Erosion on Exmoor

Introduction

Exmoor National Park covers 693 km^2 (267sq miles) of unspoilt countryside in the South West of England. It contains rocky headlands, steep wooded ravines, plunging waterfalls and jumbled heaps of fallen rocks. Inland the hills are mostly over 300m (900ft) with Dunkery Beacon being the highest point at 519m (1704ft).

Exmoor is mostly made up of sedimentary Devonian rocks, including slates, grits and sandstones. About 350 million years ago they were the mud and sand of an ocean bed, which was forced up by a massive upheaval of the earth's crust. The strata (layers) were tilted and folded to form under pressure the mass rock which was to become Exmoor. The red sandstone which makes up most of Exmoor gives rise to well-drained soils while on the slates there are often wet and peaty soils.

Unconsolidated, surface deposits are widespread and of much more recent date. One of these relates to the last Ice Age when ice sheets were probably pressed against the west Somerset and North Devon coasts. Usually the ground would have been frozen but during times of thaw at least a surface layer melted and large quantities of frost-shattered rock fragments slid down-slope in a muddy matrix to form unsorted deposit on the lower valley sides. These deposits are known as 'head'. River-laid alluvium covers the floors of some valley bottoms while blown sand forms Braunton Burrows and peat is formed on some of the high moors (see Filex 4).

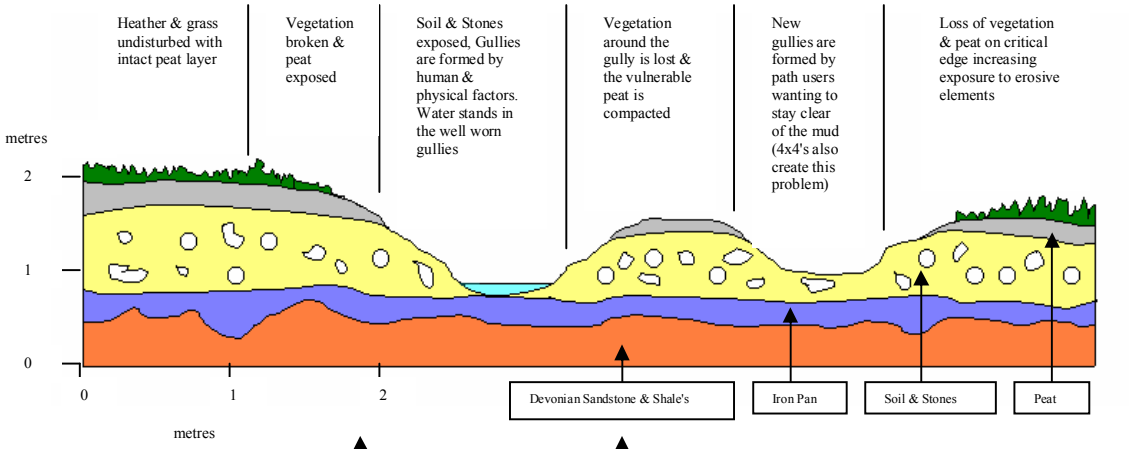
An aerial view of Heddons Mouth showing the steep combes typical of Exmoor © ENPA

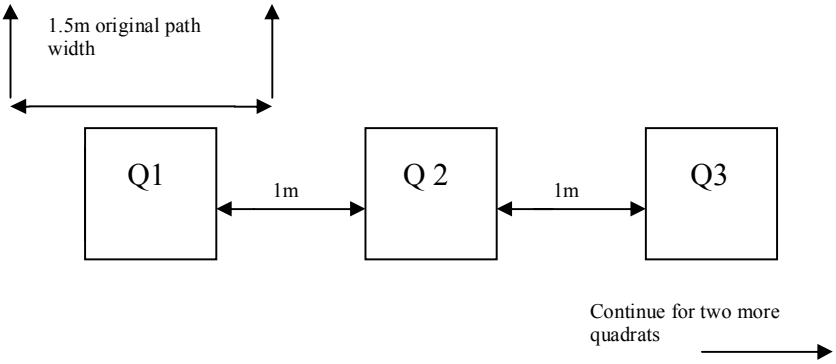
This combination of peat moorland, steep combes and loose surfaces means that Exmoor can be prone to erosion. It is the job of the Ranger and Field Services teams to identify areas most at risk and provide solutions to prevent irreparable damage occurring.

The Process of Path Erosion

A) When perfectly healthy vegetation is disturbed (usually trodden on) it gets damaged and dies - this can start with well established vegetation and ultimately ends in the soil beneath becoming bare and open to the elements
B) If the vegetation can not recover, the soil has no roots to bind it so gullies start to form, as a result of the wind, rain and human and animal movement.
C) These gullies become wider and wider as the vegetation around them starts to die or gets taken away by rain and visitor use - The paths now look bigger and encourages more and varied users which in turn also add to the overall erosion problem.
D) The soil and peat layer has been penetrated exposing rocks and stones that also get weathered and pulled out making the path rocky but also ensuring that no vegetation will grow back.
E) Water stands in the well-worn gullies forming muddy puddles encouraging people to use the sides of the path to avoid the tricky bits. This means that the trampled areas are widened creating a bigger path.

A Cross-section of an Eroded Path © ENPA





Methods of Assessing Path Erosion

1.Estimate the site and width of the original path.
2.Place a quadrat at the centre of the original path and estimate the percentage vegetation cover and percentage bare earth.
3.Take four more quadrat readings to one side only at one-metre intervals, each time moving further away from the centre of the path.

4. Then measure ten metres along the path and repeat the process. Continue to do this until you have surveyed five sites.
5. Put your results into a chart from which you can draw graphs to show your results.
At any point along the path you can carry out the following tasks - Count how many people are using the path in a 15 minute interval - measure the slope angle of the path.

Distance along the original path		Distance from the centre of the original path					Width of Path
		0 m	1 m	2 m	3 m	4 m	
0	% Veg						
	% Earth						
10	% Veg						
	% Earth						
20	% Veg						
	% Earth						
30	% Veg						
	% Earth						
40	% Veg						
	% Earth						

Shown is an example of a table you can record your results in.

To complete the path assessment you will need:
A Tape Measure
A Quadrat (a square frame)
A Pen and some Paper

Exmoor National Park has approximately 1000 kilometres of paths and walking, riding or cycling are popular activities enjoyed by many. Therefore path erosion is inevitable, particularly on the most popular routes and routes close to car parks and areas of population. In some places, this erosion is beginning to scar the landscape, affecting the habitats and our enjoyment of the moor. Erosion caused by natural and human impacts, are outlined below:

Natural Impacts

Because Exmoor is situated close to the coast of North Devon and Somerset, the high moor causes the warm, damp air from the Atlantic to rise, cool and drop its moisture. Annual precipitation (rain, snow and sleet) on the Chains (487m, 1600ft) is over 2000mm compared with 800mm to the east of the moor. May to September tend to be the drier months.

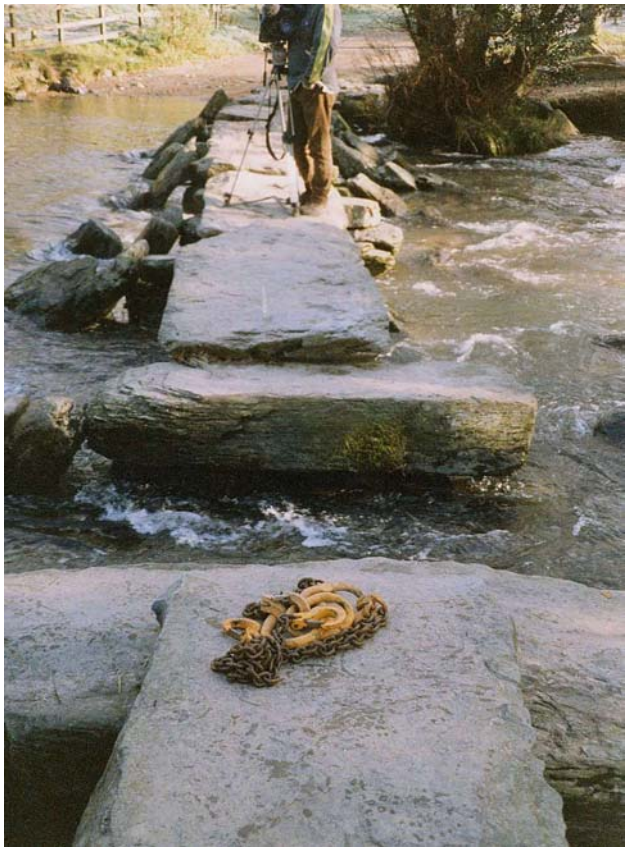
Erosion caused by excessive rainfall is a common problem on Exmoor. Torrential rain causes water to pour down hillsides turning footpaths and tracks into temporary streams. Topsoil is washed away leaving a dangerous surface of loose stones. Silt, pebbles and debris are washed into rivers and carried downstream eroding and undercutting banks causing paths to slip into the water. On the coast landslips are caused after high winds bring down trees. This loosens soil and heavy rainfall washes away both the soil and the trees.

Examples

Tarr Steps (SS 868 321)

Flooding of the river Barle in 2001 caused considerable damage to the path infrastructure in the area of Tarr Steps. Some of the main Tarr Steps clapper stones which had been washed away by the force of the river needed to be replaced. Retrieval and realignment of these was a major undertaking, and involved great skill from the team. In addition, substantial repairs were carried out to the main circular walk upstream of the bridge. This work involved pre-profiling some of the path edges, reworking the path using recycled river gravel and rebuilding a stone bridge.

The river Barle in flood washed away a stone from the Clapper bridge © ENPA



Watch your step! © ENPA

Compare the water level here with that in the flood picture © ENPA

Trentishoe Mill (SS635465)

Fast flowing streams, especially in flood conditions, can have rapid changes in their course and profile. Here a bridge has been cut off from the path. The solution was to construct a small causeway, rejoining the bank and bridge.

Streams and rivers can rapidly change course © ENPA

Solid blockwork can be a solution, although it runs the risk of being washed out © ENPA

Porlock Shingle Ridge (SS873477)

The shingle ridge across Porlock Bay is a natural formation, created as sea levels rose after the last ice age. The land behind has been reclaimed over the centuries as farmland, with tidal gates and diggers maintaining the ridge as a protective barrier.

A storm in 1996 combined with a high tide caused the ridge to be breached – an event that has occurred many times in the past. However, it was decided that the costs of repairing the ridge were too high, so the area has been left to revert to nature. The area is now turning into a tidal saltmarsh, which is an important habitat for many birds.

The south west coast path used to run along the back of the ridge – since the breach the footpath has been closed. This is an example of erosion that is impossible to repair and so the path becomes redundant. An alternative route along the back of the flooded area has now been created. **Due to the strong currents and high tidal range at the breach we do not recommend that you visit this site. For more information please contact us.**

Aerial view of Porlock Shingle Ridge 1995 (pre breach) © ENPA

Aerial view of Porlock Shingle Ridge 2000 (post breach). The brown area shows the extent of the flooding © ENPA

The area flooded on high tides © ENPA

Human Impacts

Nationally 1 in 4 households has a dog or dogs, which means there are at least 1,200 such households on Exmoor. Assuming the national average of 1.5 miles dog walking per household per day, an estimated 615,000 miles per annum would be walked by locals walking dogs. Nationally 16% of all walks undertaken are dog walks, 23% for shopping, 21% for walking to work or taking children to school and 20% for leisure. The average a person walks for these purposes is 189 miles per annum or 0.6 miles per walk. Given that many more Exmoor people than average walk to work, at a rough estimate 2 million miles per annum are walked on Exmoor by locals.

It is possible to estimate from the 1994 All Parks Visitor Survey that day visitors to Exmoor walk a total of about 790,000 miles per annum, although we do not know what proportions of their holiday visitors spend walking. If everyone who took a walk walked the same every day of their holidays the total would come to about 4.5 million miles per annum walked by tourists on Exmoor. However, from the All Parks Visitor Survey it appears that holiday visitors are much less active on average than day visitors. Only about a third of them are engaged in what can be described as a moderately active holiday. From that survey and others it can be estimated that the average walked by such visitors is about 3.5 miles per walk, making a total of 1,250,000 miles per annum walked by holiday visitors. Adding this to that walked by day visitors and the total comes to just over 2 million miles – similar to that walked by locals. This is only the amount walked by visitors for leisure – they will also walk for shopping and other activities and it is not known how much they walk for such purposes.

The condition survey of the South West Coast Path undertaken in 1999/2000 utilised new technology which, combined with the National Park Authority's Countryside Access Management System, should allow for monitoring of at least part of the network.

- *In 1999, of the 26.5km of off road sections of the South West Coast Path in the National Park, 96.5% was in good condition, on 2.1% there were seasonal problems and on 1.4% there were year round problems.* ***Source: South West Coast Path Management Survey***
- *In 1999, of the 956 metres of Coast Path identified as unsatisfactory, the majority of problems were due to natural causes or livestock. However, 108 metres were eroded by vehicles and 136 metres by heavy usage from walkers. Thus 0.5 % of off road sections of this relatively popular path was eroded by walkers.* ***Source: South West Coast Path Management Survey***
- *In 1995 a visitor survey was undertaken of the Coast Path. Estimates of annual numbers walking the path varied from 16,399 just outside of Combe Martin to 11,487 just outside of Minehead and 5,373 on Countisbury Common. In each case numbers were low compared with the average for sites of similar remoteness on the path elsewhere in the West Country.* ***Source: South West Coast Path Initiative***

The Exmoor Paths Partnership project (not currently in existence) surveyed footpath users on heavily used sections of path to assess what they thought of the condition of the

path. Responses were polarised between good and poor, reflecting the fact that many people did not recognise the signs of erosion. There was also a difference between perceived and actual damage and many walkers would tolerate a high level of erosion. In general few people recognised erosion unless they had previous experience of the path before it was eroded.

- *In 1997/8 visitors on eroded sections of footpath were questioned as to what condition they felt the path to be in. From a range between 'excellent' and 'very poor', 42.8% replied 'poor', 10.4% 'average' and 46.8% 'good'.* ***Source: Exmoor Paths Partnership 4th Progress Report***
- *In 1999 a survey of local users of Milham Lane in Dulverton showed 100% of users thinking the path to be in poor or very poor condition before remedial work and 100% thinking it to be in better condition after the work.* ***Source: Exmoor Paths Partnership 6th Progress Report***

Exmoor's Rights of Way are generally easy to use by the public. In the year 2000/1 82% was considered easy to use, an improvement of 4% in two years.

Trampling can have an effect on the environment even if it does not cause erosion. Small patches of rare plants have been destroyed by trampling or merely by people sitting on them whilst picnicking or camping. It could take only one person to destroy a rare plant but even in quite delicate habitats it may take several thousands to cause erosion. In between, there are likely to be changes to the habitat caused by the disappearance of sensitive plants and the appearance of ones resistant to trampling. In a similar manner many rare plants require poor soils and the excrement from visitors' dogs has been shown to result in the disappearance of some species along popular paths. The same has been shown for horse riding, where both the trampling and soil enrichment can be even greater.

Visitor activities in 1994:
Sightseeing 29%
Walking 23%
Visiting tourist attractions 18%
Nature watching 8%
Water related 2%
Cycling/riding 3%

Here are some examples of human erosion:

Off road vehicles/4 x4s/trail bikes

Ruts formed by vehicle use can form water channels that lead to increased run off and erosion. Soil compaction can also mean plant life struggles to regrow – trees can be lost if vehicles compact the soil across the root system.

Example

Bossington Lane (SS897481)

Before © ENPA

After © ENPA

Horses

Horse riding is one of the main forms of recreation on Exmoor. The use of Exmoor's extensive bridleway network varies depending on how close it is to a population centre, riding centre, the scenic value, weather conditions etc.

Example

Dunkery Beacon (SS895407)

Before – Note how the original line has become eroded so that large stones have become prominent. This has forced users to create a newer track below. © ENPA

After – the newer line has been made into the proper track. The old line has been scarified to encourage the heather and minimise the effects of compaction. © ENPA

Walking

Erosion due to walking can quickly become worse if not corrected. Walkers tend to go around mud rather than through it, so spreading the problem.

Example

Pinkery Pond (SS7224170)

Before – Walkers have formed a new path to avoid muddy puddle © ENPA

After – a raised walkway with drains makes the path useable. © ENPA

Cyclists

Small areas of Exmoor (especially near Minehead) have seen some localised damage from mountain bikes. The damage shown in the pictures is due to downhill bikes creating new routes. Loss of vegetation can lead to water run off and gullying. If not tackled early a major scar can form which can be difficult to repair. Piling brash across routes and erecting barriers can be effective in sealing off a route.

Mountain bikes are legally allowed on bridleways and RUPPs, where they do not add significantly to erosion caused by other users.

Before – A scar such as this can quickly develop into a serious erosion problem. © ENPA

After – Placing cut branches across the tracks
can be very effective in discouraging use © ENPA

Techniques used to rectify erosion

There are various ways of combating path erosion, the most obvious being to close the path to the public and let nature take its course until the path is vegetated again. This however is not practical as most paths are a right of way meaning that Exmoor National Park Authority can not close the path unless an alternative route is found which very often proves to be difficult. Therefore the paths have to be improved to stop any further erosion taking place.
The ways of improving paths are as follows:

- Drainage - very often this is enough to stop further serious erosion taking place, whilst maintaining the path in keeping with the rest of the area.
- Re-planting vegetation along side the edges of the path. The favoured vegetation is our strong, soil binding heather.

- Textile surfaces are often put along badly eroded areas of path with some form of hard aesthetically pleasing covering - the textile prevents further soil movement.
- The levelling of surfaces and filling in of holes and eroded parts, using silt and small stones.
- Large stones are placed as barricades to modes of transport that are not permitted along certain paths.
- The instillation of steps where a steep slope is will save the erosion of the slope.
- The introduction of wooden walkways over a particularly wet and boggy area is often needed. Stone and earth bridges/crossings that are made to look old and as natural as established as possible.
- Large stones are sometimes used on soft ground as a floating "raft" path.
- Widening of paths can take the pressure from a small surface area and allow drainage.

For more information on footpath repair techniques, see the excellent BTCV handbooks by clicking here.