

Waves



Photo: Fran Crowe



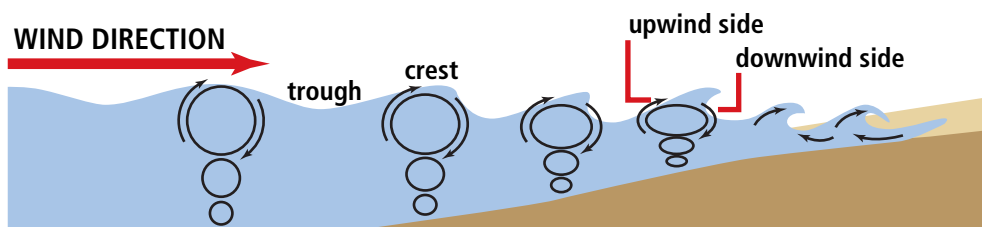
The Suffolk Coast and Heaths
- An Area of Outstanding Natural Beauty

Waves and What Do They Do?

How are waves created?

As wind passes over the water's surface, friction forces the water to ripple and waves are generated. So, the energy of waves comes from wind. Of all the wind-driven processes that shape landforms, waves are the most important.

Interestingly, in the open sea waves make floating objects bob up and down but do not push them along, and although an illusion of a horizontal movement is created, no substantial advance occurs. A wave travels through the water, and does not take the water with it. If you could watch the action of a single drop of water during a passing wave, you would see it moves in a vertical circle, ending at a point close to its original position at the wave's end.



Waves only seem to carry water with them; in fact each wave crest sets water particles circling. Notice that in shallower water these vertical circles become more oval in shape.

As waves approach the beach, the friction of the wave against the sea bottom alters the motion of the waves. The waves become higher and steeper, as the back overtakes the front forcing it into a peak, then to tilt forward and, finally to break creating the white water that rushes up the beach.

Waves or swell?

Waves – Sea waves are generated by local winds and are usually short and choppy. They have shorter wavelengths and periods (see diagram) than swell waves and are generally steeper.

Swell – Swells are waves that have moved away from their area of origin and are unrelated to the local wind conditions. These can exist for a long time, are able to travel significant distances and often have a direction different to that of the local wind.

A wave is made up of eight basic parts:

Still-water line – The level of the ocean without any waves i.e. as if it were flat.

Crest – The “peak” of the wave.

Trough – The “valley” between the crests.

Wave height – The vertical distance between the crest and the adjacent trough.

Wave length – The horizontal distance between crests.

Wave period – The time interval between the passage of two successive waves.

Wave frequency – The number of waves passing a particular point within a particular time period.

Amplitude – This is equal to one half the wave height or the distance from either the crest/trough to the still-water line.

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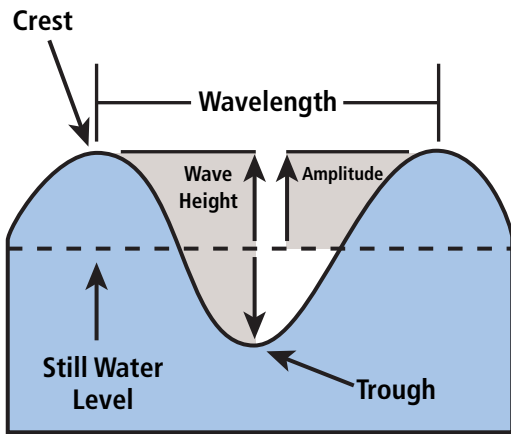


Diagram illustrating the parts of a wave.

The height of a wave is a measure of its force and depends on:

Wind speed

Wind duration – the longer the wind blows, the higher the waves get.

Water depth – waves become higher in shallow seas.

Fetch – the length of open water over which the wave has travelled.

On the west coast of the UK the fetch is longer than on the east coast. This is because on the west coast the prevailing wind has acted across the Atlantic Ocean, generating larger waves. As the North Sea is smaller than the Atlantic the east coast does not get such big waves. You would expect then that the west coast would

have greater erosion because of the longer fetch, but this is not the case as the rocks on the east coast are much softer than those on the west coast, leading to greater erosion in the east.

The shape of the seabed

The shape (topography) of the seabed is also an important factor – shoaling water can reduce speed, distance and time between waves.

The shape of any stretch of coastline is a combination of many factors. However wave action is key to determining where erosion and deposition occurs through the action of destructive (erosive) or constructive (building) waves.

The characteristics of waves types

The main features of destructive waves are:

- They are tall, toppling waves carrying a lot of energy.
- As they approach the beach they rapidly steepen and when breaking they plunge down and scour the beach.
- Because the backwash is stronger than the swash, rocks, pebbles and sand are carried back out to sea.
- They are frequent waves, breaking at an average of eleven to fifteen per minute.

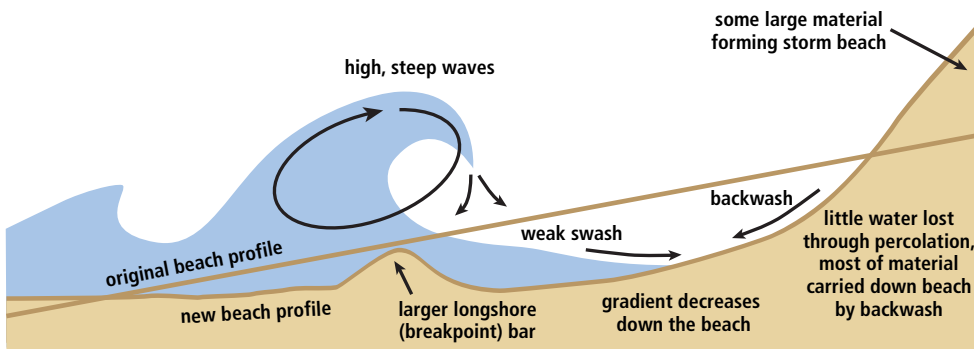


Diagram illustrating destructive (steep) waves on a shingle beach.

Waves and What Do They Do?

The main features of constructive waves are:

- They tend to be low in height (under 1 metre), and therefore low in energy.
- As they approach the beach, the wave front steepens only slowly.
- They break gently on the beach so there is little backwash pulling material down the beach.
- They break gently, with only six to nine waves per minute.

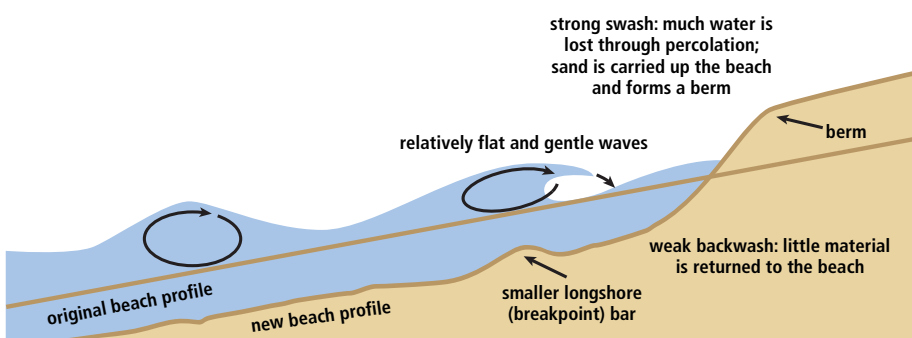


Diagram illustrating constructive (flat) waves.

This type of wave is found where there are calm sea conditions, with light winds. They have the greatest effect in sheltered coastal locations, such as bays sheltered by rocky headlands on both sides. Different weather affects the type of waves; in calm winds waves do little erosion work and this is when they tend to build beaches up.

Longshore Drift

Longshore drift is the movement (transport) of material along the shore by wave action. Waves approach the shore at an angle (usually from the direction of the most common, or prevailing, wind) and the swash moves material up the beach in this direction. Backwash pulls material straight down the beach at right angles. The result is that material is slowly moved in a zig-zag fashion along the beach.

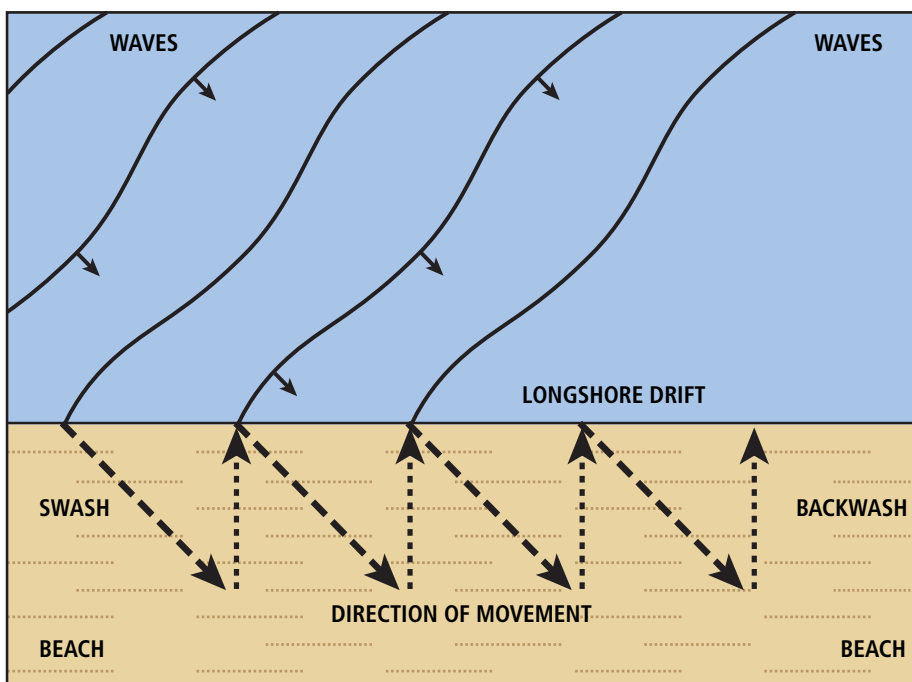


Diagram illustrating longshore drift.

Longshore drift provides a link between erosion and deposition. Material in one place is eroded, transported then deposited elsewhere. It is important to remember that longshore drift can act on a beach in more than one direction, depending on the waves and wind direction. Along the east coast it is usually north to south because, although the prevailing wind is south-westerly, the north-east wind has greater effect with a long fetch across the North Sea. This has given rise to features like Orfordness and Landguard point.