

The Big Picture: An Overview of Coastal Resources and Federal Projects

Tracy Monegan Rice

Ecological Services Field Office
U.S. Fish & Wildlife Service
Raleigh, NC

Views expressed do not necessarily represent the views of the USFWS

Zones of Impacts

Dredge and Fill Projects

- Borrow area
- Placement area
- Transport area in between

Hard Stabilization Projects

- Nearshore
- Placement area
- Upland interior
- Inlets and estuaries

Spatial Impacts

- Horizontal:
 - ▶ Alongshore
 - ▶ Cross-shore
- Vertical:
 - ▶ Water column
 - ▶ Benthos/seafloor
 - ▶ Beach surface
 - ▶ Beach substrate
 - ▶ Topography and bathymetry



Hollywood, FL 1979

Photo courtesy of Duke University

Temporal Impacts

Direct and Indirect

- Immediate, during construction
- Short-term
- Long-term
- Cumulative
- Restart the clock with each episode of renourishment

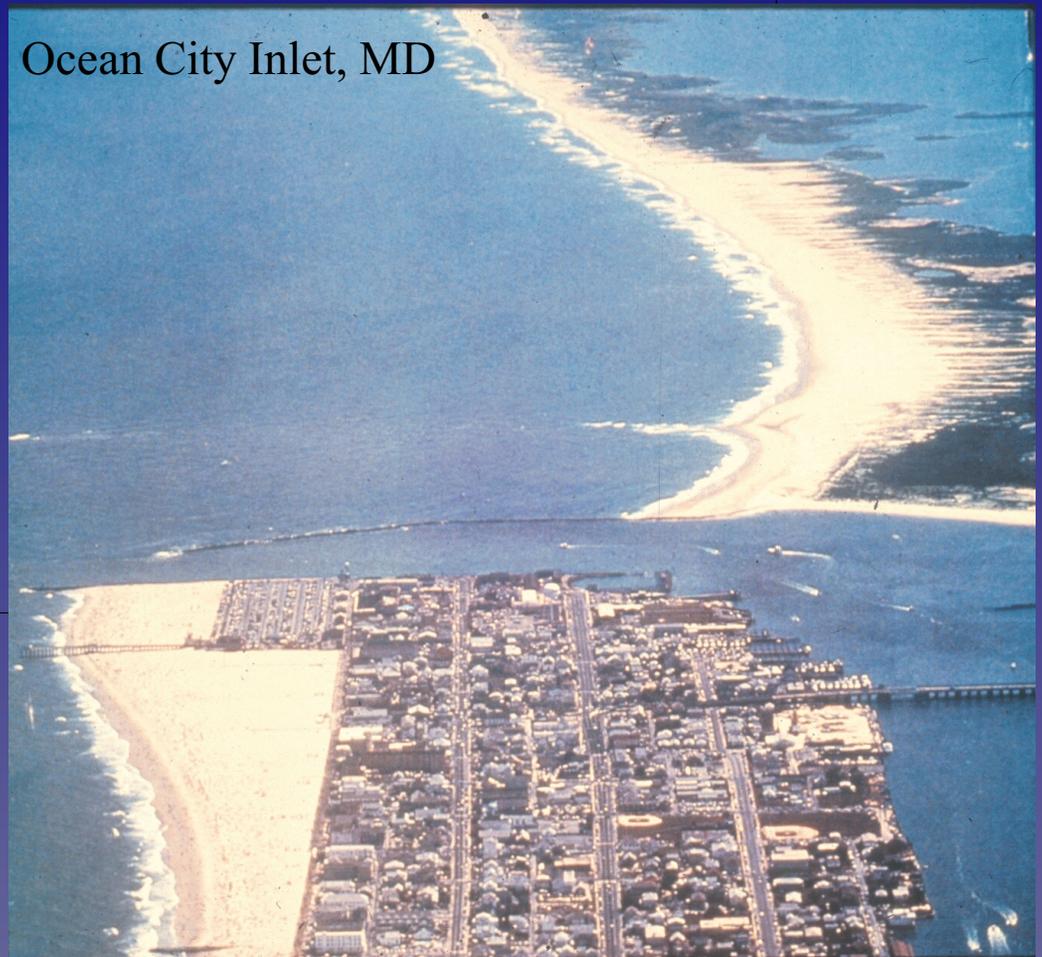
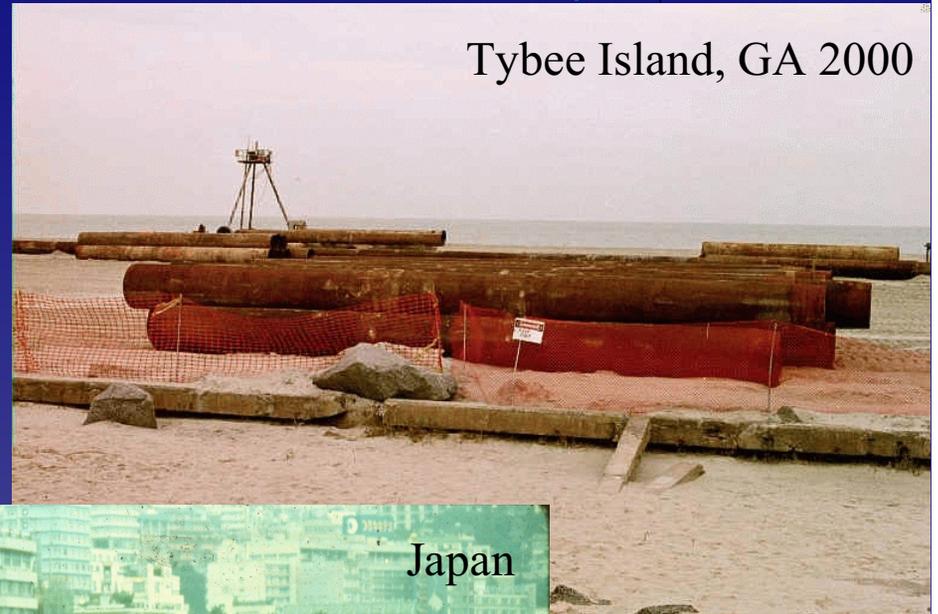


Photo courtesy of Duke University

Scales of Biological Impacts

- Individuals
- Population
 - ▶ Existing
 - ▶ Spawning
 - ▶ Recruitment
- Community
- Ecosystem

Tybee Island, GA 2000



Japan



Photo courtesy of Duke Univ.

Types of Biota Impacted

Pelagic, terrestrial, sessile, and benthic

- Microscopic
- Meiofauna
- Macrofauna
- Fish
- Birds
- Vegetation
- People



GREEN SEA TURTLE
U.S. Fish and Wildlife Service / David Vogel



Impacts of Dredging

At and near the borrow area

- Direct mortality or injury from dredge suction
- Degraded water quality
- Direct burial from overflow and siltation
- Displacement of Organisms and prey
- New substrate type and bathymetry



Short-term Impacts to Fish

Dredge and Fill Projects

- Lethal
 - ▶ Burial of species fleeing to crevices
 - ▶ Respiratory trauma (erosion of gill filaments)
- Sublethal
 - ▶ Respiratory stress
 - ▶ Separation from conspecific schools

Gag grouper

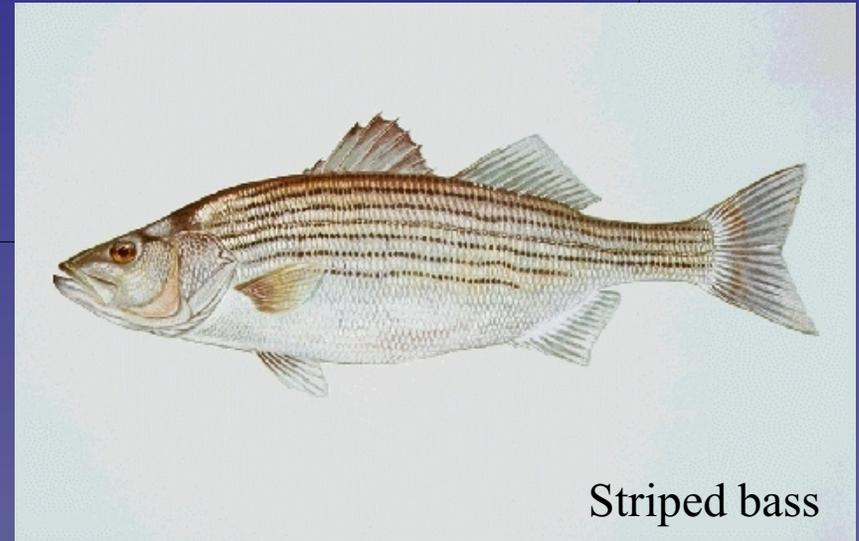


Photo courtesy of NOAA

Long-term Impacts to Fish

Dredge and Fill Projects

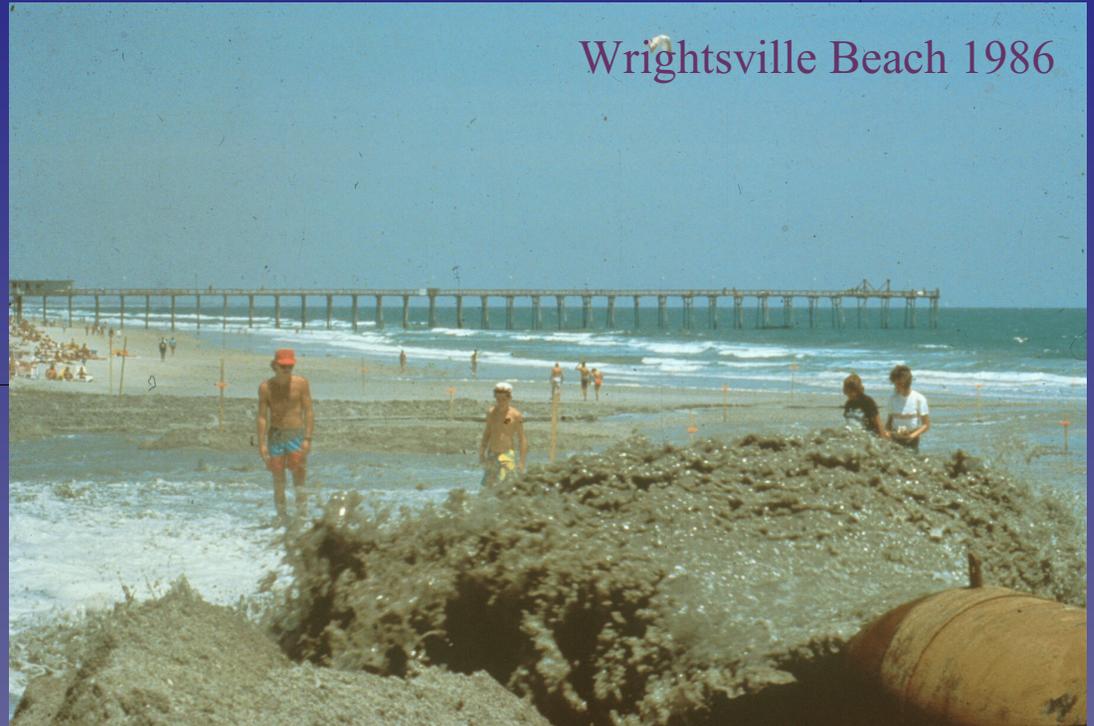
- Lethal (loss of settlement habitat)
 - ▶ Increased predation
 - ▶ Increased starvation
- Sublethal
 - ▶ Reduction in growth
 - ▶ Residence in new, suboptimal habitat



Striped bass

Direct Impacts of Fill Placement

- Mortality from burial
- Temporary increase of prey (within the slurry)
- Heavy equipment on the beach
- Dewatering of the slurry



Wrightsville Beach 1986

Photo courtesy of Duke University

Indirect Impacts in the Fill Area

- Altered substrate of less quality
- Modified hydrologic and geomorphic regimes
- Chronic turbidity due to resuspension of sediments



Topsail Island 1998

Photo courtesy of Duke University

Impacts to the Substrate

- Different minerals with modified grain sizes and shapes
- Potential for cementation
- Introduction of organic material
- Modification of gas diffusion rates, nutrient cycling, water content and circulation
- Lack of internal structure
- Altered cohesion or ability to dig and maintain burrows
- Increased erosion rate

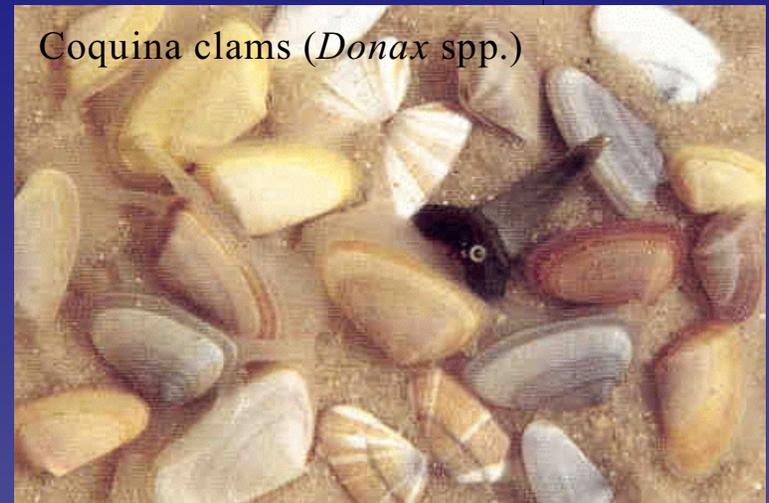


Caspersen Beach, FL 1994

Impacts to Invertebrates

Dredge and Fill Projects

- Direct mortality
- Failure of adult intertidal organisms to return from near/offshore over-wintering grounds
- Reduced densities on adjacent beaches
- Inhibited pelagic larval recruitment
- Low secondary productivity



Coquina clams (*Donax* spp.)

Photo from Meyer (1994)

Impacts to Invertebrates

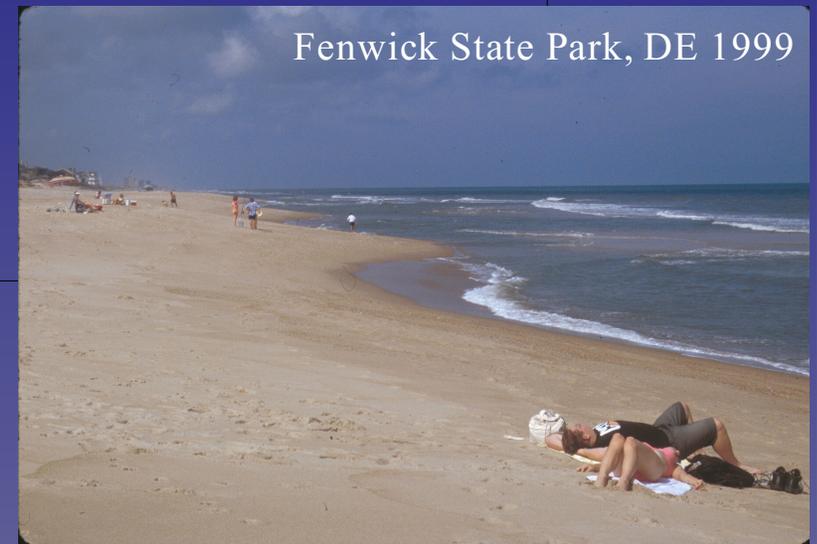
Coquina clams, mole crabs, amphipods, polychaete worms, etc.

- *Donax* spp. are “substrate sensitive”
- *Emerita talpoida* and *Donax* spp. decreased by 86-99%
- *Ocypode quadrata* decreased by 55-65% from scraping
- Post-fill recovery depends on:
 - ▶ Length of project
 - ▶ Timing of project
 - ▶ Interval between renourishment episodes

Mole crab (*Emerita talpoida*)



Photo from Meyer (1994)



Fenwick State Park, DE 1999

Impacts to Sea Turtles

Photo courtesy of Duke Univ.



- Loss of dry beach
- Compaction
 - ▶ Nest-chamber geometry
 - ▶ Reduced nesting success
 - ▶ Altered nest concealment
- Escarpments
- Contaminants and nutrients
- Water content
- Temperature
- Heavy equipment and lights



Photo courtesy of David Monegan

Impacts to Shorebirds

Shoreline Stabilization Projects

- Decreased frequency of overwash
 - ▶ Reduced nesting habitat
 - ▶ Reduced overwintering habitat
- Initial feeding frenzy
- Depressed food base
- Artificially controlled geomorphology reduces natural shelters



Sandbridge, VA

Photo courtesy of Duke Univ.

Impacts to Flora

- Artificial planting and maintenance of dune vegetation
- Maintenance of an artificial levee instead of variable dunes
- Altered salt spray and wind patterns lead to higher levels of vegetative succession behind the “dune” line
- Burial of seed base



Photo courtesy of Duke University

Impacts to People

Puppy drum, relatives prefer 'natural' beaches

PELTIER CREEK
Lee Lumpkin, who teaches law on the side, reports that puppy drum are invading the outer reaches of Core Banks. For the inexperienced, puppy drum are but one member of the vast croaker family, Sciaenidae, a worldwide crowd whose extended family seems to encompass

referred to as a crab-eater.

Surf fishermen choose spoons, plugs, metal squids, leadhead buck-tails and assorted natural baits such as cut mullet and, obviously, crabs. Casting just beyond the inner breakers, they can find these shallow-water feeders exceeding 40 pounds. The red drum, that red fish with black spots, is the most

and such kills the natural inhabitants, coquinas, shrimp, sand fleas (not actually fleas but a form of crab), surf clams of all kinds and the many other sand-dwelling creatures of the beach. The large tom-feeding choice pom... The large

- Reports of “dead beaches” displace fishermen and birdwatchers

- Rock-hard beaches alter the recreational experience
- Increased erosion rates increase the dynamism of beach width
- Restricted recreational access



Photo courtesy of Duke Univ.

Folly Beach, SC 1987

Questions will follow the last speaker



Photo courtesy of Duke University