

## *Beach and Barrier Island Response to Climate Change*

- Frequency of storms will likely not change
- Warmer water may lead to larger magnitude storms
- Geomorphic changes primarily responding to SLR
- SLR leads to loss of sand offshore
- Sand will be lost to Ebb-tidal delta
- Sand will likely move into the Sound
- Plum Island contains 32 million m<sup>3</sup>
- Changes to barrier system will occur slowly (although houses adjacent to the beach will be impacted)

# Transport Pathways

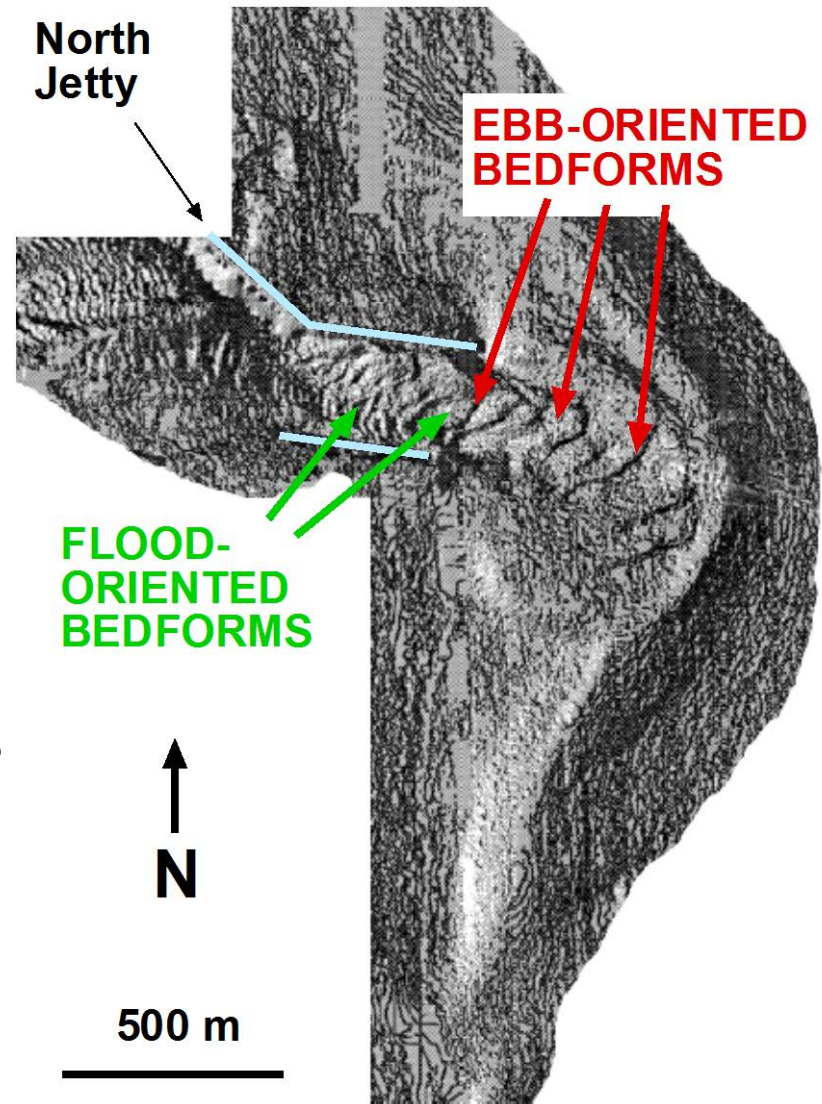
Lidar Survey shows configuration of the channel bottom

Ebb-oriented 1.5 m high,  $\lambda = 80$  m migrating out the inlet channel

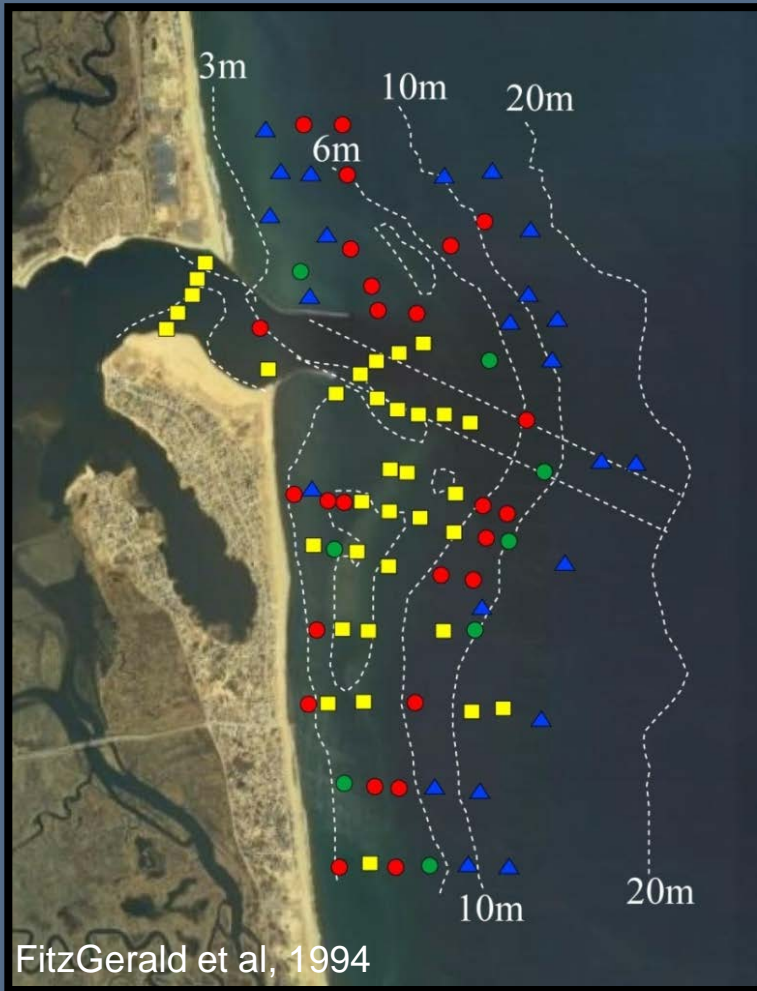
South side of channel exhibits flood oriented mega-ripples

Indicates inlet exporting sand and some recirculation of sand

Sand sourced from offshore has likely ceased

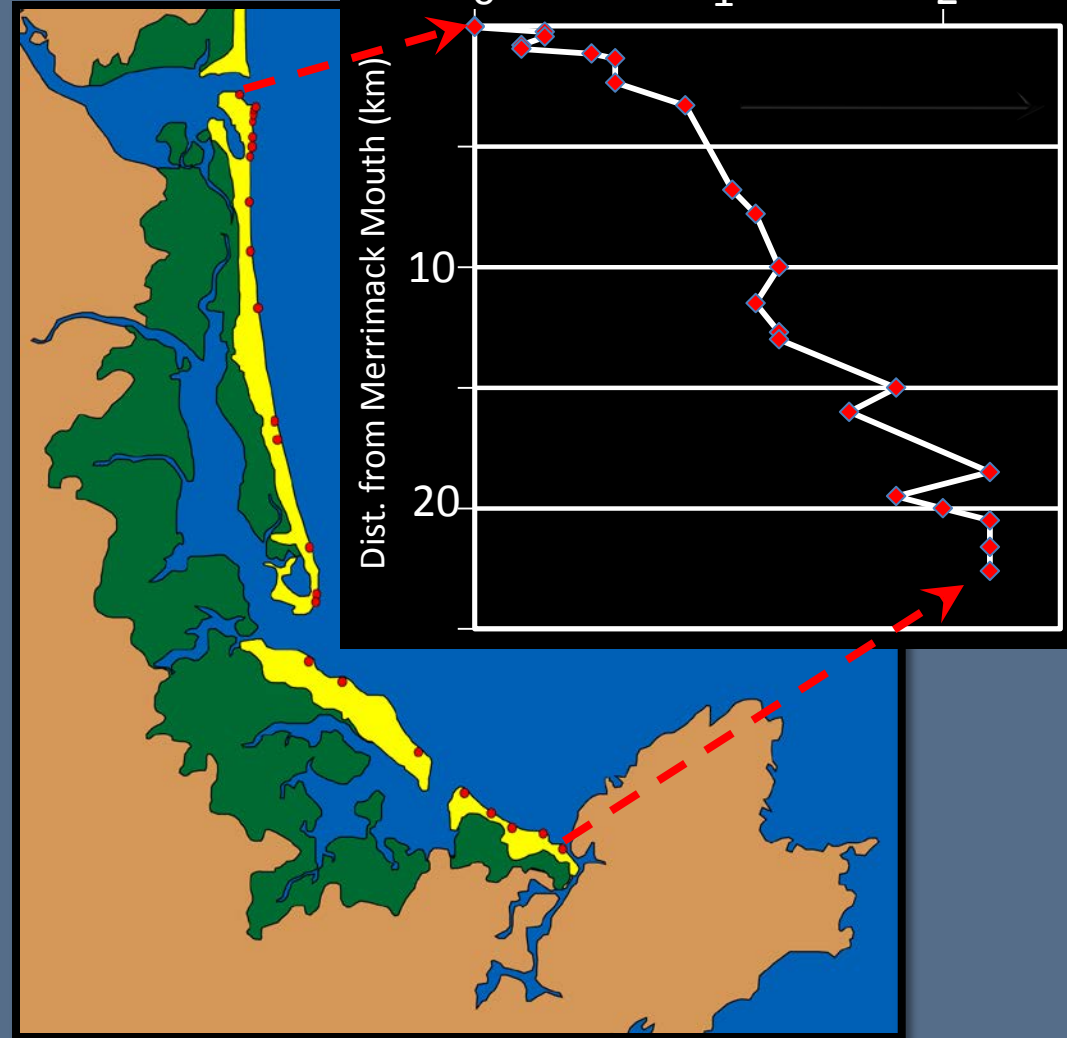


# Plum Island Formation: Riverine Source & Regressive Delta Deposits



- Very Coarse Sand and Gravel ( $<0 \phi$ )
- Coarse Sand ( $0-1 \phi$ )
- Medium Sand ( $1-2 \phi$ )
- Fine and Very Fine Sand ( $>2 \phi$ )

## Deposits





An aerial photograph of a coastal town. The town is situated along a sandy beach that curves from the top left towards the bottom right. The ocean is a deep blue, with visible wave patterns and some white foam near the shore. Several long, narrow structures, identified as jetties and groins, extend from the beach into the water. The town itself is densely packed with houses and buildings, interspersed with green trees. To the left of the town, there is a large, flat, green area that appears to be a field or a park. The overall scene is a typical coastal landscape.

Jetties

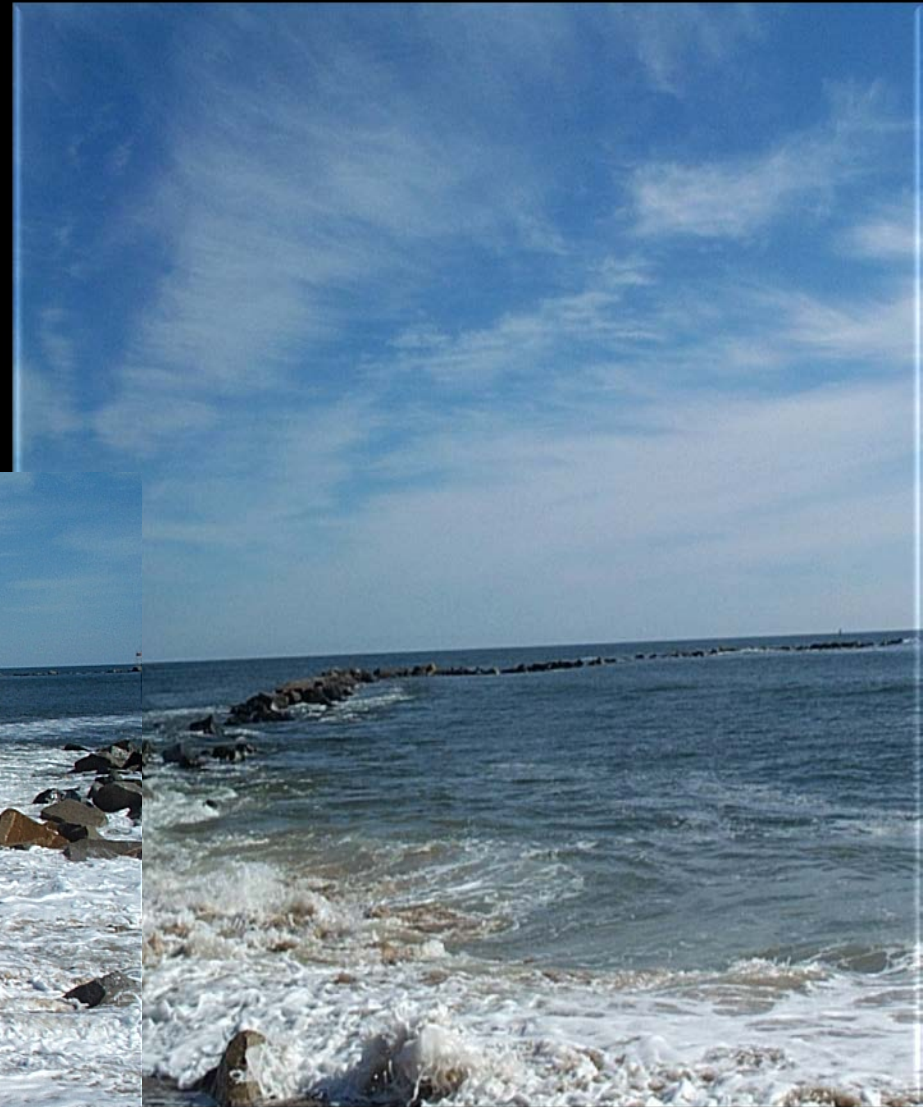
Groins

Photo by Michael Morris



## *South Jetty*

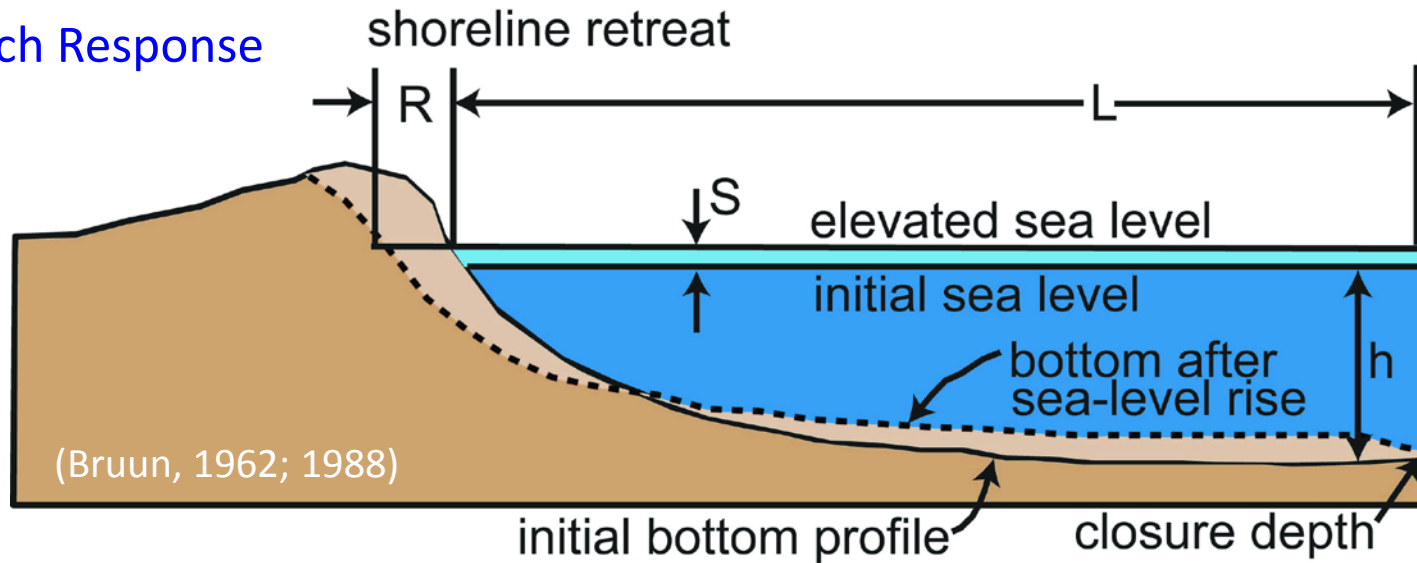
Transport over the jetty by large  
wave swell feeding sand into the inlet  
and to Reservation Terrace beach



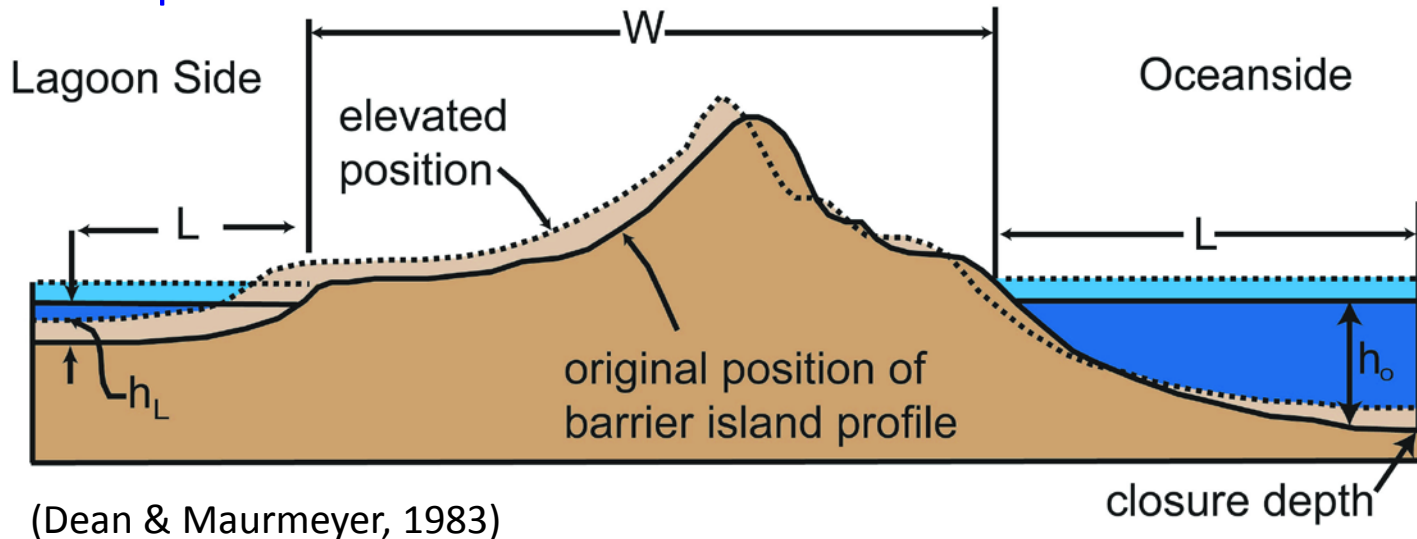
Photos from Michael Morris

# Beach & Barrier Response to Sea Level Rise

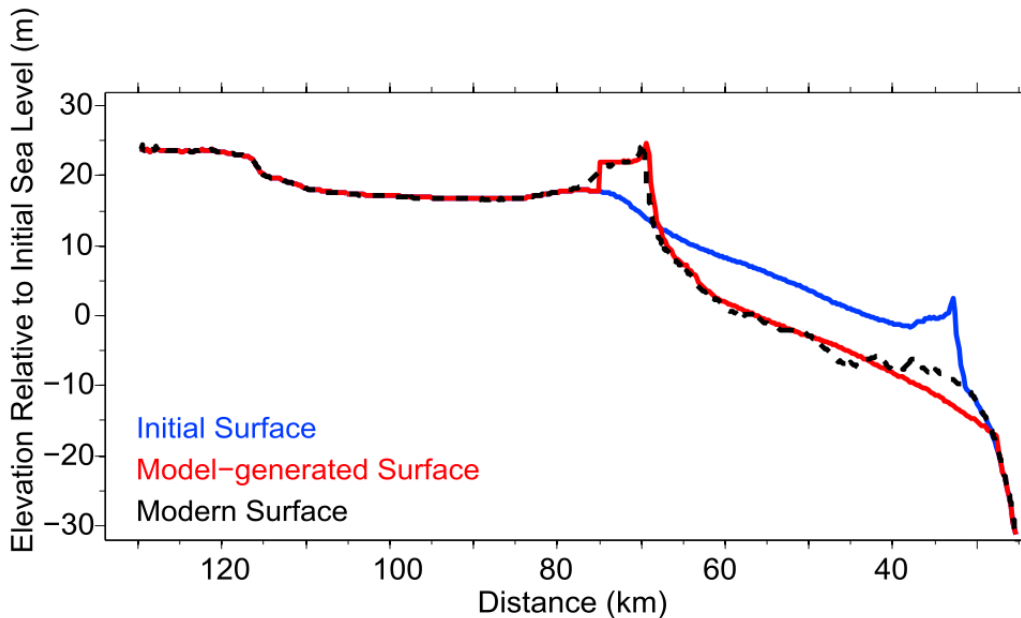
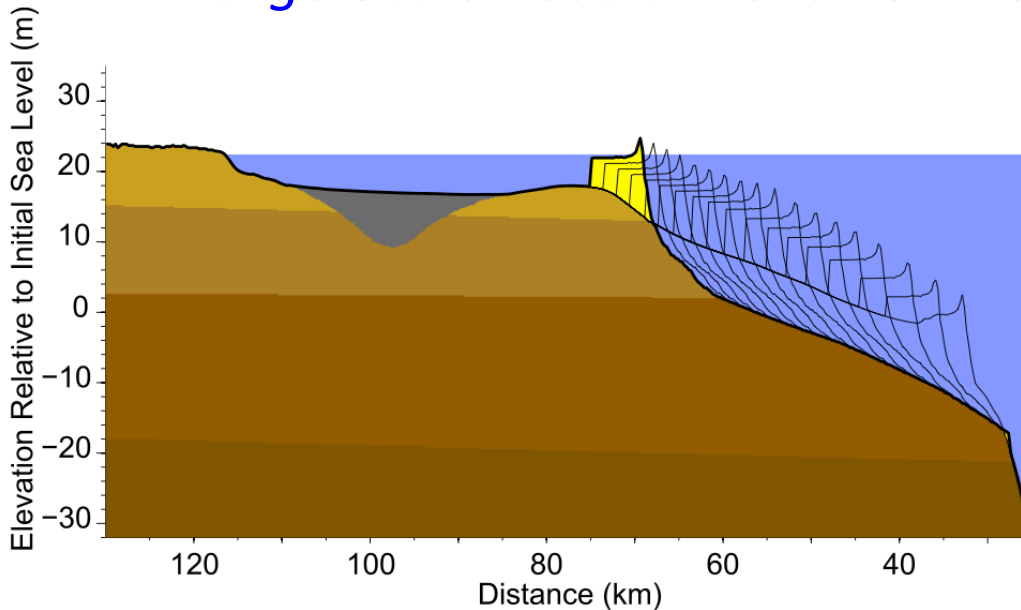
## 1. Beach Response



## 2. Barrier Response



# Large-Scale Coastal Behavior Models



(Moore et al, 2010)

## Initial Models:

- Governed by SLR scenario
- Geometric Cross-shore model
- Conservation of mass
- Equilibrium profile

**GEOMBEST** (Geomorphic Model of Barrier, Estuarine, and Shoreface Translations)

- Improved by adding composition of sea floor
- Erodeable substrate
- Useful for inverse modeling
- *Plum Island* 150 -450 m wide
- *Castle Neck* 250 to ~1 km wide