



# Living With Erosion

Greg Berman

(Woods Hole Sea Grant & Cape Cod Cooperative Extension)

# ***What is Erosion ?***

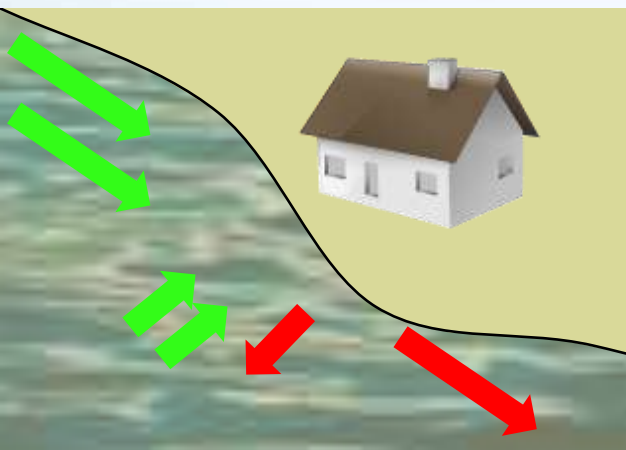




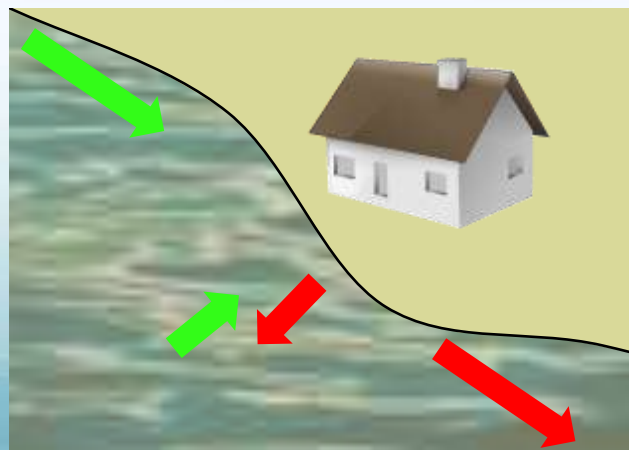
It's all sediment transport!

What is Erosion???..... just more leaving than coming in

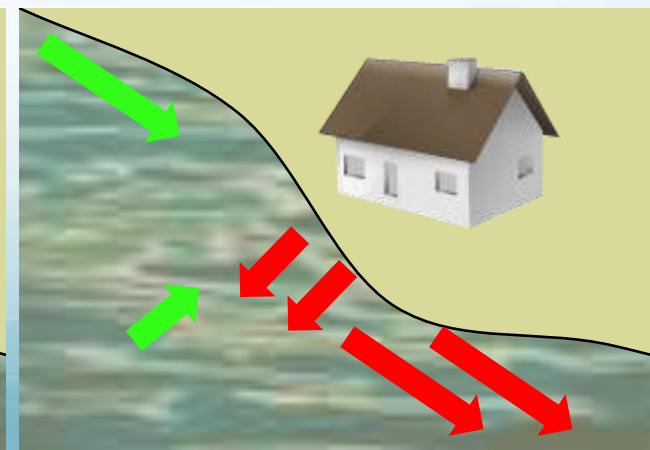
Accretion



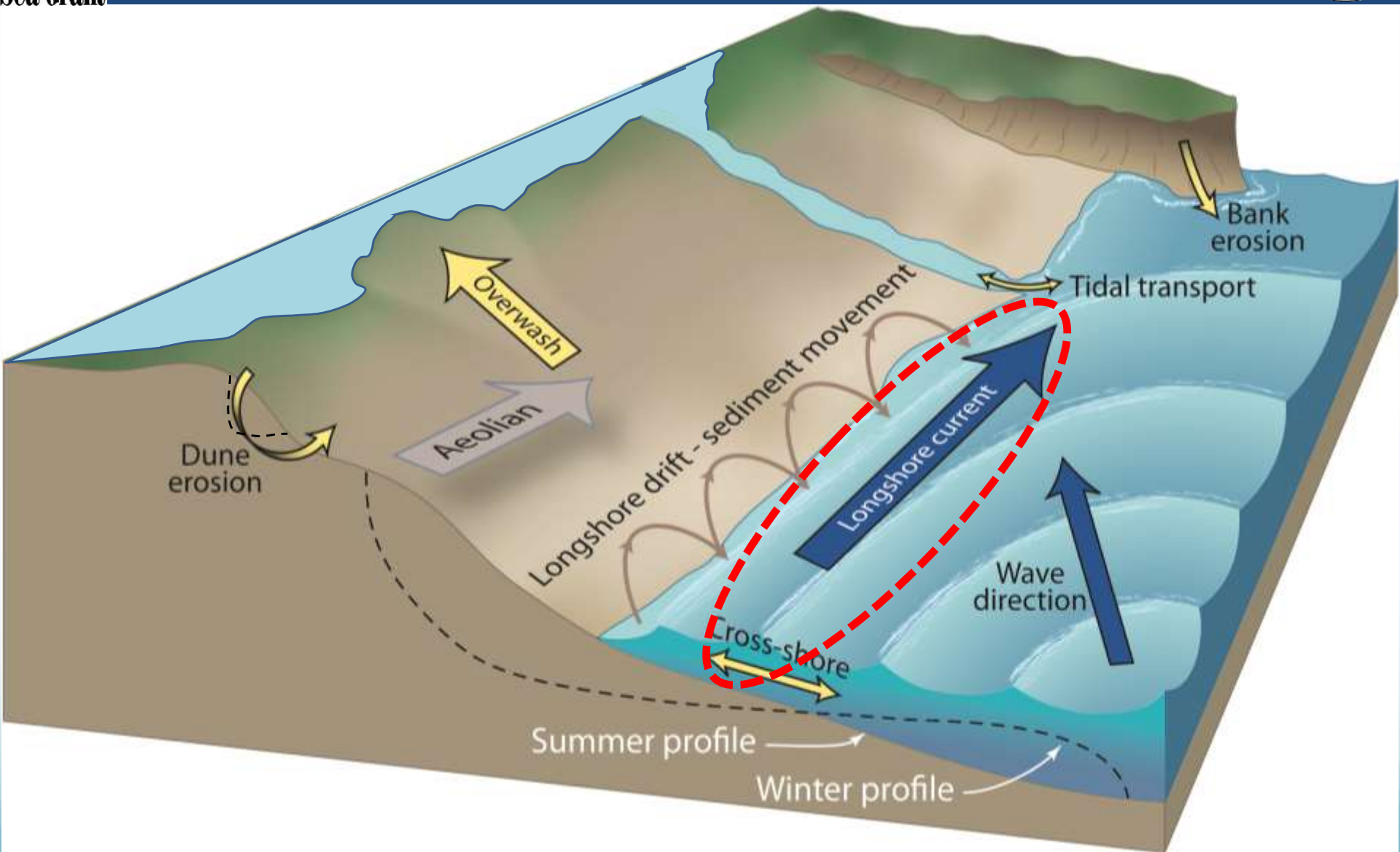
Dynamic Equilibrium



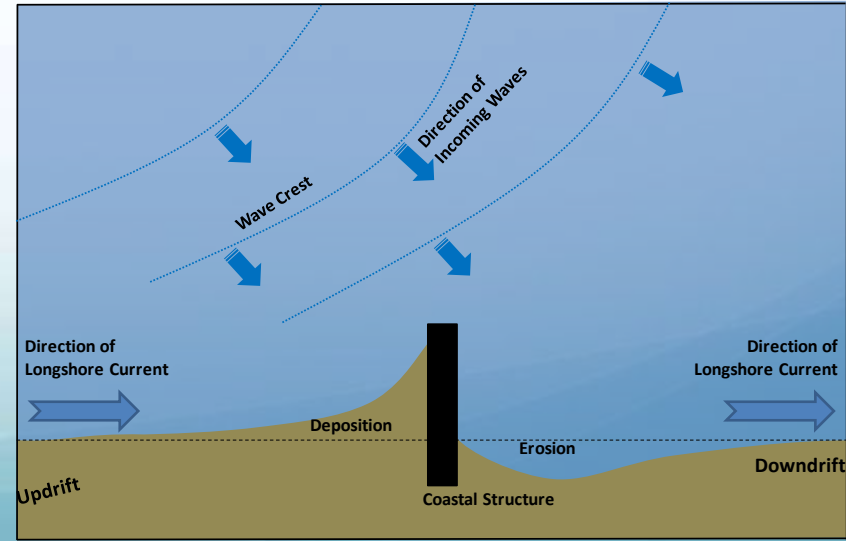
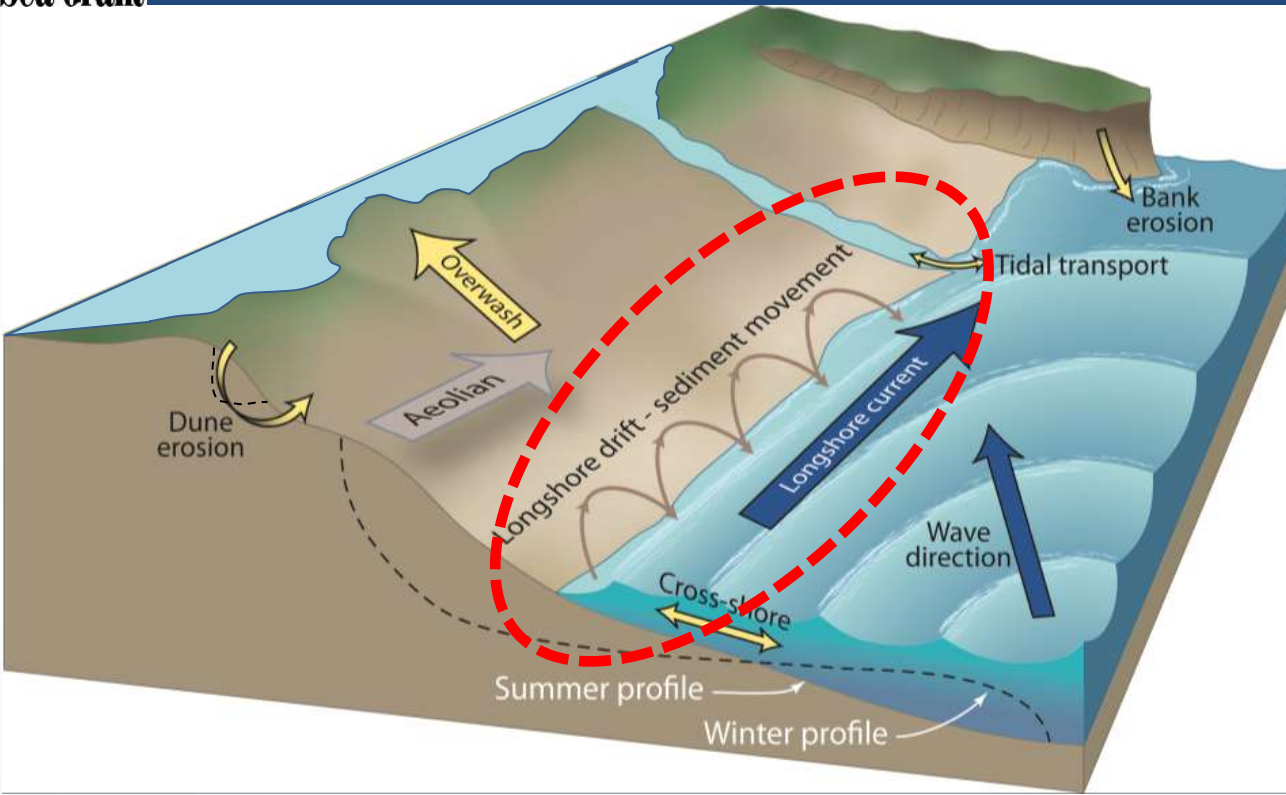
Erosion







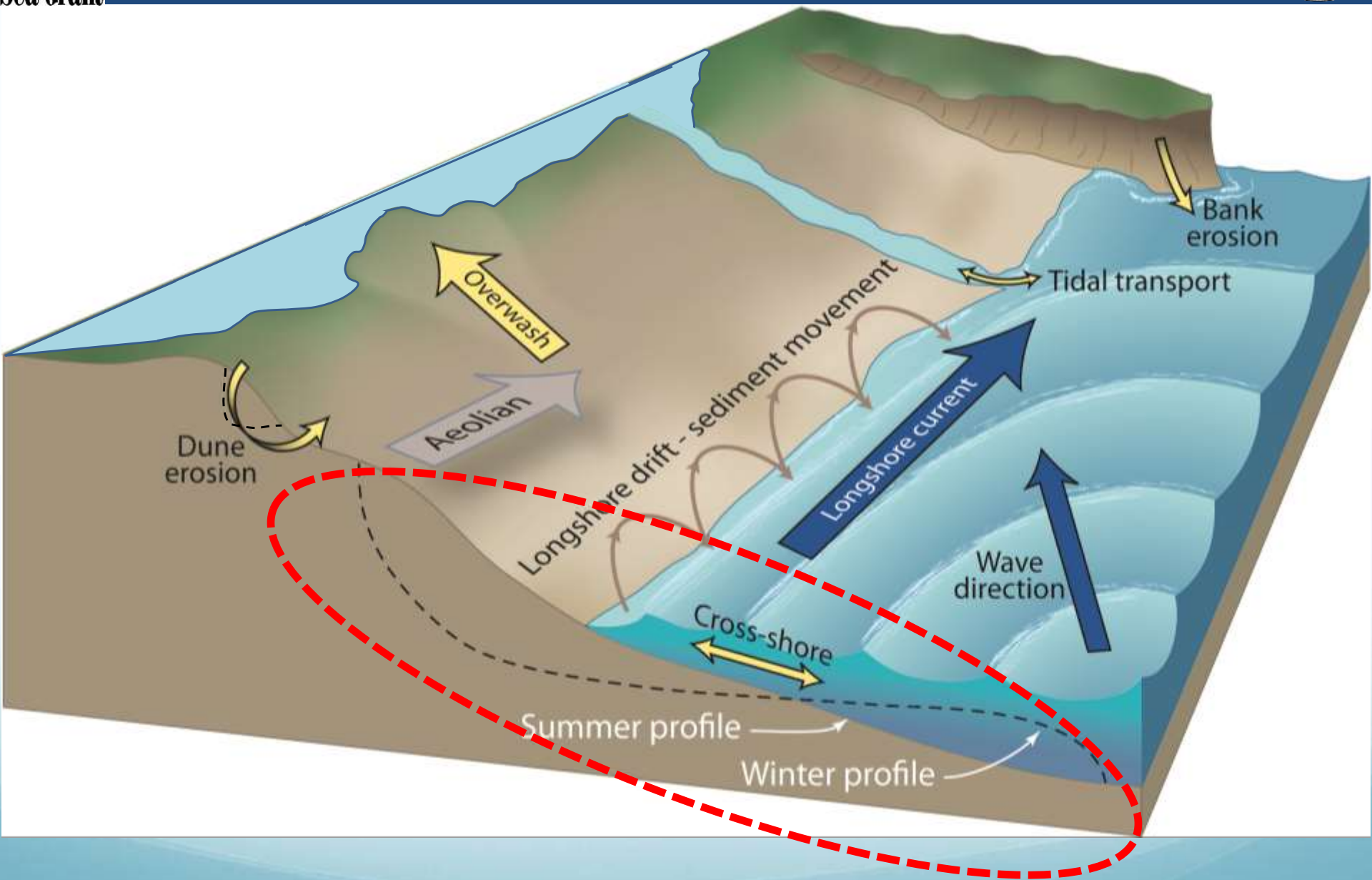
# Longshore Sediment Transport



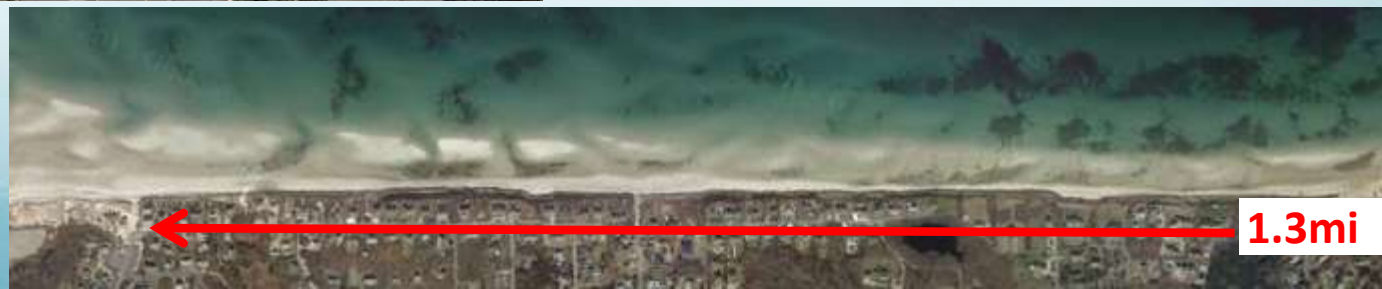
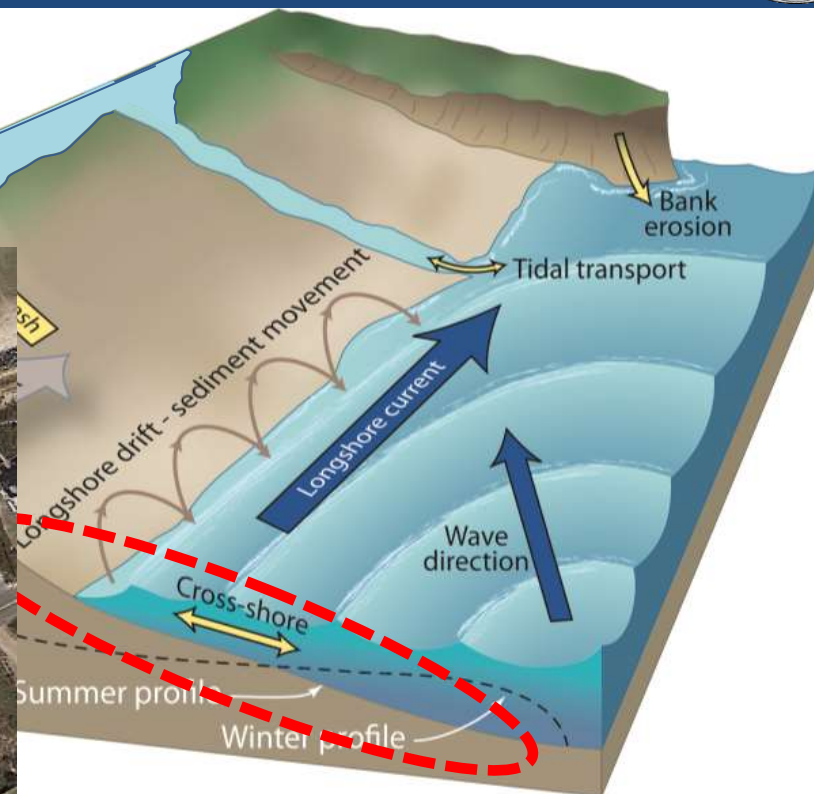
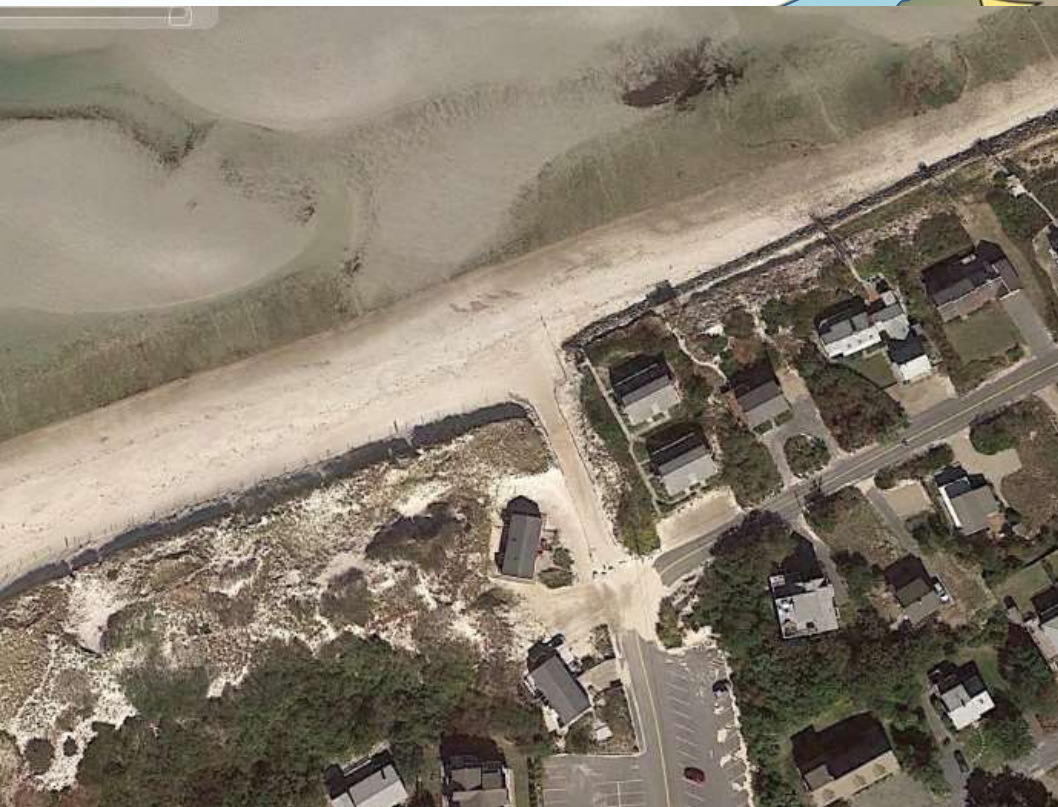


**Google Earth Engine:** Timelapse is a global, zoomable video that lets you see how the Earth has changed over the past 32 years. It is made from 33 cloud-free annual mosaics, one for each year from 1984 to 2016, which are made interactively explorable by [Carnegie Mellon University CREATE Lab's](#) Time Machine library.





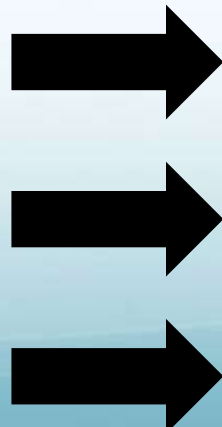
# Perpendicular Transport.....Blocked





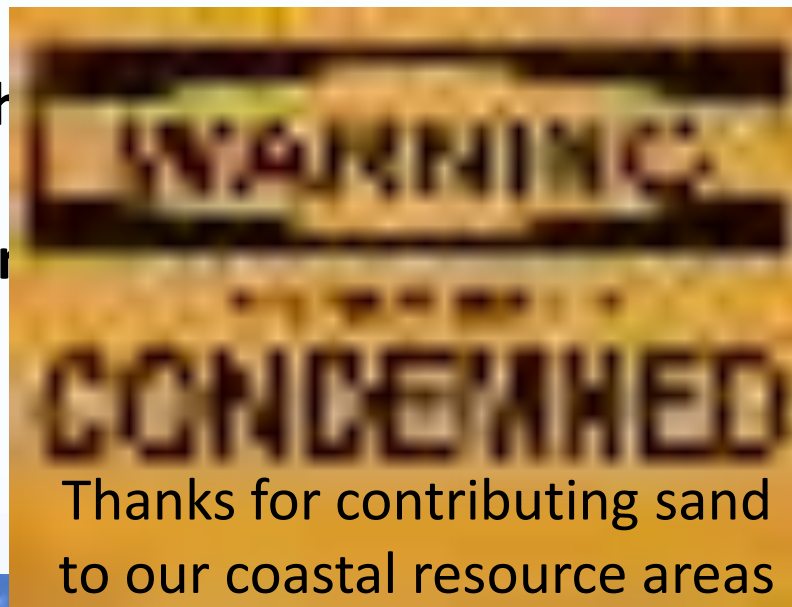
# ***Living with Erosion***

- 1. Erosion of glacial landforms is the MOST important source of sediment for dunes and beaches in Massachusetts.**
- 2. Wind and waves then transport sediment.**
- 3. Without erosion and then longshore re-deposition there would be no beaches.**



# *Living with Erosion*

1. Erosion of glacial landforms is the **MOST** important source of sediment for dunes and beaches in Massachusetts.
2. Wind and waves th
3. Without erosion a on there would be no beaches.



- **Do nothing**

1. Will system recover by itself?
2. How far is the structure from the water?
3. Grandfathering protects structures (not lawn) before August 10, 1978

March 2013



May 2013



Photo Credit: Ann McNichol

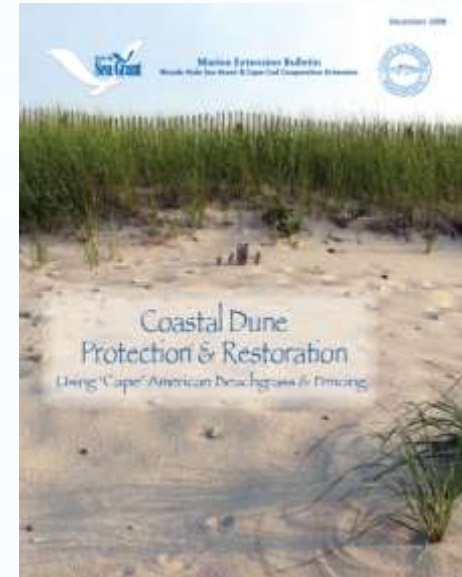


- Do nothing
- Vegetation



Plant Natives:  
Root systems stabilize.  
Take up water.  
Break the impact of  
raindrops or wave-splash.  
Slow down runoff

Remove Invasive



- Do nothing
- Vegetation
- **Re-grade**





- Do nothing
- Vegetation
- Re-grade
- **Managed retreat**



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**09/29/2015 - 01/15/2016 - 10/12/2017**



- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- **Beach nourishment = Fill of a CRA**



Photo Credit: Ted Keon

## *Sacrificial*



## *Cobble (Mixed)*



Photo Credit: CZM



- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- **Sand fencing**

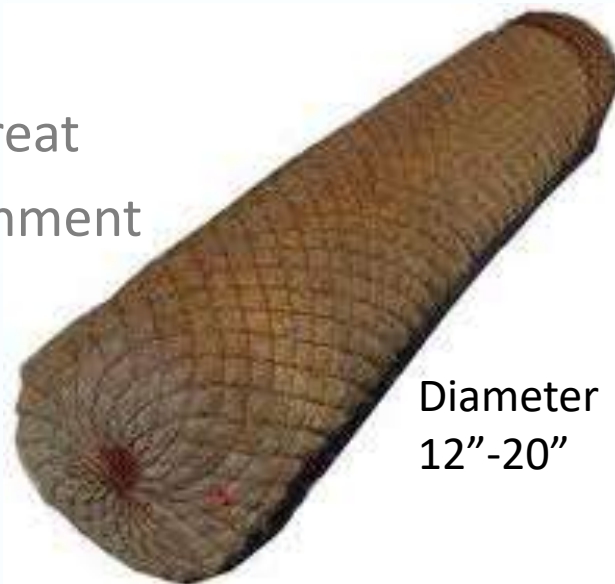




- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- **Sand fencing**



- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- **Fiber rolls**



Diameter  
12"-20"





- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- **Fiber rolls**





- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- Fiber rolls
- **Coir Envelopes**



- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- Fiber rolls
- **Coir Envelopes**



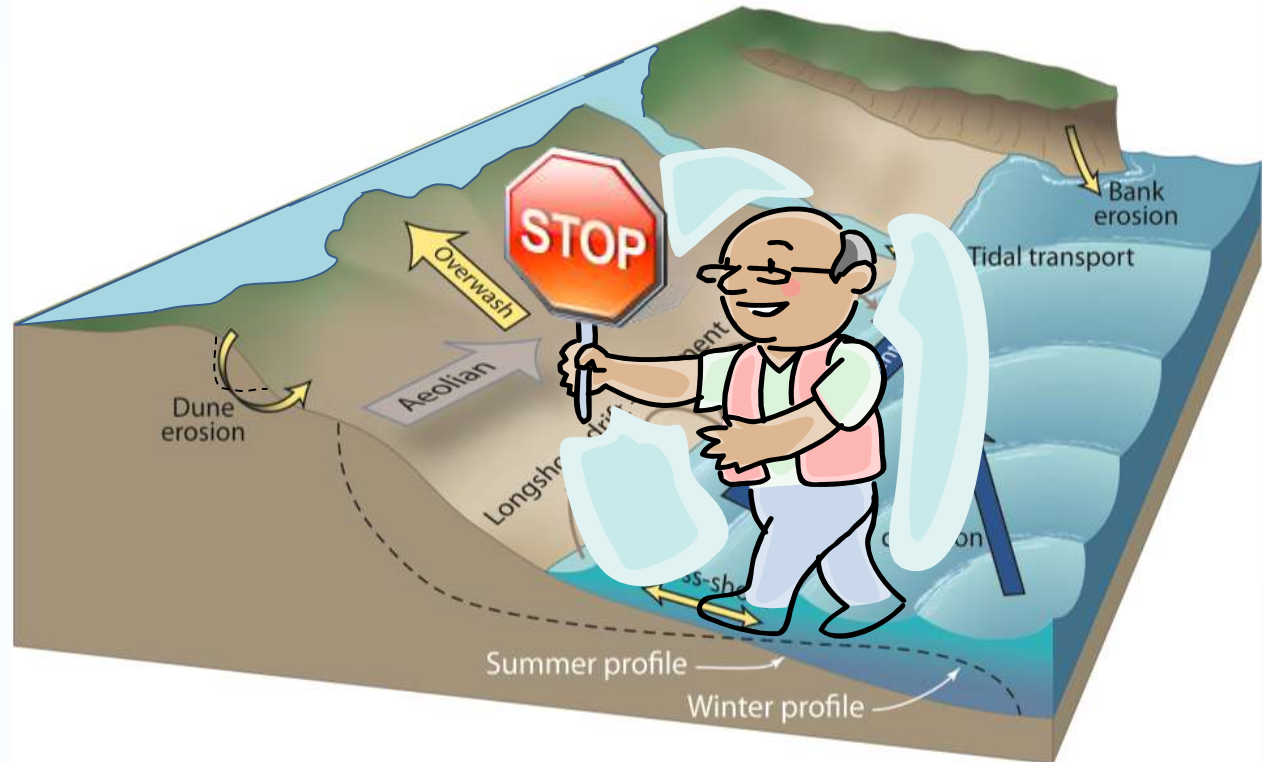


- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- Fiber rolls
- **Coir Envelopes**



- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- Fiber rolls
- Coir Envelopes

C E S



**WPA:** Coastal engineering structure means, but is not limited to, any breakwater, bulkhead, groin, jetty, revetment, seawall, weir, riprap or any other structure that is designed to **alter wave, tidal or sediment transport processes** in order to protect inland or upland structures from the effects of such processes.

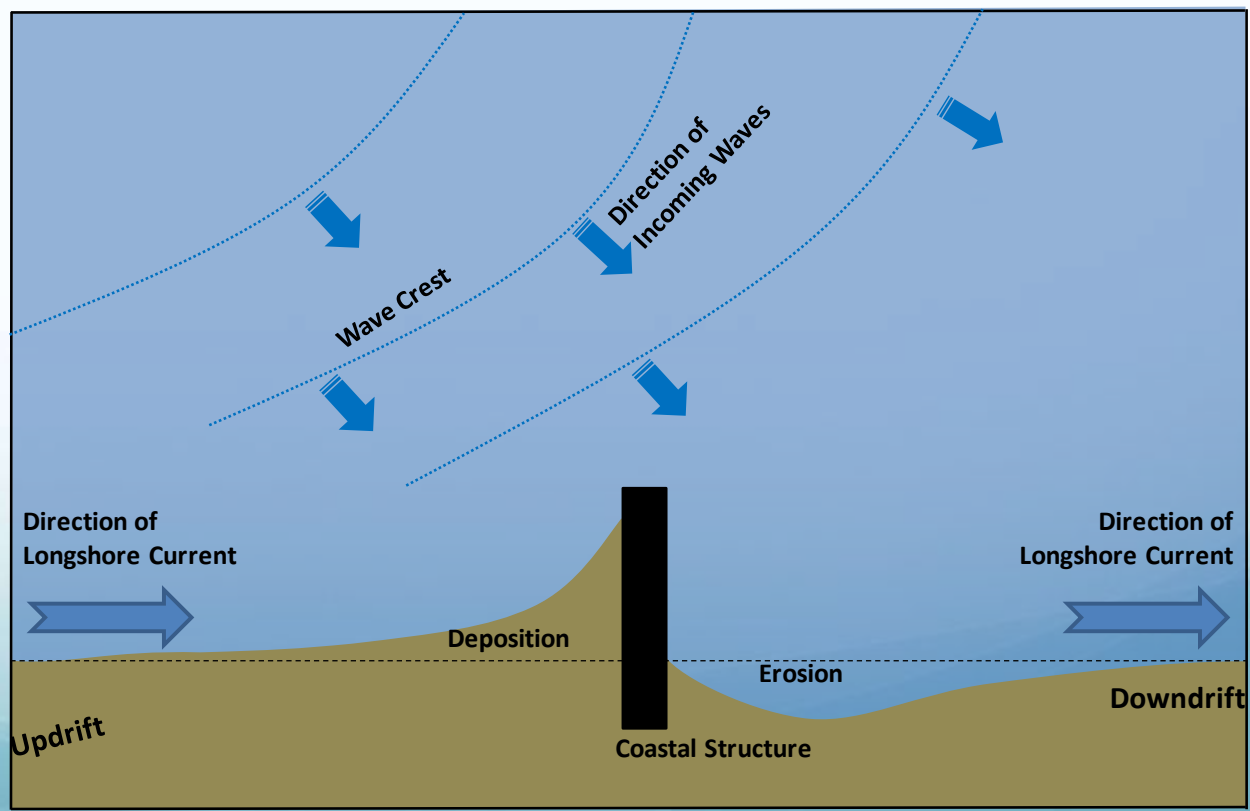


- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- Fiber rolls
- Coir Envelopes



**C E S**

**Groin**



- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- Fiber rolls
- Coir Envelopes



## C E S

- Groin



- Jetty



- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- Fiber rolls
- Coir Envelopes



## C E S

- Groin
- Jetty

## Sand Bags



- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- Fiber rolls
- Coir Envelopes



**Gabion (10-20 yrs)**

## C E S

- Groin
- Sand Bags
- **Gabion**
- Jetty





- Do nothing
- Vegetation
- Re-grade
- Managed realignment
- Beach nourishment
- Sand fencing
- Fiber rolls
- Coir Envelopes

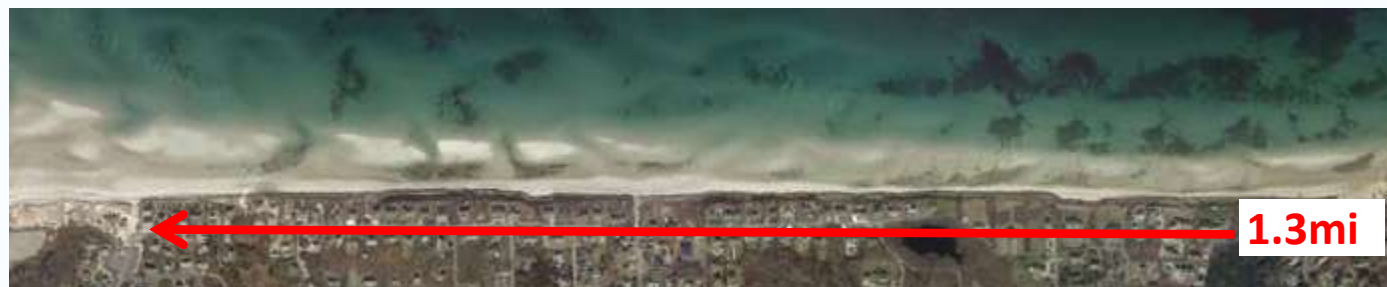


## C E S

- Groin
- Sand Bags
- Gabion
- Breakwater / Sill
- Jetty



- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- Fiber rolls
- Coir Envelopes



## C E S

- Groin
- Sand Bags
- Gabion
- Breakwater / Sill
- **Revetment**
- Jetty





- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- Fiber rolls
- Coir Envelopes



## C E S

- Groin
- Sand Bags
- Gabion
- Breakwater / Sill
- Revetment
- Jetty
- Sea








- Do nothing
- Vegetation
- Re-grade
- Managed retreat
- Beach nourishment
- Sand fencing
- Fiber rolls
- Coir Envelopes



## C E S

- Groin
- Sand Bags
- Gabion
- Breakwater / Sill
- Revetment
- Jetty
- Seawall
- Bulkhead



- ~~Do nothing~~
- ~~Vegetation~~
- ~~Re-grade~~
- ~~Managed retreat~~
- ~~Beach nourishment~~
- Sand fencing 
- Fiber rolls
- Coir Envelopes

How the “Spectrum” could be used:

Notice of Intent (NOI) →→→→ Alternative Analysis

...start at top and move down,  
explaining why each one isn't suitable.

## C E S

- Groin
- Sand Bags
- Gabion
- Breakwater / Sill
- Revetment
- Seawall
- Bulkhead
- Jetty

Massachusetts Department of Environmental Protection  
Bureau of Watershed Protection - Watersheds  
WPA Form 3 - Notice of Intent  
MASSACHUSETTS WATERSHED PROTECTION ACT 91A G. L. c. 127, §40

**A. General Information**

1. Project Location: (Include address, file or map or other to locate project area)

2. Project Name: \_\_\_\_\_

3. Project Description: \_\_\_\_\_

4. Project Purpose: \_\_\_\_\_

5. Project Sponsor: \_\_\_\_\_

6. Project Date: \_\_\_\_\_

7. Project Status: \_\_\_\_\_

8. Project Type: \_\_\_\_\_

9. Project Size: \_\_\_\_\_

10. Project Cost: \_\_\_\_\_

11. Project Impact: \_\_\_\_\_

12. Project Duration: \_\_\_\_\_

13. Project Frequency: \_\_\_\_\_

14. Project Season: \_\_\_\_\_

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↑ Resilience  $\neq$  ↓ Natural Systems

# Questions ?

