

Landslide mitigation

The best way to avoid damage, injury or loss of property is to avoid known danger areas altogether. Some landslips have been triggered by human activity such as mining, gravel extraction or even just digging fossils out of a slope face. The removal of vegetation can also destabilise a vulnerable slope.

However, in the case of areas such as Black Ven, it would be impractical to try to prevent landslides in the long term. Limited intervention can work sometimes to help stabilise areas where nearby roads and houses are at risk.

Rock falls

As with landslips, rock falls can occur without any warning but now we are considering material that falls almost vertically rather than simply sliding. As before, it is the weather conditions, the specific geology and erosional forces that act together to create cracks and fissures along fault lines in the rock. Often, these fault lines travel deep into the cliffs and so when they finally fail, enormous volumes of material become detached.

Chalk and Sandstone sea cliffs are particularly susceptible because wave action can rapidly erode the toe thus creating a heavy overhang. Eventually, the weight of the overhang overcomes the sheer

strength of the rock. The overhang breaks away and falls to the beach below. The hollowed out stretches of cliff along a beach are often referred to as the 'undercliff'.

As with landslides, this is an ongoing natural process. However, with rising seas and more violent storms, we must expect to see accelerated rates of cliff erosion and consequently, more frequent rock fall events. The general public are often unaware of these dangers, especially when using cliff paths that run close to the cliff edge.

So look out for warning signs!

How will Climate change affect landslides?

Climate studies suggest that we are likely to experience hotter drier summers and wetter winters coupled with more severe storm events. These severe storms will generate very powerful waves that will readily scour beaches and the toes of vulnerable cliffs.

As sea water warms, thermal expansion will cause sea levels around the world to rise. Climate scientists are increasingly able to make measureable predictions.

The National Trust has adopted 10 principles defining how we will manage the coastlines in our care. Those that particularly apply to the issues surrounding coastal erosion are:

- The Trust accepts that the coast is dynamic and changing and will work with the natural processes of coastal erosion and accumulation wherever possible
- The Trust will plan in the context of projected sea level rise and will favour coastal realignment wherever this can reasonably be accommodated
- The Trust will only support interference with natural coastal processes where it believes there is an overriding benefit to society in social, economic or environmental terms

For further information please contact our West Dorset Office.

Telephone: 01297 561900.

E-mail: westdorset@nationaltrust.org.uk

If you require this information in alternative formats, please call 01985 843579, or email judy.smith@nationaltrust.org.uk

Living with a changing coast

Coastal landslips and rock falls:

Why do they occur?

The Upper Greensands of Black Ven turn a golden yellow when exposed to the air because they oxidise.



We may not like it but natural hazards are all around us and some can be pretty devastating...

In densely populated areas, a major landslide can cause loss of life and property on a massive scale. Fortunately we do not have such sites in England but we do have sites that are both intriguing and dangerous where the land frequently moves. **Just such a region exists near Lyme Regis** and it is known as 'Black Ven and the Spittles'. The word 'Ven' is an old English word for 'bog'. It is reputedly the largest mudslide in Europe and has been studied by Geologists for generations.

The youngest rocks here are the golden-coloured sandstones at the summit of the cliffs. They are approximately 100 million years old and are very soft and very permeable to water. Below these golden sandstones there is a thin layer of impermeable stiff blue clay known as Gault Clay.

The Geology is complex and in fact, there is not one but a series of landslide systems that are acting semi-independently of each other. The main focus of activity in recent years has been at the Spittles (lower, western end) of the site.

The area forms part of the **National Trust's Golden Cap Estate**. It also forms part of the highly acclaimed **East Devon and Dorset World Heritage site**.

Black Ven is also a **'Special Area of Conservation' (SAC)**. These are strictly protected sites designated under the EC Habitats Directive and in this instance it is because the vegetated sea cliffs are an important (and quite rare) type of habitat.

185 million years... the age of the oldest rocks at Black Ven

What are the characteristics of a landslide that are easily seen?

The most obvious feature are the stepped terraces. These are vegetated but separated by steep, bare slopes. Land will slip along lines of weakness known as 'shear planes'. Where a slip has occurred recently, the terrace below will be covered in loose debris and mud.

At beach level, the debris will spread out in a fan-shaped arc and much of it will be washed away by waves and storms. The muds and clays will disappear first, often leaving a 'fan' of harder boulders along the waters' edge.



The mud, shale and 'debris toe' of a recent landslide

1.8 metres per year... the average rate of cliff top loss in the past 60 years

Landslip areas may be spectacular but they are very dangerous. Ground movements will occur without warning, easily trapping the unwary walker.

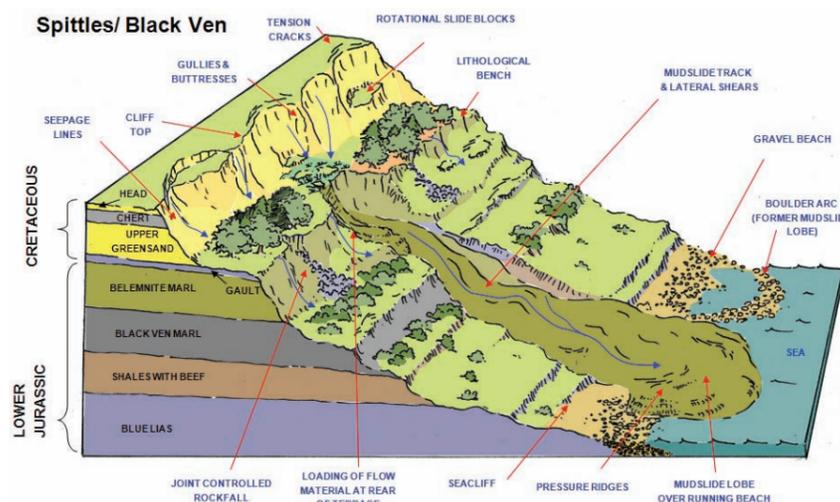
So why does land slip?

Short-term weather patterns include storms, heavy rains, frost, ice and drought conditions. They act together to affect the stability of the top soil. When these stresses occur alternately, water can penetrate cracks and travel deep below the surface.

Water will penetrate easily if the rocks are porous (such as chalks and sandstones). If a geological 'layer' is impervious (such as Clay), then rain water becomes trapped and creates a 'slip layer'.

Landslips occur when the stability of a sloping land mass fails. They can be triggered by many things including earthquakes, wave action (and quite commonly by sudden heavy rainfall) but local geology really determines whether the land is going to fail or not.

It is important to realise that this is an entirely natural process and the beauty of our coastline is sustained by allowing the process to continue largely unhindered.



What does 'Slumping' mean?

Often, the first signs that a movement is about to take place is when longitudinal cracks appear in the land surface. Then 'slumping' occurs (see opposite). A marked ridge or step is formed and it defines the boundary between the material that is 'on the move' and that which is still intact. Usually the 'slump' remains horizontal (although it may turn upwards slightly) and the overall effect is to create a series of earth steps or ledges.



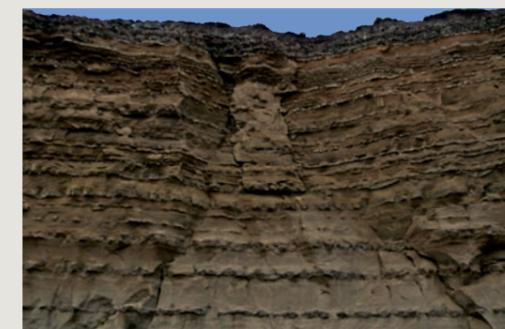
The destructive power of the sea

Waves crashing against a soft cliff will cause material from the bottom (or toe) of a cliff to be washed away. The undercutting of a soft sea cliff causes material further up the cliff to become unstable. As the angle of the inverted slope steepens, so it becomes more likely that the material above will slip.

In storm conditions, sand and sea spray combine to 'sandblast' the cliff face adding to the erosional force.

The problem has been made worse in some coastal locations where hard sea defences have interfered with the natural movement of sediments along the coast. This can result in beaches becoming depleted. Where the beaches once protected the neighbouring cliffs, they are now unable to do so because they have been starved of vital replenishing sediment.

The middle picture (right) shows a recent rock fall at Burton Beach in Dorset. The lower picture shows a dangerous section of cliff that has clear vertical faults in it and could collapse at any time.



A falling rock can reach speeds of up to 100 metres per second... that is about 224 miles per hour!! Each falling rock can weigh several tons
Playing on the ledges seems like good fun but it is very dangerous!