Little Doward

Community Earth Heritage
CHAMPIONS
project

Introduction

Forming part of the Wye Valley Area of Outstanding Natural Beauty, Little Doward is a prominent landscape feature in south Herefordshire. The diverse underlying geology and historical management practices have created a wide variety of habitats and species on the hillside. A large area of the ancient semi-natural woodland is designated as a Site of Special Scientific Interest. Three rock bands form impressive crags on the hillside and there are a number of designated Local Geological Sites.

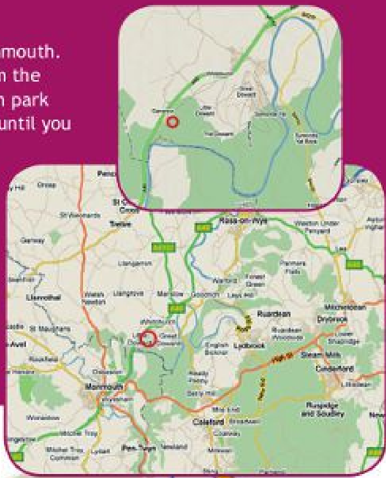
Additionally, there are many features of archaeological interest, including caves and a large Iron Age Hillfort.

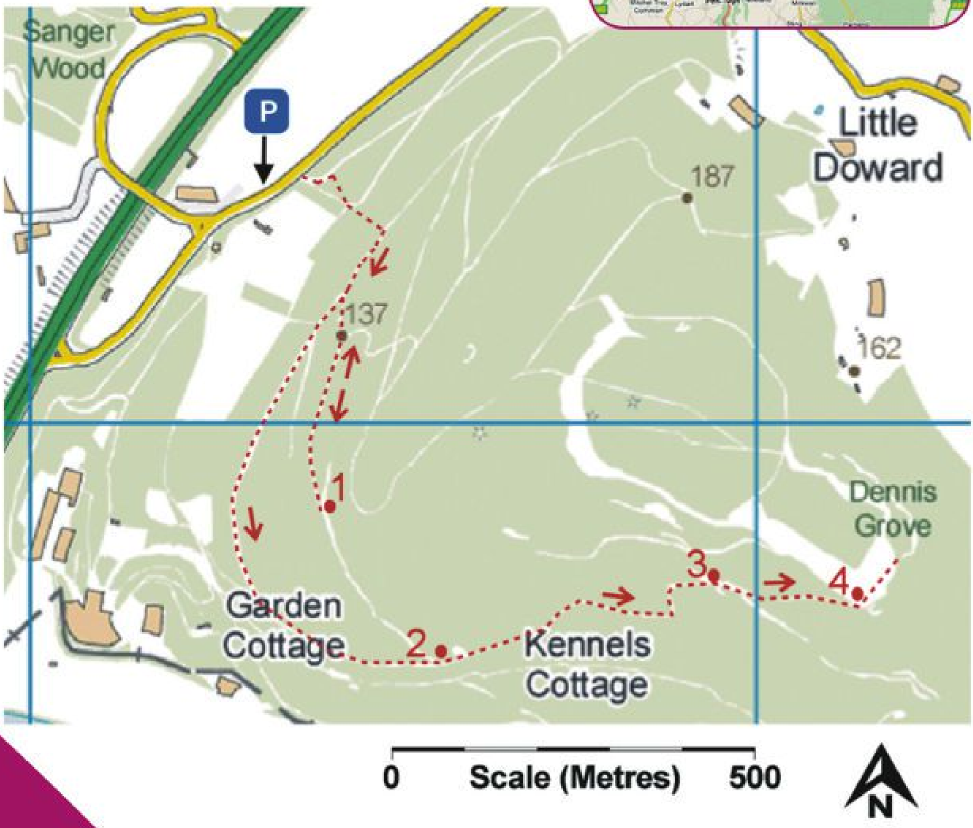
The route map opposite will help you explore the hillside. Directions to each point of interest are found in the relevant section of the leaflet. At each location there is brief information on the geology, biodiversity and archaeology of this important hillside.

▼
View down the Wye Valley towards Monmouth

Location of Little Doward

Little Doward is located just off the A40, 2½ miles north-east of Monmouth. From either direction, take the turning signposted for Ganarew. From the north, follow the road until you pass a junction on your left. You can park anywhere on your immediate right. From the south, follow the road until you reach a T-junction. Turn left and look for parking anywhere on the road. Just up the road on your right is a wide entrance leading to a gate, which marks the entrance to the Doward hillside. You may park here but please ensure that the gateway is kept clear as access is needed to the woodland at all times.





Key

- Parking
- Route
- 1 • Location of Interest

▲
Route map
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GEOLOGICAL HISTORY OF THE AREA

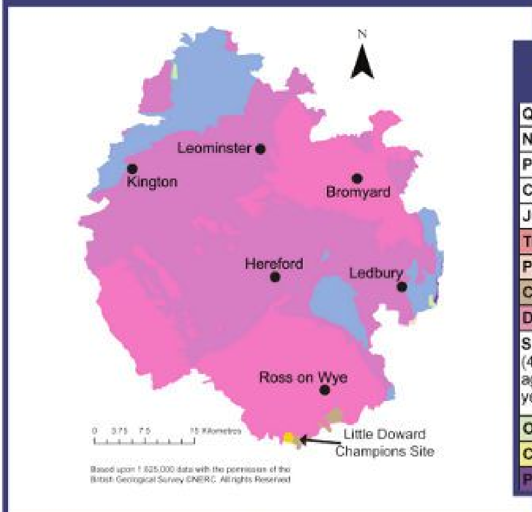
Nine geological systems are represented in Herefordshire:

1. Precambrian (4600 million years ago to 542 million years ago)
   - Igneous and metamorphic rocks making up the Malvern Hills, here they are approximately 680 million years old, and amongst the oldest in England.

2. Cambrian (542 million years ago to 488 million years ago)
   - Quartzite, sandstone and shale formed as the sea level began to rise; found in small areas adjacent to the Malvern Hills.

3. Ordovician (488 million years ago to 444 million years ago)
   - Shales deposited within a deep ocean environment; found in a small area near Pedwardine and west of the Malvern Hills, as well as igneous intrusions seen near Eastnor.

Geological Map of Herefordshire



Key to Geological Map of Herefordshire

Quaternary (2.6 million years ago to recent)	
Neogene (23 million years ago to 2.6 million years ago)	
Palaeogene (66 million years ago to 23 million years ago)	
Cretaceous (146 million years ago to 66 million years ago)	
Jurassic (199 million years ago to 146 million years ago)	
Triassic (251 million years ago to 199 million years ago)	
Permian (299 million years ago to 251 million years ago)	
Carboniferous (359 million years ago to 299 million years ago)	
Devonian (416 million years ago to 359 million years ago)	
Silurian (444 million years ago to 416 million years ago)	**Pridoli stage** (419 million years ago to 416 million years ago)
	Llandovery, Wenlock and Ludlow stages (444 million years ago to 419 million years ago)
Ordovician (488 million years ago to 444 million years ago)	
Cambrian (542 million years ago to 488 million years ago)	
Precambrian (4600 million years ago to 542 million years ago)	

4. Silurian (444 million years ago to 416 million years ago)
   a Pridoli stage (419 million years ago to 416 million years ago)
   - Mudstones, sandstones and calcretes (calcium-rich fossilised soil) deposited within a flat, arid landscape near the coast, crossed by seasonal streams.

   b Llandovery, Wenlock and Ludlow stages (444 million years ago to 419 million years ago)
   - Limestones and shales deposited in warm, shallow seas.

5. Devonian (416 million years ago to 359 million years ago)
   - Sandstones deposited by streams in an otherwise flat arid landscape.

6. Carboniferous (359 million years ago to 299 million years ago)
   - Thick beds of limestone on the southern margin of the county with very small amounts of coal measures around Howle Hill.

7. Permian (299 million years ago to 251 million years ago)
   - Red desert sandstones and breccias (sediments containing angular fragments) formed during catastrophic events such as flash floods or earthquakes. These rocks are found in a small area south of Ledbury. There is also a small igneous intrusion of this age near Bartestree.

8. Triassic (251 million years ago to 199 million years ago)
   - Siltstones and mudstones representing a change in environment from a flat, arid landscape covered in rivers and lakes, into oceanic conditions; found in a small area north of Malvern.

9. Quaternary (2.6 million years ago to recent)
   - Glacial deposits, river sands, gravels and alluvium, and chemical deposits such as tufa, overlying the hard rocks (but not shown on the geological map).

The Devonian Period and the Pridoli time of the Silurian make up a group of rocks known as the 'Old Red Sandstone' which covers most of the county. It gives the soils their characteristic red colour and in the centre of the county it reaches a thickness of up to 2000m. The other Silurian rocks give the overlying soils a grey colour.

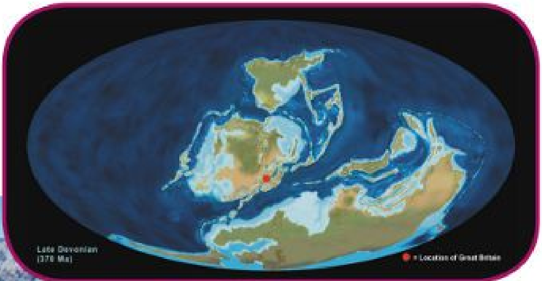
Geological History of Little Doward

The rocks seen on Little Doward were formed over a period of 50 million years of Earth's history, from a period of time known as the Devonian through to a period of time known as the Carboniferous. During this time the layout of the oceans and continents looked very different from today.

The Devonian Environment

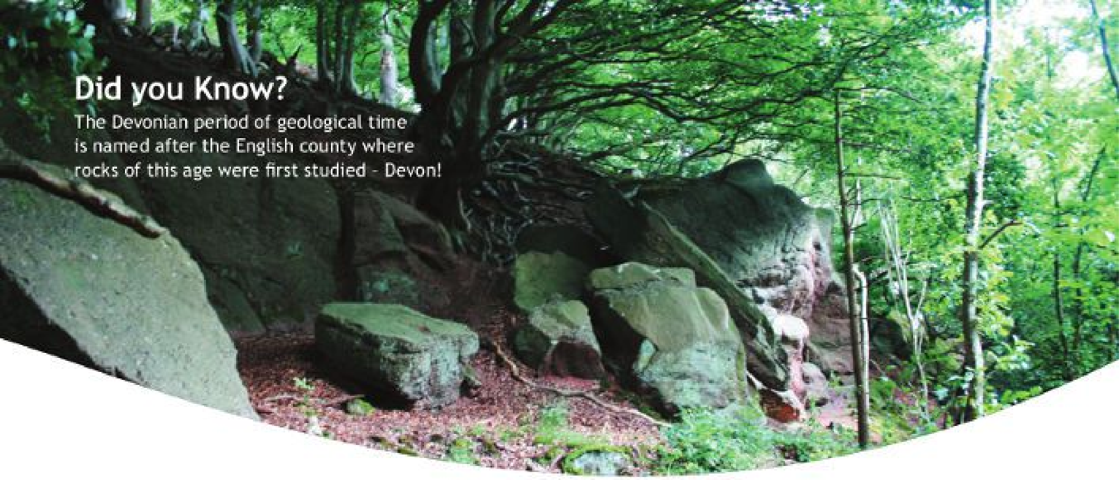
During the Devonian Period, which lasted from 416 to 359 million years ago, Britain was located some 15° south of the equator. It formed part of a newly created landmass called Laurussia, which had formed from the collision of the modern day landmasses of North America and Scandinavia. The environment was very hot and dry, with seasonal rivers criss-crossing the landscape.

The collision of ancient landmasses that formed this new continent created a large mountain chain to the west of the area. These mountains were eroded and huge amounts of sediment were transported by seasonal streams to the low-lying areas, resulting in the formation of thick layers of rock, which underlie much of the landscape of Herefordshire. These include the sandstones of the lower slopes of the hillside. Due to the presence of red iron oxide, these rocks are known as 'Old Red Sandstone'.



▲ Distribution of the continents during the Devonian © *Ron Blakey, Colorado Plateau Geosystems, Inc.*

Death Valley, California. Conditions like this existed in the area during Devonian times. © *Marli Miller, University of Oregon.*



Did you Know?

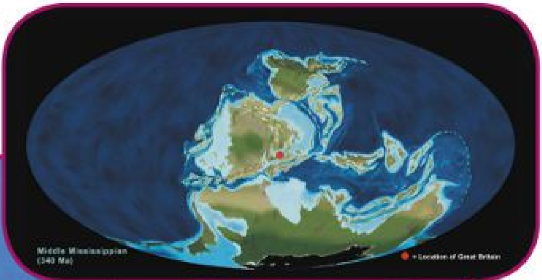
The Devonian period of geological time is named after the English county where rocks of this age were first studied – Devon!

The Carboniferous Environment

During the early part of the Carboniferous Period, which lasted from 359 to 299 million years ago, Laurussia had drifted northwards. Britain now lay just south of the equator. By now, the area had been flooded by a warm, shallow, sub-tropical sea which was full of life.

As the creatures that lived in this ancient sea died, their remains, including shells, fell to the floor. These shells helped to form calcium-rich sediments, which were compacted over a long period of time, eventually forming the limestones that can be seen towards the top of the hillside.

Distribution of the continents during the Carboniferous ▶
© Ron Blakey, Colorado Plateau Geosystems, Inc.



Reconstruction of the Carboniferous Sea
Image courtesy of John Watson
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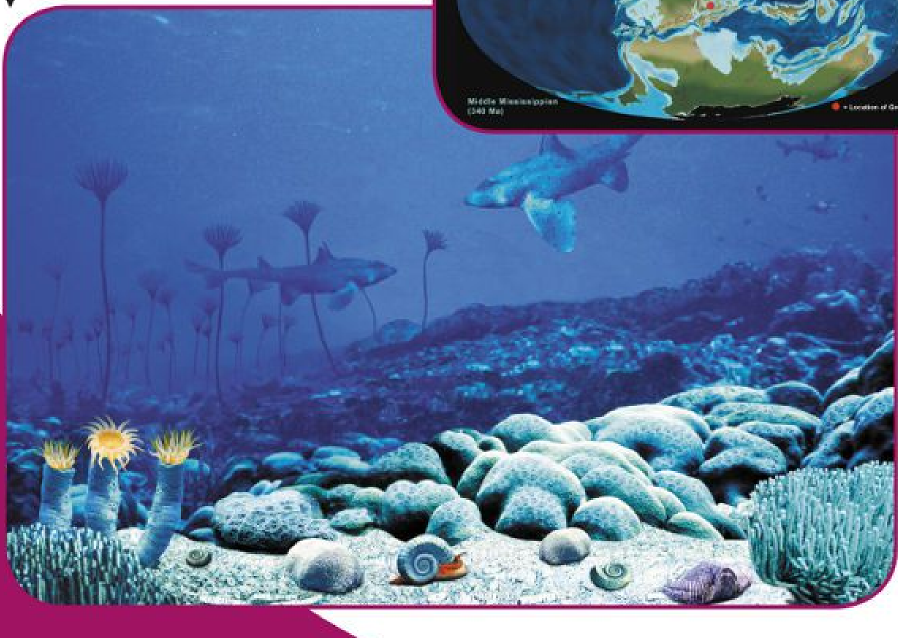


Location One: Quartz Conglomerate Cliff

Directions

From the entrance, follow the trackway for around 10 metres. Take the footpath on the right which goes up into the wood and follow it up the hill until the path forks. Take the left hand fork, continuing uphill until you reach a trackway. Turn right and follow the trackway, going through the gate in front of you. Immediately to your left are two footpaths. Take the right hand path (nearest the trackway) and follow it uphill until you meet the cliff.

Geology

The cliff face is made out of a sedimentary rock called conglomerate, which formed during the Devonian Period. The name conglomerate means that the rock is mixture of different sized pebbles, held together by a finer material, in this case a red sand. The rock formed as flash floods swept across the arid landscape that existed here at the time, dropping the water-borne material so quickly that it was not sorted by size. Most of the water-rounded pebbles that you can see are made of a milky or glassy mineral called quartz; hence the name of the rock, quartz conglomerate.

During times of flood, torrents of water carried huge amounts of material and eroded the underlying surface. As the floodwaters subsided, large pebbles were laid down, followed by smaller sized pebbles. This was due to the smaller volume of water and slower waterflow being less able to carry larger pieces of rock. On top of the layers of largely rounded pebbles, you can often see progressively smaller sand-sized particles. Sometimes these sequences are capped by layers of mud and clay. The sand and mud layers were laid down as the floodwaters continued to subside. These layers are more easily eroded and may form clefts in the rock face. Cycles of these layers can be seen in the cliff face, showing where one flood event finished and another one started.

▼ Flood events in rock face

◄ Quartz Conglomerate cliff

Did you know?

Conglomerate is sometimes known as 'Pudding Stone'

Biodiversity

The site is shaded by large trees including beech, oak and yew, some of which overhang the cliff face. The deep leaf litter from the surrounding beech trees and the lack of light results in a rather sparse ground flora that consists of scattered ferns such as male fern and broad buckler fern, alongside bramble, nettle and false brome. Mosses are locally-frequent on the woodland floor. The rock faces themselves are largely devoid of plants except for some overhanging ivy and rarely navelwort. A badger sett can be seen below the cliff face.

Archaeology

The hillside around you was formerly common land. In 1833, after the land was enclosed, Richard Blakemore, an MP and industrialist from South Wales, started constructing a picturesque, designed landscape on Little Doward, utilising the existing landscape and constructing paths, carriage rides, follies and points of interest. His paths often followed the base or the top of many of the crags on the hillside, in order to emphasise the scale of the geology and induce awe in the visitor. At this location, constructed paths run above and below the line of the cliff face. In places, the path is built on a dry stone revetment. On the path above the cliff face, two rusting cast iron gate posts are reminders of the efforts Blakemore went to in order to construct his picturesque landscape.

▲ Yew Tree overhanging cliff

▼ Terraced path running parallel to cliff face.

◄ Rusting cast iron gates on upper path

Location Two: Tintern Sandstone Quarry

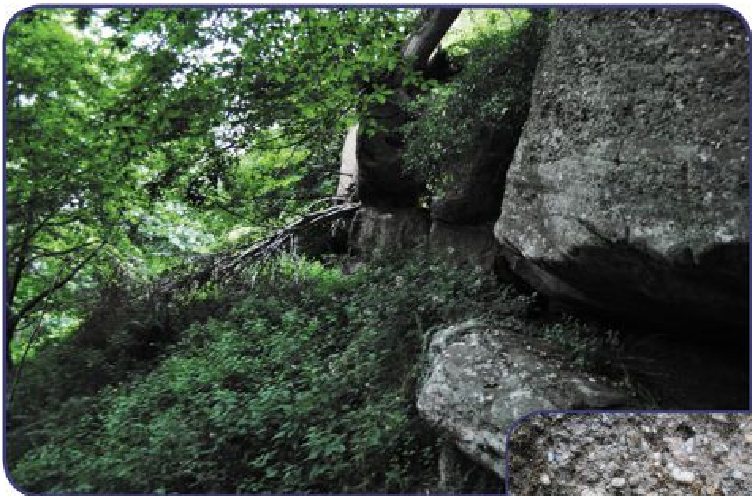
Directions

From Location One, retrace your route down to the trackway by the gate and stone wall. Do not go through the gate, but turn left and follow the track downhill. After a while the trackway rises again. Continue until the cliff face meets the track.

Geology

The rock face here is a continuation of the cliff exposure seen at Location One. Just around the corner from the crags of Quartz Conglomerate is an old quarry. Look closely at the rocks exposed. The left side of the quarry shows the Quartz Conglomerate with its quartz pebbles. To the right, however, the rock is completely different. This is a sandstone - the Tintern Sandstone.

At the time of writing, the actual junction between the Quartz Conglomerate and Tintern Sandstone cannot be seen, but is hidden beneath the soil. Whilst the Quartz Conglomerate formed during flash floods crossing an otherwise arid and dry landscape, the Tintern Sandstone formed from the finer material carried by a more gently flowing, albeit occasionally-flooding, river which criss-crossed the landscape - climate change in action!



◄ Quartz Conglomerate cliff meets the track

▼ Close-up of Quartz Conglomerate

◄ Close-up of Tintern Sandstone

Biodiversity

The quarry is shaded by trees including sweet chestnut, holly and a single large small-leaved lime that overhangs the rock face. Although supporting a number of lichens and mosses, the rock face is largely devoid of plants except for the occasional wood sage and navelwort. The woodland vegetation of the general area and between these outcrops includes occasionally-frequent false brome, bramble, bracken, soft shield fern and wood melick.

Archaeology

Historic mapping shows the sandstone quarry as being an 'old quarry' in 1890, when the first Ordnance Survey maps were produced. This indicates that working of the site was probably completed by the middle of the 19th century. The quarry was most likely worked for building stone, either before or during the creation of Richard Blakemore's designed landscape.

▲ Cliff face partially covered by lichen

▶ Contact between conglomerate and sandstone hidden beneath soil in the quarry

LOCATION THREE: LOWER DOLOMITE CLIFF

Directions

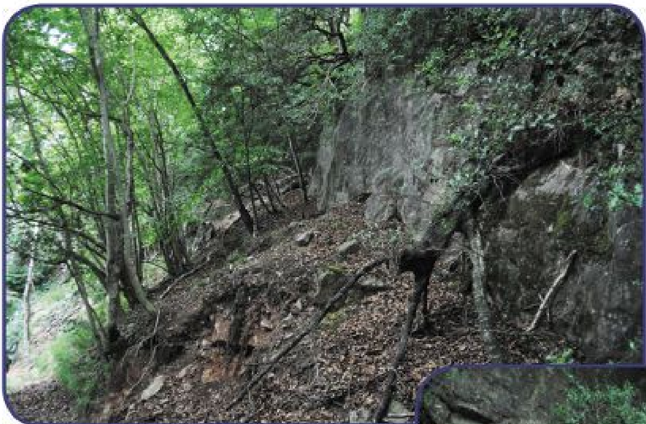
From Location Two, follow the trackway as it rises uphill. Where the track forks, take the left-hand path, carrying on up the hill. Follow the track as it winds left and right until you reach another cliff.

Geology

The rocks at this exposure are younger in age than the rocks seen at Locations One and Two. They formed during the Carboniferous Period, some 350 million years ago.

The rock seen before the point where the cliff line meets the track is a limestone. Limestones are rocks that are primarily composed of the mineral calcite and may be biological in origin, or the result of the precipitation of calcite from seawater or freshwater. Typically, they are formed from the shell fragments of millions of dead sea creatures which were deposited on the floor of a warm, shallow sea. Over a long period of time, these shell fragments and precipitations of calcite accumulate on the sea floor. As successive layers form, those underneath become buried and compacted. Here they eventually formed the spectacular limestone cliffs we can see today.

Within the lower layers of rock you might find fossils such as crinoids and brachiopods. Uphill, where the sheer rock face marks the edge of the track, fewer fossils can be found. This is because most of the rock here has been altered to a dolomite. This is a type of limestone where the calcium in the mineral calcite has been partially replaced by magnesium. This process can occur as the sediment is being compacted to form rock and often destroys any fossils that may have been present. However a few shell fragments can be found if you look closely enough.



▲ Exposure running into woodland with 19th century footpath at base

▶ Dolomite cliff face

Biodiversity

The site is located on steep ground within an area of ancient semi-natural broadleaved woodland. The rock face is shaded by a number of large beech and occasional yew trees. The sparse ground flora beneath includes locally-frequent false brome and the occasional wild madder, hart's-tongue fern, ivy and wood melick. Mosses can be seen on the rock face.

Archaeology

Below the cliff face is a narrow terrace that appears to be constructed of stone to create a roughly level route. The terrace runs up the slope below the cliff and carries on beyond the end of the rock exposure, linking up with a path further up the hillside. This route is likely to have been another of the many pedestrian routes in the Richard Blakemore designed landscape that would have been enjoyed by the 19th century visitors to the park.

Above the cliff is another terrace, with a dry stone wall constructed on its northern edge. This wall is part of the structure that defines the southern side of the area occupied by the Iron Age Hillfort that sits atop the hill. The wall itself is another 19th century feature.

▲
Hart's-tongue fern

►
Dry stone wall next to upper terrace

Location Four: Limestone Pavement

Directions

From Location Three follow the trackway uphill until you reach another cliff face. There are some features of interest here.

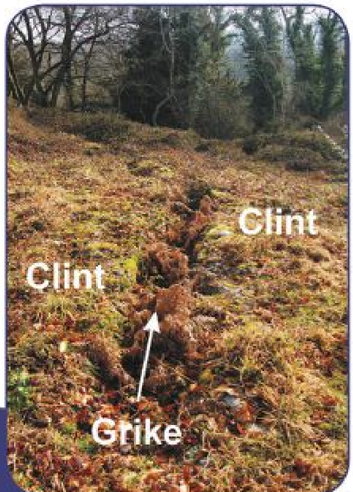
To reach the limestone pavement, continue along the trackway past the cliffs until you exit the rock cutting. Immediately turn left; the ground in front of you is where the limestone pavement can be found.

Geology

The rock seen making up the cliff here is another limestone. It shows that the warm, shallow sea continued to exist throughout the early times of the Carboniferous Period. The presence of vertical cracks in the rock, caused by stresses to which the rock was subjected after it formed, has helped to create a rare geological feature on top of the cliffs - a limestone pavement.

Limestone pavements can only form where there are relatively flat layers of limestone at the surface, covering a fairly wide area (in this case most of the top of the hill). The formation of the limestone pavement began during the last Ice Age. As ice sheets up to 1km thick carved their way across the landscape, they removed the overlying layers of soil and rock, smoothing out the top of the limestone. Since then, water has exploited the existing vertical cracks within the limestone, enlarging them and forming the limestone pavement. The fissures that have formed are called grikes (or grykes), whilst the limestone blocks that separate them are termed clints.

▲ Vertical crack in rock face



▲ Clints and grike on hilltop

Did you know?

There are very few areas of limestone pavement in the world; however the UK and Ireland have a large proportion. The Little Doward limestone pavement is also one of only a handful in southern England - most of the pavements occur in the north, making this an even more special feature!

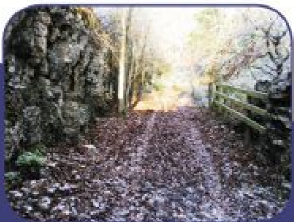
Biodiversity

The habitats that occur at this location are of particular significance, chiefly the potential for limestone pavement flora. The composition consists largely of bracken and bramble as well as woodland plants including dog's mercury, wood spurge, wood sage and false brome, but also includes several plants of limestone grassland including wild basil, common gromwell, wild strawberry, lady's bedstraw, marjoram and meadow saffron. There are also two beech trees and a small area of blackthorn located close to the cliff edge.

The cliff face itself is largely clear of vegetation, apart from several places where it is overhung with ivy or small pockets of grasses including wood meadow-grass and wood melick, which colonise narrow ledges and cracks. Of note on the rock face is a whitebeam, one of a few very rare species that have been found in this area.

▶ Meadow Saffron

Whitebeam ▼



◀ Carriage ride below cliffs

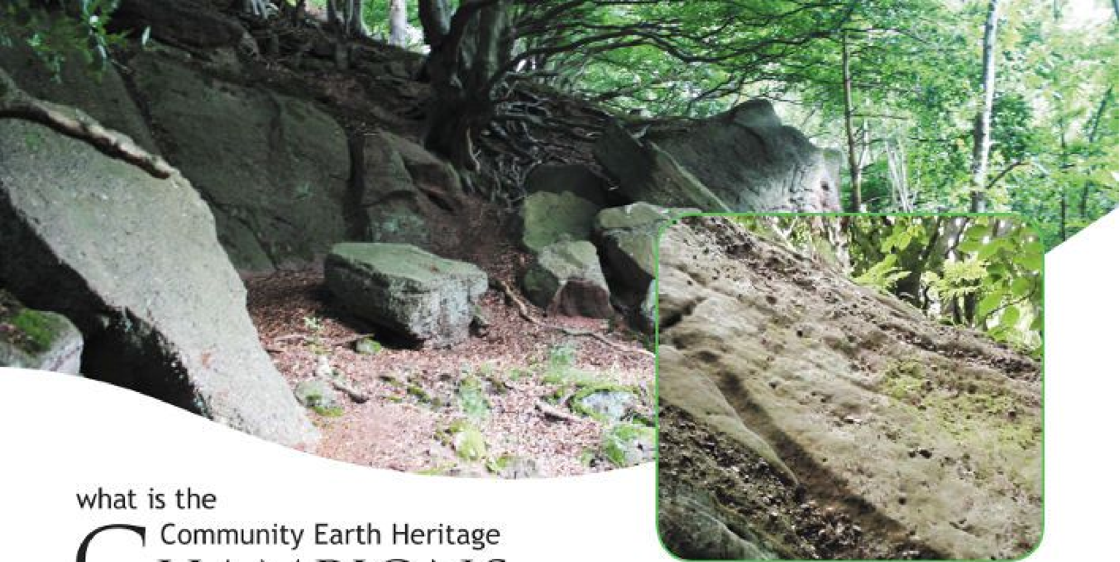
Archaeology

The limestone pavement and underlying cliffs form part of the south east corner of Little Doward Camp, an Iron Age Hillfort. This particular area of the Camp is called the annexe area. The edge of the annexe is defined on three sides by the vertical limestone cliffs. This would have made the Camp easy to defend. There are a number of flattened areas on top of the cliffs which are around 5-10 metres wide and 10-15 metres long. They are believed to have been platforms for Iron Age buildings. Evidence for this includes the recording of post holes during excavations on the hilltop.

At the north end of the site, a wide grass track marks the route of a former carriage ride, one of many that were built in the 19th century as part of the landscaping of the deer park. The track continues down the hill through the cutting in the cliffs. To the east of the track further down the hill, a two metre high dry stone wall is present, believed to have been completed in the 1850s. This wall would have formed part of the landscaped enclosure of the deer park. Towards the southern end of the site, drill holes associated with the blasting of the rock to form the carriage ride, are visible in the cutting through the cliffs.

Where the carriage ride leaves the cutting and turns downhill, another path ascends the hill, following the cliff line. Visitors in the 19th century would have toured the parkland alighting at points along the route such as this and walked along the paths, admiring the views.

▶ Platform for Iron Age buildings



what is the Community Earth Heritage CHAMPIONS project?

The Community Earth Heritage Champions Project, funded by the Heritage Lottery Fund, and Natural England through Defra's Aggregates Levy Sustainability Fund, has involved communities across Herefordshire and Worcestershire.

Each of the nineteen geological sites chosen for the project has a Champions community group carrying out conservation work, promoting the use of the site to other people in their parish and monitoring the site for any changes in condition.

The idea of the project is to take a holistic view of the environment and to understand the relationships between geology, ecology and archaeology.

The Champions have received training in a number of subjects in order to understand the features observed at their site; knowledge which they will now pass on to new volunteers. The conservation work being undertaken will help to ensure the protection of these important features and enable people to enjoy the natural world for years to come.

Community Conservation Champions

LOTTERY FUNDED

Herefordshire & Worcestershire EARTH HERITAGE TRUST

WOODLAND TRUST

For more information about the project, or any aspect of the work carried out by the Herefordshire and Worcestershire Earth Heritage Trust, please contact us at:

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