

A case study of Dawlish Warren.

UWE, Bristol

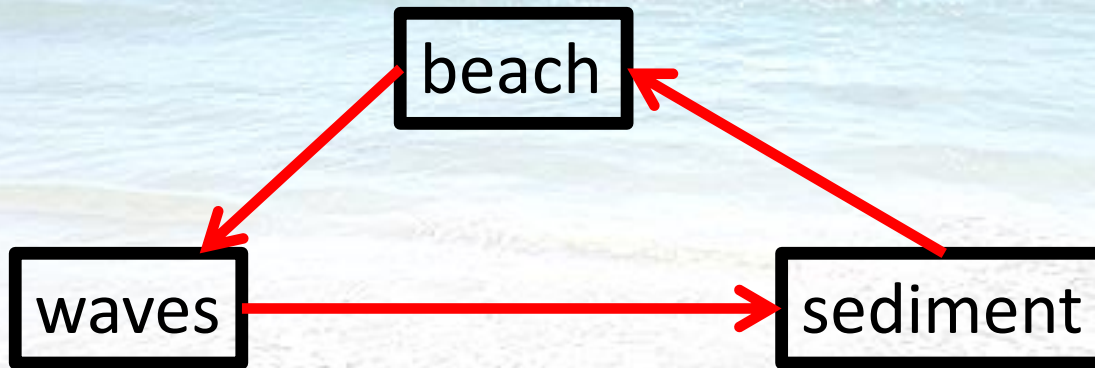


Lecture :

- coastal systems and how they respond to change
 - beaches
 - cliffed coasts
 - sand dunes
- problems at Dawlish Warren
- consider current issues at Dawlish Warren
- understanding causes of problems to more effectively manage the site

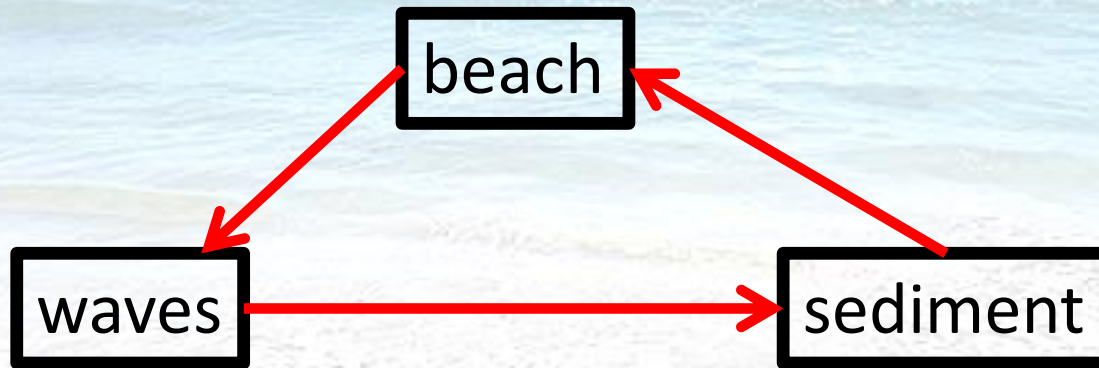
A beach as a system:

- what are the key components of a beach?

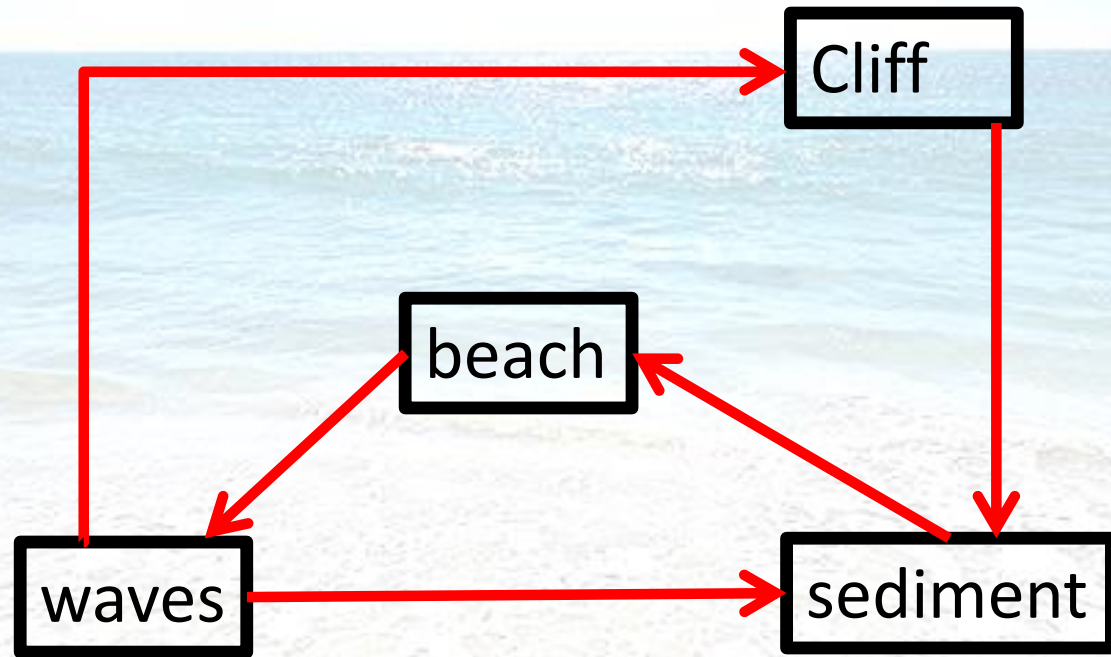


A beach as a system:

- how would it respond to changes?



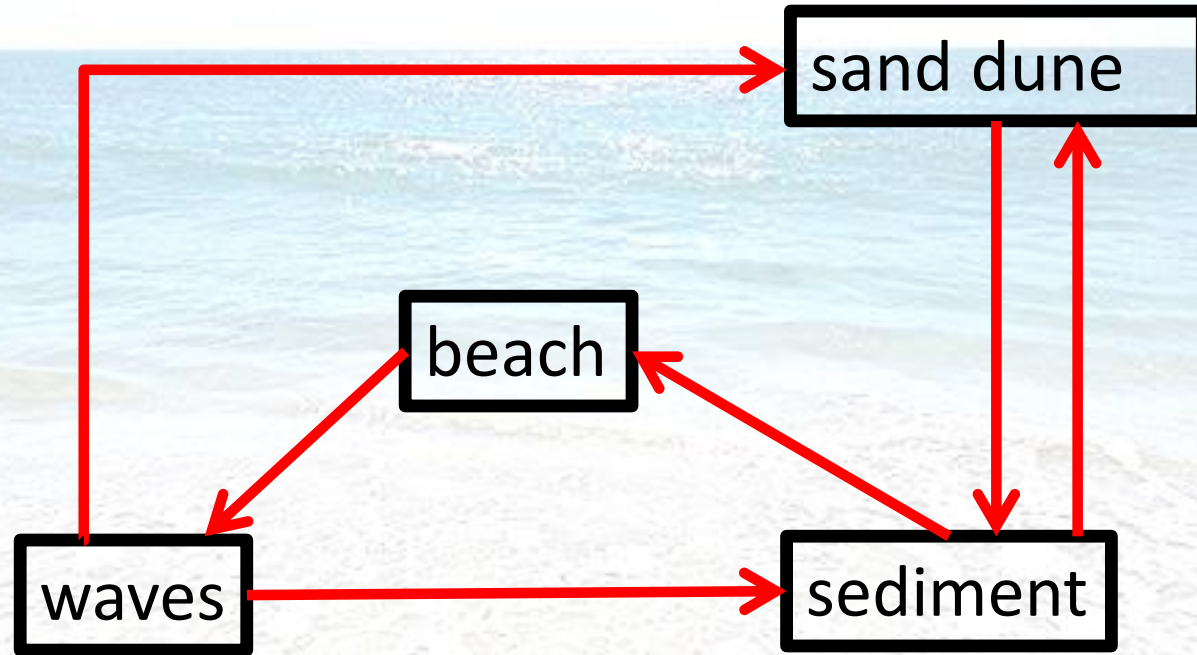
- how would changes on a beach influence cliffs behind?



- so through cliff erosion the beach is maintained

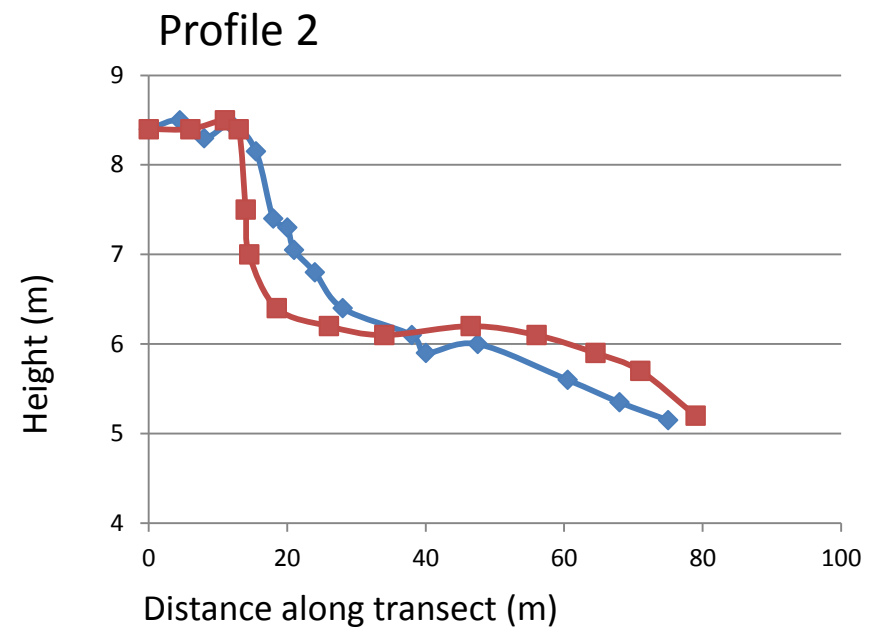


- we can have the same situation with sand dunes

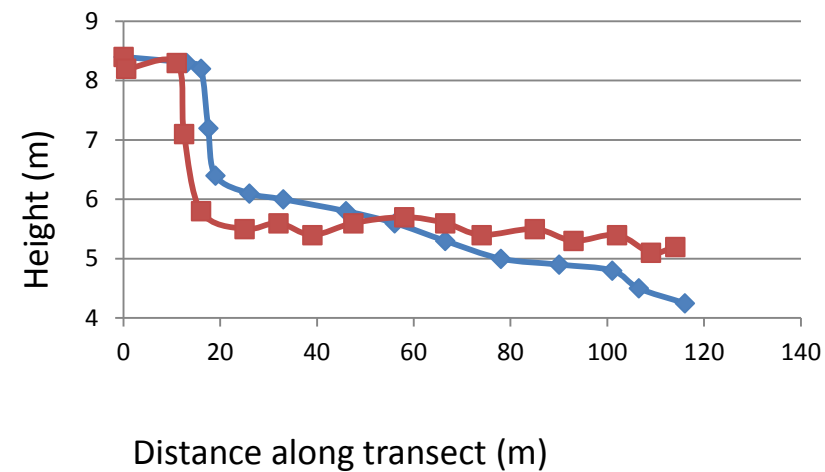


Explore this through some real data - location of surveying transects

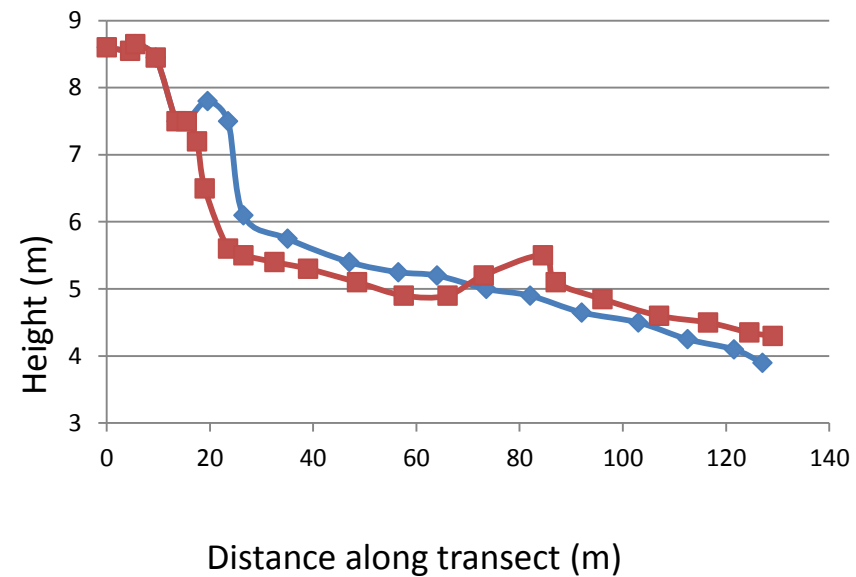




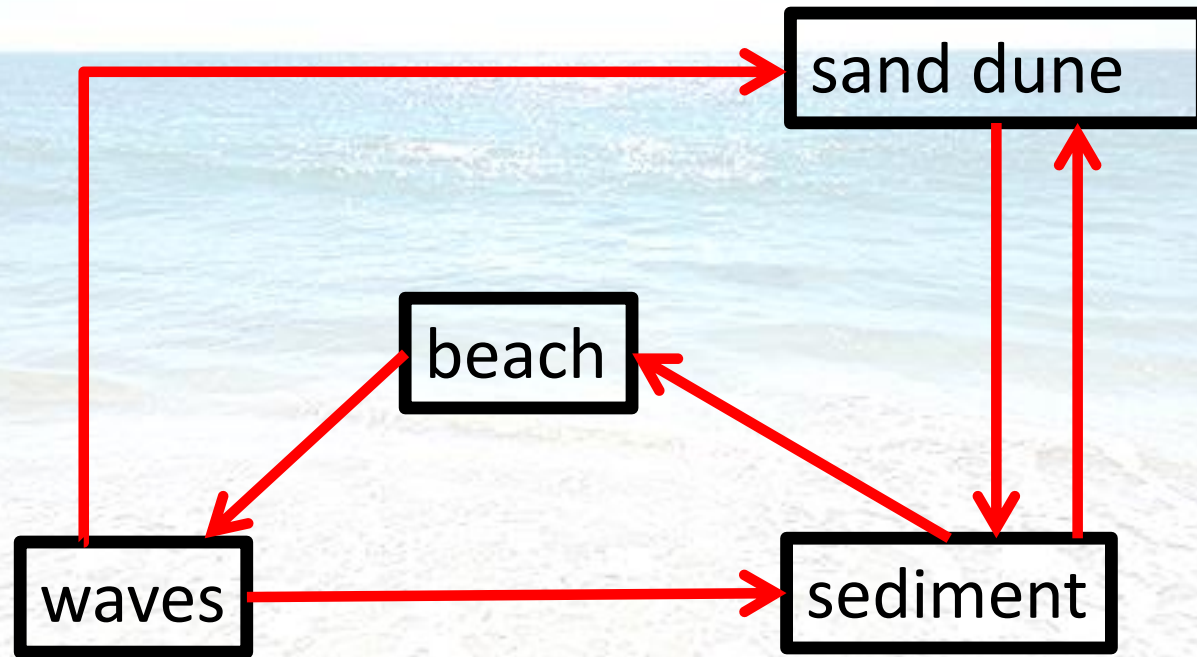
Profile 3



Profile 4



So the system has a negative feedback built in to it:.....so no problems?



Dawlish Warren is a coastal spit on the south coast of England



How are spits formed?



Coastal spits are formed by longshore drift

In southern Britain this is typically from the west to east

LONGSHORE DRIFT ANIMATION

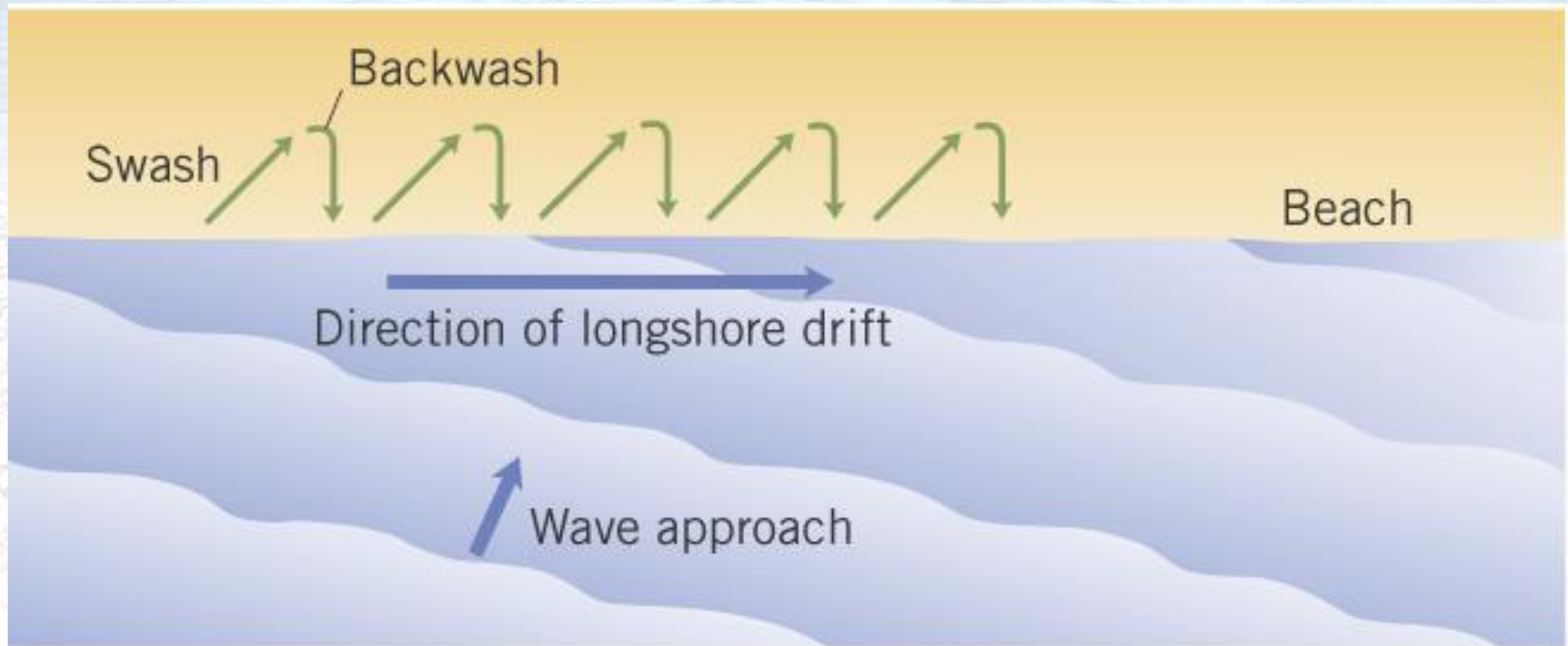
BY STEVEN VETTESE

<http://oceanica.cofc.edu/An%20Educator's%20Guide%20to%20Folly%20Beach/guide/driftanimation.htm>



Longshore currents :

- waves may approach the coast at angle
- swash approaches at an angle
- backwash returns with gravity



Longshore Drift :

- wave process leads to characteristics landforms
- landforms become detached from the coast

Spits

- narrow, elongate beaches
- detached from the coast
- longshore drift transports sediment along the coast
- where the coast is 'indented' some of this sediment is deposited
- the longshore drift can now extend further
- spit extends across the bay

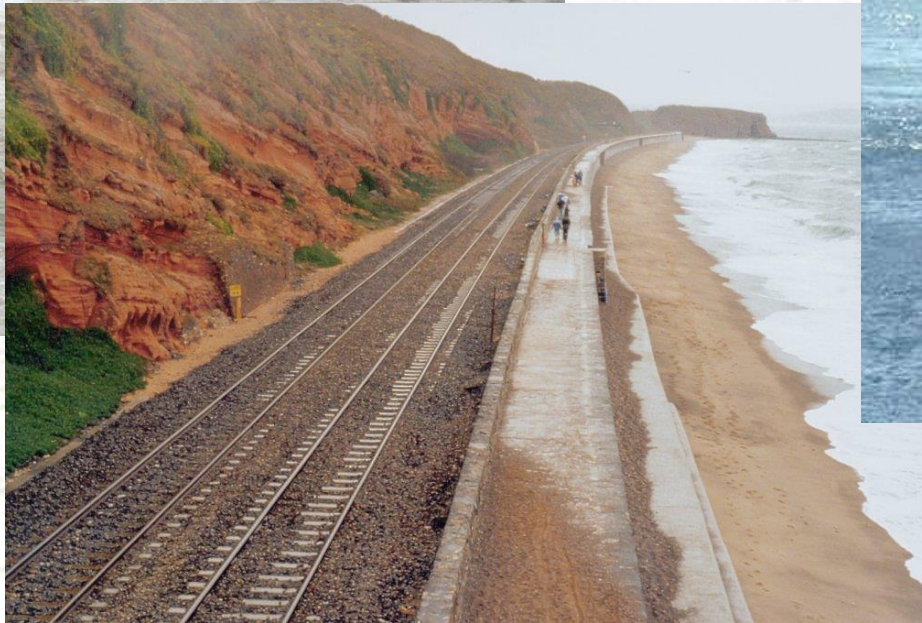


Coastal spits as systems

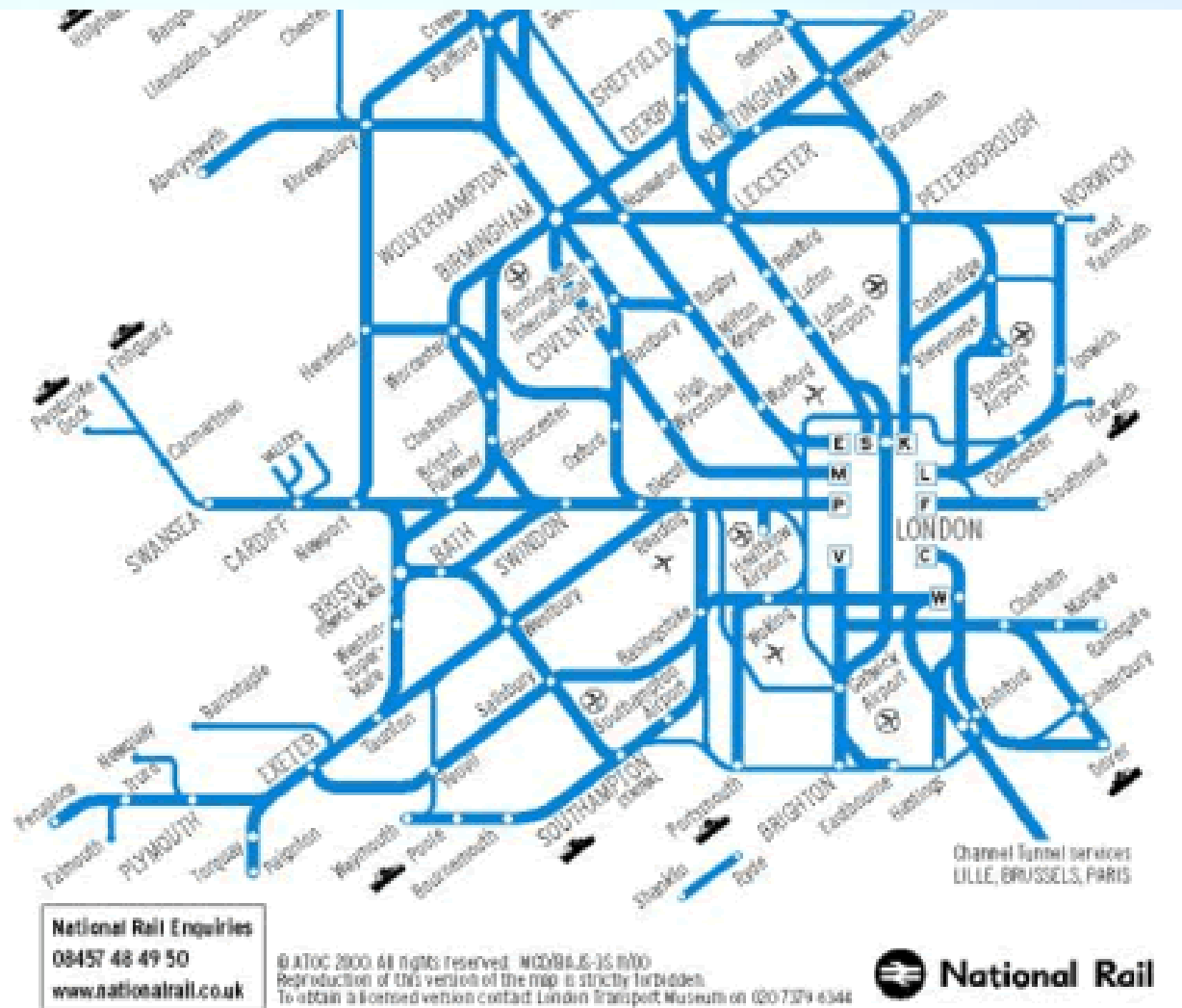


Dawlish Warren has suffered erosion problems for some time
this is essentially due to problems of lack of sediment supply

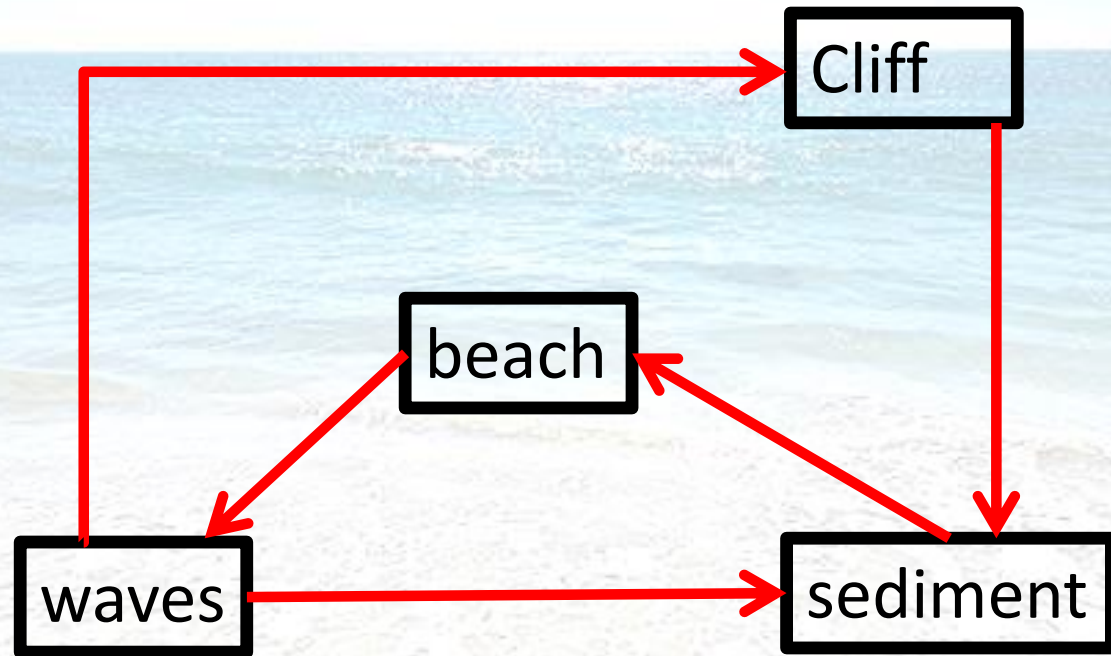
This is often blamed on the stopping of cliff erosion by Brunel's railway



In the mid 19th century a railway was built connecting areas to the south-west to the rail network



- so what does this look like in our system?



The rate of erosion was considerable, eventually leading to the erosion of parts of a settlement that had developed on the spit



Eventually this led to some researchers predicting that the spit may completely disappear by 1960

But is the story this simple?

Date	Spit Conditions
1860's	<i>Steady erosion (1.0m pa)</i>
1872-76	<i>Sea wall built to protect railway</i>
1880-1932	<i>Steady erosion (2.0m pa)</i>
1950-60	<i>Dawlish Warren expanded</i>
1960-61	Erosion
1966-72	<i>Spit size stable</i>
1972-80	Erosion
1980-2003	<i>Spit size stable, expansion at eastern end</i>
2004	Major storm, and erosion

Dawlish Warren was receding before the construction of the sea wall

In addition since this time it has also experienced some phases of growth

So the sea wall protecting Brunel's railway is perhaps not having the impact initially thought

What does this mean in terms of our understanding of spits?



The area that has been most intensively managed is the western end, where the spit is attached to the mainland

The reason for this is that :

The beaches have continued to narrow

Consequently erosion and flooding were a significant risk



Now have a better understanding of the coastal processes active here and the impact on spit development

- sea wall has cut off the cliffs from erosion so no re-supply to the western end of the spit
- Sediments are carried from the eastern end of the spit and some washed back out onto Pole Sands
- sediments are recycled between Pole Sands and the eastern end of the spit

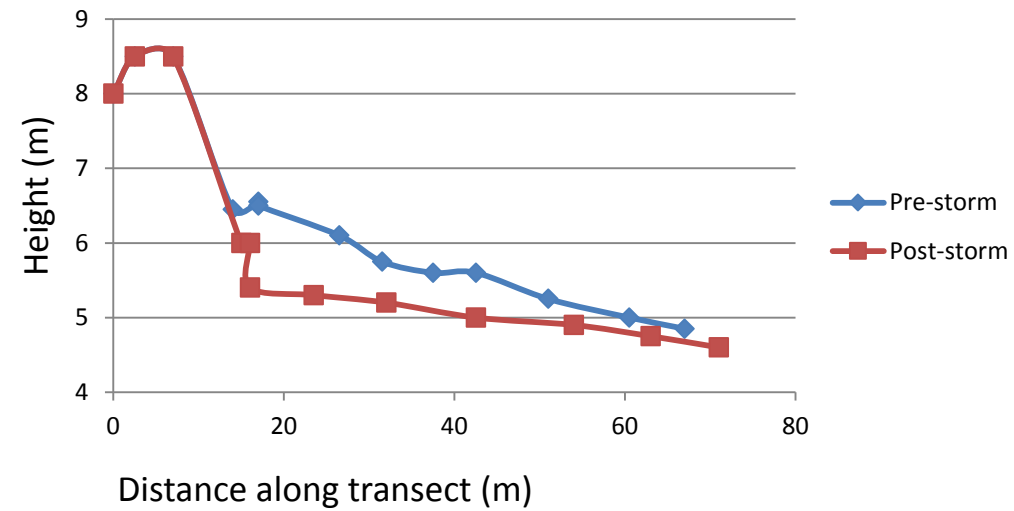
Current Situation : October 2004 and 5th February 2014 major storms hit the Devon coast causing problems for the railway and spit



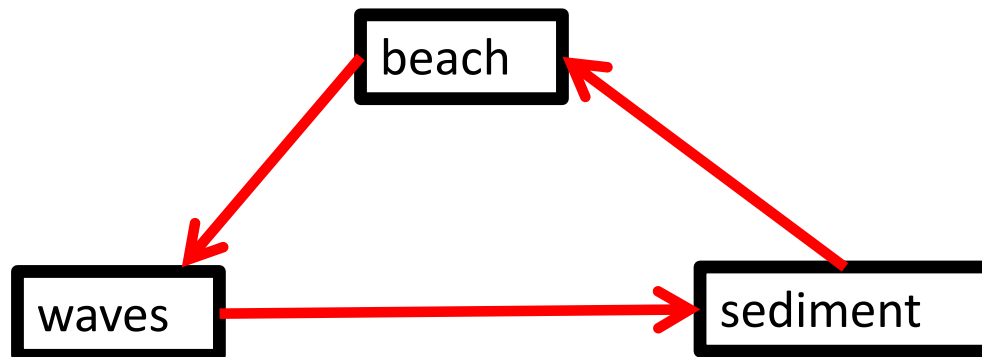
Location of surveying transects



Profile 1



Describe the trend present in this beach transect





<http://www.bbc.co.uk/news/uk-26044426>



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So on more natural coasts during a storm-

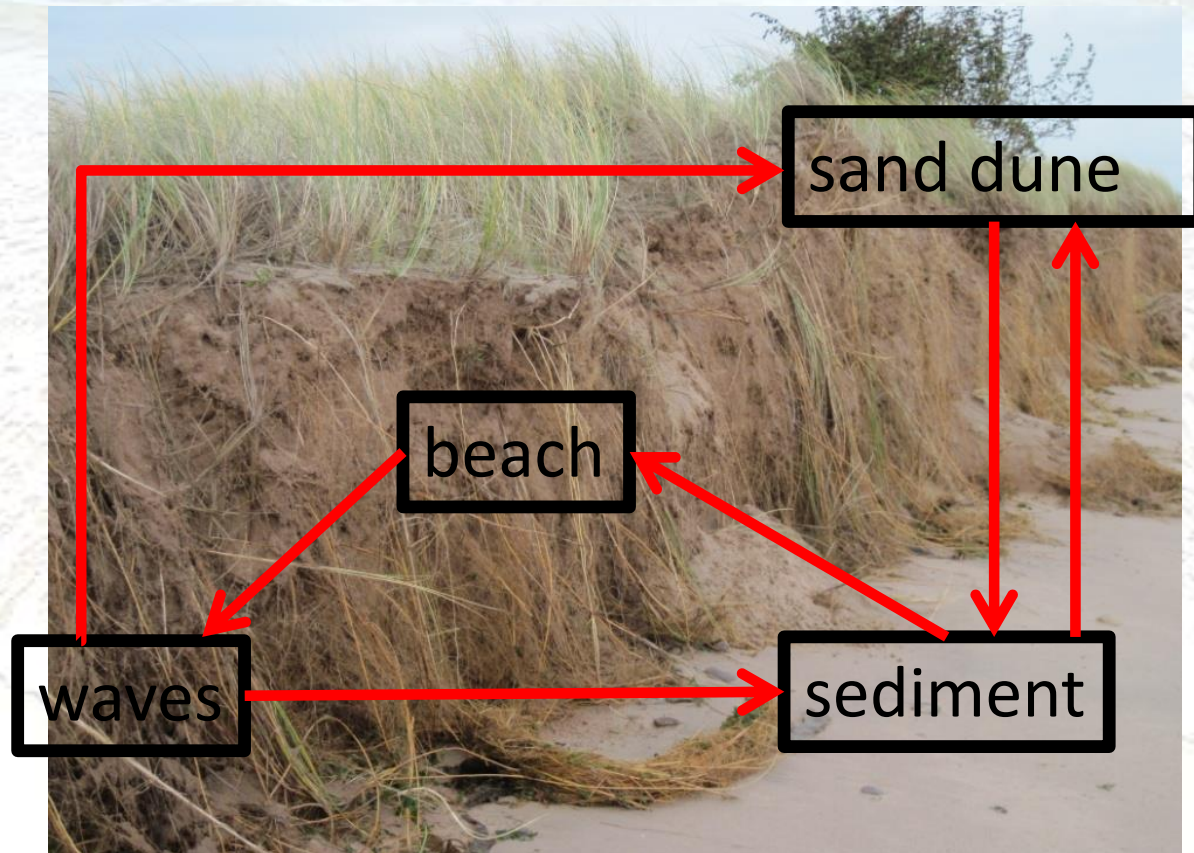
- water shallower and so wave energy reduced through the storm on natural beaches
 - negative feedback

On more engineered coasts-

- water deeper and so wave energy greater on engineered beaches
 - positive feedback
- enables beaches to survive where sea walls can be destroyed

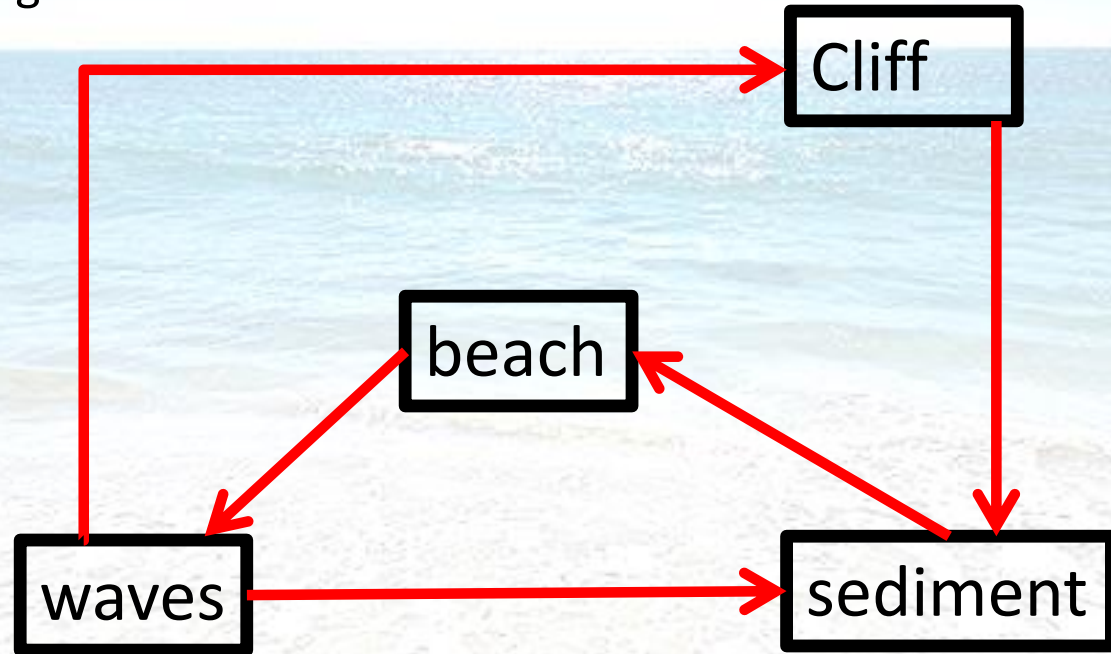
On more natural coasts, what do you think will happen in the period after the storm?

- calmer conditions with waves more well spaced out
- material transported back up the beach
- beach and dunes gradually recover



Coastal Management:

- so thinking about our understanding of these systems how might we better manage them in the future?



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- so thinking about our understanding of these systems how might we better manage them in the future?

gement Scheme?



Summary :

- development of simple systems approach to the coast
- formation of spits and problems at Dawlish Warren
- use our systems approach to design more effective coastal management

Only with a detailed understanding of the physical environment and also the human pressures that are placed on it can we manage this coastline into the future....

...geographers are very well placed to deliver this....

