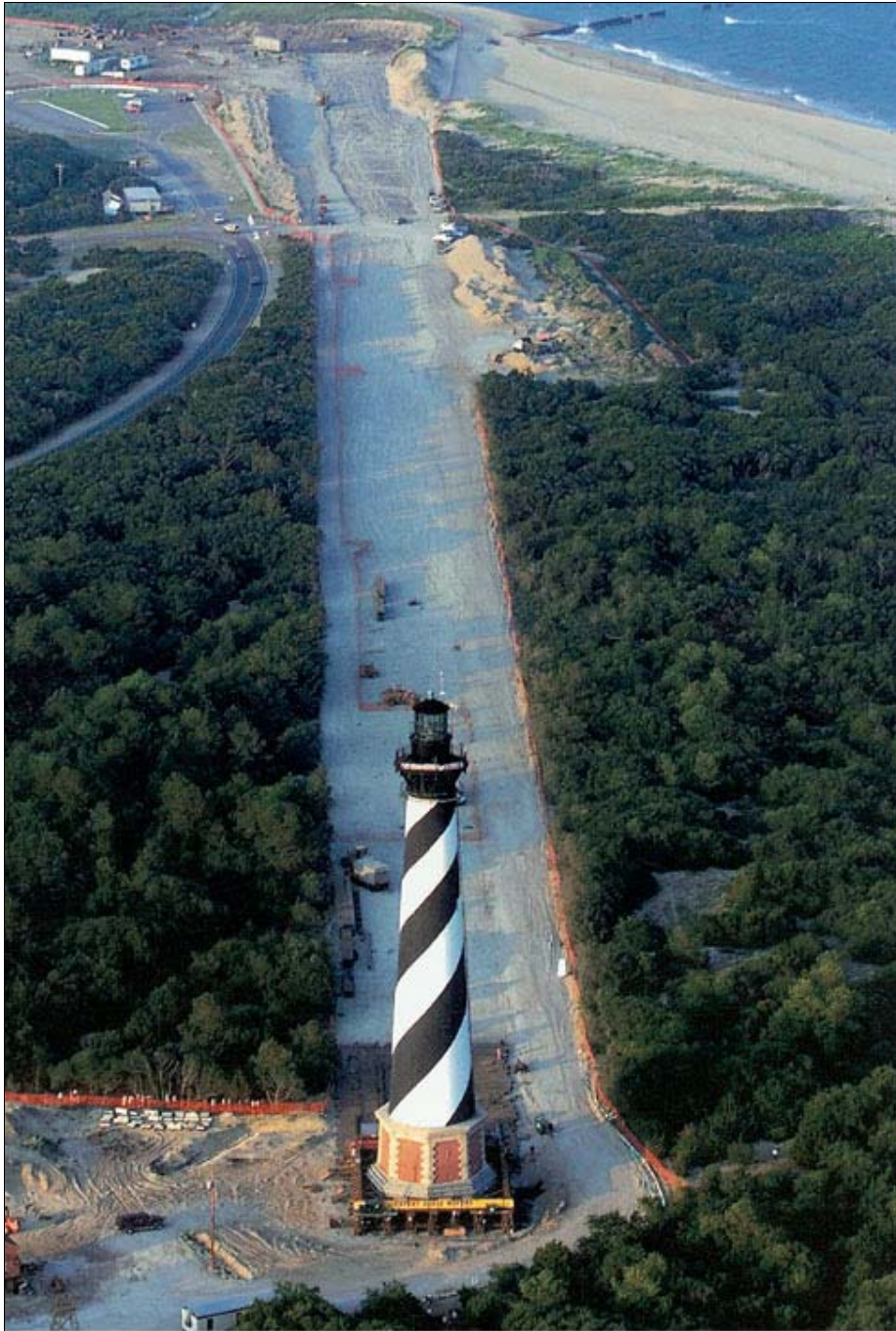
the icon



David Knowlton

Hatteras Light in trouble
37 meters from coast in 1997





Hatteras Light on the move, 1998

- why was it endangered?
- was there an alternative?
- why are barrier islands unstable?

Review of key concepts from Beach Movie

- sand is deposited on beaches in summer
- sand removed by winter storms (and hurricanes)



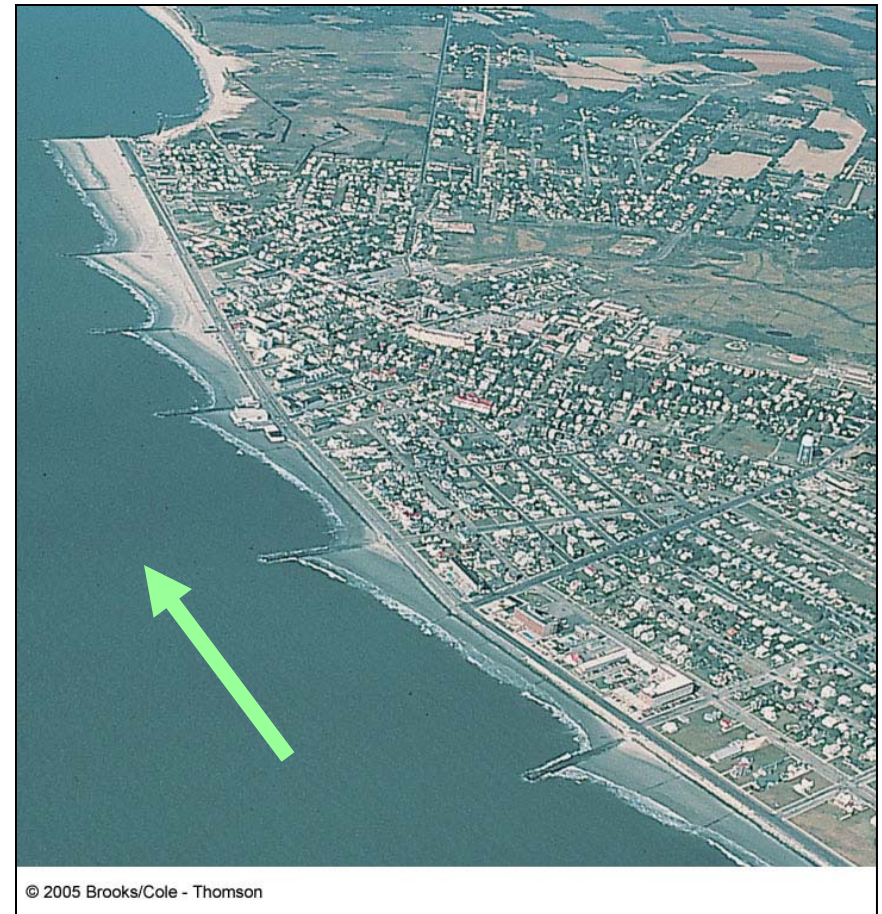
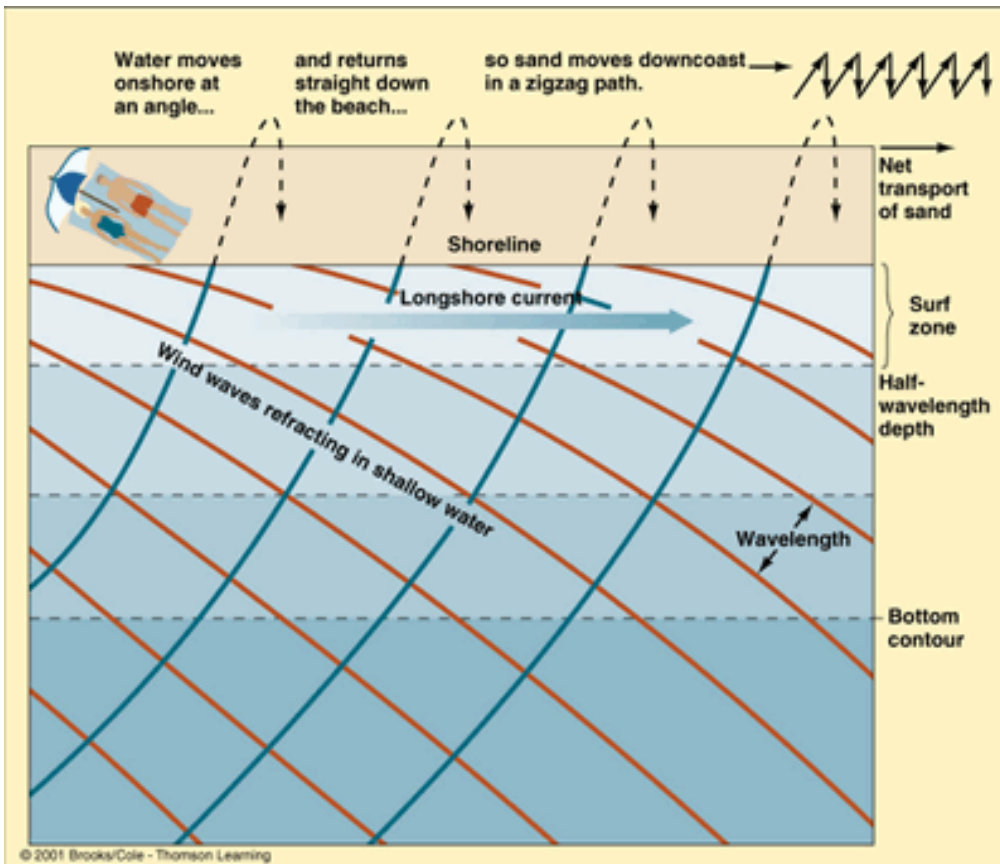
© 2005 Brooks/Cole - Thomson



© 2005 Brooks/Cole - Thomson

Review of key concepts from Beach Movie

- waves hitting beach at angle move sand along the shore
- you can tell direction of drift by looking at groins & other barriers



Review of key concepts from Beach Movie

- human interventions tend to be counter-productive



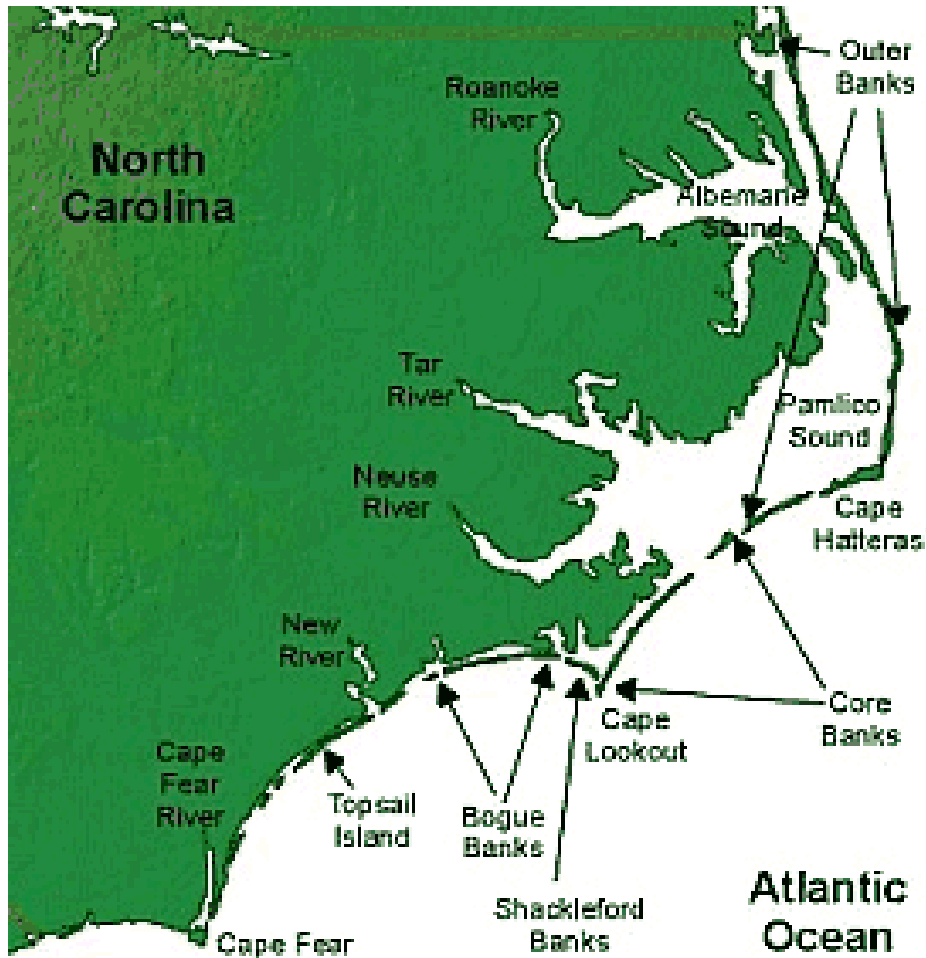
Find a satellite image of
Santa Monica

How does it look today?

This is sand... this is your house on sand ... any questions?



USGS image



Barrier Islands:

- very long (3 -- 100 km)
- very narrow (1 -- 3 km)
- parallel the mainland
- enclose a shallow lagoon
- in chains, separated by tidal inlets
- on wide, gently sloping coasts
- East and Gulf Coasts
- *protect the mainland*
- *always changing*

Castle re-emerging from sand Jockey's Ridge



old coast guard station buried in sand
ncnatural.com



Core Banks

- long & narrow
- ocean shore is straight
- lagoon shore is ragged
- shape reveals processes

Allen Glazner
UNC



Cape Lookout
Which way is longshore drift?

Allen Glazner
UNC



Islands Reveal Processes

www.salemstate.edu

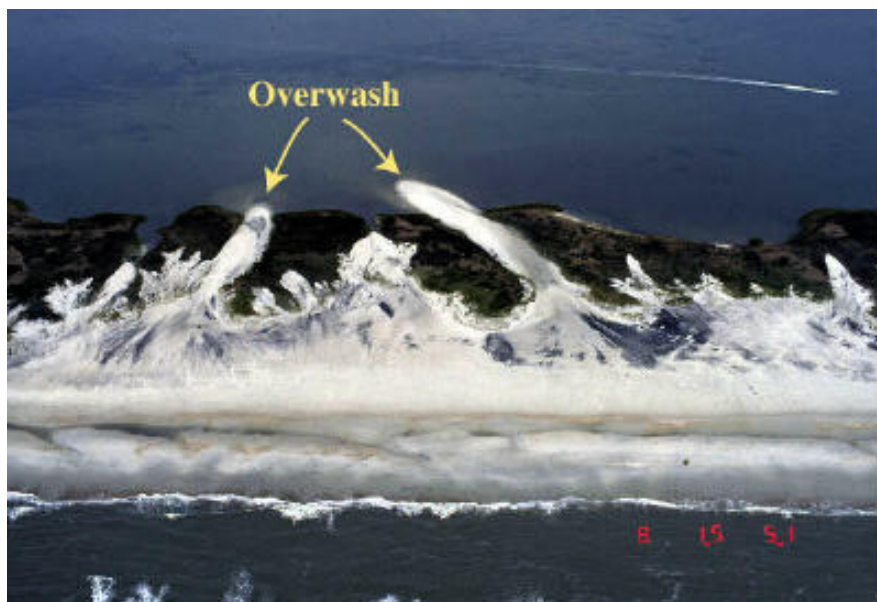
Over Wash on a Barrier Island (aerial view)



Overwash

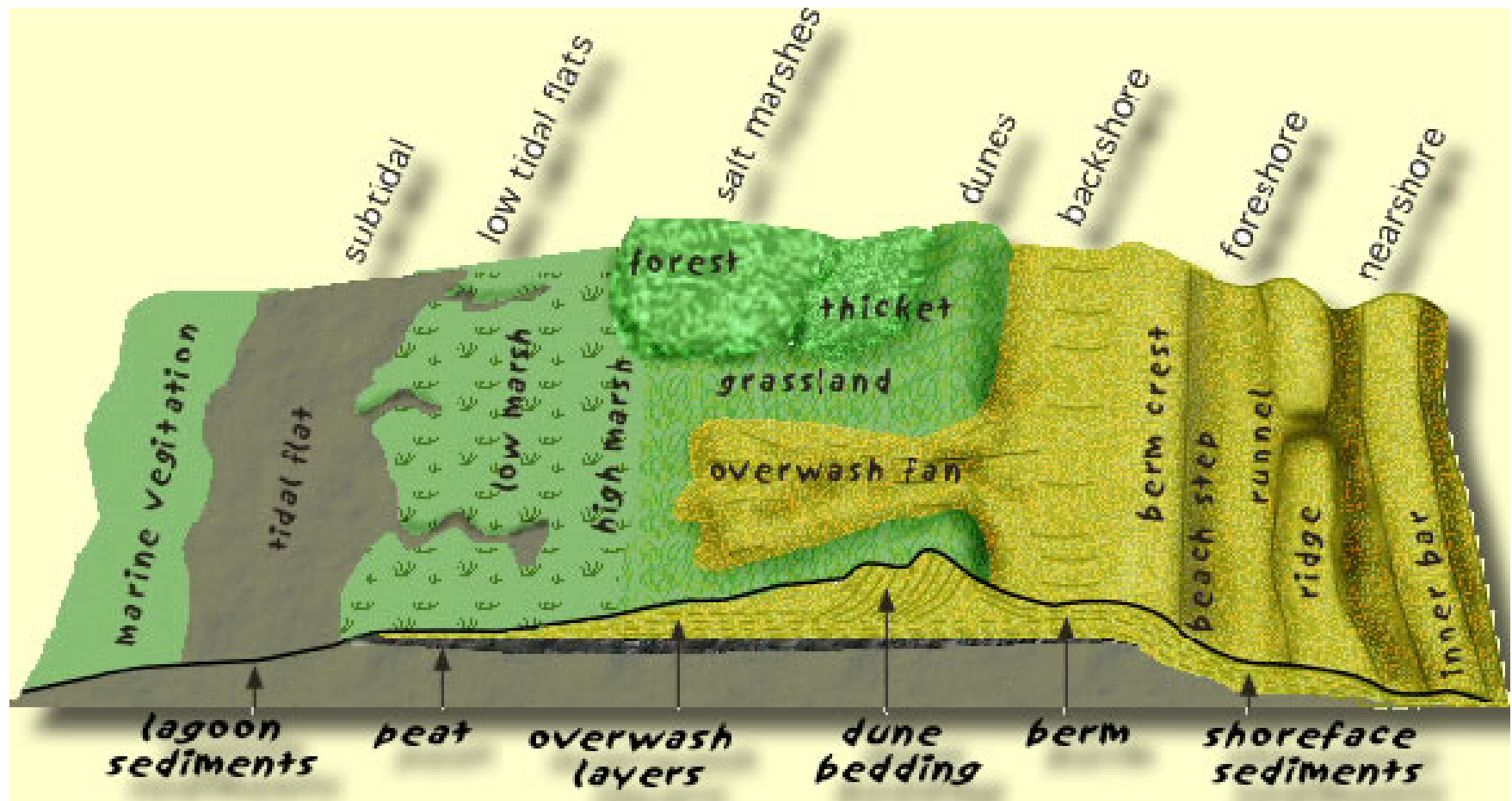
" a cannibalistic process which preserved the existence of the barrier"

salemstate.edu



- storms move sand across island
- destroys roads and buildings
- builds back of island
- constant in wild islands
- should we fight it?

<http://science.howstuffworks.com/barrier-island.htm>



built by *overwash*

dunes built by wind

backshore = beach; built by waves

foreshore = under water

Barrier Islands Change Constantly

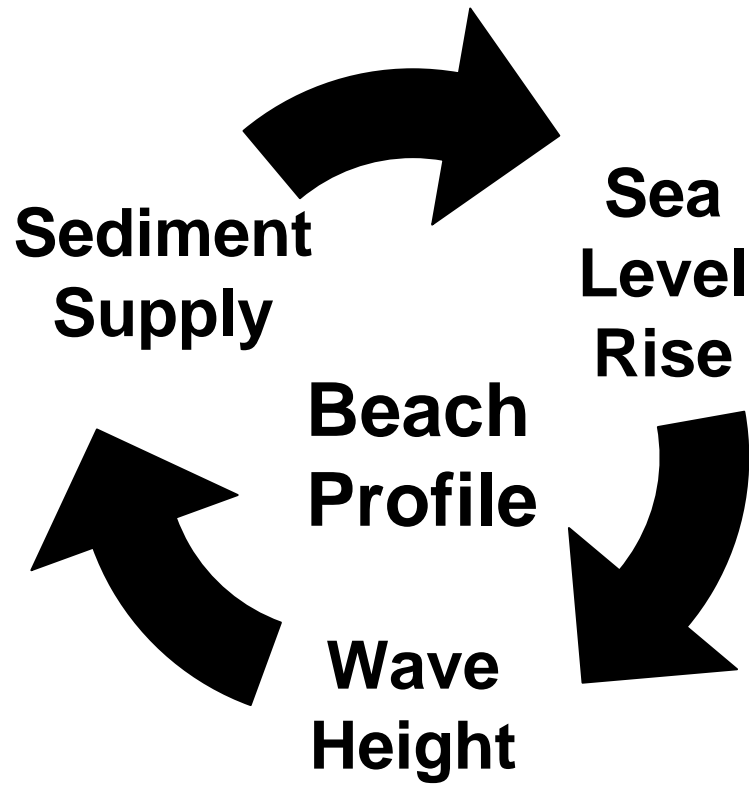
- ocean deposits sand on beach (and removes it)
- longshore currents move sand, generally southward

- wind blows sand into dunes
- grasses stabilize dunes



- storms push sand onto back of islands - *overwash*
- island migrates landward - *rollover*

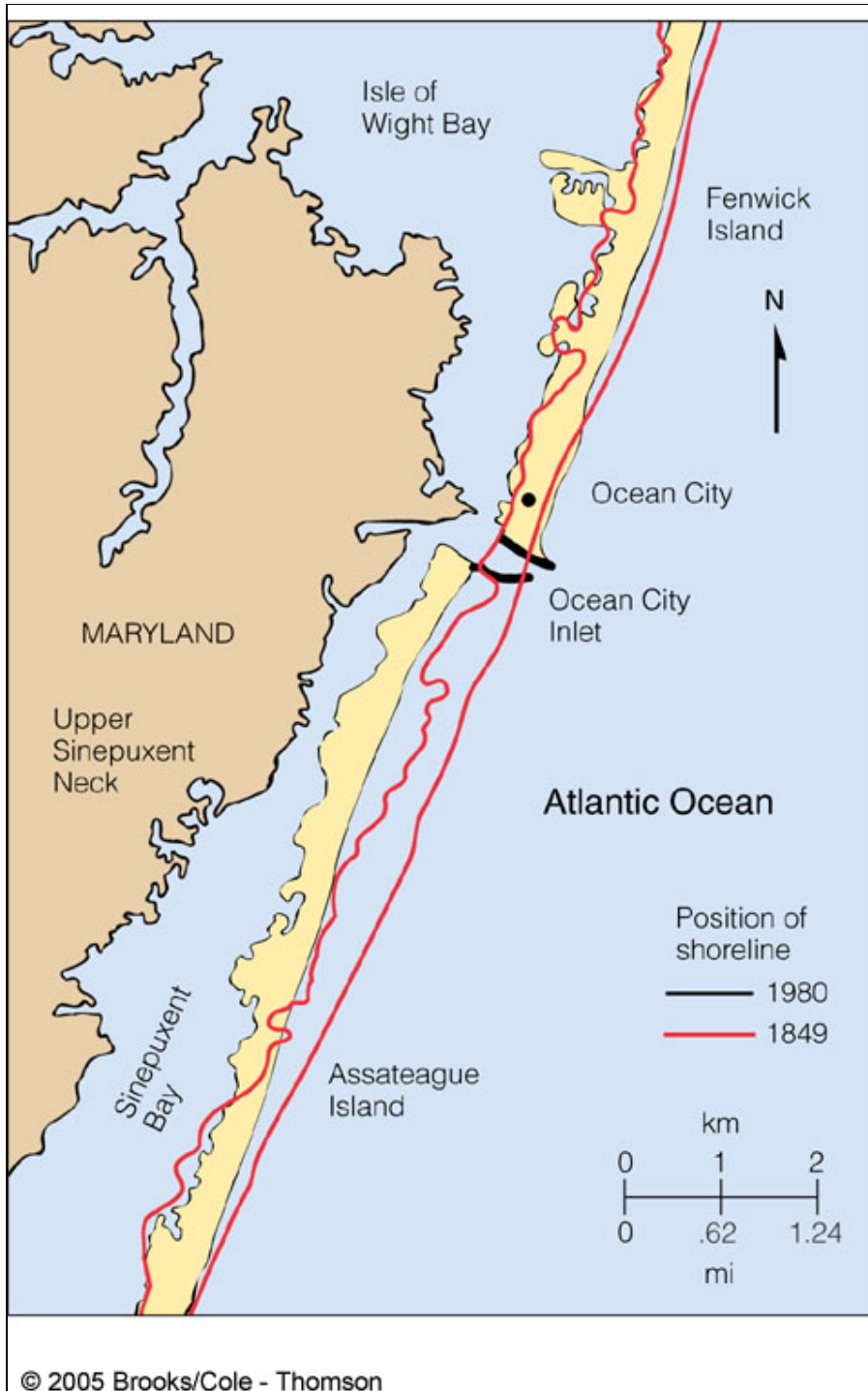
Barrier Island Processes



Ocean side of island erodes,
Lagoon side builds up.

Faster when:

- sea level rises
- sediment is cut off
- waves are big



Jetties at Assateague Island

- built in 1937
- broke longshore drift
- less sand gets to south
- island moved 500 m west

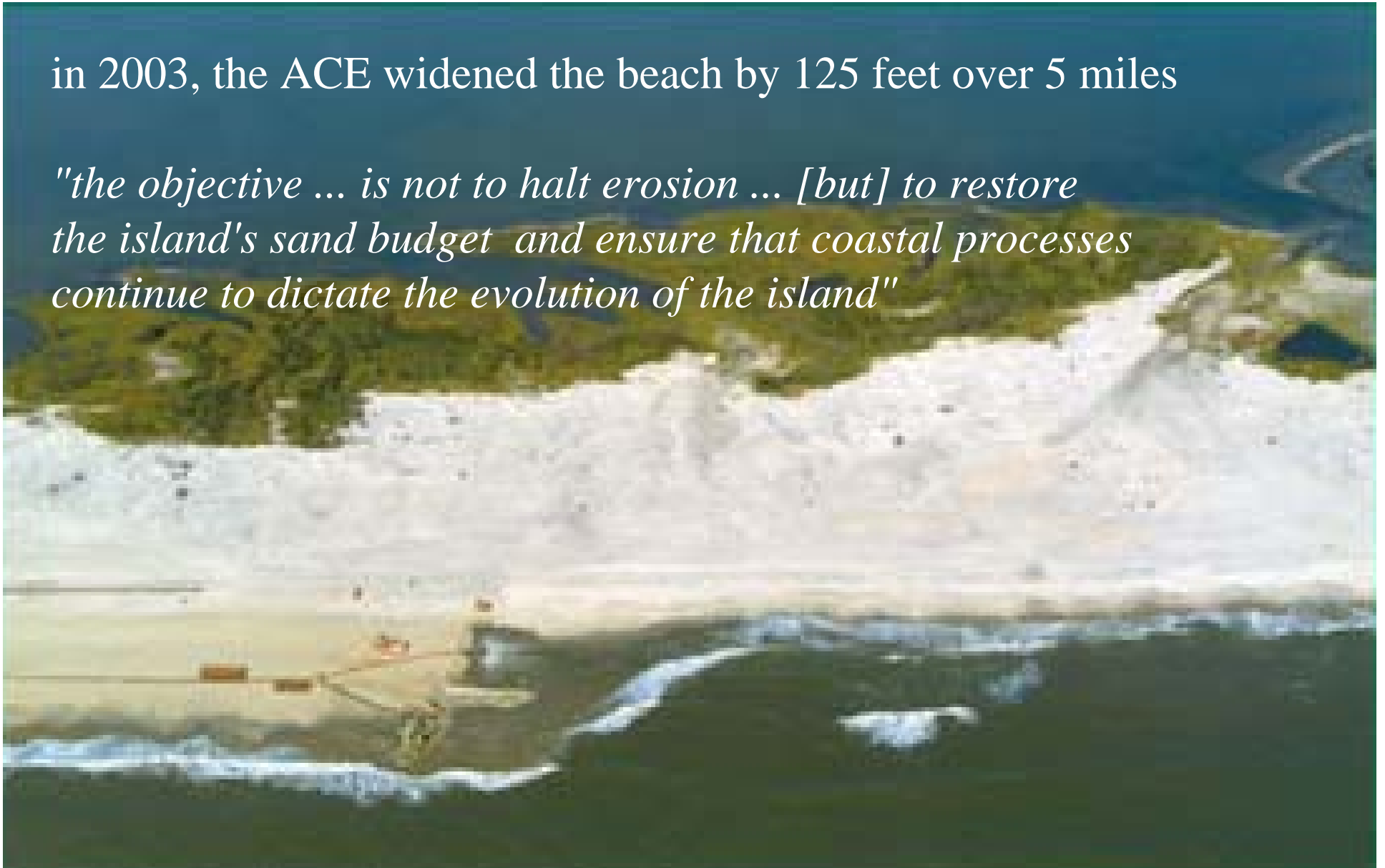
is this surprising?

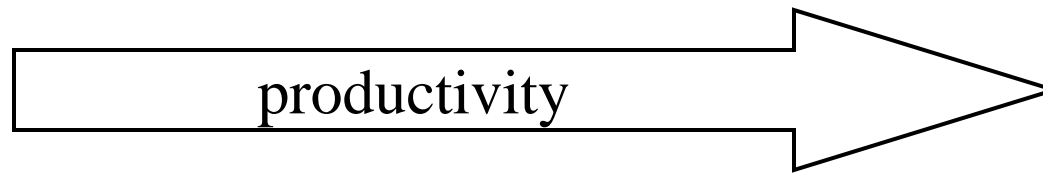
(Animation)

Assateague Island, Maryland

in 2003, the ACE widened the beach by 125 feet over 5 miles

"the objective ... is not to halt erosion ... [but] to restore the island's sand budget and ensure that coastal processes continue to dictate the evolution of the island"





Barrier Island Ecology

Habitats: ocean to lagoon

- beach - intertidal, clams & crabs
- dune - sea oats, crabs
- back dune - bushes and trees
- salt marsh - cordgrass, clams, mussels, snails, crabs, fish

review - what process builds salt marsh?



why is the beach barren-looking?

why does the salt marsh look green?



which side of the island
does he prefer?

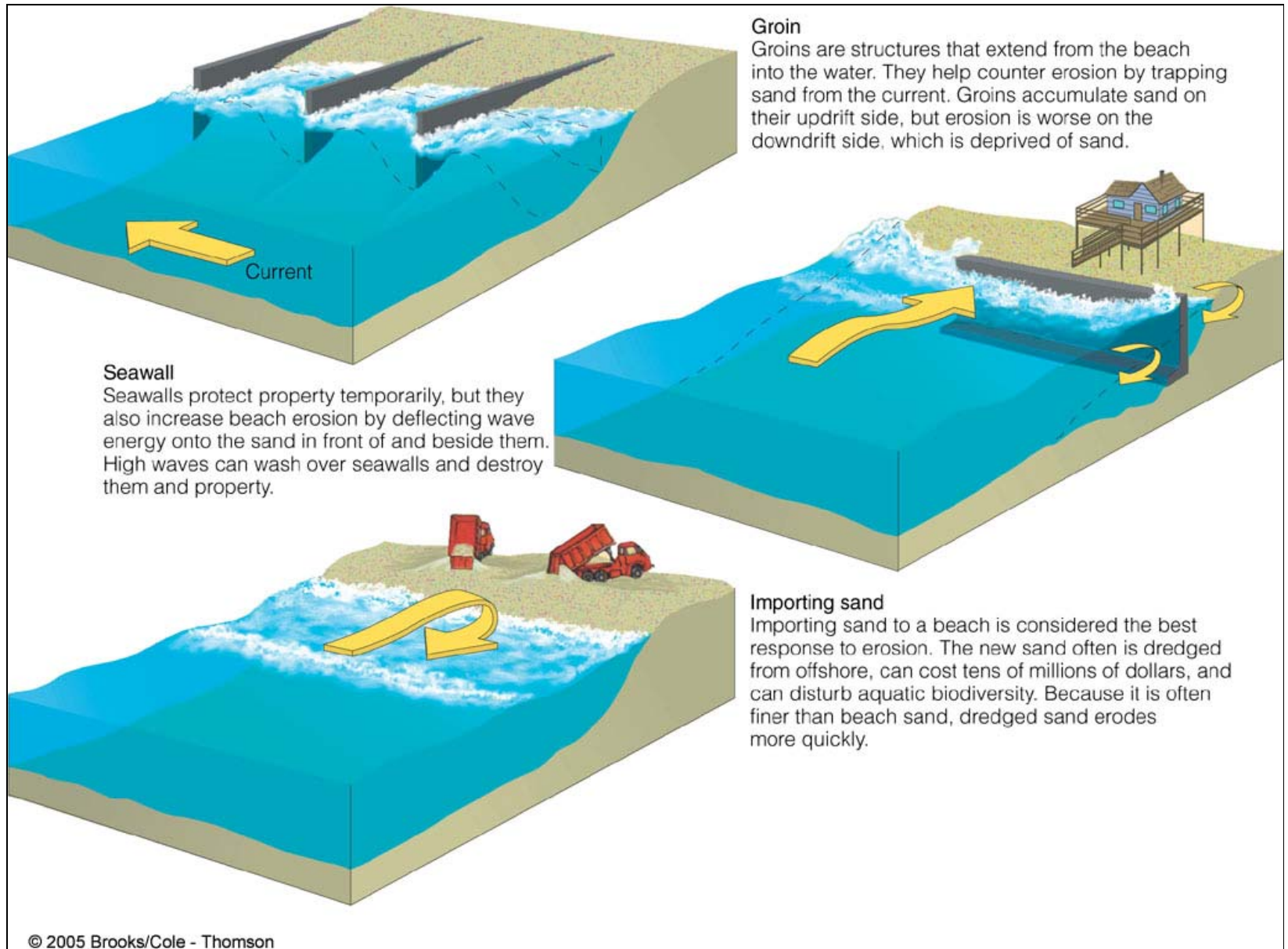


Problem:

Processes that build islands
destroy buildings & roads



Couldn't they build a wall or something? (animation)





USGS Image Seawall in Florida

- Did it protect the house?
- How did it affect the beach?



What about adding sand?

Wrightsville Beach
Renourishment
February, 2002



- 750,000 cubic yards of sand
- \$4.6 million for NC beaches
- Wrightsville paid \$157,600
- used 3% hotel tax

http://www.wrightsville.com/renorishment_of_wrightsville_beach.htm

Wrightsville Beach right after replenishment, 2002

- locals are happy
- how long will it last?

"they're spitting in the wind"
J. McNinch, VIMS





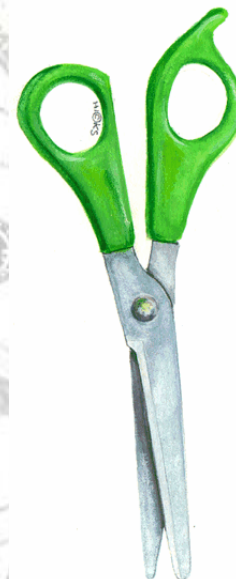
September, 2004

- feds had committed to decades of replenishment
- feds now want to cut off funding
- hotel taxes can cover replenishment through 2020
- beach towns plan to sue federal government

Replenishment is expensive and controversial!

Green Scissors on replenishment in 2002:

- federal taxpayers don't benefit equally
- coastal areas should pay more
- encourages high risk development



"just not acceptable" Rep. T. Tancredo

greenscissors.org/water/beachpr.htm (2002)

<http://zastavkin.com/>

Ecological Impacts

1) destroys nesting sites



2) increases turbidity in surf zone

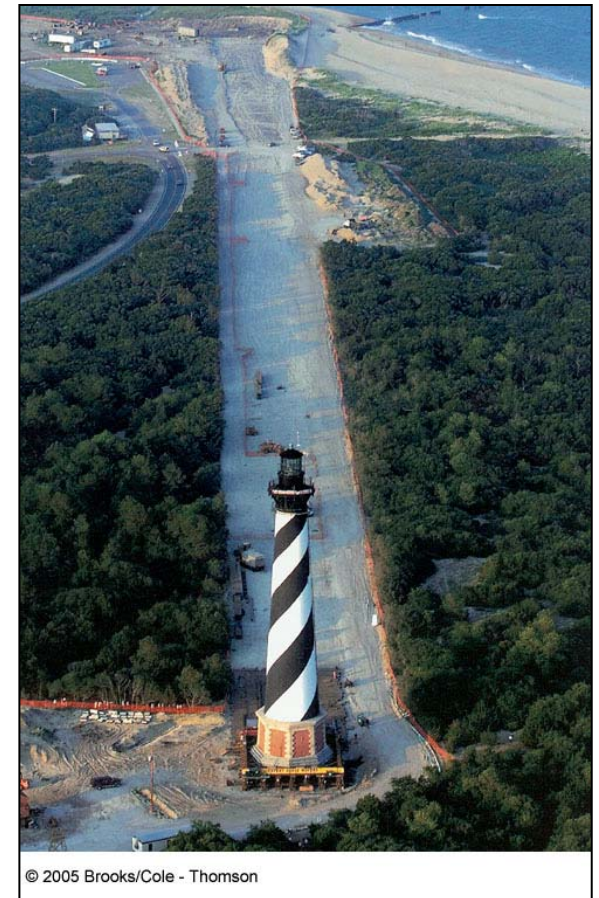
- smothers organisms
- inhibits filter feeding
- decreases photosynthesis



So, what can we do?

Relocate!

- original houses at Nag's head were small & on stilts
- 'unpainted aristocrats' moved 5-10 times!
- even Hatteras Light moved



http://www.learnnc.org/lp/editions/cede_nobx/11

What should we do about the Outer Banks?

- 1) groins, jetties and seawalls
 - counterproductive
 - illegal in NC

- 2) beach renourishment
 - temporary, lasts a few years at best
 - who pays? feds / locals /tourists
 - harms ecology

- 3) strategic retreat
 - move small buildings back from beach
 - don't build big hotels & condos
 - reduce space for people