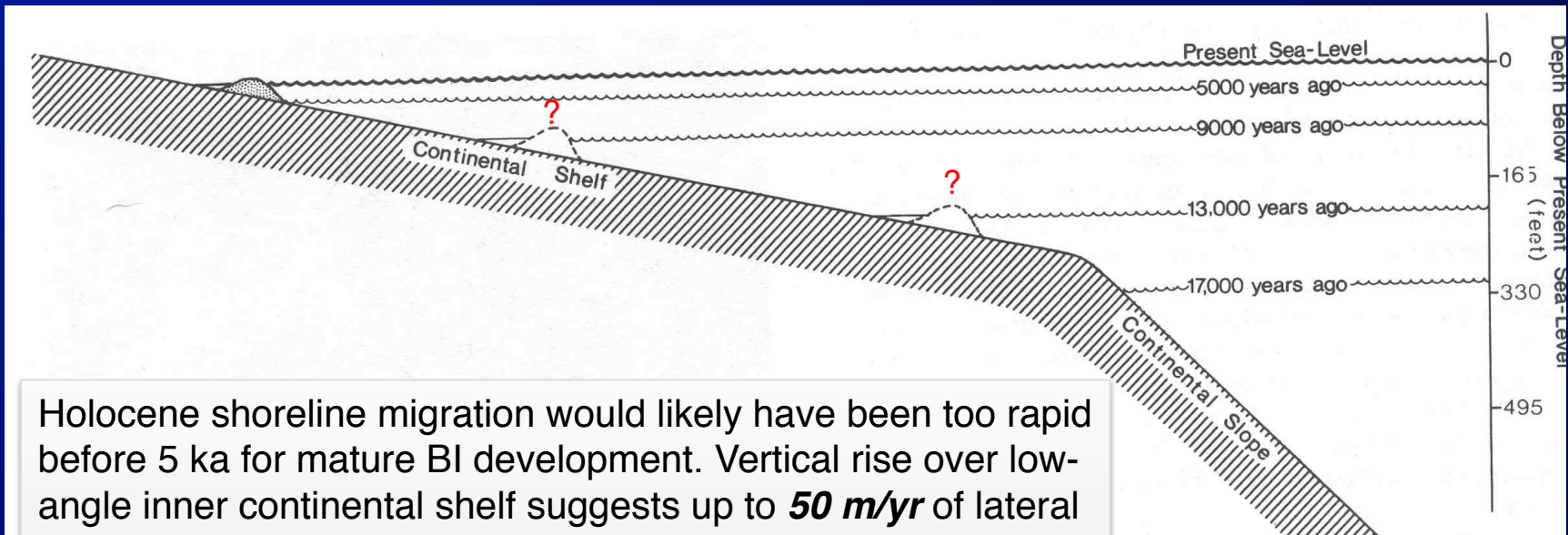
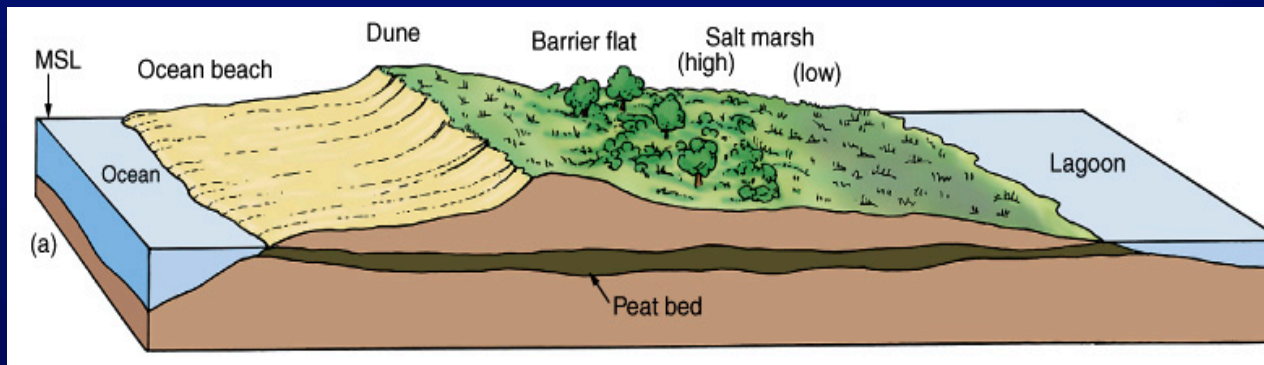


Landward Sand Migration Across Continental Shelf

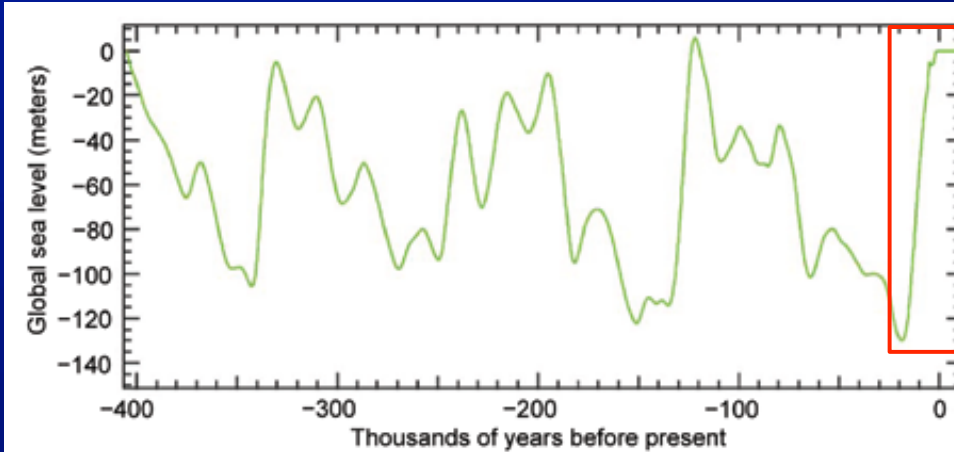


Holocene shoreline migration would likely have been too rapid before 5 ka for mature BI development. Vertical rise over low-angle inner continental shelf suggests up to **50 m/yr** of lateral shoreline "retreat" still occurring at 6-8 ka.

slope vertically exaggerated



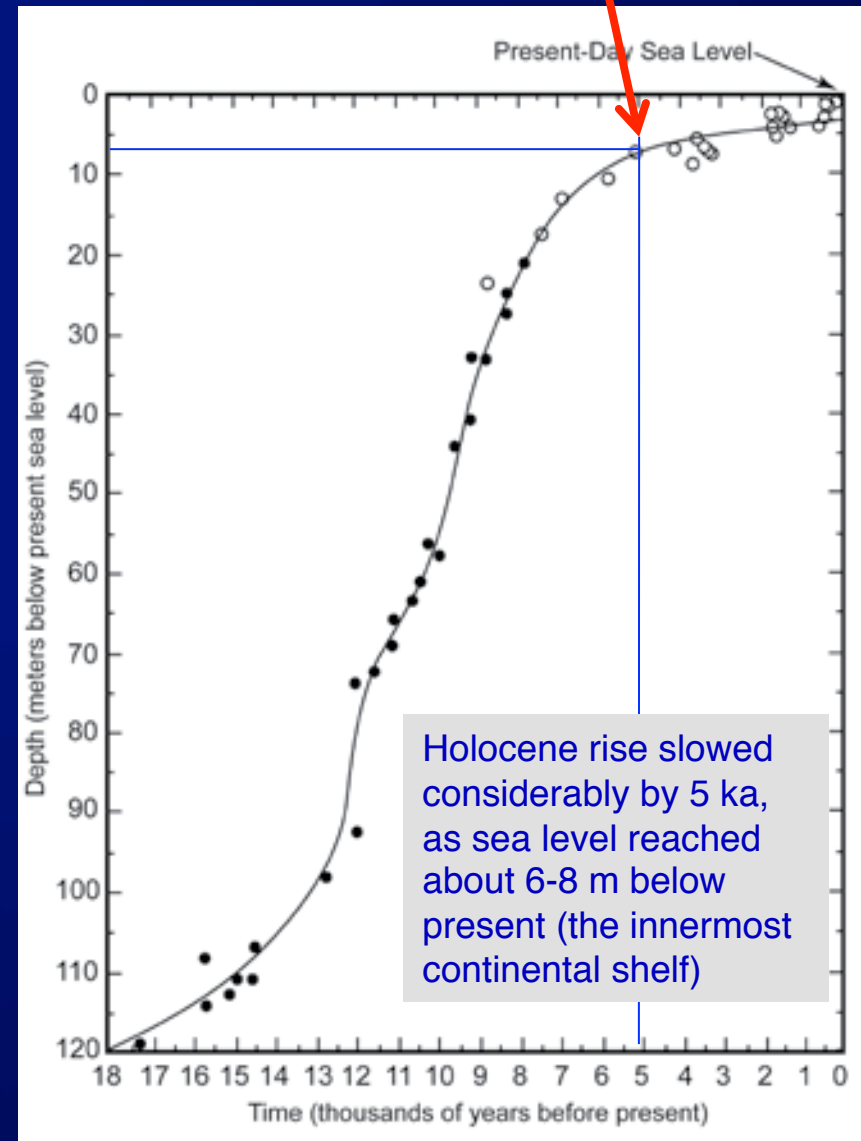
Long-term Sea Level Variation



400,000 years of global sea level change. During the Last Glacial Maximum (LGM), about 18 ka, sea level was approx. 120 meters below present – it has oscillated prior to that.

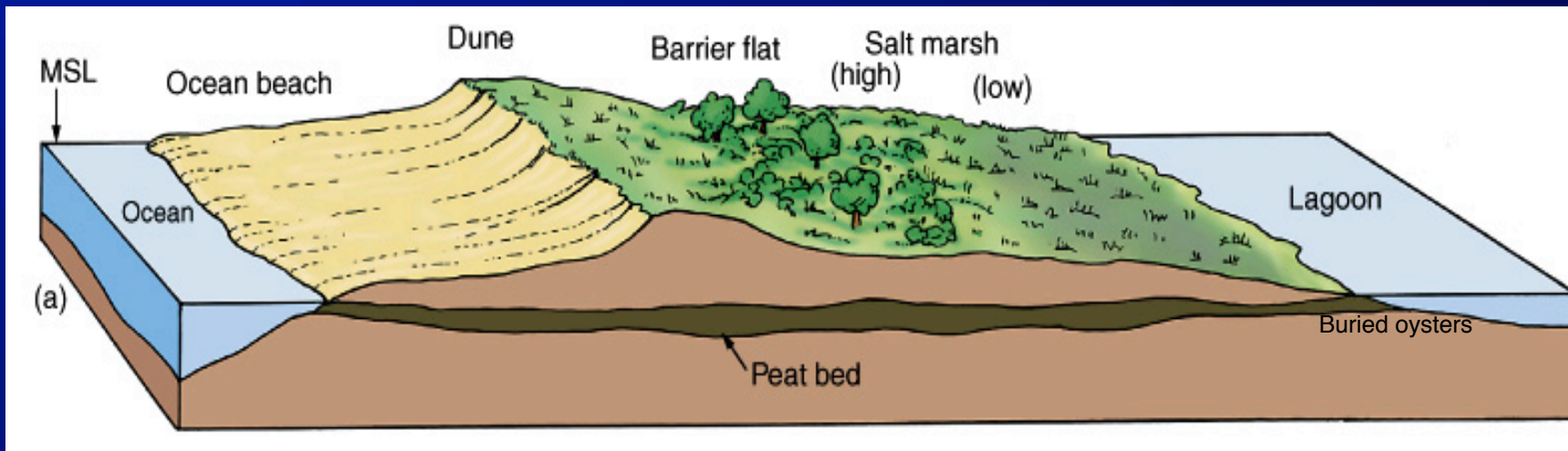
Generalized global Holocene sea level rise since LGM, in C14 years BP (“Fairbanks Curve”)

Late Holocene “shoulder” allows mature BI formation



4 Major Barrier Island Environments

Beach/berm Dune Barrier flat/
maritime forest Salt marsh/tidal flat



Ocean side
Windward/energetic

Bay side
Leeward/calm

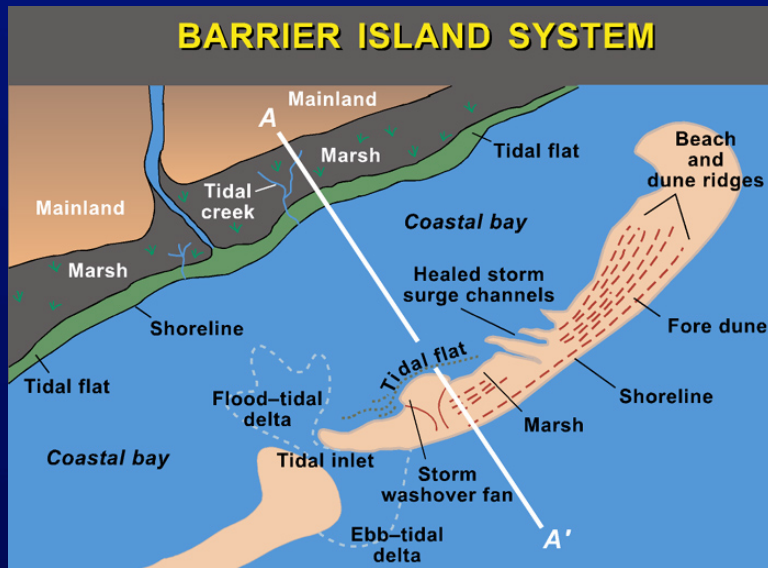
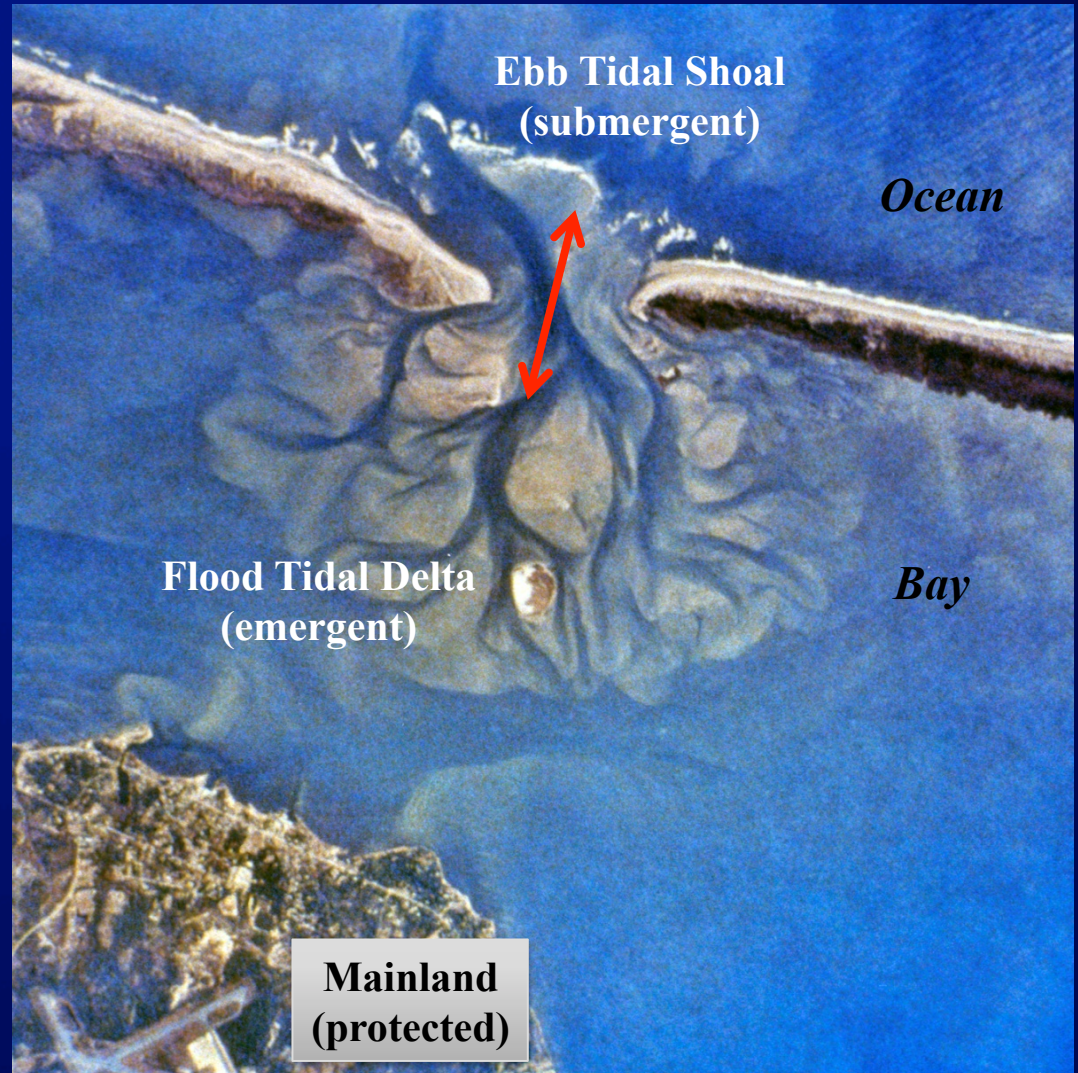
Maritime forest
trees being buried
by shifting sand



Windward/Leeward Differences: Erosion on ocean side (windward)... Deposition on leeward



Oceanic storms naturally roll the sandy islands over towards the leeward side



Windward-to-Leeward Sand Movement

“Intelligent” Barrier Island Response to Oceanic Wave-energy is to Simply “Roll-Over”

Hurricane Ida spawned a nor'easter in 2009, with storm surge of +2.4 m persisting for several days – *recall that breakers can be much taller, and therefore much more powerful, when the water is deeper.*

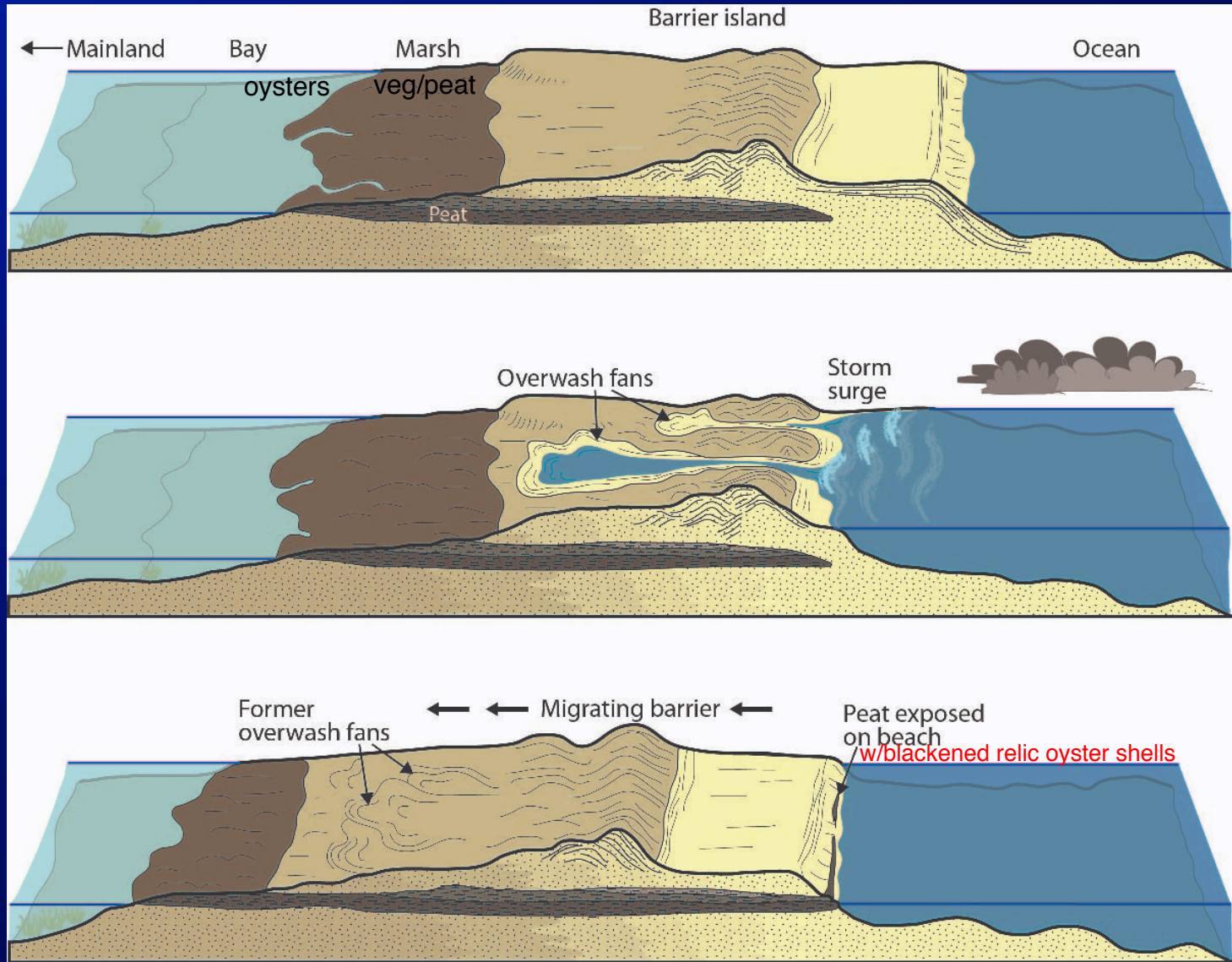
You don't have an erosion problem until you build something too close to the water.

--- Orrin Pilkey

Cedar Island, VA, before and after storm Nor'Ida (2009)



Beachfront Evidence of Barrier Island "Roll-Over"



1933 OC Inlet Breach



Hurricane-induced *bayside* breach, jetty
emplacement to keep inlet open desired by locals

The Law of Unintended Consequences



- While once continuous, August 1933 hurricane opened a new inlet at sound end of Fenwick
- Storm created a disconnected Assateague Island – locals want the passage kept open
- Army Corps of Engineers constructs Ocean City jetty (1934) to stabilize inlet
- **Within 15 months, north end beach of Assateague Island retreats 150 meters landward!**
- Accelerated back-stepping; severe and *engineered* island retrogradation (*a classic in textbooks!*)

Ocean City (OC) and northern Assateague Island (AI)

Aerial of Ocean City (2011)



- North Jetty (NJ)
- Prograde Beach (PB)
- South Jetty (SJ)
- Retrograde Beach (RB)
- Washover Terrace (WT)

Note fishing boats – a commercially desirable passage/inlet



North Jetty (looking east) traps sand that would otherwise feed AI beaches

Let's Take a Tour Across Assateague Island...



Summer 2012 NOVA Field Course

Let's Take a Tour Across Assateague Island...

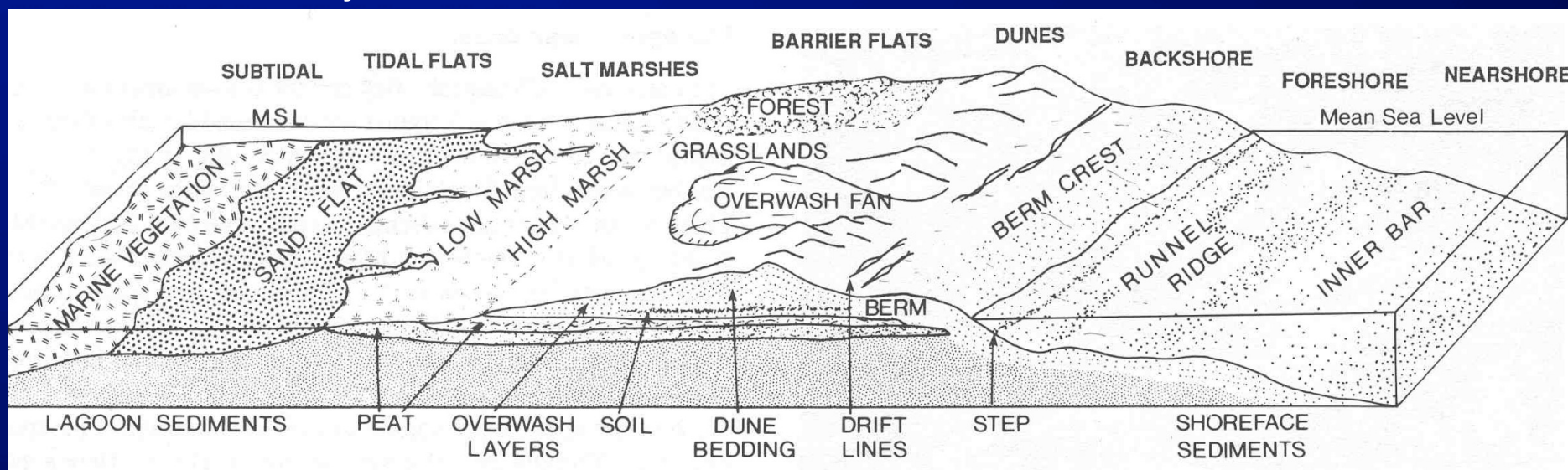


Summer 2012 NOVA Field Course

This could be YOU!

Assateague Barrier Island Anatomy... Windward Ocean to Leeward Bay

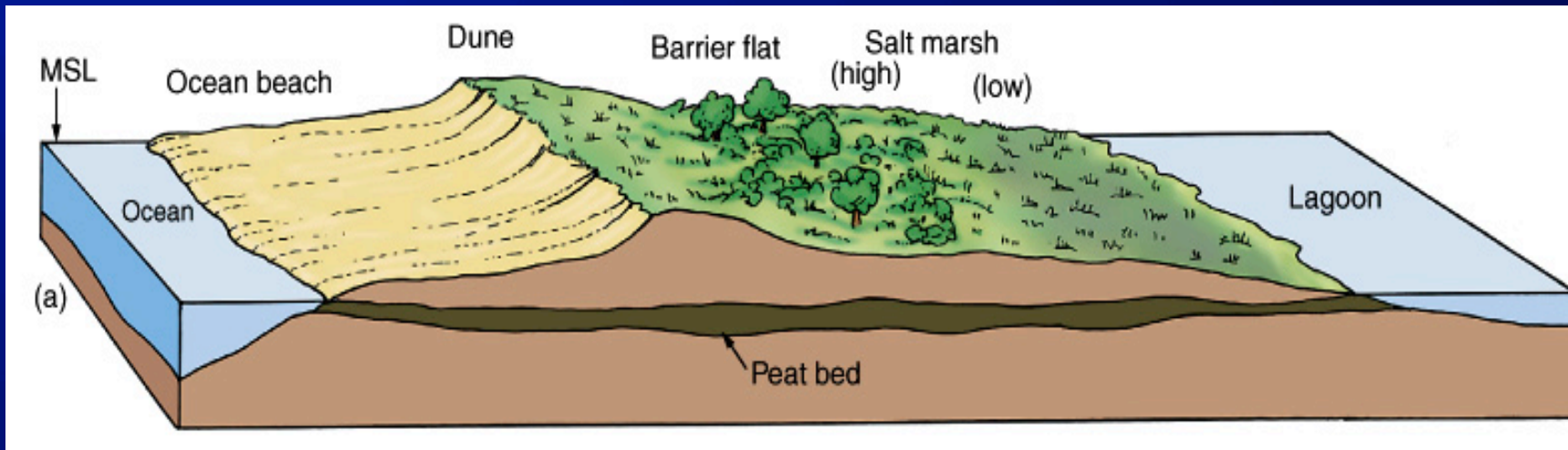
Leeward side/Bay ← Windward side/Ocean



Ward, et al., 1989

Major barrier island environments

Beach/berm Dunes Barrier flat Salt marsh/tidal flat



- Swash/backwash – southward flow of LSD
- Storm erosion and re-deposition (wrack, berms, stranded high – steeper because coarser)
- Seasonal and spatial variability
- **Highly dynamic beach-sediment “Checking Account”**

