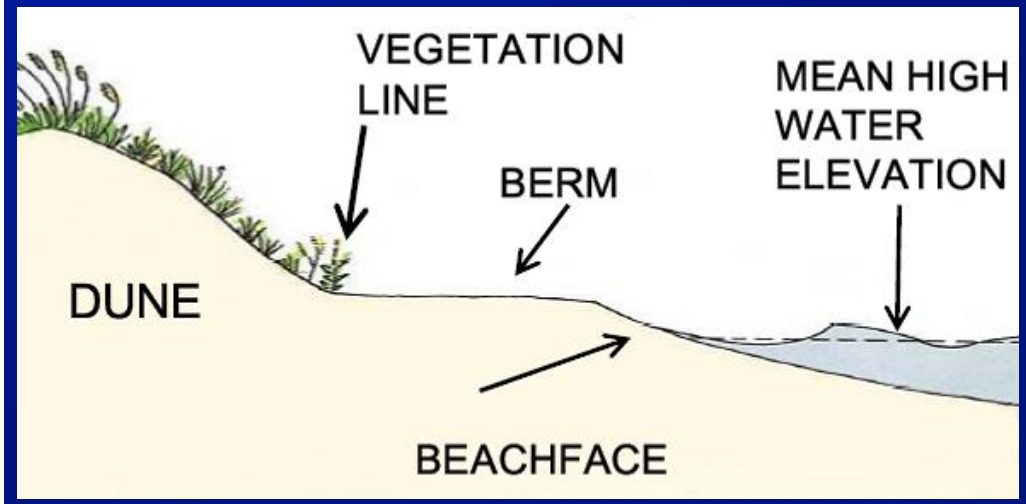
Barrier Island Beach/Berm



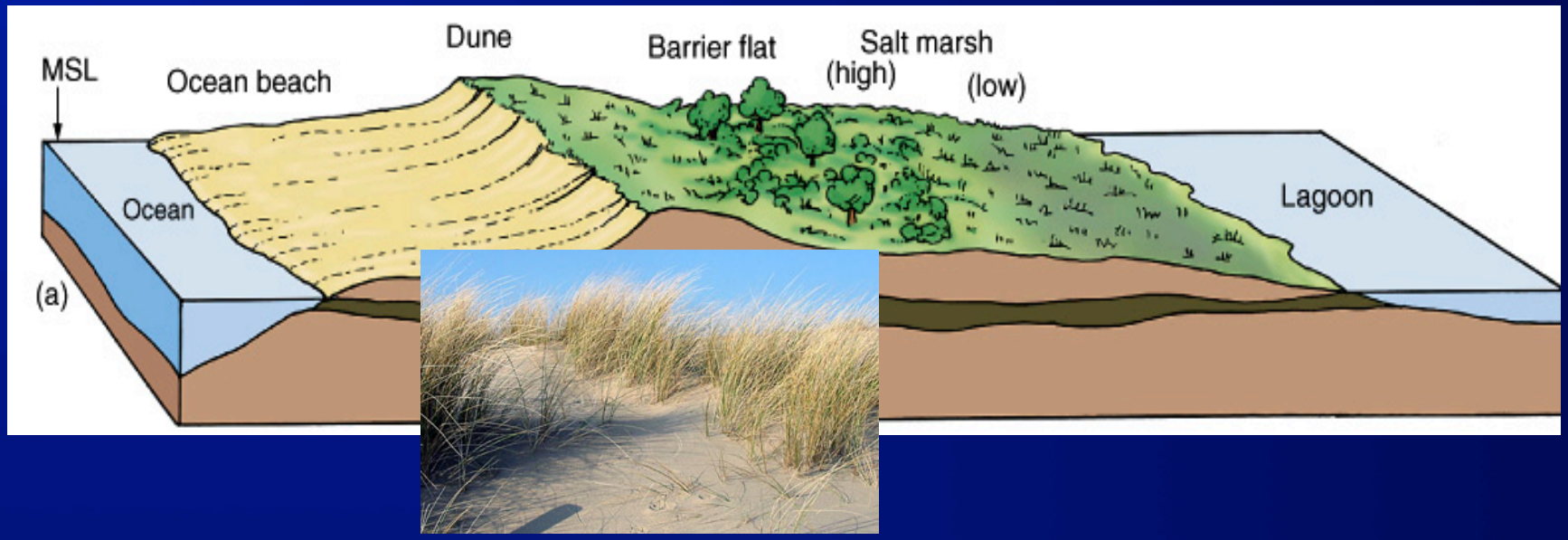
Note perched berm with organic storm debris ("wrack" line) – the organic nucleus of a potential future *dune*

Beach Berms and Wrack-line Deposition

- Shallow water waves expend their energy as turbulence upon breaking
- Coarser sand & shells “stranded” on upper beach (backshore) after storms
- Organic debris (wrack) marks last storm tides; wrack can initiate future dunes – *so don’t rake the beach!*

Higher-energy 2009 Nor’easter cuts AI beach profile, leaving only denser (black, heavy-mineral) sand

Beach/berm **Dunes** Barrier flat Salt marsh/tidal flat



- The vegetated "Backbone" of the BI; begins upon organic (wrack) nucleus
- Built by fair-weather winds off beach; height/slope a function of grain size, wind speed, sediment supply, *vegetation*
- Serves as dependable "Savings Account" for sand, re-supplies beach
- Vegetation (American beach grass *Ammophila*) is <u>essential</u>: these are not mobile, desert-type dunes (although they will move fast if vegetation is disrupted, eaten, trampled, washed-out)
- Occasional storm overwash (due to hurricanes, Nor'easters) may breach and beat back the dune *– and storms are getting more intense, lingering longer, and perched on higher seas (about 1 foot higher since 1900)*

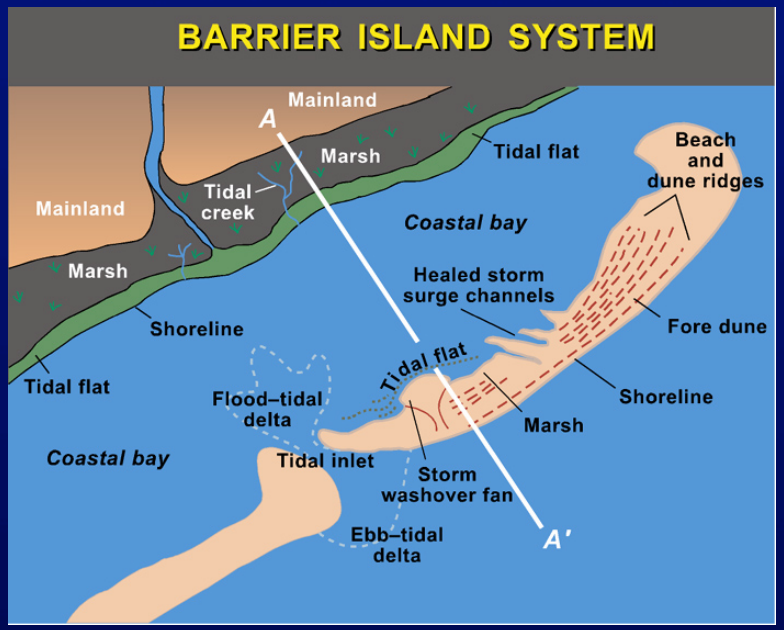
Barrier Island Foredune

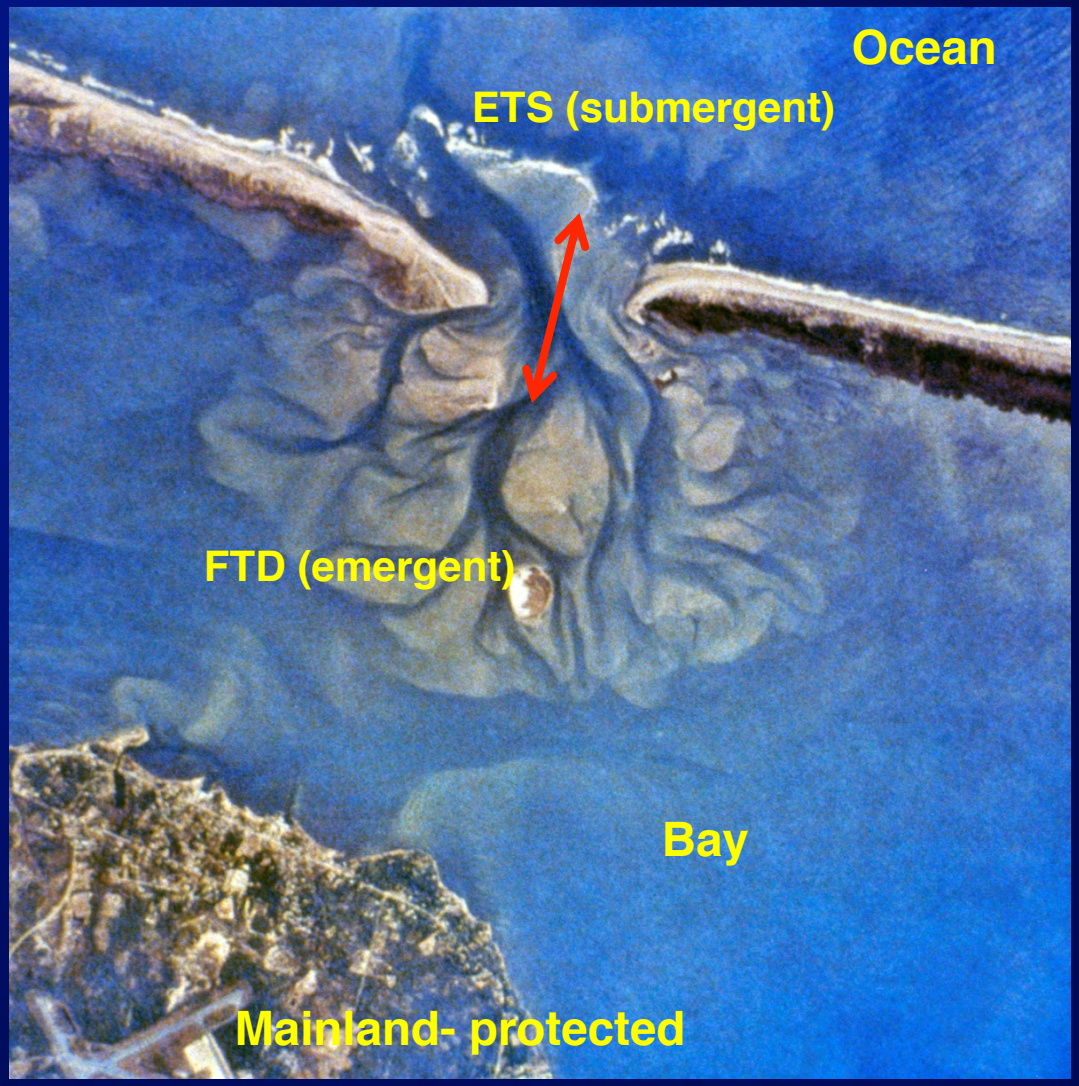
Dune grasses build and stabilize the otherwise mobile sand pile

Interdune overwash with coarse marine shells

Storm overwash may breach the island, and form new tidal inlets

FTDs begin as storm overwash fans, which cut a path thru island





FTDs store enormous amounts of sand on leeward side

Current Park Service Response to Overwash

"Before" (March 2013)

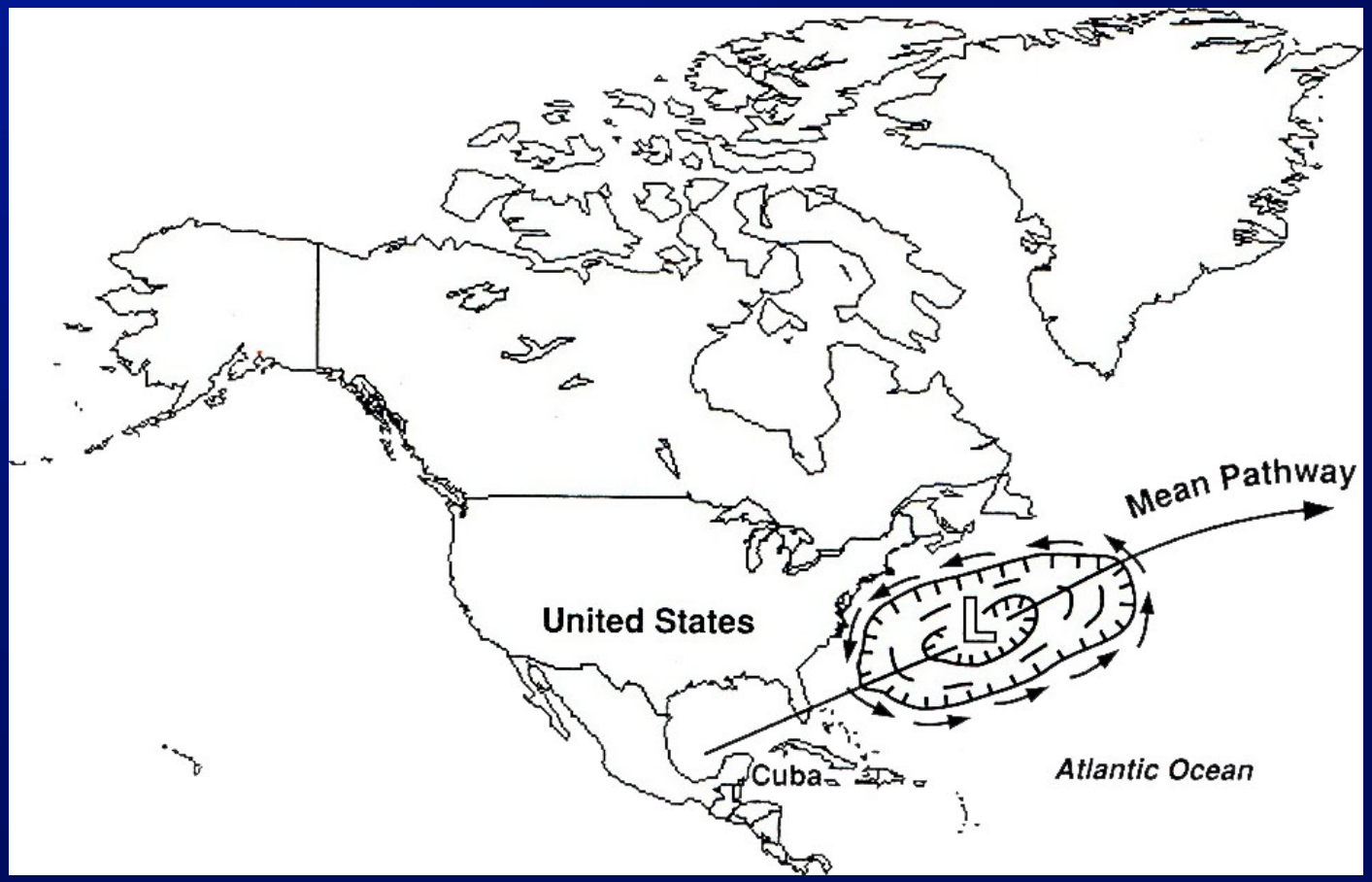
Learning to live with the reality of rapid sea-level rise and island back-stepping (retrogradation)

"After" (March 2016)

Learning to "Let Go"

Generalized Storm Tracks

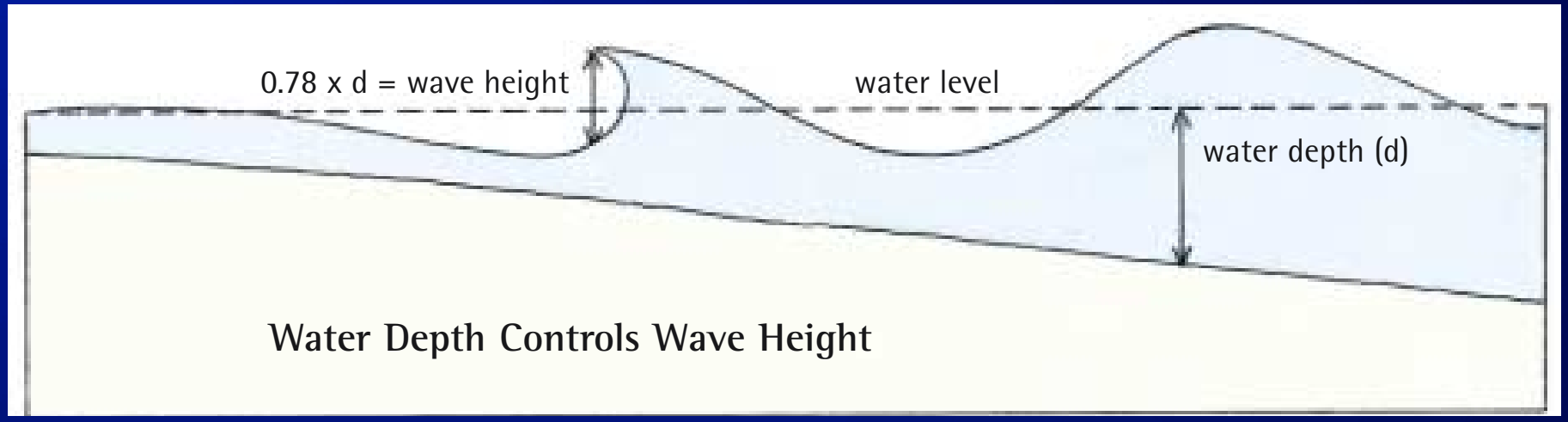
Map of the central Mid-Atlantic Bight showing the mean track of low-pressure systems that can produce northeast winds and oceanic storm waves along the Delmarva coast.



R. A. Davis, ed., 1994; Geology of Holocene barrier island systems

Low-pressure zones (tropical and extra-tropical) create a “hill” of wind-whipped, elevated water that inundates the coast (storm surge).

Maximum Breaker Height (~ 0.78 X D)



Maximum wave height is increased by strong winds and deeper water (as exists during storm surge). Deeper water allows waves to propagate further into the dune line. So… hollowed-out beach-profiles allow a more "open" energy-window for higher waves to pummel the coast farther inland and with greater erosive power (E is a function of H^2).

The future? Sea level rise results in a net erosion of the beach by *allowing storm waves to strike ever farther inland and with greater power*, and by decreasing the ability of calmer waves to rebuild the beach afterwards. (Bruun, 1962).

The Dune Book (Sea Grant, 2003)

Historic 1962 Ash Wednesday ("Five-high") Storm: Oceanic Breach & New Inlet Formation on AI

John C. Dietz, Central Photgraphic Facility.

This photo, taken in January 1963, shows the inlet formed during the 1962 storm. This view is looking approximately southwest, with the Ocean City airport in the background.

Although hurricanes (like Sept.1933) are more severe, *they are less frequent than Nor'easters (like in Mar.1962) and pass more quickly*

"Shifting Sands" Ch. 12; Krantz, et. al (2009)

Inlet formed after 1962 storm

National Ocean Service, NOAA.

April 28, 1962. Visible here is the inlet breaching northern Assateague Island that was created by the Ash Wednesday nor'easter storm of March 1962.

A Highly Consequential Storm For Assateague!

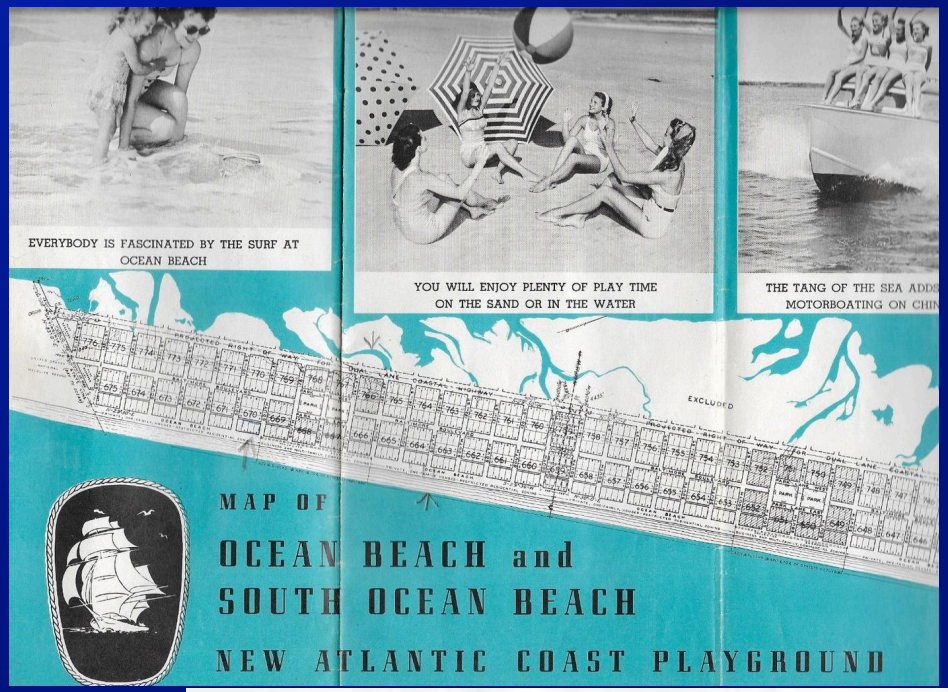
- The March 6-7 1962 Nor'easter was comparable in strength to the most intense hurricanes of historical record.
- Powerful extra-tropical storm was a slow-moving winter event fueled by a combination of several low-pressure systems.
- Ash Wed. storm lasted for several days that included as many as *five "spring" high tides* at some locations.
- What made the storm so destructive ($200 million, 40 dead, > 45,000 homes lost in NJ alone) and responsible for such widespread coastal impact was its *prolonged duration and timing.*
- *This halted the Assateague Island "Ocean Beach" development envisioned by Leon Ackerman.*

Storm tides here reached 9.4 ft > normal!

Pile of debris was once "Coronado Motel" at 47th St. in OC; in foreground are remains of "Salty Sands Motel"

USGS Web Source: Morton, et al., 2010
http://coastal.er.usgs.gov/hurricanes/historical-storms/march1962/

Photos: http://www.baltimoresun.com/news/maryland/bal-stormpg-0303,0,3987343.photogallery



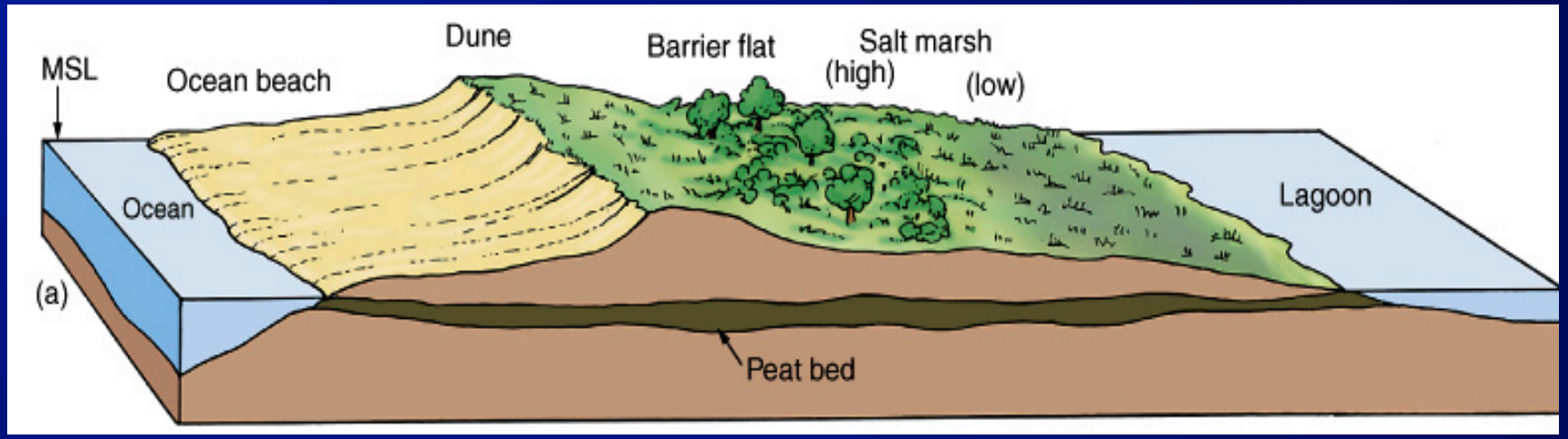
1953 Ad

Remnants of Baltimore Boulevard, the intended main drag of the ill-fated “OB” development (2012)

Remnants of Ackerman's in-progress **“Ocean Beach”** subdivision (c. 1965)

Major barrier island environments

Beach/berm Dunes **Barrier flat** Salt marsh/tidal flat



- Low relief vegetation positioned leeward (behind and below) of the protective screen of dunes
- *Sandy; formed by overwash* when storm waves surge through dunes and deposit sand leeward
- Protected from sea spray, eventually may be colonized by tall freshwater flora
- Succession from marsh grasses, to shrub thickets, to woodlands, and eventually to fully developed “maritime forests” with canopy (if dunes big enough)